Ward-Based Care of Patients Following Discharge from Critical Care: A Mixed Methods Study.

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Abstract

Background

Historically, critical care research and policy focused on survival to intensive care unit (ICU) discharge. However, as critical care innovation has progressed, emphasis has shifted to the quality of survival beyond ICU discharge. There is significant focus on the long-term rehabilitation needs of patients who have required critical care, but very little evidence exists about the period between ICU and hospital discharge. Care during this time should be focused on recovery and rehabilitation, crucial in limiting the long-term morbidity associated with critical illness. Every year in the UK approximately 163,000 patients are admitted to an ICU. Despite patients being assessed as ready for discharge from ICU, having either recovered from the acute phase of critical illness or transitioned to end-of-life care, over 8,000 of the 139,000 discharged to a ward die before hospital discharge.

Design

This study aimed to explore the post-ICU in-hospital care period, answering the research question: What challenges and problems in care exist in the management of post-ICU ward patients? A convergent parallel exploratory mixed methods design was selected, integrating two methods: retrospective case record review (RCRR), including initial overview reviews and further in-depth analysis of the records of patients who death was judged probably avoidable, and survivors; and semi-structured interviews. The paper and electronic medical records of 300 patients discharged across three UK ICUs and who subsequently died before hospital discharge were reviewed using an established RCRR methodology. For twenty patients who died their death was judged as probably avoidable and subject to further in-depth review, together with the records of twenty survivors, for comparison. The 40 in-depth reviews examined problems in care delivery and underlying contributory human factors. In parallel, patients (n= 18), family members (n= 8) and staff (n= 30) (total n=56) were interviewed about their experiences of post-ICU ward care, with the aim of identifying challenges in care delivery and potential improvements.

Results

Primary data were integrated to develop an interdependent multi-layered description of post-ICU ward care, identifying challenges to care delivery at the patient, ward and organisational level. At the patient level, data were combined which revealed a clear picture of post-ICU patients as dependent, vulnerable and complex, contributing to the concept of post-ICU patients as *other* than general ward patients – having different care needs. These differences posed challenges to care delivery due to the constraints of workload, skill mix and leadership which were identified at the ward level and emphasised the *otherness* of post-ICU ward patients. Overarching characteristics at the organisational level, such as limitations in out-of-hours care provision, training and resources constrained the ability of the ward to meet the high demands of this complex group of patients. The characteristics identified at each level had the potential to impede continuity of care between ICU and the ward which had a profound impact on both patients and staff resulting in fear and anxiety. Critical Care Outreach Teams were identified as having a key role in supporting wards to manage patients transferred from ICU, although competing priorities can lead to limited capacity to offer comprehensive follow-up of post-ICU patients.

Conclusion

This study has critically examined the challenges faced by patients and staff following transfer from ICU to the ward. Post-ICU patients were demonstrated to be perceived as *other* than, or somehow different from, general ward patients, with the current system of care struggling to meet their needs. The findings of this study will inform the development of a complex intervention to improve care delivery for this complex, vulnerable patient cohort. This study was conducted prior to the 2020 COVID-19 pandemic, but offers insight into the current challenges in managing the significant increase in patients being discharged from ICU.

Glossary

Acuity	Level of severity of illness
Acute kidney injury	Acute kidney injury identified by a combination of blood results and physiological measurements
Albumin	Blood result: Protein in blood, commonly low after critical illness
APACHE II	Acute Physiology and Chronic Health Evaluation – a measure of the severity of illness of patients on admission to ICU
Arterial blood gas	A blood test, taken from the artery, measuring lung function and blood acidity
Atrial Fibrillation	An irregular and often abnormally fast heart rate
Base excess	Indicates the amount of acid or alkali needed to return blood to a normal pH
Bowel obstruction	A mechanical or functional obstruction of the small or large intestines
Case Report Form (CRF)	Document for data collection
CCOT	Critical Care Outreach Team – a nurse-led team offering specialist critical care skills outside of ICU
Ceiling of treatment	See treatment limitations
CFS	Clinical Frailty Score – a measure of frailty prior to hospital admission
Consultant	A senior hospital-based doctor who has completed foundation and specialist training
COPD	Chronic Obstructive Pulmonary Disease
Creatinine	Blood result: measure of renal function
CRP	C-reactive protein. Blood result: marker of inflammation
CT scan	Computerised tomography scan – cross-sectional x-ray imaging of the body
Delirium	Confusion or emotional disruption, common following critical illness
Deprivation of Liberty Safeguards (DOLS)	Provides protection for vulnerable people who lack capacity to consent for treatment
DNACPR	Do Not Attempt Cardio-Pulmonary Resuscitation
Electrocardiogram	A measurement of electrical activity in the heart
Enteral Nutrition	Any nutrition delivered into the stomach, used in this thesis to indicate liquid feed given through a tube inserted into the stomach through the nose
EWS	Early Warning Score: a scoring system for vital signs observations, with a high score indicating clinical deterioration
Extubation	Removal of a breathing tube following mechanical ventilation
Fibrinogen	Part of the normal clotting process – a low fibrinogen value indicates a risk of bleeding
Fluid overloaded	An excess of fluid in the circulatory system, which may causing swelling of the limbs, high blood pressure or breathing difficulties
Frusemide (furosemide)	A diuretic often used to treat fluid overload
FY1	First year of a two-year foundation training programme for doctors who have graduated from medical school
FY2	Second year of a two-year foundation training programme for doctors who have graduated from medical school

Haemoglobin	Blood result: protein in red blood cells, indicates need for blood transfusion at low levels
High flow oxygen	Warmed and humidified high levels of oxygen
ICNARC	Intensive Care National Audit and Research Centre
ICU	Intensive Care Unit
Inflammatory markers	Blood results: indicate inflammation, raised results may be a sign of infection
Intravenous	A catheter, injection or infusion of fluid into the vein.
Intubate	Inserting a breathing tube into the bronchus to allow attachment to a ventilator
Ischaemic bowel	Occurs when blood flow to the bowel is reduced – resulting in tissue damage
Lactate	A high value may indicate reduced blood flow to vital organs due to low blood volume or sepsis
LOS	Length of stay
Magnesium	An electrolyte affected by refeeding syndrome
Medical support worker	A healthcare professional who does not necessarily have nursing or medical training
Multidisciplinary team	A team of clinical professionals, such as nurses, physiotherapists, doctors, dieticians, pharmacists, etc.
NEMS	Nine Equivalents of Nursing Manpower Use Score: Measure of nursing workload specific to ICU
NG tube	Nasogastric tube to allow feeding and drainage of stomach contents
Non-invasive ventilation	Assistance with breathing delivered through a tight face mask rather than a breathing tube into the lungs
Nutrition support team	Multi-professional team dedicated to assessing and facilitating nutrition management, consisting of a combination of dietician, pharmacist, doctors and specialist nurses
Observations	Measurements of vital signs such as heart rate, blood pressure, breathing rate, temperature and level of oxygen in the blood
Oedema	Swelling of tissues due to fluid overload
Outlier	A patient on a ward which does not specialise in their primary medical problem.
Pabrinex	Intravenous vitamins often given following a period of malnutrition
PaCO2	Partial pressure of carbon dioxide – a measure of respiratory and metabolic function
Peri-operative medical team	A team of doctors focused on managing complex medical problems occurring in surgical patients
Platelet count	Part of the normal clotting process. A low platelet value indicates a risk of bleeding
Pneumonia	Inflammation in the lung(s) usually caused by infection
Potassium	An electrolyte affected by refeeding syndrome. High or low levels may cause abnormal heart rates or rhythms
Pulmonary embolism	A blood clot in the lungs
RCRR	Retrospective Case Record Review
Refeeding syndrome	Abnormal shifts in fluid and electrolytes occurring when nutrition in restarted after a period of severe malnourishment

(Specialist) Registrar	A doctor who has completed foundation training, prior to becoming a consultant
Sepsis	A potentially life-threatening reaction to infection
SHO	Previous term for newly qualified doctors, sometimes still used – equivalent to FY2
Side room	A single room on a ward, sometime used for patients who require isolation due to, or to prevent, an infection
Specialist nurse	A nurse, usually working across several wards, offering advice and support in a clinical speciality such as diabetes or respiratory medicine
Structured Judgement Review	Method for conducting retrospective case record reviews
Step-down	Moving from ICU level care to ward-based care
TISS	Therapeutic Intervention Scoring System: Measure of nursing workload specific to ICU
Total Parenteral Nutrition (TPN)	Nutrition delivered through a catheter directly into a vein, bypassing the gastrointestinal tract
Tracheostomy	Artificial airway sometimes needed to allow ventilation in intensive care
Treatment limitations	A decision to limit escalation beyond a defined point, usually due to an assessment that this would not be in the patient's best interests or against their wishes
Wardable	Physiologically ready to be transferred from ICU to a ward

Chapter One: Introduction

1.1 Background

The term critical care encompasses services managing patients with life-threatening illnesses, usually within an intensive care unit (ICU) (FICM, 2019). Historically, critical care research and policy have focused on survival to ICU discharge. However, as critical care innovation has progressed, emphasis has shifted to the quality of survival beyond ICU, termed the 'third revolution' in critical care (Iwashyna & Speelmon, 2016). There has therefore been a significant increase in focus for both policy and research in improving the long-term survival and quality of life of post-ICU patients (Bein, Bienvenu, & Hopkins, 2019; FICM, 2019; Hatch et al., 2018; National Institute for Health and Care Excellence, 2009). Every year in the UK around 163,000 patients are admitted to an ICU. Of these, 23,000 (14%) do not survive their initial ICU admission. Despite being assessed as ready for discharge from ICU, usually indicating they have recovered from their initial critical illness, over 8,000 of the 140,000 patients transferred to a ward die before leaving hospital (ICNARC, 2019). Mortality following ICU discharge was recognised as a problem as early as the 1980s (Rubins & Moskowitz, 1988), but despite the burgeoning interest in the long-term effects of critical illness, very little is known about what factors contribute to these post-ICU in-hospital deaths. It is recognised that some patients are discharged from ICU with an end-of-life care plan but there is little evidence indicating what proportion of post-ICU in-hospital deaths are expected (Coombs et al., 2016; Pattison et al., 2015; Santamaria et al., 2015).

Although this study originated from a focus on post-ICU mortality, care following transfer to the ward also has a significant effect on morbidity. The physical effects of critical illness can be profound and prolonged, commonly persisting beyond ICU discharge (Inoue et al., 2019; Rawal et al., 2017). NICE clinical guidelines emphasise the importance of ensuring continuity of care and rehabilitation once patients are moved from intensive care to general wards (National Institute for Health and Care Excellence, 2007, 2009, 2017). This is recognised as particularly important for patients at risk of morbidity associated with critical illness.

Recently published Guidelines for Intensive Care Provision (GPICS) advocate visits from Critical Care Outreach Teams (CCOT) following discharge from ICU, to support continuity of quality care (FICM, 2019). The role of CCOTs in supporting post-ICU care has been described in the literature, particularly in Australia where this may be delivered as a separate Liaison Nurse service (Chaboyer et al., 2004; Chaboyer et al. 2005; Green & Edmonds, 2004). However, the impact of these services on patient outcome has not been clearly established (Endacott et al.,2009; Österlind et al., 2020; Tabanejad et al., 2014). Recent initiatives aiming to reduce in-hospital mortality have focused on detecting acute deteriorations, but none are specific to post-ICU ward care (Daniels et al., 2011; Royal College of Physicians, 2017a; Solomon et al., 2016). A sequence of reports investigating the care of critically ill patients on general wards (although not focused on patients who have been in ICU) suggest changes in ward care could lead to improvements in outcome (Department of Health, 2013; Keogh, 2013; NCEPOD, 2005, 2011, 2012, 2014; Royal College of Surgeons, 2011). As little attention has focused on the delivery of care following ICU discharge it is unclear whether such changes would improve outcomes in this group. Despite this lack of focus on post-ICU ward care, patients and family members have emphasised this as an important area for research. The James Lind Alliance identified physical rehabilitation following ICU discharge as one of the top ten priorities for critical care research (James Lind Alliance, 2014). During consultation with patients and family members through the course of this study, as part of PPI engagement for the study, it is clear that post-ICU ward is an important area to focus improvement. Therefore, this study aimed to explore post-ICU ward care, with the intention of informing future practice change to improve post-ICU outcome.

This study was conducted prior to the current COVID-19 pandemic. However, due to the significant increase in patients admitted to ICU due to the outbreak with a very high severity of illness, and associated prolonged recovery, the results of this study will be highly relevant to the ongoing response to the pandemic. The implications for practice in relation to COVID-19 will be discussed in Chapter Eight.

1.2 Context of this Doctorate

The work described in this thesis was part of a larger study, Recovery Following Intensive Care Treatment (REFLECT), funded by the NIHR Research for Patient Benefit funding stream (grant reference PG-0215-36149). The primary research reported here was conducted with the intention of informing the future development of an intervention to improve outcomes in this group of patients. Due to the timeframe imposed by the funding, three researchers collected data for this study. The implications of multiple researchers for this thesis will be discussed throughout.

1.3 My Position as Clinician and Researcher

I have a clinical background in ICU and medical ward nursing. In recent years I have worked as a researcher within the Critical Care Research Group at the University of Oxford. During my role I have worked on research studies exploring the use of ambulatory monitoring systems to detect changes in vital signs and identify clinical deteriorations. I have observed post-ICU ward care in the clinical settings where my research role was based, through my contact with staff and patients recruited to these studies. Within this role I have developed an interest in detecting and managing deterioration in acutely ill ward patients. This interest, combined with my ICU background led me to explore post-ICU ward management. My position within the research group allowed me to develop this interest into both a doctorate and an NIHR-funded research project. Although Associate Professor Watkinson is the Principal Investigator for this grant, I have driven the development and design of this project and led the study. This dissertation reports the exploratory data collection for the funded study.

Within the wider project, further subsequent work was undertaken to develop findings into an intervention aimed at improving post-ICU ward care. Although the further development work is beyond the scope of this thesis, some reference is made to this throughout. Refinement and evaluation of the intervention is planned in future, supported by further NIHR grant applications.

The relationship between my clinical background and this study is explored throughout this thesis, particularly in Chapter Three (section 3.3.7.7). Whilst I have taken care to mitigate against bias, I have drawn on my clinical knowledge and experience throughout this study. The data collection methods used rely on clinical knowledge and an ability to detect omissions and inconsistencies in clinical care delivery. I have also used my experience and knowledge to make decisions related to the design of the study. Whilst utilising my expertise, I have also acknowledged where my knowledge or experience were limited and sought advice from the supervision team, and both clinical and research colleagues. This has been essential to ensure my assessments of care delivery are accurate, fair and relevant to current practice.

1.4 Clinical Setting and Definitions

This thesis focuses on the care of patients discharged from a general intensive care unit (ICU) to the ward. Patients are admitted to general ICUs following planned or emergency surgery, or with medical problems such as respiratory failure. Patients with a traumatic brain injury, or requiring neurological or cardiac surgery are usually admitted to specialist ICUs and were not included in this study. The Faculty of Intensive Care Medicine define ICU as a clinical setting specialising in “treatment of patients with, at risk of, or recovering from potentially life-threatening failure of one or more of the body’s organ systems” (FICM, 2017). The decision to move a patient from ICU to the ward is usually taken when they no longer require ‘organ support’, such as mechanical ventilation, drugs to support blood pressure or renal replacement therapy, and are unlikely to imminently require this again (FICM, 2019).

Post-ICU is defined as the period of care between discharge from ICU and hospital discharge or death. Care during this period is usually focused on rehabilitation, regaining physical function following a period of immobility and continuing recovery from the condition which resulted in the need for critical care (National Institute for Health and Care Excellence, 2009). Patients may be discharged from ICU to any ward in a hospital and ward allocation is based on their admitting problem and bed availability. Some wards frequently receive patients from ICU, such as respiratory wards or surgical emergency units, whilst others, usually specialist wards such as urology, rarely receive patients from ICU. Familiarity with post-ICU patients may affect care delivery, although this is not well-established in the literature.

Out-of-hours discharge from ICU is an important focus within this thesis. There is no established international definition of out-of-hours discharge from ICU, and studies cite start times varying between 4pm and 10pm (Goldfrad & Rowan, 2000; Uusaro et al., 2003). In the UK, NICE clinical guidelines suggest discharge from ICU after 10pm should be avoided and documented as an adverse incident when this is not possible (NICE 50, 2007). However, throughout this thesis out-of-hours discharge is defined as 4pm, selected to reflect the imminent change in clinical provision associated with out-of-hours ward care. This change encompasses handover from ward medical teams to on-call doctors covering multiple wards; a period of high nursing workload due to routines such as drug rounds, evening mealtimes and ward administrators no longer managing phone calls, followed by nursing handover and a reduction in nursing staff at night; and reduction in clinical services such as physiotherapy, dietetics and specialist clinical services. This definition is rationalised throughout this thesis.

For brevity, throughout this document intensive care will be referred to as ICU. Outcome refers to post-ICU in-hospital mortality, the patient group is post-ICU in-patients and the area of care is any ward to which a patient has been discharged from ICU. All abbreviations and clinical terms are explained in the Glossary (page 10).

1.5 Structure of this Thesis

This thesis presents a convergent parallel exploratory mixed methods study exploring post-ICU ward care. In Chapter Two the current literature related to post-ICU ward care is examined, using systematic review, meta-analysis and narrative review approaches. Risk factors associated with post-ICU in-hospital mortality are identified, staff and patient perception of transfer from ICU are explored, and current clinical care provision is examined. This chapter concludes by identifying evidence gaps which will be addressed to inform practice change. Chapter Three describes the epistemology of this study, the need for a mixed methods approach, description and justification for choice of methods, and implications for the conduct of the study. Chapter Four presents the results of a retrospective case record review (RCRR) of 300 patients discharged from ICU, who subsequently died in hospital. Chapter Five builds on the results of the RCRR, analysing the records of 20 patients whose death was probably avoidable identified in the previous chapter, alongside the records of 20 surviving patients. This analysis offers further insight into care delivery including exploration of underlying human factors contributing to identified problems. In Chapter Six the results of 49 interviews with ward staff, patients and their family members are presented. As data from this study were complex and interlinked, Chapter Seven presents integration of the findings of the previous three chapters, summarising data in a meta-matrix and presenting an overall model of post-ICU ward care. In Chapter Eight the findings of this study are discussed in reference to current evidence. The strengths and limitations of the approach and implications for future practice and research are also presented. This chapter concludes by summarising how the study has contributed to current knowledge of post-ICU ward care delivery, and implications for practice.

1.6 Conclusion

This chapter has established the background to this study and the relevance to current policy. The relationship between this doctorate and the NIHR-funded REFLECT study (grant reference PG-0215-36149) has been described. A brief outline of the structure of this thesis has been given, offering a summary of each chapter. The next chapter will present a review of the literature relevant to post-ICU ward care.

Chapter Two: Literature Review

2.1. Introduction

The previous chapter outlined the focus of this doctorate and the policy underpinning current practice. This chapter will explore the current literature related to post-ICU ward care to identify gaps and inform the research question for this thesis. As this is a complex area of care, it was not possible to conduct a single systematic review which would encompass all the current evidence related to post-ICU ward care. Therefore, initial searches were conducted in relation to the overall problem of post-ICU ward care, to explore what was currently known. Initial search terms were formulated around the setting (e.g. intensive care, critical care, ICU), population (e.g. post-, transfer, following, transition) and outcome (e.g. mortality, readmission). The results of the initial scoping search, conducted at the outset of this PhD, fell clearly into four key areas which warranted in-depth exploration. These areas were: risk factors present at ICU discharge associated with subsequent in-hospital mortality; staff perspectives of receiving patients from ICU; patient perspectives of transfer out of ICU; and care provision for post-ICU ward patients. Studies focusing on risk factors identified at ICU discharge offered insight into factors which may increase the likelihood of patients experiencing adverse outcomes. However, although there were a large number of studies reporting these risk factors, no systematic exploration of these had been undertaken. As the results of these studies were varied, without combining and comparing results, no conclusions related to risk factors for post-ICU mortality could be made. In addition, it was clear from this initial search that identifying risk factors for post-ICU in-hospital mortality did not offer a full picture of the challenges related to post-ICU ward care, or offer insight into why these factors may have increased the risk of poor outcome. In order to explore post-ICU ward care in more depth, it was necessary to extend this literature review to include the perspectives of both staff and patients regarding care delivery following ICU discharge, in order to explore the underlying reasons for the risk factors identified. Finally, in order to inform development of improvements in this area of care, it was also necessary to explore the evidence for current care provision, and examine interventions already in place aimed at improving the management of patients discharged from ICU. In combination, these four areas offer a comprehensive overview of current evidence, using a variety of research methods. In the following sections these areas will be explored separately and systematically, building a clear picture of the current evidence for post-ICU ward care.

2.2. Systematic Review of Risk Factors Associated with Post-ICU In-Hospital Mortality

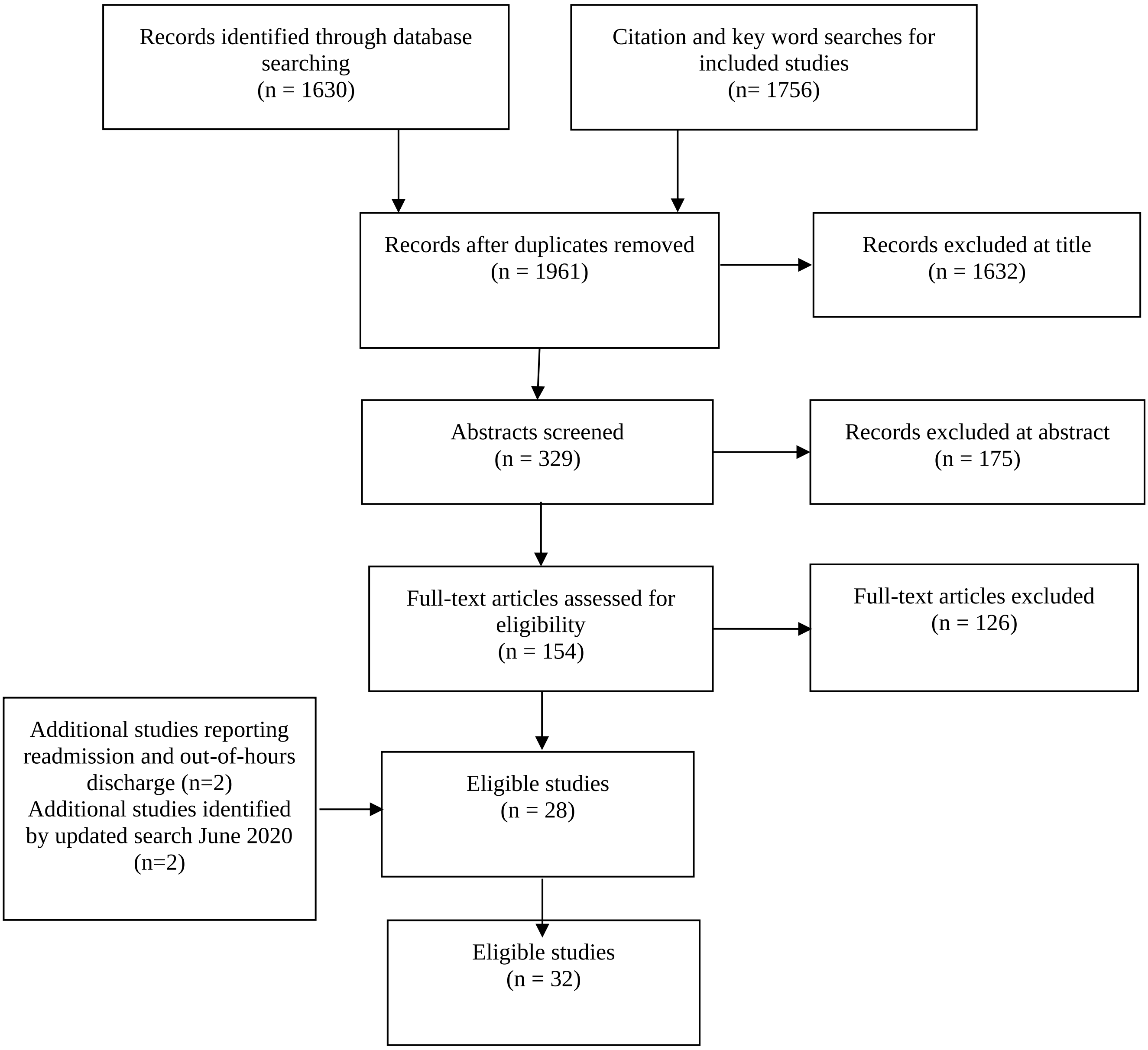
As the initial focus of this work was on post-ICU mortality, known factors associated with in-hospital mortality following ICU discharge were important to inform a background understanding of the challenges of post-ICU ward care. Initial searching of the literature identified a large number of studies identifying risk factors present at ICU discharge associated with post-ICU in-hospital mortality. The risk factors reported in these studies were restricted to those present prior to transfer from ICU. At the time, no studies had examined the association between risk factors in the post-ICU ward period and in-hospital mortality. Despite this limitation, these studies had the potential to explain some of the subsequent challenges in ward management related to problems present at discharge. As the studies identified in this initial search used consistent methods to identify and report risk factors, a systematic search of the literature in this area was undertaken, to answer the question: **what are the known risk factors at ICU discharge associated with post-ICU in-hospital mortality?**

2.2.1. Systematic Review Results

Searches were conducted in six databases: Medline; Embase; Web of Knowledge; Cumulative Index to Nursing and Allied Health Literature (CINAHL); The Cochrane Library; and OpenGrey. Studies were limited to those including adults aged 16 and over. Inclusion criteria were: studies using quantitative methods of data collection and analysis; original articles, conference papers and review articles (including systematic reviews); studies including participants who had been discharged alive from intensive care to a lower level of care (HDU or ward); and studies reporting the outcome of in-hospital mortality. Exclusion criteria were: reporting outcomes other than post-ICU in-hospital mortality; cohorts restricted to or including > 50% of patients from specialist ICUs (such as cardiac or neurology); and data not reported for post-ICU survivors versus non-survivors. Studies were not excluded on the basis of geographical area or setting (i.e. surgical and medical ICUs were included). A list of search terms is included in Appendix 1.

Initial searches were conducted in 2017. A total of 1,961 initial papers were identified by searches and were dual reviewed (with Associate Professor Watkinson acting as second reviewer). A total of 30 studies were selected for inclusion (Figure 1 for PRISMA diagram). Searches were rerun in June 2020 and two additional studies were identified for inclusion in this synthesis (Aguiar-Ricardo et al., 2019; Chatterjee et al., 2019). Both additional references post-date the published work described below (Vollam et al., 2018) and are therefore absent from the figures presented in section 2.2.1.1.

Figure 1: Search results for systematic review of factors associated with post-ICU in-hospital mortality



Details of the 32 included studies are presented in Table 1. Of the included studies, 26 papers retrospectively analysed clinical ICU databases and six collected data prospectively. For six included studies, data were reported from two national databases (ICNARC in the UK and ANZICS in Australia and New Zealand) (see Appendix Two, published manuscripts for further details of the approach taken to ensure data did not overlap between studies reporting multi-site data from national databases).

Studies were assessed for quality using the Newcastle-Ottawa Scale (Wells GA, Shea B, O'Connell D, Peterson J, Welch V, Losos M, 2012). This nine-point scales assesses studies in three areas: selection of groups (post-ICU in-hospital survivors versus non-survivors); comparability of groups; and assessment of outcome. A total of 27 studies scored moderately to well (6-9) (Table 2). Selection of groups and assessment of outcome consistently scored well across studies as 26/32 used established clinical data and all used databases. Confounders selected for assessment within the comparability of groups criteria were discharge destination, age and severity of illness. Studies generally scored poorly on comparability criteria as most did not report data on the selected confounder variables for the two groups and only 16 included adjustment for any confounders (Table 2).

Table 1. Database studies included in systematic review and meta-analysis

First Author Date	**Type of publication**	**Date of cohort**	**Country**	**No. of sites**	**Type of study**	**Primary endpoint/main focus**	**Type of ICU (state if specialist ICU included)**	**Exclusion criteria**
Aguiar-Ricardo 2019	Paper	2015	Portugal	Single site	Retrospective cohort	Sepsis	Mixed medical-surgical	Discharged for end-of-life care
Araujo 2012	Paper	2008-2009	Portugal	Single site	Retrospective cohort	Risk factors for post-ICU mortality	Mixed, including cardiac 7.6%	None
Azevedo 2015	Paper	2002-2009	Canada	Multi-site (5)	Retrospective cohort	Out-of-hours discharge	Mixed, including small proportion vascular	Missing data (n=399, 1.8%)
Barker 2010	Conference abstract	2002-2009	UK	Single site	Retrospective cohort	Out-of-hours discharge	Not stated	Missing data (n=16, 0.3%)
Beck 2002	Paper	1996-2000	UK	Single site	Retrospective cohort	Out-of-hours discharge and workload	Mixed medical-surgical	Burns, < 4 hrs, missing data (n=71, 4%)
Bramma 2012	Conference abstract	3 years, dates not reported	UK	Single site	Retrospective cohort	Out-of-hours discharge	Mixed, not stated neuro and cardiac	Missing data (n not reported)
Campbell 2008	Paper	1995-2005	UK	Single site	Retrospective cohort	Workload and out-of-hours discharge	Mixed medical-surgical	Discharged for end-of-life care
Chatterjee 2019	Paper	2016-2017	India	Single site	Retrospective cohort	Out-of-hours discharge	Mixed medical-surgical	< 24 hours, missing data (n=83, 4.4%)
Edie 2015	Conference abstract	2007-2014	UK	Single site	Retrospective cohort	Out-of-hours discharge	Mixed, unknown cardiac and neuro	Discharged for end-of-life care, discharge to other facility

Fernandez 2008	Paper	2003-2006	Spain	Single site	Retrospective cohort	Tracheostomy presence	Mixed medical-surgical	< 24 hours on ICU
Fernandez 2011	Paper	3 months in 2008	Spain	Multi-site (31)	Prospective cohort	Tracheostomy presence	Mixed medical-surgical	None stated
Gantner 2014	Paper	2005-2012	Australia	Multi-site ANZICS database	Retrospective cohort	Out-of-hours discharge	Mixed, including cardiac 7.6%	Missing outcome data (n=32,365, 4.4%)
Goldfrad 2000	Paper	1995-1998	UK	Multi-site (26 & 62, 9 overlapping)	Retrospective cohort	Out-of-hours discharge	Mixed medical-surgical	Missing data (n=431, 2.6%)
Gopal 2010	Conference abstract	2007-2009	UK	Single site	Retrospective cohort	ICU readmission following out-of-hours discharge	Mixed medical-surgical	None stated
Grander 2013	Paper	2001-2004	Austria	Single site	Retrospective cohort	Heart rate	Medical	< 24 hours in ICU, < 18 years old
Hanane 2008	Paper	2003-2006	USA	Single site	Retrospective cohort	Out-of-hours discharge	Mixed medical-surgical	< 4 hours on ICU
Ho 2008	Paper	2005	Australia	Single site	Retrospective cohort	CRP	Mixed medical-surgical	Discharged with treatment limitations
Iapachino 2003	Paper	1994-1995	Europe	Multi-site (89 from 12 countries)	Retrospective cohort	Risk factors for post-ICU mortality	Mixed medical-surgical	'Low intensity' ICU pts, missing data (n not reported)
Kramer 2013	Paper	2002-2010	USA	Multi-site	Retrospective cohort	ICU readmission following out-of-hours discharge	Mixed (including 22.7% cardiac and 8.3% neurology)	< 16 years old, burns, ICU stay < 4 hours, discharged to other facility
Laupland 2011	Paper	2006-2010	France	Multi-site >50% from 2 sites	Prospective cohort	Out-of-hours discharge	Mixed medical-surgical	Missing data (n not reported)

Lee **2016**	Paper	2011-2013	Korea	Single site	Retrospective cohort	Risk factors for post-ICU mortality	Medical	< 18 years old, transferred to other facility, discharged for end-of-life care
Litton **2007**	Paper	2004	Australia	Single site	Retrospective cohort	CRP	Mixed medical-surgical	Discharged with treatment limitations
Martinez 2009	Paper	18 months, dates not reported	Spain	Single site	Prospective cohort	Tracheostomy presence	Mixed medical-surgical	Do-not-resuscitate order at discharge
Moreno 2001	Paper	4 months, dates not reported	Europe	Multi-site (n not stated)	Retrospective cohort	Organ dysfunction and nursing workload	Mixed medical-surgical	none
Pilcher 2007	Paper	2003-2004	Australia	Multi-site (40)	Retrospective cohort	Out-of-hours discharge	Mixed, cardiac and neuro unknown	Not stated
Priestap 2006	Paper	2001-2004	Canada	Multi-site (31)	Prospective cohort	Out-of-hours discharge	Mixed, cardiac excluded	Cardiac
Ranzani 2012	Paper	2005-2008	Brazil	Single site	Retrospective cohort	CRP	Medical	< 72 hours on ICU, missing data including outcome and CRP (n=141, 19.1%)
Rodriguez-Carvajal 2011	Paper	6 years, dates not reported	Spain	Single site	Retrospective cohort	Premature discharge	Mixed medical-surgical	< 12 hours on ICU, discharged to other facility
Silvestre 2010	Paper	14 months, dates not reported	Portugal	Single site	Prospective cohort	CRP	Mixed medical-surgical	< 18 years old

Smith 1999	Paper	1 year, 1997-1998	UK	Single site	Prospective cohort	Nursing workload	Mixed medical-surgical	None stated
Utzolino 2010	Paper	Not stated	Germany	Single site	Retrospective cohort	Unplanned discharges	Mixed medical-surgical	None stated
Uusaro 2003	Paper	1998-2001	Finland	Multi-site (18)	Retrospective cohort	Out-of-hours discharge	Mixed medical-surgical	None stated

Table 2: Results of bias assessment for included studies using the Newcastle-Ottawa score

Author	**Selection**				**Comparability**		**Outcome**			**Total / 9**
	1	2	3	4	1a	1b	1	2	3	
Aguiar-Ricardo, 2019	★	★	★	★			★	★		6
Araujo, 2012	★	★	★	★		★		★	★	7
Azevedo, 2015	★	★	★	★		★	★	★	★	8
Barker, 2010	★	★	★	★			★	★	★	7
Beck, 2002	★	★	★	★			★	★		6
Bramma, 2012	★	★						★		3
Campbell, 2008	★	★	★	★			★	★		6
Chatterjee, 2019	★	★	★	★			★	★		6
Edie, 2015	★	★	★	★			★	★	★	7
Fernandez, 2008	★	★	★				★	★		5
Fernandez, 2011		★	★	★			★	★		5
Gantner, 2014	★	★	★	★		★	★	★	★	8
Goldfrad, 2000	★	★	★	★	★	★	★	★	★	9
Gopal, 2010	★	★	★	★		★	★	★	★	8
Grander, 2013	★	★	★	★			★	★		6
Hanane, 2008	★	★	★	★		★	★	★	★	8
Ho, 2008	★	★	★	★			★	★	★	7
Iapachino, 2003	★	★	★	★	★		★	★		7
Kramer, 2013	★	★	★	★	★	★	★	★	★	9
Laupland, 2011	★	★	★	★		★	★	★		7
Lee, 2016	★	★	★	★	★		★	★		7
Litton, 2007	★	★	★	★			★	★	★	7
Martinez, 2009		★	★				★	★	★	5
Moreno, 2001	★	★	★	★			★	★	★	7
Pilcher, 2007	★	★	★	★		★	★	★	★	8
Priestap, 2006	★	★	★	★		★	★	★	★	8
Ranzani, 2012		★	★	★			★	★	★	6
Rodriguez-Carvajal, 2011		★	★	★			★	★		5
Silvestre, 2010	★	★	★	★			★	★		6
Smith, 1999	★	★	★	★			★	★		6
Utzolino, 2010	★	★	★	★	★		★	★	★	8
Uusaro, 2003	★	★	★	★		★	★	★	★	7

A number of variables were examined for association with post-ICU in-hospital mortality across the papers. Single variables were focused on for 29/32 included studies, such as out-of-hours discharge, high creatinine or tracheostomy presence (Goldfrad & Rowan, 2000; Martinez et al., 2009; Ranzani et al., 2012). Within these variable-specific studies other factors were often reported, such as albumin, fibrinogen, and nursing workload (Ho et al., 2008; Ranzani et al., 2012; Silvestre et al., 2010). For three studies, no single variable was identified as the focus, and association between multiple variables and post-ICU in-hospital mortality were reported (Araújo et al., 2012; Iapichino et al., 2003; Lee et al., 2017). Multivariate analyses were conducted by 22/32 studies in addition to univariate analysis of the variable and outcome. Variables examined for association with post-ICU in-hospital mortality can be split into four categories, based on the results of the studies: nursing workload scores at ICU discharge; tracheostomy presence at ICU discharge; 'abnormal' blood results at ICU discharge (those outside normal limits as defined by each study); and out-of-hours discharge from ICU. Results will be discussed below in reference to Tables 3-5.

An association between tracheostomy presence at ICU discharge and post-ICU in-hospital mortality was found in three studies in both univariate and multivariate analysis (Araújo et al., 2012; Fernandez et al., 2008; Martinez et al., 2009) (Table 3). Two nursing workload scores were significantly associated with post-ICU in-hospital mortality in four and two studies respectively: the Therapeutic Intervention Scoring System (TISS) (Beck et al., 2002; Campbell et al., 2008; Silvestre et al., 2010; Smith et al., 1999) and Nine Equivalents of Nursing Manpower Use (NEMS) score (Iapichino et al., 2003; Moreno et al., 2001) (Table 4). Association remained in multivariate analysis for TISS only (Campbell et al., 2008).

Abnormal blood results significantly associated with post-ICU in-hospital mortality included elevated creatinine (Araújo et al., 2012; Ho et al., 2008; Litton, Ho et al., 2007; Ranzani et al., 2012) and C-reactive protein (Ranzani et al., 2012) and low albumin (Lee et al., 2017; Ranzani et al., 2012), platelets (Lee et al., 2017) and haemoglobin (Araújo et al., 2012; Lee et al., 2017; Ranzani et al., 2012) (Table

5). Association remained on multivariate analysis for only three variables: high C-reactive protein (Araújo et al., 2012; Ho et al., 2008; Litton et al., 2007; Ranzani et al., 2012) and low platelets (Lee et al., 2017) and haemoglobin (Lee et al., 2017; Ranzani et al., 2012) (Table 5).

Table 3. Tracheostomy cannula presence at ICU discharge

	Study	**Survivors vs. non-survivors**	
	First author and date	Univariate significance % or OR (95% CI)	Multivariate significance OR (95% CI)
Tracheostomy at discharge	Araújo 2012	**11% vs. 36.4%** **P<0.001**	**OR 3.8 (1.8-8.3)** **P=0.001**
	Fernandez 2008 *Ventilated subset*	**OR 5.03 (3.11-8.13)** **P=0.001**	**2.2 (1.2-4.1)** **P=0.01**
	Martinez 2009 *Sub-set*	**21.4% vs. 54%** **P=0.04**	**6.74 (1.21-38.46)** **P=0.03**
	Fernandez 2011 *Tracheostomy sub-set*	7.6% vs. 22.7% (cannulated vs. decannulated: 22% vs. 23%, P=0.5)	For cannulated vs. decannulated: 0.6 (0.3-1.2) P=0.1

Table 4. Association between workload scores at ICU discharge and post-ICU in-hospital mortality

Score	**Study**	**Survivors vs. non-survivors**	
	First author and date	Univariate significance mean (±SD) or median [IQR] or or RR (95% CI)	Multivariate significance odds ratio (95% CI)
TISS	Beck 2002	**TISS ≤30 versus TISS >30:** **RR: 1.57 (1.14-2.14)**	Not performed
	Campbell 2008	**28 [23-34] vs. 29 [24-35]** **P=0.01**	**OR 1.01 (1.00-1.02)** **P=0.064**
	Smith 1999	**14 (±8) vs. 20 (±8)** **P<0.05**	**OR not reported** **P=0.00001**
	Silvestre 2010	**24.2 (±4.3) vs 28.8 (±7.1)** **p<0.001**	Not reported
NEMS	Iapichino 2003	**0-9 points: 2.8% vs. 5.2%,** **10-19 points: 49.2% vs. 44.0%** **>19 points: 48% vs. 50.7%** **P=0.025**	Per point: 1.02 (1.00-1.05) P value not stated
	Moreno 2011	**18.4 (±6.6) vs. 19.9 (±6.9)** **P <0.0001**	Not performed
	Rodriguez-Carvajal 2011	18.3 (±2.7) vs. 18.7 (±3.4) P=0.083	Removed

Table 5. Abnormal blood results at ICU discharge associated with post-ICU in-hospital mortality

Physiological variables	**Study**	**Survivors vs. non-survivors**	
	First author and date	Univariate significance mean (±SD) or OR (95% CI)	Multivariate significance OR (95% CI)
C-reactive protein (mg/L) at ICU discharge	Ho 2008	**85.6 (±76.3) vs. 174.0 (±119.4)** **P=0.001**	**Model A: 1.09 (1.03-1.16)** **P=0.001** **Model B: 1.09 (1.05-1.34)** **P=0.001**
	Lee 2017	68 (±54) vs. 70 (±60) P=0.77	Removed
	Litton 2007	**203.7 (±105.6) vs. 62.5 (±60.9)** **P=0.001** **OR 1.20 (1.06-1.35)**	**Model A: 1.27 (1.09-1.49)** **P=0.005** **Model B: 1.19 (1.05-1.33)** **P=0.004**
	Silvestre 2010	81(±80) vs. 101(±95)	Not performed
C-reactive protein ≥6mg/dL at discharge	Araújo 2012	**44.5% vs. 67.2%,** **P=0.001**	**OR 2.8 (1.4-5.7)** **P=0.003**
C-reactive protein reduction < 25% (in 48 hrs)	Ranzani 2012	**43.4% vs. 24%** **P=0.002**	**OR 2.427 (1.370-4.310)** **P=0.002**
C-reactive protein per1n unit	Grander 2013	n/a	1.52 (1.23-1.88) P=0.12
Albumin	Lee 2017	**2.8 (±0.5) vs. 3.0 (±0.5)** **P=0.024**	Removed
	Ranzani 2012	**27 (23-32) vs. 24 (21-28)** **P<0.001**	Removed
Fibrinogen	Ho 2008	4.7(±1.8) vs. 5.2(±2.0) P=0.211	Removed
Haemoglobin (g/dL)	Araújo 2012	**10.5 (±2.1) vs. 9.6 (±2.2)** **P=0.008**	Removed
	Lee 2017	**9.6 (±1.6) vs. 10.5 (±1.7)** **P<0.001**	**OR 0.67 (0.52-0.86,)** **P<0.001**
	Ranzani 2012	**9.5 (8.1-11.2) vs. 8.6 (7.6-9.6)** **P<0.001**	**OR 0.782 (0.683-0.895)** **P<0.001**
Lactate (mmol/L)	Aguiar-Ricardo 2019	1.7 (1.2-2.6) vs. 2.5 (1.4-4.5) P=0.09	Removed

	Lee 2017	3.2 (±2.9) vs. 2.9 (±2.6) P=0.347	Removed
	Ranzani 2012	1.8 (1.3-2.3) vs. 1.9 (1.2-2.6) P=0.127	Removed
Platelet count ($x10^9$/L)	Araújo 2012	221 (171) vs. 235 (210) P=0.679	Removed
	Lee 2017	**141 (±109) vs. 206 (±132)** **P=0.001**	**OR 1.0 (0.99-1.00)** **P=0.003**
	Ranzani 2012	254 (170-371) vs. 214 (149-338) P=0.117	Removed
Standard base excess (mEq/L)	Ranzani 2012	-0.5 (-2.8-1.6) vs. 0.5 (-3.0-3.7) P=0.146	Removed
Creatinine (µmol/L)	Lee 2017	1.4 (±1.7) vs. 1.4 (±1.6) P=0.529	Removed
	Ranzani 2012	**70 (53-106) vs. 88 (62-152)** **P=0.004**	Removed

2.2.1.1. Out-of-Hours Discharge From ICU

Out-of-hours discharge was reported in many more studies than the previous variables, with a number of large multi-site studies identifying significant association (Goldfrad & Rowan, 2000; Laupland et al., 2011; Pilcher et al., 2007). The large number of studies allowed data to be pooled through meta-analysis. The protocol for this meta-analysis and results have been published (Vollam et al., 2018; Vollam et al., 2015). Brief details are given here and both publications are included in Appendix Two for reference, including a summary of contributions from each author.

A total of 14 studies reporting out-of-hours discharge and in-hospital mortality met inclusion criteria in the search described above. Several of these studies also reported ICU readmission in association with out-of-hours discharge. A further search was therefore conducted to identify any additional studies reporting readmission to ICU, identifying two more studies for inclusion. The results of the 16 studies reporting the association between out-of-hours discharge and in-hospital mortality were pooled (Figure 2). The results of the 11 eligible studies reporting the association between out-of-hours discharge and ICU readmission were also pooled (Figure 3). This meta-analysis demonstrated a strong association between out-of-hours discharge and both mortality (RR 1.39) and readmission (RR 1.30). There was significant heterogeneity between studies (I^2 = 90.1% and 90.2% respectively), most likely due to large differences in study sizes. An updated search conducted in June 2020 (as described above) identified one further eligible study (Chatterjee et al., 2019). The additional study also demonstated a significant association between out-of-hours ICU discharge and subsequent in-hospital mortality, in a single site in India.

Figure 2. Meta-analysis of association between out-of-hours discharge and mortality

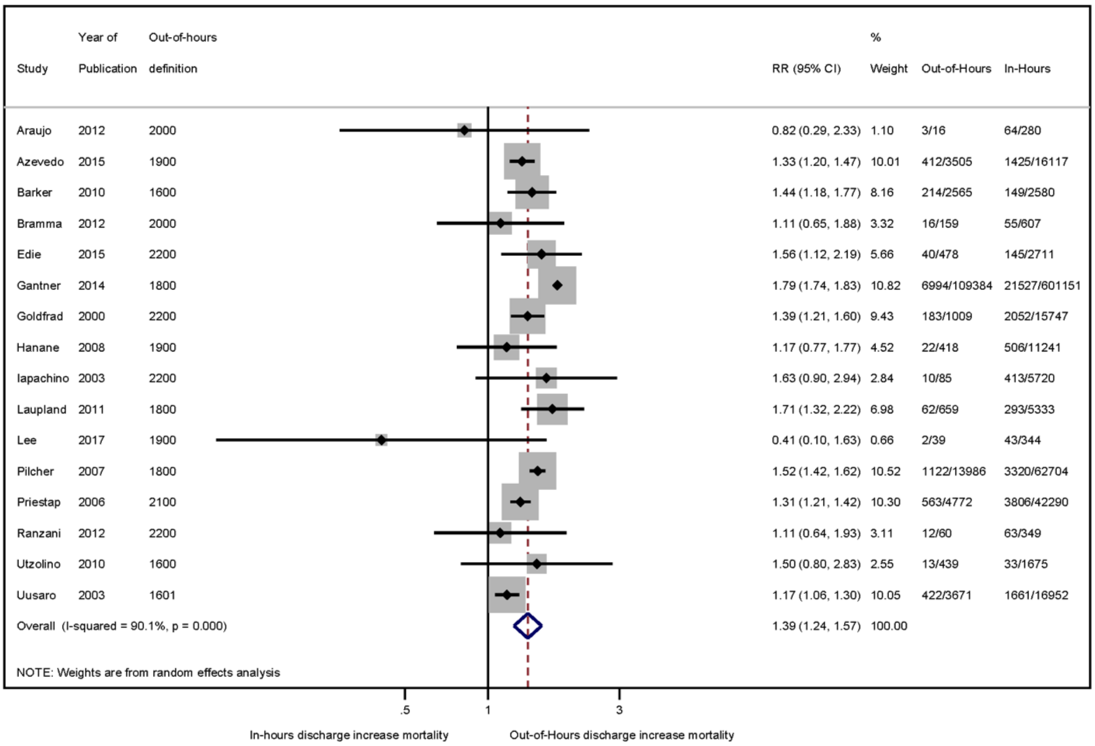


Figure reproduced from Vollam et al., 2018

Figure 3. Meta-analysis of association between out-of-hours discharge and readmission

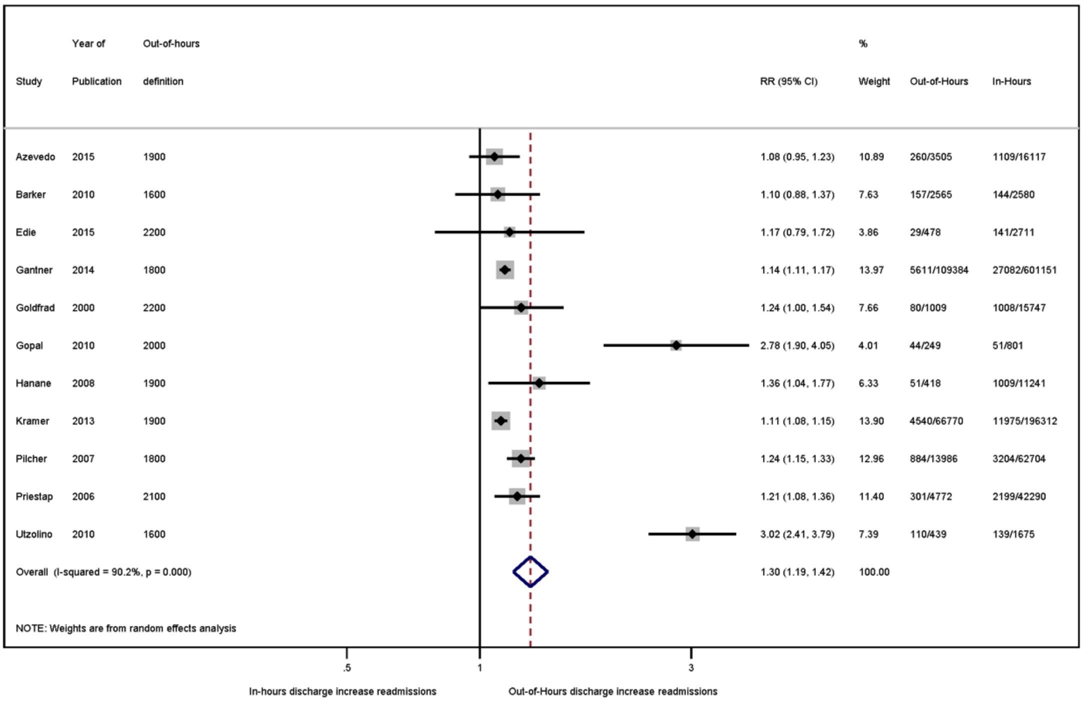


Figure reproduced from Vollam et al., 2018

This review has systematically examined current evidence on known risk factors present at ICU discharge, identifiable in clinical databases, which were associated with subsequent in-hospital mortality. However, there are several limitations to these data. A total of 13/32 included studies were over ten years old, potentially limiting relevance to current practice. In addition, the data reported within these studies were often from several years prior to publication (ranging between one and nine years), further limiting relevance to current clinical practice. For almost all blood results, aside from creatinine, data were extracted from the same three articles and were not the primary outcome of any study (Araújo et al., 2012; Lee et al., 2017; Ranzani et al., 2012). Furthermore, the number of studies reporting significant associations for each measurement varied, with only C-reactive protein, albumin and haemoglobin identified by more than one study, limiting the weight of evidence. Reporting of measurements also varied between studies. For C-reactive protein and tracheostomy in particular several approaches were used to define the variable being studied, making direct comparisons between findings less reliable. The two nursing workload scores, NEMS and TISS, have been criticised for their complexity and for reflecting severity of illness of the patients rather than nursing workload (Carayon & Gürses, 2005; Reis Miranda et al., 2003). The demonstrated association between these scores and in-hospital mortality should therefore be viewed with caution. In addition, this review is limited by the methodology of the studies, with results limited to variables identifiable within usual care databases and present at ICU discharge.

This systematic review has identified several gaps in evidence, summarised in Table 13. The variables identified are by no means a definitive list of the risk factors for post-ICU in-hospital mortality. Furthermore, these data indicate association only and offer no information about causation. These risk factors do, however, suggest particular challenges to this area of care, such as unresolved organ dysfunction, high nursing workload requirements and unplanned discharge during reduced staffing levels. In the next two sections the perspectives of staff and patients will be explored to offer further insight into post-ICU ward care.

2.3. Ward Staff Perspective of Management of Post-ICU Patients

In order to gain a sense of the contextual factors from a staff perspective, and broaden the focus beyond post-ICU mortality to explore morbidity and care deficits more generally, a narrative review approach was taken with the aim of exploring current knowledge and known challenges in this area of care (Baumeister & Leary, 1997). Initial literature searches identified studies using different approaches to explore staff experience. As this was a complex topic to systematically search, a narrative approach was used to broaden the scope and add context to the systematic review and meta-analysis above, which focused on risk factors present at ICU discharge and provided no insight into subsequent ward care. Exploring literature from different perspectives facilitated linkage between related topics and different methodological approaches (Wong et al., 2013). Due to the complexity of the topic and narrative approach, several methods were utilised to ensure adequate breadth in the search. A number of studies were identified in an initial literature search using the same databases as for the systematic review described above (key search terms can be found in Appendix Three). To ensure all relevant studies were identified, these results were then snowballed by reference and citation tracking (Greenhalgh & Peacock, 2005) and further subsequent focused searches. Initial searches were conducted in 2016 and updated in December 2019.

This review focused on staff perception of post-ICU ward care, therefore ten studies were included where the primary aim was to report the perspectives of staff discharging or receiving patients from ICU or providing ongoing ward care (see Table 6 for an overview of studies using CASP (CASP, 2013) as a framework for appraisal). A total of seven studies used interviews or focus groups to collect data (Cognet & Coyer, 2014; Cox, James, & Hunt, 2006; Enger & Andershed, 2018; Häggström et al., 2009, 2012; Häggström & Bäckström, 2014; Kauppi et al., 2018), two used questionnaires (Elliott et al., 2013; James et al., 2013), and one study combined questionnaires and interviews (Whittaker & Ball, 2000). All studies were confined to nurses’ perceptions only.

Table 6. Studies of staff perspective

First author **Year** **Country** **Focus**	**Stated approach, methodology and population**	**CASP** **A: Validity** **Recruitment strategy?** **Data collection addressed research question?** **Relationship between researcher and participants explored?**	**CASP** **B: Results** **Ethical issues addressed?** **Analysis rigorous?** **Clear statement of findings?**	**CASP** **C: Value** **Contribution to knowledge, policy** **Identify new areas for research** **How transferred to other populations**	**Main findings**	**Summary of limitations**
Whittaker & Ball **2000** **UK** **Nursing post-ICU patients**	Pilot study Open-ended questionnaires and interviews 13 questionnaires (36% response rate), 7 interviews 2 wards	Purposive non-probability sampling. framework stated. Aim to change local clinical practice by developing an ICU discharge protocol. Researcher unknown to participants. Questionnaire data treated as qualitative data.	Different analysis methods for questionnaire and interview data: question analysis and thematic content analysis. Analysis checked by external ICU nurses in attempt to reduce bias. Not clear why ICU nurses chosen. State data from questionnaires and interviews triangulated but this is not described. Findings presented as categories and very poorly described.	Limited transferability given small sample size. Acknowledgement of pilot study and need to scale up to ensure generalisability. Despite this, recommendations for practice are presented.	Need to prepare patient for ward Anxiety from junior staff. Concern about patient being ready for discharge. Impact on workload of ward.	Poor questionnaire response – acknowledged (but qualitative approach therefore less relevant). Data limited by questionnaire approach. Analysis not clearly described. Limited results reported and descriptive analysis based on broad ‘categories’. Focus limited to immediate transfer. Nurses only.
Cox et al. **2006**	Exploratory descriptive study	Purposeful sampling for range of grades and experience (all	Ethical issues addressed.	Limited by narrow sampling, small	Difficulty balancing workload. Lack of skills.	Methodology appropriate but not rigorously described.

UK **Nursing post-ICU patients**	Semi-structured interviews 7 nurses, 1 medical ward	female). Small sample size and only one ward. Very brief description of researcher/ participant relationship with no exploration of potential impact.	Content analysis as stated approach, briefly described. Clear presentation of findings, although descriptive.	numbers and one ward. Clear conclusions related to setting and staff group.	Training needs. Need to be clinically confident.	Only 1 medical ward, small sample, only female nurses. Focus limited to immediate transfer. Nurses only. Strengths: Sampling across grades.
Haggestrom et al. 2009 **Sweden** **Transition period from ICU to ward**	Grounded theory Focus groups and interviews ICU and ward nurses (35, 5 male) 2 hospitals (part of a larger study)	Initial participants invited by nurse in charge and snowballing. Further purposive sampling appropriate to approach. No description of interviewer.	Ethical issues clearly described, aside from researcher/participant relationship. Rigorous description of appropriate analysis. Clear description of findings.	Clear discussion in relation to current evidence. No clearly developed ‘theory’. Identifies need for further research to inform practice recommendations (see below).	Need to prepare patients for transition. Difficult to balance needs of whole caseload – compromising care.	No exploration of researcher/participant relationship. Data descriptive, no theory development. Focus limited to immediate transfer. Nurses only. Strengths: Rigorous grounded theory approach ICU and ward nurses.
Haggstrom et al. 2012 **Sweden** **How nurses facilitate transfer from ICU – focused from previous paper**	Grounded theory Focus groups, interviews and observations ICU and ward nurses (35, 5 male) 2 hospitals	Initial participants invited by nurse in charge and snowballing. Further purposive sampling appropriate to approach. No description of interviewer, very brief description of observer.	Ethical issues clearly described, aside from researcher/participant relationship. No acknowledgment of secondary analysis from previous study. Rigorous description of appropriate analysis. Clear description of findings.	Discussion of relevance to other similar settings. Clear recommendations from data. Wide range of sampling makes findings generalisable.	Need to prepare patient for ward. Challenge of balancing needs with workload. Need training and support for aspects outside usual practice, e.g. tracheostomy.	No exploration of researcher/participant relationship. Observations in 1 ICU 2 years after interviews. Same data as 2009 paper, used to develop recommendations. Focus limited to immediate transfer. Nurses only.

	(part of a larger study)	Observations conducted two years later – to saturate data in this focus.				Strengths: Rigorous grounded theory approach. Develops previous work. ICU and ward nurses
Elliot et al. 2013 **Australia** **Factors associated with post-ICU adverse events**	Piloted questionnaire 39 Liaison (CCOT) nurses (stated 92% response rate) Nationwide	Piloted questionnaire based on systematic review results. Nationwide recruitment but some uncertainty about population size and therefore response rate.	Choice of variables may be leading but based on evidence. Robust analysis.	Demonstrated clear concerns about several aspects of post-ICU ward care.	Liaison nurses perceive several problems in post-ICU ward care to be frequently problematic, including lack of experienced ward staff, lack of clinical support for nursing and medical staff, heavy ward workloads, clinically challenging patients and discharge out-of-hours.	Uncertainty about stated response rate. Responses limited to factors identified in systematic review and may be leading. Strengths: Piloted questionnaire and based on current evidence. Multicentre, national survey.
James et al. 2013 **New Zealand** **Transfer process**	Exploratory descriptive design Open-ended questionnaires based on previously pilot study by Whittaker and Ball	Purposive non-probability sampling framework stated.	Descriptive thematic analysis stated. Open-ended responses to questionnaire analysed as qualitative data. Some discussion on issues of rigour. Results presented focused only on communication despite	Limitations described in relation to response rate – less relevant for qualitative than quantitative study. Limitation of questionnaire methodology acknowledged.	Written and verbal communication needs differ by setting and time of transfer. Timing of transfer should be negotiated.	Study limited by questionnaire design. Reported data limited to communication at handover. Focus limited to immediate transfer. Nurses only. Strengths: Both ICU and ward nurses

	45 ICU and 47 ward nurses 1 hospital		questions on many other areas of transfer and are descriptive.	Results described in relation to current evidence. Recommendations not cautious enough given limitations of study.		Nurses from multiple wards.
Cognet & Coyer 2014 **Australia** **Ward nurse perception of ICU transfers**	5 semi-structured focus groups with 27 nurses 2 wards, 1 hospital	Brief description of participants and justification for wards selected.	Clear discussion of researcher positioning and acknowledgment of potential bias. Clear appropriate description of analysis.	Clear but limited discussion in relation to other evidence. Clear acknowledgement of limitations. Concludes need for further research. Conclusion does not summarise key findings. No clear outline of potential implications for practice.	Core category – ‘two worlds’, split into 2 levels of sub-categories describing how information is transferred (e.g. ‘what we write’, ‘information strategies’). Obscures clear identification of problems with information handover and suggested improvements.	Weaknesses: Ward nurses from two wards. Lacks clarity of findings. Strengths: Rigorous conduct and analysis.
Haggstrom & Backstrom 2014 **Sweden** **Strategies for organising care during transition from ICU**	Interviews previously analysed for two studies 3 ICUs, 5 wards	Clear description of participants but no data or rationale for sampling. Interviewer named but not described in relation to participants.	Qualitative content analysis. Analysis clearly described but not acknowledged as secondary analysis of a sub-set of a previous study. Reported themes are difficult to interpret	This study describes the processes followed in two hospitals in relation to ICU transfer and transferability is limited by this. Related findings to current evidence.	Secure, encourage and collaborate as strategies for ‘safe’ transition from ICU.	Weaknesses: Unacknowledged as a secondary analysis. Conclusion regarding safety of transfer are not supported by the data. Focus limited to immediate transfer. Nurses only.

			without reading the related descriptions.	The conclusion states that the model describes will ensure a 'safe' transfer which is not supported by the data presented.		Strengths: ICU and ward nurses
Enger and Andershed 2018 **Norway** **Nurse's experience of transfer**	Qualitative descriptive study 'open question' interviews 8 nurses, 3 wards in 2 hospitals	Convenience sample. Brief discussion of researcher/participant relationship and clear description of interview setting.	Qualitative content analysis – clear description. Clear presentation of results.	Clear discussion within current literature and implications for practice.	Premature discharge and complexity challenge skills and resources – system not suited to cope. A clear management plan at handover was often absent but needed. Significant stress associated with receiving post-ICU patients.	Small sample size, only three wards in two hospitals. Nurses only. All participants female and no newly qualified.
Kauppi et al. 2018 **Sweden** **Ward nurse's experiences of transfer process from ICU to ward**	Inductive qualitative design Focus groups and interviews 16 ward nurses in total 3 hospitals	Purposive sampling, clear description of participants (none male). Minimal rationale for focus group and interviews, no rationale for numbers of each. Acknowledged experienced nurses more vocal in the focus groups.	Inductive qualitative content analysis. Clear description of analysis and some limited discussion on rigour. Presentation of results doesn't correspond to final themes reported.	Authors related findings to current evidence. Authors argue some generalisability to similar organisations. Conclusions are not cautious enough given limitations.	Challenges in nursing former ICU patients: • Fragility (unrealistic demands) • Gap in skills and knowledge • Organisational structure (lack of HDU, poor preparation for ward).	Presentations of results and reporting of themes obscures some of the findings. Focus limited to immediate transfer. Nurses only. Strengths: Three hospitals.

Similar findings were reported throughout the papers and all were reflected in the most recent study (Kauppi et al., 2018). Key themes were focused around the perceived higher care needs of post-ICU patients, staff anxiety related to their ability to meet these needs, and the impact this had on other ward patients. Patients transferred from ICU were perceived to require a high workload, with nurses concerned about the impact this had on other patients (Cox et al., 2006; Elliott et al., 2013; Enger & Andershed, 2018; Häggström et al., 2009, 2012; James et al., 2013; Kauppi et al., 2018; Whittaker & Ball, 2000). Ward nurses often reported concern that post-ICU patients required care outside of their scope and knowledge (Cox et al., 2006; Enger & Andershed, 2018; Häggström et al., 2012; Kauppi et al., 2018; Whittaker & Ball, 2000). One survey of Liaison Nurses identified ward skill mix as a contributory factor for post-ICU adverse events (Elliott et al., 2013). Reflecting this perceived lack of skill, most studies reported nurses' anxiety about receiving an ICU patient (Cox et al., 2006; Enger & Andershed, 2018; Häggström et al., 2009; Kauppi et al., 2018; Whittaker & Ball, 2000). Several studies also identified a perceived need for further training in advanced clinical skills perceived to be required to manage post-ICU patients (Cox et al., 2006; Enger & Andershed, 2018; Häggström et al., 2012; Whittaker & Ball, 2000). Anxiety about ward nurses' capabilities for managing post-ICU patients was compounded by concerns that patients were sometimes discharged prematurely (Enger & Andershed, 2018; Häggström et al., 2009; Whittaker & Ball, 2000).

Suggestions for improving transition included the importance of handover and planning (Cognet & Coyer, 2014; Enger & Andershed, 2018; Häggström et al., 2009, 2012; James et al., 2013; Kauppi et al., 2018; Whittaker & Ball, 2000). Many studies identified a need to prepare patients for the step-down in nurse ratios by removing monitoring, moving away from the bedside and discussing with the patient and relatives what to expect (Cognet & Coyer, 2014; Cox et al., 2006; Häggström & Bäckström, 2014; Kauppi et al., 2018; Whittaker & Ball, 2000).

In common with the systematic review discussed above, this narrative review also had several limitations. Three studies were over ten years old, potentially limiting their relevance to current care and all studies reported nurse perspectives only, which was a significant limitation. Most studies had methodological limitations, such as poor response rate to questionnaires (James et al., 2013; Whittaker & Ball, 2000), limited scope of sample (Cognet & Coyer, 2014; Whittaker & Ball, 2000) and multiple analyses of the same dataset from similar perspectives (Häggström et al., 2009, 2012; Häggström & Bäckström, 2014). These limitations may impact on the generalisability or transferability of findings. Only two of the qualitative studies reported the participant/researcher relationship (Cognet & Coyer, 2014; Cox et al., 2006) and none explored this in depth (Table 6). This raises concerns regarding the credibility of responses, given the potential for perceived differences in clinical or hierarchical status (Brinkmann & Kvale, 2015; Finlay, 2002a). For most qualitative studies, justification of sample size was limited or absent making it difficult to assess the credibility and transferability of the data (Cox et al., 2006; Enger & Andershed, 2018; Häggström et al., 2009, 2012; Häggström & Bäckström, 2014; Kauppi et al., 2018). Furthermore, several studies, using interview, questionnaire and mixed methods approaches, were conducted in single hospitals or even single wards, again potentially limiting transferability or generalisability (Cognet & Coyer, 2014; Cox et al., 2006; James et al., 2013; Whittaker & Ball, 2000), although one survey was distributed nationally suggesting wider generalisability (Elliott et al., 2013). Finally, all studies were retrospective and based on staff reporting (through interview or questionnaire), as they aimed to explore nurse perspectives of transfer. Data were therefore necessarily subjective, but do offer insights into the challenges of providing care to patients discharged from ICU to a ward.

This narrative review has provided a nursing perspective of receiving patients from ICU. Key findings across the studies included:

- Nurses' concern about high workload of receiving a patient from ICU (Cox et al., 2006; Elliott et al., 2013; Enger & Andershed, 2018; Häggström et al., 2009, 2012; James et al., 2013; Kauppi et al., 2018; Whittaker & Ball, 2000);
- Perception of the need for extended skills to nurse post-ICU patients (Cox et al., 2006; Elliott et al., 2013; Enger & Andershed, 2018; Häggström et al., 2012; Kauppi et al., 2018; Whittaker & Ball, 2000);
- Nurses' anxiety about receiving patients from ICU (Cox et al., 2006; Enger & Andershed, 2018; Häggström et al., 2009; Kauppi et al., 2018; Whittaker & Ball, 2000); and
- An awareness of the need to reassure patients when being transferred to the ward (Cognet & Coyer, 2014; Cox et al., 2006; Häggström & Bäckström, 2014; Kauppi et al., 2018; Whittaker & Ball, 2000).

The results of this review reflect the earlier finding of the systematic review of high nursing workload being associated with poor outcome, although this is likely also due to a higher severity of illness. However, within the focus of this review, identified studies lacked many practical recommendations for change beyond improved handover (Häggström & Bäckström, 2014; Kauppi et al., 2018) and patient preparation (Cognet & Coyer, 2014; Cox et al., 2006; Cullinane & Plowright, 2013). Broadening the focus of this review beyond staff perspective may have identified more studies exploring strategies for improving post-ICU ward care.

There are several significant gaps in evidence identified by this review, again summarised in Table 13. Studies only included nurses and there was no evidence from the perspective of other staff groups. Further exploration of multi-disciplinary perspectives would augment this evidence. Furthermore, ongoing care of post-ICU patients was not explored by these studies (most studies focused on the initial transfer period, i.e. the first 24 hours). In addition, although nurses identified Critical Care

Outreach Teams as supporting post-ICU care, there was little exploration of how this support is delivered currently. This will be discussed further in section 2.4.

2.4. Patient Perspective

To add context and contrast to the staff perspective, the principles of narrative reviewing were again drawn on (Baumeister & Leary, 1997) to understand the patient perspective of transfer from ICU and subsequent ward care. This narrative review approach allowed for methodological diversity of included studies, and assessment of the strength of evidence based on critical appraisal. A similar approach to that of the staff perspective review was taken, using the same databases and including snowballing (using citation and reference tracking) from several papers found during the initial search, the staff perspective review and conducting a further literature search (see Appendix Four for key search terms). This review focused on exploring post-ICU in-hospital patient experience, and therefore any study exploring this was included.

The search identified nine primary qualitative interview studies (Chaboyer et al, 2005; Field et al., 2008; Forsberg et al., 2011; Green, 1996; Herling et al., 2020; Leith, 1999; Mckinney & Deeny, 2002; Odell, 2000; Strahan & Brown, 2005), all with the primary aim of reporting the patient perspective of transfer from ICU in general patient cohorts (see Table 7 for an overview of studies using the CASP tool (2013) as a framework for appraisal). In addition to these key studies, an additional four studies were identified which included the perception of transfer from ICU to the ward, although this was not the main focus. Two studies included patient perception in clinical speciality subsets (Hinton et al., 2015; Pattison et al., 2007) and one study examined patient perception within an exploration of follow-up services (Ramsay et al., 2014). A further study reported family members' perspectives of transfer from ICU (Op 't Hoog et al., 2020). These studies are included in this review as they offer key information on post-ICU ward care despite this not being their main focus.

Three reviews were also identified in this search, each with a slightly different focus but all related to patient perception of transfer and post-ICU ward care. The first published review was a qualitative meta-synthesis of the patient experience of discharge from ICU (Bench & Day, 2010). The second was a systematic review of relocation stress following ICU, which included studies of patient perception as well as exploring risk factors and interventions aimed at addressing relocation stress (Salmond et al., 2011). The third was a narrative review of qualitative studies of patient and relative perspective of transfer from ICU (Cullinane & Plowright, 2013) (Table 7). All three reviews included most of the nine primary studies focused on the patient perception of transfer in general populations. Of the further four studies identified for this review, only Pattison et al. (2007) was included in two of the reviews (Bench & Day, 2010 and Salmond et al., 2011). The other three studies were published after the three identified reviews and could not therefore have been included. The findings of these studies are examined below, with the conclusions drawn by the three reviews identified seperately to the primary studies.

Table 7. Studies of patient perspective

First author Year Country	Stated approach, methodology and population	CASP A: Validity Recruitment strategy? Data collection addressed research question? Relationship between researcher and participants explored?	CASP B: Results Ethical issues addressed? Analysis rigorous? Clear statement of findings?	CASP C: Value Contribution to knowledge, policy Identify new areas for research How transferred to other populations	Main findings	Summary of limitations Gaps in literature
Green **1996** **UK**	Approach not stated 26 patients 1 site Focused interviews 48 hours after ICU discharge	Convenience sampling. No discussion of analysis process. No information on interview setting or recording. Clear discussion of researcher/participant relationship.	'Thematic content analysis'. Data reported as proportions, no quotes presented.	Clear discussion of implications for local practice. Clear identification of limitations. Some discussion of related literature.	Data focused on recall of ICU stay as well as experience of transfer. Data reported in relation to transfer: positive perception prior to discharge but struggled with change in nursing ratio.	Timeframe of interviews precluded participation of sicker patients. Analysis and presentation of data not consistent with stated qualitative approach.
Leith **1999** **Canada**	Open-ended questionnaire/closed question interview Content analysis 53 patients and 35 family members 2 hospitals	Unclear description of method - ? interview or questionnaire. Timing of approach? Minimal description of analysis, some discussion of rigour. No description of researcher/participant relationship.	No discussion of ethical issues.	Main conclusion not informative, although data presented in paper more useful.	Patients and relatives experience three major responses to transfer from ICU: positive, neutral and negative.	Data almost 20 years old. Restricted by questionnaire approach but large sample size.

Odell **2000** **UK**	Phenomenology Semi-structured interviews On ward after transfer 6 patients 1 hospital	2 days after transfer. Semi-structured interviews. Purposive/convenience sampling – described as both. No description of researcher/participant relationship. Interviewed on ward after transfer.	Ethics discussed in terms of consent only. Analysis not clearly described. Findings well described.	Good reference to current evidence. Conclusion that transfer could be redesigned to reduce relocation stress.	Transfer from ICU as traumatic, confusing and stressful.	Focused on immediate transfer period only. Limited to reporting psychological impact only. Phenomenological approach provides deep insight but limited in transferability.
McKinney & Deeny **2002** **UK**	Phenomenology Open interviews before and after transfer 6 participants 1 hospital	Purposive sampling. Discussed researcher position in relation to phenomenology.	Clear discussion of ethics and analysis. Clear findings and theme categories clarified data.	Description of psychological impact of transfer but urge caution in labelling this 'relocation stress'. Clear discussion in relation to current evidence.	Pre-transfer: acceptance, desire for normality. Post-transfer: despondency at ongoing physical problems, differences between ICU and ward.	Focused on immediate pre- and post-transfer period only. Phenomenological approach provides deep insight but limited in transferability.
Strahan & Brown **2005** **UK**	Phenomenology Semi-structured interviews 3-5 days after ICU discharge 10 patients 1 hospital	Discusses bracketing – as appropriate for phenomenology – opposite of above. States phenomenology but offers a pragmatic perspective.	Clear discussion of analysis. Some discussion of ethics. Themes communicate findings well.	Discusses implications for practice in relation to other evidence. Clear implications for future research.	Physical: importance of sleep, nutrition, mobility; psychological: positive and negative feelings; provision of care: Information giving and care delivery.	Strength – explores physical and care aspects as well as psychological aspects. Phenomenological approach provides deep insight but limited in transferability.
Chaboyer **2005** **Australia**	Descriptive qualitative case study	Aim: collect the individual and collective perceptions of transfer out of ICU. Purposive recruitment.	Limited description of analysis. Themes communicate findings well.	Description of study in context of other evidence.	Psychological impact of transfer: abandonment, vulnerability, loss of	Strength: includes relative perspective (often more able to recall this phase).

	2 focus groups 7 patients, 6 relatives (part of larger study)	Design appropriate to aims. Very brief description of researcher/participant relationship.		Clear implications from study.	importance and ambivalence.	
Pattison 2007 **UK**	Longitudinal mixed methods study 27 surgical cancer patients Interviews and questionnaires	Aim: explore patients' experiences of care following ICU discharge, and follow-up service. Theoretical sampling framework No description of researcher/participant relationship.	Clear discussion of analysis and ethics. Themes communicate findings well.	Clear discussion of current literature and implications for practice.	Anxiety about pending transfer from ICU to the ward, importance of reassurance.	Limitations: attrition resulted in impairment of longitudinal data. Subset of cancer patients.
Field 2008 **UK**	No stated approach 35 patients from UK who experienced emergency ICU admissions (subset of data) Home interviews following ICU discharge	Aim: Produce web resource on ICU experience. Maximum variation sampling	Thematic analysis (modified grounded theory) – clear but brief description of analysis.	Clear discussion of current evidence. Clear implications for practice – not all difficulty with transfer should be labelled 'relocation stress'.	Difficulty of ICU transfer not an inevitable part of leaving a protected environment – may have clear underlying causes related to level of care not sufficient to meet needs.	Strength: includes reference to physical although emphasis on psychological.

Forsberg 2011 **Sweden**	Inductive descriptive qualitative study 10 patients 1 hospital After hospital discharge	Aim: Describe experiences of being transferred from ICU to ward. Convenience sampling. No description of researcher/participant relationship.	Thematic content analysis. Brief description of method. Discussion of ethics limited to consent and confidentiality.	Comprehensive discussion of current evidence. Clear discussion of limitations and potential transferability.	Fear and anxiety but also peace and quiet on transfer to the ward.	Presented results limited to immediate transfer. Focused on psychological impact only. Phenomenological approach may have been more appropriate to aims of study.
Ramsay 2013 **UK**	Part of larger mixed methods study 20 patients 2 hospitals After hospital discharge	Aim: to explore psychosocial needs of patients transferred from ICU. 'Attempts at purposive sampling'. No description of researcher/participant relationship.	Ethical considerations including managing unintentional distress discussed.	Limited discussion in relation to current evidence. Clear discussion of limitations. Clear implications for follow-up service practice discussed appropriately – identifying a gap in care.	Lack of understanding from nursing staff of physical dependence, and indifference to care needs. Negotiation of transition to recovery between patients and ward staff.	Interviews conducted for a different purpose to this reported analysis therefore may be limited in scope. Strength: Explores care beyond immediate transfer period.
Hinton 2015 **UK**	Qualitative interview study 18 women and 11 partners (partners views not reported)	Aim: sub-study of a larger study of experiences of near-miss maternal morbidity. Maximum variation sampling, clearly described. No description of researcher/participant relationship.	Results clearly described, data related to transfer described in one theme. Ethical issues discussed 'Interpretive qualitative analysis' – only briefly described.	Clear discussion of literature and implications for practice.	One theme related to transfer: Fear and anxiety at ICU discharge, lack of understanding from ward staff and other patients about experiences and physical limitations, importance on communication between ICU and	Secondary analysis from a larger study. Only one theme related to ICU transfer.

					ward staff to support care.	
Herling 2020 **Denmark**	Qualitative interview study Semi-structured interviews 1 site 10 patients and 4 family members	Explore patient and family members' experiences of transfer from ICU to the ward. Purposive sampling Up to 8 days following ICU discharge.	'Interpretive description' – clear description of process. Clear discussion of research/participant relationship.	Clear discussion of literature and implications for practice.	No preparation for transition from ICU, impact of busy staff on dependent patients, part of recovery process, relatives compensating for reduction in care from staff, nurses as gatekeepers to doctors.	Included relative perspective – although limited to spouse and only 4 interviews were dyadic. Recommendations refer to importance of spouse in post-ICU ward care but no acknowledgement of other family members. Sample size based on Malterud.
Op 't-Hoog 2020 **Netherlands**	Qualitative interview study Single site Semi-structured interviews 13 relatives	Convenience sample. Aim: Explore family perspective of post-ICU ward care.	Clear setting and researcher relationship description.	Clear discussion.	Not involved in care and wanted direction on how to be. Lacked information, frozen out, relied on patient to relay info.	Single site.
REVIEWS						
Bench & Day 2010 **Meta-synthesis Includes all above studies**	Meta-synthesis of qualitative studies of patient perception of ward stay after ICU discharge	Aim: identify the most significant factors in recovery following ICU discharge.	Clearly described analysis.	Clear discussion of current evidence. Themes clearly articulate findings.	Physical and psychological symptoms of transfer, safety and progress.	Focused on immediate transfer but does explore physical as well as psychological aspects.

Salmond 2011 **Systematic review** **Relocation stress**	Mixed methods review	Aim: Occurrence, meaningfulness and strategies for reducing relocation stress.	Clearly described analysis.	Comprehensive review of all evidence related to relocation stress.	Transfer stress only for minority of patients, stress related to ward staff unawareness of physical dependency, resulting in either promoting recovery or causing stress, ward care not suitable for complex post-ICU patient.	Strengths: Comprehensive review following structure methodology.
Cullinane & Plowright **2013** **Review**	Narrative review (not stated)	Aim: explore literature around transfer from ICU to ward (not stated as limited to patients but only patient perspective included). Poor description of search strategy. Includes most studies.	Descriptive presentation of results, limited to psychological aspects – discussed symptoms in ‘physical’ theme very limited with only real physical symptoms described as ‘tiredness and weakness’.	Conclusion that transfer anxiety can be reduced by information sharing and communication at transfer – inference from literature but no clear evidence to support this.	Transfer from ICU to ward predominantly a psychological response.	Poor description of methods. Limited to psychological factors despite acknowledging physical aspects. Conclusions not supported by evidence presented.

The key theme identified across all studies was ‘transfer anxiety’ (also referred to in broader terms as relocation stress) (Leith, 1999), relating to dependence on nursing presence and mechanical surveillance. This was also identified in the three reviews, and was the main focus of one (Salmond et al., 2011). This reflected the move away from the perceived security of the high level of scrutiny by ICU nurses and continuous monitoring (Chaboyer et al., 2005; Forsberg et al., 2011; Green, 1996; Leith, 1999; Mckinney & Deeny, 2002; Odell, 2000; Pattison et al., 2007; Strahan & Brown, 2005), also identified in the three reviews (Bench & Day, 2010; Cullinane & Plowright, 2013; Salmond et al., 2011). Patients often expressed uncertainty about the new environment and concern about leaving the familiar ICU setting (Forsberg et al., 2011; Leith, 1999; Mckinney & Deeny, 2002; Odell, 2000; Strahan & Brown, 2005). However, transfer was also described as a positive step in recovery. Patients saw the move from ICU to the ward as an indication that they were getting better and no longer needed such a high level of care (Green, 1996; Leith, 1999; Mckinney & Deeny, 2002; Odell, 2000; Ramsay et al., 2014; Strahan & Brown, 2005). The associations of positivity and recovery with discharge from ICU were also identified in two of the reviews (Bench & Day; Salmond et al., 2011).

Underlying this anxiety, five studies identified concerns from patients that ward staff did not appreciate their level of physical dependence, leading to feelings of vulnerability (Chaboyer et al., 2005; Field et al., 2008; Hinton et al., 2015; Ramsay et al., 2014; Strahan & Brown, 2005). Despite the main psychological focus, some clinical and physical aspects of care were explored in these studies. These included physical symptoms such as pain, weakness, loss of appetite and poor sleep (Hinton et al., 2015; Mckinney & Deeny, 2002; Odell, 2000), reduced mobility (Strahan & Brown, 2005), reduced staffing (Chaboyer et al., 2005; Leith, 1999) and perceived mis-match between what was expected of patients on the wards, and what they were physically capable of (Hinton et al., 2015; Leith, 1999; Odell, 2000; Ramsay et al., 2014). This finding was emphasised in one review, identifying vulnerability and perception of high workload of nurses on the ward as underlying relocation stress (Salmond et al., 2011).

Four studies included family members in data collection (Chaboyer et al., 2005; Herling et al., 2020; Leith, 1999; Op ‘t Hoog et al., 2020). In two further studies, family members were included in some interviews but reporting focused on patient responses (Field et al., 2008; Hinton et al., 2015). All studies identified anxiety from family members about the vulnerability of patients and concerns their needs would not be met on the ward. The most recent study identified the impact on family members who felt they were expected to fill the gap left by reduced staffing numbers, although this was based on a very small sample of four relatives (Herling et al., 2020). Although family members’ perspectives were not reported, this was echoed in a further study reporting patients’ discomfort at relying on family members to provide care which was not accessible on the ward (Field et al., 2008). A further study suggested family members wanted guidance on how to assist with ongoing rehabilitation but felt unsupported by ward staff (Op ‘t Hoog et al., 2020).

Despite the stress associated with transfer from ICU being recognised over fifty years ago (Dominian & Dobson, 1969; Jones et al., 1979; Salmond et al., 2011), the most recent study identified this as continuing problem (Herling et al., 2020). Several studies have concluded that preparing patients for transition through removal of monitoring and communication may reduce this level of anxiety (Chaboyer et al., 2005; Forsberg et al., 2011; Mckinney & Deeny, 2002; Odell, 2000; Pattison et al., 2007; Ramsay et al., 2014; Strahan & Brown, 2005). In addition, one study suggested reduced staff presence, rather than removal of monitoring, caused anxiety and recommended a reduction in 1:1 nursing on ICU to assist in preparing for transition, although this may already be routine practice in UK ICUs (Herling et al., 2020). One study also identified the importance of communication between ICU and the ward to ensure ward staff were aware of what the patient had been through and their physical limitations (Hinton et al., 2015). The systematic review (Salmond et al., 2011) also identified these approaches as strategies to facilitate transfer from ICU.

In addition to the studies exploring patient and family member experience of discharge from ICU, several studies have focused on measuring and improving anxiety at ICU discharge (Table 8). One study aimed to measure the effect of anxiety over six months following ICU discharge. Assessments undertaken on the wards within three weeks of discharge found high levels of anxiety and depression, with 42% and 37% of participating patients respectively, measured using the Hospital Anxiety and Depression Scale (Castillo et al., 2016). Three further studies tested interventions aimed at reducing relocation anxiety. Interventions included: an information booklet to patients and families with a summary of their ICU stay and information about the ward transfer (Bench et al., 2015); diaries or discharge summaries of ICU stay (Castillo et al., 2020); and a Liaison nurse service which included co-ordinating the transfer, supporting ward staff and offering information and support to patients (Chaboyer et al., 2007). One further interventional study (Tel & Tel, 2006) was included in the systematic review (Salmond et al., 2011) but excluded from this review as the population were cardiac patients transferred from a coronary care unit following myocardial infarction, and therefore potentially a different population and setting than general ICU patients. None of the studies demonstrated a statistically significant improvement in post-ICU anxiety. However, two studies were pilots, and were not powered to detect an impact on outcome (Bench et al., 2015; Castillo et al., 2020). The authors of the study of Liaison Nurse service acknowledged several limitations which affected the outcome of the study, including timing of anxiety measurements (just prior to discharge) and complexity of the intervention (Chaboyer et al., 2007). In addition, the authors critiqued the measurement tool used and have subsequently identified more appropriate measurement tools (Gustad et al., 2005). Furthermore, a new tool specifically designed to measure relocation stress has been developed (Park et al., 2010) and recently refined and validated for use in post-ICU patients (Won & Son, 2020), which may be used in future studies.

Table 8. Relocation anxiety interventions

Study	N	Design Patient group Setting/ intervention timing	Intervention vs control	Primary outcome	Major secondary outcomes	Summary of limitations
Chaboyer 2007 **Australia**	115 patients and 100 families	Block intervention study, before and after Outreach intervention to reduce anxiety at ICU discharge	Anxiety measured just prior to discharge	State trait anxiety form: Reduction in anxiety prior to ICU discharge: no significant difference	None clearly stated	Not powered to detect difference Timing of outcome measure Measurement tool: extensive Short intervention and control blocks (4 months) Intervention not clearly defined.
Bench 2015 **UK**	158 patients >72 hours ICU stay At ICU discharge	Pilot RCT (three groups) Single site	Personalised discharge booklet versus ICU steps booklet or Ad hoc advice (usual care)	HADS: 5 +/- 1 day post-ICU discharge at 28 days post-hospital discharge: No difference	Perceptions of coping; relative HADS: No difference	Time-based eligibility criteria Delivery of intervention not assessed. High attrition.
Castillo 2016 **Australia**	141 patients	Longitudinal study of anxiety over 6 months Single site	N/A Association between anxiety and ICU discharge and at 6 months	Anxiety during critical illness: 57% moderate to severe anxiety	42% anxiety and 37% depression in patients at 3 weeks following ICU discharge.	Small sample size. Attrition at 6 months.
Castillo 2020 **Australia**	61 patients >24 hour ICU stay	Pilot RCT (three groups) Partial randomisation, partial patient choice of intervention Single site	Diary vs discharge summary vs usual care. Feasibility and acceptability.	>90% found interventions helpful	Preference for discharge summary over ICU diary. Distress associated with ICU diary (42%)	High attrition at follow-up to 3 and 6 months.

There were some limitations to this review. Although these studies offer a useful insight into patients' feelings immediately after transfer, the short timeframe between transfer and interview for some studies, as well as the focus on 'transfer anxiety', may have limited the scope of these papers. Half of the 16 included studies are over ten years old. Although the single-site setting of many of the studies included and age of some may raise concerns about the transferability of results and relevance to contemporary practice, findings have been consistent throughout this period and across sites and countries. This suggests relocation anxiety remains a significant problem for patients despite efforts at improvement, and further changes to practice could be made to address patient experience of transfer from ICU. In common with studies exploring staff perception, most studies had small sample sizes. Whilst this may be appropriate for the three phenomenological studies, for many others there was also no description of the sampling approach, suggesting the numbers might have been simply convenience samples, reducing credibility and dependability.

The key findings and gaps identified by this narrative review are summarised in Table 13. The main theme identified in this review was that transfer from ICU to the ward is very challenging for patients and their families, resulting in significant stress. This was described as 'relocation anxiety' and reflected the perceived reduction in nursing ratio and monitoring. Exploration of the underlying reasons for this anxiety were limited but some studies identified concerns that physical needs were not always met on the ward, resulting in feelings of vulnerability for patients. This highlights a clear gap in the evidence linking the psychological impact of transfer with the physical needs of the patient. In addition, studies were predominantly focused on the initial transfer period between ICU and the ward and there was limited evidence on longer-term in-hospital care.

2.5. Ward-based Care Provision Following ICU Transfer

The three reviews above have examined current knowledge of problems with post-ICU ward care, but have offered little evidence on strategies for improvement. To explore what measures have previously been taken to improve this area of care, a further review of care provision at discharge and interventions aimed at improving post-ICU ward care was undertaken, following the same principles of narrative review. Searches were conducted in the same databases as in the previous reviews and details of the search terms are included in Appendix Five. In initial searches, studies fell into two broad categories: strategies to improve the transfer from ICU to the ward (encompassing handover and Liaison Nurse/Critical Care Outreach Teams), and clinical trials aiming to assess the effect of specific changes on the functional outcomes of post-ICU patients. Included studies used a variety of research methods to assess care provision and test interventions. These two areas will be explored in this section, to provide an overview of current evidence for improving post-ICU ward care. Details of included studies are presented in Tables 9 to 12.

One recent systematic review explored interventions aimed at improving transfer of ICU patients to the ward (van Sluisveld et al., 2015), including both handover changes and implementation of Critical Care Outreach Teams or Liaison Nurse services. These two aspects of transfer, although linked, are very different, and are therefore examined separately in this narrative review. Four quantitative studies and four qualitative studies examined the handover process of transfer from ICU to the ward and findings will be discussed here (Table 9). Three survey studies were conducted in Canada. An initial single-site study examined ICU doctor, ward doctor and patient satisfaction with handover (Li et al., 2011). A subsequent similar, larger study also included ward staff and nursing perspectives (Stelfox et al., 2017), and a further national survey of administrators explored the format of handover (Boyd et al.2018). Two studies found statistically significant mismatches between ICU and ward perspectives of handover content, routine use of handover documentation and elements of information staff reported giving and patients reported receiving (Boyd et al., 2018; Stelfox et al., 2017). In addition to the surveys, a national study of Dutch ICU discharge practices found variation between ICU readmission and in-hospital mortality rates, but no significant association between these two outcomes and each of eight discharge practices selected as having potential to improve post-ICU outcome (van Sluisveld et al., 2017). These discharge practices were poorly defined but included early discharge planning, verbal and written handover and post-ICU monitoring from ICU personnel. This variation in handover practices between hospitals was reflected in the survey findings (Boyd et al., 2018; Stelfox et al., 2017).

Table 9. Handover studies

First author **Year** **Country** **Focus**	**Stated approach, methodology and population**	**CASP A: Validity** **Recruitment strategy?** **Data collection addressed research question?** **Relationship between researcher and participants explored?**	**CASP B: Results** **Ethical issues addressed?** **Analysis rigorous?** **Clear statement of findings?**	**CASP C: Value** **Contribution to knowledge, policy** **Identify new areas for research** **How transferred to other populations**	**Main findings**	**Summary of limitations** **Gaps in literature**
Li **2011** **Canada** **Physician satisfaction with transfer process**	Observational 112 pts Drs (ICU and ward) and families Single site Mixed methods: patient survey, interviews and chart review	Undescribed interviews, appears to be surveys administered by interview.	No qualitative analysis of interviews, all quant reporting.	Discussed in relation to other literature. Limited acknowledgement of limitations.	61% had written discharge document, key info missing, 86% seen within 24 hrs by dr, only 12% notified of pt arrival by ward staff. Common recommendations: written discharge document, discussion of transfer with patient. Night definition 5pm – 41% discharged night/weekend.	No mention of clinical instability or premature discharge. Interview data presented but in information on participants, setting, analysis, etc. Adverse events data includes responses from participants not described anywhere. 80% response rate. Large loss of eligible participants but demographics provided for non-study participants and similar. Methods very poorly described overall.
Lin **2013**	Ethnography 28 discharges observed, 56	Participants selected as involved in observed discharges	Clear but brief description of	Clear discussion of literature and	Discharge was often delayed due to bed availability,	Higher proportion of ICU than ward staff interviewed. Single site.

Australia **Factors influencing ICU discharge process**	interviews with multidisciplinary staff 1 hospital	Interviews short: 10-15 mins.	researcher interaction with participants.	implications for future research.	leading to out-of-hours discharge. Lack of standardised procedures resulted in poor handover.	
Oerlermans 2015 **Netherlands** **Ethical dilemmas in ICU**	Exploratory descriptive qualitative study Interviews and focus groups 19 interviews, 4 focus groups – nurses and doctors in ICU and general wards 10 hospitals	Unclear recruitment selection process - ? convenience sample, snowballing for focus groups. Open-ended questions.	No discussion of researcher relationship with participants. Grounded theory analysis – limited detail of process followed.	Clear discussion of literature but limited as covering several ethical dilemmas identified.	ICU overestimate technical skills and time available on ward.	Small part of wider exploration of ethical issues.
Stelfox 2017 **Canada** **Transfer process**	Cohort study 451 transfers – notes and surveys 10 Canadian hospitals	Consecutive ICU discharges, and surveys of staff involved.	Clear description of analysis approach.	Clear discussion of results and recommendations for practice.	25 hrs for discharge process – delay due to flow. Few patients seen within an hour of transfer by doctor. Ward staff report lower rates of info than ICU staff report having given.	Poorer ward response rate Survey data meant superficial.
Van Sluisveld 2017	Mixed methods: interviews/focus	Qualitative approach rigorous, wide range	Researcher not known to interviewees.	Study will inform national guidelines:	Wide-ranging identification of	Poor questionnaire response rate (21.8%).

Netherlands **Barriers to and facilitators of discharge process**	groups with staff and patients informing questionnaire of ICU physicians 6 hospitals and national survey	of staff groups included. Questionnaire only completed by ICU physicians with the aim of 'quantify the results of the interviews'. Likert scale transformed into binary responses.	Ethical issues not addressed. Clear description of analysis.	Checklists were considered useful by ICU physicians but no data on perspective of other groups. Clear research implications – more data on characteristics of readmitted patients and organisational processes.	barriers and facilitators from interviews. Communication between ICU and wards, discharge criteria, feedback and prevention of overestimation of care provision on wards were key findings.	Questionnaire results (main data conclusions based on) limited to ICU physicians. Patients intended to be included but stopped after two as no information gained about discharge process.
Bunkenburg 2017 **Denmark** **Nurse handover**	Focused ethnography Observations and focus groups, 22 clinical situations 5 focus groups, 5 interviews with ICU and ward nurses Single site	Convenience selecting days for observation. Convenience sampling for interviews and focus groups.	No information on interview setting or relationship to researcher. Otherwise, clear section on 'rigour'.	Clear discussion and implications for practice.	Detailed info from ICU nurse, not attended by ward nurse, risking loss of info. Busyness of ward impairing handover Written handover not consulted.	Single site. All experienced staff.
Boyd 2018 **Canada** **Administrator perspective of handover**	Survey study 108 hospitals (of 128 invited) ICU administrators and ward administrators National sample	Nationwide administration of questionnaires - not validated.	Qualitative content analysis on survey responses – limited details of process.	Clear discussion of limitations. Clear discussion of results.	11% have standardised handover tool 81% ICU versus 60% ward routine written discharge handover. 21 different tools identified in the	Claim qualitative content analysis for categorisation of survey responses for improvements. Survey approach limited detailed data. 1 year between ward administrator and ICU

					11% who reported them. Recs for change: standard handover tool, communication with patients.	administrator questionnaires – processes may have changed.
De Grood 2018 **Canada** **Barriers and facilitators to successful discharge**	Qualitative study Patients, families, ICU and ‘ward clinicians’ - ? role	Semi-structed interviews. Convenience sampling based on equal numbers at each site. Hint at saturation but not clearly stated.	Qualitative content analysis. No reference to researcher relationship to participants. Data reported in quantitative format, quotes in tables.	Clear discussion of results and some limitations acknowledged.	Resource availability, culture and communication identified but not clear in what respect.	Very poor qualitative reporting, no thick description. Quantitative sampling approach. No description of setting for interviews, etc. Some ICU encounters 2 years prior to interview.
Powell 2020 **Australia** **Nurse handover**	Trauma patients Observations and FGs, semi-structured 10 handovers, 10 ICU nurses, 10 ward nurses interviews Single site	Purposive maximal sampling. Saturation. Thematic analysis.	Quantitative reporting – poor presentation of results.	Some discussion of implications for practice but limitations not clearly acknowledged.	Discrepancies in information with potential to impact patient safety, variable processes, poor patient and family involvement. Interruptions and time pressures problematic. Suggested structured tool. Detail mismatch	Mostly quant reporting of observations. Very superficial reporting of interviews. Interviews very short – median 5 minutes

Table 10. Handover interventions

Study	N	Design Patient group Setting/ intervention timing	Intervention vs control	Primary outcome	Major secondary outcomes	Summary of limitations
Williams 2010 **Australia** **Handover**	N not stated but 97% of 295 eligible discharges	Discharge plan and checklist Observational (before and after) study Discharges within 12 weeks, pall care excluded Single site	Before and after implementation of nursing discharge plan	Adverse events within 72 hours of discharge Reduced AEs sig (10% to 23%) 67 AEs, 19% preventable 17/167 AEs (10%) in previous study, 9 (52% preventable)	None stated	High incidence of AEs, unclear how measured. Reporting errors – 12 weeks or 6 months study duration Compared with previously published data as before arm (unclear timeframe) – collected at same time of year, year not stated but indications that one year later. Errors in % reported noted.
Chaboyer 2012 **Australia** **CCOT handover**	1,787 (1,001 before, 786 after)	Before and after quality improvement study Single site At ICU discharge	Redesign of discharge process: change agent, ward predicted time of discharge, redesign of handover document, discharge alert sheet versus 'before' baseline of 1,001 patients	Hours of discharge delay: Delay reduction of 3.2 hours	Mortality, readmission within 72 hours No difference	Primary outcome of discharge delay reduction, although clearer secondary outcomes of mortality and readmission – no change. ? not powered to detect outcomes.

These studies were limited by the survey design, which may have over-estimated satisfaction, especially in patients. Response rates were variable with reliability of data in one study limited by a much poorer response rate from ward versus ICU staff (Stelfox et al., 2017). One study attempted to investigate adverse events due to the handover process (Li et al., 2011). However, the approach used to identify these adverse events was not clearly and systematically described and therefore potentially unreliable. Although findings of these studies identify some problems with ICU handover, and all studies recommended implementation of a structured written handover at ICU discharge, the survey designs preclude more detailed data about how handover could be improved.

Some of the limitations of the survey approach were addressed in the five qualitative studies of ICU discharge processes identified in searches. Three ethnographies examined the handover process, from nursing (Bunkenborg et al., 2017; Powell et al., 2020) and multi-professional perspectives (Lin et al., 2013). A further study interviewed nurses, doctors and patients about their perspective of ICU to ward transfers (De Grood et al., 2018), and discussion of discharge decisions was included in a wider study of ethical considerations related to ICU admission and discharge with ICU nurses and doctors (Oerlemans et al., 2015). Two studies identified loss of information through verbal handover, identifying significant failures to communicate problems with vital signs and important clinical information (Bunkenborg et al., 2017; Powell et al., 2020).

In common with the survey studies discussed above, three studies also identified a mismatch between the information given by the ICU nurse (extremely detailed about ICU stay) and what was required by the ward nurse (pertinent information on current condition of patient), resulting in inattention to handover and a degree of hostility (Bunkenborg et al., 2017; Lin et al., 2013; Powell et al., 2020). Misunderstanding of information was also identified between ICU and ward nurses in one study (Lin et al., 2013). A failure of team work between discharging and receiving wards was identified by two studies (De Grood et al., 2018; Powell et al., 2020) In addition, in common with staff and patient perspectives discussed in sections 2.3 and 2.4, three studies identified insufficient ward resources, workload and technical skills to manage post-ICU patients (De Grood et al., 2018; Lin et al., 2013; Oerlemans et al., 2015). Premature and out-of-hours discharge were recognised as occurring due to high ICU bed occupancy despite this insufficiency (Lin et al., 2013; Oerlemans et al., 2015). These studies also had limitations. Two studies were conducted at single sites, which was common in the qualitative studies throughout this review, but does limit transferability of findings. One multisite study was not primarily focused on ICU transfer and therefore reported data were limited (Oerlemans et al., 2015). One ethnography was conducted at ten sites, but was poorly conducted, with data frequently quantitatively reported and very superficial qualitative analysis, limiting the richness and credibility of findings (De Grood et al., 2018).

Throughout these studies, the key recommendation for future practice, from both participants and authors, was a standardised, structured written handover (Boyd et al., 2018; De Grood et al., 2018; Li et al., 2011; Stelfox et al., 2017). Two studies examined the effect of changes to the discharge process (Table 10). One study demonstrated an increase in the primary outcome of adverse events, following implementation of a structured written handover (Williams et al., 2010). Implementation of a structured written handover alongside strategies to improve ICU/ward communication demonstrated a reduction of 3.2 hours in the primary outcome of discharge delay, but no impact on in-hospital mortality or ICU readmission within 72 hours (Chaboyer et al., 2012). Both studies had significant methodological flaws which limited the rigour of their findings, including single sites, small sample sizes, retrospective comparator data, and limited mitigation of bias in assessment of adverse events. In addition, findings of one study were further limited by variability in definition of adverse events before and after implementation of intervention, and reporting errors (Williams et al., 2010), limiting reliability of the data.

In addition to handover, follow-up visits from Critical Care Outreach Teams (CCOT) or Liaison Nurses (LN) have also been implemented with the aim of improving post-ICU ward care. As ICU patients may be discharged to any ward within a hospital, there is little commonality in the setting or professionals involved in their care following ICU discharge. The only common factor during this period of care is the outreach/follow-up team who in most NHS trusts will visit the patient following transfer from ICU (FICM, 2017). Despite widespread support within clinical standards (Department of Health, 2000; National Institute for Health and Care Excellence, 2009; National Outreach Forum, 2012), the role of outreach/follow-up in post-ICU ward care has not been widely researched in the UK, although several studies have been conducted examining the similar Liaison Nurse role in Australia and South America (Alberto et al., 2017; Endacott et al., 2010). Several comprehensive reviews of this literature have been conducted. Three reviews included quantitative data with the most recent published in 2020 (Niven et al.; Österlind et al., 2020; Tabanejad et al., 2016) and a further meta-synthesis, including both qualitative and quantitative data, was published in 2009 (Endacott et al., 2009). The results of these reviews, and additional studies published since the reviews, are presented here and in Table 11.

Table 11. Critical Care Outreach Team/Liaison Nurse studies

First author **Year** **Country** **Focus**	**Stated approach, methodology and population**	**CASP** **A: Validity** **Recruitment strategy?** **Data collection addressed research question?** **Relationship between researcher and participants explored?**	**CASP** **B: Results** **Ethical issues addressed?** **Analysis rigorous?** **Clear statement of findings?**	**CASP** **C: Value** **Contribution to knowledge, policy** **Identify new areas for research** **How transferred to other populations**	**Main findings**	**Summary of limitations** **Gaps in literature**
Niven **2014** **Not restricted to country** **Transition programmes**	Meta-analysis Outcomes: mortality and readmission	Method clearly stated and appropriate.	Clear analysis.	Clear discussion.	No effect on mortality or readmission.	Include MET and RRT so broader focus. Only focused on quant data and specific outcomes so limited exploration.
Osterlind **2020** **Not restricted to country** **Transition programmes**	Meta-analysis Outcomes: mortality and readmission	Method clearly stated and appropriate.	Clear analysis.	Clear discussion.	Effect on readmission, no effect on mortality overall, positive effect for CCOT only.	Include MET and RRT so broader focus. Only focused on quant data and specific outcomes so limited exploration. Update of Niven.
Tabanejad **2014**	Systematic review of interventional studies of Liaison nurse role	Clear methods including search terms although list not comprehensive.	Clear analysis – narrative, no data pooling.	Clear discussion.	Some studies demonstrating positive impact on outcomes.	Interventional studies only Diversity of interventions making comparisons difficult.

Not restricted to country **Liaison nurse**	Outomes: reducing delay to discharge, discharge planning, mortality and readmission					Broader outcome measures included than other reviews.
Endacott 2009 **Not restricted to country** **Liaison nurse and outreach**	Integrative review and meta-synthesis Including quantitative and qualitative studies	Clear systematic search.	Clear analysis. Studies clearly presented. Meta-synthesis based on Nursing Role Effectiveness Model	Clear discussion and identification of limitations of literature.	Some indication of benefit but unable to unequivocally conclude improved outcomes Improved outcomes for staff.	No pooling of data.
Athifa Australia **2011** **Ward nurse perception of CCOT**	3 hospitals Prior data and 6 months after implementation of CCOT 131 nurses in 19 focus groups	Exploratory focus groups. Semi-structured.	Framework analysis. Thematic approach. No discussion of interview setting or relationship between researcher and participant.	Limitations acknowledged. Clear discussion.	Improved communication between staff and enhanced ward transition.	Very large sample size with not discussion of saturation or justification. Focus groups had up to 20 participants.
Haggstrom 2018 **Sweden** **Ward and CCOT perception of follow-up visits**	Interviews ICU and ward nurses 2 hospitals	Semi-structured interviews. Purposive sampling 13 interviews.	Content analysis – clearly described. No discussion of researcher participant relationship or interview setting.	Clear discussion of credibility, dependability and trustworthiness. Conclusions do not consider limitations of single site.	Collaboration enhances quality of care. Ward visits beneficial to follow-up service.	Nurse-only perspective. Two sites.

A comprehensive review and meta-synthesis of the impact of the outreach/liaison role was conducted in 2009, including 20 studies from the UK and Australia, using a variety of research methodologies (Endacott et al., 2009). This review found some evidence of improvement in quantitative outcomes such as in-hospital mortality, ICU readmission rates and incidence of adverse events, although this was limited by the quality of the studies. A further systematic review was conducted in 2014, examining interventional studies only and again finding limited evidence due to diversity of interventions within the studies (Tabanejad et al., 2014). Two reviews have examined the impact of Critical Care Transition Programmes, with wider inclusion criteria than the two reviews above, encompassing nurse-led services including CCOT and LN, intensivist-led follow-up, and Rapid Response and Medical Emergency Teams (Niven et al., 2014; Österlind et al., 2020). The outcome measures for these reviews were limited to ICU readmission and in-hospital mortality and therefore the included studies differed to the two reviews described above. In addition to these outcomes, a further study retrospectively analysed the impact of a new outreach service on readmission mortality (Martin et al., 2015). This study was not included in any of the reviews previously identified as the primary outcome measure differed. Readmission mortality was selected for this study as a potential indicator that CCOTs facilitate earlier detection of deterioration and therefore earlier readmission to ICU, potentially reducing harm to the patient. However, this was a single site pilot study and the numbers included for the primary outcome (seven patients died following ICU readmission versus five) were insufficient to draw any conclusions. This may be an outcome worth considering for future studies, although very large numbers of patients would need to be recruited to demonstrate a positive effect. The most recent review found no overall improvement in ICU readmission or death due to these interventions. The authors suggest this may be due to the methodological flaws and high risk of bias identified for many of the included studies, or the limited outcomes measures of mortality and ICU readmission.

Despite the currently limited quantitative evidence to support this service, the meta-synthesis identified benefits perceived by ward staff such as improved communication between ICU and the ward and improved ward nurse confidence with post-ICU patients (Endacott et al., 2009). Two further qualitative studies have been published since this meta-analysis. Staff identified LNs as supporting continuity of advanced care by supporting staff with advanced clinical skills and offering teaching (Athifa et al., 2011; Häggström et al., 2018). In addition, ward nurses perceived CCOTs as improving patient outcomes (Athifa et al., 2011). Other studies have also demonstrated improved patient satisfaction related to outreach provision (Samuelson & Corrigan, 2009; Slattery et al., 2011). These findings suggest that previous studies may not have captured the positive impact of CCOTs for both patients and staff during post-ICU ward care.

In addition to the work focused on initial transfer from ICU to the ward, three randomised controlled trials tested interventions aimed at improving longer term clinical provision for this patient group (Denehy et al., 2013; Walsh et al., 2015; Wright et al., 2018) (Table 12). Studies measured the impact of interventions aimed at improving rehabilitation alone (Denehy et al., 2013; Wright et al., 2018) and in combination with nutrition (Walsh et al., 2015). Primary outcomes for these studies included: physical or cognitive function (Denehy et al., 2013; Walsh et al., 2015); and quality of life (Wright et al., 2018). No study demonstrated a statistically significant improvement in primary outcome.

Table 12. Ward-based intervention studies

Study	N	Design Patient group Setting/ intervention timing	Intervention vs control	Primary outcome	Major secondary outcomes	Summary of limitations
Denehy 2013 **UK**	150 (less than goal of 200)	Single site RCT >5 days ICU stay Single site Physiotherapy in ICU, ward and outpatients	Intensive physiotherapy versus usual care	6 minute walk test at 12 months post-hospital discharge: No difference	Various function tests	Time-based eligibility criteria Delivery of intervention not assessed 13% loss to follow-up Recruitment goal not reached
Walsh 2015 **UK**	240	2 centre RCT >48 hours ventilation on ICU Post-ICU in-hospital stay	Rehabilitation and nutrition assistants versus usual care	Rivermead Mobility Index at 3 months: no difference	HRQOL, satisfaction assessments, cost-effectiveness	Time-based eligibility criteria Assessment of delivery of intervention limited to number of visits, not what was delivered
Wright 2018 **UK**	308	Multisite RCT (4 sites) >48 hours ventilation on ICU **In ICU**	90 minutes daily physical rehabilitation versus 30 minutes daily physical rehabilitation	PCS SF-36 at 6 months: No difference	Multiple functional assessments	Time-based eligibility criteria. Did not meet intervention or usual care targets. Large loss to follow-up: 2/3

There were several limitations in these studies which may have contributed to failure to demonstrate a significant change in primary outcome. Eligibility was time-based for all three studies, rather than targeting the at-risk group for each intervention. One used length of stay on ICU of between 72 hours and five days (Denehy et al., 2013) and two used 48 hours on a ventilator as the limit for eligibility (Walsh et al., 2015; Wright et al., 2018). Intervention delivery was either not assessed or not achieved for all three studies (Denehy et al., 2013; Walsh et al., 2015; Wright et al., 2018), and two studies had large attrition rates or failed to achieve their sample size target (Denehy et al., 2013; Wright et al., 2018). Both the failure to demonstrate delivery of the intervention and high attrition rate limited the potential for outcome improvement. All studies were single site or small multisite studies (with a maximum of four sites), limiting generalisability. The failure to demonstrate an impact for all but one intervention is likely to be due to the limitations identified, but may also demonstrate the complexity of the problem of post-ICU ward care. In addition to these interventions, a recently published protocol describes a current study aiming to improve the escalation of deterioration on the ward by development of a complex intervention (Smith et al., 2019). Although not specifically targeted at post-ICU patients, this intervention has the potential to improve care delivery for those patients who do deteriorate following transfer and may also offer further insights into how ward-based care could be improved for patients discharged from ICU.

The main findings and identified gaps in literature from this review are summarised in Table 13. Handover has been identified as poor but interventions to improve this have not been established. Whilst there is limited quantitative evidence demonstrating improvement in outcomes there is some evidence that CCOTs are valued by both staff and patients. There is a gap in evidence to support CCOT and LN services both in terms of impact and optimum form for the service. This may be due to widespread adoption without an initial evidence base (and difficulty in conducting post-hoc analysis), diversity of provision between hospitals, and the complexity of the setting. Despite this, it is likely that

CCOT services will be an important aspect of improving post-ICU ward care, due to widespread adoption and their status as the single key commonality between patients discharged from ICU.

Table 13. Overview of literature review and identified gaps

Area of literature	Main themes	Limitations	Gaps identified	Literature
Database studies of risk factors for post-ICU in-hospital mortality	Statistically significant risk factors: • Tracheostomy presence; • Elevated CRP; • Elevated creatinine; • High nursing workload; • Out of hours discharge from ICU.	Limited to data recorded in ICU databases. Limited to factors present at ICU discharge. No exploration of underlying reasons or ways to modify risk factors.	Ongoing risk factors. Risk factors not identifiable through database analysis. Underlying reasons for risk factors.	Aguiar-Ricardo e al, 2019; Araujo et al., 2012; Campbell et al., 2008; Chatterjee et al; Fernandez et al., 2008; Goldfrad & Rowan, 2000; Ho et al., 2008; Iapichino et al., 2003; Laupland et al., 2011; Litton et al., 2007; Martinez et al., 2009; Moreno et al., 2001; Pilcher et al., 2007; Ranzani et al., 2012; Silvestre et al., 2010; Smith et al., 1999, and 17 others not referred to in the text but included in the meta-analysis.
Staff perspective of ICU patients on wards	Anxiety around receiving a patient from ICU due to lack of skills and knowledge of ward staff to provide care needed.	Many small, single site studies. All retrospective (no observational data). 3 studies reporting same data set.	Perspective of other staff groups. Ongoing ward management of post-ICU patients.	Cognet & Coyer, 2014; Cox et al., 2006; Elliott et al., 2013; Enger & Angershed, 2018; Häggström et al., 2009; Häggström et al., 2012; Häggström & Backstrom, 2014;

	Complex patients difficult and capabilities of ward underestimated. Need for better preparation of patients for transfer. Improvements in handover needed.	Limited almost exclusively to nurses’ perspectives. Few UK studies.	Role of outreach in this setting, Contrast of perspective of multiple sites/wards.	James et al., 2013; Kauppi, 2018; Whittaker & Ball, 2000.
Patient perspective of transfer from ICU to ward	Struggle with change in staff ratio. Feelings of isolation and fear: ‘transfer anxiety’, also present for family members. Transfer as a positive step in recovery.	Mostly focused on psychological impact. Little exploration of clinical care delivery or underlying reasons for fear aside from change in staffing levels.	Perspective of ward care beyond initial transfer. Perspective of physical impact of transfer.	Bench & Day, 2010; Bench et al., 2015; Chaboyer et al., 2005; Chaboyer et al., 2007; Cullinane & Plowright, 2013; Field et al., 2008; Forsberg et al., 2011; Green, 1996; Herling et al., 2020; Hinton et al., 2015; Leith, 1999; McKinney & Deeny, 2002; Odell, 2000; Op’ t Hoog et al., 2020; Pattison et al., 2007; Ramsay et al., 2013; Salmond et al., 2011; Strahan & Brown, 2005.

Interventions to improve post-ICU ward care	Handover important area for improvement. National support for CCOT. Some evidence of staff and patient satisfaction with CCOT. Limited evidence for any interventions demonstrating significant impact of post-ICU ward care.	Very limited quantitative data to support CCOT, likely due to large variations to services across UK and complexities of area. Limitations in interventional studies.	Optimum form of ha Current contribution of CCOT to ward-based care. Optimum form of CCOT service. Other interventions which may be successful in improving post-ICU ward care.	Athifa et al., 2011; Boyd et al., 2018; Bunkenborg et al., 2017; Castillo et al., 2016; Castillo et al., 2020; Chaboyer et al., 2012; De Grood et al., 2018; Denehy et al., 2013; Endacott et al., 2009; Häggström et al., 2018; Li et al., Lin et al., 2013; Martin et al., 2015; Niven et al., 2014; Oerlemans et al., 2015; Österlind et al., 2020; Powell et al., 2020; Samuelson & Corrigan, 2009; Slattery et al., 2011; Stelfox et al., 2017; van Sluesvlesd et al., 2017; Tabanejab et al., 2014; Walsh et al., 2015; Williams et al., 2010; Wright et al., 2018.

2.6. Conclusion and Study Aims

This chapter has presented the key areas of evidence relevant to post-ICU ward care, including a systematic review, meta-analysis and three reviews drawing on narrative reviewing principles to provide contextual factors. This review has identified a number of gaps in current evidence which this study aims to address, summarised in Table 13. These include:

- Ongoing risk factors for post-ICU mortality (i.e. risk factors associated with post-ICU mortality beyond those identified at ICU discharge),
- Underlying reasons for risk factors identified within the systematic review as associated with post-ICU in-hospital mortality (why patients who are discharged from ICU out-of-hours have worse outcomes than those discharged in-hours and why each individual risk factor is associated with poor outcome),
- Perspectives of staff other than nurses of the challenges of delivering ward-based care to post-ICU patients, offering a multidisciplinary view from all staff involved in this area of care,
- Patients' perception of the challenges of ongoing ward care provision, after the initial transfer period (i.e. first 24 hours),
- Patients' perspectives of the physical impacts of transfer from ICU to ward care, and
- Current interventions to improve post-ICU ward care including handover and CCOT.

This literature review has informed the aims of this study. Whilst the systematic review and meta-analysis identified risk factors for post-ICU in-hospital mortality, an understanding of the underlying reasons is yet to be established. The reviews of staff and patient perspectives emphasised the broader context of this area of care, where a qualitative approach allowed in-depth exploration of the gaps emerging from the literature reviews. Based on the gaps identified in this literature review, the research question for this study is:

What challenges and problems in care currently exist in the management of post-ICU ward patients?

The results of this study are intended to inform future development of a complex intervention aimed at improving post-ICU ward management, beyond the scope of this doctorate. As previously identified, this is a complex area of clinical management and requires data from a number of perspectives to inform development. No single study has comprehensively described the complexities and challenges in this area from multiple perspectives, specialities and sites, although drawing current evidence together brings some insight into the challenges of delivering post-ICU ward care. In this next chapter the methodology of this study will be discussed, including the epistemology, rational for choice of methods and details of the approach taken.

Chapter Three: Method and Methodology

3.1. Introduction

The previous chapter outlined what is currently known about this area of practice and identified gaps in literature contributing to the research question for this study. In this chapter, the choice of a mixed methods approach taken to answer the research questions is discussed, including the underlying epistemology, and how this influenced the design for this study. An overview of each method is then presented, followed by in-depth discussion of the choice of methods, outlining how each approach was used and how data were analysed separately and together. Rigour and trustworthiness are discussed throughout the chapter and summarised at the end.

3.1.1. Research Question

Chapter Two outlined the risk factors present at ICU discharge, which may impact post-ICU ward care. However, these data do not identify risk factors that occur during ongoing ward care. There are also qualitative (experiential) and some quantitative (surveys on perspectives) data on staff and patient perceptions of post-ICU ward care. However, there are limitations to these data, as previously identified. These include lack of exploration of the human factors underlying identified risk factors, limited transferability of small qualitative studies, and focus on nursing perspectives. Beyond data related to handover and CCOT follow-up, there is little evidence about the specific challenges of delivering care to this group of patients or the underlying reasons for these challenges. To ensure any change in practice is effective, these gaps in knowledge need to be addressed. These gaps include:

- Ongoing risk factors for post-ICU mortality (i.e. risk factors associated with post-ICU mortality beyond those identified at ICU discharge),
- Underlying reasons for the association between risk factors identified within the systematic review and post-ICU in-hospital mortality,

- Perspectives of staff (other than nurses) of the challenges of delivering ward-based care to post-ICU patients, offering a multidisciplinary view from all staff involved in this area of care,
- Patients' perception of the challenges of ongoing ward care provision, after the initial transfer period (i.e. first 24 hours),
- Patients' perspectives of the physical impacts of transfer from ICU to ward care, and
- How outreach/follow-up services currently contribute to post-ICU ward care.

This doctoral work aimed to answer the following question, defined by the identified gaps in literature and the overarching aim of the study: ***What challenges and problems in care currently exist in the management of post-ICU ward patients?***

3.1.2. Choice of Mixed Methods and Secondary Research Questions

As demonstrated by the literature review, this is a complex area of clinical care delivery involving diverse groups and settings. Current evidence has been derived using a variety of methods including retrospective database analyses, qualitative interview studies, surveys and clinical trials (Elliott et al., 2013; Field et al., 2008; Gantner et al., 2014; Walsh et al., 2015) and no single approach has succeeded in fully exploring this area. Table 13 (Chapter Two) outlined the limitations and gaps in current literature. Although there is some evidence linking factors present at ICU discharge with post-ICU mortality, these studies offered no insight into the reasons why these factors were linked to poor outcome, such as what human factors (aspects of human behaviour, such as communication and team work) may have underpinned management of these clinical aspects. The qualitative data indicated some of the challenges in managing post-ICU patients, but was limited to the perspectives of nurses and generally focused on the immediate post-ICU period. The literature review also identified a number of interventions aimed at improving post-ICU ward management. However, the lack of clear evidence of where the challenges in care delivery and underlying reasons for these challenges may have contributed to the variability of evidence to support these interventions. A clear account of post-

ICU ward care, addressing these gaps in the evidence, is needed to inform meaningful practice change in this area. This study therefore aimed to answer the research question identified above using mixed methods to address the current gaps in literature. The overarching rationale for using mixed methods was to provide a more complex understanding of a research problem than could be achieved using one method alone (Creswell & Plano Clark, 2011; Shannon-Baker, 2016). It has also been asserted that utilising mixed methods can address some of the limitations or biases of individual methods (Greene & Caracelli, 1997). A mixed methods approach offers the “breadth and depth” of understanding required for this complex area of clinical care (Teddlie & Tashakkori, 2011). This detailed picture will be essential to the future aim of this study - informing a complex intervention to improve post-ICU ward care (Farquhar et al., 2013; Medical Research Council, 2008).

Two methods were selected to explore care provision from different perspectives, which will be discussed below, using a convergent exploratory mixed methods design (discussed in section 3.3). Methods selected were: retrospective case record review (RCRR) (with two facets – initial overviews and subsequent in-depth analysis of selected cases) (discussed in section 3.3.6) and interviews with patients, relatives and staff (discussed in section 3.3.7. The secondary research questions for each approach were:

- What problems in ward-based care can be identified in documented care records for both surviving and non-surviving post-ICU patients?
- What challenges and potential improvements are perceived by multidisciplinary staff delivering ward-based care to post-ICU patients?
- How is ward care perceived by post-ICU patients and family members, and what changes could be made to improve this?

3.2. Epistemology: Realism Versus Pragmatism

There is wide debate on what the term ‘mixed methods’ refers to – method, methodology or paradigm (Creswell & Tashakkori, 2007; Johnson et al., 2007). The development of this study is best reflected by the “bottom-up” approach described by Tashakkori and Creswell (2007), whereby the choice of methods is directed by the research question being asked (Tashakkori & Teddlie, 2015). This is argued to be a ‘pragmatic’ approach and emphasises the importance of paradigm choice in mixed methods research (Tashakkori & Creswell, 2007).

3.2.1. Pragmatism

There has been discussion within the literature as to whether paradigm choice is important or useful (Bryman, 2006; Morgan, 2007; Shannon-Baker, 2016). However, identifying one’s paradigm or worldview may help the reader to understand the researcher’s standpoints and potential influences whilst conducting their research (Shannon-Baker, 2016). Traditional frameworks contrasting quantitative and qualitative research methods describe the worldviews of these approaches in stark terms. Barbour (2014) described the positivism of quantitative methods as knowing only through measuring, defined as deductive and objective. In the constructivist worldview associated with qualitative research, reality is constructed through experience and described as inductive and subjective (Barbour, 2014). It has been argued that these polar descriptions do not fit within real life research (Biesta, 2010; Bryman, 2006). Morgan (2007) argued that whilst qualitative and quantitative methodologies have their own stances in terms of subjectivity/objectivity and deductive/inductive tendencies, in reality these are not absolute distinctions. There is blurring between the two stances, with neither being a practical application in the real world (Bryman, 2006). Pragmatism takes this further to define a paradigm where the strengths of each approach can be combined to explore real-life phenomena, offering abduction and intersubjectivity as alternative descriptors (Morgan, 2007; Shannon-Baker, 2016). This was demonstrated in the literature review where the gaps in respective areas of literature reflect the positivist limitation of measuring but not explaining the underlying reasons for risk factors associated with poor outcome in this patient group, and the limitations of small qualitative studies with patients and staff which focus on perception and psychological impact without making practical recommendations for improvements.

Pragmatism has much in common with realism (Shannon-Baker, 2016). Miles et al. (2014) described themselves as pragmatic realists – arguing “social phenomena exist not only in the mind but also in the world” (p. 7). Pragmatism has also been described as moving away from the perception of polarisation of positivism and constructivism (Fletcher, 2017; Maxwell & Mittapalli, 2010). The ontology of realism lies between objectivity and subjectivity, and may serve to bring the benefits of both paradigms together and help ameliorate the drawbacks of each (Pawson, 2013). It is suggested that to describe a simple dichotomy between positivism and subjectivism creates a false impression of reality (Edwards et al., 2014). The existence of an objective world outside of personal perspective is an essential premise of this study, where the aim was to define clear factors which could be addressed to improve care. However, subjective factors which influence individual perceptions of this world are also acknowledged in this study. Between subject groups (staff and patients) and within subject groups (doctors and nurses; patients and relatives) different but complementary perspectives on the question were anticipated.

This study was designed to take all perspectives into account and use these to define a pragmatic solution to this problem. However, critical realism is theory-driven, context-focused and based on the constructed world from participant perspectives (Fletcher, 2017; Shannon-Baker, 2016). In response to concerns that critical realism was too theoretically driven, Ray Pawson developed the approach of realist evaluation: ‘What works for whom in what circumstances?’ (Pawson, 2013). This approach could be aligned to the aim of this study: to explore *what* happens to patients discharged from ICU, *why* there may be problems in delivery of this care, and *how* this could be changed. By looking at the problem from multiple perspectives, both the social constructs of care delivery in this area, and the results of these social constructs, can be explored. However, realist evaluation and Pawson's realist approach have been criticised for being too theoretically driven and not offering a methodological solution to the complexity of different perspectives (Dixon-Woods, 2014). Realism has been argued not to be concerned with defining a 'whole truth' (Shannon-Baker, 2016). Whilst realism may be useful in exploring the implementation of an intervention, pragmatism is more suited to describing a phenomenon with the intention of changing practice. As the aim of this work was to inform future practice change, pragmatism was selected as the most appropriate epistemology for this thesis.

This section has outlined the epistemology underpinning this study and how this fits with mixed methods research. Hallberg (2009) asserts that nursing research should have clinical application to be worthwhile. In using mixed methods and a pragmatic approach, this project aimed to explore this complex area in a way that will allow practice to be changed, and for these changes to be measured and reproduced.

3.3. Methods

Having established that a mixed methods approach to answer the research question was most appropriate, this section outlines the overall study design. The mixed method design is considered, and ethical considerations explored. The approach taken for each method is then described and discussed in depth, including justification of choice and detailed exploration of implications and considerations for the study.

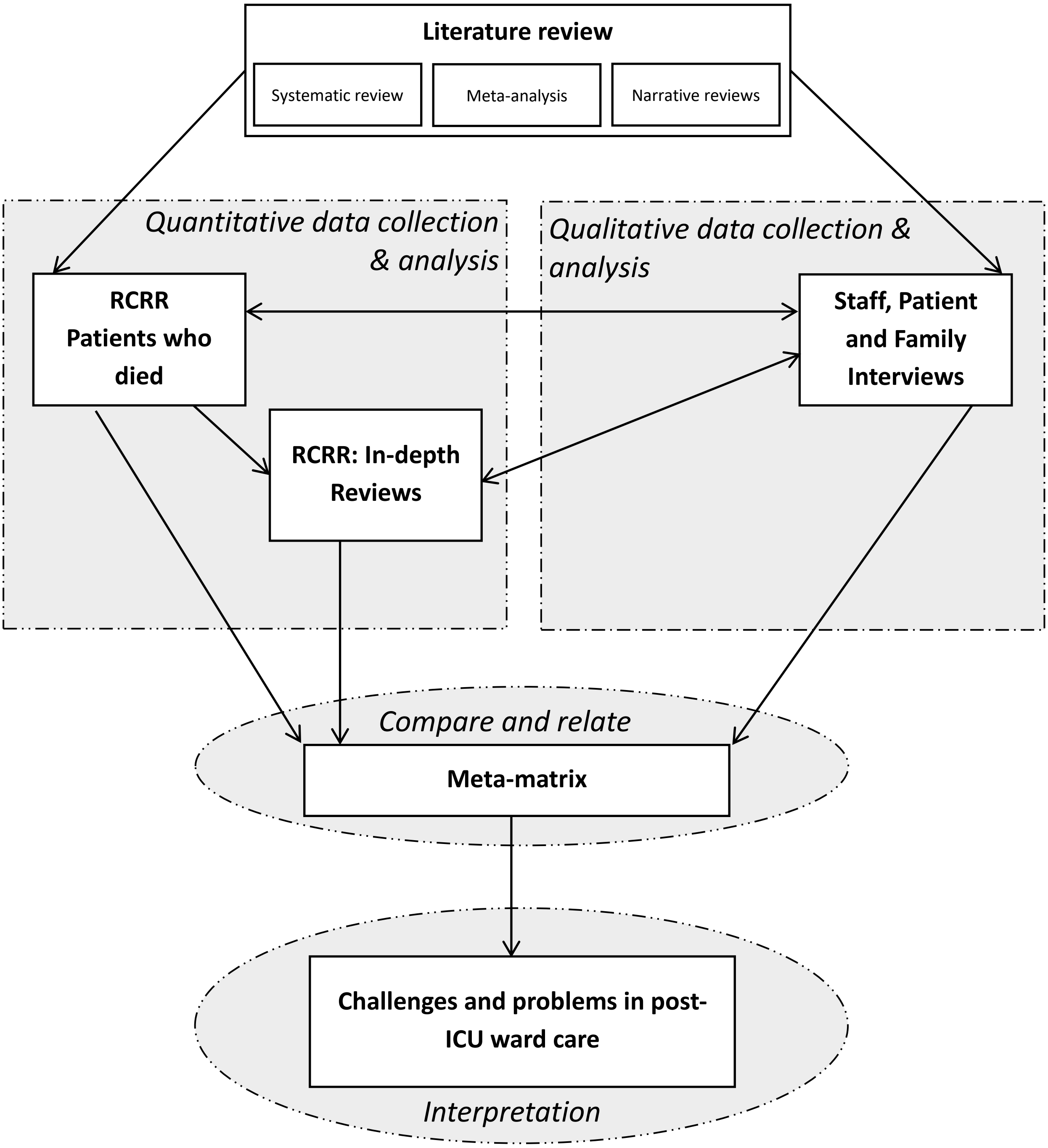
The aim of this research was to describe the challenges faced in delivering care to post-ICU ward patients and inform improvement. With this aim, two main approaches were selected: retrospective case record review (RCRR) – including initial overview reviews and further in-depth analysis of the cases of selected patients who died and survivors, aiming to explore care delivery; and semi-structured interviews, aiming to gain multiple perspectives of the challenges of post-ICU ward care.

The study also drew on current evidence as detailed earlier, mirroring the quantitative and qualitative approaches utilised in this study. Data generated by the RCRR work were both quantitative and qualitative, thus this project goes beyond traditional mixed methods approaches of combining discrete quantitative and qualitative elements (Mason, 2018), to combine several strands of quantitative and qualitative data. This could be argued to blur the distinctions between positivist and interpretivist paradigms (Greene & Caracelli, 1997; Tashakkori & Creswell, 2007) but within this pragmatic study the combination offers the richness required to address this complex research question.

The clearest example of the integrated approach taken by this study is described by Creswell and Plano Clark (2011) as 'convergent parallel exploratory', as represented in Figure 4. Most characteristics of this design fit well: pragmatic paradigm; aim to develop understanding of a topic; equal weight given to each approach (the importance of which is discussed below and in section 3.4); concurrent data collection; and separate initial analysis converging with further integrative analysis. Whilst defining the study in this way offers some clarity in the design, it may also be perceived as a restrictive and narrow description of the study (Schoonenboom & Johnson, 2017). Mixed methods approaches may also be iterative, with researchers constantly examining the data from each strand and adjusting data collection accordingly (Teddlie & Tashakkori, 2011). This description reflects data collection in this study, where the different methods were not conducted purely in isolation, diverging from the convergent parallel exploratory approach. As data collection was undertaken concurrently, issues raised in interviews influenced the RCRR and in-depth reviews, and vice versa. This interaction between datasets is represented in the double arrows in Figure 4. This approach has been described as 'integrated', where different approaches are given equal weight, are interdependent and have a common goal (Moran-Ellis et al., 2006). Qualitative interviews with staff, patients and relatives offer insights from the perspectives of those situated within this area and RCRRs provide further insight into this area of care. Table 14 outlines the planned approach including anticipated data output, and actual recruitment numbers.

Although the convergent parallel exploratory design was chosen as the best fit for this study, the two selected methods could have been used in several different ways to explore this area of care. The RCRR could have been conducted first, using the results to inform the selection of participants and questions asked in interviews, referred to as an explanatory design (Creswell & Plano Clark, 2011). The qualitative interviews could also have been conducted completely separately and been used to explain the results of the RCRR, in a 'sequential mixed' design (Teddlie & Tashakkori, 2009). However, these approaches do not give data sets equal weight, using qualitative data to explain quantitative data (Onwuegbuzie & Collins, 2007). Although it may be argued that equal weight is not necessary in some mixed methods designs (Morgan, 1998), within this study methods were selected to contribute equally to a rich picture of post-ICU ward care from multiple perspectives.

Figure 4. Diagram of study using convergent parallel exploratory mixed methods design



Convergent parallel design represented in italics, reproduced from Creswell and Plano Clark, 2011

Table 14. Outline of data collection

Method	**Planned Sample Size**	**achieved Sample Size**	**Population**	**Approach**	**Anticipated data output**
Case record review of patients who died	300	300	Last consecutive 300 patients who died following ICU discharge.	Structured Judgement Review Method	Overall description of population Overall description of complexity Overview of problems in care
In-depth review of avoidable deaths and survivors	30 avoidable deaths and 30 survivors: 60 in total	**20** avoidable deaths and **20** survivors: **40** in total	Patients who survived their hospital admission (where possible those being interviewed)	Change Analysis approach	Overview of problems in care in contrast to patients who died Detailed contextual data on common problems in care including underlying human factors
Staff interviews	30	30	Any staff involved in the care post-ICU ward patients Purposively sampled	Semi-structured face to face or telephone interview	Challenges to delivering care Solutions already implemented Areas for change Potential changes
Patient/relative interviews	20 (including up to 5 bereaved relatives)	**19** interviews (including **1** bereaved relative)	Patients who survived their hospital admission and their relatives Relatives of patients who did not survive their hospital admission	Semi-structured face to face (at clinic) or telephone interview (Bereaved relatives – office away from clinical wards)	Challenges to receiving care Areas for change Potential changes

3.3.1. Clinical Setting

The clinical setting for this project was any ward receiving patients discharged from ICU, as defined in Chapter One. The post-ICU patient cohort are diverse in age, diagnosis and prognosis. The staff involved include nurses, healthcare assistants, doctors, physiotherapists, dieticians, occupational, speech and language and other therapists. Patients are discharged to various wards within their hospital, depending on the clinical speciality of their condition and bed availability. This diversity of settings makes standardising ward provision challenging, in comparison to patients allocated to specific wards based on their condition or treatment (e.g. trauma, respiratory or gastro-intestinal surgery), where care may follow pathways specific to their condition. As identified in the literature review, the care provided to post-ICU patients is complex in terms of staff involved, the needs of the patients, resources available and communication between different specialities. Post-ICU patients often have ongoing needs such as tracheostomy support, high risk of ICU readmission, and physiological needs spanning specialities, such as dialysis or cardiology input. Care delivery is therefore dependent on collaboration between staff members both within and across different groups, specialities and settings.

3.3.2. Study Sites

To reflect a diversity of clinical settings and post-ICU care provision within the NHS, data collection was conducted across three NHS trusts in the Thames Valley and Midlands, and West Midlands NIHR Comprehensive Research Network regions: a tertiary-referral teaching trust (22 ICU beds), a university-affiliated large district general hospital (14 ICU beds) and a small district general hospital (six ICU beds). Table 15 outlines the characteristics of clinical services across the three sites. These sites were selected as they offered contrasting settings in terms of hospital size, ICU and outreach/follow-up provision, and clinical services, increasing generalisability of findings. It was not possible to gather nurse to patient ratios for each site, as these varied between wards, as well as time of day and levels of sickness and acuity. Interviewed nurses reported ratios of between 1:6 and 1:10.

Table 15. Site characteristics

Site	A	B	C
Hospital beds	1049	650	538
ICU beds	22	14	6
Clinical Services	Dedicated ICU physiotherapy team Dedicated ICU dietician On-site microbiology service On-site TPN service Nurse-led ICU follow-up service 8am-6pm: All patients with > 4 day ICU stay visited until deemed well enough to be discharged from the service (often within one to two days).	Dedicated ICU physiotherapy team Dietetic service covering ICU and wards On-site microbiology service Off-site TPN service Nurse-led ICU outreach service 24/7: All patients with > 4 day ICU stay, daily visit until deemed well enough to be discharged from the service (often within one to two days). Plus weekly visit from the Rehabilitation after Critical Illness team.	Physiotherapy team covering ICU and wards Dietetic service covering ICU and wards Off-site microbiology service Off-site TPN service Nurse-led ICU outreach service 24/7: All patients > 48 hours ICU stay, daily visit until deemed well enough to be discharged from the service (often within one to two days).
Ward layouts	Site 1: large distance between ICU and wards. Most wards a mixture four-bedded bays and few side rooms. Site 2: acute wards in close proximity to ICU and wards with some four-bedded bays but predominantly side rooms, some side rooms only.	One large site. Large distance between ICU and most wards. Most wards a mixture of four to six-bedded bays and side rooms.	One site. Acute wards in close proximity to ICU. Most wards a mixture of four-bedded bays and side rooms.

3.3.3. Multiple Researchers

As this was a funded project with a limited timeframe, it was not feasible for one researcher to collect all data across the three sites. In addition to the lead researcher, two research assistants, a research physiotherapist from the lead site and an ICU nurse from site B, were also involved in data collection. Table 16 outlines the contribution by each researcher. Despite the pragmatic addition of two research assistants, study design, co-ordination, data collection and analysis were directed by the lead researcher. The implications of multiple researchers are explored in the relevant sections, including ensuring rigour and inter-rater reliability in the RCRR (3.3.6.6) and reflexivity (3.3.7.7) dependability (3.3.6.8) in qualitative interviews.

Table 16. Contribution to data collection from each researcher

	Lead researcher (SV)	**Research Assistant 1**	**Research Assistant 2**
RCRR	95 reviews	179 reviews	26 reviews
In-depth reviews	All 40 reviews	n/a	n/a
Interviews	32 interviews	n/a	17 interviews

3.3.4. Ethics

In this section some of the key ethical considerations for this study are discussed. These include: the implications of exploring avoidability of death and problems in care delivery for professional accountability; access to deceased patients' records; informed consent; confidentiality; and recruitment of bereaved relatives. Further considerations related to recruitment are discussed for each method in the relevant sections below. This study was granted ethical approval by Wales Research Ethics Committee 4 (reference 17/WA/0139), and Confidentiality Advisory Group approval for access to medical notes of deceased patients (17/CAG/0063). The protocol was published (Vollam et al., 2019) (see Appendix Six) and the study was registered prospectively (ISRCTN 14658054: https://www.isrctn.com).

As this study aimed to identify areas for improvement, the ethical implications of examining care delivery were considered. In particular, by explicitly looking for distinct ‘problems in care’ in the RCRR this study had the potential to discover issues with clinicians’ practice which required reporting. The ethics committee expressed unease about this and required reassurance that action would be taken where there was professional concern. Incidental findings are not, however, exclusive to this study. As part of my reflexive practice I considered the implications of identifying and raising clinical concerns. As a professional I have a duty of care to escalate any issue appropriately (including appropriately reporting any findings related to the death of a patient). This is a fundamental part of my practice as a nurse researcher, and my professional duty, as outlined in my code of conduct (NMC, 2015) and Good Clinical Practice guidelines (Dixon, 1999). There was a clear protocol in place to guide management of concerns related to professional conduct. The initial action was to seek support and guidance from my immediate clinical line management. Where the concern related to professional conduct of an individual this would then be escalated to their line manager. Where a wider professional concern arose, this would be referred through the local organisation’s standard clinical governance processes, such as morbidity and mortality reviews within the relevant clinical team. This approach is supported by the Clinical Governance guidance document supporting the Structured Judgement Review method (Royal College of Physicians, 2016).

Consent approaches differed between methods and participant groups. For non-survivor reviews, it was not possible to gain consent to assess medical records. Support was therefore sought from the Confidentiality Advisory Group (reference 17/CAG/0063) to access these records without consent. For survivor reviews, patients were approached at the same time as gaining consent for interviews (described below), and could consent to participate in either or both parts of the study.

Recruitment of staff was based on purposive sampling, targeting a range of experiences and professions to offer balance across sites. Invitation letters and participant information sheets were sent to selected staff members or clinical settings by research nurses at each site. The participant information sheet outlined the study, made clear that participation was voluntary and detailed the arrangements for ensuring confidentiality. Potential participants were given as much time as they wished to consider participating and were offered the opportunity to asks questions about the study. Staff members were invited to contact a member of the research team if, after consideration, they wished participate. Informed consent was subsequently sought from interested participants by a research nurse. During the informed consent discussion, and at the start of each interview, anonymity was again emphasised, as trust was a key element of building rapport and ensuring participants felt able to be open and honest. This will be discussed further in sections 3.3.7.3 and 3.3.7.8.

The recruitment approach for patients was guided by input from the PPI groups (discussed in the next section). Patients were contacted through their local ICU follow-up clinic, who sent a study pack with their appointment letter for their routine ICU follow-up clinical appointment. The study pack included an invitation letter and information sheets for both the interview and case record review sub-studies. These were sent approximately three months after hospital discharge. To ensure that patients who did not attend the follow-up clinic (either because they did not wish to, were unable to) were not excluded from the study, the option to consent to either part of the study by post was given, and telephone interviews were offered. Patients were also approached during their follow-up clinic appointment. Great care was taken to ensure this was undertaken sensitively, with the direct care team discussing the study with the patient prior to approach from the lead researcher. As with the staff information sheets, it was made clear that participation was voluntary, confidentiality would be maintained, and that they were free to withdraw participation from the study at any point during or after the interviews, up to the point at which data were anonymised. The setting for the interviews will be discussed further in section 3.3.7.3. The inclusion of bereaved relatives is discussed in the next section.

Strategies for maintaining confidentiality and anonymity followed standard procedures within the established research facility where the study was co-ordinated. This included storing all paper documentation (such as consent forms) securely in a locked filing cabinet in a research facility and separate to other research data. Electronic data such as interview recordings and transcriptions were stored in password protected files on secure databases within NHS servers. Identifiable electronic data were only transferred where essential (to allow retrieval of medical records for the RCRR), and always through encrypted e-mail systems using password-protected documents. All participants were assigned pseudonyms (study numbers) and no identifiable data were retained. Care was taken during transcription of interviews to ensure any potentially identifiable data were removed, such as ward names or names of staff members or patients. No identifiable data were collected onto RCRR documents and care was taken with any published data to ensure case examples and quotes did not identify participants. This included not reporting individual staff bands or specialities of wards to ensure anonymity, or specifics about clinical conditions for patients.

3.3.4.1. *Researching Sensitive Topics*

Bereaved relatives were included as they offered the closest perspective to the target population. Research suggests that relatives are well placed to identify problems in care delivery (Lynn et al., 1997; Odell et al., 2010; Rance et al., 2013; Ward & Armitage, 2012). Some end-of-life surveys have demonstrated differences between patient and relative reports of care, although these differences tended to be in reference to subjective aspects such as presence of pain (Addington-Hall & McPherson, 2001). Studies reported good correlation in evaluating services (Field et al., 1995; Higginson et al., 1994; Hinton, 1996; Spiller & Alexander, 1993). While limited, these survey data support inclusion of relatives as a proxy for the target population of this study.

Including bereaved relatives, whilst challenging, was anticipated to offer insight into the care of patients who did not survive their hospital stay. Research into end-of-life and bereavement is essential in offering this group the same opportunities for improvement that other highly-researched areas have (Casarett & Karlawish, 2000; Parkes, 1995; Stroebe et al., 2003). There are many difficulties in conducting research in this area, including over-zealous and cautious gatekeepers limiting access (Bentley & O’Connor, 2014; Lee, 1993; Parkes, 1995). Authors in the area of bereavement research suggest that talking about their experiences can be cathartic for some people, and that the choice should be given to this group (Bentley & O’Connor, 2014; Casarett, 2005; Parkes, 1995; Stroebe et al., 2003).

The Research Ethics Committee raised concerns about recruiting bereaved relatives and advocated approaching them by letter. Timing of the invitation letter to relatives was considered carefully, aiming to balance recall with sensitivity. There is some question about the validity of recollection following bereavement, although there is little evidence to quantify this (Addington-Hall & McPherson, 2001). Evidence to support a decision on timing is also scant (Stroebe et al., 2003). Bentley and O’Connor (2014) conducted a study exploring the feelings of bereaved relatives about when interviews should take place. Most felt happy with being approached after five months, many earlier than this. Participants in their study suggested that it may help the grieving process to reflect on the death soon afterwards, rather than waiting until they were starting, or expected to start, to ‘move on’. They also found that participants who preferred to delay approach felt this would allow them time to reflect on what had happened, rather than in consideration of bereavement. Other studies contacted bereaved relatives at twelve to fourteen weeks following bereavement (Seamark, 2000), three months (Small et al., 2009) and six to twelve months (Hawker & Kerr, 2006). Based on this limited evidence, invitation letters were sent out at six months after bereavement, with the aim of balancing recollection with an appropriate period of time between bereavement and approach. Bereaved relatives were also approached through a support group at one site.

Guillemin and Gillam (2004) discuss the ethical tensions in qualitative research, where participants are asked to engage in a process they have not sought out and is unlikely to benefit them. Indeed, for this study, in conducting interviews with patients who may be suffering from ongoing physical and psychological problems related to their critical illness, and bereaved relatives, this tension may be further increased by the risk of causing distress through recall of difficult experiences. This challenges the concepts of beneficence (acting to benefit people) and non-maleficence (doing no harm). The approach during interviews required careful consideration to minimise the potential for harm. Beyond the usual practices of carefully obtaining informed consent, ensuring the participant knew they could withdraw at any time, pause or stop the interview and considering the environment and setting of interviews, the flowchart for participant support (Appendix Seven) outlines how patients and their family members were supported during and after the interview. Offering avenues of support is recommended by several authors (Seamark, 2000; Sque et al., 2014; Stroebe et al., 2003), which were identified both within the hospital (follow-up team including psychiatrist, PALS) and outside (bereavement charities, GP) for participants who may not want to engage in the hospital services, for instance, where there were ongoing complaints or anger regarding care.

3.3.5. Patient and Public Involvement

Input from previous patients and their family members has been sought throughout this project. During the initial development of the study an initial Patient and Public Involvement (PPI) group was created. Members were invited through the patient support website ICUsteps (https://www.icusteps.org/) and through contacts with other local and national patient groups. Eight patients and family members attended the first meeting, where the initial plans for the study were discussed. During this meeting participants clearly voiced the need for improvement in post-ICU ward care. The methods of the study were discussed and the possibility of linking interviews with case record reviews was suggested. As well as general support for the study, key outputs from the meeting were: consideration of the way data from each method could be linked; revision of the study title to focus less strongly on mortality; and agreement of two members of the group to join the study steering committee for the RfPB grant. The idea for the study was also presented to the local ICU Patient Forum (a group of previous patients and family members who support development and research in the local ICU). Plans for the initial study were also presented to the ICUsteps committee who issued a letter of support for the grant application.

During development of the study processes, further PPI input was sought from both groups. Both members of the steering committee were involved in preparing patient-facing documentation (such as participant information sheets) and these were discussed with the Patient Forum group. The timing and means of approaching patients were discussed extensively, with both previous patients and family members offering insight into the realities of post-ICU recovery and how this may impact on participants ability to engage in the study.

Throughout the study, progress has been fed back to both groups and the results have been presented. Future plans for further work and dissemination have been discussed with the ICU Patient Forum and there is a strong commitment from the group to maximise the impact of this work, both locally and nationally. A member of the ICU Forum has joined the research team as a PPI representative to collaborate in development of future plans, including further funding applications. Finally, the results of the study and future plans have been communicated to the ICUsteps committee who are supportive of future development of this work, including issuing a letter of support for future funding applications.

3.3.6. Retrospective Case Record Review

The choice of Retrospective Case Record Review will be discussed in this section, followed by details on the approach taken. Analysis will be discussed and this section concludes with considerations of rigour. The literature review (Chapter Two) established that published evidence relating to post-intensive care in-hospital mortality is limited. Exploring care for the target population of deceased patients is a key gap in knowledge. Generating these data is complicated by several factors. Firstly, deaths in this group are relatively low at 5.7% and ICUs discharge large numbers of patients (140,000 annually in the UK), making prospectively following all patients time-consuming and unfeasible (ICNARC, 2019). The nature of 'avoidable deaths' makes investigating deaths in real time with associated staff ethically and politically difficult. Retrospective case record review (RCRR) offers an alternative to prospective data collection, as a commonly-used technique for reviewing contributory factors to adverse events (AEs) in healthcare. This approach provides insight into what happens to patients who die following ICU discharge, for which little evidence currently exists.

Retrospective case record review was initially developed in the USA as a quality improvement initiative to reduce negligence claims (Brennan et al., 1991). The first large-scale use of this methodology in the UK was undertaken in 1999, finding 10.8% of the 1,014 cases reviewed to have experienced an AE, of which half were deemed avoidable. This relatively small study was intended as a pilot for a larger UK-wide study (Vincent et al., 2001). Whilst the authors highlighted the benefit of directing focus to areas of care delivery with potential for improvement, they suggested the process should be refined to avoid some of the limitations of the process. Suggested limitations included subjectivity (only moderate agreement between reviewers), reliability (compared with incident forms suggests up to 20% of AEs are missed), and hindsight bias. They also voice concerns regarding the burden of time and money required to conduct a full RCRR as well as the difficulty in interpreting the data generated (Neale & Woloshynowych, 2003).

This critique led to development of a refined approach, using a clarified and less time-consuming approach, with clearly guided steps (Woloshynowych et al., 2003). The authors also recommended this form could be utilised in small-scale, local reviews of current practice to identify areas of care which could be improved. Several studies adopted this methodology (Aranaz-Andrés et al., 2009;

Roberts et al., 2017; Sari et al., 2007; Zegers et al., 2009). RCRR was subsequently further developed to focus on deaths rather than adverse events (Hogan et al., 2012). This review used the term "problem in care" to refer to errors of omission as well as commission, and encourage a wider view of the quality of care rather than indicate discrete adverse events. In response to increased interest in identifying avoidable deaths in the NHS, the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) commissioned a specification development exercise (Mullan & Mason, 2015). This has led to the roll out of a national programme of mortality reviews using the RCRR approach (Hutchinson, 2017). This programme is linked to the Department of Health NHS outcomes framework 2016-17 and has been adopted by NHS trusts throughout the UK to facilitate organisational improvement. This current version of the RCRR is based on the Modular Review Form methodology (Hogan et al., 2014) but in a limited format as developed by Hutchinson et al (2013) and termed "Structured Judgement Review". It guides qualitative structured judgement statements for care delivery which have replaced the extensive tick boxes included in the Modular Review Form. The aim of this adaptation of the methodology was to provide a basis from which local teams or trusts "can ask the 'why' questions" (Hutchinson, 2017).

Alternative approaches to the RCRR were considered. A confidential inquiry was undertaken examining pre-ICU management of patients (McQuillan et al., 1998) using prospective data collection, structured interviews and a tick-box style form completed by clinician-researchers. These were passed to external reviewers (without the original case notes) for identification of problems in care and areas for improvement. This study reported similar limitations in methodology as RCRR, such as assessor agreement, outcome bias and subjectivity (these limitations will be discussed in relation to this study later in section 3.3.6.6). The authors did not acknowledge the limitations of recall bias or the difficulties of interviewing clinicians with direct care responsibilities about quality of delivered care. Whilst RCRR is undoubtedly limited by the reliance on documentation for evidence, this may afford less bias than reliance on recall and the subjectivity of reporting own care delivery in this context. This approach also raises ethical considerations in terms of imposing stress and threat to job security when conducting such a study (albeit a confidential inquiry).

A study in 2004 compared three techniques for case record review – retrospective, prospective and cross sectional (gathering data in one day) (Michel et al., 2004). The authors found comparable rates of AE detection but an increased work burden for prospective compared with retrospective approaches (as clinical staff were involved). They suggested that the prospective approach may be better as it has more face validity (with retrospective perceived to suffer from lack of direct staff involvement and underestimation of AEs - despite similar detection rates). As with the confidential inquiry approach, no consideration was given to the effects of staff involvement both in terms of time burden on clinical staff and the emotional impact, such as stress and perceptions of blame. Several studies have attempted to link RCRR-identified AEs with incident reports made by healthcare professionals (in incidents reports and pharmacy surveillance) and complaints by patients and relatives (Bismark et al., 2006; Christiaans-Dingelhoff et al., 2011; Olsen et al., 2007). This has been unanimously demonstrated to be ineffective, with much smaller incidence of healthcare reporting than RCRR-identification of AEs.

Although the RCRR approach is now widely used, Hogan et al. (2014) suggested that although avoidable deaths were an important area to address, mortality RCRR alone may not be a useful approach for care improvement initiatives as the incidence of death is relatively low. To address this, an extended technique for exploring the underlying causes of avoidable deaths was developed, termed Change Analysis (Hogan et al., 2014). This technique is described as a qualitative, human factors-based approach, reflecting the contemporary focus on human factors in healthcare. This method facilitates an in-depth analysis of each ‘probably avoidable’ death to identify aspects of care which may have contributed to this outcome, and a more detailed account of how these aspects could be addressed. This addition is supported by the guidance document (Hutchinson, 2017), which acknowledges the purpose of the case review methodology as a catalyst for further review of practice. By combining the overview RCRR approach with in-depth reviews of key cases, this approach fits with the mixed methods aim of this project, to gain a rich account of care delivery from multiple perspectives including clear aspects of care which could be improved. The methods for both approaches are discussed in the next two sections.

3.3.6.1. Retrospective Case Record Review Approach

A review of the care of 300 patients across the three sites, who were discharged from ICU and did not survive to hospital discharge between January 2015 and March 2018 was undertaken (see section 3.3.6.3 for sample size rationale). Reviews followed the Structured Judgement Review approach adopted by the Department of Health for all NHS mortality reviews as the National Mortality Case Record Review Programme (Royal College of Physicians, 2017b). The RCRR approach was adjusted for this study to examine care following ICU discharge only, although no changes were made to the methodology. The guidance for this programme acknowledges that not all areas of the form will be relevant to all cases, thus these adjustments may not be described as adaptations (Hutchinson, 2017). The changes made were: rewording the domain of ‘admission care’ to ‘initial transfer from ICU’ – this guides a review of the first 24 hours following transfer from ICU to the ward, rather than the first 24 hours in hospital; removing irrelevant filter questions and adding essential demographic data fields such as ICU duration, reason for ICU admission, care limitations are ICU discharge, timing of ICU discharge and details of any DNACPR order made in the course of care.

In addition to the standard RCRR data collection, data on pre-identified aspects of care were also collected. These additional pre-identified variables were based on findings from literature reviews and initial preparatory work (conducted locally and unpublished) which identified several areas of care delivery which were problematic. These were: mobility at ICU discharge; nutrition; development and management of atrial fibrillation; development and management of sepsis; and outreach/follow-up service provision. The full Case Report Form is included in Appendix Eight, with the additional data collection fields on pages 12 to 13. As acknowledged in Chapter One (section 1.4), out-of-hours discharge was defined in this study as 4pm, although actual time of discharge was collected and data were reported for three categories (Chapter Four, Table 24), reflecting common definitions in the literature.

Demographic data for each patient were recorded on the Case Report Form, including: age; sex; Clinical Frailty Scale (CFS) prior to hospital admission (Rockwood et al., 2005); type of admission (surgical/medical and elective/emergency); Acute Physiology and Chronic Health Evaluation (APACHE II) score on ICU admission (Knaus et al., 1985); ICU length of stay (LOS); and post-ICU ward LOS. Table 17 outlines data sources, hierarchy where data existed in more than one place, and rules of interpretation where data were not explicit in medical records.

Following the established Structured Judgement Review approach (Royal College of Physicians, 2017b), for each case, electronic and paper records were reviewed and a short narrative account of care written for five distinct care periods: the first 24 hours following ICU discharge; care during a procedure; ongoing care; perioperative care; and end-of-life care. This was summarised into short judgement statements which supported an assessment of quality of care during each period on a scale from 1 (very poor care) to 5 (excellent care), derived from the structured judgement statements. The quality of care scoring was based on clinical judgement and published guidance (Hutchison, 2017). Although no formal rules or definitions were set, reviewers made these judgements based on a balance of both the good and unsatisfactory elements of care delivery which may have been identified, and how significant problems in care delivery were in the context of the care period being assessed. For these reviews, only the period of ward care following ICU discharge was reviewed. The result was a short but rich account of post-ICU care delivery. Following initial review of care, any problems in care identified were considered in the context of the outcome and an avoidability of death score was assigned, following Structured Judgement Review guidance (Hutchinson, 2017). This is a 6-point scale from 6: definitely not avoidable to 1: definitely avoidable. For all patients whose death was judged to be ‘probably avoidable’ (scoring 3 or above), a further in-depth review was undertaken using the change analysis technique, which is described below.

As described in the introductory chapter (Section 1.2), and section 3.3.3 above, to ensure completion within the RfPB funding timeframe, data collection was undertaken by three reviewers. As the quality of data was reliant on inter-rater reliability (Gregory & Radovinsky, 2012; Vassar & Matthew, 2013), several steps were taken to maximise this. All three reviewers attended formal Structured Judgement Review training, delivered by the local Clinical Governance team, and published review guidance was studied and discussed (Hutchinson, 2017). To ensure consistency of approach, ten initial cases were dual reviewed and discussed by two reviewers to develop extraction approaches. Uncertainties and complex cases were discussed, extraction rules set and tested, and scores agreed. Where uncertainty remained, cases were discussed with an ICU consultant (Associate Professor Watkinson). To assess inter-relator reliability, 15 undiscussed cases were independently reviewed by two of the three researchers and scores compared.

Table 17. Definitions, sources and rules for demographic variables

Variable	Source	Interpretation rules
Age at ICU discharge	Recorded on ICU discharge documentation or calculated from date of birth	n/a
Sex	Record in medical record	n/a
APACHE II	Electronic database	n/a
Admission diagnosis	ICU admission form	Surgical – required surgery prior/during ICU admission Medical – no surgery required Trauma – admitted with trauma-related problem
Type of admission	Medical notes	n/a
Clinical Frailty Score	Interpreted from multiple sources in medical notes, such as admission clerking, ICU nurse assessment, physio assessment.	Selection of score best fitting information recorded. Score selection verified from at least two sources of information.
Length of ICU/hospital stay **ICU readmission** **Days to death**	Recorded in medical record (electronic or paper)	n/a
Day of ICU discharge **Day of ICU death**	Calculated from dates in medical record	n/a
Palliative discharge	Medical notes ICU discharge documentation	Clear plan for palliative care (palliative care team not always involved).
Location of death	Medical notes	Defined as speciality of ward on which death documented
Cause of death	Medical record Bereavement services	1st: death certificate in notes 2nd: Documentation in medical record 3rd: Bereavement services record where death certificate absent from notes

3.3.6.2. In-Depth Reviews

For every record with an avoidability score of 3 or above (judged as more than a 50:50 chance of avoidability and termed ‘probably avoidable’), a further systematic in-depth review was undertaken to explore the problems in care identified, including potential underlying human factors. This approach was based on a previous study by Hogan et al. (2014) as previously discsused in section 3.3.6. For each in-depth review, a narrative account of the care pathway was written. This was then analysed using the ‘problems in care’ and human factors frameworks developed for the original RCRR study (Hogan et al., 2012) (see Appendix Nine). Further details of this analysis are presented below in section 3.3.6.4.

“Human Factors” is defined by the Clinical Human Factors Group as “the science of understanding human performance within a given system” (2013, page 5). In the context of this thesis, the term Human Factors is used to refer to the effects of teamwork, task design, culture and organisation on the behaviour of humans, and their ability to apply their clinical knowledge (National Quality Board, 2013). Based the acknowledgement that “to err is human” (Kohn et al, 1999), examining human factors aims to acknowledge human frailties and in doing so, mitigate against these within the complex and dynamic setting of healthcare (National Quality Board, 2013). Therefore, understanding human factors can help inform improvements in care delivery.

The contributory human factors framework used by Hogan et al. (2014) and adopted for in-depth reviews in this study was devised by Taylor-Adams and Vincent (2004) as a protocol for incident investigation in healthcare, and termed by the authors “systems analysis”. The purpose of this framework was to move beyond simply identifying errors or omissions in care delivery, to support a structured but thoughtful reflection of the underlying reasons for identified problems in care delivery. The authors assert that identifying an error or omission is only the first step in investigating problems in care delivery and this framework aims to support a structured and systematic comprehensive analysis of why problems may have occurred.

Limiting reviews to just those patients who died in hospital may have risked missing key differences between survivors and patients who died. To address this, the number of in-depth reviews of patients whose death was judged probably avoidable were matched with an equal number of survivors, using the same approach. Survivor cases were not selected to match non-survivor cases in any way but were a convenience sample to provide a contrasting perspective on post-ICU ward care. Survivor case reviews were undertaken to examine whether the same problems in care existed in the care of both patients who died and survivors. This allowed comparison of the types of problems in care present in both groups, and identification of similarities and differences in how these were managed.

3.3.6.3. Sample Size and Recruitment

The sample size of 300 RCRRs was selected to offer a wide overview of care in this area. This was a pragmatic decision based on feasibility of workload and ensuring reviews were conducted of care delivered within a relatively recent timeframe. Although fewer cases were reviewed than some other studies using the RCRR technique (Hogan et al., 2012; Sari et al., 2007; Sorinola et al., 2012; Vincent et al., 2001), these studies were focused on overall hospital populations where a smaller proportion of deaths are anticipated to be modifiable (for example only 5.2% of 1000 patients in Hogan et al., 2012). This study was much larger than other RCRRs of mortality in specific patient cohorts such as pre-hospital, paediatric ICU or patients with meningitis (with sample sizes between 29 and 123) (Proulx et al., 2005; Siriwardena et al., 2018; Verlaat et al., 2018).

Preparatory work was undertaken to refine the RCRR approach, consisting of 100 initial reviews at one site. This early development work suggested that approximately 10% of cases would be judged ‘probably avoidable’ and therefore be included in the in-depth reviews (n=30). The same number of in-depth reviews of survivors as patients whose death was judged probably avoidable were undertaken, to offer a contrast between the care delivered to each group. A total of 60 in-depth reviews were anticipated overall, more than the original study reporting this in-depth approach in 52 cases (Hogan et al., 2014).

Planned sample size and actual numbers recruited are presented in Chapter Three, Table 14. The planned sample size of 300 was achieved for the RCRR. The number of in-depth reviews was dependent on the number of patients whose deaths was judged as ‘probably avoidable’ and, at 20, was lower than the 30 anticipated, with an equal number of survivor reviews conducted, totalling 40 in-depth reviews. Although this sample size was derived from the anticipated proportion of patients whose death was judged as ‘probably avoidable’, rather than considerations of data yield, it is lower than that stated prospectively. A sample size of 60 would have yielded more data and potentially offered a clearer contrast between survivor and non-survivor cases. However, 421 problems in care were identified in the 40 cases reviewed, making it likely that increasing the sample size may not have significantly altered the overall conclusions of this approach.

3.3.6.4. RCRR Analysis

Agreement between reviewers was assessed using linear-weighted Cohen’s Kappa (Salkind, 2012; Vassar & Matthew, 2013). The 300 Structured Judgement Reviews yielded a large amount of descriptive data which were summarised using descriptive statistics. For continuous measures, such as duration in intensive care, the mean (95% confidence intervals) or median (inter-quartile range) (where appropriate) were reported. Confidence intervals of means were calculated using the Clopper Pearson method (Clopper & Pearson, 1934). For categorical variables (such as avoidability of death) the number and percentage in each category were reported. In addition to the deceased RCRR, the same technique was used to examine the care of survivors, as discussed above. Survival analysis was undertaken using a Kaplan-Meier curve (Kaplan & Meier, 1958).

In-depth reviews followed the ‘change analysis’ approach developed to allow implications and recommendations for changes in practice to be drawn from RCRR data (Hoganet al., 2014). For each patient whose death was judged ‘probably avoidable’, a narrative account of care delivery was written. For each in-depth review, medical records were reviewed to generate a narrative account of care delivery. These narrative reviews were then examined in comparison with what Hogan et al. (2014) have termed ‘theoretical problem-free care’, to identify problems in care delivery. A short description of each problem identified was entered into an excel spreadsheet and given a ‘problem in care’ code, derived from the narrative description. Instances of good care were also coded in the survivor reviews.

Identified problems were coded using the ‘problem in care’ coding framework (Woloshynowych et al., 2003), as used in a previous study using this methodology (Hogan et al., 2014). This framework presents 53 codes across eight categories. However, there was significant overlap with the problems in care identified by the narrative codes described above. In assessing both coding frameworks, the narrative codes were identified as more informative for the purposes of this work and cohort. For clarity in this thesis, the results of the framework coding are not presented in the discussion on each problem in care, but are presented in Appendix Nine for reference. This is a change to the intended approach set out in the published protocol (Vollam et al., 2019) where this framework was intended to be used to identify problems in care, rather than the narrative codes described above.

Identified ‘problems in care’ were reviewed in the context of the narrative account. This included data on the time of the problem, the staff member(s) involved (including seniority where documented), and any relevant documentation preceding the instance of the problem (such as written handover, nursing evaluation or ward round plans). Using this information, underlying human factors which may have contribute to each problem were assigned using the Contributory Factor Classification Framework (Taylor-Adams & Vincent, 2004) (presented in Appendix Nine).

3.3.6.5. Case Vignettes

Case vignettes were developed to support presentation of the results of the RCRR and in-depth reviews. Vignettes have typically been used in social research to present theoretical cases to generate discussion, particularly in interview studies (Gould, 1996; Hughes, 1998; Sampson & Johannessen, 2020). In this study, vignettes were derived to present and emphasise findings rather than to generate data. In Chapter Four, case vignettes are used to illustrate decision-making around preventability of death judgements (see section 4.3.3). In Chapter Five, several case vignettes are presented as examples of common problems in care delivery and the impact these were observed to have had on patients' recovery (section 5.4). Cases were therefore chosen which typified the problems in care delivery and consequences being explored. Case vignettes were developed from the narrative accounts entered into the RCRR case report form and care was taken to ensure clinical information was limited to prevent identification of individuals. Published guidance on vignette and medical case study writing was drawn on when developing vignettes. Suggested considerations when developing vignettes included internal validity, confidentiality, and brevity of detail (Budgell, 2008; Gould, 1996; Hughes & Huby, 2004; Sampson & Johannessen, 2020; Stokes & Fertleman, 2015). However, as RCRR data were based on medical documentation, this must also be acknowledged as a limitation of these vignettes, as discussed in section 3.3.6.5. The vignettes do, however, illustrate key information related to the findings of the RCRR.

3.3.6.6. Rigour in Retrospective Case Record Review

Although the Retrospective Case Record Review offers a richer picture of the course of care following ICU discharge than the systematic review, and in particular offers a critique of clinical care of these patients, medical records have some limitations as an information source (Hogan et al., 2014). This consideration was raised during a Patient and Public Involvement meeting for the study, where previous patients were concerned that events may not be recorded accurately. During initial preparatory work, it became clear that some events may not be fully documented in the medical notes (Gregory & Radovinsky, 2012; Higgins & Green, 2011; Hogan, et al., 2014; Hutchinson et al., 2013), particularly when there was a high level of activity in a patient’s care and staff are concentrating on delivering rather than documenting care.

Furthermore, RCRR is a subjective technique. Guidance from the National Mortality Case Record Review (Hutchinson, 2017) includes advice about formulating judgements. Judgements should be explicit, include clear value statements and be backed by clear reasons. Three reviewers extracted data for the RCRR. Similar studies have reported variable agreement between reviewers on scores (Hogan et al., 2012; Sorinola et al., 2012; Verlaat et al., 2018). To mitigate against inconsistency between reviewers, a strict agreement protocol was followed, as outlined in section 3.3.6.6. Throughout the reviews, cases were frequently discussed to ensure consistency of approach and facilitate similar judgements. This open communication was essential in ensuring rigour throughout this process. Where uncertainties and complex cases arose, these were discussed between the researchers and a consensus reached. Where uncertainty remained, cases were discussed with Associate Professor Watkinson, as the Principal Investigator of the NIHR-funded study and an ICU consultant.

There is also certainly a risk of hindsight bias in RCRR (Banham-Hall & Stevens, 2019). This is acknowledged by the guidance developed by the Improvement Academy for the ‘National Mortality Case Record Review Programme’ (Hutchinson, 2017). This states that hindsight bias is a risk and that reviewers should keep this in mind. Beyond acknowledgement, there is little which can be undertaken to mitigate this bias. As this method relies on the information recorded in the medical notes, there were likely to be omissions and illegible entries which affected the overall picture of care delivery. The

Case Report Form included judgements on quality and legibility of medical notes for both clinical care and review purposes and these should be acknowledged as a limitation. In addition to the guidance document and internal development, advice was sought from the team who developed both the original case record review methodology and subsequent in-depth change analysis approach. This included detailed advice about how to extract, record and collate the contributory 'human factors' involved in each problem in care, using the framework included in the protocol (Appendix Six) and in-depth frameworks (Appendix Nine).

Despite criticism of the subjectivity, hindsight bias and reproducibility of retrospective case record review, this remains a key method for exploring care delivery. As previously discussed, prospective analysis would not be possible. This is both due to the infrequency of post-ICU deaths, and the ethical difficulties of following patients through their post-ICU ward stay in case they do not survive. Additionally, it would be professionally challenging to prospectively follow care delivery looking for problems in care, where there is both a duty and a personal impulse to intervene (NMC, 2015).

Whilst several measures were put in place to mitigate against the problems identified with this methodology, some are inherent. In particular, medical records alone cannot be considered a direct reflection of clinical reality as they are often used as a record of accountability rather than a narrative of care (Hutchinson, 2017; Ock et al., 2015; Risse & Warner, 1992). These considerations do limit the reliability of case record review and if considered in isolation would risk introducing bias. To address this, interviews were also conducted with patients, families and staff, to explore this area of care in greater depth. The combination of notes reviews and interviews offers two different and complimentary perspectives on care delivery.

3.3.7. Qualitative Interviews

In this section the choice of qualitative methodology will be discussed and details of the approach taken including recruitment and setting are presented. Finally, rationale for the analysis approach is discussed, followed by considerations of credibility, dependability and trustworthiness. The following gaps were identified in the literature around patient and nursing perspectives of the immediate period following transfer from ICU (sections 2.3 And 2.4):

- patient, relative and nurse perspectives of the ward-based period of care beyond the immediate transfer from ICU; and
- multi-professional perspectives of the whole ward-based period.

Recognising the limitations of the RCRR including hindsight bias (i.e. knowledge of the outcome of each case under review) and reliance on documentation which is likely to be incomplete and limited, exploration of this area of care from a different perspective was sought. To achieve this, several methods other than the interview approach selected may have been used. Quantitative approaches such as database analyses or surveys of staff would have reached larger numbers but yielded more limited data than interviews. A qualitative approach was selected as offering the rich descriptions of the social world and the constraints of everyday life required to address the identified literature gaps (Denzin & Lincoln, 2011). Ethnography through observation aims to convey a detailed account of the setting being researched, including processes and social interactions (Barbour, 2014; Creswell, 2007; Mason, 2018). Observing post-ICU ward care may have addressed some of the limitations identified with the RCRR approach. Observing care delivery prospectively would have addressed the retrospective nature of the RCRR. Observations would also have facilitated direct insight into the interactions between staff, addressing the limitations of reliance on documentation. However, conducting observations would have been logistically challenging given the range of wards post-ICU patients are discharged to within each hospital and three sites. In addition, as previously discussed, it would have been clinically and professionally challenging to follow patients prospectively to examine their care due to professional accountability to intervene where problems were identified (Nursing and Midwifery Council, 2015). In addition, the timeframe imposed by the grant precluded following the relatively large numbers of patients discharged from ICU to ensure sufficient episodes of post-ICU death or deterioration were observed. The RCRR allowed targeted selection of cases anticipated to offer the richness of data required for this study. Qualitative interviews also allowed access to the knowledge, experience and perspectives of the subject (Kelly, 2010). By interviewing a wide range of participants involved in post-ICU care a variety of knowledge, views, interpretations and perceptions were explored (Mason, 2018), which would not have been accessed through observation. Interviews are often described as a means of exploring social explanations of phenomenon, seeking depth in data beyond surface patterns or trends (Brinkmann & Kvale, 2015; Mason, 2018). By exploring each different perspective, a rich picture of the challenges in this area of care and potential solutions can be developed. By taking a semi-structured approach, specific areas of post-ICU ward care were explored and aspects of interest identified in the RCRR could be followed up during subsequent interviews, to encourage participants to offer perspectives of these particular areas of care may have been problematic (Mason, 2018). Analysis of interview data will be explored in sections 3.3.7.5 and 3.3.7.6, and integration of the data in section 3.4.

During the development of this study, significant discussion occurred around the choice of interviews or focus groups for staff, patients and their families. While focus groups allow several participants to participate at once, augmenting each other’s responses and developing arguments (Basch, 1987), individual interviews offer more flexibility, confidentiality where sensitive topics may be discussed and individual focus from the researcher (Brinkmann & Kvale, 2015; Mason, 2018). In light of these considerations, semi-structured individual interviews were conducted, either face-to-face or by telephone. Telephone interviews offered several benefits over face-to-face interviews. These included flexible timing for shift workers and a more comfortable and familiar environment with no need to travel for patients and family members (Miller, 1995; Tausig & Freeman, 1988). However, several limitations of telephone interviews needed to be balanced with the benefits of greater access (Creswell, 2007; Irvine & Policy, 2008). The challenge of building rapport and trust during telephone compared with face-to-face interviews will be explored further in the section on reflexivity (3.3.7.7).

Telephone interviews were also be offered to patients and relatives, but not to bereaved relatives due to the need to ensure appropriate support.

3.3.7.1. Qualitative Interview Approach

Two researchers conducted semi-structured interviews with patients, relatives and staff, using a topic guide informed by the literature review and local preparatory work. Interviews were conducted concurrently with the RCRR work. This allowed exploration of emerging themes from both interviews and reviews in subsequent interviews (Bryant & Charmaz, 2007; Creswell, 2007; Ziebland & McPherson, 2006), as demonstrated in Figure 4. The topic guide for staff is included in Appendix Ten. For the purposes of the grant, an initial Human Factors-based analysis was conducted, collating the common problems in care delivery identified by both patients and staff, and linked to the RCRR (not reported here). Further qualitative analysis of interview data used the thematic analysis approach described by Braun and Clarke (Braun & Clarke, 2006), which is described in further detail in section 3.3.7.4 and 3.3.7.5. The choice of interview setting, implications of multiple researchers and considerations of credibility and dependability are discussed in the following sections.

3.3.7.2. Sample Size and Recruitment

Although patients who survived their hospital stay may only represent some of the target population for this study, they are ideally placed to offer reflection and critique of their care. This is also true for the families of this group of patients, who often visit daily, know the patient well and may be the first to recognise something is wrong. The family-activated rapid response team deployment, in place in one of the study sites, values the knowledge and instinct of family members, and utilises this in an alert system (McKinney et al., 2019; Subbe et al., 2019). Another study also suggested that patients and their families are well placed to recognise safety issues and concerns, although they found that patients felt these were not always responded to by staff (Rance et al., 2013).

Although not a specific approach in thematic analysis, saturation was considered in selecting a sample size for interviews, with the aim of facilitating rich data. The concept of saturation has been criticised for being unsystematic and difficult to demonstrate (Guest, 2006; Mason, 2018). Saturation has also been criticised as being too positivistic by suggesting that by reaching a point of not generating new data the researcher has reached a complete and truthful account of the phenomenon under study (Braun & Clarke, 2013). However, the principle of generating sufficient data to offer a rich and detailed picture of post-ICU ward care was important for the pragmatic aims of this study. Although these interviews were not intended to offer a single truth about post-ICU ward care, this study aimed to inform practice change. It was therefore important that diverse experiences were represented and thus achieving a data set close to saturation was desirable. Several authors have suggested sample size decisions should be based in epistemology and methodological perspectives and focused on the research question (Mason, 2018; Mason, 2010; Suri, 2011). Furthermore, the sample size should be sufficient to achieve the richness and complexity offered by qualitative data (Baker & Edwards, 2012). In selecting numbers of participants, a balance between collecting enough data to create a rich picture of post-ICU ward care and ensuring the dataset was not too large to preclude deep engagement was also sought (Braun & Clarke, 2013). Therefore, the research aim of gaining multiple perspectives of post-ICU ward care guided sample size decisions.

Based on these considerations it was anticipated that approximately 20 patient and family member interviews would be sufficient, based on the current literature and the relatively narrow aim of exploring patient experience to augment what is already known in this area. When considering the number of participants, alongside the research question, the heterogeneity of participant perspectives should be considered (Baker & Edwards, 2012; Mason, 2010). Therefore, a greater number of approximately 30 staff interviews were anticipated to be required to access experiences within the diversity of staff professions involved in this area of care (i.e. nurses, doctors, healthcare assistants, physiotherapists, outreach/follow-up staff and dieticians) and across the three sites (Mason, 2018). Although sample size decisions in this study were focused on answering the research question, the time constraints imposed by the funder also contributed to decision-making (Baker & Edwards, 2012). Conducting and analysing up to 50 interviews, across three sites, was deemed feasible within the timeframe of the grant and was anticipated to yield good quality, rich data.

The planned sample size of 30 for staff interviews was achieved, although access to some staff groups was challenging and no consultants participated. Participant selection was delegated to research staff at the two external sites. This posed a challenge to purposive sampling, with researchers acting as gatekeepers to the participants (Fusch & Ness, 2015). This was particularly apparent at one site where the research nurse recruited solely nurses as staff participants. This raised concerns regarding the integrity of recruitment. However, this was resolved through discussion with the local research team and further participants were identified from other staff groups with guidance. Although 19 of the 20 planned patient and family member interviews were conducted, only one bereaved family member participated. A significant challenge emerged in patient interviews, as it became apparent that several patients had little or no memory of their post-ICU ward stay. Dyadic interviews had been planned from the start of this study, and were actively sought, in part to address this limitation. As previously discussed, identifying bereaved relatives who were willing to be interviewed was anticipated to be challenging. No responses were received to the letter approach. Recruitment through the support group at one site was more promising with several family members expressing interest, although only one felt able to proceed to interview.

3.3.7.3. Interview Setting

Participants were given a choice of setting for their interview. Patients and family members were offered a clinic room on the same day as their follow-up appointment, a meeting room within the hospital on a day of their choosing, or a telephone interview. Interviews were conducted with patients and family members, either individually or together – termed dyadic (Morgan et al., 2016). For staff, interviews were conducted in a quiet room near their place of work, in a meeting room away from the clinical area or via telephone. Participants were offered the option of an interview away from the clinical setting as it was anticipated some may find attending the hospital difficult. For staff this offered uninterrupted time away from clinical practice, and potentially greater opportunity to be honest and open about their experiences. The implications of the choice of telephone interviews will be discussed in section 3.3.7.8.

3.3.7.4. Choice of Thematic Analysis

In selecting the most appropriate analysis approach, the research questions and aim of informing practice change were carefully considered. For this pragmatic mixed methods study, thematic analysis was selected as the most practical qualitative method. Thematic analysis is commonly described as a key qualitative analysis approach in mixed methods texts (Creswell, 2007; Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009). Boyatzis described thematic analysis as a tool for translation between qualitative and quantitative languages, and therefore suited to mixed methods research (Boyatzis, 1998; Nowell et al., 2017; Teddlie & Tashakkori, 2009). Braun and Clarke, however, criticised this description of thematic analysis as too positivist, and described their approach to thematic analysis as a method rather than a tool (Braun & Clarke, 2006, 2019). Braun and Clarke (2012) described their approach as flexible and accessible, and suited to mixed methods research where a more traditional qualitative approach (such as phenomenology) would not fit the overall study. This approach reflects the pragmatic aims of this study, where qualitative data contribute to an overall picture of this area of care.

A systematic, reproducible method for analysis is essential to ensure dependability, credibility and trustworthiness (Miles et al., 2014) and address any criticism of the reproducibility of results (Creswell, 2007; Ziebland & McPherson, 2006). Despite the flexibility of thematic analysis as a method, Braun and Clarke emphasise the need to be explicit about a number of theoretical choices to ensure methodological rigour (Braun & Clarke, 2006). The epistemological stance of pragmatism was stated in section 3.2.1. The aim of this qualitative analysis has also been described: to identify problems and potential improvements to post-ICU ward care from staff and patients' perspectives. Analysis was therefore theoretically driven, using the research question to guide analysis rather than inductively developing themes across the data. The aim of this research also shaped the type of themes developed as semantic – offering an interpretation of the descriptive data, rather than developing theories underlying these data (Braun & Clarke, 2006). This reflects the pragmatic epistemology and aim of the study to provide multiple perspectives of post-ICU ward care. Braun and Clarke also described considerations of prevalence and keyness (Braun & Clarke, 2006). Within this study interviewees were selected for their differing viewpoints and experiences. Prevalence of a theme in terms of how many respondents identified it has therefore not been considered. Instead, relevance of themes to the research questions was focused on – described as keyness – emphasising the importance of themes which captured important elements of the research question.

3.3.7.5. Stages of Thematic Analysis

Braun and Clarke (2006) acknowledged the wide adoption of thematic analysis in the absence of a clearly defined method. In response, they have developed a detailed guide (Braun & Clarke, 2006) identifying six phases of analysis, described as recursive rather than linear, with analysis moving back and forth between the stages (Braun & Clarke, 2006). In addition to this guide and the authors cited above, further practical guidance was sought from Miles et al. (2014).

Several steps were taken throughout qualitative analysis to ensure trustworthiness, following Braun and Clarke's (2006) guidance. The first two steps 'Familiarity with the data' and 'generating initial codes' were undertaken simultaneously and from the start of data collection. For those interviews conducted by the additional researcher, these stages were particularly key (Braun & Clarke, 2006).

Approaches to maximise familiarity included listening to interview recordings, carefully reading transcripts and keeping a research diary of thoughts, reflections and emerging patterns. The interview topic guide document included sections for personal reflections on the interview, external factors which may have influenced the participant or interviewer (to aid reflexivity) and notes on areas to pick up and explore with the next interviews (see Appendix 10). As the interviews were conducted concurrently with the RCRR, from the first interview similarities of experience and common concepts were noted. These were developed in subsequent interviews to draw these patterns out and test initial assumptions and tentative codes.

The third phase in thematic analysis is described as 'searching for themes' (Braun & Clarke, 2012), and this started once around a third of the transcripts had been initially coded. Braun and Clarke (2006) argue against the description of themes 'emerging' during data analysis, suggesting this description is too passive. Miles et al. (2014) also describe the process of developing themes as a methods-driven, complex and very active process. Approaches taken in developing initial themes included: grouping codes together to explore potential themes; drawing mind maps; rearranging codes to create levels within themes, discussing, reviewing and reflecting on transcripts (photos of these processes are included in Appendix Eleven).

Alongside continuing initial coding, the next three stages of reviewing and renaming codes and writing up findings started. Initial themes were critically examined, reordered and removed, moving from descriptive to interpretive accounts of findings in relation the research question. These initial themes were compiled into thematic maps and considered in the context of the whole data set, to examine whether they truly represented the meanings of the interviews. Some themes were discarded and others rearranged, developed and refined. There were several iterations of this process, developing the overarching themes, collating and regrouping sub-themes into wider overarching themes. At the point where the theme map was deemed to be a fair representation of the data in response to the research question, final theme naming, refinement and interpretation were undertaken. In following these steps, analysis moved from a descriptive account of patterns in the data to an interpretive account of the challenges of delivering care to post-ICU patients transferred to the ward. Within this convergent parallel exploratory mixed methods study, data sets were first analysed within each discipline before being integrated (see section 3.3 and Figure 4 above). The process and considerations of integrating data in a mixed methods study will be considered later in section 3.4.

3.3.7.6. Analysis of Interview Data

Interviews were audio recorded, transcribed verbatim and analysed using NVIVO 12 (QSR International; 2018). Following the steps outlined above, analysis commenced with coding of ten staff interviews, yielding over 300 initial codes. The code book was exported from NVIVO and shared with the supervision team, along with example coded transcripts. Following discussion and advice, coding continued until all staff interviews were completed. The code book was again exported from NVIVO and codes reviewed with the supervision team. Initial codes were revised and grouped into coding 'trees' using paper-based approaches and applied to the NVIVO nodes structure (Appendix Eleven, photos 1 and 2). Through this process of data analysis seven overarching codes emerged, with 450 lower level codes. Overarching codes were: clinical management; clinical roles; deterioration management; handover; impact of transfer to the ward; organisation and resources; and sense of vulnerability. Initial themes were sketched out as mind maps and discussed with the supervision team (Appendix Eleven, photos 3 and 4), based on the coding tree. During this early theme development, initial ideas for potential themes included: fear and anxiety at receiving an ICU patient; ICU patients as other; and medical problems in surgical patients.

Table 18. Theme development map

1st iteration	2nd iteration	3rd iteration	4th iteration	Final iteration
Anxiety at receiving a post-ICU patient	**Staff anxiety and transfer anxiety**	**Perception of post-ICU ward care** • Staff fear • patient anxiety	**Staff fear and patient anxiety** • Staff fear • patient anxiety	**Fear and anxiety** • Relocation v premature d/c • Staff fear
Wards unable to meet needs • Experience • Staffing • Time	**ICU patients as other** • Acuity • Workload • Caveats to best practice based on resources	**ICU patients as other** • Acuity • Dependency • Complexity • Vulnerability • Organ support v care needs • Comparison to complex ward pts	**ICU patients as other** • Acuity • Dependency • Complexity • Vulnerability • Organ support v care needs • Comparison to complex ward pts	**Continuity of care and treatment**
Patients at risk of deterioration	**Role delineation and skill development** • Training • Exposure • Junior versus senior • Clinical specialists • Outreach	**Supporting safe care** • Specialist skills • Workload and prioritisation • Training • Exposure • Levels of experience • Clinical specialists • Medical decision-making/support	**Supporting safe care** • Specialist skills • Workload and prioritisation • Training • Exposure • Levels of experience • Clinical specialists • Medical decision-making/support	**ICU patients as other** • Acuity and risk of deterioration • High physical dependency and vulnerability • Complexity
ICU patients as 'other' • Workload • High risk of deterioration • Demanding (1:1 transition) • Acuity • Clinical needs beyond staff skills	**Continuity of information** • blurred boundaries • communication	**Continuity of information and care** • Ownership of medical management	**Continuity** • Of information • Of care • Information seeking	**Ensuring safe care** • Prioritising workload • Skills and training • Experiential learning versus training • Trust within teams • Clinical decision-making/support • Clinical specialist input
Trust in teams • Instinctive concern • Drs relying on nurses to escalate	**Therapeutic relationships and trust**	**Therapeutic relationships** • Assertiveness versus advocacy • Response to escalation	**Therapeutic relationships** • Staff-patient relationships • Assertiveness and advocacy • Team familiarity	**Out-of-hours care provision**
		Commonalities across themes: • CCOT • Out-of-hours	**Commonalities across themes:** • CCOT • Out-of-hours	

Following initial coding of staff interviews, patient and family member interviews coding was commenced alongside continuing analysis of staff interviews. Many codes identified in staff interviews were also relevant to patient/family member interviews (such as continuity of information, a priori rehabilitation and move to ward: positive) but many additional codes were generated, including relocation anxiety and trust in staff. The seven overarching codes remained, with over 800 total codes in the final coding tree. Throughout the process further thematic mind maps were drawn, discussed with the supervision team and developed. Initial themes were written up to facilitate analysis (see Table 18 for map of theme development). These initial themes included: ICU patients as 'other' (the term other will be explained in later chapters) – which has remained as a key theme in this analysis; and wards unable to meet needs of post-ICU patients – which was significantly revised and developed into the final theme supporting safe care. Themes evolved throughout this process, with initial ideas rearranged several times (Appendix Eleven, photo 5 and Table 18) until the themes and sub-themes were finalised to answer the research questions. Throughout analysis decisions and thought processes were recorded in a research diary (Appendix Eleven, photos 6 and 7).

3.3.7.7. Reflexivity

Both the RCRR and interviews have a degree of subjectivity in both data collection and analysis. In addition to this, multiple researchers collected data for this study. Subjectivity, both of the participant and the researcher must be acknowledged in qualitative research to ensure dependability (Braun & Clarke, 2012; Teddlie & Tashakkori, 2009). Reflexivity is described as a valuable tool in examining the position of the researcher and thus mitigating against the subjectivity of the researcher (Finlay, 2002b). Some researchers advocate bracketing, usually associated with phenomenology, whereby biases are acknowledged and may be set aside or suspended (Ahern, 1999; Tufford & Newman, 2012). However, it has been argued that so much occurs at a deep psychological level that we cannot completely account for ourselves (Corbin & Strauss, 2008). It is also suggested that making statements about one's own characteristics risks stereotyping within these specific characteristics, which do not reflect the fluidity and complexity of personal experience (Potvin et al., 2010). In addition, there is a risk that reflexivity may result in an “infinite spiralling of meta-discourse” (Pels, 2000). Despite criticisms of the limitations of reflexivity, acknowledging my biases was essential to the credibility of the study. Throughout this project I have maintained a reflexive journal, considering and acknowledging biases, reflecting on interactions with participants and recording thoughts on data analysis. Maintaining this record has supported my reflective practice throughout this study and allowed me to acknowledge and question my assumptions and biases during data collection and analysis.

A key consideration in this study was my position as an insider or outsider. The benefits of being an insider include: access; understanding; and participants being more open. The risks include: interpreting or responding as other than a researcher; and feeling conflict in conclusions and risking making assumptions (Corbin Dwyer & Buckle, 2018; Finlay, 2002b). However, Corbin Dwyer and Buckle (2018) critique the binary concept of insider and outsider as overly simplistic. They argue that the human experience is fluid and complex, meaning it is impossible to be either a complete insider or outsider. In this study, my position was complex. As an experienced ICU nurse, although not currently practising at the bedside, I was both insider and outsider to interviewed staff. For patients I was more clearly an outsider, although familiarity with the literature around post-ICU patient experience and clinical experience offered some slight insider perspective. My motivations were also different depending on my stance. As an outsider I wanted to make care better for patients, as an insider I wanted to help staff deliver the care they aspired to.

Qualitative interviewing is not a passive process, with data filtered through the researcher, making them a key aspect of the investigation (Brinkmann & Kvale, 2015; Finlay, 2002b). Qualitative research may be viewed as a co-construction of knowledge between the researcher and participants (Finlay, 2002a). Therefore, reflexivity should be used purposefully, as a springboard for interpretation (Finlay, 2002b). By maintaining reflexive practice throughout this study and reflecting on this in supervision sessions, I aimed to mitigate against biases and assumptions influencing data collection and analysis.

3.3.7.8. Dependability and Credibility of Interview Data

Having two researchers conducting interviews for this study also posed challenges to dependability. To address this, the topic guide was discussed prior to starting interviews and a continual exchange of thoughts and experiences occurred after the first interview and throughout the process. Maintaining an open and honest rapport allowed changes and concerns to be discussed as they arose. In order to address the potential for bias in interviewing style, all transcripts were reviewed to ensure the questions asked and data yielded were similar. The additional researcher posed a further challenge to the insider/outsider stance, discussed above. Whilst their situation as a local senior clinician may have elicited confidences an outsider may not have, there is also a risk that participants were less willing to be critical of practice or honest about issues they perceived to be related to the researcher's clinical practice. To address this, a proportion of staff interviews at the second interviewer's site were conducted by the lead researcher, offering an outsider view and potentially generating different data than that from that of an insider. Transcripts were also reviewed and discussed with the supervisory team. These strategies aimed to mitigate this acknowledged bias.

Building and maintaining rapport with participants was important to ensure quality data (Brinkmann & Kvale, 2015). Conducting interviews by telephone posed an additional challenge to rapport building. I addressed this by allocating more time prior to starting the interview to establishing rapport. When discussing clinical practice, I found it very important to maintain a positive, encouraging stance to reassure the participant that I was not judging their practice. I also developed my skills in using pauses and prompts in the absence of visual cues (Creswell, 2007; Irvine & Policy, 2008). As a novice qualitative researcher, my inexperience may have affected the quality of interview data (Malterud et al.; Mason, 2018). To mitigate against this, advice was sought on interview technique from the supervisory team through transcript review (Braun & Clarke, 2013). Continual reflection through reflexive diaries and open discussion with the second researcher have also assisted in technique development.

In this section, some of the risks to the credibility, dependability and trustworthiness of the study have been identified, and steps taken to mitigate these have been discussed. The interviews allowed exploration of perceptions of individuals which may not represent the wider experience or the reality of clinical practice. However, combining this approach with the RCRR method aimed to address some of these limitations and as such explore this area of care from diverse perspectives.

3.4. Integration of Data in Mixed Methods Research

As discussed in section 3.3, this study used a convergent parallel exploratory mixed methods design (Creswell & Plano Clark, 2011). Following this model, data sets were collected at the same time and analysed within their own disciplines. The convergent design allowed iteration of data, with themes emerging from the RCRR study followed up in subsequent interviews (Fetters et al., 2013) (Figure 4). Whilst it was intended that this iteration would occur in both directions (i.e. initial themes from interviews also informing the RCRR), in practice this was not possible. The RCRR followed a framework of defined 'problems in care' and analysed the data present in the medical notes, and was therefore not amenable to iterative changes to data collection. Having presented data collection and analysis for each data set separately above, this section will discuss integration and mixed methods analysis.

As previously identified in section 3.3, a major criticism of mixed methods research is that qualitative data may be regarded of less importance than quantitative data, rather than given equal weight (Teddlie & Tashakkori, 2011). In this project, both methods were integrated, relied on data produced by each other and given equal significance and weight, so the qualitative data enhanced and developed the quantitative data (Creswell et al., 2006; Mason, 2018). In this study, quantitative data provided a basis to explore the social constructs of an area of clinical care which cannot be empirically measured. Inference was generated from multiple data sets and tested within and across sources, so that the final output of the project was not one theory generated from a qualitative data set, but explanation of a phenomenon from a multitude of sources and perspectives (Creswell, 2007).

A significant challenge in mixed methods research lies in developing an integrated output (Moran-Ellis et al., 2006; Teddlie & Tashakkori, 2011). Data integration in this study was complex, due to the multiple perspectives and types of data being brought together, as well as the volume of data generated. Mixed methods research is sometimes criticised for attempting to 'verify' findings across datasets, often termed 'triangulation' (Sim & Sharp, 1998). This positivist view of confirming inferences may be criticised for clashing with the constructivist viewpoint of qualitative inquiry, as previously discussed (Moran-Ellis et al., 2006). Modell argues that a pragmatic approach side-steps these paradigmatic concerns (Modell, 2009). Mason (2018) described "parallel logic" (p. 39) as a potential risk in mixing methods, where the methods are so separated that the resulting knowledge is fragmented. The concurrent approach to data collection and integration of analysis was planned at the start of this study, and aimed to mitigate against this as a limitation. Multiple methods were not chosen as a means to verify findings but to best answer the research question (Teddlie & Tashakkori, 2011), with an anticipation of differences in findings across the datasets. These anticipated differences were as important as the similarities, reflecting this complex, multi-faceted area of care.

3.4.1. Data Integration

Table 14 outlined the four distinct data sets, from across three sites, which were generated from this study. These included:

a) Quantitative and qualitative data from the literature reviews;

b) Quantitative data from initial RCRRs on patient cohort demographics, avoidability of death judgements, quality of care scores for specified care periods, and data on specific problems in care delivery;

c) Quantitative data on types and prevalence of specific ‘problems in care delivery’ from in-depth RCRR reviews;

d) Qualitative data interpreted from in-depth RCRRs, exploring problems in care and contributory human factors; and

e) Qualitative data from interview datasets.

Data integration was initiated by drawing all of the different data sets together. This is described as “representing” (Creswell & Plano Clark, 2011), or “joint displays” (Fetters et al., 2013) - displaying multiple sources of data alongside each other. For this study, a meta-matrix approach was chosen to allow all data to be considered together through tabulation. Viewing data in this way encouraged identification of contradictions and unexpected relationships which may have been missed if data were not visualised together (Wendler, 2001). Through this process, themes were identified which represented key findings in relation to the research questions. Data entered into the meta-matrix were “abstractions”: no quotes were included, and second-order generalisations were presented for each theme (Miles et al., 2014). Early iterations of the meta-matrix were discussed in supervision meetings to aid trustworthiness and rigour, and data were continually reviewed and reflected on to ensure themes and generalisations were representative of the data (Wendler, 2001). Each theme was concluded with a reflective narrative across the datasets, summing up findings. In addition to the strengths of visualising data together, presenting a meta-matrix including reflective analysis contributed to confirmability of the research process, as there was a clear data trail (Fetters et al., 2013).

3.4.2. Following the Thread and Cross-Case Analysis

Following development of the meta-matrix, findings were examined across datasets to explore how they answered the research questions. This built on the reflective accounts in the meta-matrix, drawing ‘meta-inferences’ (Teddlie & Tashakkori, 2009). To achieve this, integration of data was developed through a narrative account, using the weaving approach – discussing integrated data theme-by-theme (Fetters et al., 2013). This is similar to the approach of following a theme through different mixed methods data sets described as “following the thread” (Moran-Ellis et al., 2006). In this approach, a theme is selected from one dataset and followed across others to create a multi-faceted description of a phenomenon (Cronin et al., 2008). The themes selected were informed by the meta-matrix. This process reflects the integrated approach taken throughout data collection. By bringing these threads together, integrated analysis is facilitated and inferences can be drawn across the datasets (Moran-Ellis et al., 2006). A further approach for exploring differences across datasets is “cross case analysis” (Miles et al., 2014). This approach has been criticised as being too quantitatively focused and thus potentially stifling interpretation (Dixon-Woods et al., 2005; Teddlie & Tashakkori, 2011). This approach has, however, been argued to deepen understanding by exploring similarities and differences between cases (O’Cathain et al., 2010) and has been drawn upon to bring in and reflect on the quantative data in relation to the qualitative datasets.

In integrating data, fit should be considered. Fetters et al. (2013) describe three different types of fit across datasets: confirmation, where findings across data sets confirm one another; expansion, where one dataset builds and expands on the findings of another; and discordance, where findings are inconstant or contradictory. Discordance within integration is likely, and care must be taken not to force fit (Feilzer, 2010). Where there is discordance, reasons suggested include bias in the data or methodological approach (Creswell & Plano Clark, 2011; Fetters et al., 2013). Suggested approaches include looking for sources of bias, re-analysing data, acknowledging limitations of approach and exploring theoretical explanations for discordance (Creswell & Plano Clark, 2011; Fetters et al., 2013).

However, this implies that confirmation across datasets indicates increased validity. This does not take into account the epistemological stance that qualitative data explore the multi-faceted social world from different perspective and therefore divergence may offer rich insights into the complexity of the setting being explored (Moran-Ellis et al., 2006). Therefore, throughout integrative analysis, cases of confirmation, expansion and discordance were identified and discussed.

3.4.3. Rigour in Mixed Methods Analysis

The aim of this study was to develop a rich understanding of this area of care in order to make improvements, and this can only be achieved by ensuring an appropriate breadth of data and depth of analysis. A further significant challenge lay in ensuring rigour and reproducibility during this integrative analysis. In addition to the support from the supervisory team during the analysis phase, keeping a clear research journal has aided in ensuring transparency and demonstrating rigour (Mason, 2018). By following this process, the paradigmatic characteristics of each data set were maintained but findings were brought together to generate an overarching account of post-ICU ward care from multiple perspectives (Moran-Ellis et al., 2006).

3.5. Summary of Rigour and Trustworthiness

Aspects relevant to the rigour and trustworthiness of this study have been identified in reference to each method, drawing on Lincoln and Guba’s framework of trustworthiness (Lincoln & Guba, 1986) and reframed for mixed methods research (Teddlie & Tashakkori, 2009). These include gathering multiple perspectives across several sites (transferability) (section 3.3.2); exploring the similarities and differences between these (credibility); presenting data integration in a meta-matrix (confirmability) (section 3.4.1); and maintaining reflexivity during data collection (dependability) (section 3.3.7.7). In addition, involvement from stakeholders throughout the project, peer review through grant funding, steering committee involvement and PhD supervision has aided dependability and confirmability.

Finally, the use of reflexive diaries aided acknowledgement of biases and supported analytic processes (sections 3.3.7.8).

3.6. Conclusion

This chapter has discussed the epistemology, design and conduct of this study. Rationale for recruitment, data collection and analysis approaches have been discussed in reference to potential alternative methods. Potential limitations have been considered and the steps taken to mitigate against these, including the implications of multiple researchers collecting data. As explored above, the convergent parallel exploratory mixed methods approach has offered a unique combination of rich and varied access to the data which were essential to answer the research question. The next three chapters present the findings from each individual methodological approach, followed by integration of the three data sets in Chapter Seven.

Chapter Four: Retrospective Case Record Review Results

4.1. Introduction

In this chapter the results from the retrospective case record review (RCRR) of patients who died following ICU discharge are presented. The objective of the RCRR approach in this study was to answer the secondary research question: *what problems in ward-based care can be identified in documented care records for both surviving and non-surviving post-ICU patients?* This chapter will focus on non-surviving patients and aims to: a) describe the population who are discharged from ICU and do not survive to hospital discharge; b) assess care delivery for this group; and c) identify common problems associated with potentially avoidable deaths. These objectives are underpinned by the gaps identified in the literature: a) ongoing risk factors for post-ICU mortality; b) underlying reasons for risk factors identified within the systematic review as associated with post-ICU in-hospital mortality; and c) how current practices such as handover and CCOTs currently contribute to post-ICU ward care. The results reported in this chapter are split into three sections: demographic data; quality of care and avoidability of death; and common problems in deaths with some degree of avoidability.

A detailed description of the approach taken and sampling strategy can be found in Chapter Three: Methodology (section 3.3.6). In brief, this work followed the Structured Judgement Review method used in previous mortality reviews of deaths in the general hospital population (Hogan et al., 2012), and adopted by the Department of Health for all mortality reviews conducted in the NHS (Hutchinson, 2017). The only change made to this methodology was a minor amendment to the definition of the first ‘period of care’ reviewed from ‘first 24 hours in hospital’ to ‘first 24 hours after discharge from ICU’, and additional data collection on pre-identified care delivery which was identified as potentially problematic through literature review and initial preparatory work (described in section 3.3.6.1).

4.2. Results

Of the 7,434 patients consecutively discharged from ICUs at the three sites between January 2015 and March 2018, 352 died during the same hospital admission. A total of 52 records (15%) were excluded: 36 sets of notes were unavailable and 16 had incomplete documentation (Figure 5). Of the 300 records reviewed, numbers for each site varied due to bed capacity during the study period: site A=140, site B=100, site C=60.

4.2.1. Demographics

Demographic data for the 300 patients who died following ICU discharge are presented in Table 19, alongside all survivors at the three sites during the study period. To provide a comparison with national data, demographics for all ICU discharges, accessed through the Intensive Care National Audit and Research Centre (ICNARC), are also presented in Table 19. Some variables (such as clinical frailty score [CFS]) were not directly reported in medical records and required interpretation by the researchers undertaking these reviews (see Appendix Twelve, Table 1 for definitions of data sources and rules of interpretation for demographic data).

An end-of-life care plan was commenced before ICU discharge for 50 patients, and data for these patients are presented separately in Table 19. Discharges with clear end-of-life care plans were frailer than discharges for active treatment (with 20% needing help with all Activities of Daily Living [ADLs] prior to hospital admission compared with 8.4%) and were more frequently medical admissions (72% vs. 55.2%). Both groups had a median Acute Physiology and Chronic Health Evaluation (APACHE II) score of 21 (IQR 18-24 vs. 17-26) (Table 19, columns 1 and 2). Site data for all discharges were similar to national ICNARC data, except for APACHE II scores which were higher at the three sites (13 (IQR 10-13) versus 16 (IQR 12-20)). This suggests the overall severity of illness was greater at the study sites than nationally (Table 19, columns 4 and 5). Patients discharged from ICU without an end-of-life care plan who subsequently died were older, frailer and had a higher APACHE II score than survivors (Table

19, columns 2 and 3). A Kaplan-Meier survival analysis was used to plot time to death following discharge from ICU (Figure 6). Half of the patients studied had died by the ninth day following transfer to the ward.

Figure 5. Patient flow diagram

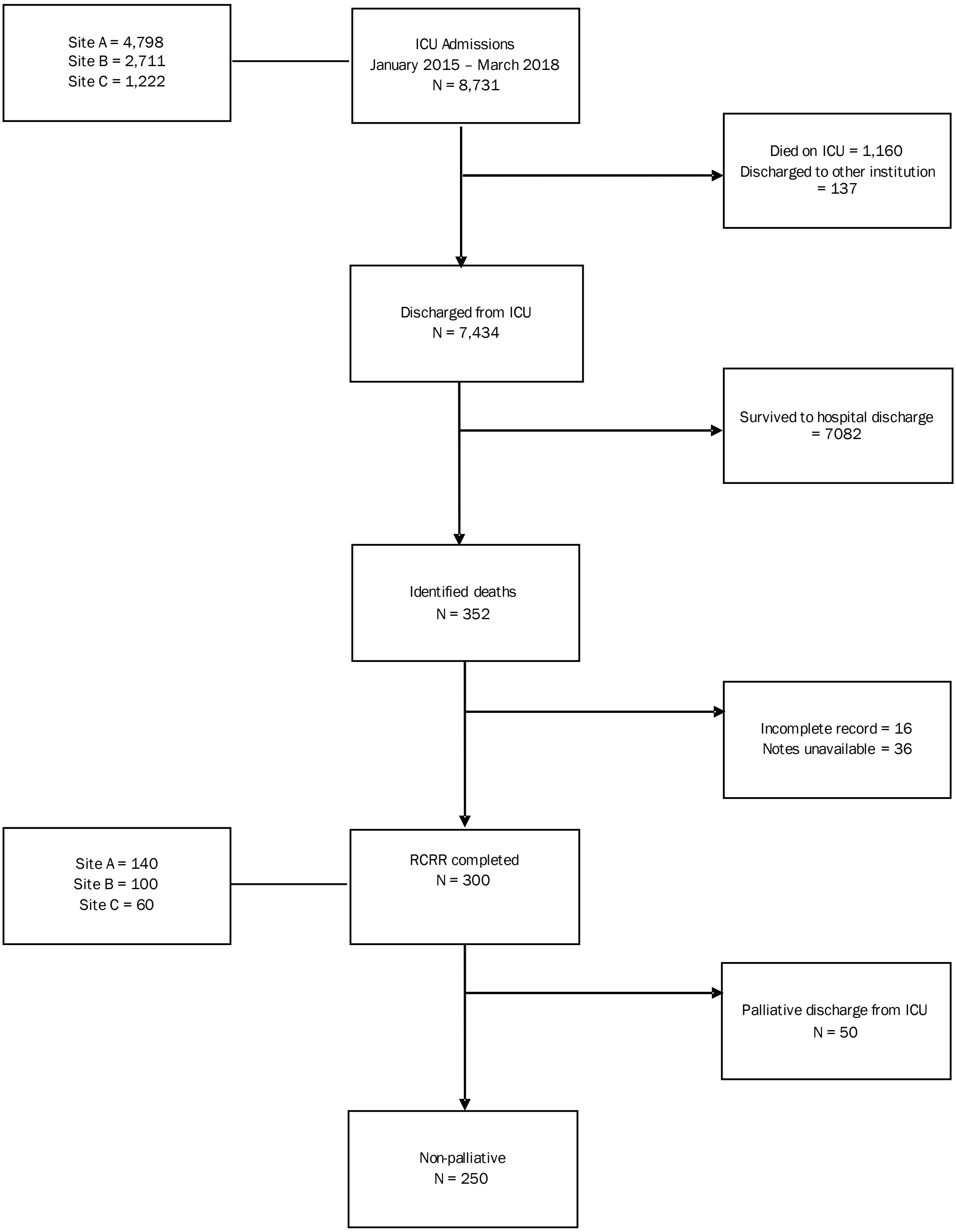
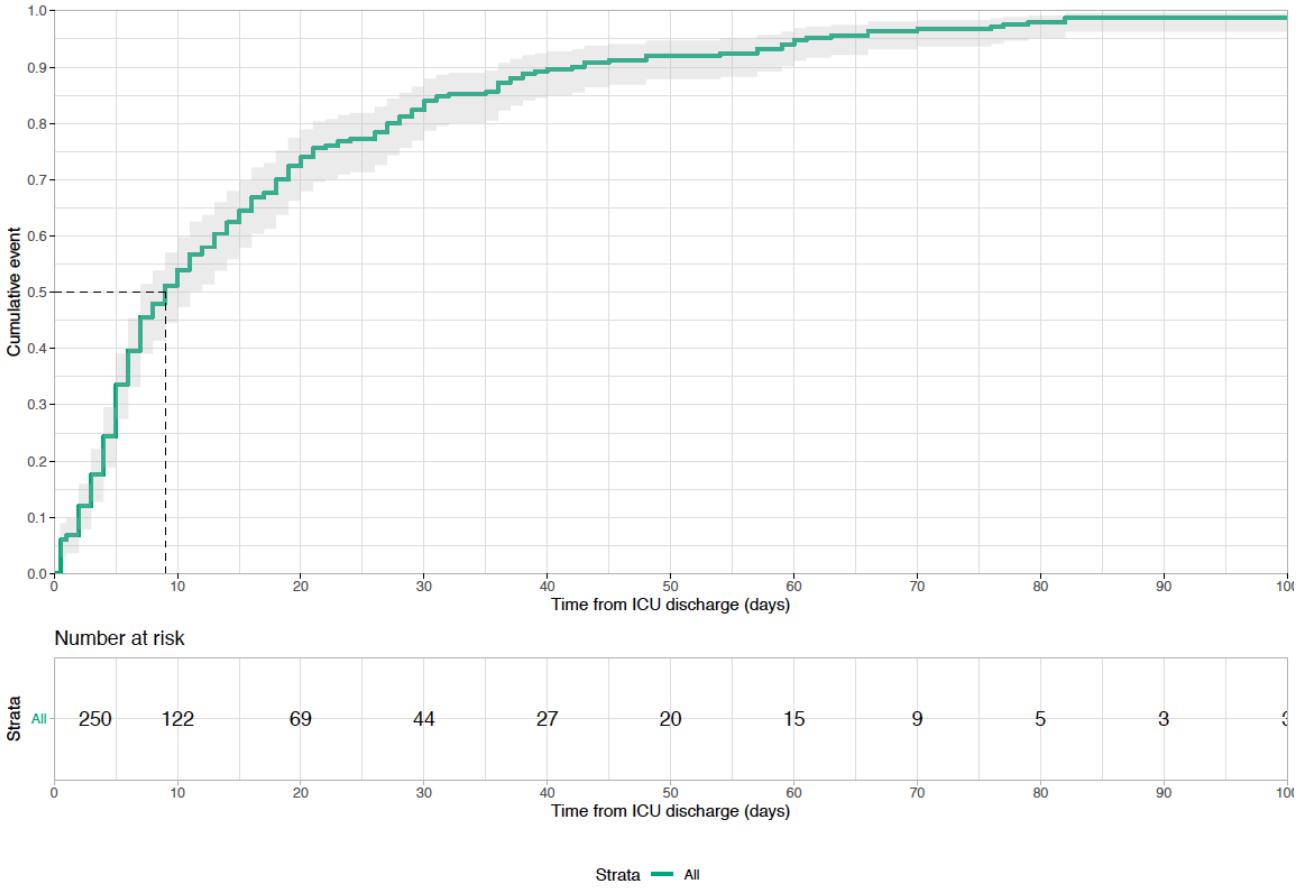


Table 19. RCRR patient characteristics

Characteristics	**Study data** Non-survivors: end-of-life care *n*=50	**Study data** Non-survivors: Active treatment *n*=250	**Study data** All survivors *n*=7,082	**Study data** Non-palliative discharge from ICU† *n*=7,332	**National CMP†† data** Non-palliative ICU discharge *n*=437,586
Age median (IQR)	73 (65-82.75)	74 (63.25-80)	62 (46-73)	62 (47-73)	63 (48-74)
Female n (%)	18 (34.6)	90 (36)	3,075 (43.4)	3,165 (43.2)	198,319 (45.3)
APACHE II median (IQR)	21 (18-24)	21 (17-26)	15 (12-20)	16 (12-20)	13 (10-18)
Admission diagnosis n (%)					
Surgical	14 (18)	112 (44.8)	3,529 (49.8)[a]	3,641 (49.7)[a]	209,098 (47.8)[d]
Medical	36 (72)	138 (55.2)	3,194 (45.1)	3,332 (45.4)	228,439 (52.2)
Type of admission n (%)					
Emergency	50 (100)	233 (93.2)	4,352 (61.5)[b]	4,585 (62.5)[b]	313,790 (71.7)[d]
Elective	0 (0)	17 (6.8)	1,702 (24.0)	1,719 (23.4)	123,747 (28.3)
Clinical Frailty Scale n (%)					
1-4	23 (46)	128 (51.2)	5,471 (77.3)[c]	5,599 (76.4)[c]	339,919 (77.7)[e]
5	12 (24)	57 (22.8)	1,218 (17.2)	1,275 (17.4)	73,822 (16.9)
6	5 (10)	44 (17.6)	185 (2.6)	229 (3.1)	17,631 (4.0)
7-9	10 (20)	21 (8.4)	105 (1.5)	126 (1.7)	4,459 (1.0)
ICU LOS (hours) median (IQR)	72 (48-144)	96 (48-168)	72 (48-120)	72 (48-120)	57 (26-120)
Post-ICU LOS (days) median (IQR)	1.5 (0-4)	9 (5-21)	8 (4-17)	8 (4-17)	8 (4-16)

†excluding 52 ward deaths not included in the review, ††Case Mix Programme, [a]359 (5%) missing, [b]1028 (14.5%) missing, [c]103 (1.5%) missing, [d]49 (0.01%) missing, [e]1755 (0.4%) missing

Figure 6. Kaplan-Meier survival analysis: time to death following discharge from ICU



4.3. Avoidability of death and quality of care

In this section, the results of avoidability of death and quality of care assessments, using the Structured Judgement Review method, are reported. To ensure a consistent approach, an agreement protocol (see Chapter Three, section 3.3.6.6) was followed. Overall agreement between the three reviewers was good (based on combined quality of care and avoidability of death scores), with a weighted kappa of 0.77, 95% (CI 0.64-0.88) (see Appendix Twelve, Table 2). Assessment of quality of end-of-life care was the least consistent, with a weighted kappa of 0.42 (0.05-0.74), possibly reflecting the different clinical backgrounds of the three reviewers (two nurses and a physiotherapist). Although this level of agreement was similar or higher than that of other similar studies, reviewers compared and discussed findings to facilitate higher agreement in subsequent reviews (Hogan et al., 2015; Sari et al., 2007; Sorinola et al., 2012; Verlaat et al., 2018).

4.3.1. Avoidability Scores

Avoidability scores, based on the Structured Judgement Review assessment (Hutchinson, 2017), are shown in Table 20, with 74% (n=185) of deaths judged to be unavoidable. In these cases, no changes to care delivery were considered to have had the potential to change outcome. Of those judged to have some degree of avoidability, 8.4% (n=21) were judged to have a slight possibility of avoidability and 9.6% as possibly avoidable but unlikely. Finally, 8% (n=20) of patients were judged to have more than a 50:50 likelihood of avoidability and this group will be referred to as 'probably avoidable' throughout this thesis. No cases were judged as having 'strong evidence of avoidability' or being 'definitely avoidable'. Overall, 26% (n=65) of patients were judged to have some degree of avoidability in their death (scoring between 2 and 5).

Table 20. Overall avoidability of death scores

Scale used to judge avoidability of death ***n*** **(%)**	**Non-palliative discharge from ICU** ***n*****= 250 (% [95% CI])**
1 Definitely avoidable	0 (0 [0-1.5])
2 Strong evidence of avoidability	0 (0[0-1.5])
3 Probably avoidable (more than 50:50)	20 (8) [5.0-12.1])
4 Possibly avoidable but not very likely (less than 50:50)	24 (9.6 [6.2-14.0])
5 Slight evidence of avoidability	21 (8.4 [5.3-12.6])
6 Definitely not avoidable	185 (74 [68.1-79.3])

4.3.2. Rationale for Scoring Judgements

This section presents six examples of cases for each avoidability score as vignettes (see Chapter Three, section 3.3.6.5 for details of how vignettes were developed using published guidance). These six cases were selected to illustrate key points in the judgements of avoidability, discussed in reference to each case. Overall judgement statements, developed as part of the Structured Judgement Review method, are included for each example. Although no cases scored 2 or 1, for some cases scoring

3, avoidability may have been deemed more likely but for the presence of underlying co-morbidities or high severity of illness. Vignette 1 presents an example case to illustrate this.

Vignette 1. Probably avoidable (more than 50:50)

Evening discharge with dehydration not acknowledged in discharge document. Symptoms of ileus and dehydration overnight well managed by on-call Foundation Year 1 doctor including suggestion to measure lactate in morning. No reference to night events on morning ward round. Discharged from CCOT on day two. Ongoing vomiting faecal fluid, dehydration and no nutrition for four days with daily consultant ward rounds not acknowledging problems and ordering nasogastric tube removal. Vomiting episode with loss of consciousness and aspiration. Slow diagnosis of aspiration pneumonia with 24-hour delay in reviewing chest x-ray. Sudden deterioration on day five. Returned to theatre with lactate 10 and terminal ischaemic bowel and perforation.

Overall judgement: Discharged from ICU in poor state. Failure to take overview of ongoing issues led to long delay to recognise bowel ischaemia and aspiration pneumonia. However, significant co-morbidities and frailty which may have contributed to death.

For many cases, aspects of poor care were deemed significantly detrimental but the condition of the patient (i.e. frailty, co-morbidities or high severity of illness) meant it was difficult to assess their death as avoidable (Vignette 2).

Vignette 2. Possibly avoidable but not very likely (less than 50:50)

Evening discharge following abdominal surgery in previously fit patient. Clear ICU plan and early home team review. Discrepancy between medical and nursing team documentation re: functioning stoma. Seen by CCOT on day one and discharged. Deterioration after 24 hours with tachycardia and pyrexia, senior medical review, on-call physiotherapy, chest x-ray, electrocardiogram and arterial blood gas. Lactate recorded as 6.5 but not commented on. Foundation Year 1 doctor review three hours later, discussed patient with ICU who recommended arterial blood gas and intravenous albumin. Arterial blood gas repeated three hours later – lactate 7.2. ICU recommended further intravenous albumin and to repeat bloods in the morning. Senior ICU review one hour later who reported no abdominal signs and unclear aetiology for increase in lactate. Deterioration in respiratory function one hour later resulting in admission to ICU with lactate of 12. Readmitted to ICU within 72 hours of discharge and died within 48 hours from significant left ventricular failure not responding to treatment.
Overall judgement: Slow management of increasing lactate but severe left ventricular failure probably not recoverable.

Deaths fell into several similar categories across cases scoring 4 (slight evidence of avoidability) or 5 (no evidence of avoidability): sudden death with no obvious prior signal but co-morbidities; non-engagement with care and poor psychiatric management; died in active treatment but with co-morbidities or frailty; and died following instigation of end-of-life care and with co-morbidities. The differentiation between scores of 4 and 5 lay in the degree of patient frailty, co-morbidity or severity of impact of the problem in care. For example, good management of non-engagement in treatment resulted in a score of 5 (Vignette 3), with a similar patient in whom no effort was made to manage non-engagement in treatment scoring 4. An example of very poor care on a background of extensive co-morbidities and severity of illness is presented in Vignette 4. Given the degree of co-morbidities and frailty, changes in care delivery were judged to have the potential to change outcome in around one in ten deaths scoring 5. For cases scoring 4 this was judged to be higher at one in five deaths.

Vignette 3. Probably not avoidable and proactive effort to manage non-engagement with care

Discharged from ICU after eight days, with clear treatment plan and early ward multidisciplinary team reviews. Background of severe dementia and unable to speak English. Interpreter not organised until discharge to the ward. Regularly aggressive and non-engagement with multidisciplinary team treatment despite interpreter. Psychological medicine referral and review concluding lack of capacity. Deprivation of Liberty Safeguarding (DOLS) assessment appropriately completed. Multidisciplinary team encouragement of mobilisation in conjunction with family. Ongoing CCOT involvement until day 14. Medical plan for discharge to community hospital despite documentation of no rehabilitation. Rapid deterioration 16 days after discharge from ICU.
Overall judgement: Very difficult patient to manage. Not engaging with care and frequently aggressive, but every attempt made to facilitate engagement and delivery of clinical care.

Vignette 4. Probably not avoidable but significant problems in care

Elderly frail patient with multi-organ failure, evening discharge before a weekend. Discharged with high early warning score due to hypotension. Seen by medical team overnight and fluids given. No CCOT review overnight. Daily consultant review and regular CCOT and dietetic input. No physiotherapy input despite worsening chest symptoms with chest x-ray showing pulmonary oedema +/- hospital acquired pneumonia. ICU review including discussion with family and instigation of DNACPR. Worsening type one respiratory failure until sudden death on day five without instigation of end-of-life care.
Overall judgement: Poor ICU discharge with ongoing problems and no ceiling of treatment. Severely ill and unlikely to recover, but poor management of pneumonia and failure to recognise profound deterioration and instigate end-of-life care.

The 74% of patients whose death was deemed definitely not preventable fell into four categories: early instigation of end-of-life care (a decision made to change focus to end-of-life care within first 24 hours of ICU discharge); unexpected sudden death (death within 48 hours of discharge from ICU with no evidence of ward-based problems in care); death caused by progression of known disease (such as liver failure, chronic respiratory disease or cancer); and death not attributed to progression of known disease (Table 21). Within the latter two categories, ward-based problems in care were commonly identified. Despite this, as before, changes in care delivery were not deemed to have the potential to prevent death due to the condition of the patient (Vignettes 5 and 6).

Table 21. Reasons deaths judged to be unavoidable

Reason death deemed unavoidable	**Proportion of deaths with no avoidability** *n* = 185
Progression of a known chronic disease	51
instigation of end-of-life care within 24 hours of ICU discharge	14
Died suddenly within 48 hours, with no problems in care delivery	5
Had problems in care but deaths were deemed unavoidable	64
Had no problems in care delivery	51

Vignette 5. Probably not avoidable due to multiple co-morbidities

Moderately frail patient with short gut syndrome and leukaemia. Discharged weekend late evening. No multidisciplinary team review over weekend. Regular home team review during the following week and CCOT review on request. Physiotherapy and dietetic input. Complex management of patient with multiple co-morbidities. Cardiac arrest on day four with ICU input but no readmission.

Overall judgement: Complex patient but poor ICU discharge and died in active treatment.

Vignette 6. Rapid instigation of end-of-life care

Elderly, severely frail patient with pneumonia. Evening discharge with active treatment plan but not for ICU readmission. Home team assessment on arrival with family member present. Respiratory deterioration and family discussion within 24 hours and instigation of end-of-life care.
Overall judgement: No ceiling of treatment at ICU discharge but quick reasonable shift to end-of-life care in elderly frail patient.

4.3.3. Quality of Care Scores

Overall quality of care scores for the 250 patients discharged without an end-of-life care plan in place are presented in Table 22, stratified by avoidability judgement. Scoring was based on the Structured Judgement Review methodology (Hutchinson, 2017). Patients were judged to have received poor or very poor care in 24.8% (n=62) of all cases reviewed. Care was more likely to be poor or very poor where death was judged to be possibly avoidable (46/65, 70.8%, 95% CI 58.2-81.4) than in unavoidable deaths (16/185, 8.65%, 95% CI 5.02-13.7).

Table 22. Overall quality of care scores

Score n (%)	**Deceased patients with some degree of avoidability n=65**	**Deceased patients without avoidability n=185**	**All active-treatment discharges from ICU n=250**
1 Very poor care	8 (12.3)	3 (1.6)	11 (4.4)
2 Poor care	38 (58.5)	13 (7)	51 (20.4)
3 Adequate care	15 (23.1)	55 (29.7)	70 (28)
4 Good care	4 (6.1)	109 (58.9)	113 (45.2)
5 Excellent care	0 (0)	5 (2.7)	5 (2)

Problems in care resulting in harm were identified as part of the Structured Judgement Review form. The frequency of problems in care identified for each care period are presented in Table 23. Median length of stay was 9 (IQR 4-18) days for deceased patients with problems in care and 8 (IQR 4-22) days for deceased patients with no problems. Density of problems in care (number of problems identified per day) was therefore greatest in the first 24 hours after ICU discharge with 29.4% of the problems identified overall (n=82/279), although ongoing care (the period after the first 24 hours) had the highest proportion with 60.9% of the total problems identified (n=170/279).

Table 23. Number of problems in care by period following discharge from an ICU

Phase of care n (%)	**Deceased patients with some degree of avoidability n= 65**	**Deceased patients without avoidability n= 185**	**All non-palliative discharges from ICU n=250**
First 24 hours	43 (22.8)	39 (43.3)	82 (29.4)
Procedure	1 (0.5)	2 (2.2)	3 (1.1)
Ongoing*	132 (69.8)	38 (42.2)	170 (60.9)
Perioperative	0	0	0
End of life	13 (6.9)	11 (12.2)	24 (8.6)
Total problems	189	90	279

4.4. Pre-Identified Care Issues

Table 24 shows data collected for pre-identified care issues for patients discharged without an end-of-life care plan in place, both overall and stratified by perceived avoidability. For each care issue, definitions, data sources and rules for interpretation are presented in Appendix Twelve, Table 3. As discussed in the Chapter Three (section 3.3.6.1), these variables were selected based on previous preparatory work and published literature, and were collected to augment RCRR data.

As previously discussed in Chapters One and Three (sections 1.4 and 3.3.6.1), this study has defined discharge out-of-hours as any occurring after 4pm, reflecting an imminent change in clinical care provision. Out-of-hours discharge was common, with 67.2% (168/250) of patients discharged after 4pm, and occurred more frequently in ‘possibly avoidable’ deaths at 76.9% (50/65). Additional definitions of out-hours discharge are also presented, with 18.4% (46/250) of patients discharged after 10pm.

A high proportion of patients were physically dependent, with 62% (155/250) unable to stand and step from bed to chair on discharge from ICU. Daily mobilisation was often not delivered on the ward, with 69.3% (167/241) of patients who were assessed as appropriate for daily mobilisation (as defined in Appendix Twelve, Table 3) not mobilised to a chair on every day they could be. This judgement was based on physiotherapy or nursing documentation of reason for not mobilising on each day where this did not occur. Where this was not documented and the patient was not mobilised, reviewers used clinical judgement of patient condition and care delivery for the day to assess whether the patient could have been mobilised. Need for ongoing nutritional support at ICU discharge was assessed as being required by 185/250 patients (defined as requiring enteral or parenteral nutrition or assistance with feeding). However, a clear feeding plan was absent from discharge documentation in 41.1% (76/185) of cases. In the one site with a dedicated ICU dietician this proportion decreased to 16%.

Management of two common clinical problems was also examined. A new diagnosis of Atrial Fibrillation was made on the ward for 16% of patients (40/250). Of these, 30% (12/40) were judged not to have received appropriate initial management (e.g. timely administration of drugs to manage heart rate, advice sought from cardiologist) and 42.5% (17/40) had no subsequent investigation of potential underlying causes (e.g. CT scan to investigate potential septic sources or review and correction of electrolyte imbalance). Suspected or confirmed sepsis was documented for 60.2% (150/250) of patients. However, 33.3% (50/150) of these cases did not received the full Sepsis Six care bundle (Daniels et al., 2011).

Outreach/follow-up services were present at all sites, although provisions differed (see Table 15 in Chapter Three, section 3.3.2 for a description of the different CCOT services at each site). Most patients (82.8%, 207/250) were seen by a CCOT practitioner following discharge. However, 31.9% (66/207) of these patients were discharged from the service, or visits ceased, on the first day after ICU discharge and 72.5% (74/102) of those discharged by CCOTs were not reassessed when they subsequently deteriorated on the ward. Findings were similar across the three sites, despite the variation in services, and did not differ based on avoidability assessment.

Table 24. Pre-identified care issues

Problems in care *n* (%)	**Deceased patients with some avoidability** *n*= 65	**Deceased patients without avoidability** *n*=185	**All discharges for active treatment** *n*= 250
Discharged			
16:00 - 08:59	50 (76.9)	118 (63.8)	168 (67.2)
18:00 - 08:59	36 (55.4)	76 (41.1)	112 (44.8)
22:00 - 08:59	8 (12.3)	38 (20.5)	46 (18.4)
Mobility			
Unable to stand and step from bed to chair on ICU discharge	39 (60.0)	116 (62.7)	155 (62.0)
Not mobilised to a chair	46 (73.0) *(n=63**)*	121 (68.0) *(n=178**)*	167 (69.3) *(n=241)*
Not mobilised away from bed	42 (84) *(n=50**)*	106 (73.6) *(n=144**)*	148 (76.3) *(n=194**)*
Atrial Fibrillation			
New diagnosis	9 (13.8)	31 (16.8)	40 (16.0)
Initial treatment not appropriate	5 (55.6)	7 (22.5)	12 (30)
Underlying cause not investigated	6 (66.6)	11 (35.5)	17 (42.5)
Sepsis			
Diagnosis/suspicion	43 (66.2)	107 (57.8)	150 (60)
Sepsis 6 not completed	19 (44.2)	31 (29)	50 (33.3)
Nutrition*			
Plan required and not documented	24/53 (45.3)	52/132 (39.4)	76 (41.1)
Follow up/Outreach			
Seen by follow up/outreach	53 (81.5)	154 (83.7)	207 (82.8)
Discharged (n=207)	30 (56.6)	72 (46.8)	102 (49.3)
Day discharged* med (IQR)**	1 (1-2)	1 (1-2)	1 (1-2)
Not re-assessed	21 (70)	53 (73.6)	74 (72.5)

**n=185 requiring nutritional plan* ** number for whom this was clinically appropriate ****n=99*

4.5. Conclusion

This retrospective case record review of 300 patients across three NHS sites, who died in hospital following ICU discharge, provides clear data on the care delivered to these patients. Within this chapter, demographic data for this group are presented in comparison with national ICU admissions. This has demonstrated that patients who die following ICU discharge are older, frailer, more physically dependent and sicker than the general ICU population. This RCRR has demonstrated that 8% (n=20) of deaths following discharge from ICU, without an end-of-life care plan in place, were probably avoidable. Analysis also suggested 26% (n=65) had some degree of avoidability of death, termed possibly avoidable, although presence of significant co-morbidity and complexity commonly reduced the confidence in avoidability judgement. Quality of care assessments suggest there are significant problems in managing post-ICU patients, regardless of avoidability of death. This is probably due to the complexity of care needs identified in the vignettes and indicated by the additional data collected. For all cases, additional data on pre-identified problems in care were collected. These included: discharge from ICU out-of-hours; poor nutritional planning, mobilisation delivery, sepsis and atrial fibrillation management; and early discharge from CCOT services. Results were limited by the pre-specified variables collected, and do not represent all problems in care identified, but do offer further data on post-ICU ward care. These data will be augmented by in-depth reviews of both ‘probably avoidable’ deaths and survivor cases, presented in the next chapter.

Chapter Five: In-Depth Case Record Reviews

5.1. Introduction

The previous chapter presented the results of retrospective case record reviews (RCRR) of 300 patients who died following discharge from ICU. To explore the findings of the RCRR further, including examining the context of care delivery, all 20 patients whose deaths were judged as probably avoidable were subsequently reviewed in depth, using an established approach. The medical notes for 20 survivors were also reviewed using the same approach, to provide a contrast in care delivery. Details of this methodology are included in Chapter Three, section 3.3.6.2. As discussed in Chapter One (section 1.1), patients who died were selected for review as the original target population for the planned future intervention. It was also anticipated that patients who died would provide a higher proportion of problems in care than survivors, therefore yielding rich data. However, the focus of this work was subsequently broadened beyond mortality to focus more generally on improvement of ward care following ICU discharge.

In this chapter, the characteristics of the 40 cases reviewed are described, and vignettes of some example cases are presented. Cases are referred to by study numbers, with the prefix ‘D’ for deceased patients and ‘S’ for survivors, and the sites signified by A, B, or C. For example, DA021 was a patient who died at site A. The analysis was undertaken in three stages: identifying each problem in care, coding within an established framework, and assigning a contributory factor to each problem identified (Hogan et al., 2014) (see Chapter Three, section 3.3.6.2 for details and rationale for this approach). Differences in instances of problems in care are explored, to demonstrate how care differed between survivors and patients who died. Throughout this chapter several vignettes of cases will be referred to, to provide an in-depth illumination of the variety of problems in care. Instances where care delivery went well will also be explored. Examples of full analysis output are included in

Appendix Thirteen. Abbreviations and medical terms are defined in the glossary. Survivor cases were selected as a convenience sample from those approached to participate in interviews and were not selected to match the characteristics of the patients whose death was judged as probably avoidable. Further details of recruitment are included in Chapter Three, section 3.3.6.3.

5.2. Cases Included in In-Depth Review

In this section, overview data for the 40 cases reviewed in depth are presented in the same format as the previous chapter. These include characteristics, quality of care assessments, categorisation of care delivery and data on pre-defined ‘problems in care’. Further details of how these data were derived is included in Chapter Three (section 3.3.6.1).

5.2.1. Demographics

Demographics for the 20 patients whose death was judged as probably avoidable and 20 survivors are presented in Table 25. Data from the 250 patients who died presented in the previous chapter are included for comparison. Most data are similar for all three groups. Median age was ten years lower in survivors than patients whose death was judged as probably avoidable. Patients who died were slightly frailer and less mobile than survivors, with a slightly longer ICU stay. Median length of stay between ICU discharge and death or hospital discharge was slightly longer for patients whose death was judged as probably avoidable than for all post-ICU survivors at 11 days (IQR 4-19) versus 9 days (IQR 5-11), and an additional seven days for survivors at 16 days (IQR 7-26).

Table 25. Characteristics of patients whose death was judged as probably avoidable and survivors

Characteristic	***Non-palliative discharge from ICU n= 250***	**Avoidable deaths** ***n*= 20**	**Survivors** ***n*= 20**
Age median (IQR)	*74 (63.25 – 80)*	75 (62 – 77)	65 (51 – 70)
Female n (%)	*90 (36)*	6 (30)	7 (35)
APACHE II median (IQR)	*21 (17 – 26)*	21 (17 – 26)	16 (14-22)
Admission diagnosis n (%)			
Surgical	*112 (44.8)*	11 (55)	12 (60)
Medical	*126 (50.4)*	8 (40)	8 (40)
Trauma	*12 (4.8)*	1 (5)	0 (0)
Type of admission n (%)			
Emergency	*233 (93.2)*	16 (80)	17 (85)
Elective	*17 (6.8)*	4 (20)	3 (15)
Clinical Frailty Scale n (%)			
1-4	*128 (51.2)*	12 (60)	15 (75)
5	*57 (22.8)*	4 (20)	3 (15)
6	*44 (17.6)*	4 (20)	2 (10)
7-9	*21 (8.4)*	0	0
ICU LOS median (IQR)	*4 (2 – 7)*	4 (2 – 7)	3 (2 – 6)
Post-ICU LOS median (IQR)	*9 (5-21)*	11 (4-19)	16 (7-26)

5.2.2. Quality of Care Scores

Quality of care scores are presented in Table 26 (see Chapter Three, section 3.3.6.1 for definitions). Care for patients whose death was judged as probably avoidable was assessed as poorer than for survivors, with 75% (n=15) judged to have received poor care and 25% (n=5) very poor care. In survivors, 40% (n=8) were assessed as having received poor care overall, with 25% (n=5) adequate care and 35% (n=7) good care.

Table 26. Quality of care scores for patients whose death was judged as probably avoidable and survivors

Score ***n (%)***	**Avoidable deaths** ***n*= 20**	**Survivors** **n= 20**
Very poor care	5 (25)	0
Poor care	15 (75)	8 (40)
Adequate care	0	5 (25)
Good care	0	7 (35)
Excellent care	0	0

Table 27 presents statements reflecting the overall assessment of care for each of the 40 cases. These have been adapted and categorised based on the judgement statements written to support the assessment of avoidability of for patients whose death was judged as probably avoidable. The same approach was applied to the survivor cases.

Table 27. Overall assessment of care delivery

Overall assessment of care	**Probably avoidable deaths** ***n*= 20**	**Survivors** **n= 20**
Premature discharge from ICU	5	1
Poor management of main problem	8	2
Poor overall care in dependent patient	7	5
Good care	0	2
Mixed good and poor aspects of care	0	9

5.3. Data on Pre-Defined Problems in Care

As described above, the same RCRR approach was applied to survivor cases as the reviews of patients who died, presented in Chapter Four. This included collecting data on pre-defined problems in care. Data for both patients whose death was judged as probably avoidable and survivors are presented in Table 28. For reference, these data are displayed alongside the 250 discharges without an end-of-life care plan in place, presented in the previous chapter (see Chapter Three, section 3.3.6.1 for further details on how these were selected and defined). Pre-defined problems in care were identified in both probably patients whose death was judged as probably avoidable and survivors but were generally more common in patients who died. Survivors were more commonly not mobilised on a daily basis (13/20) than patients who died (9/16). However, where needed, a nutritional plan was in place more frequently in survivors (6/15) than patients who died (3/14), and there was a greater prevalence of suspected sepsis in patients whose death was judged as probably avoidable (12/20) than survivors (4/20). Where sepsis was suspected or confirmed, the Sepsis Six care bundle was often not completed for either group. Discharge after 4pm was also common in both groups (28/40 cases). Median duration to discharge from CCOTs was also the same in both groups (1.5 days, IQR 1-2) This chapter will explore care beyond these pre-defined problems, as well as examining the impact on patient care of these problems and their underlying contributory human factors.

Table 28. Problems in care from overview RCRR for probably avoidable deaths and survivors

Problems in care	***All active-treatment discharges from ICU n=250***	**Avoidable deaths *n*= 20**	**Survivors *n*= 20**
Discharged after *n* (%)			
16:00	*168 (67.7)*	14 (70)	14 (70)
18:00	*112 (45.2)*	10 (20)	7 (35)
22:00	*46 (18.5)*	1 (5)	1 (5)
Mobility			
Unable to stand and step to chair	*155 (62)*	10 (50)	6 (30)
Not mobilised to a chair *n* (%)	*167 (70)*	9 (56.3)	13 (65)
(n= appropriate to mobilise to chair)		*(n=16)*	*(n=20)*
Not mobilised away from bed *n* (%) ***(n= appropriate to mobilise)***	*148 (76)*	14 (87.5) *(n= 16)*	8 (47) *(n=17)*
Atrial Fibrillation			
New diagnosis *n* (%)	*40 (16)*	1 (5)	2 (10)
Initial management assessed as not appropriate *n* (%)	*12 (30)*	1 (100)	2 (100)
No investigation of underlying cause *n* (%^{a})	*17 (42.5)*	0 (0)	0 (0)
Sepsis			
Diagnosis/suspicion *n* (%)	*150 (60.2)*	12 (60)	4 (20)
Sepsis 6 not completed *n* (%)	*50 (33.3)*	9 (75)	3 (75)
Nutrition			
Plan required and not documented on discharge from ICU *n* (%)	*76 (41.1)*	6/15 (40)	3/14 (21.4)
Follow up/Outreach			
Seen by follow up/outreach *n* (%)	*207 (83.1)*	15 (75)	17 (85)
Discharged *n* (%)	*102 (49.3)*	11 (55)	30 (56.6)
Day discharged† med (IQR)	*1 (1-2)*	1.5 (1-2)	1.5 (1-2)
Not re-assessed *n* (%)	*74 (72.5)*	10/12 (83.3)	3/5 (60)

5.4. Vignettes

To illustrate some of the common problems in care and their impact, five vignettes are presented below and referred to throughout this chapter. These vignettes were derived from the narrative accounts of each case, using established techniques, as described in Chapter Three (section 3.3.6.5). These five vignettes were selected to emphasise and support key points made later in this chapter, demonstrating several of the most common problems in care delivery and the impact these problems had. These common problems include premature ICU discharge, poor management of main clinical problem, and multiple problems with nutrition, mobilisation, and detection, escalation and response to deterioration. Cases are referred to by study number throughout and demographic and condition details have been removed to ensure anonymity.

The care of DB026 is presented as an example of a premature overnight discharge resulting in multiple problems in care, including: poor handover; failure to escalate initial high early warning scores (EWS); failure to appreciate seriousness of condition during the ward round; and failure to monitor deteriorating vital signs.

Vignette of case DB026. Premature discharge from ICU

> Discharged overnight with unresolved hypotension which was not referred to in handover documentation. High EWS score on first ward-based observations, not escalated. Rechecked twice overnight with continuing high EWS and no escalation. Seen by ward round in morning. Minimal acknowledgement of ongoing low blood pressure, tachycardia, pyrexia and dropping oxygen saturations. No further medical documentation. Infrequent observations with worsening hypotension. CCOT review in afternoon, facilitating ICU review and readmission. Died on ICU within 24 hours.

Patient DA028 experienced poor management of their main problem of gastrointestinal bleed due to: failure to communicate information between nurses and doctors; failure to escalate clinical signs; disagreement about management between consultants; and overall failure to appreciate their clinical condition.

Vignette of case DA028. Poor management of main problem

Daytime discharge with review by Foundation Year 1 doctor (see glossary for definition of medical roles) on arrival. Seen by two consultants over following days with conflicting plans for feeding in light of feed malabsorption and signs of ileus. Black diarrhoea and dropping haemoglobin not acknowledged or investigated. Outlier for main problem of gastro-intestinal issues (on vascular ward) with no involvement of general surgeons. Delays in blood transfusion. Poor physiotherapy input, unable to mobilise due to fatigue suspected due to anaemia. Worsening signs of pneumonia with no chest assessment from physiotherapy or microbiology input. Early CCOT discharge despite ongoing problems and no documented escalation of noted anaemia. Dietetic input throughout but advice not followed. Deterioration on day five generally well managed with some delay in delivering planned investigations (i.e. arterial blood gas). Readmitted to ICU. Discharged from ICU second time with gradual deterioration and further readmission to ICU followed by instigation of end-of-life care.

Probably avoidable deaths DA021, DB100 and DC028 and survivor SA10 are examples of poor overall management in frail patients. These cases have been selected as they represent a variety of common problems in care including: poor physiotherapy provision; multiple examples of poor monitoring and escalation; and different approaches to outreach/follow-up provision between the sites.

Vignette of case DA021. Poor overall management in frail patient

Evening discharge after elective one-day stay for high risk surgical procedure due to Chronic Obstructive Pulmonary Disease (COPD). Clear plan of low threshold for antibiotics as high risk of chest infection not included in ICU discharge document. Chest not monitored on ward and mobilised infrequently. Dropping oxygen saturations treated as fluid overload. Chest x-ray taken on day two but delay in reporting. Ongoing discussion with ICU with lack of clarity on readmission status. Specialist respiratory team review of chest x-ray day three (24-hour delay to review) and diagnose pneumonia with appropriate plan. Rapid increase in C-reactive protein (marker of infection and inflammation) without acknowledgement and unexpected sudden death on day seven.

Vignette of case DB005. Poor overall management in frail patient

Friday evening discharge in frail dependent patient with complex needs. Initial plan for total parenteral (intravenous) nutrition following no nutrition for seven days. Plan reversed on day two due to bowel sounds present. Initial good nutritional team input, but advice not followed. Discharged on day three when patient eating soft diet. Poor fluid intake with no intravenous fluids initially. Ongoing hypotension not escalated or treated, limiting mobilisation due to dizziness. Comprehensive physiotherapy input, noting ongoing problems and escalating to Foundation Year 1 doctor with no documented response. Gentamycin (intravenous antibiotic with high risk of harm to kidneys) overdose for nephrostomy stent removal. Ongoing anaemia and deteriorating renal function not noted until change in Foundation Year 1 doctor on day four, with appropriate escalation of renal failure, fluid overload and identification of abdominal collection needing theatre. No CCOT input after initial review on day 1. Readmission to ICU for seven days before returning to ward with very poor prognosis but five days of active treatment and late recognition of end-of-life.

Vignette of case DC028. Poor overall management in frail patient

Late evening discharge before weekend. High dependency. Seen by CCOT on transfer but no medical review. Fell overnight, not escalated and no medical review. Seen by physiotherapist day one - not mobilised due to confusion. No medical review until day two. Ongoing problems with not absorbing nasogastric feed, converted to naso-jejunal tube following delay of three days. Poor surveillance throughout of electrolytes including bloods not being taken or checked, delay in prescribing Pabrinex (intravenous vitamins), and then not given. Oral potassium and phosphate prescribed but not given for various reasons and not converted to intravenous. Ongoing confusion regarding fluid status with intravenous frusemide, fluid restriction and oedema. Total parenteral nutrition not started despite very poor nutritional intake. Suspected small bowel obstruction not investigated (no CT scan and not operated due to high risk). Poor physiotherapy input throughout and not mobilised every day. Electrolytes supplemented on day 28 with potassium of 2.9. No further assessment of electrolytes. Cardiac arrest during endoscopy. Readmitted to ICU and quickly transitioned to end-of-life care.

Vignette of case SA10. Poor overall management in frail patient

Evening discharge in dependent, complex patient. Allocated side room on ward despite weakness meaning unable to use call bell. Large gaps in nasogastric feeding due to uncertainty in theatre timings, delays in restarting nasogastric feed and displacement of nasogastric tube with delay to confirmation of resisted tube including 4-hour delay to review chest x-ray for placement confirmation overnight. Attentive physiotherapy, consultant and CCOT input. CCOT facilitated psychiatry input for delirium. Ongoing high EWS not escalated or investigated but deterioration identified by CCOT during routine review and escalated.

These vignettes will be referred to throughout this chapter to provide examples of the problems in care being discussed, and explore the consequences of these problems.

Table 29. Frequency of common ‘problems in care’ and their contributory human factors

Problem in care category	**Non-survivors**	**Survivors**	**Contributory human factor category**	**Contributory human factor sub-category**	
	Frequency (n)	*Frequency (n)*			*Frequency (n)*
At or related to ICU discharge:					
Optimisation at ICU discharge	7	7	D Team factors	D:4 Team structure	8
			E Work environment factors	E:1 Staffing levels and skill mix	6
Out-of-hours discharge	14	14	F Organisation/management factors	F:4 Safety culture and priorities	28
Medical review on ward transfer	12	6	D Team factors	D:4 Team structure	14
			E Work environment factors	E:1 Staffing levels and skill mix	4
ICU handover	14	10	C Individual (staff) factors	C:2 Competence	5
			D Team factors	D:2 Written communication	10
				D:4 Team structure	2
			E Work environment factors	E:1 Staffing levels and skill mix	7
Specific clinical needs or conditions:					
Prognosis/complexity	19	6	A Patient factors	A:1 Condition (complexity & seriousness)	24
			F Organisation/management factors	F:4 Safety culture and priorities	1
Mobilisation	11	8	A Patient factors	A:1 Condition (complexity/seriousness)	2
				A:3 Personality and social factors	3
			C Individual (staff) factors	C:2 Competence	1
			D Team factors	D:3 Supervision and seeking help	1
				D:4 Team structure	5

			E Work environment factors	E:1 Staffing levels and skill mix	5
				E:2 Workload and shift patterns	2
Chest physiotherapy	8	3	C Individual (staff) factors	C:1 Knowledge and skills	3
			D Team factors	D:1 Verbal communication	3
				D:3 Supervision and seeking help	5
Nutrition provision	16	5	B Task and technology factors	B:1 Task design and clarify of structure	2
			D Team factors	D:2 Written communication	1
				D:4 Team structure	18
Fluid management	11	1	D Team factors	D:3 Supervision and seeking help	2
				D:4 Team structure	5
			E Work environment factors	E:1 Staffing levels and skill mix	5
Infection management	14	1	C Individual (staff) factors	C:1 Knowledge and skills	4
			D Team factors	D:4 Team structure	10
			F Organisation/management factors	F:4 Safety culture and priorities	1
Identification/management problems:					
Monitoring	15	5	A Patient factors	A:1 Condition (complexity/seriousness)	1
			B Task and technology factors	B:1 Task design and clarify of structure	1
			C Individual (staff) factors	C:1 Knowledge and skills	5
			D Team factors	D:3 Supervision and seeking help	1
				D:4 Team structure	9
			E Work environment factors	E:1 Staffing levels and skill mix	2
				E:2 Workload and shift patterns	1

Monitoring (blood results)	20	6	B Task and technology factors	B:1 Task design and clarify of structure	3
				B:3 Availability/accuracy of test results	4
			C Individual (staff) factors	C:1 Knowledge and skills	1
			D Team factors	D:3 Supervision and seeking help	1
				D:4 Team structure	15
			E Work environment factors	E:1 Staffing levels and skill mix	1
			F Organisation/management factors	F:2 Organisational structure	1
Escalation	18	5	B Task and technology factors	B:1 Task design and clarify of structure	1
				B:2 Availability and use of protocols	6
			C Individual (staff) factors	C:1 Knowledge and skills	6
				C:2 Competence	7
			D Team factors	D:1 Verbal communication	2
				D:4 Team structure	1
Management of identified problems	17	6	C Individual (staff) factors	C:1 Knowledge and skills	9
			D Team factors	D:3 Supervision and seeking help	5
				D:4 Team structure	6
			E Work environment factors	E:1 Staffing levels and skill mix	2
				E:2 Workload and shift patterns	1
Radiological investigation	10	6	B Task and technology factors	B:3 Availability/accuracy of test results	5
			C Individual (staff) factors	C:1 Knowledge and skills	1
			D Team factors	D:4 Team structure	7
			E Work environment factors	E:2 Workload and shift patterns	3

Clinical services:					
Specialist input	22	3	D Team factors	D:3 Supervision and seeking help	3
				D:4 Team structure	3
			F Organisation/management factors	F:2 Organisational structure	19
Outlier for main problem	7	2	D Team factors	D:4 Team structure	4
			F Organisation/management factors	F:2 Organisational structure	5
Outreach/follow-up services	15	9	C Individual (staff) factors	C:2 Competence	1
			E Work environment factors	E:1 Staffing levels and skill mix	1
			F Organisation/management factors	F:3 Policy, standards and goals	14
				F:4 Safety culture and priorities	8
Medical support and leadership	19	13	D Team factors	D:3 Supervision and seeking help	3
				D:4 Team structure	20
			E Work environment factors	E:2 Workload and shift patterns	7
			F Organisation/management factors	F:2 Organisational structure	2
End of life care	15	0	D Team factors	D:4 Team structure	15
Other*	18	3	n/a	n/a	n/a
	302	**119**			

*'Other' includes categories with fewer than 7 instances (documentation; resuscitation; pain management; psychiatric management and drug administration).

5.5. Exploration of Common Problems in Care

There were 302 problems identified across the 20 probably avoidable deaths, and 119 in survivor cases (Table 29). Contributory human factors identified for each problem are also presented in Table 29 and an overview of frequency of each code is presented in Appendix Nine and discussed in section 5.7. In this section the most common problems in care identified through in-depth review are presented. Examples are used to describe the problems and the impact these had on probably avoidable deaths and survivors and the contributory human factors underlying them are identified, in reference to Tables 25 to 29 and the vignettes. Examples of good care in survivors are also presented, to offer contrast and illustrate points. Problems in care have been split into four sections for clarity: problems at and with discharge from ICU; problems with clinical care delivery; identification and management problems; and organisational and team problems.

5.5.1. Problems at or Related to ICU Discharge

5.5.1.1. Optimisation Prior to ICU Discharge, Discharge Timing and Medical Review on Arrival

Optimisation at ICU discharge – resolution or management of ongoing medical problems - was identified as a problem for 14/40 patients (seven probably avoidable deaths and seven survivors) (Table 29). For eight patients (including B026 and SB10 – see vignettes) organ support therapies (such as blood pressure supporting drugs, breathing tube removal and discontinuation of high flow oxygen) were withdrawn in the 12 hours prior to ICU discharge. Signs of ongoing medical problems on arrival to the ward were identified for six patients. These signs included dehydration, fluid overload, low oxygen saturations and acute pain (including DA024 – see vignette). These ongoing problems were not acknowledged in the written handover for any case. All 14 patients experienced negative consequences of this failure to optimise, which were challenging to manage on the ward.

Out-of-hours discharge was common, with 28/40 patients (14 probably avoidable deaths and 14 survivors) discharged after 4pm (Tables 28 and 29). 14/28 patients (ten probably avoidable deaths and four survivors) discharged out-of-hours were not reviewed by a doctor (of any level) within 24 hours of arrival, compared with 4/12 patients (two probably avoidable deaths and two survivors) discharged in-hours (Table 29). No difference in provision of medical review overnight was observed across the three sites, despite one site having no night-time CCOT service. Where a medical review did occur out-of-hours this was almost always by the most junior doctors. Lack of medical review on arrival was particularly problematic where there were ongoing problems on ICU discharge, as described above.

Of the 28 patients discharged out-of-hours, 12 (six probably avoidable deaths and six survivors) had a high EWS on arrival to the ward or shortly afterwards (within four hours). There were between three and nine hours between this high EWS and the next set of observations, and only two patients were reviewed by a doctor or CCOT practitioner (despite local protocolised response to repeat observations in one hour and inform doctor and/or CCOT). For example, patient DB026 (see vignette) was discharged overnight with a high EWS on arrival and no escalation. It is not clear from documentation why nursing staff failed to escalate the high EWS or respond to their low oxygen saturations overnight. This was less common for in-hours discharges, with only two patients having a high EWS on arrival, both of whom were reviewed by a doctor or CCOT practitioner.

For five probably avoidable deaths and one survivor, their discharge was assessed to have been premature. This was indicated where their clinical condition suggested an ongoing need for organ support (indicated by clinical problems on the ward which did not respond to ward-based therapy) or likelihood of deterioration on discharge (including DB026 – see vignette) (Tables 27 and 29). Five were discharged out-of-hours (after 4pm) and none had a medical review on arrival. In all cases their EWS on first ward observations was high and not documented as escalated by the nurse who recorded the EWS, or repeated within the protocolised timeframe of one hour. In each case the patient either died or was readmitted to ICU within 24 hours of discharge (see vignette DB026 for an example of premature discharge). As above, problems were not acknowledged in the ICU handover documentation for any of these patients and there was no indication this was recognised as a premature discharge.

The contributory human factors identified as underlying failure to optimise for ICU discharge were split between ‘team factors: team structure’ and ‘work environment: staffing and skill mix’ (Table 29). This reflects the frequent absence of documentation to acknowledge the condition of the patient at ICU discharge, indicating failure either to recognise these ongoing problems or appreciate the challenge this would present to ward staff. There were no instances of individual decision-making as multiple staff members were involved in discharge decision-making and handover. Other potential underlying reasons for failing to optimise patients for ICU discharge, such as high ICU bed occupancy, could not be identified through notes review. However, in all cases there was no acknowledgement of failure to optimise, suggesting this was not recognised, or not communicated, by ICU staff.

The contributory human factor identified as underlying out-of-hours discharge was ‘organisation and management factors: safety culture’, selected as there was an apparent lack of recognition of out-of-hours discharge as problematic. The contributory human factors underlying lack of medical review on ward arrival were ‘team factors: team structure’, reflecting the team approach of not routinely reviewing post-ICU patients; and ‘work environment: staffing and skill mix’, where the patient arrived on the ward out-of-hours, reflecting the difference in availability of medical staff overnight. Providing a routine medical review following transfer from ICU may have identified these failures to escalate, and treatment may have been initiated earlier. This is particularly important for those premature discharges who deteriorated within hours of ICU discharge. In one site (C), CCOT practitioners routinely made an overnight check visit for patients discharged that day, providing an opportunity to address failure to escalate high EWSs or support management of ongoing problems.

5.5.1.2. Handover

There were 24 instances in 22 patients (12 probably avoidable deaths and ten survivors) of problems with handover (Table 29). These included: no written discharge document (1/24) missing or contradictory information (particularly a clear ongoing medical management plan) (17/24); failure to acknowledge ongoing problems (as identified above) (3/24); and failure to prescribe required medication (3/24). For example, information regarding analgesia for DA174 was contradictory throughout their handover document and no analgesia had been prescribed. Handover structure was different across the three sites, but all formats included a plan for ongoing medical management. Plans included monitoring blood results, antibiotic management, specialist referrals and actions in case of further deterioration. A medical plan was frequently absent from the handover documentation at sites A and C but almost always present, although not necessarily complete, at site B. Medical plans for site B were documented on a hospital-wide form outlining medical management, which was completed at ICU discharge and reviewed regularly on the ward as part of usual practice.

Problems with handover commonly occurred with out-of-hours discharge, with 16/24 instances in patients discharged after 4pm (ten in probably avoidable deaths and six in survivors). Absence of a medical plan was frequently identified in these cases, despite being particularly important in out-of-hours discharges, when delay to medical team review was common (as above). Treatment limitations were also often absent from ICU handover documentation, resulting in decision-making problems on the ward. Again, this was especially challenging for out-of-hours discharges who did not receive a medical review on arrival on the ward. For example, DB021 (see vignette) deteriorated rapidly after out-of-hours discharge with no clear ceiling of treatment and died rapidly in active treatment soon after having been assessed by ICU as suitable for readmission. This will be discussed further in section 5.5.4.5 (end-of-life care).

Contributory human factors identified for problems with handover included ‘individual: competence’ and ‘individual: knowledge and skills’, indicating the responsibility of the individual to ensure the comprehensiveness of the discharge document. ‘Team factors: written communication’ was also selected in some cases, reflecting the importance of written handover in communicating information between teams. The notes review was limited by reliance on the written handover only, although there were some instances where information documented as having been verbally handed over contradicted the written handover.

This section has identified problems related to ICU discharge and the subsequent implications of these. Out-of-hours discharge compounded the challenges posed by failure to optimise prior to discharge, poor handover, and absence of a medical review on transfer. Contributory factors commonly identified included ‘organisation and management factors: safety culture’, and ‘work environment: staffing and skill mix’, indicating a lack of awareness of the implications of discharge at night. Team factors were also commonly identified, but there were some problems linked to individual competence in handing over key information. Problems related to optimisation and out-of-hours discharge occurred frequently for both patients who died and survivors, but absence of medical review and handover were more common in probably avoidable deaths. The next section will explore the underlying management of these challenges.

5.5.2. Problems with Management of Specific Clinical Needs or Conditions

There were several areas of care delivery where clinical provision was consistently poor. These included mobilisation in dependent patients; chest physiotherapy; provision of adequate nutrition; fluid management; and management of infection. For all these problems, frailty and complexity provided an additional challenge to care delivery.

5.5.2.1. *Frailty and Complexity*

Frailty, measured by the Clinical Frailty Score (CFS) (Rockwood et al., 2005), was identified in the previous chapter as common in the post-ICU population. Of the 20 probably avoidable deaths, only four patients who died were fit and independent before ICU admission (CFS 1-3). Seven patients had a CFS of four, indicating a general 'slowing up', and defined as vulnerable. Eight patients needed help with activities of daily living (CFS 5-8). In contrast, the survivors were less frail, with twelve fit and independent (CFS 1-3), three scored as vulnerable (CFS 4) and only five needing any help with activities of daily living (CFS 5-8) (Table 25).

Although frailty alone cannot be defined as a problem in care delivery, it was linked to complexity of care needs and prognosis, which were identified as posing a challenge to care delivery in all but one probably avoidable death, and six survivors (Table 29) (see vignettes DA021, DB005, DC028 and SA10). Complexity was identified where combinations of high physical dependence, high care needs such as support with nutrition, and ongoing medical problems as a consequence of existing co-morbidities or their critical illness, resulted in a high level of multidisciplinary involvement. Frailty and complexity were often not acknowledged in the written ICU handover.

In all but one case of frailty and complexity, the contributory factor identified was 'condition: complexity and seriousness'. For one patient (SA10, see vignette) 'safety culture and priorities' was selected, as their level of dependency and complexity was so profound that adequate management was extremely difficult to provide on the ward. This highlights the extra challenge frailty poses to clinical care delivery in the ward setting.

5.5.2.2. *Mobilisation and Chest Physiotherapy*

Mobility at discharge was low for all probably avoidable deaths, with ten unable to stand and step from bed to chair, compared with six survivors (Table 28). Mobilisation was defined as daily movement from bed to chair and/or away from the bed space (depending on ability) and could be delivered by any staff member (usually a physiotherapist, nurse and/or clinical support worker) (see Chapter Three, section 3.3.6.1 for rationale for the selection of mobilisation as an indicator of rehabilitation). The RCRR identified 9/16 probably avoidable deaths and 13/20 survivors as not mobilised from bed to chair on every day they could have (Table 28). Problems with mobilisation were more common for probably avoidable deaths (11/20) than survivors (8/20) (Table 29). Documented reasons for not mobilising included fatigue due to anaemia, pain, dizziness due to hypotension, confusion, oedema, ICU acquired weakness and leaking dressings. Four patients declined physiotherapy, often in combination with pain, confusion or general non-engagement. Reasons for not mobilising were commonly not escalated by physiotherapists or nursing staff to the medical team or, where escalated, were not addressed. For several patients this resulted in multiple days in bed (including DA021, DB005 and DC028 – see vignettes). For probably avoidable death DB005, a physiotherapist repeatedly raised concerns about the patient's condition, including reviewing bloods and highlighting anaemia, but this was not acted on by the medical team.

Physiotherapy interactions were predominantly mobility-focused, and chest assessment was rarely documented. Chest physiotherapy delivery was identified as problematic for eight probably avoidable deaths and three survivors. Problems were identified where there was no chest assessment despite suspected chest infection/pneumonia or high risk due to COPD, or where chest physiotherapy was requested on the ward round but not delivered. It was not possible to assess from documentation whether this need was verbally communicated to the ward physiotherapist. In combination with failure to mobilise, this may be perceived as a failure to deliver preventative treatment for potential infection. This was apparent for DA021 (see vignette) who was identified as at high risk of developing pneumonia at ICU discharge due to long-standing COPD. Having declined mobilisation on day one, no chest assessment was performed despite falling oxygen saturation levels and documented high risk of hospital-acquired pneumonia. Patient DB098 was treated for a hospital-acquired pneumonia on the ward with a clear plan for chest physiotherapy and intravenous antibiotics. No chest physiotherapy was provided, and the patient was rarely helped out of bed. In both cases cause of death was certified as hospital-acquired pneumonia.

Contributory human factors for mobilisation and chest physiotherapy were variable and depended on the context. The primary factor identified was ‘team factors: team structure’, reflecting the multidisciplinary nature of mobilisation and rehabilitation. ‘Individual (staff) factors: knowledge and skill/competence’ and ‘team factors: supervision and seeking help’ were also identified where there appeared to be a failure to recognise the importance of mobilisation and chest physiotherapy for recovery. In addition, failure to provide chest physiotherapy was identified as potentially due to ‘team factors: verbal communication’ where need for chest physiotherapy was documented in the medical notes but may not have been handed over.

5.5.2.3. Nutrition

The previous chapter identified a large proportion (74%, n=185) of patients who died following ICU discharge as requiring nutritional support at ICU discharge. Nutritional support was defined as total parenteral nutrition; enteral nutrition; or help with oral feeding including supplementation. In this analysis, 15 probably avoidable deaths and 14 survivors were identified as requiring nutritional support at ICU discharge (Table 28), with problems in nutrition delivery identified 16 and five times respectively (including two instances for one patient who died) (Table 29). Problems included failure to recognise and act on general poor intake (10/21), reluctance to start total parenteral nutrition (6/21, including DC028 – see vignette), and early cessation of enteral or total parenteral nutrition (5/21 including DA028 and DB005 – see vignettes).

All three sites had access to dedicated dietetic and/or Nutritional Support Team input, although only one site had an ICU dietician and specific total parenteral nutrition team. However, for six patients (including DA028 and DB005 – see vignettes) where Nutritional Support Team input was present, advice was not followed, usually by withdrawing the advised nutritional support such as enteral or total parenteral nutrition. This will be discussed further in section 5.5.4.1 (specialist input). Documentation of nutritional intake was generally incomplete or absent, even in patients requiring enteral feeding. Nutritional Support Teams and dieticians highlighted this absence of monitoring as limiting their ability to assess nutritional status for six patients. CCOT reviews also emphasised the need to monitor nutritional intake. This will be discussed further in section 5.5.3 (monitoring).

Where enteral nutrition was established and intake was documented, there were prolonged gaps. These gaps in feeding were usually due to tube displacement and subsequent delays in re-siting and confirming tube position, and breaks for surgical procedures or time away from the ward. Prolonged gaps resulted in failure to deliver prescribed volumes of feed. For example, surviving patient SA10 (see vignette) had extensive exuding wounds increasing nutritional requirements but experienced multiple stops in enteral nutrition due to planned and subsequently cancelled surgical procedures, and nasogastric tube dislodgement followed by delays in re-siting and confirming placement by x-ray. Over the course of 72 hours they received a total of four hours of feeding.

A total of 13 problems were identified with management of low electrolytes in 12 patients (eight probably avoidable deaths and four survivors), which were documented by Nutritional Support Teams as probably indicating refeeding syndrome due to periods of malnutrition. Despite Nutritional Support Team advice, problems with management included failure to take or review bloods regularly and failure to supplement low electrolyte levels (including magnesium, potassium and phosphate). As well as the Nutritional Support Team, in some cases CCOT practitioners also highlighted low electrolyte levels in their documentation and advised regular monitoring, but this advice was seldom followed by medical staff. In three cases, new-onset atrial fibrillation may have been triggered by low electrolytes. In one case, where malnutrition and a combination of failure to monitor, prescribe and administer supplements may have contributed to prolonged low levels of magnesium and potassium, the patient suffered a cardiac arrest (DC028 - see vignette). This failure to monitor will be discussed further in section 5.3 (monitoring).

Due to the complexity, prolonged duration and multidisciplinary nature of nutritional support, the contributory human factor selected for most problems with nutrition was ‘team factors: team structure’ (Table 29). The only exception was for problems with nasogastric tube displacement and reinsertion, where ‘task and technology: task design’ was selected, reflecting the impact of the process of reinsertion, chest x-ray and review on prolonging periods without nutrition.

5.5.2.4. Fluid Management

Fluid management was identified as problematic for 11 probably avoidable deaths and one survivor (Table 29). Like nutritional intake, fluid balance monitoring was rarely maintained, even for patients who were identified as at risk of dehydration or renal impairment at ICU discharge. Where urine output was documented as low, this was often not escalated, not treated, or treatment not assessed (five cases including DA028 and DB005 – see vignettes). This was particularly apparent for patient DB005 for whom hypotension impaired physiotherapy due to dizziness. They did not receive any intravenous fluids despite frequent suggestions from the Nutritional Support Team and referral to the Foundation Year 1 doctor by the physiotherapist. In addition to monitoring fluid balance, blood tests measuring renal function were also not monitored closely in four patients (including DB005), leading to delay in identifying acute kidney injury. This will be explored further in section 5.3 (monitoring).

Contributory human factors for problems with fluid management were split between two codes. ‘Team factors: team structure’ again reflected the prolonged time periods of problems and multidisciplinary responsibility for ensuring adequate hydration, and ‘work environment: staffing and skill mix', indicated failure to complete fluid balance charts either due to lack of time or lack of appreciation of the importance of this monitoring (Table 29).

5.5.2.5. Infection and Sepsis Management

There was a lack of clarity between infection and sepsis in documentation. This possibly reflected the complexity of this group, or a lack of understanding of difference between infection and sepsis. However, 12 probably avoidable deaths and four survivors were clearly documented as suspected of, or diagnosed with, sepsis (Table 28). The standard NHS-adopted Sepsis Six care bundle (Daniels et al., 2011) was not completed for 9/12 probably avoidable deaths and 3/4 survivors. Serial lactate measurement, fluid administration and urine output monitoring were the most commonly omitted, and reasons for these omissions were not documented.

In addition to delivery of the Sepsis Six care bundle, 14 problems in infection management were identified for ten probably avoidable deaths (three patients had two problems) and one survivor (Table 29). Problems included not recognising or acting on signs such as raised inflammatory markers (blood results indicating infection); high EWSs (including temperature spikes) or symptoms of chest infection; delays in radiological investigation where indicated; and poor antibiotic management. Patient DA021 experienced all of these problems despite being highlighted as at high risk for chest infection at ICU discharge (see vignette). In addition, chest infections may have been more rapidly identified if physiotherapists were more proactive in assessing respiratory function and providing preventative chest physiotherapy for high risk patients, as discussed in section 5.5.2.2.

All three sites had access to a microbiology advice service, either on site or by telephone. Antibiotic management was complex in some patients due to long-standing infections which had been treated with several antibiotics. There were seven instances of poor antibiotic management in the absence of documented microbiology advice including: delay or failure to start antibiotics (including DA021 – see vignette); changing antibiotics without documented rationale (also identified for DA021); and failure to change antibiotics where ineffective. Microbiology advice was not documented as having been sought where needed or was sought but not followed in four patients (including DA028 – see vignette). This will be discussed further in section 5.5.4.1 (specialist input).

Where individuals documented signs of infection and did not escalate them, the contributory human factor assigned was ‘individual: knowledge and skills’, but it was more common for several professionals to be involved in monitoring and identification of infection, where ‘team factors: team structure’ was again selected (Table 29).

In this section, several key areas of care provision were commonly identified as problematic, including: frailty and complexity; mobilisation; and nutrition, fluid and sepsis management. Aside from mobilisation, problems with management of specific needs were much more prevalent in probably avoidable deaths than survivors, potentially indicating higher care needs in these non-surviving patients. Underlying contributory human factors were predominately based around team factors including ‘team structure’ and ‘supervision and seeking help’. However, commonly identified factors also included ‘individual factors: knowledge and skills’, and ‘work environment: staffing and skill mix’, suggesting clinical skills were sometimes identified as insufficient to meet post-ICU patients’ needs. In addition, ‘patient condition: complexity and seriousness’ was identified, indicating the challenges posed by the acuity and dependency of some patients. Management of problems identified in this section was often underpinned by identification and treatment, which are discussed in the next section.

5.5.3. Monitoring, Escalating, Responding to and Investigating Clinical Problems

As discussed above in sections 5.5.1 and 5.5.2, there were many instances where problems were not identified due to failure to monitor, escalate or act on results. Failure to monitor was identified as a problem 15 times in 11 probably avoidable deaths and four survivors (Table 29). Problems were identified in monitoring of fluid balance, urine output, lactate levels, EWS, pain, nutrition and response to treatment (such as medication for atrial fibrillation). There were also instances where clinical signs rather than physiological measurements were not escalated appropriately. For example, for avoidable death DA028 (see vignette) high volumes of black diarrhoea and presence of blood clots in nasogastric aspirate were documented in nursing notes but ward round documentation suggests this was not escalated as suppositories were prescribed for constipation and enteral feeding was ordered to be resumed. In addition to physiological monitoring, there were also two instances of dependent, acutely ill patients being allocated side rooms on arrival on the ward where they could not be easily seen (including SA10 - see vignette). In neither case was this indicated or documented as isolation due to infection risk.

Blood results monitoring was identified as problematic 19 times in 14 probably avoidable deaths and six times for survivors. Blood results requiring monitoring included lactate, haemoglobin (including for DA028 and DB005 – see vignettes), electrolytes (DC028 – see vignette), inflammatory markers (DA021 – see vignette), clotting, and renal function tests (DB005 – see vignette). As previously discussed, failure to monitor blood results posed problems with identification and management of sepsis, acute kidney injury, nutrition and refeeding syndrome. In addition, where monitoring had occurred, there were seven instances of failure to recognise and manage anaemia (haemoglobin) and bowel ischaemia (lactate). Bloods were often taken regularly and were available on electronic systems (viewed as part of the notes review) but not documented or referred to in the medical notes. This absence of documentation suggests they may not have been reviewed, especially where there were results which required action which was not taken.

Where monitoring was undertaken, failure to escalate results was identified as problematic 23 times (18 times for probably avoidable deaths and five for survivors, including multiple instances for some patients) (Table 29). Most commonly this was a failure to escalate high EWS according to local protocol, either by increasing the frequency of observations or escalating management to a doctor or CCOT practitioner (13/23). Failure to escalate was also identified for other parameters, such as poor urine output (3/23) and clinically based problems such as signs of bleeding or reduced consciousness (7/23). Failure to escalate high EWS on initial transfer from ICU was discussed above in section 5.5.1.1 but this was not limited to the initial post-ICU period. Failure to escalate EWS occurred more frequently at night. In addition, there were often several hours to the next set of observations following a high EWS, despite protocolised responses requiring rechecking observations in one hour. For example, for patient BN021 (see vignette) there were seven hours between the second and third set of observations indicating a high EWS due to low oxygen levels, followed by profound deterioration and rapid death within two hours. There were also instances of failure to assess the effectiveness of treatment for high EWS, such as fluid boluses for low blood pressure (CN035 and C0N55).

Where problems were identified through monitoring and escalated, information was often still not appropriately acted on. A total of 17 problems with management of identified clinical issues were identified in ten probably avoidable deaths and six survivors (Table 29). Problems included delay of more than 24 hours to blood transfusion, delay of more than two hours to medical review following escalation, failure to deliver adequate oxygen and failure to supplement electrolytes adequately (see vignette DA028).

There were 16 problems identified with radiological investigations in 13 patients (ten for probably avoidable deaths and six for survivors). Radiological investigations included chest and abdominal x-rays, and CT scans. Radiological investigations were undertaken to aid detection of sepsis source (abdominal or chest); diagnose pulmonary embolism, pneumonia, bowel obstruction or ischaemic bowel; and confirm nasogastric tube placement prior to feeding. Problems included delay to ordering radiological investigation, delay of between 6 and 24 hours to receiving radiological report (including

DA021 and SA10 – see vignettes); and delay to reviewing radiological report once issued of 4 to 24 hours (including DA021 – see vignette).

As with other ongoing problems, the primary contributory human factor identified for failure to monitor, escalate and respond was ‘team factors: team structure’ (Table 29). Where bloods were regularly taken but not documented as reviewed or acted on, this was judged as ‘task and technology: availability of results’ and ‘task design and structure’, indicating the failure to integrate blood results into ward rounds and daily reviews. Where single measurements were not documented as escalated (such as high EWS), the contributory factor was identified as ‘individual: knowledge and skills’ or ‘task and technology: availability/use of protocol’, indicating the protocolisation of escalating EWSs at each site. Although escalation may have occurred verbally and not been documented, in the cases examined, no subsequent management was undertaken. For radiological investigation problems the contributory human factors ‘availability/accuracy of test results’ was selected where there was a delay to receiving the radiological report and ‘workload and shift patterns’ where the delay to reviewing the radiological report occurred overnight, suggesting workload for junior doctors was impairing their ability to review the report.

In this section, the management of clinical problems has been explored, building on the challenges to care delivery identified in section 5.5.2. The importance of monitoring, escalation of monitoring results and appropriate action have been discussed. As with previous sections, team work was frequently identified as the underlying contributory human factor, but skills and knowledge of individuals, and workload factors related to out-of-hours infrastructure were also identified. The protocolisation of care was also identified in reference to escalation of high EWSs. In the next section, problems related to wider clinical services, supporting this management, will be explored.

5.5.4. Clinical Services

Throughout the above sections, multiple clinical services had input into the problems discussed. These included Nutritional Support Teams, specialist medical teams and nurse-led outreach/follow-up teams (services differed across the three sites but are referred to as CCOT for brevity). Oversight of care delivery, including ensuring adequate monitoring and management of problems and involvement of specialist teams, was the responsibility of the consultant allocated to each patient. Provision and co-ordination of these services will be explored in this section.

5.5.4.1. Specialist Input

Problems related to accessing support from specialist clinical teams was identified 22 times in ten probably avoidable deaths and three times for survivors (Table 29). Four avoidable deaths experienced three or more problems in this category. This large difference between instances of problems between patients who died and survivors may be due to greater complexity of care needs in the probably avoidable deaths. For some probably avoidable deaths this was identified more than once, where multiple specialist teams were involved in their care. Specialist teams included general surgery, general medicine (see section 5.5.4.2 outliers), cardiology, dietetic/Nutritional Support Teams (see section 5.5.2.3); ICU; psychiatry; speech and language therapy; microbiology (see section5. 5.2.5); palliative care; and respiratory and diabetes specialist nurses.

Identified problems included failure to refer (4/25), delay to referral (15/25), specialist advice not followed (3/25), and specialist advice inadequate (3/25). For example, where patients were not engaged in care delivery (such as with mobilisation – as discussed in section 5.5.2.2) there was sometimes a delay or failure to involve psychiatric services. However, for the three survivors who required this, referral was prompt (within 24 hours), and facilitated by the CCOT. Dietetic referral was identified as delayed in five cases, possibly due to poor surveillance of nutritional intake (including DA028 – see vignette), as previously discussed in section 5.5.2.3. Even where nutrition team input was present, advice was often not followed, particularly in surgical patients, where there appeared to be a drive to reinstate nutrition rapidly. Microbiology input was delayed in three patients with complex antibiotic management in the two sites where there was no on-site microbiology service and advice was sought by telephone, as previously discussed in section 5.5.2.5. In the three instances of new onset of fast atrial fibrillation (discussed in section 5.5.3), cardiology input was either not sought or was unclear. For patient DB006, their longstanding respiratory condition became the main focus of their treatment but there was reluctance to move them to the respiratory ward and input from respiratory specialists was infrequent. This will be discussed further below in the 'outlier for main problem' section 5.5.4.2.

In most problems related to specialist input the contributory human factor identified was 'team factors: team structure', demonstrating that seeking support from specialists was the responsibility of the whole team rather than one individual (Table 29). It was not clear from documentation to what extent these problems may have been underpinned by failures of communication. 'Organisational and management factors: organisational structure' was also identified where there were problems with the referral process, again possibly due to communication problems, and 'team factors: supervision and seeking help' where there was a failure to identify a need to seek specialist advice or advice was not followed.

5.5.4.2. Outlier for Main Problem

For seven probably avoidable deaths and two survivors, problems in care were identified relating to being an outlier for their main problem, i.e. the ward they were on did not specialise in their predominant health problem (Table 29). This was documented as due to bed capacity issues in two cases but more frequently occurred when patients recovered from their surgical admission problem but remained in hospital due to ongoing medical problems (including DA021 and DB005 – see vignettes). Medical problems in surgical patients were particularly poorly managed, with surgical ward rounds focused on routine surgical management such as drain removal and reinstating nutrition (as discussed in section 5.5.2.3). In these instances, monitoring was poor, with deranged blood results frequently not acknowledged, leading to poor identification and management of acute kidney injury, atrial fibrillation and fluid intake (as discussed in section 5.5.3). For these patients, a clear medical management plan at ICU discharge may have been particularly beneficial in drawing attention to problems and advising on management. At one site there was a dedicated peri-operative medical team who reviewed surgical patients with complex medical problems, acknowledging the need to improve care in this area.

As well as the common contributory human factor ‘team factors: team structure’, problems relating to being an outlier were assigned ‘organisation and management factors: organisational structure’, due to the splitting of specialities into wards being detrimental to the care of complex patients (Table 29). Problems related to being an outlier were similar to those in reference to specialist input above, and were more common in avoidable deaths than survivors. This again emphasises the complexity of care needs of patients who died following ICU discharge, requiring input from multiple professions and specialities.

5.5.4.3. Outreach/Follow-Up Services

Problems related to outreach/follow-up were identified for 15 probably avoidable deaths, and nine survivors. Provision of outreach/follow-up services differed across the three sites (termed CCOT throughout this section for brevity). For all three teams, however, part of their role was to review patients following discharge to the ward, for at least the first 24 to 48 hours (see Chapter Three, section 3.3.2 for description of CCOTs at the three sites). Visits tended to include documentation of an extensive assessment of the patient, including review of vital signs monitoring, blood results, intake and output, pain management and need for specialist referral, summarised by a management plan. CCOTs also reviewed and highlighted the medical plan at ICU discharge. The non-surviving cohort in this study were, as discussed above, generally frail, dependent, elderly and requiring complex input. Despite this, six probably avoidable deaths and five survivors were formally discharged from the service, or visits ceased, after day one, despite ongoing problems acknowledged in CCOT reviews (including DB005 – see vignette). A further three probably avoidable deaths were discharged or visits ceased in the subsequent two to five days despite documented ongoing problems (including DA028 – see vignette). Problems highlighted by CCOTs on the day of discharge from the service included chest pain, low urine output, pain, non-engagement with care, delirium, poor nutrition management, chest infection, and overall complexity of care needs.

There were instances of CCOTs facilitating rapid response to deterioration including readmission to ICU (three cases including DB026 – see vignette,) and management of clinical deteriorations (two cases including SA10 – see vignette). In the surviving group, CCOTs visited six patients regularly until their hospital discharge and facilitated responses to identified problems for these patients, such as rapid psychiatric input. There were, however, also many instances of CCOT documenting problems in the medical notes but not facilitating or following up on responses to these problems. As discussed above, this included identification of deranged electrolytes, clinical problems such as low urine output or dehydration and problems with nutrition.

Where CCOT visits had ceased, only one patient who died was re-referred to the service following subsequent deterioration. The mechanism for re-referring to CCOTs varied across sites but was based on EWS, although remit for reviewing in response to high EWS was unclear. At one site (A), remit was limited to follow-up of patients discharged to the ward, rather than a referral service for deteriorating patients. The system at one site (B) where there was a 24/7 CCOT service was described as having an automated alerting system for high EWS although remit for responding to alerts was not clear. High EWS were frequently not reviewed by CCOTs or doctors either automatically or through escalation (as discussed in sections 5.5.1.1 and 5.5.3). For three premature discharges, CCOTs facilitated rapid readmission to ICU once they assessed the patient (including DB026 – see vignette).

Contributory human factors related to problems in CCOT provision were split between 'organisation and management factors: policy, standards and goals' and 'organisation and management factors: safety culture and priorities', relating to discharge from the service and subsequent escalation of high EWS. Where CCOTs were present during deteriorations they facilitated prompt proactive care. However, due to early discharge from the service and failure to re-refer to CCOT during deteriorations, the opportunity to provide this additional support was often lost.

5.5.4.4. Medical Support and Leadership

Care delivery for reviewed patients was led by a consultant, including co-ordinating care provision, identifying and treating deterioration, and facilitating recovery. There were 19 identified instances of problems with medical support and leadership in 14 probably avoidable deaths and 13 in 11 survivors. This was the only category where individual survivors were identified as experiencing multiple instances of the same problem category. These problems included poor consultant oversight; disagreement between consultants (including DA028 – see vignette); instances of no documented consultant input for between 48 hours and five days from transfer from ICU; unsupported junior doctors; failure to recognise acuity; and failure to recognise terminal deterioration (including DA021 and DB005 – see vignettes). These problems are likely to have resulted in potentially avoidable deteriorations such as pneumonia, bowel obstruction, delay to identifying pulmonary embolism, and general poor condition resulting in slow deterioration or inability to undergo surgery.

For most patients, the daily ward round was the point at which decisions about management were taken, usually occurring in the morning and led by a consultant. It was often difficult to assess the level of seniority of medical ward rounds from documentation. However, there appeared to be six cases of patients not being seen by a consultant for between two and five days after discharge from ICU, and three patients with no documented consultant contact during their ward stay. This assessment is limited by documentation, with ward rounds frequently not identifying whether a consultant was present. However, for four patients there were documented instances of registrar, senior house officer and Foundation Year 1 doctor ward rounds, suggesting absence of consultant input.

As previously discussed in section 5.5.4.2, surgical ward rounds tended to focus solely on surgical issues without reference to medical problems such as high EWS, onset of atrial fibrillation, infection identification and review of blood results. There were also instances, as discussed above (section 5.5.3), of decisions being taken apparently in the absence of key information from nursing staff (see vignettes DA028 and DB026). Consultant ward rounds were less likely to take place during the weekend and three patients were not seen by a doctor of any level over the weekend, despite ongoing clinical problems (including DC028 – see vignette). The lack of consultant presence appeared to impair decision-making and this sometimes impacted on ordering investigations and co-ordinating care. There were five instances for avoidable deaths of conflict between multiple consultants involved in care (including DA028 – see vignette), leading to blood transfusions and radiological investigations being ordered and cancelled, feeding plans being changed, and disagreements from different specialities over responsibilities for the patient. This resulted in poor overall co-ordination of care.

Contributory human factors identified for medical support and leadership were predominantly ‘team factors: team structure’, demonstrating the importance of teamwork in providing medical support (Table 29). ‘Team factors: supervision and seeking help’ was selected where junior doctors appeared to be working outside of their expertise without senior support. Where there were problems related to weekend and out-of-hours medical support, ‘organisation and management factors: organisational structure’ and ‘work environment factors: workload and shift patterns’ were selected.

5.5.4.5. Treatment Limitations and End-of-Life Care

In addition to co-ordinating recovery, poor medical leadership also resulted in delay to recognise deterioration at the end of life, and either make clear decisions about ceiling of treatment or move to end-of-life care. Decisions related to treatment limitations were judged as problematic for six probably avoidable deaths, and nine died in active treatment or within hours of initiating end-of-life care despite clear signs of irreversible deterioration (see vignettes DA021 and DB005). There was a reluctance to make the decision to withdraw treatment until the patient was in extremis. Delaying this decision meant resuscitation attempts were made in two cases, palliative care teams had little or no input, and patients and families were unprepared for death.

In all cases of failure to recognise that the patient was dying, the contributory factor identified was ‘team factors: team structure’, reflecting the overall multidisciplinary nature of identifying end of life and providing appropriate care. This was ultimately the responsibility of the consultant and therefore linked to medical leadership as well as appropriate escalation and communication of deterioration (Table 29).

In this section, several aspects of clinical provision have been identified as important in the delivery of post-ICU ward care, again more frequently identified for probably avoidable deaths than survivors. The need for input from clinical specialists was identified as common but often problematic, and this was compounded for outliers. The need for specialist input was often not recognised and advice was commonly not followed. Follow-up visits from CCOTs were identified as key to supporting post-ICU ward care but visits frequently ceased in the first days following ICU discharge. Medical leadership was identified as important in directing care, but problems were identified with consultant input, especially around ward rounds. This had clear implications for end-of-life care. However, medical leadership relies on clear escalation and communication of problems, which was identified as frequently problematic earlier in section 5.5.3. In addition to team-related contributory human factors, in this section organisation and management factors such as ‘organisational structure’, ‘safety culture and priorities’ and ‘policy, standards and goals’ were also commonly identified, indicating a wider organisational level focus for provision of clinical services.

5.6. Problems Occurring Out-of-Hours

Throughout the previous sections, several problems in care have been identified as related to, or more prevalent, out-of-hours (defined as after 4pm – see Chapter Three, section 3.3.6.1 for rationale). These included premature discharges, failure to optimise, poor handover, and failure to escalate high EWS both on admission and during ongoing care. The frequency of problems in care occurring at night suggests out-of-hours care provision was problematic, although the reliance on documentation meant it was challenging to identify what the underlying reasons for problems arising overnight were. However, where medical input occurred this was almost always from the most junior doctors, suggesting lack of experience and support may have been a contributing factor. There were also three instances of Foundation Year 1 doctors and CCOTs being called but unavailable to attend patients, suggesting workload limitations. Infrequent observations despite high EWSs may also indicate high workload or limitations in clinical judgement due to inexperienced nursing staff. Common instances of premature discharge and poor handover in night-time discharges may indicate pressures from high ICU bed occupancy, but again, this could not be identified through documentation.

5.7. Summary of Contributory Human Factors

Over half of the problems in care identified in probably avoidable deaths, and a large proportion for survivors, were deemed to be due to ‘team factors: team structure’ (167 for probably avoidable deaths and 41 for survivors) (Appendix Nine, Table 4). This frequency demonstrates the multi-disciplinary nature of ward care, with input from specialists and ward-based staff requiring co-ordination and overview. Other commonly identified contributory human factors were ‘organisation and management factors: safety culture' (23 and 15), mostly related to out-of-hours discharge; and 'condition: complexity and seriousness' (20 and 7), indicating the high level of complexity in probably avoidable deaths compared with survivors. The prevalence of 'team factors: supervision and seeking help' (20 and 3) and 'individual: knowledge and skills' (19 and 12) demonstrate the importance of appropriate support and clinical skills in managing post-ICU patients.

As with the problems in care framework, some factors were not identified in any cases. Verbal communication was likely to have been a facet of the 'team factors' identified, but the reliance on documentation made this difficult to identify. Exceptions to this were ICU handover, where 'team factors: written communication' was identified (section 5.5.1.2), and chest physiotherapy provision, where 'team factors: verbal communication' was assigned (section 5.5.2.2). It was difficult to assess whether protocols were available, unless specifically stated, therefore the only one referred to was the EWS escalation protocol, which is a nationally adopted tool. Other decision-making aids were not documented in the notes and therefore were not assessed in this work. It was impossible to identify any institutional factors within the data available, therefore these factors were not assigned to any cases. The physical and mental health of individual staff members was also impossible to identify from the data available.

5.8. Conclusion

This chapter presented the results of 40 in-depth reviews of care delivery for both probably avoidable deaths and post-ICU survivors. Although characteristics for both groups were similar, probably avoidable deaths were frailer and more physically dependent than survivors. The problems in care identified for both groups were also similar, although almost three times more problems were identified in probably avoidable deaths than survivors. Probably avoidable deaths were far more likely to be discharged prematurely, have a high EWS on transfer and for this not to be escalated according to local protocol. Common problems in care delivery for both groups included out-of-hours discharge, poor handover, and problems with nutrition, fluid management, mobilisation and sepsis management. These problems were underpinned by a failure to monitor, escalate and respond to clinical information, and problems with medical leadership. Problems were more common and had a greater impact out-of-hours, indicating a change in clinical service provision at night. CCOTs had key roles in managing these problems but their visits often ceased early in the post-ICU period, missing opportunities to offer support. The most common contributory human factors identified as related to these problems in care was ‘team structure’, emphasising the multi-disciplinary nature of post-ICU ward care.

This in-depth review builds on the RCRR data from the previous chapter. The RCRR identified common problems with care delivery, indicating post-ICU ward care was challenging. The in-depth reviews have explored these problems in care in greater detail, offering context around care delivery and identifying some of the underlying contributory human factors. These reviews have highlighted many of the challenges of delivering care to post-ICU patients, but have not offered data on why wards were not able to manage these problems. In the next chapter the results of interviews with patients, relatives and staff will offer further insights into post-ICU care delivery including further context for the problems in care identified from multiple perspectives.

Chapter Six: Interviews with Staff, Patients and Family Members

6.1. Introduction

In the previous two chapters the results of retrospective case record reviews for 300 post-ICU non-survivors and in-depth reviews of 40 post-ICU patients' care records were presented. To develop and complement these data, direct accounts of post-ICU ward care from different perspectives were sought through interviews, the results of which are presented here. Interviews were conducted with 30 staff members, 11 individual patients, seven dyadic patient and family member interviews and one bereaved family member (a total of 19 patient/family member interviews with 26 participants). Interviews were conducted over the three sites by two interviewers and transcribed verbatim. The interview approach, topic guide, setting and recruitment are outlined in Chapter Three: Methodology, section 3.3.7.2. Data were analysed using thematic analysis and details of the analysis and development of themes is presented in Chapter Three, section 3.3.7.6. Summary data for the participants interviewed are included in Appendix Fourteen, Tables 1 and 2. Participants are identified either by profession, interview number and site, or patient/family member, interview number and site. Where dyadic interviews were undertaken both the patient and family member are included in the participant identification and the participant speaking is stated at the start of the quote.

Analysis of the interviews was focused on answering the overall research question:

- "***What challenges and problems in care currently exist in the management of post-ICU ward patients?***"

and the two secondary research questions specific to this approach:

- *"What challenges and potential improvements are perceived by staff delivering ward-based care to post-ICU patients?"* and

- *"How is ward care perceived by post-ICU patients and what changes could be made to improve this?"*

Five key themes emerged from this analysis: Fear and Anxiety (exploring the impact of post-ICU ward care on both patients and staff); Continuity (underpinning delivery of safe and effective care); Post-ICU Patients as *Other* (identifying how patients were perceived as different, and more challenging to care for than other ward patients); Ensuring Quality and Safety of Ward Care (exploring the aspects of care delivery identified as important for patient safety and quality of care); and Out-of-Hours Care Provision (exploring the additional challenges to this care delivery at night). Within some themes, several facets were identified and are referred to as sub-themes. There was significant overlap and interdependence throughout the themes (see Chapter Three, section 3.3.7.6 for how the themes were evolved throughout analysis). The fear and anxiety identified in the first theme is developed and explored in further detail throughout the subsequent themes, identifying factors which contributed to this experience for both patients and staff members. In the theme "ICU Patients as *Other*" some specific characteristics of post-ICU patients are identified, with the impact of these on specific areas of care delivery explored in subsequent theme "Ensuring Quality and Safety of Ward Care". In the theme "Out-of-hours Care Provision" several aspects of post-ICU ward care previously identified are examined in the context of changes in the system of care delivery at night. These include the increased importance of continuity of information identified in the second theme, and the impact of further reducing the staffing numbers and level of experience and access to specialist support services at a time when patients may be discharged prematurely resulting in a greater level of acuity, identified as one aspect of the *otherness* of post-ICU patients. Themes and their component sub-themes are presented below.

6.2. Theme: Fear and Anxiety

Fear and anxiety related to post-ICU care was reported by most staff, patients and families, with some exceptions, and will be explored in this theme. It was clear from interviews with patients that being admitted to ICU was a significant event in their lives. Several patients described their experiences in dramatic language, using phrases such as "back from the brink" and "massive operation". These patients also discussed how close they came to dying in frank terms.

> "Obviously in ITU you have had this very close relationship with your team of carers and doctors who are around you to cocoon you and bring you back from the brink in my case, and I suppose in most cases when they come into intensive care." *Patient 5, site C*

For many patients it was clear they felt compelled to express the enormity of the illness that resulted in an admission to ICU before they were able to discuss their experiences after discharge.

6.2.1. Sub-Theme: Relocation Anxiety Versus Premature Discharge

In common with current literature, discussed in section 2.4, patients and family members indicated that ICU felt like a safe, secure place which provided all the care and support patients felt they needed. In contrast, being moved to the ward was described as a significant change in terms of staff availability and consequently provision of care. Where patients were physically dependent, the transition from one-to-one nursing was described as having a significant effect on their feeling of safety, leaving them feeling vulnerable.

> ". . . you've got to manage. Someone has made the decision that I'm strong enough to be in [ward name] on my own and not twenty four hour care therefore the nurses I'm sure thought he's okay to be there and I probably was although it was a frightening experience." *Patient 6, site A.*

This patient response has been termed ‘relocation anxiety’ in the literature (Leith, 1999; McKinney & Melby, 2002), but this feeling of vulnerability may also convey a well-founded concern that ward staff were unable to meet the needs of post-ICU patients, as previously identified in the literature review (Field et al., 2008; Salmond et al., 2011) (section 2.4).

Nurses were acutely aware of the impact of transfer to the ward on both patients and their families and described many factors related to this relocation anxiety. These included relative busyness and noise in comparison to ICU, proximity of nursing staff and the duration of time patients had spent on ICU. There was some conflict over who was responsible for managing the expectations of patients being transferred to the ward. Ward staff described their frustration that patients were not prepared for transition whilst in ICU, but recognised that this was out of the control of ICU nurses at times due to high ICU bed occupancy and associated pressures to discharge patients. In consequence of this pressure, one CCOT practitioner described “running them out of the door”.

> “I suppose, I presume that they know that they’re not going to be one to one nursed, but I don’t know, actually, that they’re told that but I presume they are, actually.” *Ward sister/charge nurse, staff interview 5, site A*

> “. . . but you don’t always get the bed until about 3 o’clock . . . and then you’re suddenly trying to rush everything and you’re running them out of the door and you’re like well actually I’ve just not had time to sit with them and say this is what to expect on the ward, this is how it’s different . . . and you just by the way here you are and this is your new ward . . .” *CCOT/follow-up nurse, staff interview 2, site A*

Some ward nurses described approaches to try to smooth this transition such as offering reassurance, increasing nursing contact and clear communication. It was acknowledged, however, that this did incur an additional time burden and was not always possible due to workload.

> "Um, so I often found that I had to be very proactive in going to see them, just in terms of, to make sure they're alright, and actually, going in to see them was a lot better, to keep going in and checking on them was a better way to do it than to wait for them to build up all that anxiety and then to call me." *Ward nurse, staff interview 1, site A*

In contrast, one nurse framed this as managing expectations, rather than reassurance, describing being "brutal" in their honesty about the limitations of their workload.

> "I think we just have to be quite brutally honest with them really and say we are obviously going to monitor you still closely however I can't stand at the end of your bed when I've got up to another fifteen patients . . ." *Ward nurse, staff interview 5, site C*

Despite staff reporting efforts at reassurance, many patients described poorer communication on the wards compared with ICU, with a feeling that no-one knew what was going on. This was particularly attributed to bedside nurses. There were several accounts of being referred to the senior nurse or doctors when questions were asked about care, even simple things such as what a medication was for or discharge plans. This led to uncertainty and a fear that they were lost in the system, compounding their feelings of vulnerability.

> "Family member: Yes and he seemed to have been forgotten a bit and in all that time he couldn't eat or drink.

> Patient: Yes and there was a bit of confusion amongst the nurses about what I could and couldn't have and I think some of that was left to me to actually say no I can't have that or am I meant to be having that and querying it." *Patient 7 & Family member 4, site B*

Some respondents described the ward round as the main point of information exchange. Accessing the ward round was difficult for families who may not be present all the time, and information was described as a source of reassurance.

> "Patient: Yes I was okay. I think it was worse for my wife than it was me.
>
> Interviewer: Why do you say that?
>
> Patient: Well because she wasn't getting any information and she needed to feel comfortable but just so that she knew what was happening to stop her worrying." *Patient 2 & Family member 1, site B*

In this sub-theme, the concept of relocation anxiety has been examined in the context of the challenges of post-ICU ward care. Patients identified problems with communication from both ICU and the ward. Although some nurses demonstrated an awareness of the anxiety caused by discharge, they identified limitations in their ability to address this, due to pressures of workload and ICU bed occupancy. This suggested that there was a mismatch between what staff knew was needed from patients and what they were able to deliver in the context of their workload. This is explored further in the theme Post-ICU Patients as *Other* (section 6.4) and the implications for care delivery examined in the theme Ensuring Quality and Safety of Ward Care (section 6.5).

6.2.2. Sub-Theme: Staff Fear

In common with patients and families, staff members frequently demonstrated profound worry and fear regarding post-ICU ward care. This has previously been identified for ward nurses but not explored for other staff groups (Enger & Andershed, 2018; Häggström et al., 2009; Kauppi et al., 2018). Fear resonated throughout many specific issues with care delivery, but also presented as a general unease about the level of acuity (severity of illness) of post-ICU patients, and the ability of staff members to cope with this. In this sub-theme staff fear is explored briefly and will be expand in subsequent themes, in relation to individual aspects of care delivery.

Staff often spoke openly about their fear, present from the moment the patient arrived on the ward. Doctors in particular felt the weight of responsibility for patients transferred from ICU, as they were perceived to be more acutely unwell than the general ward cohort. One doctor described this fear as the “heebie jeebies”.

> “. . . obviously they are a lot sicker than other people on the ward, umm, and if you like don’t know that they’ve been gradually getting better they look really scary because just the snapshot of when they arrive often . . . looks a bit alarming.” *Foundation Year doctor, staff interview 6, site A*

> “The patients who really gave me the heebie jeebies were people with medical co-morbidities who'd gone to ITU for medical care . . .” *Foundation Year doctor, staff interview 6, site A*

Underlying this fear was a concern that patients may not be physiologically ready for ward transfer, and still require a high level of care or observation. Feelings of unease in their abilities to provide the care patients needed were frequently described. It appeared that staff were often working at the very limits of their clinical skill without the support they needed to feel safe. This was particularly apparent in discussions about incidents during the night where help appeared to be less accessible.

> "I suppose I always worry about whether I can look after them and are they wardable [*ready for the ward*] or are they pushing them out because they need an ITU bed and can I look after them . . . if you probably ask an ITU nurse some of the patients that get discharged aren't completely wardable yet but they're the most wardable so they're the ones that go." *Ward nurse, staff interview 10, site C*

> "I'm definitely always more worried about a patient who's come from intensive care than a regular general medical patient just because they've physiologically been through a huge amount and may not have the same reserve and I do think they get sicker quicker." *Specialist Registrar, staff interview 5, site B*

In contrast, some staff members did not perceive all post-ICU patients as worrying in themselves, and viewed acuity on an individual patient basis. This reflected a more patient-centred approach, driven by clinical judgement, described by one nurse as "just focus[sing] on the patient". This perspective tended to be demonstrated by more experienced nurses, possibly indicating more advanced clinical knowledge or confidence.

> "I'm never worried receiving a patient from ITU, I only worry when they start deteriorating, no I'm never worried. I just focus on the patient." *Ward nurse, staff interview 6, site C*

This theme has explored the stark fear and anxiety demonstrated by staff, patients and families in relation to post-ICU care. Patients described feeling vulnerable and found the transition from ICU to the ward very challenging, due to the change in staff availability. Several aspects of care delivery appeared to underlie staff fear. These included the perceived acuity of patients transferred from ICU to the ward in comparison with other ward patients; concern that patients may be discharged before they are ready to leave ICU and often at night; and staff feeling they are working at the limits of their skills and needed to be supported. Discussions around post-ICU care indicated that experience with post-ICU patients and advanced clinical judgement may lead to a reduction in this fear, and not all staff agreed that this level of acuity should be attributed to all post-ICU patients. The factors underlying the fear and anxiety identified in this first theme are explored in subsequent themes: Post-ICU Patients as *Other* (section 6.4), Skills and Training (section 6.5.2) and Out-of-Hours Care Provision (section 6.6).

6.3. Theme: Continuity of Care and Treatment

Continuity of care and clinical management was a strong theme throughout the interviews, underlying the patient anxiety and staff fear identified in the previous theme. There was a lack of clarity in who was responsible for directing medical treatment in the initial period after transfer to the ward. This was apparent in discussions around handover, observations of patients on the ward and ongoing clinical management. There was an expectation from some staff that the ICU handover should include clear instructions on monitoring, acceptable parameters for vital signs and what action to take if the patient deteriorates. There was an apparent lack of clinical judgement or autonomy in this preference for clear direction of management on the ward. This again reflects the descriptions of post-ICU patients as more acutely ill and at higher risk of deterioration than general ward patients, requiring advanced management which was outside of the scope of ward staff to direct.

> “. . . what the plan is moving forwards so keep the blood pressure above this, strict two-hour fluid balance, close observations and those kinds of things and if there’s a do not resuscitate form or anything like that . . . I think it just helps with communication between the two wards… and for patient safety as well so that everyone’s singing off the same hymn sheet.” *Ward nurse, staff interview 8, site B*

> "We always have a plan and as long as there's a plan then we're okay. If someone was to be brought round and there was nothing there, no plan what to do next or what happens if the blood pressure plummets or anything serious that we should be looking for and that wasn't necessarily said out loud if they were concerned about something then maybe we would be a little bit worried." *Ward nurse, staff interview 7, site C*

One Specialist Registrar stated that the medical plan was not always present, in contrast to the nurse above who suggested there was always a plan in place. This may demonstrate a difference between sites, a difference in perception of what constitutes a medical plan or a difference in nursing and medical handovers.

> "I saw that happen in a couple of my F1 [Foundation Year 1 doctor] colleagues where they would take a handover of a patient coming from intensive care and I think often their worry was if this person has been really sick what am I going to do if this person gets sick now . . . one line of what is their resuscitation status, would they come back to intensive care… sometimes isn't always there and that's really problematic." *Specialist Registrar, staff interview 6, site B*

One bereaved family member described the consequences of poor handover, resulting in her husband not receiving the same medication he had received in ICU. She expressed extreme frustration that this could have been easily avoided.

> "I would have thought the simplest thing to do would be that there's patient notes or something which actually say what processes have been happening and I would have felt happier if I'd had known that had gone with him and I could see that it had gone with him and

> they would carry on until they made a different decision. It just seems so bloody obvious." *Family member 7, site B*

A key hurdle for continuity of care and treatment, described by both doctors and nurses, was use of different documentation between ICU and the ward. Vital signs observations and fluid balance charts needed to be transcribed, which was time consuming and prone to errors, and having information in two places risked missing trends.

> ". . . and trying to find their obs[ervation chart] that was another thing that was really frustrating actually was not having the drug chart and the obs[ervations] on a continuous system 'cos particularly if they'd come up to you with an [EWS] of 5 or something like you'd want to be able to see if they were running a heart rate of 130 the whole time and that not always the easiest thing to find." *Foundation Year doctor, staff interview 6, site A*

Timing and routes of drug administration were different on ICU to the ward, meaning some interpretation and adjustment was needed to fit into ward routines. Where ICU documentation was printed out, ward staff found it difficult to navigate and interpret, adding to the challenge and stress of receiving a patient from ICU.

> ". . . ICU seem to have completely different paperwork to ourselves which we don't actually get to see at all and so the fluid balance, the obs[ervation] chart they can print if off but it's not necessarily so easy to read . . . drugs charts as well again and so regarding drugs I don't know what medication they've had in ICU as to whether or not that's the same as what's prescribed on our drug charts. It seems like it makes life a little bit more difficult." *Ward nurse, staff interview 5, site C*

Several staff members described having a ward team medical review after transfer to the ward as an important part of continuity of care particularly in the absence of clear handover from ICU. Concerns were raised that this was unlikely to occur if the patient arrived on the ward in the afternoon or overnight, which would mean there was no clear plan for management for the first few hours following transfer.

> ". . . quite often the patient doesn't come down before 5/5.30 and that's when our team generally leaves the ward or around that time. I think it's really important that the team are on the ward when a patient does arrive to be properly assessed and everything. I think that gives us a lot more confidence going into that period where it's the evening and the night shift its really important to have a clear plan of what the patient needs." *Ward nurse, staff interview 7, site B*

CCOT/follow-up teams were described by some staff as supporting continuity of information and care between ICU and the ward, especially for junior doctors who may feel unsupported by their senior medical colleagues. This was described by one junior doctor as making discharges safer.

> "I feel that the link that critical care, outreach nurses and the rest of the team give to a discharge makes it a lot safer and a lot more supportive especially sometimes when juniors on surgical wards are not well supported by their peers because their peers are in theatre or in other places likes clinics or off-site doing clinics elsewhere." *Foundation Year doctor, staff interview 13, site C*

Staff described being frustrated by a lack of continuity of information from ICU and the impact this had on care delivery. Continuity of medical treatment was perceived to be impaired by a lack of a clear medical management plan in the ICU discharge document, although this was not identified as a problem by all staff interviewees. A clear medical plan was identified as particularly important when patients were discharged at night, during a time of reduced staffing and senior support, the implications of which will be explored further in the theme Out-of-Hours Care Provision (section 6.6). Outreach and follow-up teams were identified as important in supporting discharges from ICU. The impact of the support offered by these teams will be discussed in further detail in later themes. Continuity of information was described as important for post-ICU patients because they were perceived as more acutely unwell, at higher risk for deterioration and having greater clinical needs than general ward patients. This will be explored in the next theme.

6.4. Theme: Post-ICU Patients as *Other*

Underlying the anxiety and fear related to providing continuity of care for post-ICU ward patients were descriptions from both patients and staff indicating that this group were different from the general ward cohort. In exploring these differences this theme draws on the concept of the *other* originating in philosophy, sociology and nursing (Clifton-Soderstrom, 2003; Johnson et al., 2004; Peperzak, 1993). *Othering* is often explored in the context of exclusion due to cultural differences between patients and staff (Canales, 2010; Roberts & Schiavenato, 2017). This has been identified as resulting in feelings of vulnerability in those who are *othered* (Burns, 2017; Ryan, 2012). In this thesis *other* is used to describe the differences perceived in the clinical needs between post-ICU patients and general ward patients. These differences manifested as high acuity and risk of deterioration, physical dependency, and complexity, all contributing to a feeling of vulnerability for patients. These separate but interlinked challenges are explored in this section as sub-themes.

6.4.1. Sub-Theme: Higher Acuity and Risk of Deterioration

Acuity and risk were often discussed in comparison with other patients on the ward, with staff describing preparing themselves for potential deterioration. This anticipation reflects the theme of staff fear, with staff describing feeling nervous about the potential for new or further deterioration, and uncertain about their ability to identify and manage this.

> “They might be recovering from severe infections and they’re at a limbo state where they might potentially get worse or they could be getting better and so you need to be able to identify which way they’re swinging. They’re just not as stable as a general inpatient on the ward.” *Foundation Year doctor, staff interview 13, site C*

Many nurses and some doctors described admitting post-ICU patients into an observation bed – a bed in the centre of the ward closest to staff and designated for patients deemed the highest acuity (sickest or at highest risk of deterioration). This meant patients were more easily observed by nursing staff and demonstrated a heightened awareness of these patients within the clinical team. This was also seen as offering reassurance for the patient, as identified in the previous theme.

> “ITU [patients] always comes into that acute bay, they never go into the off bays . . . we still prefer to keep them there just for that closer monitoring and probably as well for their reassurance to be honest but mainly for our reassurance so that we know they’re going to be seen that little bit extra.” *Ward nurse, staff interview 5, site C*

In addition to being admitted into an observation bed, post-ICU patients were described by nurses as being more closely monitored on arrival. Vital signs observations were taken more frequently than for other ward patients, or continuous bedside monitoring was used to allow nurses to identify any change in vital signs quickly. Close monitoring was described as continuing until a baseline had been established for the patient.

> “With step-downs [patients transferred from ICU to the ward] obviously, they need to be done a little more often to make sure that they’re still stable and maintaining what their normal baseline would possibly be.” *Medical Support Worker, staff interview 3, site B*

> “Initially I would do at least two-hourly obs[ervations] even if it’s just for the first six hours . . . I think that’s really important and I think it gives you the opportunity to escalate anything, even if there’s a slight change . . . It just gives you that little bit of a window to get them reviewed and things.” *Ward nurse, staff interview 7, site B*

There was little clinical rationale offered in relation to closer monitoring, although it may have been driven by nervousness due to the perceived risk of deterioration. One participant also indicated that frequency of observations could be directed by ICU, as part of handover, rather than by ward nurses’ clinical judgement.

> “We generally do their obs[ervations] about two to four hours unless we’re told otherwise by the ITU nurse or unless we’re worried.” *Ward nurse, staff interview 6, site C*

Underlying the high acuity and risk of deterioration discussed above, staff described concerns that patients were sometimes discharged from ICU before they were ready, due to high ICU bed occupancy. Phrases such as “on a wing and a prayer”, conveyed a lack of control in the situation.

> “I think especially when at times there has been high pressure not only on our beds but on ICU beds . . . that patients are tending to be moved, I almost hesitate to say it, but on a wing and a prayer sometimes.” *Physiotherapist, staff interview 2, site B*

In contrast, one Foundation Year doctor disagreed, suggesting patients were never discharged from ICU prematurely in their experience. This disagreement may be due to lack of exposure to post-ICU patients, or better support mechanisms within their medical team. They also discussed being geographically close to ICU, which may have resulted in closer collaboration and offered a safety net for managing post-ICU patients.

> "Not once did I think a patient was inappropriate[ly] stepped down from ITU to the ward and although not verbally communicated everything was written down to the extent that we needed it and if it wasn't we were always able to go onto ITU and ask what the doctors on ITU would do and what the nursing staff might do. I never felt that we were in an unsafe position having the patient back onto the ward." *Foundation Year doctor, staff interview 14, site C*

Staff generally perceived post-ICU patients to be more acutely unwell than other ward patients and at higher risk of deterioration, emphasising the staff fear identified earlier. To manage this risk, nurses described closely monitoring patients in the initial hours following transfer, although there were some indications that this may have been driven by routine rather than clinical judgement. Several staff members described concerns that patients were sometimes discharged before they were ready, increasing the risk of deterioration and worry about receiving post-ICU patients, although not all staff agreed this was a problem.

6.4.2. Sub-Theme: High Physical Dependency and Vulnerability

A significant aspect of not feeling ready for transition to the ward lay in the high level of dependency described by patients, due to reduced mobility and reliance on help for personal care. Patients perceived that their level of dependency was higher than the general ward cohort, making it harder for them to get the help they needed. This was previously identified in the literature, as referred to in section 2.4. (Enger & Andershed, 2018; Häggström et al., 2018).

> “I found it difficult in some respects that some people were, I think, physically fitter than what I was at that time . . .” *Patient 1, site A*

Many staff, particularly nurses, also described patients as being more dependent than the general ward cohort, due to muscle weakness and deconditioning that these patients experienced on ICU discharge, termed ICU-acquired weakness or post-ICU syndrome (Rawal et al., 2017).

> “Sometimes I think oh my god, how are you going to get by on the ward . . . because they’re so weak and fragile and frail . . .” *CCOT/follow-up nurse, staff interview 4, site B*

This had an impact on the ability of ward staff to provide rehabilitation, and in particular sitting patients out of bed when they required multiple staff to help. Some staff members described concerns that physiotherapy provision on the wards was insufficient to meet the needs of patients with high rehabilitation requirements. Nurses were often identified as providing daily mobilisation and this was identified as negatively impacting ongoing rehabilitation.

> “. . . but if they [ward physios] weren’t there and the patients were more and more dependent then the nursing staff are . . . very much ‘I’m not sure I want to do that’ because actually that’s a very difficult heavy manual handling and rehab manoeuvre and they’ll need two members of staff to do that and so maybe they’ll get a session in the afternoon and then [nothing for] two days and so it’s very frustrating.” *ICU physiotherapist, staff interview 3, site A*

In contrast, several patients reported that ward staff did not appreciate their high level of dependence. This may in part be due to a lack of physiological understanding and awareness of the impact of critical illness. A failure to hand over the physical limitations of patients from ICU to ward staff may also contribute to this lack of appreciation of dependency, indicating a failure in communication impacting continuity of care.

> "I was so weak but I was told I'd be alright and I fell and hurt myself on my knee and whatever. They were not very sympathetic in so much as they just underestimated my weakness and thought I could just get up by myself which of course I couldn't." *Patient 2, site C*

> "Family member: The other issue that we had was the physios, wasn't it? Because they were giving him things to do but they didn't seem to realise how weak he was, they were just giving him exercises for his knee rather than taking into account what else he'd been through and wasn't strong enough or able to do what they were suggesting." *Patient 7 & Family member 4, site B*

It is unclear why there was discrepancy between patients' perception of staff understanding of their dependency and the awareness described by staff. However, some patients suggested ward staff intentionally pushed them to be more involved in their own personal care, to encourage independence and promote recovery. This may have been perceived by some patients and families as misunderstanding of their needs, leading to discomfort and frustration, and reflecting the issues with communication and continuity. This discrepancy between patient and staff accounts may also indicate the inability of staff to accommodate patients with higher dependency despite awareness of their needs.

> "He was left uncomfortable for a long time because they thought it would help him because he actually needed – you need to take exercise and your muscles need to work but he was left uncomfortable for, I think, too long. I don't know but I think there weren't enough staff on and it was a terrible time." *Family member 7, site B*

For dependent patients, the reduction in staffing ratio between ICU and the wards was described as resulting in a strong sense of vulnerability. Nurses were far less visible on the wards, resulting in patients feeling frightened and unsafe. Many patients described being reliant on call bells, as the only means of getting attention. However, despite these being seen as vital there were problems with them including being out of reach or unusable, and not always answered as quickly as patients would have liked. This added to feelings of vulnerability.

> “I know when I moved to [ward name] there was a feeling of fear that I’d had twenty four hour care, there was someone beside me in an open ward and suddenly my only point of safety was a button that I didn’t really have the strength to press that could easily have fallen out of my hand and yes it was quite terrifying.” *Patient 6, site A*

Staff, patients and families identified high physical dependency as a challenge in post-ICU care, although patients and families felt staff did not appreciate this. This apparent misunderstanding about high physical dependency suggests a lack of continuity of information between ICU and the ward, both in terms of handover for individual patients and education about the physical effects of critical illness, as identified in the second theme, Continuity of Care and Treatment. There may also have been a failure of ward staff to communicate the reasons for encouraging patents to be more independent. In addition, staff may be unable to meet highly dependent patients’ needs, despite awareness, due to limitations in workload. Reliance on call bells emphasised the high care needs of this group of patients, which may not have been met on the wards. This reliance compounded patients’ feelings of vulnerability and anxiety identified in the first theme.

6.4.3. Sub-Theme: Complexity

In addition to high levels of acuity and dependency, post-ICU patients were also perceived as being clinically complex. This complexity was described as either due to the presence of both acuity and high physical dependency, as described above, or in combination with other complex care needs. Specific complexities included co-morbidities and ongoing medical problems resulting from critical illness, such as a tracheostomy, non-invasive ventilation, nutritional support, refeeding syndrome, ongoing infections and other conditions requiring monitoring and treatment. These combinations of complexities were described as posing a significant challenge to management on the ward in terms of workload. Nurses also discussed considering skill mix on the ward when allocating transfers from ICU, suggesting more experienced nurses with extended clinical skills were needed to meet the complex needs of post-ICU patients.

> ". . . and then you do get some that come down that are very complex that have got all sorts of needs and that's where it's important that you look at your staffing for the shift and you make sure that you've got staff that can deal with, for example they might have a PEG [permanent feeding tube] in, they might have a trache[ostomy], they might be on NIV [non-invasive ventilation] and they might be on lots of different things." *Ward nurse, staff interview 7, site B*

> "And so patients who are physiologically well leaving ICU having recovered from organ failure still have complex care requirements be they nutritional, fluid related, medication related, and not least psychological. And so you have a patient who's recovered from their [physiological] insult and but still has complex issues." *ICU Specialist Registrar, staff interview 10, site A*

Within discussion regarding premature ICU discharge, specific aspects of ICU care were discussed, such as recent weaning from high flow oxygen or extubation (breathing tube removal). There was also a clear conflict between patients no longer requiring organ support and still needing a high level of nursing care and advanced clinical skills. Some staff suggested providing high level nursing care was the role of ICU, with others suggesting that once a patient no longer needed organ support they no longer needed ICU input.

> ". . . one of the big frustrations is that patients needed intensive nursing . . . but there being nowhere to get that but ITU and then ITU not being able to offer that because they needed it for people who need level 3 organ support." *Foundation Year doctor, staff interview 6, site A*

> "If the patient has got a lot of needs and they're going to a busy ward where the ward won't be able to meet those needs because that is not seen as a reason for the patient to stay in ICU because I know that the ICU bed is a scarce resource but you see this very vulnerable patient who has got lots of needs and they're going to go to an area that may be is not going to meet those needs." *CCOT/follow-up nurse, staff interview 4, site B*

This tension may be underpinned by concerns voiced by staff that they were unable to provide the level of care required to prevent patients from deteriorating, or to manage deteriorations when the occurred. This may be due to feeling insufficiently staffed and skilled to monitor patients closely, and perceiving ICU to be better able to provide this level of care.

Not all staff agreed that post-ICU patients were inherently different to other patients on the ward. Whilst some respondents described all post-ICU patients as at high risk, several staff members described variability in acuity, dependency and complexity. This was most frequently described as a difference between elective post-operative patients and unplanned ICU admissions, with the latter often requiring a longer ICU stay. Several staff members suggested that not all post-ICU patients were complex and not all non-ICU patients were straightforward, assessments should be individualised.

> “Um, so our ITU patients do frequently deteriorate, but, I think, they are just very complex, and so, do they deteriorate any more than our very complex trauma patients? Potentially not a lot.” *Ward nurse, staff interview 1, site A*

This theme has explored characteristics of post-ICU patients which staff, patients and their families have identified as unique and challenging, defining post-ICU patients as *other* than general ward patients. These included three separate but interlinked aspects: high acuity; physical dependency; and complexity (having multiple care needs in addition to acuity and dependency). Combined, these characteristics suggest post-ICU patients are at increased risk of deterioration and require high care needs. This was described by some staff as leading to a tension between patients no longer needing organ support and still requiring high level nursing care, with uncertainty about where responsibility for providing this high-level care lay. This tension was underpinned by ward staff describing feeling insufficiently skilled, staffed and supported to meet the needs of acutely ill patients at risk of deterioration. All these factors contributed to patient anxiety and staff fear in relation to feeling unable to meet the needs of post-ICU patients and providing continuity of care, as identified in the first two themes. These underlying aspects are explored in the next theme: Ensuring Quality and Safety of Ward Care.

6.5. Theme: Ensuring Quality and Safety of Ward Care

In this section the theme Ensuring Quality and Safety of Ward Care will be presented, exploring some aspects of ward care which staff identified as key to providing high quality and safe care to post-ICU patients. This theme builds on the findings of previous themes to explore how the characteristics of *otherness* of post-ICU ward patients can impact ward-based care provision. Examining ward care in this context also provides further insight into the challenges of providing continuity of care and subsequently contributing to the fear and anxiety previously identified. Findings are presented in six subthemes exploring key aspects related to care delivery to patients discharged from ICU identified by staff and patients. These include prioritising workload, having specialist skills, training in those skills, exposure to deteriorating patients and support from peers and more experienced colleagues. Through examination of these aspects, some of the challenges and facilitators to delivering safe, high quality care to this "*other*" group of patients are identified.

6.5.1. Sub-Theme: Prioritising Workload

This sub-theme builds on the perceptions of increased workload of reassurance, monitoring, high dependency and complexity associated post-ICU patients identified in the previous themes. Impact on nursing workload has previously been identified in the literature (Chapter Two, section 2.3), but there has been little exploration within other staff groups (Elliott et al., 2013; Kauppi et al., 2018; Whittaker & Ball, 2000). Several staff, especially nurses, described different approaches to managing the higher workload associated with post-ICU patients, centred around prioritisation. These included: considering allocation of nursing staff; delegating tasks; responding to escalation calls based on early warning scores; and needing to be responsive to changes. Nurses in particular described the need to prioritise their workload so that less urgent tasks were either delayed or delegated to other staff members.

> ". . . So I've done a whole other set of meds for another nurse because she was stuck 1:1 with this patient and couldn't really leave, and then the CSWs will pick up the slack in terms of rolling and going to the toilet and feeding and all of that, and so . . . huh, in some cases those other patients just lose out a little bit, because obviously I'm still looking after my own patients while trying to help with that, and so they would more often, so if there is a wound dressing

> that is, a post-surgical one that’s four days and could be left to five days, that would get left.” *Ward nurse, staff interview 1, site A*

This prioritisation may have impacted patients’ sense of vulnerability on the wards due to perceived high dependency and low visibility of nurses, possibly contributing to feelings of anxiety. During the interviews there were some accounts of extremely poor care experienced on the ward, causing significant distress to patients and their families. For some patients, instances of poor care resulted in feelings of humiliation and lack of dignity, as well as physical consequences such as pressure sores. These instances may have been a result of high workload on the ward, but also possibly poor prioritisation and awareness of post-ICU patients’ dependency.

> “. . . but they also did keep me in a wet bed and also because of the antibiotics they were going through me and I had very bad diarrhoea and there was one time they actually left me in the bed with the diarrhoea and I was literally covered . . . and I ended up getting really bad sores, pressure sores.” *Patient 3, site A*

Patients’ and families’ critique of care delivery on the ward was often caveated with reference to how busy staff were. Instances of poor care were often described as not the fault of ward staff, but that of the system which was unable to accommodate the increased workload associated with patients transferred from ICU, emphasising the perception of post-ICU patients as *other*. Nurses were described as extremely stretched, resulting in delays to answering call bells and suggestions that staff were too busy to engage with patients, again contributing to anxiety and vulnerability.

> “It’s quite noisy and you press your buzzer and it can take a little while for somebody to come because although the nurses and everything are really good they’re just so busy and that

> would be one of the things that is more noticeable . . . They do a really good job but they are so stretched.” *Patient 5, site A*

In response to this perception of overwhelmed staff, some patients described seeking help with personal care from outside the ward as they felt staff were unable to provide the level of care they needed. This was usually sought from family members, although there were also instances of using professional services.

> “My sisters, they’re both carers and so they came in and just grabbed a bowl and did it but you do have to ask the cleaning staff which is okay and they do bring it to you and they take it away and stuff and for like disposable pants and even things like that you have to go and ask for them.” *Patient 5, site A*

This sub-theme has developed the perception of post-ICU patients as *other* in terms of the higher workload associated with greater dependency and higher acuity than other patients. Staff, patients and their families described the ward environment as stretched and without the capacity to accommodate the increased needs of post-ICU patients related to their higher dependency and acuity. This may have contributed to a failure of continuity of care between ICU and the ward. Patients’ descriptions of poor care and efforts to outsource help emphasise the restrictions of workload on the ward, as well as potentially indicating poor prioritisation or inexperience with post-ICU patients. This will be explored in the next sub-theme.

6.5.2. Sub-Theme: Skills and Training

Throughout staff interviews, a commonly described source of worry was the need for extended or specialist skills in managing post-ICU patients, identified as one aspect of their *otherness*. Specialist skills included delivering nutritional support, tracheostomy care, high flow oxygen and managing invasive lines. This need for extended skills has been previously identified in the literature by patients and nurses (Chapter Two, sections 2.3 and 2.4) (Enger & Andershed, 2018; Field et al., 2008), and was also identified in other staff groups in this study.

> “. . . if they’ve got drips and drains and PCAs [patient-controlled analgesia] and things it’s got to be somebody who’s been qualified for a while and has got those skills . . .” *Ward sister/charge nurse, staff interview 5, site A*

Some staff members suggested there was a need for more training on the ward in deterioration management in particular, as post-ICU patients were perceived as at high risk becoming more unwell. Training was sometimes described as accessed through formal courses but was more often sought through informal peer support.

> ‘. . . peer support is really useful, going to other F1s and other people who’s seen that kind of patient before.” *Foundation Year doctor, staff interview 6, site A*

> “We’ve got quite a good skill mix and are planning or have done a cardio-respiratory course in [university name] and so that goes to the A-to-E [assessment] and deteriorating patient as well.” *Ward nurse, staff interview 10, site B*

CCOTs were particularly valued in this role, training and supporting staff with extended skills such as tracheostomy management. Many staff also described learning skills in acute care and deterioration management from them. Support was also sought from more ‘senior’ nurses who had more experience with deteriorating patients.

> “now the juniors [doctors] will say to you ‘have you called outreach?’ and yes we have because I think they know they can learn from them and we certainly learn from them all the time.” *Ward nurse, staff interview 8, site B*

> “Just your more experienced nurses . . . So someone somewhere has seen something similar before . . . So, it was a really good way, because of the way the team worked, to get information and get support and things. I don’t know how common that is elsewhere.” *Ward nurse, staff interview 1, site A*

Despite frequent discussion of extended skills, many of the challenges identified with managing post-ICU patients were related to more common nursing activities, such as monitoring vital signs, assisting with personal care and rehabilitation. One family member, reflecting on the poor care delivery she felt her husband received, described this as “ordinary nursing”. Despite this description, she emphasised that this required skill and may be impaired by understaffing on the wards.

> “It was – I don’t know . . . understaffing, but you need people with skills just to do the ordinary nursing, it isn’t rocket science and it was that that I thought didn’t help.” *Family member 7, site B.*

One Foundation Year doctor suggested that ICU experience would not reduce the challenge of managing post-ICU patients in the ward environment due to the high workload and lack of time.

> “I think it’s mostly time pressure . . . and some skills and knowledge. I think that if you put an ITU nurse in that situation then they would probably have a better idea of what the most important things to prioritise were. Umm . . . but they still won’t probably be able to do it all because of time pressure.” *Foundation Year doctor, staff interview 6, site A*

Although many staff members perceived a need for extended skills to manage post-ICU patients, not all respondents agreed. This was demonstrated in the discussion of “ordinary nursing” by one family member, contrasting advanced skills with providing personal care. Anxiety about the need for extended skills may actually reflect concern about the impact these patients have on workload. This emphasis suggests that prioritisation was a skill some staff lacked, or that workload was too high to enable staff to deliver safe and supportive care for post-ICU patients who had greater needs than other ward patients. Informal peer and specialist teaching were valued by both nurses and doctors, with CCOTs key in providing support and training in advanced clinical skills, supporting continuity of care and treatment between ICU and the ward.

6.5.3. Sub-Theme: Experiential Learning Versus Safety

Experience and familiarity were also described as a key way of obtaining the skills required to manage post-ICU patients. Several staff, including nurses, doctors and physiotherapists described having had experience on ICU as beneficial to their practice on the wards, as they understood the needs of post-ICU patients and had developed specific clinical skills through exposure.

> “Yes, I think there’s a lot of good physio skills I’ve learnt down there and MDT [multi-disciplinary team] skills that I’ve obviously tried to carry on and take to the wards.” *ICU and ward physiotherapist, interview 4, site A*

CCOT practitioners described needing to focus their support on wards less exposed to critically ill or post-ICU patients. This was described both in terms of clinical skills and awareness to call for help if needed.

> "I would be more concerned probably of wards that don't see intensive care patients on a frequent basis that would be my concern where I'd need to actually raise my level because nurses where you see, say the [ward names] they see us so frequently and they'll talk to us and they'll also ask for advice . . ." *CCOT/follow-up nurse, staff interview 9, site A*

However, although ICU experience was valued, some staff described feeling deskilled if they had not used their knowledge for some time.

> "Seeing less of them yes, and I've lost my skills." *Ward nurse, staff interview 10, site C*

Staff also discussed developing knowledge and skills through exposure to acutely ill patients on the wards. This was particularly clear for the Foundation Year doctors, who described rapidly developing their practice based on their experiences. Developments included knowing what questions to ask and what clinical signs to respond to or tolerate, indicating development of clinical confidence. This rapid increase in skills was discussed in positive terms but was also described in relation to a significant level of fear. Describing rapid skill development in this way suggested this was due to exposure beyond their comfort zone and a necessary evolution to cope with a perceived lack of support.

> ". . . but then as the job progressed and we had more experience managing the patients on the ward we realised actually what would be useful to know and what would be useful to ask and similarly the ICU F1 would get used to handing that information over . . ." *Foundation Year doctor, staff interview 8, site A*

> "just for like the grumbling [ongoing] septic patients I just feel like we don't have a really good idea of what we should actually be doing with them and sometimes, sometimes people come out really blasé about it and actually what that is coming from is that they've seen lots of

> patients like this and they know they take weeks to settle and that’s ok and there’s no point making them multi-drug resistant by giving them stronger and stronger antibiotics and we don’t want to overload them with fluids and just, but sometimes in a 5 minute surgical ward round that perspective, it doesn’t get well communicated and then you still have all the like, sepsis paranoia . . .” *Foundation Year doctor, staff interview 6, site A*

Some staff members described conflict between the need for inexperienced staff to be exposed to complex patients in order to learn, and the need for experienced staff to manage complex patients. This exposure needed to balance patient safety with gaining required skills through experience.

> “So the ethical dilemma is what is best for the individual patient now versus what is best for all the patients in the hospital so I, certainly it is to the benefit of that individual patient for me to come and see them I mean not me as a doctor but me as a representative of the intensive care because first of all I’ll probably know them and second of all I’m old and experienced and I’m comfortable with complex patients ‘cos that’s what I do every day.” *ICU Specialist Registrar, staff interview 10, site A*

> “I wouldn’t say [experience is] essential because otherwise they don’t learn but sometimes I think, and we have had a few staff that have left because they felt the pressure was too much too soon for newly qualifieds.” *Medical Support Worker, staff interview 3, site B*

Whilst experience of critical care areas may indicate advanced clinical expertise, lack of exposure risks losing these skills. Foundation Year doctors described rapidly developing skills due to exposure to situations beyond their expertise, which was a source of fear. Exposure to acutely ill patients needs to be balanced with both patient safety and staff wellbeing. Nurses may be more mindful of supporting junior colleagues whilst they develop skills through exposure to deteriorating patients.

6.5.4. Sub-Theme: Trust Within Teams

Familiarity within the team was also an important factor for staff, particularly in trusting decision-making around escalation of deterioration. When staff had previously worked together they described respecting each other's experience and judgement.

> ". . . and I think that's very hard if that doctor and that nurse haven't worked together before because you don't know what each other is capable of and you don't know what each other has done before . . . if actually that nurse is really experienced and well trained and has done all these things and something's still not right . . . particularly doing ward cover because you're working on wards that you don't usually work on . . ." *Specialist Registrar, staff interview 6, site B*

Several nurses described needing to be assertive at times to get a response to escalation, suggesting doctors may not always trust or appreciate the urgency of a call, or have prioritised another task above it due to high workload.

> "I think sometimes some doctors will use that [EWS] to manage their workload and they'll say that person's not scoring highly, that person's observations are normal therefore I don't need to see them right now and I suppose in one sense that's true but in another sense if someone's telling you they're not happy you've kind of got to do something." *Specialist Registrar, staff interview 6, site B*

Sometimes this assertiveness was met with negativity and both nurses and doctors described needing to balance negative responses with patient safety.

> “I certainly teach juniors . . . the number one thing you should remember is do not be afraid to ask for help. Harm will only come to a patient if you don’t ask for help whereas if you ask for help you might get the occasional Registrar . . . scolding you but . . . you’ve done the best for the patient.” *Foundation Year doctor, staff interview 13, site C*

Nurses also expressed concerns that Foundation Year doctors may feel under pressure to cope with deteriorations and were sometimes reluctant to call for help. No Foundation Year doctors describe this reluctance themselves. This discrepancy may demonstrate misconception or may reflect doctors’ reticence to acknowledge patient safety may be compromised due to fear of hostility and lack of support from their team.

> “I think some of the time the senior doctors can come across as a bit imposing and they [Foundation Year doctors] feel that they should be able to do things without having to go to them, especially if it’s very early on . . . whereas maybe a year down the line they don’t have to go them quite as much and they can do more on their own.” *CCOT/follow-up nurse, staff interview 2, site A*

In contrast, many staff members, especially nurses and Foundation Year doctors stated that CCOT practitioners would always respond to concerns about a patient. ICU outreach/follow-up services were frequently described as providing reassurance and support when ward staff were worried about a post-ICU patient. Several staff members emphasised that they were more approachable and responsive than other routes of escalation and were always available to offer advice and support.

> “They never say they can’t come and then put the phone down. . . that would perhaps stress me out a little bit but its we’ll be there shortly could you just do . . . it’s just reassuring that

> they’re going to come and they’ve told you to get on with something because they’ve taken on what you’ve said.” *Ward nurse, staff interview 7, site C*

CCOT practitioners were also perceived as a support when concerns or escalations were not responded to, because they were outside the immediate team. This outsider status was described as making them more willing to risk conflict or negativity. Because of their experience they may also be more confident in their clinical judgement, and possibly more likely to be listened to and their judgement trusted.

> “I remember at my induction that one of the senior nurses in outreach quite openly said something along the lines of our career progression doesn’t rely on your boss’ approval which I thought was fantastic, but it’s so true because I think medicine is very traditional unfortunately and I think it’s so helpful that they are outside of that traditional structure and they can question and if they are concerned then I think the reg[istrar]s and consultants listen.” *Specialist Registrar, staff interview 6, site B*

In this sub-theme, the importance of trust within ward teams has been explored. Due to the high workload of ward staff, there was a perceived need to be assertive to ensure needs were met and deteriorations were responded to rapidly. Staff described the importance of familiarity between individual team members in ensuring trust in decision-making and the impact of negative responses from individuals. CCOTs were perceived as willing to circumvent usual escalation routes where there was concern about the response to patient deterioration and reliably responsive to requests for help.

6.5.5. Sub-Theme: Clinical Decision-Making and Support

In the theme Continuity, the importance of a medical plan at ICU discharge was explored, with differences of opinion in who was responsible for directing care immediately after transfer. Both staff and patients perceived the ward round as the key point at which decisions were made and care was planned. For the surgical ward rounds this was sometimes described as too focused on the specific surgical aspects without considering overall management. When this happened, junior doctors described struggling to manage non-surgical problems with little support and relying on other medical teams for support.

> “Our ward round would be like nil-surgical you know that would be like the extent of the note [laughs] and then almost for like the rest of the day you’ve got this kind of the feeling that you get on nights in medicine which is that you're kind of just fire-fighting [laughs] until a senior can see them umm and I think that that kind of really proactive management particularly on surgical wards is something that they maybe don’t get.” *Foundation Year doctor, staff interview 6, site A*

> “. . . there were still a lot of things going on and we had on a surgical ward, ward round especially these patients, I mean patients in general don’t get more than a minute each and these patients needed quite a bit more time than that so it kind of came down almost to the F1 and the peri-operative team especially to make sure that these patients were receiving adequate care and kind of holistic care . . .” *Foundation Year doctor, staff interview 8, site A*

This emphasises Foundation Year doctors’ descriptions of fear and the need to develop skills rapidly through necessity.

Some staff discussed the implications of this failure to take an overview of the patients’ condition due to brief ward rounds and lack of senior medical support. Poor oversight was particularly apparent in discussing nutrition, where there was a perceived failure to monitor and respond to inadequate intake.

> ". . . we'd like to monitor actually what's gone in and then, so we can calculate what the deficit is but often on the wards the fluid balance chart isn't completed so we know the feed's been, say, signed for on the electronic drug chart but we don't know how much has gone in . . ." *ICU dietician, staff interview 7, site A*

The reluctance of the medical team to start nutritional support, such as nasogastric feeding or total parenteral nutrition, was described by one newly qualified doctor as 'false optimism' rather than 'negligence'. This appeared to suggest medical teams may sometimes wait and hope that a patient's condition improves without intervention, perhaps indicating a lack of awareness of the additional needs of post-ICU patients or a failure of handover from ICU.

> ". . . I think perhaps because once you put somebody on TPN [total parenteral nutrition] it's quite… you set them back quite significantly in terms of their recovery period so I think people would hold out hoping the patient would improve and then they wouldn't improve and eventually when they were started on TPN it would be a bit too late. So I don't think it was through negligence as such I think it was more false optimism." *Foundation Year doctor, staff interview 8, site A*

One ward sister acknowledged that this may be an area where nurses were not as proactive as they could be, possibly due to lack of close monitoring of nutritional intake. The reasons for this lack of monitoring were not discussed but could be due to high workload on the ward, or lack of awareness of the need to monitor due to failure of communication through handover from ICU, impacting continuity of management.

> "The patients who are eating and you just presume they're eating so they're fine. But actually, its them, that maybe their appetite isn't as good, and maybe as nurses we're not as good at monitoring that, especially the elderly . . . it could be quite a few days before you suddenly think actually… they're still not really eating." *Ward sister/charge nurse, staff interview 5, site A*

Many staff, including doctors, nurses and CCOT practitioners suggested that junior doctors felt unsupported by senior medical staff, particularly on surgical wards. There was a consensus that surgical consultants had to be in theatre and therefore were not available to support management of complex patients on the ward. CCOTs were described as making discharges from ICU safer in the absence of medical support.

> "And yes, I as a ward sister or them as the FY1 can contact their consultant, but if the consultant's operating, and their registrar's operating, then it's difficult too . . ." *Ward sister/charge nurse, staff interview 5, site A*

In this sub-theme the need for clear decision-making and oversight of care have been explored. Medical support was identified as particularly problematic on surgical wards, and this posed challenges to managing post-ICU patients whose clinical needs were perceived as more complex than other ward patients. This was described as causing significant stress for Foundation Year doctors. In the absence of senior medical support, Foundation Year doctors often relied on help from specialist teams including CCOTs, which will be discussed in the next sub-theme.

6.5.6. Sub-Theme: Clinical Specialist Input

Throughout the staff interviews, several specific specialist roles were described in relation to post-ICU ward patients. These included ICU outreach/follow-up teams; peri-operative medicine; microbiology;

and specialist medical roles. Whilst most of these roles were not specific to post-ICU patients (with the exception of ICU follow-up), the frequency of description of their involvement in the care of this group emphasises the *otherness* of post-ICU patients in requiring a higher level of specialist input than other ward patients because of their comparative complexity of care needs.

> "umm they're [peri-operative medical team] just very experienced clinicians . . . they understand things like fluid balance a lot better than we do as F1s to begin with so if the patient was in AKI [acute kidney injury] but also [fluid] overloaded they would guide how to rehydrate or diurese [give diuretics to] them essentially . . . we had absolutely no idea how to balance these things but then it was the input of the peri-operative medicine team, them teaching us essentially." *Foundation Year doctor, staff interview 8, site A*

As previously identified, CCOT practitioners were frequently described as a source of clinical expertise offering support in managing a deteriorating patient or with advanced clinical skills. In addition, there was a perception that CCOTs were key in managing acute deteriorations and were often referred to at the same time as the consultant when a patient deteriorated.

> "So we'd escalate to our consultant but also we could get outreach who are a huge help not just for us doctors but a huge help to the nursing staff as well, so practically the consultant and critical care outreach and that's just get the initial stuff done like IV [intravenous] access, catheters and ECGs [electrocardiograms] . . ." *Specialist Registrar, staff interview 5, site B*

Some CCOT practitioners also described themselves as having a role in co-ordinating other specialist input as they were frequently required by post-ICU patients and therefore there was familiarity between the teams.

> “. . . I’m used to working with the pain team, or the TPN team, quite closely, because we all see a lot of the same patients, so if the wards . . . and I think it’s easier for us as well because we actually work quite closely even though we’re separate teams, than necessarily the ward nurses, because they don’t work with them in the same way.” *CCOT/follow-up nurse, staff interview 2, site A*

However, concerns were voiced about specialist roles deskilling staff by reducing the exposure needed to develop the necessary knowledge and experience.

> “. . . there’s a vicious cycle in place whereby anyone gets sufficiently unwell, the decision-making is outsourced so then you then lose the experience in managing these patients and the decision is outsourced again so you become less and less skilled, less and less comfortable in managing these patients . . .” *ICU Specialist Registrar, staff interview 10, site A*

In this theme several aspects of post-ICU care delivery were identified by staff as being key to providing high quality, safe care for complex post-ICU patients. Throughout this theme the *otherness* of post-ICU patients has been emphasised in comparison with the needs of general ward patients, building on the findings of previous themes. Staff identified post-ICU patients as requiring extended clinical skills, although there was some disagreement about whether this actually reflected staff struggling to prioritise the high workload associated with post-ICU patients, emphasised by one bereaved family member referencing “ordinary” nursing. Although formal training was highly valued by staff for developing these advanced skills, there was a concern that deskilling would occur without continual exposure to acutely ill patients. In contrast, junior doctors appeared to rapidly develop skills in managing post-ICU patients in the absence of training and senior medical support. There were clear descriptions from staff of needing to balance exposure with patient safety as well as staff wellbeing, reflecting the impact of staff fear identified in the first theme. Post-ICU patients were described as often requiring input from several clinical specialists, which may be co-ordinated by CCOTs, in addition to their own specialist input. However, concerns were voiced by some staff members that ring-fencing these roles may result in deskilling ward staff, posing problems when the services were not available. The implications of this for out-of-hours care provision will be explored in the next theme.

6.6. Theme: Out-of-Hours Care Provision

Out-of-hours care provision was identified as challenging to post-ICU ward care throughout all themes. Several staff participants suggested that premature discharges were more common at night, often resulting in readmission to ICU. Premature discharges were described in relation to bed pressures but it was not clear why this occurred more frequently at night.

> "However there has been a couple of occasions where we might receive a patient that comes down to us about 6/6:30 in the evening that actually ends up . . . transferred back to ICU. Obviously that's completely dependent on the patient and obviously you can't predict all the time what's going to happen . . . but say they've come off high flow and then they've required it again and in my experience that happens more when there's less people around." *Ward nurse, staff interview 7, site B*

Receiving patients from ICU in the evening or at night was also described by several nurses as challenging because of reduced staffing numbers and high workload due to ward routines. The perception of higher frequency of premature discharges at night may be due to reduced staffing making these transfers feel less safe than in the daytime and therefore more memorable.

> ". . . unfortunately the transfer times seem to actually be the biggest issue I find, it's normally always late afternoon, teatime, evening time and so just as you're doing you're evening drug round, suppers and everything always happens around 6 o'clock on the ward when you're

> trying to do your obs[ervations] as well . . . all of a sudden you've got a patient from ICU and you want to drop everything so that you can take the patient, but we don't have many staff on a late shift and so that does make a big difference." *Ward nurse, staff interview 5, site C*

> "Interviewer: In terms of the impact on your ward, do you think that [out-of-hours discharge] would pose any problems for you?
> Staff member: Yes because it's the staffing again. It's always the staffing isn't it . . . but at least at 6 o'clock it's a better time than in the middle of the night where its dark and you're messing around." *Ward nurse, staff interview 9, site C*

Being discharged at night was described as a frightening experience for patients when they were already feeling vulnerable. Fewer staff on shift may have contributed to the chaos described by one patient discharged at night.

> ". . . it was still a bit chaotic especially getting down there at 9 o'clock at night or whatever time it was and it was dark and there was darkness through the corridors of the hospital and a bit chaotic." *Patient 7 & Family member 4, site B*

Familiarity with the patients on the ward was also highlighted by one Foundation Year doctor as an additional challenge overnight, suggesting continuity was an important aspect of medical decision-making. In addition, the lack of specialist staff indicated a reduction in the safety net of support available during the day.

> "Bar clinicians, there's just not enough doctors or advanced clinical practitioners available at night and at weekends and I think it's a well-known problem unfortunately and often it's a junior F1 or F2 doing ward cover who have got huge numbers of jobs to do and it's not the

> team that’s looking after them, they don’t know the patient, they’re covering a lot more patients . . .” *Foundation Year doctor, staff interview 13, site C*

In particular, there was concern about lack of clarity in ICU readmission status for patients. Newly qualified doctors were particularly concerned about out-of-hours discharges, possibly because they were working unsupported by senior doctors who would usually make these decisions.

> “I think it’s really useful that when patients are discharged that ITU make it very clear if or not they would be readmitted . . . it’s really useful that the goals of ITU are very clear so if you have somebody oh we’ll take them post-laparotomy for careful monitoring or something, but in general we would not like intubate them [put them on a ventilator] or something . . . yeah and it just helps you kind of understand a bit, how you’re trying to manage that patient . . .” *Foundation Year doctor, staff interview 6, site A*

Some doctors described being reliant on nursing staff to escalate concerns when patients were discharged overnight, as it was often not possible to routinely review out-of-hours transfers. Medical reviews were deemed an important part of continuity of care but were unlikely to occur when a patient was discharged out-of-hours, further impairing the management of premature out-of-hours discharges.

> “. . . so I think ideally what we would have liked to do is sit down and review them. And that often didn’t happen just 'cause of work pressures and also if they’re looking ok and if the nurse doesn’t come to you and say I’m concerned about this, then often that didn’t happen . . .” *Foundation Year doctor, staff interview 6, site A*

Junior doctors often described feeling unsupported and overwhelmed by their role as on-call medical support at night. Agency staff were also described as challenging this trust, both through uncertainty about their clinical skills and their unfamiliarity with the ward, resulting in additional vulnerability.

> “. . . when you have more out-of-hours than in-hours [transfers from ICU] and when you have nurses who are agency nurses or bank workers who don’t always work on that ward and they don’t know where the kit is . . .” *Foundation Year doctor, staff interview 13, site C*

Out-of-hours was mostly discussed in reference to night, but there were also differences identified at weekends, particularly in the availability of clinical specialist advice and physiotherapy support. Specialist roles often were not available overnight and at weekends compounding this loss of expertise. The combination of reducing exposure to acute patients due to specialising roles, siloing information in handover and limited access to training may result in staff out-of-hours and at weekends being without the skills to manage post-ICU patients.

> “. . . or say they’d been seen by junior doctors they won’t worry about things because they haven’t had that much experience to know what they need to worry about and so I just think it’s a stretched workforce and particularly out-of-hours more junior members of the team seeing patients.” *Specialist Registrar, staff interview 5, site B*

> “. . . one of the things I would say is the biggest problem is your long stay patients going out and having like the rehab . . . and it’s a weekend there’s no physios apart from respiratory… and you say to the nurse you say to patient have you been able to sit up, no they’ve not and you know there’s no physios . . . and there’s no nursing staff and it just knocks back everything that you’ve done.” *CCOT/follow-up nurse, staff interview 9, site A*

This theme has developed findings of the previous themes, exploring the underlying reasons why post-ICU care provision was particularly challenging out-of-hours. Staff described a reduction in staffing, skill mix and support at night, impacting on their ability to manage complex, dependent post-ICU patients, characterising them as *other*. These challenges impacted on patients, increasing their feelings of vulnerability on transfer from ICU to the ward. Furthermore, premature discharge at a time of reduced staffing was identified as particularly problematic, and resulted in significant stress for staff, as identified in the first theme. Continuity of care and management, the importance of which was described in the second theme, were emphasised throughout, indicating that this was worsened by the differences in care provision identified at night.

6.7. Conclusion

In this chapter, five key themes were presented from interviews with staff, patients and their families, related to post-ICU ward management. These themes have built on the findings of the two previous chapters, exploring the underlying reasons for problems in care delivery, and the consequence of these. Post-ICU ward care was described as causing significant anxiety for both patients and staff, and reflected a perception of post-ICU patients as *other* – requiring a high level of input due to dependency, complexity and a high risk for deterioration. Continuity of care and management was identified as a key aspect of ensuring safe care in the transition from ICU to the ward and was underpinned by handover from ICU. Staff identified significant challenges in managing these patients within their workload, and patients and families described the profound consequences of this in terms of poor care and vulnerability. Staff identified the need for training and support with extended skills they perceived post-ICU patients as needing, characterising their *otherness*. The reduction in staffing, skill mix and support identified during the night and at weekends further challenged the ability of staff to ensure post-ICU patients received high quality care, and this resulted in significant stress for both staff and patients. Throughout the themes, CCOTs were identified as key in supporting post-ICU ward care through expertise, training provision and support. Themes were interdependent and interwoven, building a clear and detailed picture of the challenges of post-ICU ward care, and overlap was emphasised throughout this chapter. In particular, the implications of characteristics of *otherness* identified in “Post-ICU Patients as *Other*” are explored in the theme “Ensuring Quality and Safety of Ward Care”. The impact of this *otherness* is further examined in the context of reduced clinical service provision in the final theme “Out-of-Hours Care Provision”. Exploration of these challenges throughout the themes contribute to the understanding of the anxiety and fear experience by patients and staff, identified in the first theme. The results of this approach will now be considered in the context of the retrospective case record reviews and in-depth reviews in the next chapter.

Chapter Seven: Data Integration

7.1. Introduction

The previous chapters have presented a literature review and results from each of the individual methods used in this study. To summarise, methods were: retrospective case record review of 300 patients who died following discharge from ICU (described as RCRR throughout this chapter); in-depth analysis of 20 patients whose death was judged as possibly avoidable and 20 survivors (RCRR in-depth); and interviews with 56 patients, relatives and staff (interviews). This chapter presents an integration of data from the four data sets: RCRR, in-depth reviews, interviews with staff and interviews with patients and their families.

During initial development, data from each set were tabulated to facilitate comparison, as described in Chapter Three (section 3.4). Key factors were drawn out and developed through discussion with the supervisory team. To explore linkage between data sets, emerging factors were drawn in a linear model with arrows representing connections between facets. Through a process of mind mapping, a circular diagram was developed (see Appendix Fifteen, photos 1-3), which represents the interlinked and interdependent factors identified as contributing to post-ICU ward care.

Development of the circular diagram has drawn on the principles of micro/meso/macro models used in social analysis (Niskanen et al., 2016; Serpa & Ferreira, 2019), and applied to the sociological exploration of healthcare organisation (Allen & Pilnick, 2005). Allen and Pilnick (2005) described micro characteristics of healthcare as the working practices of individuals. This was refocused for this study to represents patient-level characteristics which were identified as posing particular challenges to ward care. The macro level has often been characterised in previous literature as based in national policy, but was here framed around the organisational system being studied. The meso level in this model was identified at the interim ward level, where care was directly delivered but depended on the characteristics of the patients (at the micro level) and the over-arching organisational system (at the macro level). Within the meso and macro levels individual staff behaviours were also identified, linking back to the micro layer. This reflects the interdependence describe by Allen and Pilnick (2005), allowing exploration of both the whole picture of healthcare and the interaction of the individual components.

In initial drafts of the model, patient anxiety was identified as a micro level characteristic and staff fear a meso level characteristic. However, in developing the model further, it became clear that fear and anxiety permeated every level of post-ICU ward care and were therefore moved to the centre of the model. During further development and discussion, the emphasis on the central theme of *otherness*, which was inherent at each level but not explicitly represented in the model, was placed at the centre of the model, to more clearly represent this as the central theme of the model. Fear and anxiety were represented as lines through the model, to demonstrate this as a common thread throughout the micro, meso and macro layers. To more clearly differentiate between patient fear and staff anxiety, these were represented as individual lines. This allowed identification of the few areas which were relevant to staff fear but not identified as contributing to patient anxiety. These were: nutrition at the micro level; monitoring, escalating and responding at the meso level; and team trust at the macro level. Out-of-hours discharge was also initially identified as a patient-level characteristic but was later combined with out-of-hours care provision, identifying this as a consequence of problems at the organisational level. As the model was developed, the initial table outlining key findings from each data set was developed into a meta-matrix. This was organised into the four layers of the model, with a reflective summary of each key aspect identified, as outlined in Chapter Three (section 3.4.1). An abridged overview is presented in Table 30 and a full version in Appendix Sixteen, Table 1. Development of the meta-matrix facilitated further integration and synthesis of the four data sets into the final model.

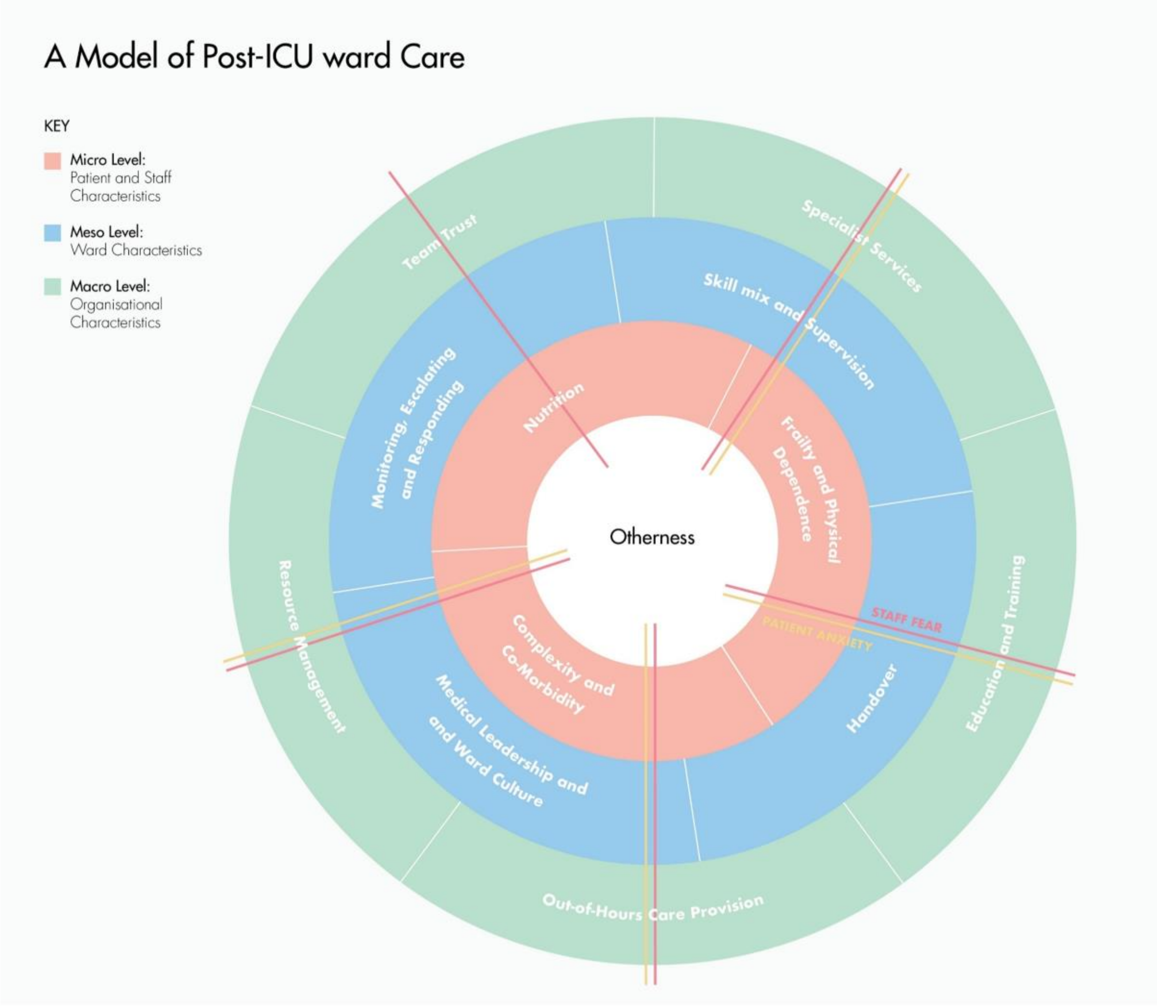
In the final model, micro (patient-level) characteristics included: frailty and physical dependency; nutritional support; and complexity and co-morbidity, recognising their interdependence. The meso level, representing ward-based characteristics, included handover; monitoring, escalating and responding; skill mix and supervision; staffing and workload; and medical leadership and ward culture. These aspects were identified as underlining management of patient-level characteristics situated at the previous level. Individual staff behaviours were also identified at the meso level which linked back to the micro level. Finally, macro, organisational level, characteristics were identified as influencing both micro and meso level factors and included: education and training; team trust; out-of-hours care provision; access to specialist services; and resource management. Staff anxiety and patient fear were identified throughout all levels as a consequence of the challenges identified, and were therefore situated at the outside of the model. The key theme throughout each level of the model was the *otherness* of post-ICU patients, which influenced each level. This was therefore placed at the centre of the model to demonstrate the centrality of this theme to the overall model, with the consequences of the micro level characteristics influencing and challenging care provision at the meso and macro levels. Each aspect will be discussed below, in reference to the meta-matrix (Table 30) and model (Figure 7) integrating the data sets generated from this study.

Table 30. Simplified meta-matrix of study data

	Literature Review	**RCRR**	**RCRR (in-depth)**	**Interviews: staff**	**Interviews: patients/family**
	Systematic review, meta-analysis and 3 narrative reviews	**300** post-ICU in-hospital deaths	**20** probably avoidable deaths and **20** survivors	**30** interviews with staff involved in post-ICU care	**19** interviews with 26 patients and/or their families
CENTRAL THEME					
Otherness	✓	✓	✓	✓	✓
PATIENT CHARACTERISTICS (MICRO)					
Frailty and Physical Dependence	✓	✓	✓	✓	✓
Nutritional Support		✓	✓		
Complexity / Presence of Co-Morbidities	✓	✓	✓	✓	✓
WARD LEVEL (MESO)					
Handover	✓	✓	✓	✓	✓
Monitoring, Escalating, and Responding	✓	✓	✓	✓	
Staffing and Workload	✓		✓	✓	✓
Skill Mix and Supervision	✓		✓	✓	✓
Medical Leadership and Ward Culture		✓	✓	✓	
ORGANSIATIONAL LEVEL (MACRO)					
Education and Training	✓		✓	✓	
Access to Specialist Services		✓	✓	✓	
Team Work and Trust			✓	✓	✓
Resource Management	✓	✓	✓	✓	✓
Out-of-hours Care Provision	✓	✓	✓	✓	✓
MULTI-LAYER THEADS					
Staff Fear	✓			✓	
Patient Anxiety	✓	✓		✓	✓

Key: ✓=identified in data set

Figure 7. Integration of data into a model of post-ICU ward care



7.2. Central Theme: Post-ICU Patients as *Other*

Throughout this work the *otherness* of post-ICU patients has been a central theme. This was identified most clearly in the interviews with patients, family members and staff, where characteristics of *otherness,* also identified in the RCRR and in-depth reviews, were described and discussed. This *otherne*ss was identified as having a profound effect on patients' feelings of vulnerability, linked to a perception that staff on the wards were not always able to meet their needs. This was recognised by staff members who identified the challenge of meeting the higher care needs of post-ICU patients. Staff described high levels of fear related to managing post-ICU patients related to this *otherness*. The following sections will discuss the characteristics, impact and implications of *otherness* at each level of the model.

7.3. Micro level: Patient Characteristics

At the micro level, several patient characteristics were identified as posing a challenge to the delivery of post-ICU ward care. As identified above, these characterised the perceived *otherness* of post-ICU patients identified in staff and patient interviews. Patient characteristics will be explored in this section, and include: frailty and physical dependence; nutritional support; and complexity and co-morbidity (Figure 7, Table 30 and Appendix Sixteen, Table 1). Although explored separately in this section, these characteristics were often present concurrently and were interdependent. This will be discussed at the end of the section.

7.3.1. Frailty and Physical Dependence

In the RCRR, frailty was identified as high in patients who died, with survivors in the in-depth reviews requiring less help with activities of daily living prior to hospital admission than patients whose death was judged as probably avoidable. This suggests that patients at risk following discharge from ICU may be more dependent than other ward patients, which was reflected in interviews with staff and patients. This was indicated in the literature review, with nursing workload scores at ICU discharge associated with post-ICU in-hospital mortality. This will be discussed further in section 7.3.4 – Staffing and Workload.

Physical dependence was the clearest aspect of frailty in this cohort, requiring ongoing rehabilitation, including regular mobilisation. The RCRR identified frequent failure to mobilise patients who died following discharge from ICU, which may have been linked to this high level of frailty. This finding was developed in the in-depth reviews, with problems related to mobilising patients commonly identified. Problems included instances of physiotherapists not mobilising physically dependent patients for reasons such as fatigue due to anaemia, pain, dizziness due to hypotension, confusion, oedema, ICU acquired weakness and leaking dressings. Viewed in isolation, these decisions not to mobilise a patient for one day may be reasonable. However, there were cases of a cumulative effect resulting in failure to mobilise for many days, posing an arguably higher risk to the patient. This cumulative effect was identified with the benefit of hindsight offered by the in-depth reviews. Post-ICU patients were clearly identified in interviews as highly dependent, challenging care provision within the confines of ward workload and staffing. Patients and their families vividly described the impact this had on their sense of safety on the ward. Interviewed physiotherapists also identified a skills and knowledge gap between ICU and the ward, suggesting that ward physiotherapists may be fearful of ICU patients and therefore more cautious when mobilising them.

Mobilisation was particularly poor at the weekend, suggesting failures in providing rehabilitation may be due to staff availability (acknowledged to be lower during the weekend, see sections 7.4.3 – Staffing and Workload and 7.5.4 – Resource Management). There were examples in the in-depth reviews, however, of nursing staff hoisting patients out of bed daily without the assistance of physiotherapists. This may suggest that rehabilitation is in part influenced by the culture of the ward, as well as ward activity levels, and delivery may vary depending on the importance placed on rehabilitation and who was perceived as responsible for this aspect of care (see section 7.4.5).

7.3.2. Nutrition

Nutrition delivery was identified as a significant problem in the RCRR, with absence of a clear nutritional plan on ICU discharge common. In-depth reviews allowed exploration of the implications of this failure of handover and ongoing nutrition provision. Problems related to nutritional delivery were diverse, including failure to monitor intake, reluctance to start nutritional support, and failure to seek specialist input. Like rehabilitation, problems with nutrition delivery appeared to be due in part to a failure to appreciate the overall status of the patient rather than viewing their care day by day, and this was exemplified by a common lack of nutritional monitoring. In contrast, the better nutritional management identified in survivors may reflect their lower frailty compared with patients who died and therefore ability to manage their own nutritional needs, emphasising the impact of characteristics of *otherness* such as complexity of care needs.

Multiple professions were involved in providing nutritional support, indicated by the high frequency of 'team structure' identified as an underlying contributory human factor. Despite this, interview data provided a stark contrast to the RCRR data, with little discussion of nutrition from staff and no identification by patients. This lack of focus on nutrition in the interviews may explain in part why nutritional delivery is problematic, due to failure to perceive this as an important area of post-ICU care by either staff or (surviving) patients. This was acknowledged by one interviewed ward sister who identified a lack of focus on monitoring nutritional intake. This may have been due to the *otherness* of post-ICU patients compared to the wider ward cohort, who perhaps did not require nutritional support and therefore nutritional monitoring was not a part of the ward culture. Problems with nutrition management may also be a result of poor handover, contributing to a failure of continuity in nutritional support. This will be explored further in section 7.4.1 (Handover and Communication).

7.3.3. Complexity of Care Needs and Co-Morbidity

The literature review demonstrated an association between post-ICU in-hospital mortality and nursing workload scores, tracheostomy presence and signs of ongoing infection (Chapter Two, section 2.1). These associations suggest ongoing complexity of care needs may be challenging to manage on the ward, as identified in the previous two sections. Pre-specified data collected for the RCRR indicated that in addition to rehabilitation and nutritional support, management of sepsis, and atrial fibrillation were problematic. The RCRR found 16% of patients who died following discharge from ICU experienced a new onset of atrial fibrillation and 60% suspected or confirmed sepsis. These conditions were often poorly or incompletely managed on the wards. The in-depth reviews explored this management in greater detail, identifying instances of failing to monitor for these conditions or respond to signs they were present. This will be explored further in section 7.4.2 (Monitoring, Escalating and Responding).

Frailty, low mobility, nutritional support needs and ongoing medical problems have been discussed separately in this and earlier chapters, to allow details specific to each aspect to be explored. However, these characteristics were often linked and interdependent. In the in-depth RCRR, all 20 patients whose death was judged as probably avoidable had a combination of the complexities described above and which were identified as contributing to their avoidable deaths. They were frailer and more dependent than the survivors and experienced multiple problems in care delivery. The contributory human factor ‘patient factors: complexity and seriousness’ was identified as underlying 26 problems in care for patients who died, compared with only seven instances in survivors. Care was judged to be poor or very poor for all 20 patients whose death was judged as probably avoidable, compared with 62/250 non-palliative deaths and eight survivors. The level of avoidability and prevalence of poor care delivery in patients who died are likely to have been a direct consequence of the care required not being met on the ward due to this overall complexity of care needs. These results of the RCRR contributed to the perception of post-ICU patients as *other* than general ward patients.

In interviews, staff perceived post-ICU patients to be more acutely ill and complex than other ward patients, contributing to the perception of *otherness*. Patients and family members described concerns about safety on the ward, linked to the lack of availability of staff and reliance on call bells to access help. Acuity of illness was linked to concerns about premature discharge and high risk of deterioration, as well high physical dependence and complexity of care needs. Staff identified a gap in skills and knowledge as well as a lack of workload capacity to manage the challenges posed by post-ICU patients. These concerns will be explored in the following sections (7.4.3. and 7.4.4)

Through analysis of all four data sets, a clear picture of the key patient-level challenges was developed, building on indications in the systematic review of the literature and clear numerical data in the RCRR with contextual and background explanation in both in-depth reviews and interviews. These challenges characterised post-ICU patients as *other*, requiring higher levels of care than general ward patients. These characteristics were identified as posing a challenge to ward-level care delivery, including workload, skill mix, medical support and monitoring, escalation and management of clinical deteriorations which were difficult to deliver within the constraints of the ward. These will be discussed in the next section.

7.4. Meso Level: Ward Characteristics

At the meso level, several ward-based characteristics were identified which underpinned clinical management of the patient level characteristics discussed above. These included: handover and communication; monitoring, escalating, and responding to clinical problems; staffing and skill mix; and medical leadership and ward culture. The meso level aspects were identified across the datasets and allowed exploration of the underlying reasons why the patient-level characteristics were challenging to manage on the ward (Figure 7, Table 30 and Appendix Sixteen, Table 1), emphasising the *otherness* of post-ICU ward patients.

7.4.1. Handover and communication between ICU and the ward

Handover was identified across the datasets as a key aspect of communication between ICU and wards, with written nutritional handover demonstrated as commonly absent by the RCRR. In-depth reviews explored handover in much greater detail, finding that a clear documented medical plan for ongoing management of clinical problems was commonly missing. The implications of this were described in staff interviews, with junior doctors discussing their preference for a clear medical plan which they could follow in the absence of senior support. This emphasis of the importance of a management plan links to medical leadership at the meso level and out-of-hours staffing at the macro level, where newly qualified doctors felt unsupported in managing problems they were inexperienced with (explored later in section 7.4.4). Other staff groups did not identify absence of a medical plan as problematic, perhaps identifying this problem as confined to the medical team. The perceived need of a clear management plan for post-ICU patients again emphasises the *otherness* of this group of patients, whose complex medical needs were seen to be challenging to manage within the usual medical cover of the ward.

Absence of clearly stated limitations of medical treatment at ICU discharge were commonly identified in the in-depth RCRR. This was particularly apparent and problematic where rapid deterioration followed premature discharge, especially at night (see section 7.5.5). Absence of documented limitations of treatment persisted as a problem throughout ward care, with many instances of patients being actively treated until profound deterioration requiring ICU review resulted in a decision not to readmit to ICU. The reason for this reluctance to clearly document limitations of treatment in the event of deterioration was unclear but had a profound effect on end-of-life care. In many cases, decisions to instigate end-of-life care may have been made sooner if an escalation plan had been in place, and fewer patients may have died in active, invasive treatment. This will be explored further in section 7.4.5 (Medical Leadership and Ward Culture).

Handover documentation differed between the three sites but related problems remained similar. Many iterations of ICU to ward handovers were identified, including separate nurse to nurse, doctor to doctor and physiotherapist to physiotherapist handovers, in both written and verbal formats. Multiple handovers risked missing or contradicting information and creating silos of information by profession which was required by the whole multidisciplinary team, potentially impairing continuity of care delivery. Patients and family members identified profound effects of this lack of continuity of care, including poor communication of needs between ICU and the ward. Patients and family members also identified struggling to access information from ward staff, again suggesting key information may not have been handed over. CCOTs were identified by in-depth review as having a key role in maintaining continuity of information. In-depth reviews identified many instances of CCOTs following up or re-emphasising written medical plans and highlighting omissions in care delivery, although it was unclear whether this was limited to documentation or proactively facilitated on the ward.

Failures in communication through handover commonly resulted in a lack of continuity of care between ICU and the ward. This was particularly apparent in the premature discharges and/or those discharged out-of-hours, where no indication was given in handover documentation of their ongoing problems. This suggests the needs of post-ICU patients were *other* than the general ward cohort, in terms of their care needs, therefore requiring clear direction of ongoing management. CCOTs were identified as key in supporting communication between ICU and the ward.

7.4.2. Monitoring, Escalating and Responding to Clinical Problems

As previously discussed in section 7.3., due to ongoing problems, post-ICU patients often require close monitoring of blood results and vital signs to identify changes in condition. This was identified in the literature review, where several blood tests, when out of range, were associated with post-ICU in-hospital mortality (Chapter Two, section 2.1). The RCRR also identified two specific conditions where identification and management were particularly problematic (sepsis and atrial fibrillation). In-depth reviews developed these findings, identifying blood results as often being taken but not reviewed, or being reviewed and documented as out of range but not acted on. This was particularly common for low haemoglobin (requiring a blood transfusion) and for elevated inflammatory markers (potentially indicating infection).

The negative implications of failure to monitor were frequently identified in the in-depth RCRR, with many instances judged to have contributed to patients whose death was judged as probably avoidable. Even where clinical problems or out-of-range results were identified and treated, such as for atrial fibrillation or low haemoglobin, investigation of the underlying cause was commonly not undertaken. In addition to clinical measurements, there were examples of physical signs of underlying problems being documented but not escalated or addressed, such as black diarrhoea and blood clots in naso-gastric aspirate (suggesting gastrointestinal bleeding). This failure to act on clinical results and signs suggests a failure to appreciate the implications, combine with other clinical information, formulate a diagnosis and make a treatment plan. Staff interviews offered some insights into the underlying reasons for not acting on these signs, although this was not identified by patients or family members. In interviews, newly qualified doctors described a lack of clarity from more senior doctors about when to tolerate results which were out of range, and when to treat, adding to their anxiety and feelings of being out of their depth. This will be explored further in section 7.4.5 (Medical Leadership and Ward Culture).

In addition to bloods results, monitoring of high early warning scores (EWS), nutritional intake and fluid balance were also identified as problematic, as previously identified in section 7.3.2. In interviews, nurses commonly described post-ICU patients as at high risk of deteriorating, requiring either frequent intermittent or continuous vital signs monitoring and allocation of beds near to the nurses' station. However, this close monitoring was not reflected in the multiple instances of failure to monitor and/or escalate high EWS on arrival to the ward identified in the in-depth RCRR. The reason for this discrepancy is unclear, although interviewed nurses often described high workload impairing their ability to provide the care they aspired to, particularly overnight (see sections 7.4.3 and 7.5.5).

Although monitoring, escalating and responding to problems is situated at the meso level in this model, aspects also span the micro level, where omissions in care such as failure to escalate high EWS or failure to review blood results may have been attributed to individual staff members. However, as care was delivered by a multi-disciplinary team with clinical supervision within and between professions, the overall impact remains at the meso ward level. This was demonstrated in Chapter Five, where greater than half of the problems in care identified were assessed as being related to team-based contributory human factors (section 5.7). Furthermore, infrastructure at the macro level also influenced care delivery by individuals, through education and training, and resource availability, which will be explored in later sections.

7.4.3. Staffing and Workload

In common with literature review findings, interviewed nurses raised concerns about the impact of post-ICU patients on their workload due to perceived higher acuity, higher dependence, anxiety and need for monitoring, as discussed in section 7.3.3. In this study, concern about the impact of post-ICU patients on workload extended to all staff groups, identifying the negative impact of this on their own and colleagues' practice, affecting the system of care delivery overall. This contributed to the characterisation of post-ICU patients as *other* than general ward patients.

Interviewed patients also identified a sense of insufficient staffing to meet the workload of the ward, emphasising their *otherness*. As described above in section 7.3.1, they perceived themselves to be more physically dependent than other ward patients, and offered some profound descriptions of failure to meet personal care needs resulting in both anxiety for patients and stress for staff, which will be discussed in the final section of this chapter. One family member in particular recounted her distress at the care received by her husband prior to his death on the ward. Despite describing examples of poor care delivery, patients were defensive of ward staff, and nurses in particular, who they perceived as very busy and hard-working. Patients described seeking alternative ways of accessing personal care such as from family members and paid carers, indicating staff were working within a system that did not enable post-ICU patients' needs to be met.

Staffing and workload were not explicitly documented in medical records and therefore could not be clearly identified within the RCRR or in-depth reviews. However, where problems in care identified in the in-depth reviews were more prevalent at night (such as failure to escalate EWS), or at weekends (such as absence of physiotherapy or ward rounds), reduced staffing was implicated. Failure to mobilise more dependent patients and a low threshold for not mobilising, discussed previously in section 7.3.1, may also be interpreted as a symptom of insufficient staff, or due to poor prioritisation of workload or lack of experience with post-ICU patients. In addition, the in-depth reviews identified occasions where doctors and CCOTs were unable to attend escalations due to their workload. It is not clear from documentation whether this was due to inappropriate prioritisation, failure to communicate the urgency of the problem or competing priorities. The underlying reasons for this will be explored in section 7.5.3 (Team Trust).

7.4.4. Skill Mix and Supervision

One aspect of post-ICU patients' *otherness* identified by staff in interviews, and in the literature review (Chapter Two, section 2.3), was the need for specialist skills to care for them. The implications of this perceived lack of skill were discussed in interviews. As previously identified in section 7.4.1 (Handover), several patients and family members described nurses as unable to answer simple questions about their care, possibly suggesting some ward staff were insufficiently experienced with post-ICU patients. However, this may also reflect an absence of key information being handed over from ICU, meaning staff did not have access to it, or that workload was so high staff had not had the opportunity to assimilate all information about the patient.

In common with workload, discussed above, skill mix was not explicitly identified in the RCRR due to the limitations of documentation. However, there were instances identified in the in-depth reviews of EWS being very high but not escalated or rechecked for several hours, suggesting failure to either prioritise or appreciate the implications of the score, both of which may indicate lack of experience. Furthermore, failure to monitor nutritional intake and fluid balance may have been due to a lack of appreciation of the importance of this for clinical care, as discussed in section 7.4.2. These omissions may also indicate lack of supervision from more experienced nursing staff. Limitations in knowledge or clinical support were also implied in the failure to assess and provide chest physiotherapy in high risk immobile patients, with physiotherapy on the ward predominantly focused on rehabilitation. Senior clinical support was also identified in staff interviews, particularly with newly qualified doctors who expressed profound anxiety about their limited exposure to deteriorating patients and lack of senior guidance.

In interviews, CCOTs were perceived as supporting staff where patients required advanced skills or their needs were complex. Staff, especially nurses and junior doctors, described various ways in which this support was offered. These included providing direct care for complex patients, advice on management, and training in specific skills such as tracheostomy management. This was reflected in the in-depth reviews through examples of CCOTs facilitating rapid intervention when patients were deteriorating.

Although nurses identified lacking advanced skills as a concern, most problems in care delivery identified through in-depth review were related to basic care such as monitoring vital signs, fluid balance and nutritional intake, and escalating problems with these. This was described by one interviewed family member as “ordinary nursing”. The findings of the in-depth reviews conflict with the staff perception that ICU patients needed specialist skills, again reflecting a general sense of unease with post-ICU patients which may be due to the impact they were perceived to have on workload rather than the skills required to manage their needs.

7.4.5. Medical Leadership and Ward Culture

The RCRR identified 20 patients whose death was judged as probably avoidable and 65/250 patients whose death was judged as having some degree of avoidability. In all cases these were complex patients with multiple problems, as discussed in section 7.3.3. Their care therefore required careful monitoring and co-ordination. Oversight of clinical management is traditionally led by the medical team, therefore failures to identify and manage clinical problems were the responsibility of the consultant leading care. In-depth reviews developed this exploration, identifying common issues in consultant leadership and oversight of care delivery, contributing to the problems in care delivery identified. The most frequently identified contributory human factors in the in-depth reviews was ‘team factors’, reflecting the multidisciplinary nature of post-ICU care. Without clear direction and oversight, problems were frequently missed or poorly managed. This was particularly apparent on surgical wards, where ward rounds were focused on surgical problems and commonly missed documented clinical and contextual information which may have aided decision-making. However, medical oversight does rely on monitoring and escalation by team members, to ensure consultants are aware of all relevant information to make decisions. Medical leadership therefore relied on staff behaviours at the micro level, as discussed in section 7.4.2.

Staff interviews highlighted this failure to manage problems, particularly in surgical patients. Several newly qualified doctors identified this as being due to extremely brief ward rounds, and frequent absence of the surgical consultant on the ward. There was a perception that surgeons were compelled to be in theatre, limiting their time on the wards and leaving the most junior doctors to manage clinical problems. Both doctors and nurses working on surgical wards described this absence as unavoidable, suggesting this was culturally accepted despite the clear pressure this put on newly qualified doctors and patients. Although situated at the meso level as related to ward care, cultural acceptance may also be organisationally led at the macro level. This demonstrates the cross-linking between levels and the complexity of the system of post-ICU ward care.

Failure to monitor and escalate clinical problems, as well as previously identified problems with rehabilitation and nutritional support, may also be associated with ward culture. The importance of these aspects of care may not be fully recognised as problematic, especially on wards where patients are usually far less frail or dependent. This was termed “false optimism rather than negligence” by one junior doctor, indicating an expectation that post-ICU patients would follow the same recovery trajectory as general ward patients, emphasising the concept of *otherness* central to this model. Interviewed CCOT nurses identified variability in the level of support wards needed with post-ICU patients and this may also be due to ward culture and exposure to post-ICU patients.

At the meso level, ward characteristics were identified which allowed exploration of why some patient-level characteristics were challenging to manage after discharge from ICU, building insight into care delivery and the central *otherness* of post-ICU patients. Data from all approaches contributed to the development of this explanation, with problems identified in the RCRRs explored from multiple perspectives in interviews with patients and staff. In this section, cross-overs between both micro/meso and meso/macro levels have been identified. This interdependence signifies the complexity of delivering post-ICU ward care. In the next section the overarching macro level characteristics of this system of care will be explored.

7.5. Macro Level: Organisational Characteristics

The previous two layers of the model identified the patient and ward characteristics associated with delivery of post-ICU ward care. Overarching both levels are several ‘macro’ organisational factors which were identified as influencing care at the previous two levels and contributing to the perception of *otherness*. These include education and training; access to specialist services; team trust; resource management; and out-of-hours care provision (Table 30, Appendix Sixteen and Figure 7). In this section, each aspect will be explored, identifying how they link to the micro and macro factors discussed above.

7.5.1. Education and Training

As discussed in section 7.4.4, interviewed staff described the need for training in specific skills related to post-ICU ward care, which was also identified in the literature review. Like most meso level factors, it was impossible to explicitly identify lack of education or training as an underlying problem in the RCRRs, although issues identified in the in-depth reviews such as failure to deliver chest physiotherapy or failure to monitor nutritional intake, fluid balance or EWS suggest lack of appreciation of the importance of these activities by ward staff (section 7.4.5).

In interviews, some staff members discussed the benefits they perceived from formal education in managing acutely unwell patients. However, discussion of peer support and training was much more common, particularly for nurses and newly qualified doctors. Several staff, especially junior doctors, described rapidly improving their skills when exposed to acutely ill patients. This perception suggests that exposure is an important part of developing and retaining skills. There appeared to be a clear need to allow staff to be exposed to acutely ill patients whilst being supported by more experienced colleagues, to enable safe development of skills. However, the many examples of poor care identified, particularly overnight, alongside the profound stress described by staff overarching the model, suggest that the balance between exposure and patient safety was not always achieved.

CCOTs were perceived as important training providers, both in specific skills such as tracheostomy management, and as a general support with complex patients. Within nursing hierarchies there was a strong sense of support from ‘senior’ nurses, with less experienced nurses seeking their advice, and oversight of care on the ward described by many. As with nurses, newly qualified doctors described seeking advice from CCOTs and learning from their approach. In contrast, conflict between specialist services providing the support needed to patients and the subsequent deskilling of staff when this happened was also identified, which will be explored in the next section.

7.5.2. Specialist Services

Specialist input was identified in interviews as important in supporting management of clinical problems in post-ICU patients, and clear consequences of not doing so were identified in in-depth reviews. Services included: critical care outreach/follow-up services (CCOTs); microbiology; nutrition support teams; nurse specialists such as diabetes or respiratory; and specific medical teams such as surgery, respiratory or peri-operative medicine. The RCRR identified that specialist cardiology advice was often not sought for patients with new onset atrial fibrillation. In the in-depth reviews delay or failure to seek specialist input was common and led to poor management of many clinical conditions, such as atrial fibrillation, sepsis, malnutrition and dehydration. This was particularly apparent on surgical wards where, as previously discussed, ward rounds were commonly focused on surgical management rather than holistic care. At one site (A) this problem was acknowledged and a peri-operative medical team was developed to focus on managing the multiple problems faced by complex surgical patients, including those discharged from ICU. In addition, getting specialist input was particularly problematic for 'outliers' – patients whose main clinical problem was not the speciality of the ward they were on, compounding their *otherness*.

Reasons for not undertaking specialist reviews are likely to be complex but may include: failure to recognise a clinical problem needing specialist input (such as malnutrition); failure to appreciate the need to seek specialist advice in managing an identified problem (such as microbiology for complex prolonged infection); or lack of clarity in the referral process, including responsibility, resulting in delay to treatment (such as chest physiotherapy or initial dietetic input). These reasons for not seeking specialist review are linked to monitoring, escalation and response to clinical problems identified in section 7.4.2. All of these aspects of care delivery are also underpinned by education and experience, as identified in section 7.4.4.

Interviewed CCOT nurses identified co-ordination of specialist teams as a key part of their role. In-depth reviews identified CCOTs often documented the need to seek specialist input as part of their review. There were examples of CCOTs facilitating specialist reviews such as psychiatry for delirium. However, due to the reliance on records of this methodology it was unclear whether this documented advice was verbally handed over or acted on. CCOT support was also valued by staff in terms of training, advice, and approachability where escalations were not responded to. In contrast, interviewed patient and family members did not identify CCOTs as important in their experiences of post-ICU ward care. In the in-depth reviews there were instances of CCOTs co-ordinating response to deteriorations and facilitating medical plans. However, the RCRR identified frequent withdrawal of CCOT visits within the first one to two days of ICU discharge in patients who died, limiting the impact this service may have had on the care of this cohort. This may also explain why patients did not identify this service as important in their recovery.

7.5.3. Team Trust

The most common contributory human factor identified through in-depth reviews was team work, with 167 instances in patients whose death was judged as probably avoidable. This was identified as underlying problems related to response to escalation, failure to supervise and failure to communicate. As previously identified, it is not clear in the cases of non-response to escalation whether there was a failure to communicate the urgency of the call. It may be argued that in the absence of trust in team members' decision-making, escalations may not be appropriately prioritised. Trust was commonly discussed by staff, who identified familiarity as a key aspect of team working. Great value was placed on trusting a team member's judgement, and assessing this judgement was a way of prioritising tasks such as multiple EWS escalation calls. Staff identified reliance on colleagues to be familiar with the ward and workload, suggesting lack of familiarity with bank staff impaired this trust. Doctors described relying on nurses' judgement to flag deteriorating post-ICU ward patients as they were not able to routinely review them. As identified in the previous two sections, CCOTs were described by most staff as responsive and approachable, meaning staff would often seek their support with concerns that they felt doctors may not listen to. This echoed the sense of feeling more confident with long-standing familiar CCOTs than rapidly changing and relatively inexperienced newly qualified doctors. Team trust was not identified by patients in reference to their care delivery, most likely as this was not an aspect of their care delivery they were exposed to.

Although situated at the macro layer, team trust spanned both the micro and meso levels as well, and contributed to the central theme of *otherness*. Individual behaviours such as responsiveness or hostility to escalation of high EWS were identified within interviews as influential to future escalation behaviours. Ward level meso factors such as ward culture were also identified as influencing trust, with CCOTs describing offering more support to wards who were less familiar with post-ICU patients (Chapter Six, section 6.5.3). Therefore, trust was situated at the macro level but was linked to factors at the other levels.

7.5.4. Resource Management

At the meso layer, staffing, a key resource, was identified as an important factor in delivering post-ICU ward care (section 7.4.3). Doctors and physiotherapists identified insufficient staffing as limiting their ability to provide the care post-ICU patients needed, due to their acuity, dependence and complexity. This was echoed by patients (section 7.3). Staff discussed the tension between patients being ready for discharge from ICU because they no longer needed organ support, and still needing a high level of nursing input. The in-depth reviews identified multiple examples of failure to provide adequate personal care and rehabilitation (section 7.3.1), failure to monitor (section 7.4.2) and failure to manage clinical problems due to high workload and possibly poor prioritisation (section 7.4.3). Supporting patients with high workload requirements was perceived to be the responsibility of ICU as it was acknowledged there was no flexibility in staffing levels on the ward. There was also a sense that patients were sometimes prematurely discharged due to bed pressures (section 7.3.3). These aspects suggest that limited resources both in ICU and the wards impacted care delivery for post-ICU patients whose needs were *other* than the system was able to meet.

CCOT provision varied across the three sites, possibly due to resource considerations. This service was strongly valued by staff for their advice and support. However, as previously discussed, the RCRR frequently identified discharge of complex post-ICU patients in the first few days of transfer to ward, despite ongoing clinical problems. Although not identified in the data, this was likely due to caseload management and a failure to prioritise these frail, complex patients.

The in-depth RCRR identified a clear worsening of care delivery overnight and at weekends (sections 7.4.1, 7.4.2 and 7.4.3). This was compounded by frequent discharges from ICU to the ward occurring at night. Although not expressly identified in the notes, this reduction in care quality may be due to reduced staffing and skill mix at night and at weekends, which was highlighted in the interviews with staff. The impact of this reduction in service availability overnight, possibly due to resource constraints, will be explored in the next section.

7.5.5. Out-of-Hours Care Provision

Within the literature review, the meta-analysis identified out-of-hours discharge from ICU as being associated with poor outcome (section 2.1). The RCRR identified out-of-hours discharge as common in patients who died following discharge from ICU. The in-depth review and interviews built on these two findings, providing contextual information on the consequences of out-of-hours discharge. Three patients whose deaths were judged probably avoidable were clearly discharged prematurely from ICU with ongoing clinical deteriorations which were poorly managed on the wards. This poor management appeared to be due to reduced staffing overnight, with calls to both doctors and CCOTs documented as not responded to due to workload. Two of these patients died within a few hours of ICU discharge. The in-depth reviews identified many patients being discharged without required drugs prescribed, or arriving on the ward with high EWS requiring review, but not being seen by a doctor for several hours, impacting on continuity of care and patient safety.

Data from the RCRR and in-depth reviews were limited by documentation. It was therefore impossible to explore the underlying reasons for out-of-hours discharge through this method, but this was discussed frequently in interviews. A key issue with out-of-hours discharge described by staff was lack of medical support at night, and medical review on arrival in particular. Being reviewed by a senior doctor on arrival to the ward was perceived as important by several staff, who raised concerns which supported the findings of the RCRR that this rarely happened at night. The reason for this perceived importance was not clearly expressed, but was related to continuity of treatment on the ward.

As well as lack of support overnight, nursing staff described a particularly high workload out-of-hours. Reasons for this increase in workload included ward routines making the early evening very busy, and reduced nursing staff on the wards overnight. This reduced staffing was described as a source of anxiety as both nurses and doctors felt unable to provide patients with the level of care they needed when they arrived on the ward (explored later in section 7.6). This was reflected in the patient experience, where transfer at night was described as frightening, chaotic and distressing, possibly indicating reduced staffing on the ward or a rapid discharge without preparation. As discussed in section 7.4.2 (monitoring, escalating and responding), nurses generally described closely monitoring patients who had been transferred from ICU but in-depth reviews identified several instances of deterioration in vital signs overnight not being rechecked or escalated, suggesting this may not be done out-of-hours due to fewer staff and reduced access to doctors and/or CCOTs.

Despite these concerns, out-of-hours discharge was commonly accepted by staff as unavoidable due to high ICU bed occupancy, as previously discussed in section 7.3.3. Several staff described instances of this resulting in rapid readmission to ICU. In the in-depth data none of the premature out-of-hours discharges were described as such in their handover and ongoing problems were not acknowledged. By failing to highlight discharges as premature and provide clear plans for management of ongoing problems, wards were not given the information they needed to provide adequate continuity of care, which may have avoided readmission or death.

The overall picture of out-of-hours care provision indicated that this was a stressful time for both patients and staff because staffing and skill mix were lower at night and workload higher. This reduced capacity resulted in poor surveillance of the patient on arrival and therefore failure to detect and manage deterioration when it occurred. Premature discharges at night posed a particular challenge due to their high acuity and workload at a time of reduced capability. Therefore, *otherness* of care needs was emphasised in the limitations of care provision at night, which was challenged by patients with high care needs. This was compounded when patients were discharged prematurely and were therefore even more *other* due to high acuity.

In this section the overarching organisational level factors influencing post-ICU ward care have been discussed. Due to the complexity and acuity characterising post-ICU patients as *other*, training, specialist input, and team trust were identified as important in delivering continuity of care. Several problems in post-ICU ward care were identified as underpinned by resource considerations, including early cessation of CCOT input. Changes in care provision overnight, possibly also due to resource limitations, were identified as particularly problematic for this high-risk group.

7.6. Fear and Anxiety

A strong sense of fear and anxiety emerged throughout interviews with both staff and patients (Figure 7 and Table 30). This finding builds on current evidence of patient and nurse perceptions of fear and anxiety related to post-ICU ward care, as explored in Chapter Two, sections 2.3 and 2.4. In interviews for this study, fear was displayed by all professions. Staff fear was related to multiple factors related to post-ICU ward care. Factors included: patients' high physical dependence, high acuity and risk of deterioration; a perception of lacking the skills needed to provide adequate care; and patients' complexity and co-morbidity. These factors combined to make post-ICU care delivery very challenging, resulting in fear and anxiety related to a perceived inability to meet the needs of these patients. Staff fear was therefore a result of the perception of post-ICU patients as *other* – having different needs to general ward patients.

This study has demonstrated that relocation anxiety (Leith, 1999) remains a significant concern for post-ICU patients, despite being identified in the literature over 50 years ago (Dominian & Dobson, 1969). The ongoing presence of relocation anxiety contrasts with the clear awareness of the effect of transfer from ICU amongst nursing staff. This emphasises the importance of communication in smoothing the transition from ICU to the ward, although staff acknowledged this required time and planning and was therefore not always deliverable. It was not possible to directly identify fear and anxiety in the reviewed documentation. However, the RCRR found the highest number of problems in care delivery in the first 24 hours after transfer. This finding suggests relocation anxiety may not be solely due to the profound change in environment, but may indicate this was a problematic period of care. This suggests that as well as being a consequence of the characteristics of *otherness,* fear and anxiety may also contribute to a sense of *otherness* for patients, both in terms of the behaviours of staff such as close monitoring and surveillance, and potentially an awareness of fear and anxiety exhibited by staff.

Fear and anxiety are not specific care-based characteristics but were identified as both an important consequence of the challenges of post-ICU care and a contributory factor to *otherness.* Fear and anxiety were linked across all aspects of post-ICU ward care and have therefore been represented as lines or threads running through the model, encompassing the micro, meso and macro levels (Figure 7). This representation emphasises the impact the challenges of post-ICU ward care have on patients, their families and staff. Although staff fear and patient anxiety were present at every level of the model, patient anxiety did not encompass every characteristic. This has been demonstrated in the model to accurately represent the findings of this study.

7.7. Conclusion

In this chapter all of the data from this mixed methods study were integrated to develop a model of the challenges of delivering post-ICU ward care. The four data sets (RCRR, in-depth review and interviews with staff and patients) contributed to the development of this model. The RCRR provided an overview of the outcomes of post-ICU patients and the extent of problems in this area of care. The in-depth reviews facilitated detailed exploration of these aspects of care delivery, providing data on contributory factors to these problems, and what the implications for poor management were. In addition, in-depth reviews offered the benefit of hindsight and overview of the trajectory of care, allowing the consequences of cumulative failures in care to be examined. Staff and patient interviews offered further exploration of these challenges in care, including underlying reasons for problems identified in the RCRR, and social context such as clinical support and perceptions of workload.

The result of this mixed methods study is a rich account of the challenges of post-ICU ward care from multiple perspectives and dimensions, which would not have been achieved without the contribution of all data sets. Several interdependent patient-level characteristics were demonstrated as challenging to manage on the wards, contributing to the perception of post-ICU patients as *other* than general ward patients that permeated the micro, meso and macro levels of the model. The overall effect of these challenges was a failure to provide continuity of care between ICU and the ward, resulting in significant harm to post-ICU patients and a strong sense of fear and anxiety in patients and staff. In the next chapter the results and implications of this study will be discussed, as well as the strengths and limitations of the approaches taken.

Chapter Eight: Discussion

8.1. Introduction

The previous chapters have presented the related literature, design, and results of this mixed methods parallel convergent exploratory study aiming to answer the question: ***What challenges and problems in care currently exist in the management of post-ICU ward patients?*** In this chapter, key findings will be discussed in relation to current literature. Strengths and limitations of the study will also be explored. This thesis will then be concluded with a summary of overall contribution to knowledge, implications for practice, and areas for future research.

8.2. Summary of Key Findings

By using mixed methods, this study has identified several problems in care delivery and some of the underlying factors which contribute to these problems. Using a micro/meso/macro framework (Allen & Pilnick, 2005; Serpa & Ferreira, 2019), a model of post-ICU ward care has been developed to organise these challenges.

The key overarching finding of this study is that post-ICU patients were perceived as *other* than general ward patients, by both staff and patients. *Otherness* in this context was related to higher care needs due to specific characteristics, and the impact this had on ward staff. Within the framework several patient characteristics were identified at the micro level as contributing to this *otherness* and challenging care delivery. These characteristics included high acuity, physical dependency, presence of co-morbidities, and complexity of care needs.

By exploring care delivery at the meso and macro levels it was demonstrated that the current system of post-ICU ward care struggled to support this *otherness*. Characteristics at the micro level had implications for workload, skill mix and ward culture at the meso (ward) level, and specialist support at the organisational (macro) level. A reduction in care provision out-of-hours further challenged post-ICU ward care, indicating that the needs of post-ICU patients were sometimes at the very limit of what wards were able to provide. A reduction in this capacity at night therefore had significant implications for patient safety and quality of care.

The limitations identified at the meso and macro level resulted in potential failure to provide continuity of care between ICU and the ward. This failure of continuity caused significant distress for patients, resulting in profound vulnerability and anxiety. Staff were aware of the implications of pressure on ward-based care and the negative effect this had on post-ICU patients. This resulted in feelings of fear about receiving patients from ICU and the challenges of meeting their needs. Patient anxiety and staff fear were identified as both a consequence of the *otherness* of post-ICU patients, and a contributory factor to defining post-ICU patients as *other,* both by staff and patients. The limitations in care provision identified at the micro and meso level, such as workload, staffing and skill mix, as well as changes in care provision overnight, are unlikely to be easily changed. Therefore, any practice changes aimed at improving post-ICU ward care need to take these limitations of the system into account, and be deliverable within the current organisational structure.

In the next section these key findings will be explored in relation to current evidence. The characteristics of post-ICU *otherness* will be explored in reference to general hospital cohorts as well as other studies examining post-ICU ward care. Ward and organisational level aspects will be discussed, with particular focus on key aspects, including: handover and communication; workload and skills; ward culture and medical leadership; out-of-hours care provision; and the specialist input of Critical Care Outreach Teams (CCOT). This section is then concluded with a discussion of the psychological impact on patients of this constrained system.

8.3. Comparison with current literature

8.3.1. Post-ICU Patients as *Other*

The central theme of the model and a key theme in interviews with both patients and staff was the perception of post-ICU patients as *other* – different from general ward patients and requiring higher levels of care. *Other*ness was first conceptualised by the French philosopher Levinas in 'Time and The Other', written in 1947, where he describes the lone self and then contrasts this with the *other*, identifying them as "what I myself am not" (p. 83) (Levinas, 1947). This is further developed in his later books 'Totality and Infinity' (Levinas, 1961) and 'Otherwise than Being' where he identifies meeting the *other* as giving rise to spontaneous moral responsibility: "Proximity, difference which is non-indifference, is responsibility." (p. 139) (Levinas, 1974). This responsibility is described as particularly pertinent when the *other* is vulnerable, characterising this responsibility as "non-indifference to the other" (p. 89) (Levinas, 1974). The concept of compassion for the *other* and recognition of their vulnerability is central to Levinas' writing about the *other* (Peperzak, 1993).

In the literature, two concepts have evolved from the original concept of *other* – "Othering" and "Otherness". *Othering* has been used in the ethical, sociological and nursing literature to define and identify exclusion of specific groups, usually through racial or gender biases or due to disability (Canales, 2000; Hughes & Paterson, 1997; Jebran, 2014; Johnson et al., 2004; Peternelj-Taylor, 2004). Nursing literature has focused on the negative impact of *othering* – describing stark discriminatory practices related to gender, ethnicity and diagnosis affecting patient care (Jebran, 2014; Johnson et al., 2004; Peternelj-Taylor, 2004). Although Canales (2000) sought to reframe this through inclusionary *othering*, this was in response to marginalisation and remains a negative perception of this concept. In contrast, Ryan (2012) identified the concept of exclusionary *othering* through being part of a non-dominant culture, resulting in feeling marginalised and vulnerable. Jebran (2014) described *othering* where there is a suggestion that resources are limited for severely cognitively impaired infants due to a reduced expectation of recovery, described as the "demanding other". Similarly, Nortvedt (2003) described the conflict between meeting the needs of the individual patient and limitations of resources to provide care. This was also identified by Jebran (2014), who acknowledged that the vulnerable *other* exists alongside further patient others, who also have care needs. In contrast, White et al. (2012) described the *othering* of patients perceived as not sick enough to be in ICU, and were therefore challenging the integrity of the ICU as the place for the sickest patients in the hospital. Whilst Jebran (2014) framed this argument as one of futility versus rationing, in this study of post-ICU patients, the perception may not be related to futility, but more of the rarity of the high needs of post-ICU patients (or acutely ill patients who have not been discharged from ICU), therefore the rationing relates to meeting the needs of the many and not the outlying acutely ill others. The rationing of care provision in this case falls to staff working within a system which is not designed for these patients. Where staff were confronted with the needs of vulnerable post-ICU patients they described struggling to meet these needs whilst also ensuring safety and care of the wider ward cohort. Where there is conflict between meeting individualised needs and the needs of the 'third' – i.e. the wider cohort, this may result in significant moral distress for staff (Clifton-Soderstrom, 2003).

In this study, both aspects of *the other* were identified – *othering* by staff through identification of differences, and patients' perception of *otherness* through awareness of these differences. Staff described characteristics contributing to the concept of *othering* of post-ICU patients in stark terms, identifying a variety of attributes such as acuity, high dependency, complexity of care needs and high workload. Advanced clinical skills, experience and time were all aspects identified as essential in managing this *otherness*. However, previously the concept of *othering* was often negatively framed, describing discrimination due to differences (Jebran, 2014; Johnson et al., 2004; Peternelj-Taylor, 2004). In this study *othering* was framed in relation to the challenges of meeting the needs of post-ICU patients rather than discrimination due to specific characteristics. However, the characterisation of post-ICU patients as difficult to manage due to their *otherness* suggested an expectation of ongoing responsibility for the discharging ICUs to support care. This expected support included ongoing medical plans and provision of training and support through CCOTs. In addition to post-ICU patients as *other,* there was also a perception that ICU staff were *other* than ward staff in terms of their skills and experience. The *otherne*ss of ICU staff was also identified by White (2007, unpublished thesis), who described the distinctions intensive care staff make between themselves and the rest of the hospital, to emphasise the *otherness* of ICU. The negative characterisation of *otherness* in the literature was also identified by patients in this study who described perceiving themselves as different to general ward patients. For these patients, the concept of *otherness* was not related to physical or cultural characteristics, but to clinical aspects such as high acuity and/or physical dependency which challenged the system of care delivery. Therefore, although this perception of *otherness* resulted in a sense of vulnerability, this was not related to subordination of this group, but of an inherent struggle to meet their clinical needs. Although it is likely that this was to some extent underpinned by a change in clinical setting, reduction in staffing, loss of familiarity and increasing awareness of the extent of their illness, it is likely that an awareness of *otherness* also contributed to these feelings.

In Canales' (2000) concept of inclusionary othering she advocated recognising what it is to be *othered*. This reflects the importance of identifying the *otherness* of post-ICU patients, to support both patients and staff. Ryan (2012) also suggested that where the *othered* person is recognised and helped they may be able to adapt to their *otherness*, but will remain isolated and vulnerable if not. By identifying where the challenges for these *other* patients lie, changes may be made to the system to support care provision. Identifying the challenges in delivering post-ICU ward-based care was the primary aim of this study, with the intention of informing changes to future practice, to improve both post-ICU outcome and experiences for patients and staff.

To develop a comprehensive picture of the challenges of post-ICU ward care, data sets from this study were integrated into a micro-meso-macro model of post-ICU ward care. This model is similar to that developed by Ferlie and Shortell (2001), to inform change within healthcare. This model recognises that healthcare is not delivered by individuals but by a complex organisation. This was identified in the in-depth reviews where ‘team factors’ was the most commonly identified contributory human factor to problems in care. Problems identified at the patient level were often associated with characteristics at the ward and organisational level. These system-level aspects underpinned care delivery and contributed to the continuity of care delivery between ICU and the ward.

Within this study, characteristics at the micro level contributed to the identification of post-ICU patients as *other*. These included high acuity and risk of deterioration; high physical dependency; and high care needs such as nutritional support, ongoing clinical problems and co-morbidities. These characteristics combined to pose significant challenges to the workload, skills and experience of ward staff. However, as identified by comparison of cases in in-depth reviews, and interviews with staff, not all post-ICU patients may be regarded as *other*. In-depth reviews identified the same types of problems in care in survivors and patients who died, but in smaller numbers and with lesser impact on condition. Staff described post-ICU patients as falling into two predominant categories: complex, dependent patients, usually following a long ICU stay; and elective surgical patients following a brief ICU stay. This finding was limited by the relatively small number of survivor Retrospective Case Record Reviews (RCRRs), but should be acknowledged when considering changes in post-ICU ward care such as focused follow-up of at-risk patients (discussed later in section 8.6).

8.3.1.1. Preventability of Death

In Chapter Four (section 4.3), the RCRR explored avoidability of death and quality of care of 300 patients who died following discharge from ICUs in three NHS hospitals. In this study, 16.7% (n=50) of post-ICU in-hospital deaths were of patients discharged to the ward with a clear end-of-life care plan, and their care was not examined further. For each of the remaining 250 patients, care was examined using a Structured Judgement Review approach to assess avoidability of death. Two previous studies of general hospital populations classified between 4.2% and 5.2% (95% CI 3.8-6.6) of deaths as probably avoidable (scoring 3 or more) (Hogan et al., 2012; Rogne et al., 2019). The proportion of deaths identified as probably avoidable in this study was higher at 8%, although the smaller sample size makes the estimate less precise (95% CI 4.6-11). No cases in this study scored a 2 (probably preventable) or 1 (definitely preventable), compared with 2.3% (Hogan et al., 2012) and 2.2% (Rogne et al., 2019) in similar studies. For some cases scoring 3, avoidability may have been deemed more likely in the absence of underlying co-morbidities or severity of illness, and therefore given a score of 1 or 2.

Chapter Four (section 4.3.2) outlines the basis for avoidability judgements, identifying co-morbidity, frailty and complexity as key factors in selecting a score of 4 or 5, despite presence of problems in care delivery. The two previous similar studies of general hospital populations found much lower rates of potentially avoidable deaths than in this study (scoring between 1 and 4), at between 5.1% and 8%, compared with 17.4% in this cohort (Hogan et al., 2012; Rogne et al., 2019). These differences may reflect the complexity and high risk unique to this study cohort where frailty and high dependency were more common than in general populations (Chapter Four, section 4.2.1), although this may also reflect differences in scoring and judgements between studies, despite efforts made to ensure rigour in the approach (as outlined in Chapter Three, section 3.3.6.6). To explore preventability further, an analysis of all cases where a degree of avoidability was identified was also undertaken, finding 26% (n=65) of patients scored between 1 and 5 (i.e. judged as having some degree of preventability), but with the presence of greater frailty and co-morbidity making assessment of avoidability of death less certain. Furthermore, in the Norwegian study of general hospital deaths, 25% of patients died within the first 24 hours of admission and median length of stay was five days (Rogne et al., 2019). For patients in this study, median length of stay following ICU discharge was nine days (IQR 5-21), similar to the national median of eight days (IQR 4-16) for all post-ICU discharges during the same time period

(Section 4.2.1, Table 19). This exposure to longer periods of ward-based care may suggest there was a higher chance of problems in care occurring and contributing to patient deaths.

A recent Canadian study took a similar retrospective case review approach to quantify incidence of adverse events in the first seven days after transfer from ICUs in 10 large teaching hospitals (Sauro et al., 2020). They found 18.6% (n=84) of post-ICU patients experienced an adverse event, with a third judged to be preventable. Adverse events were found to be associated with ICU readmission, death and longer length of hospital stay, and most adverse events occurred within three days of transfer. Data were, however, limited as a large number of eligible patients were excluded (n=323, 42%), mostly due to problems obtaining consent. Most deaths occurred within two to three days, possibly due to the inclusion of patients discharged with an end-of-life care plan. Furthermore, ICU and ward doctors were asked to predict adverse events, readmission and death, with predictions found to be generally inaccurate. No discussion is offered regarding how this assessment may have impacted discharge decisions. Adverse events were broadly categorised and no specific data were given on the nature of events. Despite these limitations, this study does emphasise that post-ICU ward care remains a time of high clinical risk.

Patients whose death was judged as probably avoidable were more frequently judged to have received poor care overall than patients whose death was judged to have had no degree of avoidability (Chapter Four, section 4.3.1). Whilst this is unsurprising, in other similar studies this difference was less striking. Hogan et al. judged 37% of avoidable cases as receiving good or excellent care overall, compared with only 6.1% in this study (Hogan et al., 2012). This may indicate a failure of general wards to provide the level of care required by this frail, dependent post-ICU cohort, emphasising the impact of characteristics of post-ICU *otherness*, such as frailty and high dependency have on care delivery.

This sub-section has explored how judgements of preventability and quality of care delivery compared with similar studies of general hospital cohorts. These data emphasise the impact of *otherness* in the care of post-ICU patients, whose deaths were more likely to be probably avoidable, and to have received poor or very poor care overall. Findings suggest that post-ICU patients may be more challenging to manage on the ward than other patients, due to frailty, high dependency and complexity of care needs, as identified in model of post-ICU ward care discussed in Chapter Seven. These challenges to care delivery emphasise the concept of the “demanding other”, whose needs may not be met within the limitations of the system of care, limiting the ability of staff to provide individualised care (Jebran, 2014; Nortvedt, 2003). These identified characteristics of *otherness*, and how they impact care delivery, will be discussed in further detail in the following sub-sections.

8.3.1.2. Frailty and Physical Dependency

Chapter Four (section 4.2.1, Table 19) presented data on the 300 patients in this study in comparison with national data on all ICU discharges during the same period. Patients who died were frailer than the general ICU population with half needing help with activities of daily living before hospital admission compared with a quarter of survivors. These data are, however, limited by retrospective collection. For the 300 patients in this study, their Clinical Frailty Score was derived from documentation, following rules of interpretation defined in Chapter Three, Table 17. Furthermore, national data from the Intensive Care National Audit and Research Centre (ICNARC) were categorised into score ranges, making comparisons less reliable (Table 19, section 4.2.1). Despite establishing clear interpretation rules, inferring Clinical Frailty Scores retrospectively from medical documentation may limit reliability, although a recent, though small, study, suggests this may be a reliable way to derive this score (Darvall et al., 2019). Frailty has been shown to be associated with in-hospital and short-term (30-day) mortality in ICU patients (Flaatten et al., 2017; Muscedere et al., 2017) and was often linked to physical dependence in this study.

The RCRR demonstrated that patients who died following discharge from ICU were physically dependent, with 62% (n=155) unable to stand and step from bed to chair on ICU discharge. One Dutch study has previously reported physical dependency following ICU discharge, similarly finding 76% (n=52) of patients to be totally or severely dependent at four days after transfer (median, range 3-7 days), based on the Barthel Index score (van der Schaaf et al., 2008). However, findings were limited by the relatively small sample size of 69 patients, and did not offer any ongoing analysis of changes in physical function over time. A further study examining functional independence demonstrated a strong link between poor outcomes and age, with patients categorised within the study as older than 66 and with a greater than two week ICU stay experiencing far worse functional outcomes than other groups at both seven days and one year following critical illness (Herridge et al., 2016). However, a significant limitation was the lack of pre-morbid frailty assessment, relying instead on age, which cannot be used as a surrogate for frailty. The sample size for this study was again also limited, although larger than the previously discussed study, at 391. However, the study did include analysis of recovery over time rather than at one time point, which offered further insight into both medium and long-term recovery following ICU admission.

The literature review identified physical dependency as a concern for ward staff (section 2.3). One recent qualitative study with Swedish nurses suggested that lack of time on the ward meant that ward nurses were unable to mobilise post-ICU patients, and this task fell to CCOT practitioners as they were aware of the consequences of prolonged immobility on recovery (Häggström et al., 2018). It was not clear whether lack of awareness of patient needs was also a factor, but this may also explain why post-ICU patients were mobilised by CCOTs. Interviewed staff and patients in this study supported these findings of poor function in post-ICU patients, and identified the level of physical dependence of post-ICU patients as difficult to manage within their workload despite awareness of these needs. The implications of workload and skill mix will be discussed further in section 8.3.2.2.

NICE Clinical Guidance 83 (Rehabilitation after critical illness) and NICE Quality Standard 125 outlined a need for ongoing physical rehabilitation following discharge from ICU (National Institute for Health and Care Excellence, 2009, 2017). Guideline for Provision of Intensive Care Services (version 2) also support ongoing rehabilitation following discharge from ICU through a clear multi-disciplinary plan (FICM, 2019). Daily mobilisation was selected for collection in the RCRR as an indirect measure of rehabilitation. Although daily mobilisation is not the only means of delivering physical rehabilitation, this was easily measurable within the RCRR, and rehabilitation was subsequently explored in further detail in the in-depth reviews and interviews. Despite clear guidelines for ongoing rehabilitation, patients in this study were often not assisted to sit out of bed on every day that it was judged by reviewers to be clinically possible and only a very small proportion were mobilised away from the bed space every day that it was judged clinically possible to do so. This assessment was limited by reviewer subjectivity and reliance on documentation, but was guided by clinical expertise (one reviewer was an ICU physiotherapist) and team discussion where uncertainty existed. This is a potential limitation and will be discussed further in section 8.4.

The in-depth reviews identified various documented safety-related reasons for not mobilising patients, many of which were judged by reviewers as reasonable on each isolated day. There is some discussion in the literature related to safety criteria for mobilising critically ill patients, including physiological aspects such as resting heart rate, and organisational considerations such as staffing levels (Nydahl et al., 2017; Stiller, 2007). Expert consensus in early mobilisation in ICU suggests risks should be considered against the benefits of mobilisation (Hodgson et al., 2014). Although early mobilisation is focused on patients in ICU, clinical guidelines and NICE emphasise the importance of continuity of rehabilitation on transfer to the ward, as discussed above. In general hospitalised patients, the known risks of not implementing early mobilisation include reduced physical function, pneumonia, deep vein thrombosis, pulmonary embolism, urinary tract infections and pressure ulcers (Cortes et al., 2019; Wu et al., 2018). These risks may be particularly high in this frail post-ICU cohort.

Given the risks and emphasis on continuity of rehabilitation in clinical guidance, the principles of early mobilisation may be applicable to the immediately post-ICU population, but this has not been established in the literature.

There has been a strong research focus on rehabilitation in ICU and following hospital discharge, acknowledging the impact of ICU acquired weakness (ICUAW) following critical illness (Iwashyna, 2012; Jolley et al., 2016). However, very few studies have focused on continuity of rehabilitation during the post-ICU ward stay. As identified in the literature review (section 2.5), the three studies which implemented post-ICU in-hospital rehabilitation did not demonstrate improved outcomes in the primary outcomes (Denehy et al., 2013; Walsh et al., 2015; Wright et al., 2018). The literature review identified limitations in all three studies, including choice of outcome measure, selection criteria and attrition rates. This may also suggest that post-ICU in-hospital rehabilitation is multi-faceted due to the complexity of care needs of this group, and no intervention to date has successfully addressed all problematic areas of care or barriers to successful ward-based rehabilitation.

This study suggests that wards are unable to cope with the high level of dependency identified, limiting delivery of the rehabilitation required to facilitate ongoing recovery. Further work has been undertaken as part of the wider NIHR RfPB grant (reference PG-0215-36149), beyond the scope of this thesis, to explore the barriers and facilitators of mobilisation provision to post-ICU patients, with the aim of informing this aspect of a future complex intervention. This had included mapping the process of mobilisation on the ward, using primary data from this study and stakeholders from the three sites, using the Functional Resonance Analysis Method (FRAM) (Clay-Williams et al., 2015) (See Appendix 17 for the mobilisation FRAM figure). The output of this work has identified the complexity of mobilising a dependent patient on the ward and the barriers to delivery.

8.3.1.3. Nutritional Support

The RCRR identified 76% (n=185) of patients required nutritional support at ICU discharge (defined as receiving enteral/parenteral feeding or requiring assistance with eating) of whom 41% (n=76) did not have a nutritional plan at ICU discharge (section 4.4). Although not specific to post-ICU patients, NICE clinical standard 24 states that all patients should be screened for malnutrition and a clear management plan put in place for those who require nutritional support (National Institute for Health and Care Excellence, 2012). Previous studies have demonstrated poor delivery of nutrition in post-ICU patients (Merriweather et al., 2016; Ridley et al., 2019). A key factor in poor enteral nutrition delivery was fasting for repeated procedures, resulting in prolonged breaks to planned feeding (Chapple et al., 2016), which was also identified in the in-depth reviews (Chapter Five, section 5.5.2.3), although not in the other data sets.

Removal of feeding tubes before oral intake is established was also identified as a problem in care in the in-depth reviews and this was suggested during interviews to be due to pressure to promote recovery, and a drive towards discharge. Previous studies have also identified a cultural drive to remove feeding tubes to promote oral intake and rehabilitation (Chapple et al., 2018; Merriweather et al., 2014). In contrast, two studies have identified post-ICU patients receiving oral diet only as particularly at risk of calorie deficit, compared with enteral nutrition or a combination of enteral nutrition and oral diet (Chapple et al., 2016; Ridley et al., 2019). A further study identified that post-ICU patients manage less than 50% of their nutritional needs through oral intake (Wischmeyer, 2018). Reasons for poor oral diet in post-ICU patients include poor appetite and physical dependency making eating difficult (Merriweather et al., 2016). This suggests that close monitoring of intake and oral supplementation are needed, and a low threshold for enteral feeding where target nutrition is not achieved, both of which were identified as problems in this study.

Problems with nutrition delivery were commonly identified in in-depth reviews of patients whose death was judged as probably avoidable. Chapter Five (section 5.5.2.3) explored the complexity of nutrition delivery, identifying multiple problems including: failure to monitor nutritional input; failure to deliver, or early cessation of, enteral or parenteral nutrition; and failure to involve or follow nutritional specialist team advice. Contributory human factors identified for these problems were predominantly team-based, emphasising the multi-disciplinary nature of ensuring adequate nutrition. In the post-ICU ward care model, nutrition was identified as an aspect of care which relied on ward culture. Although malnutrition was not formally assessed in this study, a high proportion of patients required nutritional support at ICU discharge, with ongoing provision of nutrition identified as poor in documented care.

This study has identified continuity of nutritional care as a common problem in post-ICU ward care, underpinned by failures to monitor and respond to identified poor intake. The need for adequate nutrition is emphasised in the literature, particularly alongside ongoing rehabilitation. Nutritional support requires nursing time and specialist input, at the meso and macro level of post-ICU ward care, contributing to complexity of care needs. These aspects of the system of care will be explored in later sections.

8.3.1.4. Complexity of Care Needs and Multi-Morbidity

In chapter Four (section 4.3.1), the effect of co-morbidities and ongoing clinical problems on judgements of preventability of death were examined, as discussed above (section 8.3.1.2). In in-depth reviews the category ‘complexity and clinical condition’ was also commonly identified as a contributory human factor for problems in care (Chapter Five, section 5.7). In Chapter Seven the characteristics of complexity of needs was examined. These were identified as a combination of frailty, dependency, ongoing clinical problems and pre-existing co-morbidities, all contributing to high care needs. In interviews, staff identified an increasing prevalence of co-morbidities in post-ICU patients, which may be indicated by the high level of frailty identified in studied patients who died. A report for The Health Foundation supports this, finding emergency admissions to hospital with five or more health conditions rose from one in ten in 2006 to one in three by 2015 (Stafford et al., 2018). This report suggests complexity of healthcare needs pose a challenge to secondary care delivery, risking fragmented care and reducing patient safety. These complex health conditions may be defined as frailty, with the Clinical Frailty Score a measure of the extent to which these co-morbidities have impacted on a patient's physical function. Searle and Rockwood (2018) suggest that despite the expectation of healthcare professionals that patients will present with clearly defined and treatable single health problems, in reality this frailty and complexity makes diagnosis and treatment challenging. In this post-ICU cohort frailty and dependency were common, resulting in complexity in their clinical management posing clear challenges to the system of care delivery.

This study has identified several interdependent conditions commonly developed by post-ICU patients and linked to the frailty and dependency discussed above. These included: new onset of atrial fibrillation; new or ongoing infection and sepsis (including chest infection or pneumonia); and electrolyte disturbances, in some cases potentially related to refeeding syndrome, defined as rapid shifts in fluids and electrolytes following re-introduction of feeding following a period of malnutrition (National Institute for Health and Care Excellence, 2006). In this cohort only a third of patients with suspected or confirmed sepsis received the full Sepsis Six care bundle (Daniels et al., 2011). This may be due to the lack of clarity between infection and sepsis in clinical care, and related to clinical monitoring, escalation and management. This may be underpinned by workload, skills and ward culture (Aitken et al., 2011). These ward-level characteristics are identified at the meso level of the post-ICU ward care model (Chapter Seven, section 7.4). The sepsis care bundle is usually associated with severe, sudden presentation, described as "front door sepsis" by one interviewee. Implementation may not therefore have been recognised as necessary in cases where signs of sepsis developed over a number of days, or were not deemed clinically urgent. The implications of not managing sepsis on ongoing rehabilitation are discussed later in this section. New onset of atrial fibrillation is a common complication during critical illness (Bosch et al., 2018). Despite the association and risks of atrial fibrillation, treatment in study cases was commonly confined to management of the arrhythmia, with underlying causes rarely considered or investigated. Incidence was higher in patients whose death was judged as probably avoidable, suggesting in addition to being a clinical deterioration itself, atrial fibrillation may also be a useful marker of other underlying clinical problems requiring investigation and management.

Although frailty, rehabilitation, nutritional management and medical problems such as sepsis and atrial fibrillation have been examined separately, there was clear interdependence and linking between these characteristics of post-ICU *otherness* in this study. This was particularly apparent in the in-depth reviews, were many of patients whose deaths were judged probably avoidable experienced several of these characteristics at the same time. For example, high physical dependency was often linked to frailty and needing nutritional support (Chapter Five, section 5.5.2.1). Furthermore, ongoing rehabilitation was often hindered on the wards by other ongoing medical problems, such as low blood pressure, anaemia and confusion (Chapter Five, section 5.5.2.2). Poor nutritional management was also linked to refeeding syndrome and potentially contributed to development of atrial fibrillation in some patients (Chapter Five, section 5.5.2.3). Where these characteristics occurred together, the challenges to post-ICU ward management were compounded.

Interdependence between identified characteristics of *otherness* is also reflected in the literature. Malnutrition in critically ill patients has been associated with poor rehabilitation in both the medium and long-term, emphasising the importance of ensuring adequate feeding in this dependent and frail post-ICU cohort with complex care needs (Dénes, 2004; Wei et al., 2015). Furthermore, ongoing inflammation associated with infection and injury has been established to result in a catabolic state, where nutrition cannot be utilised (McClave et al., 2016; Wischmeyer, 2018). By not identifying and halting the inflammatory process of sepsis, malnutrition may be worsened (Cohen et al., 2014). This has significant implications for patients already requiring nutritional support and ongoing rehabilitation, particularly when they are also frail and dependent (Wischmeyer, 2018). Onset of atrial fibrillation has been associated with sepsis and may be triggered by systemic inflammation (Meierhenrich et al., 2010). There is also evidence of an association between atrial fibrillation and electrolyte imbalance, common in enteral or parenteral feeding following a period of malnutrition, termed refeeding syndrome (Boot et al., 2018; da Silva et al., 2020; Mehanna et al., 2008). Although it was difficult to clearly define incidence of refeeding syndrome in this study as this was not the aim, there were 12 cases of electrolyte disturbances identified in the in-depth reviews and documented by nutritional support teams as potentially due to refeeding syndrome. Incidence of refeeding syndrome is not well-documented but literature suggests between 2-8% in at-risk patients, and up to 34% in critically ill patients (da Silva et al., 2020), suggesting incidence in this study of 4.8% may be similar to other at-risk groups. Electrolytes are easily monitored through routine blood sampling, but in-depth reviews found these were commonly not checked, reviewed or acted on. This omission may be due to the relatively rare incidence of refeeding syndrome in the general hospital population, although it is common in ICU patients who have often had a period of malnutrition and/or catabolism due to sepsis (da Silva et al., 2020; Mehanna et al., 2008). Failure to manage electrolyte disturbances may therefore be linked to skills, workload, experience with post-ICU patients and ward culture, as identified within the model of post-ICU ward care (Chapter Seven, Figure 7 and discussed later in section 8.3.2.2).

In addition to co-morbidities and clinical problems, high acuity was also identified as an aspect of the *otherness* of post-ICU patients. Acuity was linked by staff interviews to premature discharge from ICU and high risk of deterioration due to lack of reserve following critical illness, both specifically associated with post-ICU patients (Chapter Six, section 6.4.1). The systematic review identified six studies reporting a statistically significant association between nursing workload at ICU discharge and subsequent in-hospital mortality (section 2.1.1). In addition to interventions which are specific to ICU, these workload scores indicate ongoing management activities indicating clinical problems or risk, such as: close monitoring; fluid balance measurement; intravenous drug and fluid administration; and tracheostomy management and nutritional support (Reis Miranda et al. 1997; Smith et al., 1999). Higher scores at ICU discharge indicated that ICU-specific interventions (such as mechanical ventilation, renal replacement therapy or cardiovascular support), had been withdrawn in the preceding 24 hours, and/or presence of non-ICU specific interventions indicating ongoing clinical problems. Both workload scores have, however, been criticised. The Nine Equivalents of Nursing Manpower Use Score (NEMS) was developed as a simplified version of Therapeutic Intervention Scoring System (TISS), as this was deemed too complicated to complete easily (Reis Miranda et al., 1997). Both TISS and NEMS have subsequently been critiqued for a strong basis on clinical interventions rather than directly measuring nursing input. There is therefore a concern that this score may be an indication of severity of illness rather than nursing workload (Carayon & Gürses, 2005; Debergh et al., 2012). Both scores have been superseded by other workload scores such as the Nursing Activities Score (NAS), which assesses nursing workload per shift (Debergh et al., 2012; Reis Miranda et al., 2003). Although NAS has been widely used in research and has been acknowledged as a reliable measure of workload, limitations have been identified such as level of complexity to complete, and failure to consider risk or skill mix (Greaves et al., 2018). Despite these limitations, the association between these scores and post-ICU mortality may indicate an ongoing burden outside the usual workload of ward patients, either due to nursing requirements or simply as a marker of high acuity. This may also reflect the interdependency of frailty, rehabilitation and nutritional needs, in addition to ongoing medical problems, resulting in higher care needs.

A further systematic review supports this association between severity of illness scores (SAPS and APACHE II/III) and ICU readmission (Wong et al., 2016), again indicating post-ICU patients may still be acutely ill, typified as *other* than general ward patients in this study. This is supported by an Australian survey of Liaison Nurses which found that 57.9% (n=23) identified increased illness acuity and 68.8%

(n=27) identified ‘clinically challenging patients’ as often or always contributing to adverse events in post-ICU patients (Elliott et al., 2013). There was no clear definition of clinically challenging, but this may indicate dependency and complexity.

The impact of post-ICU care needs on in-hospital adverse events has been recognised in a very recent study examining a new score for nursing complexity – the Patient Acuity and Complexity Score (PACS) - alongside other markers of complexity selected by the authors (Sanson et al., 2020). This score aimed to quantify nursing complexity by assessing factors such as: functional status; delirium or sleep disturbance; complex drug administration; and unstable vital signs. Analysis demonstrated an increased risk of an adverse event with a higher PACS score. Other variables predicting adverse events included high creatinine (as identified in the literature review of risk factors for post-ICU in-hospital mortality, Chapter Two, section 2.2.1), cough strength and partial pressure of carbon dioxide in arterial bloods gases (PaCO2). However, the study collected data at a single site, with a very small sample size of 148 patients. In addition, post-ICU in-hospital mortality reported in Sanson et al.’s (2020) study was higher than the national UK average at the time of data collection (2015), at 15.5% compared with 6.5% (ICNARC, 2016), suggesting findings may not be generalisable to wider post-ICU populations. A large number of variables were also analysed for an association with adverse events, suggesting results may be prone to type I errors due to multiple statistical tests. Further analysis with a larger, multi-site sample size would be required to support adoption of this new score into clinical practice. However, it does add some further support to the findings of this study and others, that post-ICU patients are challenging to manage within the workload and skill mix limitations of the ward, due to factors such as functional status (measured by frailty and mobility level in this study) and instability of vital signs (indicating high clinical acuity). The implications of this *otherness* on workload will be discussed further in section 8.3.2.2.

This study has demonstrated several characteristics of post-ICU patients which contribute to an overall complexity of needs, such as acuity, high dependency, high care needs and co-morbidities. Although discussed separately, these characteristics have been demonstrated to be interdependent and indicate ongoing dependency and complexity of care needs, posing significant challenge to post-ICU ward care. These challenges have contributed to an overall characterisation of post-ICU patients as *other* than ward patients, resulting in clear problems in care delivery. Both Canales (2000) and Ryan (2012) advocated identification and recognition of *otherness* to facilitate patient support and adaption. In addition, by recognising this *otherness*, system-level restrictions such as those identified by Jebran (2014), may be addressed to accommodate the “demanding other”. The next section will explore system level characteristics related to these challenges in delivering post-ICU ward care.

8.3.2. System Level Characteristics: Ward

The previous section identified several patient-level, micro, characteristics which posed challenges to delivery of post-ICU ward care. Recognition of these interdependent complexities is key to providing safe, high quality care, particularly in frail, high risk patients. Both in-depth reviews and interviews identified failures of medical leadership and ward culture in monitoring, escalating and treating problems. Experience, knowledge and support from senior colleagues were also identified as problematic, particularly for junior doctors, leading to uncertainty and stress about management of post-ICU patients, who were perceived to be complex. The ward round was identified as the key opportunity to direct clinical care but problems with communication and oversight during the ward round were identified in both interviews and in-depth reviews, potentially missing this opportunity to direct care. These meso-level aspects of care delivery will be explored in this section.

8.3.2.1. Handover and Communication

Many of the issues with managing the characteristics described above related to continuity of care through communication. The handover between ICU and the ward is recognised as a key aspect of ensuring continuity of care and there are clear guidelines on content (FICM, 2019). NICE clinical standard 158, rehabilitation following critical illness, states recommendations for handover of rehabilitation between ICU and the ward (National Institute for Health and Care Excellence, 2017). Key components of handover stated in this guidance include a monitoring and investigation plan; a plan for ongoing treatment; and a clear physical rehabilitation programme, emphasising the importance of handover for continuity of care. The importance of handover for patients has also been recognised (Bench et al., 2013). This will be explored later in section 8.3.2.1.

Chapter Seven summarised the findings related to handover (section 7.4.1), and handover was also identified as a key area in the literature review (section 2.5) (Bunkenborg et al., 2017; Stelfox et al., 2017; van Sluisveld et al., 2017). In this study one of the most problematic aspects of handover was the absence of an ongoing medical plan. Junior doctors in particular valued the presence of a clear management plan when transferred to the ward, which was often absent, even in the case of premature and out-of-hours discharges (the implications of this are discussed later in section 8.3.3.1). This preference suggests there was a lack of clarity and support from senior medical colleagues on the ward. The need for a clear management plan at ICU discharge was emphasised by many studies, with indications that written documentation was often absent at handover, both from a medical and nursing perspective (Boyd et al., 2018; De Grood et al., 2018; Enger & Andershed, 2018; Stelfox et al., 2017).

Problems with handover also impaired continuity of monitoring on the ward, identified within the model as key to managing post-ICU patients with complex care needs (Chapter Seven, section 7.4.1). Three previous ethnographic studies have examined the handover process, two for general cohorts

(Bunkenborg et al., 2017; Lin et al., 2013) and one focused on trauma patients (Powell et al., 2020). They identified handover as a complex interaction. A degree of hostility was observed between ICU and ward nurses in one ethnography (Bunkenborg et al., 2017), identified as due to a mismatch between information being given and what was required. In combination with distractions due to the ward workload and simplification of information to fit processes, there was concern that critical information which was not documented would be lost, risking patient safety (Bunkenborg et al., 2017; Powell et al., 2020). In particular, failures to communicate information related to EWS were identified. Other studies have also described nursing handovers between ICU and the ward as too technical and detailed but lacking key information about current clinical needs (Cognet & Coyer, 2014; Enger & Andershed, 2018; James et al., 2013; Whittaker & Ball, 2000). Multiple handovers were identified in this study, separated by profession. These included both verbal and written nurse to nurse and doctor to doctor handovers. In this study it was not possible to examine the content of verbal versus written handover, and assessments relied on written communication between ICU and the ward. As previously identified, conducting an ethnography may have offered more detailed information about the handover process, and in particular examined the importance of verbal versus written handover. This will be discussed further in section 8.4 – strengths and limitations. However, problems with missing and contradictory information were identified and poor handover was implicated in poor continuity of care between ICU and the ward.

A recently developed framework aims to improve continuity of care by providing a screening tool – the Post-ICU Presentation Screen (PICUPS) - to identify rehabilitation needs in post-ICU patients (National Post-intensive Care Rehabilitation Collaborative, 2020). This framework has been developed in response to the COVID-19 pandemic, but is acknowledged as applicable to the wider post-ICU population. However, it is not yet clear how this tool would be used in post-ICU ward care and benefits may rely on expertise in post-ICU recovery. Additionally, if the system of care is unable to meet the needs of these patients, as identified in this study, continuity may not be improved. However, the

PICUPS tool has potential to raise awareness of the needs of post-ICU patients on the ward, and direct care delivery.

This study also identified problems related to the differences in documentation between ICU and wards, contributing to a loss of continuity of information. CCOTs were identified in this study as key in following up medical plans and translating information from ICU documentation to ward forms, indicating they had a role in facilitating continuity of care. There was a clear link identified between handover and CCOT/LN roles within the literature, with interventions such as liaison nurses and checklists suggested to improve communication and thus continuity of care (Lin et al., 2013; van Sluisveld et al., 2015; Zakrison et al., 2016). This will be explored further in section 8.3.3.2.

8.3.2.2. Workload, Skill Mix and Management of Clinical Problems

As previously discussed, post-ICU patients have been identified in this study to be complex and dependent. In interviews, staff and patients identified this dependency as negatively impacting ward workload and ability to meet the needs of post-ICU patients. The literature review (Chapter Two, section 2.3) identified concerns amongst nursing staff that post-ICU patients were associated with an increase in workload and need for advanced skills which the ward was unable to accommodate (Elliott et al., 2012; Enger & Andershed, 2018; James et al., 2013; Salmond et al., 2011). This study also found anxiety related to post-ICU ward care, both from nurses and other staff groups such as physiotherapists and doctors, in terms of the impact of workload and confidence in their own skills. A further study characterised this capacity gap between ICU and ward as a "relative lack of care capacity" – where there is a ward bed available but the ward staff are unable to give the time required to manage ongoing care needs of the patient (Oerlemans et al., 2015). This was identified within the model of post-ICU ward care as contributing to the *otherness* of post-ICU ward patients due to the higher workload associated with managing the characteristics identified at the micro level (Chapter Seven, Figure 7 and section 7.3).

In recent years, in response to the Francis report (Francis, 2013) there has been increasing focus on nurse-patient staffing ratios. There is a growing body of evidence suggesting a link between nurse workload (or patient/nurse ratio) and patient safety, adverse events and mortality (Fagerström et al., 2018; Greaves et al., 2018; Griffiths et al., 2016, 2019). The RN4CAST research programme demonstrated that increasing nurses' caseload by one patient resulted in a 7% increased likelihood of an inpatient dying within 30 days of admission (Aiken et al., 2014). This programme also identified an increase in reporting of poor quality of care with each additional patient added to nurse caseloads (Aiken et al., 2012). These analyses support the suggestion in this study that high workload associated with receiving a patient from ICU may have contributed to the commonly identified problems in monitoring, escalating and responding to clinical problems discussed above.

The literature review identified nurses' concerns that ward skill mix and supervision limited their ability to meet the care needs of post-ICU patients. This study augmented these findings by exploring the perspectives of all staff groups and found the same concerns amongst junior doctors and physiotherapists as well as nurses (Chapter Seven, section 7.2). In the interviews, junior doctors in particular described feeling out of their depth clinically with post-ICU patients, and often felt unsupported. Previous studies have also indicated skill mix may be important to patient safety, with one study finding increased patient mortality where the ratio of nursing assistants to qualified nurses was higher (Griffiths et al., 2019). The importance of clinical expertise in detecting deterioration was identified in the literature review of nursing perspective (Chapter Two, section 2.3). In this study, the importance of experience was also identified by other staff groups. CCOTs in particular identified varying support needs between wards, dependent on experience with post-ICU patients. The in-depth reviews also identified variation in mobilisation practices and nutritional support on different wards, potentially indicating ward-level cultural differences based on patient cohorts (Chapter Seven, section 7.4.5). This may link to *otherness*, where some wards were more familiar with post-ICU patients or acutely ill patients and therefore post-ICU patients were less *other* and the system was adapted to support them.

A meta-ethnography of nurses' experiences identified lack of time and adherence to routine as impairing the capacity of nurses to care for patients on the ward (Bridges et al., 2013). This was directly contrasted with ICU nurses who were identified as having greater capacity to build therapeutic relationships perceived to be due to richer skill mix and lower nurse-patient ratios than the ward. This suggestion was also echoed in the literature review (Chapter Two, section 2.3), with patients identifying better relationships with ICU nurses in part due to the 1:1 staff ratio. The meta-ethnography also identified significant moral distress amongst ward nurses due to this reduced capacity (Bridges et al., 2013), which reflects the staff anxiety identified in this study and the literature review (Chapter Seven, section 7.2 and Chapter Two, section 2.3). A report by the General Medical Council suggested a similar situation for doctors (GMC, 2019). They found 34% of doctors surveyed felt unable to provide the level of care they would like to and 44% of doctors in training felt unsupported by their colleagues on a weekly basis. The report concluded that too little resource and emphasis was placed on medical leadership, leading to junior doctors feeling unsupported and at risk of burnout. Although not examined in this study, some of the accounts of fear given by junior doctors were profound and may have indicated significant stress in this staff group. This evidence supports the finding in this study that staff, and junior doctors in particular, were very worried about receiving patients from ICU, compounding the perception of *otherness* related to their perceived high acuity and risk of deterioration.

National guidelines suggest an element of flexibility in nurse staffing is required, based on patient case mix (National Institute for Health and Care Excellence, 2014; The Health Foundation, 2017). However, as patients may be discharged from ICU to any ward within a hospital, it remains challenging to accommodate this fluctuating workload within the current system, as identified in interviews with staff. Flexibility may also not be possible where staffing is already poor due to long-standing problems with recruitment and retention (The Health Foundation, 2017). A recent study of ward nurses in Norway also identified attrition of staff due to workload as affecting ward skill mix and therefore their ability to manage post-ICU ward patients (Enger & Andershed, 2018). This was also highlighted in interviews with staff through discussions related to bank staff, skill mix and attrition due to workload pressure (Chapter Six, sections 6.5.1, 6.5.3 and 6.5.4).

Failures in monitoring and escalation were identified frequently in this study, contributing to problems in care delivery and often occurring overnight (Chapter Seven, section 7.4.2). In particular, failure to adequately monitor and escalate early warning scores was identified in the in-depth reviews (Chapter Five, section 5.5.3). This is termed "Afferent Limb Failure" in the rapid response system literature (DeVita, et al., 2006; Olsen et al., 2019). Compliance with EWS monitoring has been documented as poorly adhered to (Credland et al., 2018), supporting findings from this study. Smith et al. (2020) identified a number of unexpected behaviours related to the afferent limb of rapid response systems which may have contributed to the failures of escalation identified in this study. These included: delays in escalation of observation frequency according to local protocols; Health Care Assistants taking vital signs observations and either not escalating high EWS or delaying documentation; and nurses not escalating high EWS to CCOTs, deviating from local escalation protocol. Although it was not possible to link any of the unexpected behaviours to who took the documented observations, or whether these were escalated within the nursing team, instances of not increasing observation frequency and not escalating appropriately to doctors and CCOTs were identified in the in-depth reviews. Other suggested reasons underlying afferent limb failure in the literature include: workload and staffing - particularly at night; education; clinical support; patient complexity; and tension within teams (Donohue & Endacott, 2010; Ede et al., 2019; Elliott et al., 2013; Massey et al., 2017; Peterson et al., 2010; Smith & Aitken, 2016; Olsen et al., 2019). A review of the literature related to failure to rescue identified knowledge and education as key to detecting and escalating clinical deterioration (Massey et al., 2017). A key theme to emerge from their analysis was “knowing the patient” – being familiar enough with them to recognise a change in condition. This was reflected in the findings of this study, with many of the instances related to failure to escalate occurring soon after discharge from ICU (Chapter Five, section 5.5.1.1), which may indicate unfamiliarity with the patient as a contributory factor, linked to handover and continuity of care. This emphasises the *otherness* of post-ICU patients, who are not known to ward staff but may still be acutely ill or at risk of deterioration on arrival. One further study examined the protocolised response to high EWS and found unclear directions in terms of timing and responsibility for actions (Smith et al., 2019). In addition to workload and skill mix challenges, this finding may offer some insight into why high EWS were not documented as escalated in this study, despite clear clinical deteriorations resulting in harm to the patient (Chapter Five, section 5.5.3 and Chapter Seven, 7.4.2).

The complexity of factors contributing to afferent limb failure identified in the literature is also reflected in the model. Although failure to monitor and escalate may at times be related to an individual omission, commonly in this study multiple opportunities were missed within the wider team to recognise and respond to deterioration. Failure to monitor and escalate was therefore situated at the meso level. However, elements of the organisational macro level were also identified as having influence over escalation processes, through training, protocolisation, and resource management (such as out-of-hours care provision) (Chapter Seven, section 7.4.2). Failure to monitor and escalate therefore spanned all levels of post-ICU ward care. This was also identified in a qualitative study by Johnstone et al. (2014) who identified factors related to the decision to escalate that echoed the micro, meso and macro levels of the post-ICU ward care model.

Food charting accuracy has also been identified as poor in several studies, with between 44% and 93% of charts identified as inaccurate (Palmer et al., 2015; Reeves et al., 2014). A further study found inaccuracy of food charts significantly impaired the assessment of nutritional intake in post-ICU care

(Ridley et al., 2019). Reasons for poor food and fluid balance chart completion have not been widely explored but may include lack of training, or prioritising other aspects of care over nutritional monitoring (Merriweather et al., 2014; Reeves et al., 2014). One interviewed ward sister emphasised this by suggesting nutritional monitoring could be more proactive on their ward, supporting the findings of the in-depth reviews. This may also be linked to ward culture, which will be discussed in the next section.

8.3.2.3. Medical Leadership

Medical leadership was identified in this study as key to co-ordinating the complex care of post-ICU patients. Presence of consultants, particularly on ward rounds was important in decision-making and oversight of care (Chapter Seven, section 7.4.5). Several reports acknowledge the benefits of consultant input in clinical care, including timely decision-making, improved patient outcomes and junior doctor training (Academy of Medical Royal Colleges, 2012; Bell & Redelmeier, 2001; National Confidential Enquiry into Patient Oucome and Death, 2010; Sutton et al., 2018). As identified above, the absence of senior medical leadership has been identified to impact junior doctors, causing stress and uncertainty (GMC, 2019; Rich et al., 2016), which was reflected in this study. Particularly on surgical wards there was a cultural acceptance of this absence and junior doctors described the need to seek clinical support from other avenues than surgical consultants and registrars as they were often unavailable due to their being in theatre. This lack of support was identified as contributing to significant fear and stress amongst junior doctors identified within the theme Fear and Anxiety in the interviews (Chapter Six, section 6.2.2) and in the model of post-ICU ward care (Chapter Seven, section 7.6). In this study the ward round was a key opportunity for team communication and decision-making, but there were common failures to assess overall condition and address clinical problems. Studies have identified improved decision-making on ward rounds where bedside nurses are present, facilitating communication about patient condition (Desai et al., 2011). Although it was not possible in this study to identify when ward rounds were multi-disciplinary, it is likely that where significant information on patient condition was not considered, the key staff involved in this care may have been absent or not consulted.

This study identified the characteristics of *otherness* of post-ICU patients identified at the micro level, such as high acuity and physical dependency as challenging within ward settings. However, there were indications that some wards were better able to manage this *otherness* than others, due to increased exposure to post-ICU patients or acutely ill patients. This was characterised by advanced clinical skills, but also a culture of awareness of the needs of post-ICU patients, such as proactive mobilisation, close nutrition surveillance and monitoring (Chapter Seven, section 7.4.5).

In the previous handover section, a medical management plan was identified as important for continuity of care on the ward. This raises questions about who should direct post-ICU care. Although care was theoretically transferred to the ward consultant on transfer, in-depth reviews identified delays in medical reviews following transfer and consultant reviews commonly did not occur until the day after arrival on the ward.

Throughout these sections several aspects of care delivery have been identified as linked to ward culture. These include rehabilitation, nutrition provision and monitoring, escalating and treating deterioration. This section has established that ward-level characteristics posing challenges to the care of post-ICU patients are long-standing and unlikely to be amendable to change without significant investment and commitment. Improvements to post-ICU care delivery therefore need to take this into account and provide solutions which accommodate the recognised limitations of general wards.

8.3.3. System Level Characteristics: Organisational

Characteristics at the organisational level of the model (Chapter Seven, Figure 7) were identified which supported (or had the potential to improve) post-ICU ward care. Education and trust have been referred to throughout the previous two sections in reference to co-ordinating and delivering care to post-ICU patients. Resource implications have also been identified in reference to workload, staffing, skill mix and consultant presence. In this section, two key organisational aspects will be explored in further depth: out-of-hours care provision and specialist support from CCOTs.

8.3.3.1. Out-of-Hours Care Provision

This work adds significantly to the current knowledge of out-of-hours discharge from ICU. Out-of-hours discharge has long been reported in association with poor outcome (Campbell et al., 2008; Goldfrad & Rowan, 2000; Santamaria et al., 2015). The literature review and meta-analysis brought together the current evidence to confirm the association with in-hospital mortality and crucially also ICU readmission, suggesting that those patients who die following out-of-hours discharge were expected to survive and deemed potentially rescuable when they deteriorated (Chapter Two, section 2.2.1.1). However, limited direct evidence existed about the underlying reasons for this association. There is uncertainty within the literature about whether there is a 'weekend effect' associated with reduced availability of consultants out-of-hours and subsequent impact on mortality (Academy of Medical Royal Colleges, 2012; Aldridge et al., 2016; Bell & Redelmeier, 2001; Bray & Steventon, 2017; Chen et al., 2019). One qualitative study identified staff and patient perceptions of reduced staffing and high workload at weekends as contributing to poorer quality of care (Sutton et al., 2018). Although these findings cannot be directly attributed to night-time, it is possible that the challenges are similar. This study has augmented these data, providing context around reasons for out-of-hours discharge, and why this is problematic for patient care.

Definitions of 'out-of-hours' in recent studies have varied widely, starting between 4pm and 10pm. However, very few studies defined out-of-hours at the limit of this range (Goldfrad & Rowan, 2000; Iapichino et al., 2003; Ranzani et al., 2012), with definitions more commonly starting in the early evening (Barker & Flint, 2010; Li et al., 2011; Uusaro et al., 2003; Williams et al., 2010) (see Chapter

Two, Figures 2 and 3 for definitions of out-of-hours for studies included in the meta-analysis). National guidelines recommend avoiding discharge after 21.59 hours and treating this as an adverse clinical incident when it does occur (FICM, 2019; National Institute for Health and Care Excellence, 2007). Despite this, 18.4% (n=46) of patients in this study were discharged after 22:00, suggesting these guidelines are not, or cannot be, adhered to. The underlying reasons for this were not identified in this study but may have been due to frequent high ICU bed occupancy, non-availability of ward beds, or a lack of awareness of the importance of avoiding night-time discharge. Although data were collected for three different definitions of out-of-hours discharge, as previously discussed, this study defined out-of-hours discharge as occurring after 4pm. Although the findings of the meta-analysis cannot rule out confounding due to differences in patient groups being discharged overnight compared with the day, this study aimed to investigate whether this difference was due to a reduction in care provision on receiving wards at night. The definition of out-of-hours was therefore selected to reflect the time at which changes in clinical staffing are taking, or are about to take place.

It was identified in staff interviews that out-of-hours discharge was perceived as inevitable due to the need to create ICU beds for incoming patients. The RCRR found 67% (n=168) of post-ICU patients were discharged after 4pm. These data suggest there may be challenges in facilitating day-time discharge from ICU. Staff often described the pressure to discharge patients due to high ICU bed occupancy. It was not possible to identify bed occupancy as a factor in overnight and premature discharge. However, the in-depth reviews identified several overnight premature discharges with significant ongoing medical problems suggesting this may have been a factor. Alternative approaches such as ethnography, or additional data collection such as ICU occupancy rates at time of discharge may have offered further insight into this problem (see discussion of limitations, section 8.4 below). Pressure on discharges due to bed occupancy were also identified in the literature review, causing fear and stress for nursing staff (section 2.3). An ethnographic study of the discharge process identified discharge delay due to bed availability, resulting in out-of-hours discharge (Lin et al., 2013) and one survey study of CCOT nurses perceived out-of-hours discharge as frequently contributing to adverse events in patients discharged from ICU to the ward (Elliott et al., 2013). This was echoed in one qualitative study which identified higher care needs in patients discharged overnight as they were less prepared for transfer (Enger & Andershed, 2018). This was also identified in interviews in this study, where concerns were raised about how ready patients were for discharge (Chapter Six, section 6.4.1).

Through in-depth reviews and staff interviews, the importance of an in-depth clinical review on arrival to the ward has been established. Absence of a medical review was identified as a key problem related to out-of-hours discharge and was almost always undertaken by the most junior doctors in the team when this did occur (Chapter Seven, section 7.3.2). This was linked to failure of continuity of care and ongoing medical management and resulted in very poor care for several patients who subsequently deteriorated, possibly due to premature discharge (Chapter Five, section 5.5.1.1 and Chapter Seven, section 7.3.3). In contrast, where patients arrived during the day they were often reviewed by a consultant or Specialist Registrar and a plan for ongoing care made. In the literature, one survey study related to handover identified that only 12% of doctors reported being made aware of a patient's arrival from ICU (Li et al., 2011). A further survey study found 60% of doctors (level not stated but defined as receiving doctor) were made aware of ICU transfers, but only 12% of patients were reviewed within an hour of ward arrival (Stelfox et al., 2017). This suggests there may be failures in communication around ward transfer contributing to the low rate of medical review, particularly at night, although this was not identified directly in this study.

This study also identified out-of-hours discharge from ICU as stressful for patients. This finding was supported by one survey study of anxiety related to timing of discharge which demonstrated a significant increase in Hospital Anxiety and Depression Score (HADS), measured up to 72 hours after transfer, if discharged after 22:00 (McCairn & Jones, 2014). The study had significant limitations – a small sample size (n=47), a large proportion of missed eligible patients (n=74), and significant limitations associated with HADS as a measure of anxiety and depression. Other tools may have been more appropriate, such as the State Trait Anxiety Inventory or the Faces Anxiety Scale (Chaboyer et al., 2007; Gustad et al., 2005) However, findings do add to the evidence that discharge out of ICU at night is stressful for patients and compounds relocation anxiety.

In addition to out-of-hours discharge, ward care was identified as generally poorer at night, due to reduced staff and skill mix, particularly apparent for junior doctors (Chapter Seven, section 7.3.2). This reduction in care delivery capability was recognised in the implementation of the Hospital at Night initiative, providing multidisciplinary professionals focused on emergency care for acutely ill or deteriorating patients overnight (Hamilton-Fairley et al., 2014). This was seen across all data for this study, with staff describing worry over support at night, and instances of poor escalation and deterioration particularly for premature discharges, which were more frequent at night.

Like the previously identified problems of workload, skill mix and medical leadership, problems with out-of-hours care provision have long been recognised and are unlikely to be changed without significant investment and commitment. Post-ICU patients may be particularly vulnerable to these limitations in ward care delivery, due to the potential for premature discharge, ongoing clinical management and high physical dependency and care needs. This work suggests out-of-hours discharge should be avoided wherever possible. However, where out-of-hours discharge is unavoidable, this should be explicitly acknowledged and support put in place to ensure this is not detrimental to the patient. This support should include a clear handover outlining a medical plan for ongoing problems, and a senior medical review on arrival to the ward.

8.3.3.2. Specialist Support from Critical Care Outreach Teams

Within the literature review, the role of CCOTs in supporting ward care was identified (Chapter Two, section 2.5). As outlined in Chapter Three (section 3.3.1), models of care provision at each site were different, but most patients in the study were visited by a CCOT or follow-up practitioner. Many staff recognised CCOTs as an essential part of post-ICU ward care. Benefits included: continuity of information; training and education; approachability and responsiveness to concerns; support with clinical deteriorations; and expertise in advanced skills associated with complex post-ICU patients (Chapter Six, sections 6.5.2 and 6.5.4, Chapter Seven, section 7.3.1).

The problems in care discussed in previous sections were often detected by CCOT during routine review. In this study, however, visits by the CCOT often ceased on day one or two (usually documented as a formal discharge), and were rarely re-referred to the service before their death (Chapter Four, section 4.4). Discharge from the service was likely due to service limitations and a focus on responding to deteriorations rather than step-down from ICU, although in the one site which focused solely on post-ICU follow-up, proportions of patients discharged after day one did not differ compared to the other two sites. The in-depth reviews identified that discharge sometimes occurred despite ongoing clinical deterioration or specialist needs, suggesting that the risk of prematurely stopping CCOT reviews was missed, or the teams were unable to accommodate this need within their caseload. Furthermore, the survival analysis curve (Chapter Four, Figure 6) demonstrated that 50% of patients who died following discharge from ICU were still alive nine days following ICU discharge, suggesting there was a period of time between discharge and death where CCOTs could have been involved in their care. In a review of critical care transition programmes (including CCOTs, Liaison Nurses and Rapid Response Teams), Niven et al. (2014) identified that three out of eight included studies had a protocolised follow-up duration of 48 hours following ICU discharge. In a Canadian study of implementation of a transition programme in three hospitals, the team remit was 12-hourly visits for a minimum of two visits and ceasing when deemed physiologically stable (Stelfox et al., 2016). These studies indicate that early discharge from CCOT identified in this study is replicated in other CCOT services internationally. Furthermore, one multisite study identified that clinicians were unable to predict adverse events, including ICU readmission and death, at ICU discharge (Stelfox et al., 2017).

This suggests decision-making about discharge from ICU follow-up services in the first day following transfer may not be reliable. In addition to the reasons identified in the literature review (Chapter Two, section 2.5), this early cessation of services may have contributed to the lack of quantitative evidence to support follow-up visits from CCOT or Liaison Nurses.

The findings of this study suggest this common practice should be reviewed, with a longer period of follow-up. However, this has clear implications for workload and a re-focussing or expansion of the service to focus on prevention rather than, or in addition to, response to deterioration. In Australia and South America, Liaison Nurses have a specific remit to visit patients following discharge from ICU, with the aim of supporting continuity of care between ICU and the ward, as discussed in the literature review (Chapter Two, section 2.5), although recent studies suggests this role has expanded to encompass Rapid Response and ward referrals (Alberto et al., 2017; McIntyre et al., 2019). In the UK, follow-up visits have developed to become part of the role of Critical Care Outreach Teams, with a much wider remit. The CCOT role often encompasses several facets of emergency care, including being notified of all high EWS in the hospital, sepsis flags, taking referrals for all (including pre-ICU) deteriorations and forming part of the Hospital at Night team (FICM, 2019; Hamilton-Fairley et al., 2014; National Outreach Forum, 2012; NHS England, 2015). This multifaceted role may explain the early withdrawal of follow-visits identified in this study, although it is unclear why CCOTs were rarely re-referred to prior to death for many patients. However, this early cessation misses the potential to prevent deteriorations by prompt intervention, suggesting the risks faced by post-ICU patients may be underestimated or not acknowledged by CCOTs. This may suggest a potential shift in focus for CCOT from reacting to deterioration to proactive prevention, although the implications for the wider caseload of CCOTs must be considered to prevent worse outcomes in other patient groups as a result. In contrast, it is likely that not all patients discharged from ICU are *other*, as acknowledged in staff interviews (Chapter Six, section 6.4.1). Therefore, follow-up services may be targeted on specific high-risk patient cohorts to facilitate longer follow-up within the wider workload of CCOTs. Data from the

RCRR (Chapter Four, section 4.2.1) suggest Clinical Frailty Score, level of physical dependency and presence of complexities such as nutritional support may be appropriate variables to use to identify this high-risk cohort.

The results of this study are limited by the focus on one aspect of the CCOT role. Alternative approaches such as ethnography may have identified reasons for early discharge and absence of re-referral at the point of deterioration. This may also have been explored through more focused interviews with CCOT practitioners. This limitation will be explored further in section 8.4 below. However, inclusion of three sites with three different CCOT models did offer some insight into different models of service. At one site the service was focused solely on supporting post-ICU patients with no additional role in supporting deteriorating patients. Despite these differences, no differences in impact on patient care were detected and the timing of discharge from the services was similar across the three sites. It is not clear why the follow-up only service experienced the same limitations as at the other two sites. However, the remit of this service covered two separate, although geographically close, hospitals and the staffing establishment was smaller than the others, indicating the same constraints of workload may have been present.

This study has established that the system of healthcare does not support post-ICU patients adequately, but it is unlikely that significant change could be made at an organisational level to support this minority of complex, multi-morbid patients. CCOT follow-up visits offer an opportunity to support this system by targeting these vulnerable patients and addressing the common problems in care delivery identified by this study, however any change in focus must be considered within the wider context of the CCOT workload.

In addition to detecting deterioration and supporting the ward with clinical skills, CCOTs were also identified in supporting patients during the transition from ICU to the ward. This role, however, was identified as dependent on discharge planning, requiring advanced warning and time within the workload of ICU, typified by one interviewed CCOT practitioner describing “running out of the ward” with a patient when occupancy pressures required rapid discharge (Chapter Six, section 8.3.3.2). This quote emphasised the lost opportunity to prepare the patients for transfer, supporting this transition, which will be explored in the next section.

8.3.4. Psychological Impact of Post-ICU Ward Care

Fear and anxiety were identified both as a key consequence of the challenges of post-ICU ward care, and a contributory factor to the perception of post-ICU *otherness*. In the model described in Chapter Seven, fear and anxiety were situated as threads spanning the micro, meso and macro layers, to indicate this was an integral part of post-ICU ward care at every level. As identified in the literature review, the psychological impact of being transferred from ICU to the ward has long been recognised (Field et al., 2008; Jones et al., 1979; Leith, 1999). Termed relocation anxiety or transfer stress in the literature, the impact is often characterised by significant concern from patients about the change in staffing ratios, visibility of staff and change of environment. This was often viewed from a psychological perspective (Bench & Day, 2010; Leith, 1999) but there was some recognition of the limitations of ward workload in managing the care needs of dependent patients.

Staff interviewed in this study were aware of relocation stress and discussed strategies to minimise the impact of transfer on patients, including reducing monitoring and giving information on what to expect on the ward (Chapter Six, section 6.2.1). These interventions have also been described in the literature (Bench et al., 2015; Häggström et al., 2013). Despite these efforts, patients still vividly described a strong sense of vulnerability and stress related to their move to the ward. Anxiety described by patients and family members was often focused on care provision rather than change in environment. As identified in section 8.3.1 above, patients discharged from ICU identified themselves as *other* than general ward patients, and that the system of care was unable to meet their needs. This may indicate that relocation anxiety is not solely a reaction to being moved to an area with less staff visibility, but is linked to a lack of continuity of care. Furthermore, the pervasiveness of anxiety amongst staff in relation to transfer may also have been transferred to patients.

Ryan (2012) identified two consequences of *otherness* – “shame and nakedness”, referencing the impact of awareness of this *otherness*, and “resolve and assimilation, leading to integration”, demonstrating adaptation in response to recognition of *otherness*. These consequences reflect the two groups identified by Salmond (2011): those who can cope with the decrease in care availability, and those who cannot. This was also identified in previous studies and interviews with patients, who emphasised the need to view discharge from ICU as a positive step in their recovery (Chapter Two, section 2.4 and Chapter Six, section 6.2.1). In this study, the in-depth reviews identified similar problems in care between survivors and patients who died, although the consequences of these were less significant in the survivors, and problems were less prevalent. Although this finding should be viewed with caution due to the small numbers and convenience sample for survivors (as discussed in limitations, section 8.4 below), this may reflect a group of patients able to adapt to the limitations of ward care, possibly due to lower levels of physical dependency. This was echoed by staff who identified two groups of post-ICU patients – those who were in ICU for a short period, usually following elective surgery, and those who were more vulnerable due to the effects of a longer ICU stay (Chapter Six, section 6.4.1). This may be an important consideration when seeking to improve the care of post-ICU patients, as the needs of all post-ICU patients may not be the same.

In this section the main findings of this study have been discussed in relation to current evidence. The key concept of post-ICU patients as *other* has been explored in reference to the micro, meso and macro aspects of care delivery. At the micro level, characteristics contributing to this *otherness* were identified, including frailty and high dependency, nutritional support and complexity and co-morbidity. At the meso ward level, aspects of care delivery were discussed, including handover and communication, workload and skill mix and medical leadership. At the macro level, two key organisational characteristics in post-ICU care delivery were explored – out-of-hours care provision and Critical Care Outreach Team services. The characteristics at each level were identified as contributing to widely recognised patient anxiety as well as staff fear related to post-ICU ward care. In the next section the key strengths and limitations of this study will be discussed.

8.4. Strengths and Limitations of This Study

This study had several strengths. The mixed methods design allowed the three approaches to be combined to provide a rich, detailed account of post-ICU ward care, in addition to mitigating some of the limitations of the individual methods. The in-depth reviews allowed key cases to be explored in detail, identifying the context and contributory factors to problems in care delivery. This close analysis extended the RCRR data, augmenting the contribution of these data to current knowledge of clinical care delivery. Interviews with patients, families and staff provided multiple perspectives on post-ICU ward care, offering contextual data on the problems in care identified in the RCRR. This data set also offered insight into the reality of care delivery on general wards, and the challenges which need to be overcome when aiming to improve care delivery.

Understanding human factors is widely considered as underpinning patient safety (National Quality Board, 2013; Clinical Human Factors Group, 2013; Taylor-Adams & Vincent, 2004). Using a human factors framework as part of the in-depth reviews facilitated capture of the complexity of how harm occurred, augmenting the traditional RCRR approach to look beyond what problems in care were identified to explore how these may have occurred (Hogan et al., 2014). The framework used in this study is structured to guide examination of the system of care delivery from a wide spectrum of perspectives, from the individual patient and staff member level, through to organisational level policy and decision-making (Taylor-Adams and Vincent, 2004). This structure reflected and supported the micro/meso/macro levels of the model of post-ICU ward care, emphasising the importance of considering factors at every level to gain a comprehensive insight into problems in care delivery. The work within this thesis was a small part of a wider focus on human factors which lies outwith this thesis. Specific problems in care identified during this primary data collection phase of the study were subsequently examined in depth using established human factors techniques including Functional Resonance Analysis Method, Driver Diagrams and Failure Mode and Effect Analysis (Clay-Williams et al., 2015; NHS Improvement, 2010; Clinical Human Factors Group, 2013).

As outlined in the methodology chapter, comprehensive steps were taken to mitigate against biases in this study, including using multiple methods to generate a rich data set. However, there were some limitations to this study. Due to the time pressures of the grant to complete data collection, data collection was undertaken by a small multi-disciplinary team. This collaborative approach to data collection facilitated a wider insight into care delivery than in other studies, where reviewing teams consisted solely of medical staff (Hogan et al., 2012; Rogne et al., 2019). However, poor inter-rater reliability are common criticisms of case record review approaches (Hayward & Hofer, 2001; Hogan, 2016; Hutchinson, 2017; Lilford et al., 2007). Similar studies have reported variable agreement between reviewers with scores of between κ=0.40 and 0.49 (Hogan et al., 2012; Sari et al., 2007; Sorinola et al., 2012). To mitigate against problems with inter-rater reliability, a strict protocol was followed to facilitate reproducibility (outlined in Chapter Three, section 3.3.6.6), including reporting agreement statistics. Reviewers were able to communicate freely and discuss uncertainties in cases, facilitating higher than usual agreement. Interviews were also conducted by two researchers. Chapter Three (section 3.3.7.8) outlines the steps taken to mitigate against bias associated with multiple researchers with different clinical backgrounds, as part of wider efforts to ensure trustworthiness within the study. Despite these efforts, some differences in data were observed, including a more leading approach by the second interviewer potentially reducing the richness of data in responses. This limitation was considered during analysis.

The RCRR and in-depth reviews relied on documentation from a variety of sources. For some data, interpretation of written documentation was required. Clear rules on sources of data and interpretation were agreed between reviewers. Explicit judgements were based on what was documented but care was taken to ensure all potential sources of documentation were carefully reviewed to assess actions in care delivery. In addition, reviewing documentation alone risks missing information due to omissions or inconsistencies in documentation. Case record reviews may also be susceptible to hindsight bias due to knowledge of the outcome of care (Banham-Hall & Stevens, 2019; Hutchinson et al., 2013; Sorinola et al., 2012). These considerations were acknowledged throughout the review and analysis processes. In in-depth reviews 302 problems in care were identified, guided by the frameworks. However, may of the problems may have been interrelated rather than distinct problems, as these were often linked. Numbers of problems should therefore be viewed with some caution.

Despite careful consideration of the method of approach, a key limitation of the interviews was the involvement of only one bereaved family member. It is likely that the lack of response to letters may have been due to the choice of timeframe, or the lack of context from letters received in the post. Evidence suggests that recruitment approach by a known and trusted professional is beneficial in bereavement research (Bentley & O'Connor, 2014; Sque et al., 2014; Stroebe et al., 2003). It is likely that the letter approach was problematic as there was no context or relationship with the study team. The timeframe may also have been problematic, although the choice of six months was supported by literature. Recruitment through a support group gained more interest, but only one family member was willing to be interviewed. However, the timeframe for recruitment through this method was brief, due to the time pressures imposed by the funding. A separate study with more time to develop relationships and allow consideration of involvement may have enabled further recruitment and could be considered in the future. Although this is a limitation of the data, several family members of surviving patients also participated in the interviews, offering a different but still relevant perspective.

Staff members were generally well represented in the sample of staff interviewed, with the notable exception of consultants. Although consultants were approached for interview, appointments were more difficult to arrange. Consultants were identified within the model as key in clinical decision-making and co-ordination of care, and lack of representation in interviews is a significant limitation.

Integrating the data sets in a meta-matrix allowed cross-comparison of findings, facilitating a clear and detailed overview of data. Utilising the micro/meso/macro framework enabled organisation of findings into a cohesive picture of care delivery. This framework allowed identification of the interdependencies of aspects of post-ICU ward care. However, not all identified aspects fit neatly within the layers, with some overlap particularly between ward-based meso characteristics and macro-level organisational aspects. This reflects the complexity of clinical care delivery. Developing these data into a model of post-ICU ward care also offered a visual representation of the challenges of delivering ward-based care to post-ICU patients, emphasising the need to work within the established organisational structure. Removing any one approach would have limited the data considerably. Only by viewing post-ICU ward care from multiple perspectives and in great depth was it possible to develop such a comprehensive picture of the challenges of delivering post-ICU ward care.

As previously discussed, other approaches such as ethnography or focused interviews with specific staff groups may have offered more detailed data on problems in care. However, for the exploratory aim of this study to identify problems in post-ICU ward care, the approach was appropriate. In addition, this study was constrained by the timeframe imposed by funding, which may have limited ethnographic observations. Furthermore, previous studies have focused on adverse events following ICU discharge (Endacott et al., 2010; McLaughlin et al., 2007; Sauro et al., 2020). An alternative to the pre-specified data and in-depths reviews may have been to use a similar approach to identify adverse events in both survivors and patients who died, rather than focusing on preventable deaths. However, details related to adverse events were limited in these studies, and would not have fit the aims of this study to explore post-ICU ward care in depth. In addition, data collection could have focused on National Nursing Quality Indicators, including falls and pressure ulcer prevalence (Montalvo, 2007) or the Safe Nursing Indicators outlined by NICE (National Institute for Health and Care Excellence, 2014). Although these data would have augmented understanding of the challenges of delivering nursing care to post-ICU patients, again this would not have offered a detailed enough picture of care delivery, and would have been limited to nursing perspective. Other approaches could also have been taken to address limitations of documentation, such as collecting ICU bed occupancy data at the time of discharge to explore underlying factors for out-of-hours or premature discharge. Future work will aim to address these limitations by focusing data collection on specific problems identified.

8.5. Generalisability and Transferability

Data were collected for this study at three NHS hospitals: a tertiary referral centre, a large university-affiliated district general hospital and a small district general hospital. The three sites had very different CCOT/follow-up services and were selected to offer a contrast in settings. Chapter Four demonstrated demographic data for all ICU discharges for the three sites with national ICNARC data, and demonstrated little difference, suggesting this study is generalisable in terms of cohort and post-ICU provision in the UK. However, it may be argued that additional sites would have increased generalisability, in particular by including sites with very high or low throughput of patients, where pressure to discharge prematurely or out-of-hours may have varied significantly.

8.6. Contribution to Knowledge and Implications for Practice

Contributions to knowledge from this study fall into three categories: supporting what is already known; developing what was previously known; and offering new data. The RCRR approach has identified a higher degree of potential avoidability in the post-ICU population than general hospital populations, alongside poorer care delivery. This was not previously known and little data were available on the post-ICU non-surviving cohort.

This study has built on previous evidence to identify the *otherness* of post-ICU patients. In previous studies *otherness* has been used in exclusionary terms in reference to discrimination and subjugation of particular groups, often based on ethnicity or gender. In this study the term was used not to identify exclusion or argue for inclusion, but to characterise the perceived differences in a particular patient group. The aim of characterising post-ICU patients as *other* was to offer insight into the challenges of delivering care to this group in order to inform improvements. This identification of *otherness* may to some degree explain the relatively high preventability of death, commonly poor care delivery and profound anxiety experienced by both patients and staff in relation to transfer from ICU. Exploration of care delivery from multiple perspectives has allowed identification of the limitations of current ward care in relation to the needs of post-ICU ward care. This study has developed the perception of relocation anxiety to explore the underlying reasons for the profound stress described by patients in relation to transfer from ICU to the ward. Whilst it is likely some of this anxiety is due to a change in environment, aspects of ward care have been demonstrated as struggling to meet the needs of more dependent post-ICU patients. This was demonstrated by the description from patients of sourcing external help with their care needs. Continuity of care needs was identified as problematic in this study, in reference to the characteristics of *otherness* identified at the micro level. This included poor ongoing management of mobilisation, nutrition and ongoing complexity and high acuity. This continuity was underpinned by poor handover practices, previously identified within the literature as problematic.

This study has demonstrated that the current system of care on the wards may be insufficient to provide safe and high quality care to complex, dependent post-ICU patients. These included staffing, workload, skill mix and medical decision-making and supervision. Any planned changes aiming to improve care delivery must acknowledge the limitations of the current system and offer solutions to these challenges.

Out-of-hours discharge has been previously identified as problematic in post-ICU ward care. This study has demonstrated some of the underlying reasons for this – a higher ward workload at night, reduced staff, and poor supervision. In addition, the role of CCOT was demonstrated as important in providing a supportive safety net. However, within the current limitations of the system patients are discharged from the service within one to two days of transfer. A longer period of follow-up may offer opportunities to improve care, support both ward staff and patients, and reduce the risk of adverse events. However, it is likely that not all patients discharged from ICU will require prolonged follow-up. Duration of follow-up may be based on the presence of risk factors identified as contributing to the *otherness* of post-ICU patients (frailty, high physical dependency, nutritional support and complexity, co-morbidity or acuity).

A number of recommendations for practice can be made based on these findings. These recommendations fall broadly into three levels, representing individual practitioners or wards; single organisations (i.e. NHS trusts); and national policy. At the individual practitioner or ward level, these results may be used to inform care of individual patients. This could include:

- Informing decision-making related to discharge from ICU to the ward, considering individual patients' overall care needs and how these may be met on the ward.
- Avoiding discharging out-of-hours where possible.
- Promoting preparation of patients prior to discharge from ICU, both psychologically and physically, to aid the transition of care.
- Enhancing handover of care between ICU and the ward to support the transfer of care, by either influencing the content of individual handovers, or as a wider local practice change.

- Guiding CCOT practitioners to focus on aspects of care delivery such as rehabilitation, nutrition and clinical management in their own daily practice.

At a local organisational level, these results could inform more widespread clinical change, such as:

- An organisational policy to avoid discharge at night where possible, and support patients and the staff looking after then where this is unavoidable.
- A standardised change to handover processes, including a structured written handover including a clear medical management plan, verbal communication with the team receiving the patient and acknowledgement and a clear management plan for any ongoing clinical problems.
- Refocusing the CCOT remit to follow at-risk patients on the ward for longer, using risk factors to guide selection of patients with increased support needs (such as high physical dependency, nutritional support needs, frailty and co-morbidities).
- Supporting therapies services at an organisational level to prioritise the needs of patients with complex rehabilitation needs following ICU discharge.

At a national level, these findings have the potential to inform policy and service development, including contributing to national standards including Guidelines for Provision of Intensive Care Services and NICE. This could include policies avoiding out-of-hours discharge from ICU, supporting focus on physical rehabilitation and nutritional management, and psychological support of patients being discharged from ICU. The results of this study also have the potential to inform national recommendations from the National Outreach Forum on how CCOTs can focus support on at-risk patients discharged from ICU, and prioritise their needs within the wider remit of their role. This work may also inform debate on the threshold for discharge for ICU, and how changes to this may impact the workload and patient flow of both receiving wards and discharging ICUs.

8.7. Implications for COVID-19

In addition to the implications for practice identified above, this work also has relevance to the COVID-19 pandemic declared by the World Health Organisation on 11th March 2020. In the first five months of the pandemic (to the 30th July 2020), 10,624 patients were admitted to ICUs with confirmed COVID-19 in England, Wales and Northern Ireland. This was a huge increase in comparison with the 5,782 admissions for viral pneumonia in total across the previous three years (ICNARC, 2020). The NHS saw an unprecedented uplift in intensive care beds in response to the pandemic, with significant focus on ensuring sufficient ventilated beds were available to those who needed them, an uplift that is likely to continue with calls for a long-term increase in critical care capacity (Arabi et al., 2020; de Lange et al., 2020; Michard et al., 2020; NHS England, 2020). However, no corresponding uplift in post-ICU services, such as CCOT, occurred nationally to support the increased numbers of patients discharged from ICUs during this surge. Data for this study were collected prior to the pandemic and have identified the difficulties faced by wards in managing complex, dependent post-ICU patients. In addition to the increase in patient numbers, the disease profile of COVID-19 is unique. Survivors had a median LOS of 12 days versus 6 for the historic viral pneumonia cohort and 72.1% required advanced respiratory support, compared with 48.4% (ICNARC, 2020). This high severity of illness required high levels of sedation, prolonged ventilation and an increased need for tracheostomy insertion (Barazzoni et al., 2020). These ICU-based therapies are known to result in significant Post-Intensive Care Syndrome, a key characteristic posing challenges to post-ICU ward management (Rawal et al., 2017).

In addition to the burden of increased patient numbers, the organisational hospital structure may have resulted in wards which may have previously been unfamiliar with post-ICU patients (such as infectious diseases wards with the infrastructure to provide isolation rooms) receiving most of the patients discharged from ICU with COVID-19. As previously identified (section 8.3.2.2), familiarity with post-ICU patients was key in managing the challenges posed by the *otherness* of post-ICU patients. This may have compounded the challenges of managing this cohort of patients, at a time when CCOTs were likely to have an increased workload and were therefore less able to offer support. Furthermore, the pressure of high bed occupancy may also have increased the number of out-of-hours or premature discharges occurring, further pressuring the system of care delivery. The findings of this study therefore offer insights into management of the increased number of patients discharged from ICUs to wards, suggesting a need to ensure adequate resources to support patients discharged from ICU commensurate with increases in capacity within ICUs. Further research is urgently needed to explore how to support patients being discharged from ICU during the current surge in critical care capacity, and ensure preparation for similar pandemics in the future.

8.8. Further Questions and Recommendations for Future Research

As well as the implications for current practice outlined above, this study has identified several gaps which could inform future research. This study was conducted with the aim of informing the design of an intervention to improve post-ICU ward care. As part of the wider grant work, process mapping of rehabilitation, nutrition provision, handover and discharge from ICU has already been undertaken, using the human factors-based Functional Resonance Analysis Method (see Appendix 17 for an example of this work). This process offers further contextual information on the facilitators and barriers of provision of post-ICU ward care, in relation to the complexity and challenges of the system. Future work will involve developing and feasibility testing an intervention aimed at improving post-ICU ward care. Patient and family member groups will be involved in the continuing development and conduct of this work, to ensure the focus remains relevant to this population.

Although this study offered detailed data on the role of CCOTs in post-ICU ward care, there was a problem with cessation of this service within a few days of transfer from ICU. Further research is needed to explore the underlying reasons for this. In particular, the impact of the follow-up role within the wider CCOT role is not well documented. In order to inform changes to this services future research should focus on how follow-up currently fits within the wider CCOT role, what impact a change in prioritisation of patients may have on the workload of CCOTs, which patients would benefit from a longer period of follow-up, and the model of care delivery which would maximise the impact of CCOTs on post-ICU patients. In addition to this, relocation anxiety was identified as an enduring feature of the experience of post-ICU ward care, despite long-standing recognition in the literature and staff efforts to address this. Further work is required to explore what interventions may improve the experience for patients discharged from ICU to the ward.

To summarise, the key future questions for this work are:

- What interventions could be implemented to prevent out-of-hours discharge, and support post-ICU ward care delivery of mobilisation, nutrition delivery, handover and management of complexity?
- Can changes to these areas of care delivery improve patient outcome and patient experience, including reducing anxiety related to transfer to the ward?
- What further interventions could be implemented to improve relocation anxiety in patients and relatives following discharge from ICU?
- Could interventions be delivered within the current CCOT role and how would this impact the current service?
- Which patients should be targeted for a prolonged period of follow-up?

8.9. Conclusion

This study has contributed to the understanding of post-ICU ward care delivery. Post-ICU patients have been identified as *other* than general ward patients. The model of post-ICU care has demonstrated that this *otherness* is difficult to manage within the traditional system of ward care, resulting in a failure to provide continuity between ICU and the ward. Future changes in clinical practice need to acknowledge this context and support post-ICU patients within this established framework. CCOTs are well situated to deliver supportive care but the workload associated with supporting post-ICU patients must be considered in the context of their priorities. However, it is clear from the findings of this study that minimising harm to this complex patient group is imperative to recovery following critical care.

This work will inform development of a complex intervention to deliver this change by supporting staff to deliver safe quality care to patients discharged from ICU aimed at maximising their recovery from critical illness. Findings will also augment current knowledge about post-ICU ward management and will inform post-ICU ward management more widely.

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Appendices

Appendix 1. Systematic Review of ICU Database Studies

Search terms

P = Patients discharged from ICU to the ward

I = (example additional search term: Out-of-hours discharge)

C = (example additional search term: In-hours discharge)

O = In-hospital mortality

A general search was conducted (up to search term 20 below), followed by further searches including specific variables identified in general searches (such as CRP, out-of-hours discharge, tracheostomy presence).

The search strategy was adapted according to the database being searched, but general structure and terms included were:

1. MORTALITY
2. *DEATH.
3. (mortality OR death* OR die OR died)
4. 1 OR 2 OR 3
5. *INTENSIVE CARE
6. *INTENSIVE CARE UNITS
7. *CRITICAL CARE
8. "intensive care"
9. "intensive treatment"
10 "intensive therapy"
11."critical care"
12."critical* ill*"
13. (ITU OR ICU OR AICU)
14. 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13
15. *PATIENT DISCHARGE
16. discharge*
17. (post OR after OR following)
18. (ward* OR inhospital OR "in hospital")
19. "transfer* from"
20. 15 OR 16 OR 17 OR 18 OR 19
Additional search terms for out-of-hours discharge
21. “out of hours”
22. off-hour
23. night-time
24. 21 OR 22 OR 23
25. 4 AND 14 AND 20 AND 24

Appendix 2. Out-of-hours meta-analysis – published papers

Paper 1: Out-of-hours discharge from intensive care, in-hospital mortality and intensive care readmission rates: a systematic review protocol

Summary of contribution:

I designed the study and drafted the protocol for publication, with the support of the co-authors, including statistical advice from SD, guidance on search terms from TP and methodological advice from PW and DY.

Paper 2: Out-of-hours discharge from intensive care, in-hospital mortality and intensive care readmission rates: a systematic review and meta-analysis

Summary of contribution:

I conducted the searches with advice from TP, screened results with PW as second reviewer, collated data, ran initial analyses in ReVMan, followed by further analyses conducted by SD. I drafted the manuscript with advice from all co-authors.

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PROTOCOL **Open Access**

Out-of-hours discharge from intensive care, in-hospital mortality and intensive care readmission rates: a systematic review protocol

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Abstract

Background: Most patients are discharged from an intensive care unit with an expectation that they will survive their hospital stay, yet these patients have high subsequent in-hospital mortality. Patients are frequently discharged from an intensive care unit to a lower level of hospital care in the evenings and at night (out-of-hours). By affecting the care that patients receive, out-of-hours discharge may alter post-intensive care in-hospital mortality rates.

Methods/design: Two searches will be conducted—the first a general search for all factors associated with post-intensive care in-hospital mortality and a second focused specifically on out-of-hours discharges. Searches will be performed in multiple databases, including Medline, Embase, Web of Knowledge, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and the Cochrane Library. OpenGrey will also be searched, to ensure any unpublished 'grey' data are accessed. Language and date restrictions will not be applied. Assessment for inclusion and data extraction will be undertaken by two independent reviewers. Methodological quality will be assessed using the ACROBAT-NRSI tool. The primary outcome measure will be post-intensive care in-hospital mortality. To provide a clearer picture of this problem, studies reporting readmission to the intensive care unit (ICU) will also be included, even in the absence of report of in-hospital mortality.

The primary outcome data will be synthesised and summarised using a random-effects meta-analysis. Where possible, subgroup meta-analyses will assess associated factors such as discharge destination, palliative care discharges and severity of illness scores.

Discussion: To the best of our knowledge, a systematic review of the association of out-of-hours discharge with in-hospital mortality has never been undertaken. Synthesis of the available information is important because out-of-hours discharge remains common and, if associated with post-intensive care unit mortality, is highly amenable to system change.

Systematic review registration: PROSPERO CRD42014010321

Keywords: Intensive care, Critical care, High dependency unit, Mortality, Out-of-hours, Systematic review, Meta-analysis

Background

Rationale

Discharge from an intensive care unit (ICU), rather than representing recovery from the life-threatening part of an illness, is for many patients only the start of a high-risk journey. Subsequent in-hospital mortality rates are reported to be 5.9–13.3 % in multi-centre studies [1, 2], representing around a third of all ICU-associated mortality. These findings compare unfavourably with in-hospital mortality in other groups considered high-risk such as patients after upper gastrointestinal surgery (2.4 %) or cardiothoracic surgical patients (2.7 %) [3, 4]. In fact, in-hospital mortality following discharge from intensive care is at least comparable with mortality for the entire hospital stay (including deaths on intensive care) for patients admitted with acute exacerbations of chronic obstructive pulmonary disease (COPD) (7.5 %) [5]. As early as the 1980s, the need to investigate the discharge and subsequent

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management of patients who survive ICU was acknowledged [6–8]. As out-of-hours discharge from an ICU could be considered a marker of premature discharge (the patient is discharged before they are ready because of bed pressures for example) [9] or because discharge out-of-hours may result in a relatively high-intensity patient arriving in area with less staff than in the daytime, resulting in decreased care [10], some authors have looked specifically at the effect of out-of-hours discharge from an ICU as a factor in this high post-ICU mortality rate [1, 2, 11]. There are also many studies which have retrospectively interrogated intensive care databases which may contain information on the effect of out-of-hours discharge [12, 13]. To the best of our knowledge, a systematic review of the association of out-of-hours discharge with in-hospital mortality, incorporating data from both of these two types of studies, has never been undertaken. Synthesis of the available information is important because out-of-hours discharge remains common [14] and, if associated with post-ICU mortality, is highly amenable to system change.

Objective

This review aims to determine the effect of out-of-hours discharge in comparison to in-hours discharge on post-ICU in-hospital mortality in survivors of treatment on an ICU. Where possible, factors associated with this effect, such as discharge destination, definition of out-of-hours and inclusion of palliative care discharges will also be examined.

Strengths and limitations

This review will be the first to synthesise the evidence on the effect of out-of-hours discharge from ICUs on hospital mortality.

It may be limited by differences in the definitions of ‘out-of-hours’ and ‘in-hours’ between studies (and between institutions in which the research has been undertaken). It may also be limited by different definitions of discharge destination (high dependency unit and ward level). As with all such analyses, it may be limited by the quality of the available data.

Methods/design

This protocol has been developed using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [15], PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analyses—Protocol-specific) [16] and MOOSE (Meta-analysis Of Observational Studies in Epidemiology) guidelines [17] where applicable.

Eligibility criteria

To be included, patients must have been discharged alive from a general surgical, medical or mixed intensive care unit to a lower level of in-hospital care (high dependency or ward level) and at discharge must have been defined as discharged out-of-hours or in-hours. All patient ages (≥16 years) and conditions will be included. The primary outcome measure will be post-ICU in-hospital mortality, and studies reporting this outcome will be included. To provide a clearer picture of this problem, studies reporting readmission to ICU will also be included, even in the absence of report of in-hospital mortality. We will include original studies which use quantitative methods of data collection and analysis. Where appropriate, we will use review articles including systematic reviews to facilitate identification of original data. Date and language restrictions will not be applied, and every effort will be made to access translations of potentially relevant articles not in English. Where possible, we will include both published and unpublished data.

Data sources

Searches will be performed in multiple databases, including Medline, Embase, Web of Knowledge, Cumulative Index of Nursing and Allied Health Literature (CINAHL) and the Cochrane Library. OpenGrey will also be searched, to ensure any unpublished ‘grey’ data are accessed.

Search strategy

The design of this search strategy will be guided by a medical librarian, who will assist in the conduct of these searches. Two searches will be conducted—the first a general search for all factors associated with post-ICU in-hospital mortality and readmission to ICU and a second focused specifically on out-of-hours discharges. The two searches will be conducted as some studies may report out-of-hours discharge as one of many variables contributing to post-ICU in-hospital mortality, and therefore, a more focused search would miss these, particularly if the findings are non-significant and therefore unlikely to feature in the abstract. Also, where studies are found in the general search which report multiple variables associated with post-ICU in-hospital mortality but which do not report the effect of out-of-hours discharge, authors will be contacted to discover whether this information was extracted, but not published. We anticipate that studies reporting readmission to ICU will also report in-hospital mortality, but both search terms will be included to ensure we capture all relevant studies. An initial detailed search strategy for Medline is included as an additional file (Additional file 1) and will be adapted where necessary to the database being searched. Search terms will include (mortality OR death* OR die OR died OR readmission), (ITU OR ICU OR AICU OR intensive care OR critical care OR intensive therapy unit), (post OR after OR following OR discharge OR ward* OR inhospital OR ‘in hospital’ OR ‘transfer* from’) and (‘out-of-hours’ OR off-hour OR night*time OR evening). Where possible, terms will be 'exploded' and MeSH terms will be used. Once both searches have been conducted, the findings will be pooled and duplicates removed. The focused search will act as a second check to ensure no pertinent studies are missed.

Once the initial searches have been performed and a list of studies for inclusion has been agreed, we will conduct further searches using relevant keywords (using Medline) from papers included from the initial search and citation searches (using Web of Knowledge) for each paper.

Study selection

Results will be reviewed in three stages—at title, at abstract and at full text.

Stage 1: Search results will be screened by title by two independent researchers and either rejected as obviously not relevant or selected for abstract review. Where disagreement occurs at this stage, the article will remain for consideration at the abstract stage.

Stage 2: Articles selected at title will have abstracts reviewed by two independent researchers and either rejected as obviously not relevant or selected for full text review. Any discrepancies between the two researchers will be discussed and agreed with a third reviewer. Where any doubt remains, the full text will be retrieved.

Stage 3: Full text articles for review will be collated and will be assessed independently by two reviewers. Studies which otherwise meet inclusion criteria will be excluded if

- They included patients who were predominantly discharged from specialist intensive care units (for example cardiothoracic or neurosurgical units) or were restricted to a specialist patient group (for example liver transplant patients).
- Post-ICU mortality cannot be identified from whole hospital stay mortality.
- Follow-up was discontinued before hospital discharge.

As before, any discrepancies between reviewers will be discussed with a third reviewer. Where eligibility cannot be ascertained, the authors of the study will be contacted for clarification. An overview of the selection process is shown in Fig. 1.

Data collection process

After conducting the searches, the results will be exported to an independent database and merged and duplicates automatically identified and removed, as described above. Each team member will receive a copy of this final database, using a reference manager software (Endnote, Thomson Reuters, www.endnote.com).

Data for each study will be extracted by two researchers using data extraction tables which will be piloted prior to use. These data will include the type of publication, date of publication, study type, setting, numbers of patients, eligibility criteria, missing data, definitions of in-hours and out-of-hours and main findings: numbers of deaths in each group, effect sizes (relative risk or odds ratio and their CIs), population and cohort data, main conclusions and data to allow risk of bias analysis (see Table 1). Where there is lack of clarity in the data extracted, this will be sought from the authors. Where studies do not report participant-level data, this will be sought from the authors.

Protocol amendments

To ensure transparency of process, any amendments to this protocol will be documented separately with date, description and rationale. Amendments will not be made to the main body of the protocol, as suggested by the PRISMA-P guidelines [16].

Analysis

Risk of within-study bias assessment

Once all searches have been completed, the included studies will be assessed for quality using the Cochrane Risk Of Bias Assessment Tool: for Non-Randomized Studies of Interventions (ACROBAT-NSRI) [18]. This scale examines bias in seven domains through four stages of a study: pre-intervention, at-intervention and post-intervention. The final output offers five levels of risk of bias: low risk, moderate risk, serious risk, critical risk and no information on which to base a judgement.

It is not anticipated that results will be used to weight studies in the meta-analysis, but the results will be used to aid assessment of the overall results. This will be addressed in the discussion. Bias assessment of individual papers will be made available in the final publication.

Synthesis of results

From extracted data, the mortality rate of out-of-hours discharges and that of in-hours discharges will be compared over all included studies. As there are likely to be different definitions of out-of-hours discharge between studies and some studies may include different types of discharge criteria, it is expected that effects may vary between studies. Therefore, data will be synthesised and summarised using a random-effects meta-analysis with the mortality risks expressed as relative risk, showing the mean effect and 95 % confidence intervals, with the significance level (*p* value). The DerSimonian and Laird Method of computing the between-studies variance will be utilised. Results will be displayed in a forest plot using either RevMan (http://tech.cochrane.org/revman) or using the Stata metan procedure (StataCorp LP). This process

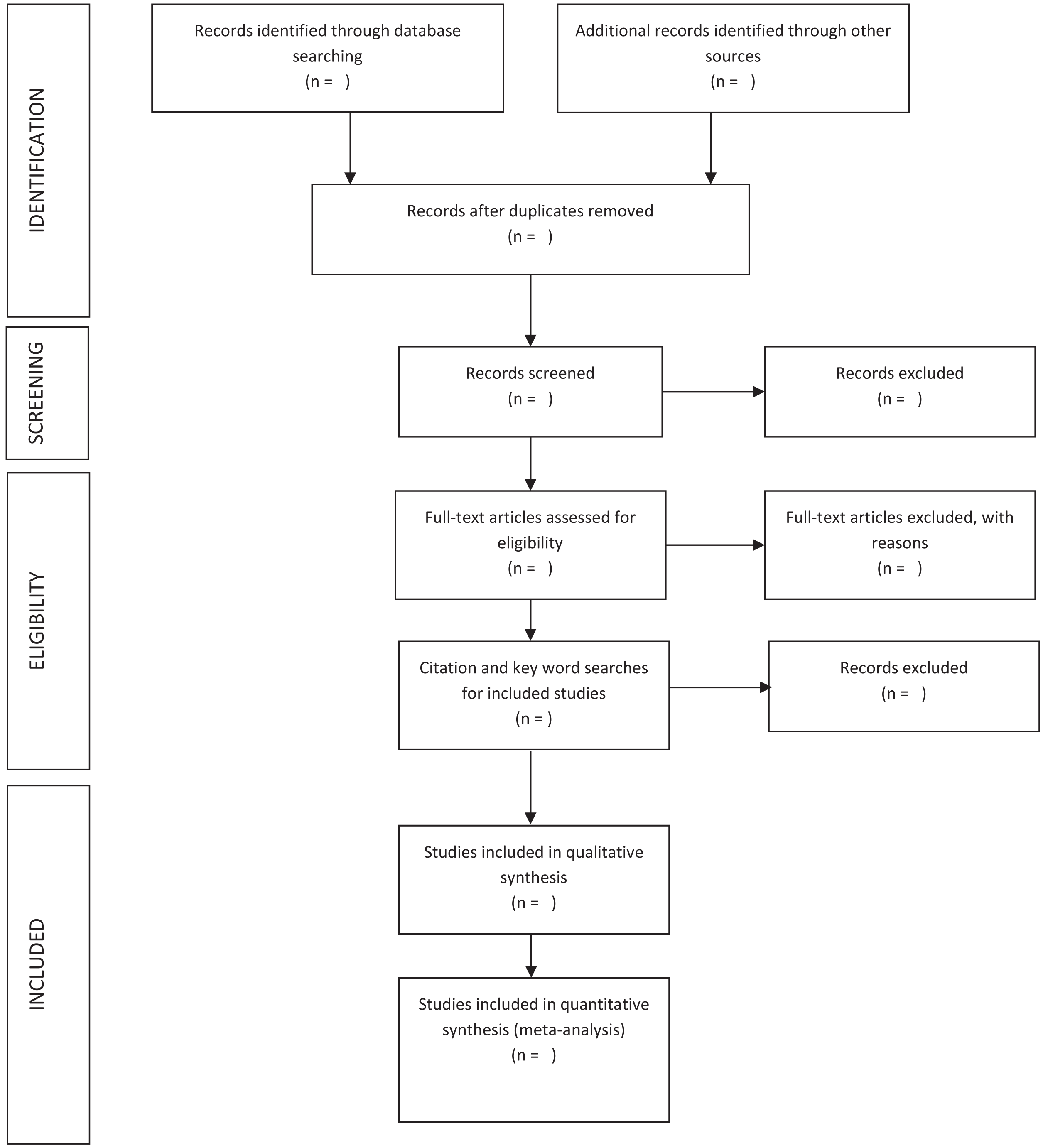

Fig. 1 PRISMA flowchart

will also be followed to analyse readmission to ICU for out-of-hours and in-hours discharges.

Assessment of heterogeneity for meta-analysis

Based on our current knowledge of the available data, it is anticipated that meta-analysis will be possible for some if not most studies. Data will be aggregated at the level of individual studies. An assessment of heterogeneity will be made (using both the χ^2 test and the I^2 statistic). Sensitivity analysis will be carried out by repeating the random-effects meta-analysis omitting studies of different quality or risk of bias.

Risk of bias across studies

Visual assessment of funnel plots and Egger's regression will be used to assess publication bias. The GRADE

Table 1 Data extraction categories

Patients/ population	Age, sex, surgical status (elective, emergency, none), severity of illness assessment. Availability of high-dependency care within ICU or in discrete unit, ICU type
	Assessment of occupancy
	Assessment of premature discharge
Intervention	Proportion discharged 'in-hours'. Definition of in-hours
	Discharge destination (level of subsequent care)
	Proportion of discharges deemed 'premature'
Comparison	Proportion discharged 'out-of-hours'. Definition of out-of-hours
	Discharge destination (level of subsequent care)
Outcome assessment	Mortality associated with out-of-hours discharge
	Data source for mortality
	Coding of palliative care patients
	Missing data
	Readmission rate
	Data source for readmission rate associated with out-of-hours discharge
	Severity score assessment of in-hours versus out-of-hours groups
Study	Study design, number of sites, authors, publication year, country, duration
	Primary endpoint (where stated) or main focus (time of discharge versus factors associated with outcome post-discharge, other)
Quality assessment	ACROBAT-NRSI criteria
	Sources of participants
	Follow-up time
	Completeness of data
	Adjustment for potential confounders
	Further subjective assessment in relation to heterogeneity of studies
	Method of severity of illness assessment
	Method of risk adjustment
	Risk-adjusted results

(Grading of Recommendations Assessment, Development and Evaluation) methodology will be used to report the overall strength of the review as high, moderate, low or very low [19].

Subgroup analysis

If sufficient numbers of studies differentiate between discharge destinations (ward or 'high dependency' area), a random-effects subgroup meta-analysis will be undertaken. Other potential subgroup analyses that will be undertaken if there are sufficient studies will include different definitions of out-of-hours and in-hours, inclusion or exclusion of patients discharged for palliative care (or other similar limitation of treatment) and whether intensive and high-dependency care were provided within the same physical facility. In addition, reflecting the potential for change in practice across the time spread of studies, differential effects over time will be considered and analysed if sufficient data are available. These analyses will be presented as before but for the individual subgroups and combined overall.

Discussion

This systematic review will synthesise current available evidence on whether out-of-hours discharge affects post-ICU in-hospital mortality, a synthesis which has not previously been undertaken. In undertaking the proposed subgroup meta-analyses, associated considerations (such as inclusion of palliative care discharges and level of care at discharge destination) will also be examined. Whilst, as with all systematic reviews, the findings may be limited by the quality, comparability and potential biases within the available literature, undertaking the analysis remains important. Preventing out-of-hours discharge impacts out-of-hours admissions, where delay may also have deleterious consequences or require costly spare capacity within intensive care units. It is therefore only rational to prevent out-of-hours discharge if there are significant deleterious consequences to these patients. Conversely, if out-of-hours discharge does present a significant patient risk, it is highly amenable to system change.

Study registration

This systematic review has been registered with PROSPERO—the international prospective register of systematic reviews, registration number: CRD42014010321.

Additional file

Additional file 1: Sample search strategy. An initial detailed search strategy for Medline.

Abbreviations

ACROBAT-NRSI: A Cochrane Risk Of Bias Assessment Tool: for Non-Randomized Studies of Interventions; AICU: adult intensive care unit; CI: confidence interval; CINAHL: Cumulative Index of Nursing and Allied Health Literature; COPD: chronic obstructive pulmonary disease; GRADE: Grading of Recommendations Assessment, Development and Evaluation; ICU: intensive care unit; ITU: intensive therapy unit; MeSH: medical subject headings; MOOSE: Meta-analysis Of Observational Studies in Epidemiology; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PRISMA-P: Preferred Reporting Items for Systematic Reviews and Meta-Analyses—Protocol-specific.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

SAV and PJW conceived the original idea. SAV prepared the manuscript with revisions from PJW and JDY. SJD provided statistical advice. All authors read and approved the final manuscript.

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SYSTEMATIC REVIEW

Out-of-hours discharge from intensive care, in-hospital mortality and intensive care readmission rates: a systematic review and meta-analysis

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Abstract

Purpose: Discharge from an intensive care unit (ICU) out of hours is common. We undertook a systematic review and meta-analysis to explore the association between time of discharge and mortality/ICU readmission.

Methods: We searched Medline, Embase, Web of Knowledge, CINAHL, the Cochrane Library and OpenGrey to June 2017. We included studies reporting in-hospital mortality and/or ICU readmission rates by ICU discharge "out-of-hours" and "in-hours". Inclusion was limited to patients aged ≥ 16 years discharged alive from a non-specialist ICU to a lower level of hospital care. Studies restricted to specific diseases were excluded. We assessed study quality using the Newcastle Ottowa Scale. We extracted published data, summarising using a random-effects meta-analysis.

Results: Our searches identified 1961 studies. We included unadjusted data from 1,191,178 patients from 18 cohort studies (presenting data from 1994 to 2014). "Out of hours" had multiple definitions, beginning between 16:00 and 22:00 and ending between 05:59 and 09:00. Patients discharged out of hours had higher in-hospital mortality [relative risk (95% CI) 1.39 (1.24, 1.57) $p < 0.0001$] and readmission rates [1·30 (1.19, 1.42), $p < 0.001$] than patients discharged in hours. Heterogeneity was high (I^2 90.1% for mortality and 90.2% for readmission), resulting from differences in effect size rather than the presence of an effect.

Conclusions: Out-of-hours discharge from an ICU is strongly associated with both in-hospital death and ICU readmission. These effects persisted across all definitions of "out of hours" and across healthcare systems in different geographical locations. Whether these increases in mortality and readmission result from patient differences, differences in care, or a combination remains unclear.

Keywords: Intensive care, Out of hours, Intensive care readmission, In-hospital mortality

Introduction

The days in hospital following discharge from an intensive care unit (ICU) are high risk. In multi-centre studies, in-hospital mortality rates after ICU discharge are between 4.0 and 13.3% [1, 2], and account for one-third of all in-hospital deaths in patients treated in an ICU. These findings compare unfavourably with in-hospital mortality in other "high-risk" patient groups, cardiothoracic (2.7%) or upper gastrointestinal (2.4%) surgery [3, 4]. While in hospital, patients discharged from an ICU remain at high risk of requiring re-admission to an ICU [5–7]. Readmission to an ICU is associated with

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substantially higher mortality rates than a single admission [1, 5, 8].

Whether out-of-hours discharge from an ICU to a ward is associated with these poor outcomes is unclear, with studies showing differing results [1, 9–11]. Where an association has been found, opinions differ as to whether out-of-hours discharge from an ICU results in differences in care that cause these outcomes [12–14]. Observed outcome differences may also be explained because the population discharged out-of-hours differs from that discharged in-hours rather than there being differences in care. There are reasons why these differences in population might occur. If discharge out-of-hours results from bed pressures (more patients requiring admission to the ICU than available beds) [12], patients thought unlikely to benefit from further ICU support may be discharged preferentially. In this case, it would be expected that readmission rates in those discharged out-of-hours should be lower than in those discharged in-hours. Alternatively, if the patients are discharged before the point they no longer need ICU care, mortality and readmissions may increase.

Some researchers have looked specifically at out-of-hours discharge as a factor in post-ICU mortality or readmission [2, 8, 11, 15], and other cohort studies have included the effect of out-of-hours discharge in broader studies of mortality and readmission rates [5, 16–18]. To the best of our knowledge, a robust systematic review of the association of out-of-hours discharge with in-hospital mortality and ICU readmission, including both types of study, has never been undertaken. Synthesis of this information is important because out-of-hours discharge remains common [19]. If associated with post-ICU mortality or readmission, it is highly amenable to system change. If not, discharge at night may be a reasonable course to optimally manage ICU occupancy.

Our primary objective was to determine whether discharge from a general medical, surgical or mixed medical–surgical ICU out-of-hours in comparison to in-hours is associated with subsequent in-hospital mortality. Our secondary objective was to determine whether out-of-hours discharge in this population in comparison to in-hours discharge is associated with ICU readmission. As both ICU provision and practice differs internationally [20], we looked for geographical effects on these outcomes.

Methods

Search strategy and selection criteria

We registered this systematic review and meta-analysis with PROSPERO (CRD42014010321). We published the protocol (https://systematicreviewsjournal.biomedcentral.com/articles/10.1186/s13643-015-0081-8) [21] and followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [22] and MOOSE (Meta-analysis Of Observational Studies in Epidemiology) guidelines [23] where applicable.

To be included, studies had to: report in-hospital mortality and/or ICU readmission rates for all patients aged ≥ 16 years discharged alive from a general surgical, medical or mixed ICU to a lower level of in-hospital care (high dependency or ward-level); report these outcomes separately for patients discharged from ICU out-of-hours and in-hours; and follow-up patients to hospital discharge. We defined “out-of-hours” and “in-hours” as separate time periods in each day of the week with “out-of-hours” including 00:00 and “in-hours” including 12:00. We did not change definitions for the weekend period. Studies that separated weekday and weekend but did not separate in-hours from out-of-hours were excluded. We excluded papers where patient episodes included in the out-of-hours analysis also contributed to the analysis in a larger study. We also excluded studies restricted to specific patient populations (e.g. patients who underwent cardiac surgery, were managed in a specialist neurosurgical intensive care or received liver transplants). We included prospective or retrospective original studies that used quantitative methods of data collection and analysis. All publication languages were included. We did not apply date restrictions. We included unpublished data, where found.

We performed searches in Medline, Embase, Cumulative Index of Nursing and Allied Health Literature (CINAHL), the Cochrane library and OpenGrey. The last search date for all databases was 12 June 2017. Reviews or reports of risk factors at ICU discharge may not refer to out-of-hours in the title or abstract, particularly if the effects were not significant. To address this, we conducted two searches: a general search for all factors associated with post-ICU in-hospital mortality or readmission and a search focused specifically on out-of-hours discharges. A medical librarian (T.P.) guided our search strategy. Details of the search strategy are shown in the supplementary material, Table 1. We undertook additional keyword and citation searches from identified studies using Medline and Web of Knowledge.

Take-home message

Out-of-hours discharge from an ICU is strongly associated with both in-hospital death and ICU readmission. These effects persisted across all definitions of “out of hours” and across healthcare systems in different geographical locations. Whether these increases in mortality and readmission result from patient differences, differences in care, or a combination remains unclear.

Data analysis

We exported all search results to a reference management software programme (Endnote; Thomson Reuters, www.endnote.com), which automatically identified duplicates. Two researchers (P.W. and S.V.) reviewed the initial results in three stages (title, abstract and full text). We resolved disagreements by recourse to the original text. From this list, further searches using relevant keywords (using Medline), and citation searches (using Web of Knowledge) for each paper were conducted.

Two researchers (S.V. and P.W.) extracted summary estimate data (relative risk or odds ratios, where reported) independently from each identified study. We used data extraction tables that we piloted before use. We extracted type of publication (academic paper or conference paper), publication date, study type, setting, eligibility criteria, proportion and strategy for missing data, and definitions of in-hours and out-of-hours. We extracted data on the numbers of patients included in the study, numbers of deaths and readmissions, demographic data including illness severity (where reported by in-hours and out-of-hours), co-variates used in multi-variate analysis and main conclusions (see Tables 1, 2 and 3). We extracted additional data to determine risk of bias using the Newcastle–Ottawa Scale [24]. Where data or details were missing, we contacted the authors by e-mail.

We compared mortality rates and readmission rates in patients discharged from intensive care out-of-hours versus in-hours. For each study, we calculated risk ratios and 95% confidence intervals for each of the available outcomes, mortality and readmission. We summarised data using a random-effects meta-analysis (to account for the variance we found between studies). We used the DerSimonian and Laird method of computing the between-studies variance [25]. We present results in forest plots using the STATA metan procedure [26]. We aggregated data at the level of individual studies. We assessed consistency using both the χ^2 test and the I^2 statistic [27]. Where studies adjusted their analysis for potential confounders, we summarised odds ratios using the same methods.

We pre-specified sensitivity analysis by omitting studies of different quality or risk of bias. We pre-specified subgroup analyses by discharge destination (ward or high dependency unit, as defined by the authors), different definitions of out-of-hours and inclusion of patients receiving palliative care (again as defined by the authors), where there were sufficient studies. As ICU practice and provision is known to vary geographically [20], we undertook post hoc analyses of the effect of out-of-hours discharge on mortality and readmission to an ICU by the main geographical areas of the published studies (United Kingdom, Europe, Australasia, Asia, United States of America with South America and Canada).

We used the Newcastle–Ottawa Scale (NOS) to assess study quality [24]. This tool focuses on three broad areas: selection of groups, comparability of groups and ascertainment of outcome. The final output offers a score out of nine. We selected discharge destination (ward or high dependency unit), age and "admission severity of illness" as potential confounders. Two reviewers (S.V. and P.W.) separately assessed the studies. We resolved disagreements by discussion or referral to a third reviewer if necessary. We assessed the risk of publication bias by visual assessment of funnel plots and Egger's regression [28]. We assessed study heterogeneity using both the χ^2 test and the I^2 statistic [27].

Results

We identified 1961 papers, of which 329 were deemed potentially eligible and reviewed at abstract. A total of 154 full text papers were reviewed following abstract screening (Fig. 1). We identified 34 articles eligible for inclusion (4 conference abstracts and 30 papers), of which 16 were subsequently excluded. Nine studies were excluded because they included data also reported in a larger study (i.e. large national database studies) [6, 13, 19, 29–34]. Four studies were deemed ineligible on further review. We contacted the authors of three papers: two were excluded as we could not obtain patient numbers, and one paper contained reporting errors which the authors were unable to resolve.

We included 18 studies (14 papers and 4 conference abstracts) in the meta-analysis [1, 2, 5, 8–11, 15–18, 35–41]. The 18 studies (9 multicentre and 9 single centre) included 1,191,178 patients. The characteristics of the included studies are shown in Table 1. Study size ranged from 296 to 263,082 patients. Study duration varied between 5 months and 9 years. ICU admission periods spanned 1994–2014. Nine papers reported both mortality and readmission, seven reported mortality only and two readmission only.

Definitions of out-of-hours varied, starting between 16:00 and 22:00 and ending between 05:59 and 09:00. Two studies [2, 37] performed more than one analysis using different definitions of out-of-hours. As 13 of the other 16 studies defined out-of-hours as commencing between 18:00 and 22:00, we selected the definition starting between these times for inclusion in this analysis (Table 1). All studies presented data for the same time periods at the weekend as in the week.

Five of seven studies that compared illness severity between in-hours and out-of-hours discharges found significantly higher severity of illness at admission in the out-of-hours group (Table 2) [1, 2, 8, 10, 35]. Different

Table 1 Characteristics of included studies

Authors	Type of publication	Date of cohort	Country	Setting	Study design	Primary endpoint/main focus	Type of ICU	Exclusion criteria	Out-of-hours definition	Discharge destination	Proportion of cohort discharged out-of-hours (%)
Araujo el al. (2012) [16]	Paper	2008–2009	Portugal	Single centre	Retrospective cohort,	Risk factors for post-ICU in-hospital mortality	Mixed medical-surgical (including 7.6% cardiac surgery)	None reported	20:00–08:00	High dependency unit or ward (proportions not stated)	16/296 (5.4)
Azevedo et al. (2015) [10]	Paper	2002–2009	Canada	Multicentre	Retrospective cohort	In-hospital mortality following out-of-hours ICU discharge	Mixed medical-surgical	Patients with missing data ($n = 399$, 1.8%)	19:00–07:59	Not clearly stated	3505/19,622 (17.9)
Barker and Flint (2010) [39]	Conference abstract	2002–2009	UK	Single centre	Retrospective cohort	In-hospital mortality and readmission following out-of-hours ICU discharge	Mixed medical-surgical	Patients with missing data ($n = 16$, 0.3%)	16:00–07:59	Not stated	2565/5145 (49.9)
Bramma et al. (2012) [37]	Conference abstract	Not reported (3 year collection period)	UK	Single Centre	Retrospective cohort	In-hospital mortality following out-of-hours ICU discharge	Mixed medical-surgical	Patients with missing data (n not reported)	20:00–07:59[a] or 17:00–07:59	Not stated	159/766 (20.8)
Edie et al. (2015) [40]	Conference abstract	2007–2014	UK	Single centre	Retrospective cohort	In-hospital mortality following out-of-hours ICU discharge	Mixed medical-surgical	Palliative care at discharge ($n = 80$, 2.5%)	22:00–06:59	Not stated	478/3189 (15)
Gantner et al. (2014) [1]	Paper	2005–2012	Australia	Multicentre	Retrospective cohort	In-hospital mortality following out-of-hours ICU discharge	Mixed medical-surgical (ANZICS database)	Patients with missing data ($n = 32{,}365$, 4.4%)	18:00–05:59	Not stated	109,384/710,535 (15.4)
Goldfrad et al. (2000) [2]	Paper	1995–1998	UK	Multicentre	Retrospective cohort	In-hospital mortality following out-of-hours ICU discharge	Mixed medical-surgical	Patients with missing data ($n = 431$, 2·6%)	22:00–06:59[a] or 00:00–04:59	Split by high dependency unit and ward	1009/16,756 (6)

Table 1 continued

Authors	Type of publication	Date of cohort	Country	Setting	Study design	Primary endpoint/main focus	Type of ICU	Exclusion criteria	Out-of-hours definition	Discharge destination	Proportion of cohort discharged out-of-hours (%)
Gopal et al. (2010) [38]	Conference abstract	2007–2009	UK	Single centre	Retrospective cohort	In-hospital ICU-readmission following out-of-hours ICU discharge	Mixed medical-surgical	None reported	20:00–09:00	Not stated	249/1050 (23.7)
Hanane et al. (2008) [11]	Paper	2003–2006	USA	Single centre	Retrospective cohort	In-hospital mortality and ICU-readmission following out-of-hours ICU discharge	Mixed medical-surgical	< 4 h on ICU	19:00-06:59	Not clearly stated	418/11,659 (3.6)
Iapachino et al. (2003) [17]	Paper	1994–1995	Europe	Multicentre	Retrospective cohort	Risk factors for post-ICU in-hospital mortality	Mixed medical-surgical	"low intensity" patients, Patients with missing data (*n* not reported)	22:00–06:59	Ward (HDU analysed separately)	85/5805 (1.4)
Kramer et al. (2013) [5]	Paper	2002–2010	USA	Multicentre	Retrospective cohort	In-hospital ICU-readmission following out-of-hours ICU discharge	Mixed, (including 22.7% cardiac and 8.3% neurological)	Patients < 16 years, with burns, stay < 4 h, discharged to another facility ($n = 49,303$, 15.7%)	19:00–06:59	Ward or HDU, proportions not stated	66,770/263,082 (25.4)
Laupland et al. (2011) [15]	Paper	2006–2010	France	Multicentre	Prospective cohort	In-hospital mortality associated with admission to and discharge from ICU time	Mixed medical-surgical	Patients with missing data (*n* not reported)	18:00–07:59	Not stated	659/5992 (9.5)
Lee et al. (2016)	Paper	2011–2013	Korea	Single centre	Retrospective cohort	Risk factors for post-ICU in-hospital mortality	Medical	Patients < 18 years, transferred to another facility, palliative discharge	19:01-06:59	High dependency unit or ward, proportions not stated	39/383 (10.2)

Table 1 continued

Authors	Type of publication	Date of cohort	Country	Setting	Study design	Primary end-point/main focus	Type of ICU	Exclusion criteria	Out-of-hours definition	Discharge destination	Proportion of cohort discharged out-of-hours (%)
Pilcher et al. (2007) [8]	Paper	2003–2004	Australia	Multicentre	Retrospective cohort	In-hospital mortality and ICU-readmission following out-of-hours ICU discharge	Mixed, cardiac and neuro unknown	Not reported	18:00-05:59	Not stated	13,986/76,690 (18.2)
Priestap et al. (2006) [35]	Paper	2001–2004	Canada	Multicentre	Retrospective cohort	In-hospital mortality following out-of-hours ICU discharge	Mixed, cardiac excluded	Patients < 16 years, patients after cardiac surgery, patients admitted due to lack of available bed, transferred to another facility (*n* = 7270, 13.3%)	21:00–06:59	Not stated	4772/47,062 (10.1)
Ranzani et al. (2012) [18]	Paper	2005–2008	Brazil	Single centre	Retrospective cohort	Association between C-reactive protein and post-ICU in-hospital mortality	Medical	Patients with < 72 h on ICU (n = 189, 13.5%), Patients with missing data (*n* = 141 19.1%)	22:00–06:59	Not stated	60/409 (14.7)
Utzolino et al. (2010) [9]	Paper	Not reported	Germany	Single centre	Retrospective cohort	In-hospital mortality and ICU-readmission following out-of-hours ICU discharge	Mixed medical-surgical	Not reported	16:00–07:59	Ward	439/2114 (20.8)
Uusaro et al. (2003) [36]	Paper	1998–2001	Finland	Multicentre	Retrospective cohort	In-hospital mortality associated with admission to and discharge from ICU time	Mixed medical-surgical	Not reported	16:01–07:59	Not stated	3671/20,623 (17.8)

[a] Definition selected for inclusion where more than one is reported

Table 2 Cohort characteristics by study

Authors	Population age (in-hours vs. out-of-hours) Mean (SD) or mean (95% CI)	Population sex (in-hours vs. out-of-hours) % male	Surgical status (in-hours vs. out-of-hours) % by category	Severity of illness (in-hours vs. out-of-hours) Score type Mean (SD) or median (95% CI)
Araujo el al. (2012) [16]	Not reported[b]	Not reported[b]	Not reported	Not reported[b]
Azevedo et al. (2015) [10]	57.5 (18.0) vs. 57.2 (17.9) $p=0.30$	58.1 vs. 56.7 $p=0.11$	Post-operative 35.3% vs. 25.9% $p<0.001$	APACHE[a] II: 19.3 (7.4) vs. 20.1 (7.6) $p<0.001$
Barker and Flint (2010) [39]	Not reported	Not reported	Not reported	Not reported
Bramma et al. (2012) [37]	51.9 (18.1) vs. 54.0 (17.7) p not reported	48.9 vs. 50.9 $p=0.65$	Not reported	APACHE[a] II: 15.8 (8.7) vs. 17.4 (8.0) p not reported
Edie et al. (2015) [40]	Not reported	Not reported	Not reported	Not reported
Gantner et al. (2014) [1]	60.3 (19.3) vs. 59.4 (19.8) $p<0.001$	Not reported	Not reported	APACHE[a] III: 46.5 (22.9) vs. 50.0 (25.3) vs $p<0.001$
Goldfrad et al. (2000) [2]	58.2 (57.9, 58.5) vs. 57.5 (56.4, 58.7) p not reported	Not reported	Not reported	APACHE[a] II: 14.6 (14.5, 14.7) vs. 15.5 (15.1, 160.0)
Gopal et al. (2010) [38]	Not reported	Not reported	Not reported	Not reported
Hanane et al. (2008) [11]	62.7 (17.8) vs. 61.6 (18.0) $p=0.230$	53.1 vs. 56.0 $p=0.24$	Not reported	APACHE[a] III: 51.2 (23.6) vs. 53.2 (24) $p=0.088$
Iapachino et al. (2003) [17]	Not reported[b]	Not reported	Not reported[b]	Not reported[b]
Kramer et al. (2013) [5]	Not reported[c]	Not reported[c]	Not reported[c]	Not reported[c]
Laupland et al. (2011) [15]	Not reported[d]	Not reported[d]	Not reported[d]	Not reported[d]
Lee et al. (2017) [41]	Not reported	Not reported	Not reported	Not reported[b]
Pilcher et al. (2007) [8]	59.1 (±0.17) vs. 58.6 (±0.08) $p=0.009$	Not reported	Not reported	APACHE[a] III: 46.0 (±0.1) vs. 47.7 (±0.1)
Priestap et al. (2006) [35]	61.7 (17.5) vs. 61.6 (17.7) $p=0.930$	57.4 vs. 58.0 $p=0.46$	Non-surgical 60.5 vs. 68.2 $p<0.001$	APACHE[a] II: 15.0 (7.4) vs. 15.7 (7.7) $p<0.001$
Ranzani et al. (2012) [18]	Not reported[b]	Not reported[b]	Not reported[b]	Not reported[b]
Utzolino et al. (2010) [9]	62.7 vs. 59.9 (SD not reported) reported as $p=$ NS	55 vs. 57 $p=0.44$	Not reported	Not reported
Uusaro et al. (2003) [36]	Not reported	Not reported	Not reported	Not reported[b]

[a] Acute physiology and chronic health evaluation

[b] Reported as survivors vs. non-survivors

[c] Reported as categorical data by % of readmissions

[d] Reported cohort data included discharges during weekend days

measures of illness severity were used, preventing pooling of data. Two of eight studies that compared age between in-hours and out-of-hours discharge found significant differences (both Australasian studies finding patients discharged at night to be slightly younger) [1, 8]. None of the five studies that compared gender between in-hours and out-of-hours found significant differences. The absence of data in many of the included studies, combined with the different measures of illness severity used prevented post hoc analysis to investigate whether differences between in-hours and out-of-hours populations accounted for differences in outcome.

We included 16 studies containing data on 927,046 patients in the mortality analysis. Figure 2 shows the association between out-of-hours ICU discharge and mortality. The pooled relative risk estimate for discharge at night (95% CI) was 1.39 (1.24, 1.57), $p<0{\cdot}0001$. Out-of-hours discharge was associated with significant increases in in-hospital mortality for all definitions of out-of-hours (supplementary material, Fig. 1). Overall heterogeneity was high (I^2 statistic 90.1%), mainly arising from differences in the size (rather than the presence and direction) of the effect in studies defining out-of-hours commencing 18:00–21:59.

Table 3 Unadjusted and adjusted odds ratios with included co-variates for mortality and readmission

Authors	Co-variates for adjustment	Mortality, calculated unadjusted odds ratios (95% CI)	Mortality, reported adjusted odds ratio (95% CI)	Readmission, calculated unadjusted odds ratios (95% CI)	Readmission, reported adjusted odds ratios (95% CI)
Araujo el al. (2012) [16]	n/a	0.78 (0.21, 2.82)	n/a	n/a	n/a
Azevedo et al. (2015) [10]	Age, co-morbidities, APACHE^a II, use of mechanical ventilation, ICU length of stay, surgical status, admission source, primary diagnostic category, study year.	1.37 (1.22, 1.54)	1.29 (1.14, 1.46)	1.08 (0.94, 1.25)	n/a
Barker and Flint (2010) [39]	n/a	1.49 (1.20, 1.84)	n/a	1.10 (0.87, 1.39)	n/a
Bramma et al. (2012) [37]	n/a	1.12 (0.63, 2.02)	n/a	n/a	n/a
Edie, Burt and Paddle (2015) [40]	n/a	1.62 (1.12, 2.33)	n/a	1.18 (0.78, 1.78)	n/a
Gantner et al. (2014)	APACHE^a III predicted mortality, presence of treatment limitations, diagnostic category and clustering by site	1.84 (1.79, 1.89)	1.34 (1.30, 1.38)	1.15 (1.11, 1.18)	n/a
Goldfrad et al. (2000) [1]	APACHE^a II, premature discharge	1.48 (1.25, 1.75)	1.33 (1.06, 1.65)	1.26 (0.99, 1.60)	n/a
Gopal et al. (2010) [38]	Age, gender	n/a	n/a	3.16 (2.05, 4.86)	2.75 (1.7, 4.3)
Hanane et al. (2008) [11]	Do not resuscitate status, last ICU day APACHE^a III predicted mortality (%)	1.18 (0.76, 1.83)	1.05 (0.64, 1.70)	1.41 (1.04, 1.90)	n/a
Iapachino et al. (2003) [17]	n/a	1.71 (0.88, 3.34)	n/a	n/a	n/a
Kramer et al. (2013) [5]	n/a	n/a	n/a	1.12 (1.08, 1.16)	n/a
Laupland et al. (2011) [15]	Gender, SAPS II^b, discharge SOFA^c, Decision to forego life-sustaining therapy, primary diagnosis by system, discharge day.	1.79 (1.34, 2.38)	1.54 (1.12, 2.11)	n/a	n/a
Lee et al. (2016)	n/a	0.38 (0.09, 1.63)	n/a	n/a	n/a
Pilcher et al. (2007) [8]	Admission APACHE^a III predicted mortality, emergency admission status	1.56 (1.45, 1.67)	1.42 (1.32, 1.53)	1.25 (1.16, 1.35)	n/a
Priestap et al. (2006) [35]	Age, gender, APACHE^a II, source of admission, admission diagnosis by system, hospital type	1.35 (1.23, 1.49)	1.22 (1.10, 1.36)	1.23 (1.08, 1.39)	n/a
Ranzani et al. (2012) [18]	n/a	1.13 (0.57, 2.26)	n/a	N/a	n/a
Utzolino et al. (2010) [9]	n/a	1.52 (0.79, 2.91)	n/a	3.69 (2.80, 4.87)	n/a

Table 3 continued

Authors	Co-variates for adjustment	Mortality, calculated unadjusted odds ratios (95% CI)	Mortality, reported adjusted odds ratio (95% CI)	Readmission, calculated unadjusted odds ratios (95% CI)	Readmission, reported adjusted odds ratios (95% CI)
Uusaro et al. (2003) [36]	SAPS[b] II, TISS[d], care restrictions	1.20 (1.07, 1.34)	1.11 (0.93, 1.31)	n/a	n/a
Pooled results		1.33 (1.28, 1.62) $n = 16$ $I^2 = 88\%, p < 0.001$	1.33 (1.30, 1.36) $n = 8$ $I^2 = 46\%, p = 0.073$	1.32 (1.2, 1.45) $n = 11$ $I^2 = 89.9\%, p < 0.001$	

[a] Acute physiology and chronic health evaluation

[b] Simplified acute physiology score

[c] Sequential organ failure assessment

[d] Therapeutic intervention scoring system

The effect of out-of-hours discharge on mortality remained for four of the five geographical areas: UK [relative risk (RR) 1.41 95% CI 1.27, 1.57]; Australasia (RR 1.65, 95% CI 1.40, 1.94); Europe (RR 1.38, 95% CI 1.08, 1.76); and United States of America with South America and Canada (RR 1.31, 95% CI 1.23, 1.40). Asia included only one small study and found no effect (RR 0.41, 95% CI 0.10, 1.63) (supplementary material, Fig. 2). Discharge out-of-hours remained significantly associated with subsequent in-hospital mortality in six of eight included studies that undertook multivariate analysis (Table 3) [1, 2, 8, 10, 15, 35].

We included 11 studies, including 1,156,904 patients in the ICU readmission analysis. Figure 3 shows the association between out-of-hours discharge and readmission to an ICU. The pooled risk estimate for discharge out-of-hours (95% CI) was 1.30 (1.19, 1.42). Heterogeneity was high (I^2 statistic 90.2%). Heterogeneity arose from differences in effect size rather than the presence or direction of effect [42].

The effect of out-of-hours discharge on readmission remained when analysed for studies in Australasia (RR 1.18, 95% CI 1.09, 1.28), Europe (RR 3.02, 95% CI 2.41, 3.79) and United States of America with South America and Canada (RR 1.14, 95% CI 1.07, 1.21). The effect in the UK was borderline (RR 1.42, 95% CI 1.00, 2.02) (supplementary material, Fig. 3).

Table 3 shows studies that adjusted for potential confounders. We show the confounders used (for which there was no consensus). The summary adjusted odds ratio (95% CI) for mortality was 1.33, (1.30, 1.36), $p < 0.001$. For comparison, the unadjusted odds ratio was 1.33, (1.28, 1.62), $p < 0.001$. Analysing only studies that adjusted for potential confounders reduced heterogeneity (the eight studies reporting adjustment tended to be larger studies). One study undertook multivariate adjustment for readmission (out-of-hours discharge remained significant) [38]. We were unable to perform planned sub-group analyses of discharge destination and palliation status due to inconsistent reporting of these data. Too few studies in each group meant we were unable to perform sub-group analysis of out-of-hours definition.

Funnel plots and Egger's regressions for the effect of out-of-hours discharge on mortality and readmission are shown (supplementary material, Figs. 4, 5, 6, 7). Both funnel plots and Egger's regression suggest there may be some publication bias whereby studies showing a strong association between mortality and out-of-hours discharge, particularly smaller studies, are not published ($p = 0.014$). This was not as obvious for studies of readmission ($p = 0.057$), but this may have been due to a smaller sample of studies.

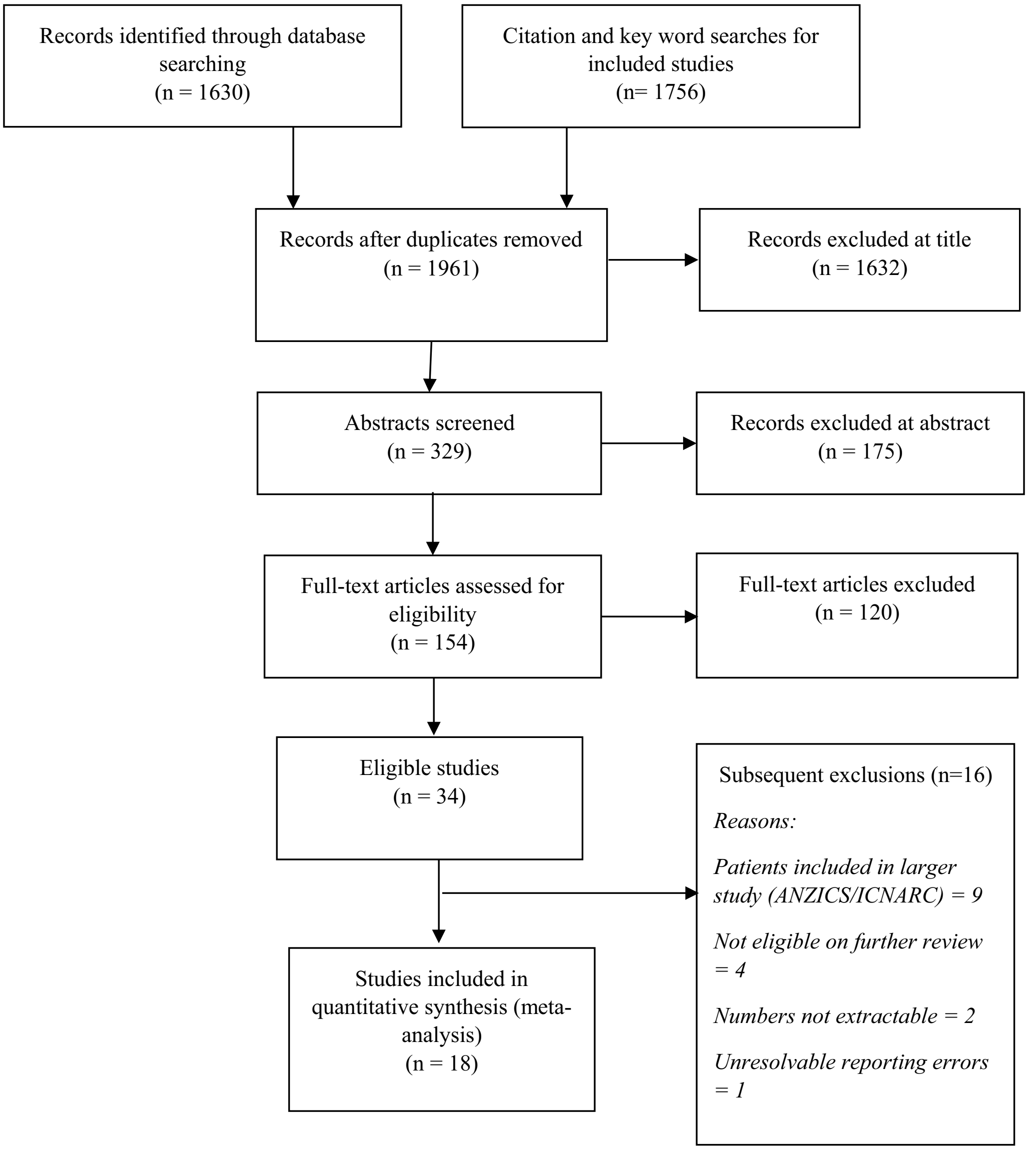

Fig. 1 Prisma flowchart

Quality assessment findings are shown in supplementary material, Table 2. Most studies scored well, between seven and nine out of nine. However, only five studies defined whether the two patient groups were discharged from ICU to a ward or higher dependency area. To assess the influence of each study on bias, we omitted each study in turn (supplementary material, Figs. 8, 9). Removal of any individual study did not remove the effect for either mortality or readmission. The largest effect for mortality occurred when removing a study including the majority of Australasian ICUs [1] reducing the RR (95% CI) to 1.36 (1.26, 1.47). For ICU readmission, both funnel and regression plots supported removal of two major outliers [9, 38]. Removing the outliers reduced the heterogeneity but did not significantly change the RR (supplementary material, Figs. 6, 7, 8, 9).

Discussion

To the best of our knowledge, our meta-analysis brings together the available data on the effects of out-of-hours discharge from intensive care on subsequent hospital mortality and ICU readmission for the first time.

We included 18 studies enrolling 1,191,178 patients. We found that out-of-hours discharge is associated with around a 41% increase in subsequent in-hospital mortality and a 30% increased risk of deteriorating to require

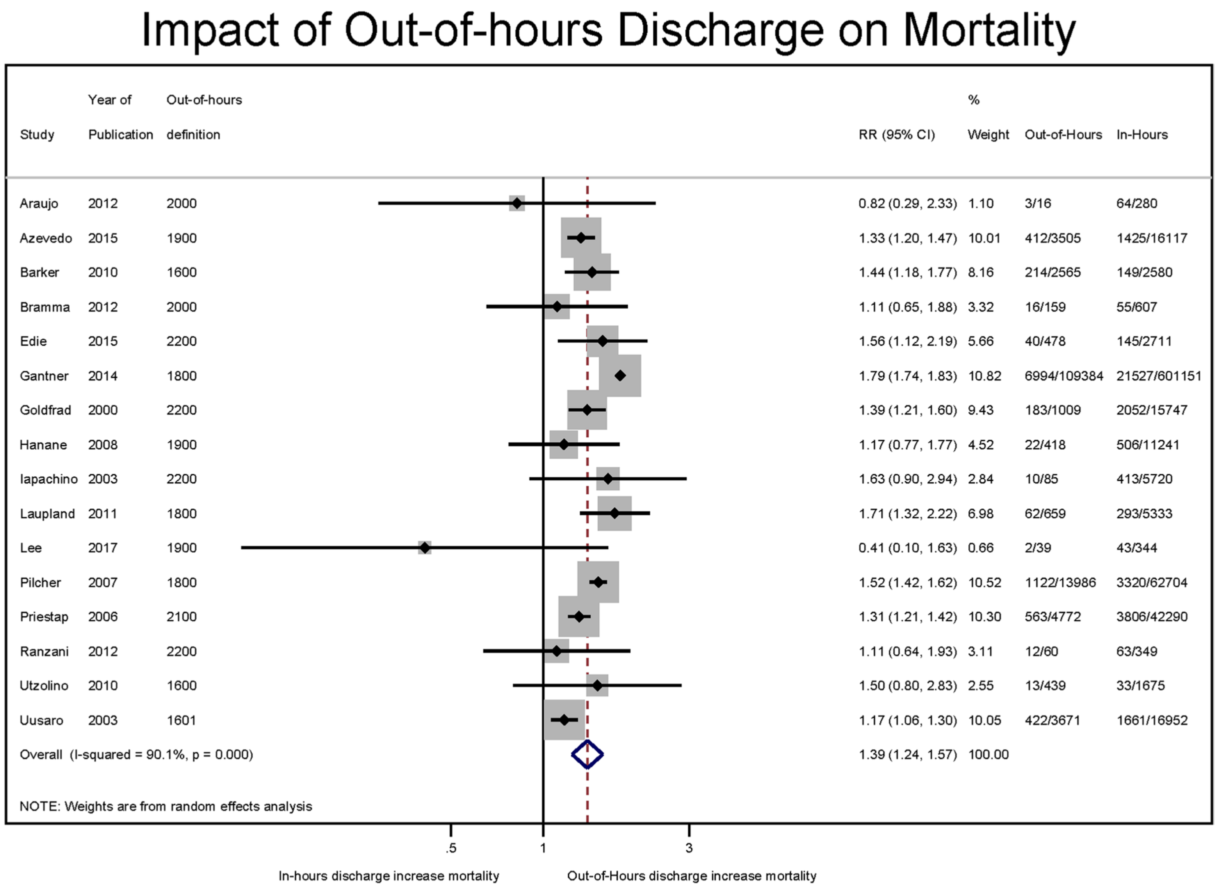

Fig. 2 Forest plot of the association between out-of-hours discharge and mortality

readmission to an ICU. The effects persisted across different healthcare systems in different geographical areas and across different definitions of out-of-hours.

Strengths and weaknesses

We used a clearly defined, peer-reviewed protocol to conduct this review [21] to ensure a rigorous process and to minimise concerns regarding internal validity. A major strength of our study is that we demonstrate that out-of-hours discharge is associated with both an increased risk of death and an increased risk of readmission.

Our findings are consistent across large numbers of patients, different healthcare systems and different definitions of out-of-hours.

For both mortality and ICU readmission, our meta-analyses showed substantial heterogeneity. However, the heterogeneity mainly lies in how large the effects are rather than whether effects are present. Some heterogeneity was explained by differences in the definition of out-of-hours. Stratifying for different out-of-hours definitions decreased heterogeneity in some groups, but the association with mortality remained for all groups. Heterogeneity was lowest when we summarised the adjusted odds ratios for the eight studies reporting them. The association with mortality remained present. The reported duration of the out-of-hours period varied between 9 and 16 h. As a consequence, patients discharged at 20:30 are classified as out-of-hours in 12 studies and in-hours in 5 studies. Although inconsistent, investigators may differ in out-of-hours definitions because of differences in what time services change in their healthcare system. We chose, along with all the included authors, to treat out-of-hours at weekends in the same way as weekdays.

Our findings are limited by the cohort design of all the included studies. However, in the absence of any controlled studies, they provide the best available evidence. The limited data provided by many studies restricted our ability to explore underlying causes. Some were not primarily focused on the effects of out-of-hours discharges and so did not report population characteristics by discharge time. Where disease severity was reported by discharge time, studies differed in the assessment used. Where reported, most studies excluded patients

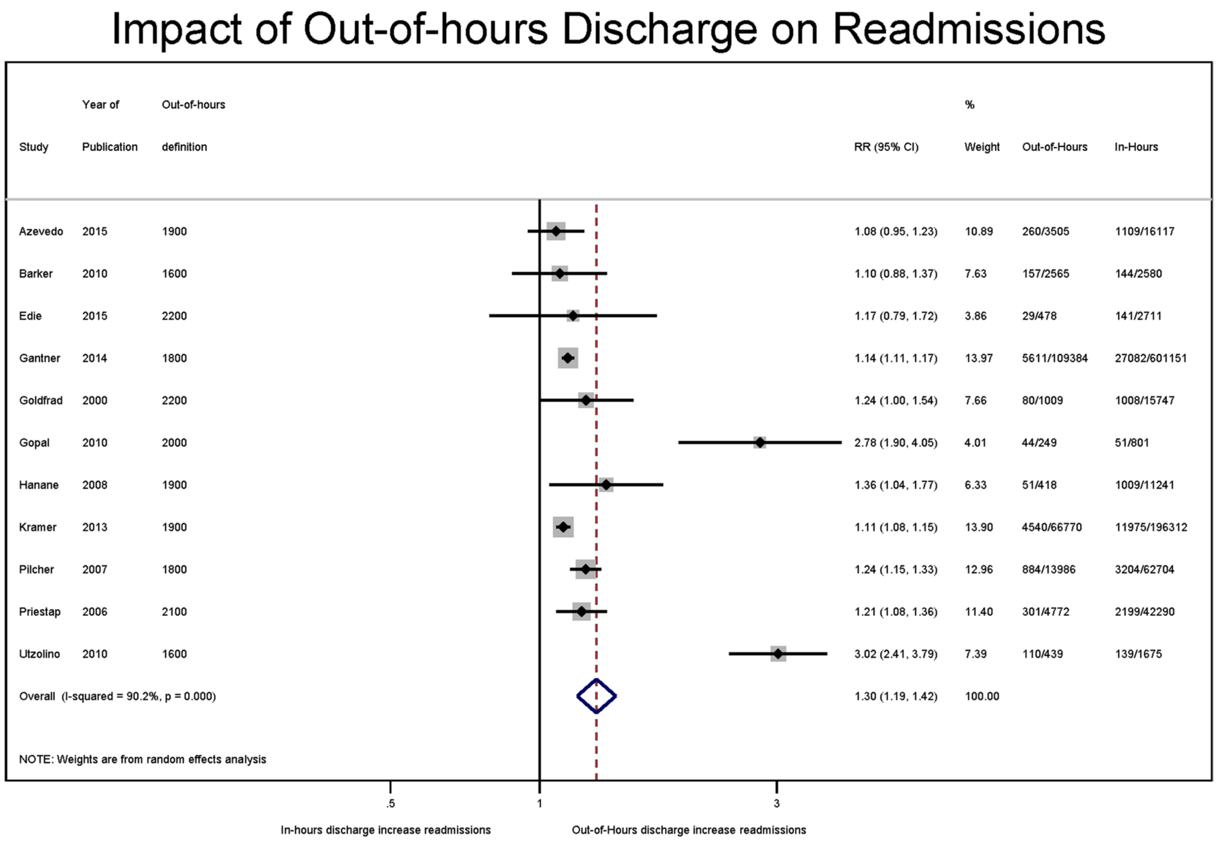

Fig. 3 Forest plot of the association between out-of-hours discharge and ICU readmission

discharged to another healthcare facility [5, 9, 11, 17, 18, 35, 37, 40, 41]. This introduces a potential bias if outcomes by discharge time differ in this group.

Despite being widely used in published systematic reviews, there is disagreement within the literature as to the appropriateness of scoring systems to assess study quality [43–45]. We used the NOS [24] rather than the ACROBAT-NRSI tool [43] proposed in our protocol. We selected the NOS as a frequently used and more suitable tool for the database cohort studies included. Studies commonly failed to define whether patients discharged in or out-of-hours were discharged to a ward or to high dependency area. This tended to occur in large multisite studies where high dependency facilities were not reported. As only two (small) studies scored less than seven, we did not undertake the planned sub-group analysis according to study quality.

There remains a risk of other studies not reporting outcomes related to out-of-hours discharge where no effect was seen. However, both the funnel plots and Eggers regression for mortality suggest publication bias against publishing studies with high out-of-hours discharge mortality rates. This could be explained by a reluctance of single centres to publish data associated with a perceived poor practice of out-of-hours discharge with high mortality. Our meta-analysis may therefore under- rather than over-estimate effects associated with out-of-hours discharge. As a result, our findings of increased mortality and increased ICU readmission associated with out-of-hours discharge appear robust.

Comparison to what is previously known

Prior to our meta-analysis, it remained unclear whether out-of-hours discharge was associated with increased mortality and readmission rates. Many studies that alone were not large enough to show a statistically significant effect (and could have been misinterpreted as there being no effect) contributed to our overall findings [9, 11, 16–18, 37–41]. One previous meta-analysis of the association between time of discharge from ICU and hospital mortality has been undertaken [46]. However, this meta-analysis did not include substantial amounts of relevant information, meta-analysing only 14 studies (of which we excluded 4 as they contained data duplicated within larger studies [19, 29–31] and did not study ICU readmission. The absence of registration or a published peer-reviewed protocol may in part explain these weaknesses.

Where increased post-ICU mortality or readmission has been associated with out-of-hours discharge, there has been debate as to whether out-of-hours discharge is causally associated with worse outcomes or simply defines a patient group who are more at risk [12, 14]. Differences in disease severity at admission to ICU have convincingly been shown not to explain the excess mortality and readmission rates found with out-of-hours discharge [1, 2, 8, 13, 15, 35]. The presence of treatment limitations at ICU admission also did not account for the effect [1]. In contrast, two studies [19, 36] corrected out an increased risk of out-of-hours discharge found on univariate analysis by including steps in their statistical model that corrected for factors suggestive of differences in care [continuing therapies such as dialysis and parenteral nutrition, decreased conscious state, increased therapeutic intervention scores (TISS) scores]. The findings are not contradictory; rather, the question asked is different. The first approach suggests that the worse outcomes associated with out-of-hours discharge are not explained by differences in patients at the point of admission to ICU (baseline covariates). The second provides differences in the care pathway that help explain the worse outcomes. It is whether these differences are of significance when a patient is discharged out-of-hours that is of interest, rather than any concept that crossing the threshold of an ICU between particular hours is causally associated with mortality. The combination of the findings of both types of study suggest that differences in management of patients discharged out-of-hours in part explain the worse outcomes seen. Other findings support this idea. Goldfrad and colleagues [2] found only 44.1% of discharges at night were fully ready for discharge in comparison to 86.3% in the day. Premature discharge was the main determinant of increased mortality associated with night-time discharge in their model. There is also evidence that patients with a high treatment need are disproportionately discharged at night [13]. Patients discharged out-of-hours also have higher severity of illness on their last ICU day [10, 11] and a greater incidence of treatments normally delivered in ICUs [19]. All of these might suggest that premature discharge in part explains our findings. One recent study [19] suggests that premature discharge is not a factor; however, the incidence of documented premature discharge is so low in comparison to previous studies [2], and the incidence of delayed discharge so high, that the meaning of this is unclear. Studies to date differ as to whether including differences in the presence of treatment limitations in statistical models corrects out the increased risks of out-of-hours discharge [1, 11, 15, 19, 36]. It seems unlikely that these patients would commonly benefit from readmission to an ICU.

Meaning

Our study resolves the question of whether out-of-hours discharge is associated with worse outcomes. The association with increased mortality and with readmission is substantial. Only the magnitude of the association remains somewhat uncertain. The retrospective non-randomised nature of all the studies undertaken prevents the attribution or non-attribution of causation (both for the studies and our analysis). Whether these increases in mortality and readmission result from patient differences, differences in care or a combination remains unclear. Our meta-analysis does, however, resolve a key area of debate. Disproportionate out-of-hours discharge of patients who will no longer benefit from intensive care cannot explain the increased mortality, as more of this group are readmitted.

Future work

Further work is required to explain why out-of-hours discharge is so strongly associated with post-ICU mortality and readmission, and how these adverse outcomes can be addressed. Future studies should aim to measure and account for confounders appropriately. To investigate the question of whether discharge out-of-hours results in poor outcomes studies should account for patient factors such as age and admission illness severity, which are not altered by differences in treatment in or after the ICU. To investigate the causes of differences found, studies should measure and account for differences in care. These would include measures of ICU exposure (length of ICU stay), illness severity at the point of discharge and ongoing care requirements and quantification of post-discharge care. The contribution of post-discharge care to differences in out-of-hours outcomes has so far only been explored to a limited extent in a single study [19], despite clearly being key to further understanding the problem [12].

Conclusion

Out-of-hours discharge from an ICU is associated with substantial increases in subsequent in-hospital mortality and ICU readmission. These risks remain across different healthcare settings, different geographical areas and different definitions of out-of-hours.

Electronic supplementary material

The online version of this article (https://doi.org/10.1007/s00134-018-5245-2) contains supplementary material, which is available to authorized users.

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Author Contributions
PW, SV and DY conceived the meta-analysis. PW and SV extracted all data. TP undertook and refined the searches. PW, SV, SD and SL co-wrote the paper. SD undertook the statistical analyses. All authors contributed to and revised the final manuscript.

Compliance with ethical standards

Conflicts of interest
The authors declare that they have no conflict of interest.

Ethical approval
For this type of study formal consent is not required.

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Appendix 3. Narrative Review of Staff perspective of post-ICU ward care

Search strategy

This search was based on the systematic search described above but broadened to encompass more complex topics and using search terms from papers previously identified.

Key search terms:

Intensive care

Critical care

(ITU OR ICU OR AICU)

*PATIENT DISCHARGE

discharge*

(post OR after OR following)

(ward* OR inhospital OR "in hospital")

"transfer* from"

Receiving

Relocation

“relocation stress”

“transfer anxiety”

Appendix 4. Narrative Review of Patient Perspective of Post-ICU Ward Care

Search strategy

Taking a similar approach to the staff review, searches were based on the systematic search described above but broadened to encompass more complex topics and using search terms from papers previously identified.

Key search terms:

Intensive care

Critical care

(ITU OR ICU OR AICU)

*PATIENT DISCHARGE

discharge*

(post OR after OR following)

(ward* OR inhospital OR "in hospital")

"transfer* from"

Transition

Relocation

“relocation stress”

Appendix 5. Interventions to improve post-ICU ward care

Search strategy

Taking a similar approach to the two previous narrative reviews, searches were based on the initial systematic search but developed to focus on interventional studies. As previously, search terms from papers previously identified were used to guide the search and snowball results.

Key search terms:

Intensive care

Critical care

(ITU OR ICU OR AICU)

*PATIENT DISCHARGE

discharge*

(post OR after OR following)

(ward* OR inhospital OR "in hospital")

"transfer* from"

RCT

Intervention

Appendix 6. Published protocol

Summary of contribution:

I devised the initial idea for this study, developed the research plan with expert advice from the co-authors and drafted the manuscript. All co-authors had input in finalising the document for publication.

Open access Protocol

BMJ Open

Protocol for a mixed-methods exploratory investigation of care following intensive care discharge: the REFLECT study

Sarah Vollam,[1] Owen Gustafson,[2] Lisa Hinton,[3] Lauren Morgan,[4] Natalie Pattison,[5] Hilary Thomas,[6] J Duncan Young,[7] Peter Watkinson[8]

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ABSTRACT

Introduction A substantial number of patients discharged from intensive care units (ICUs) subsequently die without leaving hospital. It is unclear how many of these deaths are preventable. Ward-based management following discharge from ICU is an area that patients and healthcare staff are concerned about. The primary aim of REFLECT (Recovery Following Intensive Care Treatment) is to develop an intervention plan to reduce in-hospital mortality rates in patients who have been discharged from ICU.

Methods and analysis REFLECT is a multicentre mixed-methods exploratory study examining ward care delivery to adult patients discharged from ICU. The study will be made up of four substudies. Medical notes of patients who were discharged from ICU and subsequently died will be examined using a retrospective case records review (RCRR) technique. Patients and their relatives will be interviewed about their post-ICU care, including relatives of patients who died in hospital following ICU discharge. Staff involved in the care of patients post-ICU discharge will be interviewed about the care of this patient group. The medical records of patients who survived their post-ICU stay will also be reviewed using the RCRR technique. The analyses of the substudies will be both descriptive and use a modified grounded theory approach to identify emerging themes. The evidence generated in these four substudies will form the basis of the intervention development, which will take place through stakeholder and clinical expert meetings.

Ethics and dissemination Ethical approval has been obtained through the Wales Research and Ethics Committee 4 (17/WA/0107). We aim to disseminate the findings through international conferences, international peer-reviewed journals and social media.

Trial registration number ISRCTN14658054.

Strengths and limitations of this study

- ► This exploratory study uses mixed methods to gather rich data from multiple perspectives to inform the development of an intervention.
- ► This protocol has been designed using Medical Research Council guidance on the development of complex interventions.
- ► As this is a complex cohort of patients, it is not clear whether problems in care will be distinct enough to be amenable to change through an intervention.

INTRODUCTION

In 2015–2016, over 8000 of the 134 000 patients discharged from intensive care units (ICUs) in England and Wales died without leaving hospital.[1] This mortality rate is higher than hospitalised groups considered to be at high risk[2–4] and is more than five times the annual number of UK road traffic accident deaths.[5]

Most patients who are discharged from ICU are expected to go home ([6] and preliminary analysis provided by Intensive Care National Audit and Research Centre. There are widely varying in-hospital post-ICU mortality rates (2.9% to 22.6%)) for patients of similar illness severity at admission to ICU.[7 8] Several studies of general ward populations indicate changes in care could lead to improvements in outcome.[9–15]

In 2000, the Department of Health (DH) recognised the need to improve outcomes in this vulnerable patient group, recommending the introduction of critical care outreach 'to support the continuing recovery of discharged patients on wards …'.[16] The DH provided substantial financial support to establish these teams. The teams are costly, often constituted of skilled senior critical care practitioners.[17] However, there is limited evidence in terms of outreach efficacy on reducing mortality in the post-ICU population.[18]

Qualitative studies with patients[19–25] and staff[26–29] have identified problems with the transition from ICU to ward care. Many have focused on the psychological impact rather than clinical care, although one study found patients were concerned about the quality and availability of nursing and medical care on the wards.[25] A secondary analysis of these interviews conducted by the Health Experience Research Group was undertaken as preparatory work for this study (http://www.healthtalk.org). We found patients were able to identify problems in care delivery such as lack of specific clinical skills and awareness of level of physical dependency.

Some studies have investigated which patients are most at risk. Potentially modifiable risk factors identified at ICU discharge include the presence of tracheostomy,[30–32] elevated C reactive protein[8 33] or creatinine[33] and most compellingly, discharge out of hours.[7 34–40] The evidence identifying risk factors present on the ward after ICU discharge is currently somewhat limited.[41–44] There have been several single intervention, physical therapy-based strategies which alone have not been found to improve mortality.[45–48] Recently, the RECOVER study reported no effect from delivering increased physiotherapy and dietetic advice to hospitalised patients following ICU discharge.[49] The history of interventions tried in this patient group emphasises the need to carefully establish an appropriate intervention package to trial. There is currently insufficient information about the ward management of these patients to know what an effective intervention aimed at reducing post-ICU in-hospital mortality would contain. Recent National Health Service (NHS) guidance[50] has emphasised the need to incorporate patient experiences to improve their care. In combination with the experience of the carers in the ward environment, evidence from patients provides the most immediate information on identifiable problems with the care they receive. Additionally, case review has previously been shown to yield valuable information with which to improve ward-based care.[9 10 51 52]

The problem is urgent. Over 8000 patients died in 2017 in hospital following discharge from ICU. It is not currently known what proportion of these are expected deaths, but a substantial proportion of these deaths may be avoidable. The operation of ICU outreach teams throughout the country would greatly benefit from the development of an evidence-based care package.

METHODS

Objectives

Our primary objective is to develop a multifaceted human factors-based intervention to reduce in-hospital mortality rates in patients who have been discharged from ICU. Our secondary objectives are to identify examples of high-quality care and areas for improvement.

Patient and public involvement

A patient and public involvement (PPI) focus group was conducted during development of this study. The group were consulted on the design of the study with focus on patient/relative interviews approach and the burden of participating. Two members of this group are members of the steering committee. They have been consulted on the ongoing conduct on the study and have provided feedback on participant documentation.

General design

REFLECT (Recovery Following Intensive Care Treatment) is a multicentre mixed-methods exploratory study examining ward care delivery to patients discharged from ICU. Data collection is split into four substudies: a retrospective case records review (RCRR) of deceased patients, patient and relative interviews/focus groups, staff interviews/focus groups and an RCRR of survivors (figure 1).

RCRR deceased patients

Medical notes of patients who were transferred to wards from ICU and subsequently died will be examined using a RCRR technique. This review will use an adaptation of a validated tool for making safety and quality judgements about care delivery.[53–55] Medical notes are reviewed and 'structured judgement' statements are made about the

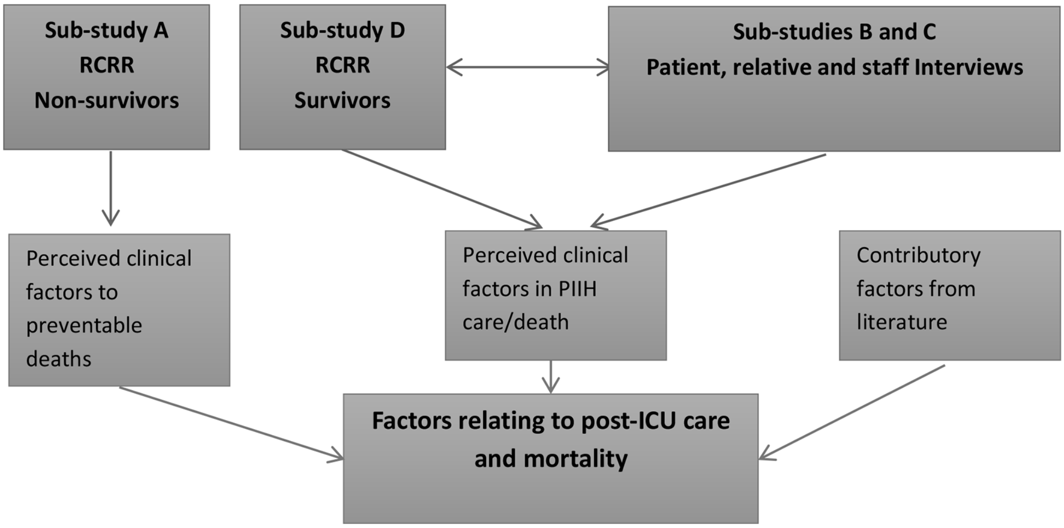

Figure 1 Primary data collection. ICU, intensive care unit; RCRR, retrospective case records review; PIIH, post-intensive care in-hospital.

delivery of care. These statements are explicit, value-based comments on care delivery. The output of this is a relatively short but rich account of care delivery, identifying both good and poor care. The output of this stage will be a collation of care delivery, both where it has been excellent and where improvements could be made. This approach has been used extensively in other patient groups,[51 54] but not previously in this population. It is currently being adopted by the DH as a clinical governance tool within trusts as the National Mortality Care Record Review Programme.[53] It contains guidance to ensure a consistent and valid approach. We have piloted this review methodology and undertaken preparatory work to ensure the methodology will capture where novel processes could change outcomes for hospitalised patients discharged from ICU. Training will be conducted with the three researchers involved in these reviews, to ensure consistency of findings.

Cases where differences in care delivery could improve outcomes will be further analysed using the 'change analysis' method developed by Hogan *et al*.[56] This is an in-depth qualitative analysis of the narrative account of care delivery for each patient, using a human factors framework. The analysis will allow the identification of areas where novel care processes could change outcomes, and what processes could facilitate this. These findings will guide the design and implementation of the intervention.

Patient and relative interviews/focus groups

Patients and their relatives are ideally placed to offer reflection and critique of their care.[57–59] Our secondary analysis of relative and patient interviews showed patients and relatives could clearly identify areas of their post-ICU ward care which they considered unsatisfactory. However, discussions about post-ICU care were limited as the interviews spanned the entire hospital experience. Further interviews with survivors and their relatives are required to focus on how care on the wards following ICU discharge could be improved. Focus groups will be offered where more than three people are interested in participating on a given day. Telephone interviews will also be offered as an alternative to face-to-face interview.

We will also interview relatives of patients who died in hospital following ICU discharge, to ensure that their experiences are included (involving relatives of patients who died was recommended by our PPI group). This will provide a unique perspective and augment the findings of the RCRR of deceased patients. A focus group or telephone option will not be offered to this group due to the potential for the participant to become distressed, as this would not allow appropriate management of the interview.

Staff interviews/focus groups

We will conduct interviews with staff, with focus groups offered where more than three staff members are able to attend together. Interviews/focus groups will be conducted with a variety of staff members to encourage a multidisciplinary analysis of this area of care. Telephone interviews will be offered as an alternative to face to face interviews.

Interviews with patients and staff will be conducted in parallel so that emerging themes can be explored across groups. The interviews will build on themes identified in the preliminary secondary analysis and evidence synthesis discussed above. This work will take an approach informed by the tenets of grounded theory, reflecting the inductive approach to developing an understanding of this area of care.[60 61] Interviews and focus groups will use a topic guide, based on completed work and input from patient representatives. We anticipate the topic guide will evolve throughout the interviews/focus group phase to ensure any emerging themes are explored,[62] reflecting the iterative nature of qualitative research.

RCRR survivors

We will review the case records of patients who survived their post-ICU ward stay. Ideally, all patients who were interviewed will be included (subject to participant consent). The reviews will follow the same structure proposed for reviewing deceased patient medical notes. This will be modified to assess examples of high-quality care and areas for improvement (using structured judgement and clear rationale). All cases will be further analysed using the 'change analysis' method described above. We will triangulate areas identified by patients and relatives with those found in the case records and compare with those identified for non-survivors.

Study setting

The study is taking place in three separate UK NHS Trusts. There are approximately 2000 patients discharged from the general adult ICUs across the three trusts annually. The RCRR and patient, relative and staff interviews will occur at all three trusts. The specialist cardiothoracic and neurosurgical ICUs will not be included in the study.

Participant selection

RCRR deceased patients

Patients will be identified by a search of the local NHS database. The most recent 300 patients who were discharged from ICU and died during the same hospital admission will be identified and their medical records retrieved. All patients aged 18 years or above discharged from ICU to a ward who died prior to hospital discharge will be included. Any patients with inaccessible medical notes will be excluded.

Patient and relative interviews/focus groups

Patients discharged from hospital

Patients invited to attend the intensive care follow-up clinic will also be invited to participate in semistructured interviews. Their relatives will also be invited and may participate either as well as or instead of the patient. This invitation will be issued by the clinic organiser (a member of the direct care team). Patients will be eligible if they are willing and able to give informed consent, are 18 years or older and are a patient or relative of a patient who was discharged from ICU to a ward and survived to hospital discharge. Patients will be excluded if they lack the capacity to consent or have poor spoken English as it will not be possible to conduct the interviews through an interpreter. Participants will be sought with varying experiences, to facilitate maximum variation in the sample.[63]

Patients who did not survive to hospital discharge

Our planned involvement of relatives of patients who died follows advice from two experts in the field, Dr Colin Parkes (emeritus Senior Lecturer in Psychiatry, Royal London Hospital) and Professor Maggie Stroebe-Harrold (University of Utrecht), published guidelines,[64] bereavement research[65] and advice from the study PPI group. A pack will be sent by the ICU follow-up team to relatives of patients who were discharged from ICU and subsequently died on a ward. This will include a covering letter, brief leaflet and participant information sheet. Letters will be sent out 6 months following the relative's death, as suggested by bereavement research.[64 65] The letter will invite the relative to consider the study and contact the study team if they are interested. It will clearly state that they are very welcome to completely discard the letter and no further contact will be made. It will also be made clear that if they do participate, they can withdraw at any time, including during the interview.

If we are unable to recruit participants through this approach, we may contact local support groups, such as ICUSteps (www.icusteps.org) to explore recruitment through them. The study has been endorsed by the national ICUSteps group. In this instance, packs (including covering letter, leaflet and PIS) would be given out by the group facilitator if, and when, they felt this was appropriate. This direct approach is used successfully by the Health Experience Research Group in many of their studies, including those recruiting bereaved relatives.[25 66] Participants will be included if they are willing and able to give informed consent, are 18 years or older and are a relative of a patient who was discharged from ICU and did not survive to hospital discharge. As with survivor interviews, participants will be excluded if they lack the capacity to consent or have poor spoken English.

Staff interviews/focus groups

Staff involved in the care of patients discharged from ICU to the wards (including nurses, doctors, physiotherapists, dieticians and other allied health professionals) will be recruited to participate in interviews/focus groups. As above, purposive sampling will be used to ensure a diverse range of exposure, experience and background training. Invitation letters and attached participant information sheets will be distributed to all staff by ward clerks, or a similar member of staff to wards with a high throughput of post-ICU patients. In addition, posters will be placed on wards, advertisements placed on trust-wide intranet and prior contact with senior managers will be sought for endorsement. We also anticipate an element of snowballing from other participants. Participants will be included if they are willing and able to give informed consents, are aged 18 years or older and are a member of NHS staff involved in the care of patients discharged from ICU to the wards. There are no exclusion criteria.

RCRR survivors

Patients who are approached to participate in the interview study will also be asked to participate in the RCRR. Ideally, all those who are interviewed will consent to notes review, but it is anticipated that some may not. Patients may consent to the RCRR without participating in the interview study. Information about the study will be sent out with the ICU follow-up clinic appointment, around 2 weeks in advance. Participants will be included if they are willing and able to give informed consent, are aged 18 years or older and have been discharged from ICU to the ward and subsequently discharged from hospital.

Consent

Consent will not be obtained for the RCRR for deceased patients. Support to access notes for this group will be sought from the Confidentiality Advisory Group, who advise the Health Research Authority on applications to process patient information without consent. For patients/relatives undertaking interviews, consent will be sought by trained researchers at the time of interview if face-to-face. Postal consent will be offered as an alternative if the participant requests a telephone interview or for notes review only. If the patient opts for notes review only, they may sign and return the consent form without speaking with the research team. The patient will be able to discuss the study with a member of the study team prior to signing the consent form if they wish. Documents relating to informed consent are available within the trial registry.

Sample size

RCRR deceased patients

Based on previous audit, up to 300 patient records will be reviewed, yielding approximately 30 records for in-depth analysis. These records will be sourced from all three trusts.

Patient and relative interviews

We estimate approximately 20 interviews will be required to supplement data from our secondary analysis of patient and relative interviews. We anticipate these participants will be recruited from all three trusts. Data collection will continue with concurrent thematic analysis, until theoretical saturation has been reached (ie, no new themes are emerging). Anticipated numbers are given for each group, but may vary to achieve saturation.[60 61]

Staff interviews

we anticipate conducting interviews/focus groups with approximately 30 staff members, across all three trusts.

RCRR survivors

Up to 30 patient records (to match the number for in-depth analysis above). We anticipate these will be recruited from across the three trusts.

Data storage

All electronic data will be password-protected and stored on a secure server within a university research facility. All paper documentation (such as consent forms and case report forms) will be stored in a locked university research facility behind two swipe access doors.

Data analysis

RCRR deceased and survivors

Statistical analysis will be mostly descriptive. This will include proportions of patients experiencing one or more 'problem with care'. For deceased patients, we will report the proportion of cases deemed to have more than a 50% chance of death being avoidable. Avoidability will be judged based on the case record review and decisions discussed and verified between the three researchers conducting the RCRR. For survivors we will report proportion of cases who experienced examples of high-quality care and areas where improvements could be made. Cases where improvements could be made (perhaps using examples of high-quality care) will be further analysed using the 'change analysis' method developed by Hogan *et al*.[56] This additional analysis will add an in-depth qualitative analysis of the links between identified 'care areas' and associated human factors. This is particularly useful in cases with multiple complex problems, anticipated to be the case in this population.

We will triangulate 'care areas' identified by patients and relatives with those found in the case records. We will compare the 'care areas' identified with those identified for non-survivors. Records will be reviewed after interview, to avoid any potential conflict of interest for the researcher.

A report will be produced summarising the potential areas and approaches for interventions and the human factors which contributed to the identified 'care areas'.

Interviews and focus groups

Audio recordings will be transcribed verbatim and entered into qualitative analysis software (NVivo). Interviews and focus groups will be transcribed verbatim into a specialist software package for coding qualitative data (QSR NVivo). A modified grounded theory approach will be used to identify emerging themes. This will ensure identification of 'care areas' important to patients and health professionals, as well as those that researchers anticipate.[60 61 67] This approach has previously been used to identify areas of care which patients believed could be improved.[25 68 69]

Preliminary coding will take place soon after the interviews are conducted. This will allow any emerging themes to be explored in subsequent interviews. Preliminary coding will be refined using the method of constant comparison (until no new themes emerge) to produce a report for each theme.[60] Each report will reflect the most important themes that participants talk about in their interviews and represent the full range of experiences included in the interviews. These reports will reviewed and themes will be verified within the research team, comprising four qualitative researchers (SV, HT, NP and LH).[69] Any differences in interpretation or emphasis will be discussed and resolved. For the final output, these themes will be further categorised by areas of care which could be improved, and suggestions for improvement.

Modelling the intervention

Stakeholder meeting

The evidence generated through the methodology above will form the basis of the intervention development (figure 2). Guided by a Human Factors researcher, a stakeholder group will prioritise areas for intervention from those identified in the interviews, focus groups, case record reviews and our earlier research. The meeting will take the form of a prioritisation exercise, including a facilitated card sort to rank the potential areas for improvement. They will select the most promising areas that can be pragmatically combined in a multifaceted intervention. For an area to be prioritised, the mechanism by which intervention in that area could be expected to reduce mortality will need to be defined.

Literature searches

We will then undertake literature searches to check if our prioritised areas have been previously investigated in other hospitalised patient populations. To capture relevant successful methods for change implementation, we will review previous implementation methods for interventions in the post-ICU hospitalised patient group

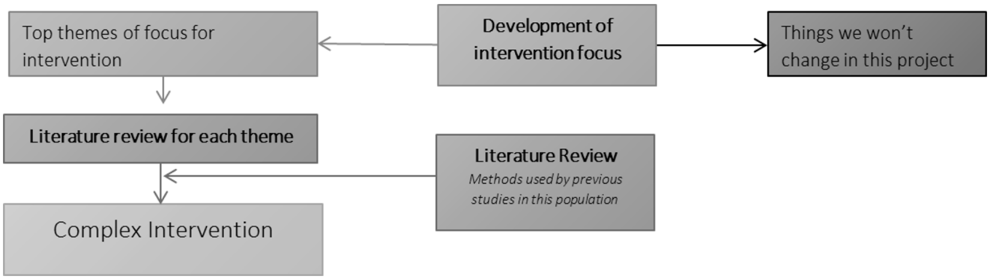

Figure 2 Modelling the intervention.

and methods used in studies of our prioritised areas in other hospitalised patient populations. This will result in a refined list of areas for inclusion and identification of previous methods used to successfully implement change in these areas.

Paper modelling exercise

Components of the multifaceted intervention will be examined in an initial paper modelling exercise.[70] This exercise will allow exploration of: the interdependencies of the components, different implementation strategies and challenges that may be encountered.

Clinical experts meeting

The prioritised areas and the results of the paper modelling exercise will be taken to meeting of stakeholders and clinical experts. At this meeting, the proposed intervention will be finalised with input from those likely to deliver the intervention and those who have previously experienced care.

ETHICS AND DISSEMINATION

Ethics

The study has received ethical approval from the Wales Research Ethics Committee. The University of Oxford will act as sponsor. The study will be overseen by a steering committee and includes PPI involvement throughout.

This paper reports protocol version 1 (April 2017) and has been written with reference to the SPIRIT (Standard Protocol Items: Recommendations for Interventional Trials) checklist.[71]

RCRR deceased patients

As informed consent cannot be obtained for deceased patients in this substudy, an application has been approved by the Confidentiality Advisory Group for suspension of the duty of confidentiality under Section 251 of the NHS Act 2006 specifically in relation to this section of the project. The research brings the possibility of identification of areas where practice may not have been optimal, which will be referred through the organisations standard clinical governance processes. The response will follow the guidance given by the Royal College of Physicians Clinical governance guide to mortality case record reviews.[53]

Patient and relative interviews

Where possible, for patients, these interviews/focus groups will take place on the same day as their ICU follow-up clinic appointment. This will ensure support will be available should the interview raise issues that may cause distress. For patients and relatives requiring further support, appropriate referrals will be made within the existing hospital system and details of organisations outside the hospital offered.

Relatives of deceased patients will be identified and sensitively approached as discussed above. Training on talking with bereaved relatives will be provided for researchers. We will also use the 'buddy' system used by the Health Experiences Research Group, whereby another researcher will be available to debrief after each interview if necessary.

Staff interviews/focus groups

Given the sensitive nature of this subject, it is possible that discussions may cause distress to staff members. NHS Trust Occupational Health will be made aware that we are conducting this study and any staff member who causes concern to the researchers will be signposted to occupational health in the first instance.

Any answers which cause concern in terms of professional conduct will be discussed with clinicians within their management structure in the first instance, with a view to raising this with the line manager of the participant. Any disclosures raising serious concerns about a specific patient will be dealt with as described above.

RCRR survivors

It is anticipated that most patients participating in the RCRR will also be interviewed. In order to ensure there is no bias or conflict of interest which might influence the conversation, these reviews will be completed after the interviews. Any identified significant care areas will be escalated as outlined for the RCRR for deceased patients.

Dissemination

Results from this study will be disseminated at regional and international conferences and in peer-reviewed journals. Authorship of any papers related to this study will follow the ICMJE recommendations (http://www.icmje.org/recommendations/).

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Appendix 7. Protocol for support during interviews

Pre-interview:

- Encourage participant to bring someone to support them to the interview
- Ensure the participant understands the purpose of the interview, and what to expect

During the interview:

- Before starting the interview, reinforce the purpose of the study and the interview. Explain what will happen and that the participant is free to ask to pause or stop at any time.
- Observe the usual practices in responding to the needs of the participant during the interview, offering to pause or stop the interview if necessary

After the interview:

- Offer advice on avenues of support if wanted, such as bereavement charities, participant's GP
- Offer attendance at the ICU follow-up clinic, including a post-ICU psychiatrist who specialises in supporting patients and relatives following ICU experience
- Signpost to PALS if any concerns about care arose which the participant feels they would like to follow up
- A printed sheet of all contacts above will be offered
- Agree a timeframe to follow up with the participant to discuss any concerns which may have arisen since the interview and ensure they have not been adversely affected in any way

During follow-up, discuss avenues of support again if needed, particularly follow-up clinic and post-ICU psychiatrist.

Appendix 8. RCRR CRF

REFLECT
Retrospective Case Record Review
CRF

Study number.............................

In partnership with:

Improvement Academy
Part of the Yorkshire & Humber AHSN

Datix®
Software for patient safety

Commissioned by:

HQIP
Healthcare Quality
Improvement Partnership

National Mortality Case Record Review Programme: structured case note review data collection

Please enter the following.

Age at death (years):

Gender: M/F

Length of stay (ICU):

Day of ǘǋl·ȳǎŦŜǋ ŦǋƻϒL/¦:

Time of arrival: (on ward)

Day of death:

Time of death:

Number of days between arrival and death:

Multiple ICU readmissions?

Details (number of readmissions, length of stay ward and ICU):

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

Discharge destination (ward):

Further ward transfers?

Details (wards and length of stay on each ward):

……………………………………………………………………………………

……………………………………………………………………………………

Month cluster during which the patient died:

Jan/Feb/Mar Apr/May/June Jul/Aug/Sept Oct/Nov/Dec

Specialty team at time of death:

Specific location of death: (ward)

Type of admission: elective/emergency surgical/medical

The certified cause of death if known:

Frailty score (1-9):

Structured case note review data collection

Phase of care: ¢ǊI·ỹăŦŜǊ **and initial management (approximately the first 24 hours)**

Please record your explicit judgements about the quality of care the patient received and whether it was in accordance with current good practice (for example, your professional standards or your professional perspective). If there is any other information that you think is important or relevant that you wish to comment on then please do so.

Please rate the care received by the patient during this phase.

1 = very poor care **2 = poor care** **3 = adequate care** **4 = good care** **5 = excellent care**

Please circle only one score.

Phase of care: **Ongoing care**

Please record your explicit judgements about the quality of care the patient received and whether it was in accordance with current good practice (for example, your professional standards or your professional perspective). If there is any other information that you think is important or relevant that you wish to comment on then please do so.

Please rate the care received by the patient during this phase.

1 = very poor care **2 = poor care** **3 = adequate care** **4 = good care** **5 = excellent care**

Please circle only one score.

Phase of care: **Care during a procedure (excluding IV cannulation)**

Please record your explicit judgements about the quality of care the patient received and whether it was in accordance with current good practice (for example, your professional standards or your professional perspective). If there is any other information that you think is important or relevant that you wish to comment on then please do so.

Please rate the care received by the patient during this phase.

1 = very poor care **2 = poor care** **3 = adequate care** **4 = good care** **5 = excellent care**

Please circle only one score.

Phase of care: **End-of-life care**

Please record your explicit judgements about the quality of care the patient received and whether it was in accordance with current good practice (for example, your professional standards or your professional perspective). If there is any other information that you think is important or relevant that you wish to comment on then please do so.

Please rate the care received by the patient during this phase.

1 = very poor care **2 = poor care** **3 = adequate care** **4 = good care** **5 = excellent care**

Please circle only one score.

Phase of care: **Overall assessment**

Please record your explicit judgements about the quality of care the patient received overall and whether it was in accordance with current good practice (for example, your professional standards). If there is any other information that you think is important or relevant that you wish to comment on then please do so.

Please rate the care received by the patient during this overall phase.

1 = very poor care 2 = poor care 3 = adequate care 4 = good care 5 = excellent care

Please circle only one score.

Please rate the quality of the patient record.

1 = very poor 2 = poor 3 = adequate 4 = good 5 = excellent

Please circle only one score.

Avoidability of death score
We are interested in your view on the avoidability of death in this case. Please choose from the following scale. **Score 1** Definitely avoidable **Score 2** Strong evidence of avoidability **Score 3** Probably avoidable (more than 50:50) **Score 4** Possibly avoidable but not very likely (less than 50:50) **Score 5** Slight evidence of avoidability **Score 6** Definitely not avoidable
Please explain your reasons for your assessment of the level of avoidability of death in this case, including anything particular that you have identified.

Assessment of problems in healthcare

In this section, the reviewer is asked to comment on whether one or more specific types of problem(s) were identified and, if so, to indicate whether any led to harm.

Were there any problems with the care of the patient? (Please tick)

No ☐ (please stop here) **Yes** ☐ (please continue below)

If you did identify problems, please identify which problem type(s) from the selection below. Please indicate whether it led to any harm and in which phase(s) of care the problem was identified. Please tick all that relate to the case.

Problem types

1. **Problem in assessment, investigation or diagnosis** *(including assessment of pressure ulcer risk, venous thromboembolism (VTE) risk, history of falls)* **Yes** ☐ **No** ☐

   Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

   In which phase(s) did the problem occur?

Admission and initial assessment	☐	Ongoing care	☐
Care during procedure	☐	Perioperative care	☐
End-of-life care	☐		

2. **Problem with medication / IV fluids / electrolytes / oxygen** *(other than anaesthetic)* **Yes** ☐ **No** ☐

   Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

   In which phase(s) did the problem occur?

Admission and initial assessment	☐	Ongoing care	☐
Care during procedure	☐	Perioperative care	☐
End-of-life care	☐		

3. **Problem related to treatment and management plan** *(including prevention of pressure ulcers, falls, VTE)* **Yes** ☐ **No** ☐

   Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

   In which phase(s) did the problem occur?

   Admission and initial assessment ☐ Ongoing care ☐

   Care during procedure ☐ Perioperative care ☐

   End-of-life care ☐

4. **Problem with infection management Yes** ☐ **No** ☐

   Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

   In which phase(s) did the problem occur?

   Admission and initial assessment ☐ Ongoing care ☐

   Care during procedure ☐ Perioperative care ☐

   End-of-life care

5. **Problem related to operation / invasive procedure** *(other than infection control)* **Yes** ☐ **No** ☐

   Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

   In which phase(s) did the problem occur?

   Admission and initial assessment ☐ Ongoing care ☐

   Care during procedure ☐ Perioperative care ☐

   End-of-life care ☐

6. **Problem in clinical monitoring** *(including failure to plan, to undertake, or to recognise and respond to changes)* **Yes** ☐ **No** ☐

   Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

   In which phase(s) did the problem occur?

   Admission and initial assessment ☐ Ongoing care ☐

   Care during procedure ☐ Perioperative care ☐

   End-of-life care ☐

7. **Problem in resuscitation following a cardiac or respiratory arrest** *(including cardiopulmonary resuscitation (CPR))* **Yes** ☐ **No** ☐

Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

In which phase(s) did the problem occur?

Admission and initial assessment	☐	Ongoing care	☐
Care during procedure	☐	Perioperative care	☐
End-of-life care	☐		

8. **Problem of any other type not fitting the categories above** *(including communication and organisational issues)* **Yes** ☐ **No** ☐

Did the problem lead to harm? No ☐ **Probably** ☐ **Yes** ☐

In which phase(s) did the problem occur?

Admission and initial assessment	☐	Ongoing care	☐
Care during procedure	☐	Perioperative care	☐
End-of-life care	☐		

ADDITIONAL INFORMATION

MOBILITY

Level at discharge	
Daily sit out?	
If no, please give brief details (i.e. reasons why not)	
Daily physio: Bed to chair?	
Daily physio: Away from bed	
If no, please give brief details (i.e. reasons why not)	

AF MANAGEMENT

Was AF diagnosed during ward care?	
Was short-term management appropriate?	
If no, please give brief details (i.e. reasons why not)	
Were underlying causes investigated?	
If no, please give brief details (i.e. reasons why not)	

SEPSIS 6

Was sepsis diagnosed/suspected?	
If so, was the sepsis 6 care bundle adhered to?	
If no, please give brief details (i.e. reasons why not)	

NUTRITION

Dietetic plan at ICU discharge?	Yes/No/Not required
If no, please give brief details (i.e. reasons why not)	

FOLLOW-UP

Seen by Follow-Up team after discharge?	
If no, please give brief details (i.e. reasons why not)	
Discharged from Follow-Up team?	
Day post-ICU discharged from service:	
Re-assessed if deteriorated?	
If no, please give brief details (i.e. reasons why not)	

FURTHER DETAILS

For patients with identified problems in care please summarise care below:

Appendix 9. In-depth Framework Outputs

Table 1: Frequency of problem in care category for ‘probably avoidable’ deaths and survivors

Problem in care category	**Frequency n (%)**		
	Non-survivors: problems	**Survivors: problems**	**Survivors: good care**
1 Diagnosis	84	39	14
2 Assessment	57	22	4
3 Clinical monitoring /management	123	51	23
4 Infection-related	16	4	3
5 Technical problem	0	0	0
6 Drugs and fluids	15	3	0
7 Resuscitation	1	0	0
8 Other	6	0	0
Total	302	119	44

Table 2: Frequency of problem in care sub-categories for ‘probably avoidable’ deaths and survivors

Problem in care	**Frequency n (%)**		
	Non-survivors: problems	**Survivors: problems**	**Survivors: good care**
1.1 Failure to take an adequate history and/or to perform a satisfactory physical examination.	0	0	0
1.2 Failure or delay to employ indicated test.	5	2	0
1.3 Test was incorrectly performed	0	0	0
1.4 Test was incorrectly reported	0	0	0
1.5 Failure or delay to receive report	3	2	0
1.6 Failure or delay to act upon results of tests or findings.	12	1	0
1.7 Failure to draw sensible/reasonable conclusions or make a differential diagnosis	17	11	0
1.8 Failure or delay to get expert opinion from:			
1.8.1 more senior member of team	5	8	2
1.8.2 specialist clinical team	41	13	12
1.8.3 non-clinical specialist (e.g. radiologist)	0	1	0
1.9 Expert opinion incorrect	1	0	0
1.10 Other (specify)	0	1	0
2.1 Failure to take a full clinical history	0	0	0
2.2 Failure to examine carefully	0	0	0
2.3 Failure to take account of co-morbidity	18	6	0
2.4 Failure to monitor adequately	25	14	5
2.5 Failure to record	2	2	0
2.6 Failure to communicate to the rest of the team (clinical and multi-disciplinary)	12	0	0
2.7 Other	0	1	0
A inadequate monitoring/management of:			
3.1 Abnormal vital signs (including neurological status)	5	1	1

3.2 Problems with fluids/electrolytes including renal function	19	5	1
3.3 Side-effects of medication	0	0	0
3.4 Cardio-pulmonary dysfunction	2	1	0
3.5 Damage to skin and pressure areas	0	1	0
3.6 Adequate mobilisation	11	7	11
3.7 Infection	3	0	0
3.8 Poor progress in healing	0	0	0
3.9 Changes to the patient's general condition	2	0	0
3.10 Other (nutrition)	13	4	6
B In what respect clinical management unsatisfactory:			
3.11 Failure to take note of 'routine' observations	5	1	0
3.12 Delay in noting lab/test results	3	0	0
3.13 Not aware of significance of lab/test results	0	0	0
3.14 Failure to act appropriately on lab/test results	1	1	0
3.15 Poor note-keeping	1	0	0
3.16 Inadequate handover	7	9	0
3.17 Lack of liaison with other staff	13	1	0
3.18 Inadequate 'out-of-hours' cover/working practice	19	16	2
3.19 Guideline/ protocol failure (either not available or not followed)	4	3	0
3.20 Apparent failure to recognise deterioration	7	0	0
3.21 Deterioration recognised but additional care not provided	4	0	1
3.22 Failure to recruit help:			
3.22.1 Medical	1	0	0
3.22.2 Nursing	0	0	0
3.22.3 Ancillary	0	0	0
3.23 Other (dehydration/malnutrition)	3	0	0

B Error in infection management:			
A infection site 4.1-6	0	0	0
4.7 Failure to drain pus or remove necrotic material	1	0	0
4.8 Failure to give appropriate antibiotics (including overuse)	7	1	0
4.9 Failure to give appropriate physiotherapy (e.g. chest)	9	3	3
4.10 Failure to maintain care of catheters/cannulas/drains/wounds	0	0	0
4.11 Other	0	0	0
5 Errors related to a procedure	0	0	0
6.1 Error in prescription/preparation of drug/IV fluids/blood	4	1	0
6.2 Error or accident in administering drug/IV fluids/blood	4	0	0
6.3 Failure to monitor drug action/toxicity/fluid balance	7	2	0
n/a	6	0	0
	302	119	44

Table 3: Frequency of contributory factor categories for 'probably avoidable' deaths and survivors

Contributory factor category	**Frequency n (%)**	
	Non-survivors	Survivors: negative
A Patient factors	26	7
B Task and technology factors	23	4
C Individual (staff) factors	26	22
D Team factors	167	41
E Work environment factors	18	17
F Organisation and management factors	41	28
G Institutional factors	0	0
	302	119

Table 4: Frequency of contributory sub-factor categories for 'probably avoidable' deaths and survivors

Contributory sub-factor	**Frequency n (%)**	
	Non-survivors	Survivors
A:1 Condition (complexity and seriousness)	20	7
A:2 Language and communication	0	0
A:3 Personality and social factors	6	0
B:1 Task design and clarify of structure	8	1
B:2 Availability and use of protocols	7	0
B:3 Availability and accuracy of test results	6	3
B:4 Decision-making aids	2	0
C:1 Knowledge and skills	19	12
C:2 Competence	7	10
C:3 Physical and mental health	0	0

D:1 Verbal communication	4	1
D:2 Written communication	6	3
D:3 Supervision and seeking help	20	3
D:4 Team structure	137	35
E:1 Staffing levels and skill mix	15	11
E:2 Workload and shift patterns	3	6
E:3 Design, availability and maintenance of equipment	0	0
E:4 Administrative and managerial support	0	0
E:5 Physical	0	0
F:1 Financial resources and constraints	0	0
F:2 Organisational structure	11	5
F:3 Policy, standards and goals	8	8
F:4 Safety culture and priorities	23	15
G:1 Economic and regulatory context	0	0
G:2 National health service executive	0	0
G:3 Links with external organisations	0	0
	302	119

Appendix 10. Topic guide for staff interviews

REFLECT
CRF and INTERVIEW topic guide STAFF

STUDY ID	

INTERVIEW INFORMATION

STUDY ID	
DATE OF INTERVIEW	
Staff group (e.g. nurse/doctor/physio	
Years qualified/in role	

Withdrawal from study

PATIENT REQUESTED WITHDRAWAL FROM STUDY ☐

DATA DESTROYED ☐

Interview topic guide

Core themes to explore

1. Facilitators to delivery of care
2. Barriers to delivery of care
3. Role of staff member in delivering care
4. Issues specific to post-ICU patients

Interview schedule

Could you tell me about your experiences of looking after patients on the ward following intensive care discharge, particularly those patients who become unwell?

Prompts:

Can you explain to me the process for a patient being admitted to the ward from ICU?

- Communication between teams?
- Documentation
- Standardised procedures?
- Barriers to delivery of care?

Do you have any concerns about this process?

How are patients transferred from intensive care different from other patients?

- How does this impact care delivery?
- How do you manage this?

Once the patient is on the ward, how do you or others find caring for them

Who are key staff members involved in looking after patients transferred from ICU?

Is there a difference in patients becoming unwell after discharge from ICU to other patients on the ward?

- What happens when patients become unwell after discharge from ICU?

What one thing worries you most about the transfer of patients from ITU to the ward?

Identifying/managing unwell patients:

Could you talk me through how you identify unwell patients?

Are there times when an unwell patient is not identified or identification is delayed?

What are the main reasons for a patient not being identified?

What is the consequence of identification being delayed?

What can be done to improve the identification of unwell patients?

Whose responsibility is it to identify unwell patients?

Could you talk me through what happens once a patient has been identified as becoming unwell?

What are the good points in this process?

What is worrying about this process currently/what could be done better?

What do you do if you feel you need more help/who do you speak to about the patient?

Are you satisfied with the response you receive when asking for help with a patient?

Are there any other factors you think are relevant to the management of patients transferred from intensive care?

Ways of better managing these patients

Improvements that could be made to practices

Anything that used to happen that no longer happens

Who should I talk to to find out more?

General Impressions from the interview

Significant non-verbal cues, particular questions or thoughts raised that stood out, any changes to interview schedule that should be considered?

Context of interview

What was going on today that may have affected interview? Time pressures, sources of bias, reflexive reflections

Additional reflections

Appendix 11. Qualitative Analysis Development

Photo 1: Paper-based coding tree development

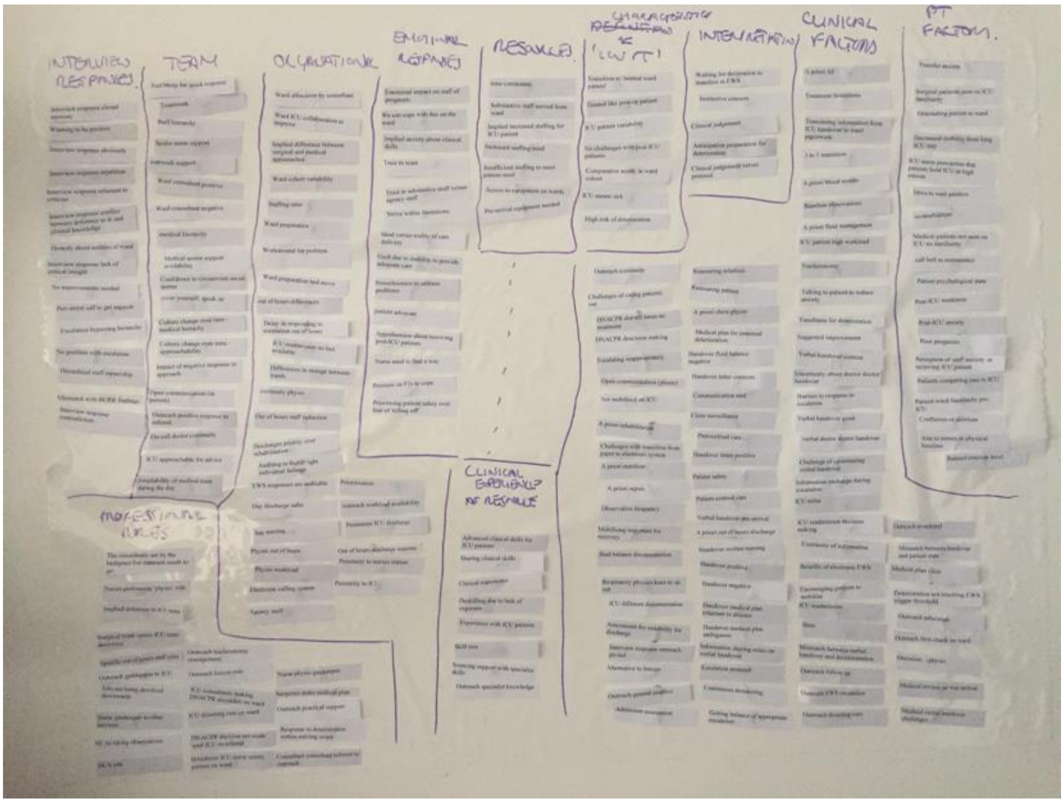
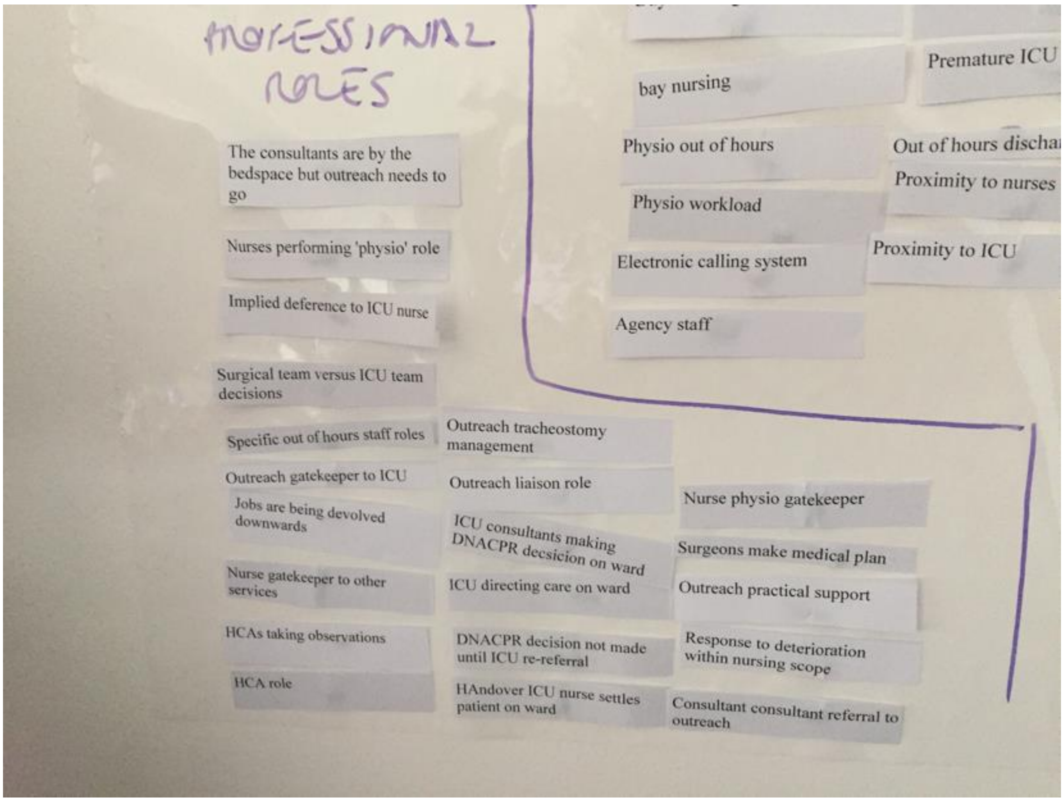


Photo 2: Paper-based coding tree development – detail



The consultants are by the bedspace but outreach needs to go

Nurses performing 'physio' role

Implied deference to ICU nurse

Surgical team versus ICU team decisions

Specific out of hours staff roles

Outreach gatekeeper to ICU

Jobs are being devolved downwards

Nurse gatekeeper to other services

HCAs taking observations

HCA role

bay nursing

Physio out of hours

Physio workload

Electronic calling system

Agency staff

Premature ICU

Out of hours dischar

Proximity to nurses

Proximity to ICU

Outreach tracheostomy management

Outreach liaison role

ICU consultants making DNACPR decsicion on ward

ICU directing care on ward

DNACPR decision not made until ICU re-referral

HAndover ICU nurse settles patient on ward

Nurse physio gatekeeper

Surgeons make medical plan

Outreach practical support

Response to deterioration within nursing scope

Consultant consultant referral to outreach

Photo 3: Initial mind maps of developing themes

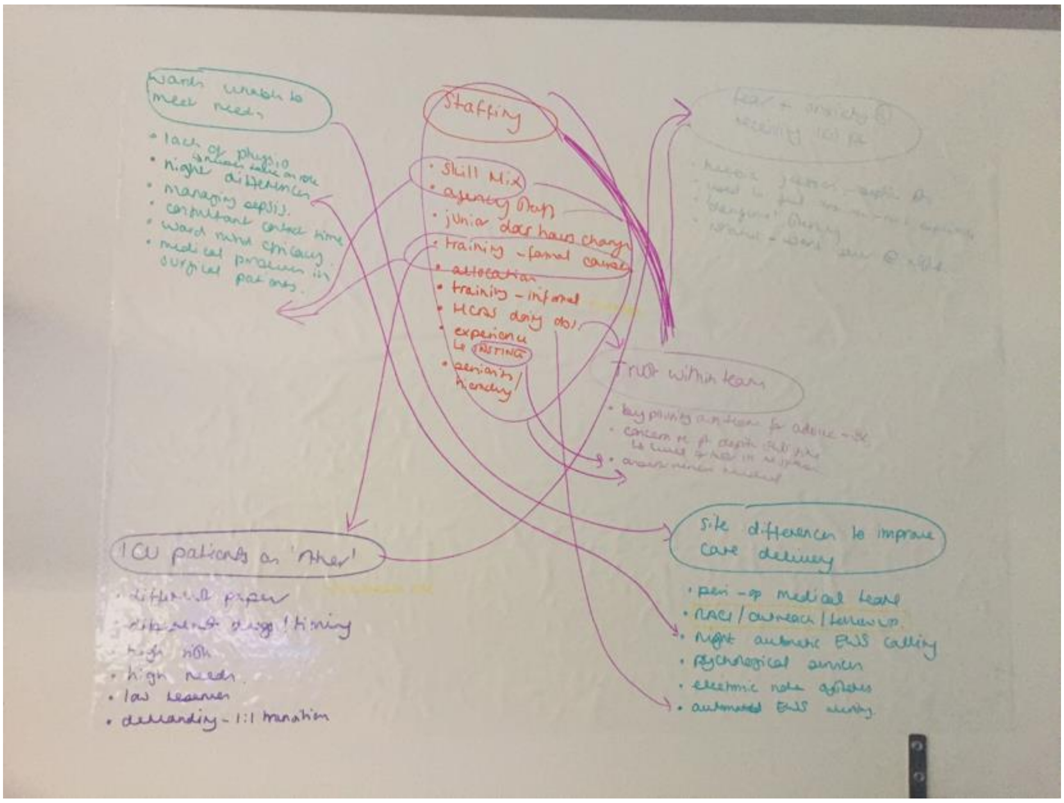


Photo 4: Initial mind maps of developing themes

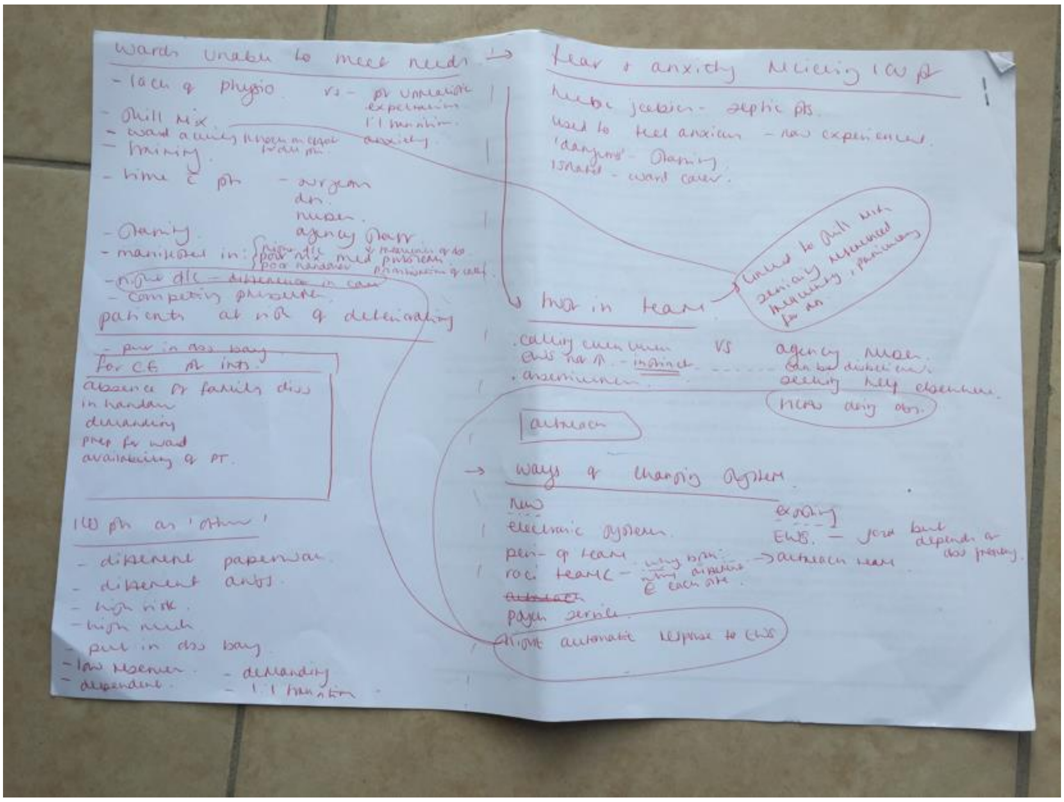
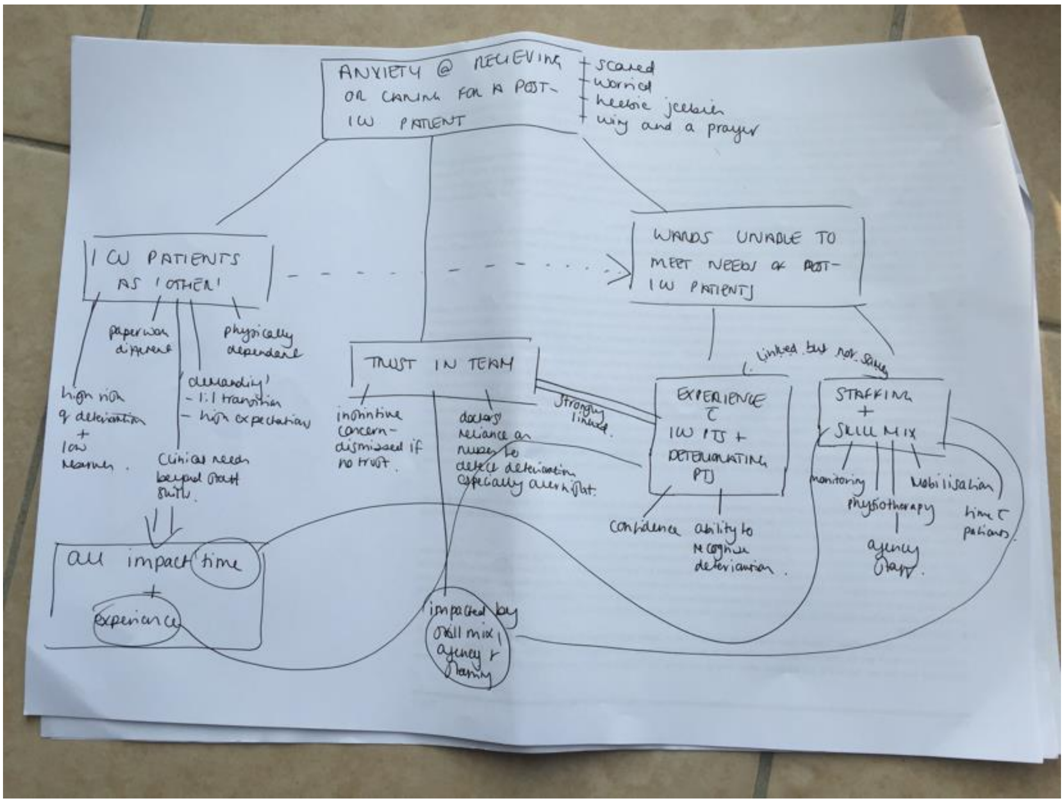
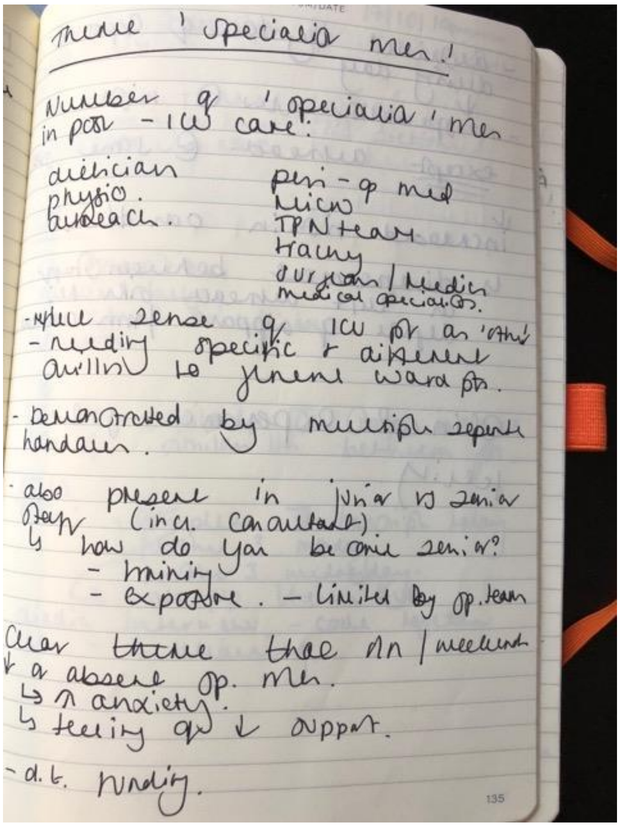


Photo 5: Further mind map of theme development



Photos 6 and 7: Reflective notes from research diary



Theme 'specialist needs'

Number of 'specialist' needs in post-ICU care:

dietician
physio.
outreach.

peri-op med
micro
TPN team
trachy
surgical/medic
medical specialists.

- make sense of ICU pt as 'other'
- needing specific & different skills to general ward pts.

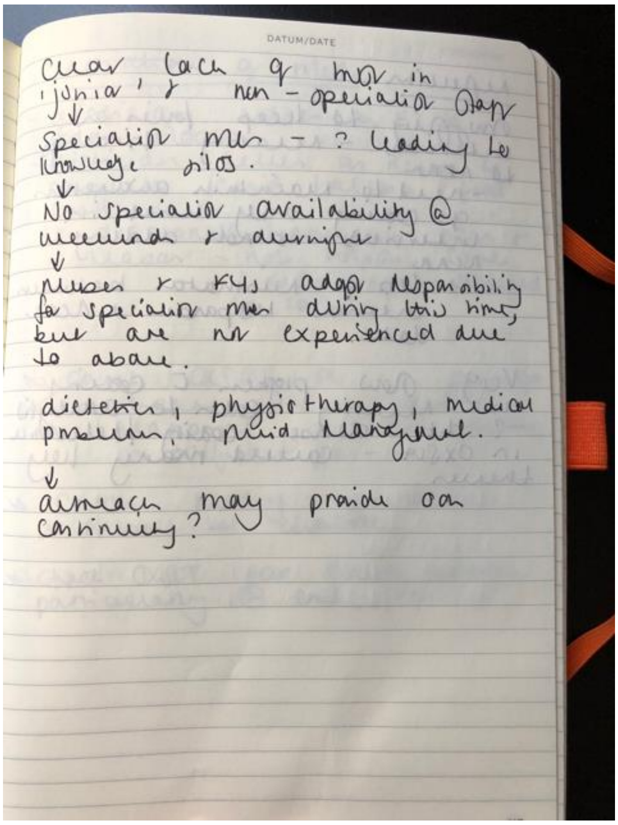
- demonstrated by multiple separate handovers.

- also present in junior vs senior staff (incl. consultants)
↳ how do you become senior?
- training
- exposure. – limited by sp. team

Clear ~~theme~~ that on/weekends & absent sp. needs.
↳ ↑ anxiety.
↳ feeling of ↓ support.

- d.t. funding.

135



DATUM/DATE

Clear lack of skill in 'junior' & non-specialist staff
↓
Specialist needs – ? leading to knowledge silos.
↓
No specialist availability @ weekends & overnight
↓
Nurses & FY1s adopt responsibility for specialist needs during this time, but are not experienced due to above.

dietetics, physiotherapy, medical problems, fluid management.
↓
outreach may provide some continuity?

Appendix 12. RCRR Additional Tables

Table 1. Definitions, sources and rules for demographic variables

Variable	Source	Interpretation rules
Age at ICU discharge* †	Recorded on ICU discharge documentation or calculated from date of birth	n/a
Sex* †	Record in medical record	n/a
APACHE II* †	Electronic database	n/a
Admission diagnosis* †	ICU admission form	Surgical – required surgery prior/during ICU admission Medical – no surgery required Trauma – admitted with trauma-related problem
Type of admission* †	Medical notes	n/a
Clinical Frailty Score* †	Interpreted from multiple sources in medical notes, such as admission clerking, ICU nurse assessment, physio assessment.	Selection of score best fitting information recorded. Score selection verified from at least two sources of information.
Length of ICU/hospital stay* † **Days to death**	Recorded in medical record (electronic or paper)	n/a
End-of-life care	Medical notes ICU discharge documentation	Clear plan for end-of-life care (palliative care team not always involved).

*Data for survivors extracted from local site ICNARC databases

† Data for national cohort of non-palliative discharges extracted from central ICNARC database

Table 2. RCRR agreement scores

	First 24 hours	Ongoing management	Care during a procedure	End-of-life care	Overall Assessment	Avoidability of death	Overall
Kappa (95% CI)	0.70 (0.35-1.00)	0.87 (0.53-1.00)	1 (n/a-n/a)*	0.42 (0.05-0.74)	0.78 (0.44-1.00)	1 (n/a-n/a)*	0.77 (0.64-0.88)

*CI n/a as all scores agreed

Table 3. Definitions, sources and rules for 'problems in care' variables

Variable	Source	Interpretation rules
Time of discharge from ICU	ICU documentation Ward nursing documentation Documentation of first observations on ward	1st: ward nurse stated time of admission to ward 2nd: Time stated on ICU discharge summary 3rd: First observation set on ward 4th: Interpretation of category of time of day from documentation, e.g. morning, afternoon, early evening, night.
Mobility at ICU discharge	ICU physiotherapy documentation ICU discharge documentation	If score not recorded by physiotherapist, interpretation from ICU documentation.
Mobilised to chair	Physiotherapy and nursing documentation	Yes = mobilised to chair on every day that patient condition allowed: as per physiotherapy and nursing documentation where present, or interpretation of patient condition using clinical judgement.
Mobilised away from bedspace	Physiotherapy and nursing documentation	Yes = mobilised away from bedspace on every day that patient condition allowed: as per physiotherapy and nursing documentation where present, or interpretation of patient condition using clinical judgement.
New diagnosis of AF	Medical notes	AF documented on ward and not documented in PMH or ICU discharge summary.
AF appropriate initial management	Medical notes, nursing notes, drug chart	Administration of any rate-controlling medication or consultation with cardiologist.
AF investigation of underlying cause	Medical notes	Documented investigation of any potential cause following onset of AF (not necessarily related to AF). For example, septic screen, CT scan to investigate potential septic sources, review and correction of electrolyte imbalance.

Sepsis: diagnosis/suspicion	Medical notes	Evidence of infection and documentation of sepsis diagnosis or suspicion Documentation must include word ‘sepsis’.
Sepsis 6 completed All aspects of sepsis 6 completed or considered:	Medical and nursing documentation, laboratory data, drug chart, fluid balance chart	
a) Administer oxygen (or SpO_2 above 94%)		a) Oxygen saturations of >94% on vital signs chart; oxygen administered if saturations below 94% in nursing notes
b) Take blood cultures		b) Documentation in medical notes of cultures taken; cultures documented in laboratory tests
c) Give IV antibiotics		c) Documentation in medical notes of antibiotic prescription; antibiotic prescription on drug chart
d) Give IV fluids (if hypotensive or plasma lactate concentration >2mmol/l)		d) Normotension on vital signs chart; documentation of IV fluids given in nursing notes; documentation on fluid balance chart of IV fluid bolus
e) Check (serial) lactate concentration.		e) Lactate measurement documented in medical notes; arterial or venous blood gas result documented

f) Measure urine output		f) Urine output documented on fluid balance chart
Nutrition plan required and completed	ICU discharge summary Nutrition team documentation Nursing documentation	Patient receiving enteral or parental feeding and/or Requiring oral nutritional supplements and/or Documented poor oral intake/need help to eat AND Documented plan from nutrition team
Seen by outreach/follow up	Medical notes	Documentation of outreach/follow-up visit on ward
Discharged from outreach/follow-up	Medical notes	Clear documentation of discharge (if not seen but no documentation of discharge = no)
Day discharged	Medical notes	n/a
Not reassessed	Medical notes Nursing notes	Documentation of review following clinical deterioration after discharge from service

Appendix 13. Example In-depth Analysis Output

DB026: Premature discharge from ICU

Vignette
Discharged overnight with unresolved hypotension which was not referred to in handover documentation. High EWS score on first ward-based observations, not escalated. Rechecked twice overnight with continuing high EWS and no escalation. Seen by ward round in morning. Minimal acknowledgement of ongoing low blood pressure, tachycardia, pyrexia and dropping oxygen saturations. No further medical documentation. Infrequent observations with worsening hypotension. CCOT review in afternoon, facilitating ICU review and readmission. Died on ICU within 24 hours.

Narrative
Discharged overnight with unresolved hypotension, on day inotropes stopped. Not referred to in handover documentation. High EWS score on first observations on ward (hypotensive, pyrexial, tachycardic), not escalated. Rechecked after 3 hours and a further 4.5 hours, with continuing high EWS (improved blood pressure but pyrexia and tachycardia persist and oxygen saturations dropping to 92% on 2 litres oxygen) and no escalation. Seen by ward round in morning. Minimal acknowledgement of ongoing low blood pressure, tachycardia, pyrexia and dropping oxygen saturations. Plan for four-hourly IVI and arterial blood gas. No further medical documentation (blood gas taken but not documented - found unfiled in medical notes): pO2 8.46, potassium 6 and sodium 128 - nil action. Infrequent observations with worsening hypotension. Nursing documentation states 'outreach and doctors aware'. Outreach review in afternoon, facilitating ICU review and readmission. Died on ICU within 24 hours.

Cause of death	**Problem in care narrative**
Not documented	Very poor management of clinical deterioration but background of co-morbidities and frailty despite young age.

Problem narrative	**Problem definition**	**Problem category**	**Problem sub-category**	**Contributory factors**	**Contributory sub-factors**
Premature ICU discharge (hypotension)	Not optimised at ICU discharge	3 Clinical monitoring /management	3.11 Failure to take note of 'routine' observations	Team factors	Team structure

Ongoing hypotension not handed over	ICU handover	3 Clinical monitoring /management	3.16 Inadequate handover	Team factors	Team structure
Night discharge	Out-of-hours discharge	3 Clinical monitoring /management	3.18 Inadequate 'out-of-hours' cover/working practice	Organisation and management factors	Safety culture and priorities
Non-escalation of EWS	Failure to escalate	3 Clinical monitoring /management	3.19 Guideline/ protocol failure (either not available or not followed)	Task and technology factors	Availability and use of protocols
Observations not rechecked within protocolised timeframe	Failure to monitor	3 Clinical monitoring /management	3.11 Failure to take note of 'routine' observations	Individual (staff) factors	Knowledge and skills
Failure to fluid-resuscitate	Fluid management	3 Clinical monitoring /management	3.2 Problems with fluids/electrolytes including renal function	Team factors	Supervision and seeking help
Arterial blood gas undocumented in medical notes	Documentation failure	2 Assessment	2.5 Failure to record	Individual (staff) factors	Knowledge and skills
Potassium 6 and sodium 128 on blood gas	Blood result surveillance	3 Clinical monitoring /management	1.6 Failure or delay to act upon results of tests or findings.	Individual (staff) factors	Knowledge and skills
Delay in outreach review	Outreach support	5 Technical problem	1.8.2 specialist clinical team	Organisation and management factors	Safety culture and priorities

Failure to recognise sepsis	Infection management	3 Clinical monitoring /management	3.7 Infection	Team factors	Team structure
Overall failure to recognise acuity	Consultant leadership	1 Diagnosis	1.7 Failure to draw sensible/reasonable conclusions or make a differential diagnosis	Team factors	Team structure

DC028: Poor overall management in frail patient

<table>
<tr><th colspan="2">Vignette</th></tr>
<tr><td colspan="2">Late evening discharge before weekend. High dependency. Seen by CCOT on transfer but no medical review. Fell overnight, not escalated and no medical review. Seen by physiotherapist day one - not mobilised due to confusion. No medical review until day two. Ongoing problems with not absorbing nasogastric feed, converted to naso-jejunal tube following delay of three days. Poor surveillance throughout of electrolytes including bloods not being taken or checked, delay in prescribing Pabrinex (intravenous vitamins), and then not given. Oral potassium and phosphate prescribed but not given for various reasons and not converted to intravenous. Ongoing confusion regarding fluid status with intravenous frusemide, fluid restriction and oedema. Total parenteral nutrition not started despite very poor nutritional intake. Suspected small bowel obstruction not investigated (no CT scan and not operated due to high risk). Poor physiotherapy input throughout and not mobilised every day. Electrolytes supplemented on day 28 with potassium of 2.9. No further assessment of electrolytes. Cardiac arrest during endoscopy. Readmitted to ICU and palliated.</td></tr>
<tr><th colspan="2">Narrative</th></tr>
<tr><td colspan="2">Discharged on Friday late evening with high nursing requirements. Minimal medical plan on discharge documentation. Seen by outreach on arrival. Fell out of bed during night with no medical review. No physiotherapy day 1, not stat out due to confusion. No medical review until day 2. Ongoing problems with NG feeding (not absorbing) - planned for NJ tube day 3, not inserted until day 5 and feed not started until day 6. Day 5 Oral phosphate prescribed but not given for 7 days, oral potassium not given day 9 onwards (various reasons including patient refusal, NJ tube). Pabrinex prescribed but not given days 4-10. Day 6 - ongoing IV frusemide for oedema. Day 13 - improving oedema noted. Day 14 - NJ tube pulled out. Limit oral fluids to 500mls/day due to respiratory crackles. Day 15 - oral feeding established. Allow free fluids - oedema improving. Day 16 - fortisips and light diet. Day 20 - ileus - ? TPN. Day 21 - small bowel obstruction, not for theatre (mortality 80%). Day 22-25, no feed. Hold off TPN. BO - for sips. Day 26- NG feed started. Day 27 - for NJ rather than NG feeding. No bloods throughout. Day 28 - bloods reviewed - low magnesium and potassium (2.9) supplemented, NJ inserted. Day 29 - ? pancreas disturbance from NJ insertion. Increasing WCC absolute contraindication for TPN, therefore continue with NJ feed. Not sat out daily throughout due to confusion and oedema. Continuing attempts to NJ feed, no refeeding bloods monitored until day 33 - arrested in endoscopy during NJ insertion. Good arrest management. Readmitted to ICU and palliated.</td></tr>
<tr><th>Cause of death</th><th>Problem in care narrative</th></tr>
<tr><td>1a Multi-organ failure
1b Pancreatitis</td><td>Ongoing very poor nutritional and electrolyte management in frail dependent patient, potentially contributing to cardiac arrest</td></tr>
</table>

Problem narrative	Problem definition	Problem category	Problem sub-category	Contributory factors	Contributory sub-factors
Evening ICU discharge	Out-of-hours discharge	3 Clinical monitoring /management	3.18 Inadequate 'out-of-hours' cover/working practice	F Organisation and management factors	F:4 Safety culture and priorities
Complexity	Prognosis/complexity	2 Assessment	2.3 Failure to take account of co-morbidity	A Patient factors	A:1 Condition (complexity and seriousness)
No medical plan in discharge documentation	ICU handover	3 Clinical monitoring /management	3.17 Lack of liaison with other staff	C Individual (staff) factors	D:2 Written communication
No medical review on arrival	Medical review on ward transfer	2 Assessment	2.4 Failure to monitor adequately	E Work environment factors	E:1 Staffing levels and skill mix
No medical review following fall overnight	Failure to escalate	2 Assessment	2.4 Failure to monitor adequately	C Individual (staff) factors	C:1 Knowledge and skills
No investigation of confusion	Failure to monitor	1 Diagnosis	1.8.2 specialist clinical team	D Team factors	D:4 Team structure
2 days to first medical review	Medical support	2 Assessment	2.4 Failure to monitor adequately	F Organisation and management factors	F:2 Organisational structure
Early outreach discharge despite ongoing problems	Outreach support	3 Clinical monitoring /management	3.17 Lack of liaison with other staff	F Organisation and management factors	F:4 Safety culture and priorities

Failure to monitor electrolytes	Blood result surveillance	3 Clinical monitoring /management	3.2 Problems with fluids/electrolytes including renal function	B Task and technology factors	B:1 Task design and clarify of structure
Reticence to start TPN	Clinical reasoning	3 Clinical monitoring /management	3.23 Other (dehydration/malnutrition)	D Team factors	D:3 Supervision and seeking help
Failure to administer prescribed electrolyte supplements	Drug adverse event	6 Drugs and fluids	6.1 Error in prescription/preparation of drug/IV fluids/blood	B Task and technology factors	B:1 Task design and clarify of structure
Failure to prescribe electrolyte supplementation appropriately	Drug adverse event	6 Drugs and fluids	6.2 Error or accident in administering drug/IV fluids/blood	C Individual (staff) factors	C:1 Knowledge and skills
Failure to communicate non-administration of electrolyte supplements	Failure to escalate	2 Assessment	2.6 Failure to communicate to the rest of the team (clinical and multi-disciplinary)	D Team factors	D:1 Verbal communication
Failure to supplement electrolytes appropriately	Failure to respond to clinical need	6 Drugs and fluids	6.3 Failure to monitor drug action/toxicity/fluid balance	D Team factors	D:3 Supervision and seeking help
Lack of clarify in fluid management	Fluid management	1 Diagnosis	1.7 Failure to draw sensible/reasonable conclusions or make a differential diagnosis	D Team factors	D:4 Team structure

Suboptimal nutritional intake	Nutrition	3 Clinical monitoring /management	3.10 Other (nutrition)	D Team factors	D:4 Team structure
Failure to appreciate severity of condition	Failure to recognise terminal deterioration	1 Diagnosis	3.20 Apparent failure to recognise deterioration	D Team factors	D:4 Team structure
Not sat out daily	Rehabilitation	3 Clinical monitoring /management	3.6 Adequate mobilisation	A Patient factors	A:3 Personality and social factors

Appendix 14. Participant Characteristics

Table 1: Patient and family member participant data

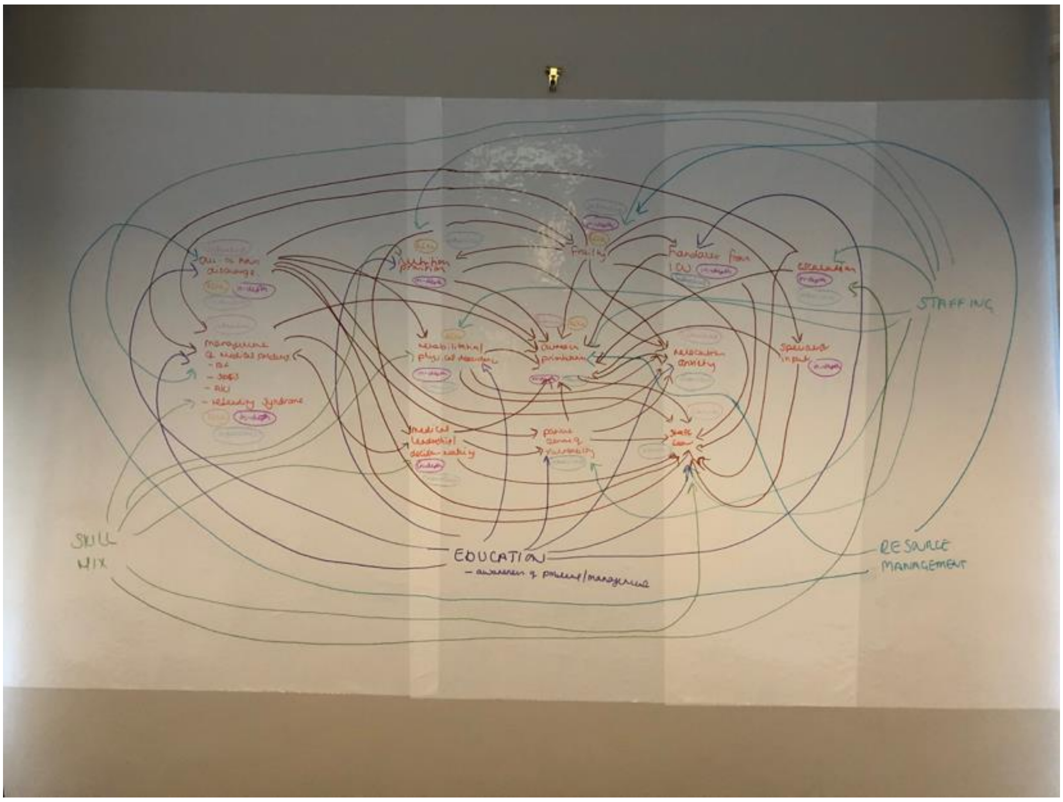
Site		Dyadic (n)	Relationship to patient
A	6	0	n/a
B	9	6	Wife (3) Daughter (1) Husband (2)
C	4	1	Daughter

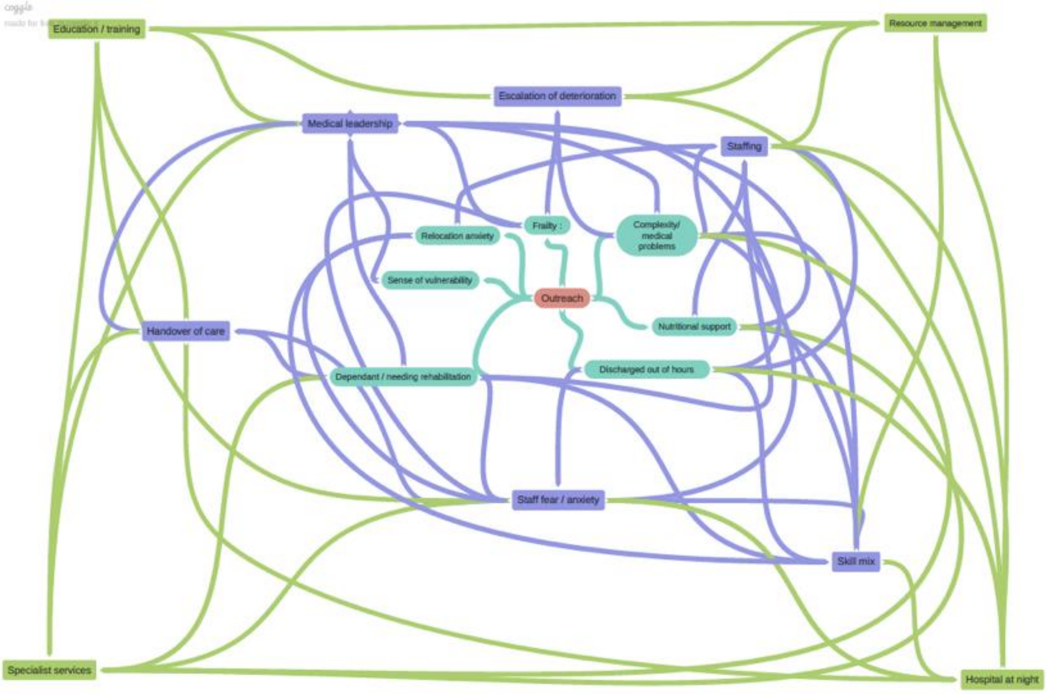
Table 2: Staff participant data

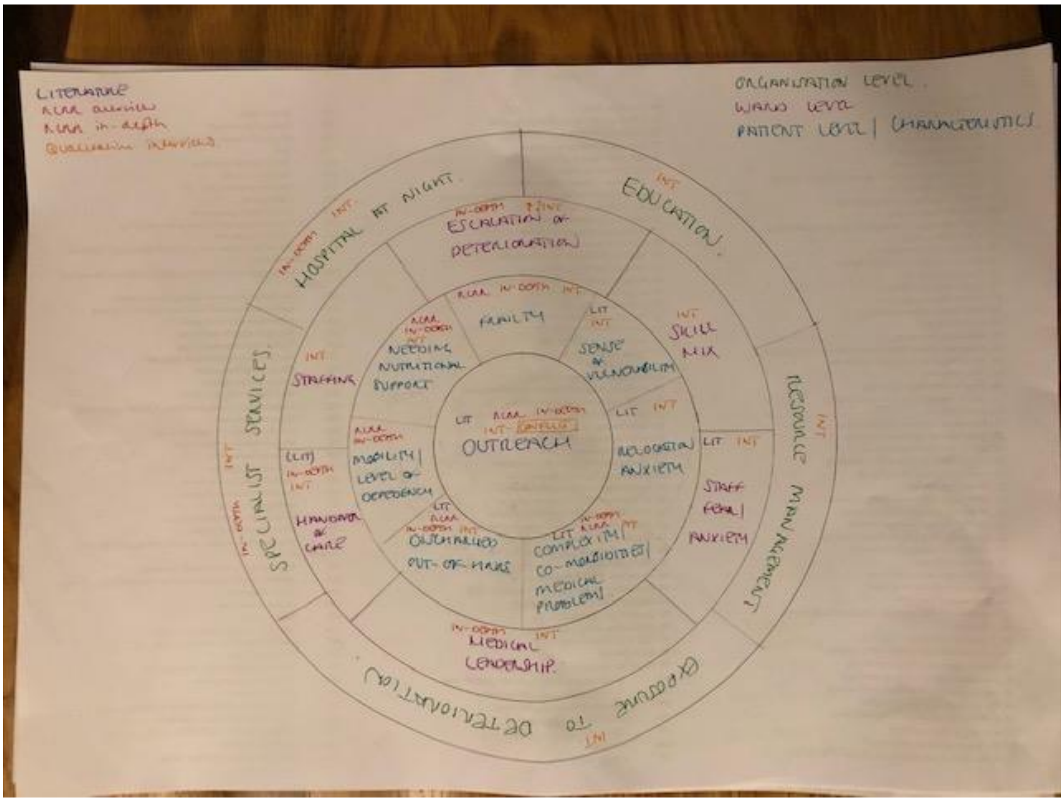
Staff group	Number
Nurse	13
Medical support worker	1
Physiotherapist	3
Specialist Registrar	3
FY1/FY2	4
Dietician	1
Critical Care Outreach/Follow-up Nurse	5

Appendix 15. Integration diagram development

Photos 1-3: Initial development






LITERATURE
NCAA overview
NCAA in-depth
Qualitative interviews
ORGANISATION LEVEL
WARD LEVEL
PATIENT LEVEL | CHARACTERISTICS
HOSPITAL AT NIGHT
EDUCATION
RESOURCE MANAGEMENT
EXPOSURE TO DETERIORATION
SPECIALIST SERVICES
ESCALATION OF DETERIORATION
SKILL MIX
STAFF FEAR | ANXIETY
MEDICAL LEADERSHIP
HANDOVER OF CARE
STAFFING
FRAILTY
SENSE OF VULNERABILITY
RELOCATION ANXIETY
COMPLEXITY | CO-MORBIDITIES | MEDICAL PROBLEMS
OVERWHELMED OUT-OF-HOURS
MOBILITY | LEVEL OF DEPENDENCY
NEEDING NUTRITIONAL SUPPORT
OUTREACH
LIT
NCAA
IN-DEPTH
INT

Appendix 16. Full Meta-Matrix

Literature Review	**RCRR**	**RCRR (in-depth)**	**Interviews: staff**	**Interviews: patients/family**
	300 post-ICU in-hospital deaths	**20** 'probably avoidable' deaths and **20** survivors	**30** interviews with staff involved in post-ICU care	**19** interviews with 26 patients and/or their family members
CENTRAL THEMES				
Staff Fear				
Staff perspective: Nurses identified several sources of anxiety including high acuity, impact on workload and not having the skills needed to care for post-ICU patients.	Not identified.	Not directly identified but reluctance to mobilise post-ICU patients may indicate anxiety about skills and fear of post-ICU patients.	Staff displayed profound fear and anxiety about receiving post-ICU patients. Not all staff were fearful, and this was sometimes described in terms of their clinical experience. In contrast one doctor described being well supported in managing post-ICU patients.	Not identified but linked to patient anxiety.

Reflective response: Staff described a strong sense of fear and anxiety related to many of the themes identified. There was a sense that this was related to uncertainty about their ability to provide the level of care patients needed. Not all staff described this and gave a sense that this was related to clinical knowledge and experience.				
Patient Anxiety				
Staff perspective: Nurses identified in interviews: prepared for move by removing monitoring and moving away from bedspace, and giving information to patients. **Patient perspective:** Patients identified in interviews: uncertainty about environment, ICU perceived as secure, needed help to prepare.	Not directly, but most problems occurred in the first 24 hours after transfer to the ward, possibly indicating reasons for anxiety on transfer.	Not identified.	Staff recognised the transition from ICU to the ward was challenging for patients. They described spending time with them, giving information and being clear about the realities of the ward. Nurses voiced concerns about whether ICU could do more to help manage patients' expectations.	Relocation anxiety was a strong theme in patient interviews. ICU was described as a place of safety and there was a profound sense of fear on transfer to the ward where there was a stark reduction in staff. In contrast, some patients described the move to the ward as a positive step in their recovery.
Reflective response:				

Patients continue to describe the same transfer anxiety identified by the literature 10 years ago. Staff describe strategies to try to address this but these do not appear to be having an impact. The RCRR found the highest number of problems in care delivery in the first 24 hours after transfer, indicating that this could be a difficult time in terms of care delivery and relocation anxiety may not be solely due to the profound change in environment.				
PATIENT CHARACTERISTICS (MICRO)				
Frailty and Physical Dependency				
Systematic review: Nursing workload scores associated with post-ICU in-hospital mortality, indirectly indicating high dependency.	Many cases were judged unavoidable despite multiple problems in care delivery, due to underlying frailty and co-morbidities. 62% of non-palliative non-survivors were unable to stand and step from bed to chair on ICU discharge. 70% were not assisted to mobilised from bed to chair daily.	Survivors were less frail: 8/20 needed help with ADLS prior to hospital admission) than non-survivors: 15/20 and care was judged as poorer for non-survivors than survivors. Frailty was frequently identified as a challenge to delivering post-ICU care. The contributory human factor identified in all cases of frailty was ‘condition: complexity and seriousness’.	Some staff questioned the appropriateness of some ICU admission due to their level of frailty. Nurses perceived post-ICU patients to be more dependent than others on the ward. Nurses and physiotherapists identified staffing and workload as barriers to providing rehabilitation on the ward.	Frailty was not directly identified by patients but may have contributed to their sense of vulnerability on the ward. Patients also perceived themselves as more dependent than others on the ward. They described staff as being too busy to provide the help they needed with personal care and mobilisation. Patients described exploring other ways of getting help

		Physiotherapists often documented reasons for not mobilising, resulting in prolonged time in bed. No oversight of rehabilitation on ward rounds. Most problems assessed as due to ‘team structure’.	Reluctance of physiotherapists to mobilise may be due to fear and lack of knowledge and experience.	on the wards such as from family or paid carers.
Reflective response: Frailty was identified by in-depth RCRR and by patients and staff as a challenge to the delivery of post-ICU ward care. This was linked to physical dependence, co-morbidity and complexity of care delivery and impacted on workload and skill mix. Rehabilitation delivery was poor on the wards and was linked to staffing, workload and ward culture. Appreciation of the importance of rehabilitation may improve delivery.				
Nutritional Support				
Systematic review:	185/250 non-palliative non-survivors required	Multiple problems with nutritional delivery were identified, including monitoring, not meeting	Discussion about nutrition was not common. When identified, related to problems with handover	Not identified

Nursing workload scores associated with post-ICU in-hospital mortality	nutritional support at ICU discharge. Nutritional handover was absent for 40% of these patients.	requirements, prolonged periods without feeding, and failure to request specialist input. There was a failure to oversee nutritional delivery on ward rounds.	and hampered by different documentation. Acknowledged reluctance to start feeding support, described as 'false optimism rather than negligence. One nurse acknowledged nutritional monitoring could be better.	
Reflective response: Nutrition was a significant problem in the RCRR and in-depth RCRR, with failures across all areas of delivery. Like rehabilitation, this appear to be in part due to a failure to appreciate the overall status of the patient, rather than viewing their care day by day. Handover identified in RCRR and staff interviews as impacting nutritional delivery. Limited discussion of nutrition in interviews may indicate a lack of appreciation of the importance.				
Complexity / Presence of Co-Morbidities				
Systematic review: Clinical measurements relating to ongoing organ dysfunction associated with post-ICU in-hospital	Poor management of AF, sepsis, nutrition provision and rehabilitation.	Complex medical problems were more common in non-survivors than survivors.	Junior doctors described feeling unsure about how to manage medical problems and often sought support outside of their specialty as	Patients described feeling vulnerable and there was some sense that they felt staff were unable to meet their needs on the ward,

mortality: CRP, creatinine, haemoglobin, lactate, high nursing workload scores and presence of tracheostomy.	26% of deaths judged to have some degree of avoidability.	Care judged to be worse in avoidable deaths than survivors.	they perceived there to be a lack of expertise within their team.	including giving basic information about their treatment.
Staff perspective*:* Common theme in qualitative studies -- identified by nurses as challenging. Overestimation of ward capabilities to manage complex patients identified as a barrier to the discharge process.	As with frailty, avoidability in non-survivors may have been higher in absence of co-morbidities.	Medical problems were poorly managed. This included problems with monitoring, recognition, escalation and management.	Nurses described post-ICU patients as complex and more acutely unwell than other ward patients, making them challenging to care for. There was a sense that they are becoming more complex and co-morbid.	

Reflective response:

Complexity was identified across all data sets. Complexity was related to frequent problems in care delivery identified in the RCRR. Patients with ongoing organ dysfunction or complex conditions requiring monitoring and management were perceived as challenging by ward staff, who felt unable and unsupported to deliver appropriate management.

WARD LEVEL (MESO)

Handover				
Staff perspective: Common theme in qualitative studies and surveys - need to improve handover of information	Most problems in care occurred in the first 24 hours after transfer, indicating handover has a role to play in initial post-ICU care. Nutrition handover was poor in 40% of cases.	Premature discharge and ongoing clinical problems often not acknowledged. Commonly medical plan was absent or incomplete. ICU and ward documentation were different, requiring transfer of information and impairing continuity. Handover problems were worse in out-of-hours discharges. Lack of clarity in ceiling of care made ongoing treatment difficult.	Medical plan perceived to be important, especially for out-of-hours discharges. Transfer of information to ward documents hampered continuity of care – drug and fluid charts, nutrition plans. Newly qualified doctors preferred a clear medical plan for management of ongoing problems in ICU handover.	Some patients described a sense that the wards had little information about their treatment and plans. Not directly identified but sense that ward staff did not appreciate their level of dependency and vulnerability may be due to failures in handover.

<table>
<tr><td></td><td></td><td>Handover documents were different at all three sites.</td><td></td><td></td></tr>
<tr><td colspan="5">Reflective response:
Nurses and doctors identified documentation differences, as seen in in-depth reviews. The multiple iterations of handover identified risk missing and conflicting information. As handover occurred profession to profession this may also risk restricting information that was required by the whole multidisciplinary team. This was perceived to have an impact on care delivery such as nutrition support and rehabilitation.</td></tr>
<tr><td colspan="5">Monitoring, Escalating, and Responding</td></tr>
<tr><td>Systematic review:
Blood tests identified as associated with post-ICU in-hospital mortality.</td><td>Sepsis and AF management were identified as problematic.</td><td>Monitoring, escalation and management assessed as poor in many aspects of care delivery: vital signs (EWS); nutrition; fluid balance; rehabilitation; bloods: electrolytes (refeeding syndrome), haemoglobin, acute kidney injury, markers of sepsis.</td><td>Nurses describe closely monitoring patients on arrival as they were perceived to be more acutely unwell than other ward patients.
Newly qualified doctors describe a lack of clarity in when to treat out-of-range blood results.</td><td>Not identified.</td></tr>
<tr><td colspan="5">Reflective response:</td></tr>
</table>

Failure to monitor underlies all patient-level problems discussed above. Despite nurses describing closely monitoring patients on arrival from ICU failure to escalate high EWS still happened, more frequently overnight.				
Staffing and Workload				
Systematic review: TISS/NEMS associated with increased post-ICU in-hospital mortality. **Patient perspective:** Patients identified reduced staffing on the wards in comparison with ICU. **Staff perspective:** Strong theme in qualitative studies - nurses identified the negative impact of ICU patients on their workload and implications for their other patients.	Not directly identified but post-ICU quality of care was frequently judged to be poor or very poor.	Staffing was not documented explicitly in the notes but staffing was indicated where problems were more prevalent at night (such as escalation of EWS), and where there were delays to response to escalation due to availability of staff. Other indications of staffing impairing care included absence of physiotherapy and ward rounds at the weekend and low threshold for not mobilising. Reduced medical cover at night and weekends, including consultant input,	High workload and insufficient staffing was a strong theme for all staff, impairing their ability to provide the care patients needed. Nurses described post-ICU patients as requiring a high level of care, impacting on their other patients. There was little discussion of prioritisation, and concern around workload may indicate a lack of appropriate prioritisation.	Patients described staff as very busy and often not having the time to meet their needs, particularly in those patients who were physically dependent. This had a profound impact on their sense of safety and security on the ward.

Survey of ICU doctors - ICU staff may underestimate the ability of the wards to cope with post-ICU patients		was identified as problematic.		
Reflective response: There was a strong sense of workload underlying poor care delivery from both patients and staff. This may in part indicate poor prioritisation.				
Skill Mix and Supervision				
Staff perspective: Nurses described feeling they lacked some of the skills required to provide adequate care to post-ICU patients.	Implied in failure to deliver adequate mobilisation, nutrition, and manage clinical problems, but not clearly identified.	As above, not documented but implied in problems in care delivery such as physiotherapists not identifying need for chest physiotherapy.	Strong theme in staff interviews. Sense of not having the skills needed to deliver care to post-ICU patients. Some mismatch between perception of advanced skills needed for post-ICU patients and problems being identified in more usual ward-based care such as rehabilitation and nutrition.	Sense that ward staff were not as skilled at ICU staff.

<table>
<tr><td></td><td></td><td></td><td>Outreach key in supporting staff with advanced skills and offering training.
Advanced skills were associated with exposure to post-ICU patients.</td><td></td></tr>
<tr><td colspan="5">Reflective response:
The in-depth reviews identified multiple areas of care where skills and experience may have contributed to poor delivery. This may indicate a lack of supervision and support. Outreach were identified as key sources of help and support.</td></tr>
<tr><td colspan="5">Medical Leadership and Ward Culture</td></tr>
<tr><td>Not identified</td><td>Poor or very poor care frequently identified in post-ICU non-survivors.
Problems in management of pre-defined areas common, possibly linked to poor medical leadership.</td><td>Medical ward rounds often focused on speciality rather than overall patient condition (such as surgical problem). This was problematic for complex, co-morbid patients.</td><td>Very junior doctors described anxiety over lack of supervision and support, particularly in surgical teams. This resulted in uncertainty about management of clinical deteriorations.</td><td>Patients described bedside staff as unable to answer questions about their treatment, and needing to wait for the ward round/consultant to get information.</td></tr>
</table>

		Where consultants were absent from ward rounds for several days medical decision-making was poor or deferred. Where conflict existed between consultants involved in a patient's care overall management was poor. War culture may underlie consistent failure to deliver nutrition, variation in rehabilitation between wards and poor oversight on ward rounds.	Junior doctors described surgeons as being under pressure to be in theatre and therefore absent from the ward. Nurses described the need for a specialist medical team to manage complexity in surgical patients. Outreach identified variability of support needs between wards. Ward culture may underlie absence of discussion of nutrition as problematic.	Ward culture may underlie sense of busy wards and failure to provide care to dependant patients

Reflective response:

Underlying all the problems identified above was the absence of clear oversight of care from the consultant. Absence of medical leadership impacts on both the patient and staff, and is linked to 'complexity'. Ward culture has been identified throughout the factors discussed at both micro and meso levels. Aspects include ensuring a medical review on transfer from ICU, low threshold for mobilising, failure to appreciate importance of mobilisation and nutrition, failure to monitor and escalate problems, and consultant leadership. This may be linked to experience with post-ICU patients and general ward acuity.

ORGANSIATIONAL LEVEL (MACRO)				
Education and Training				
Staff perspective: A strong theme in interview studies with nurses was identified need for training in skills needed to care for post-ICU patients.	Not identified	Identified as underlying reason for problems in care delivery such as chest physiotherapy, failure to escalate EWS and failure to monitor nutritional intake and fluid balance.	Staff identified need for formal training. Outreach offer strong peer training on the wards. Peer support and exposure to acutely ill patients key to developing skills.	Patients identified some gaps in staff knowledge, such as degree of physical dependence and treatment plan, but these may have been due to failure to handover rather than poor skills.
Reflective response: Although formal education was discussed positively, there were also instances describing a sense of deskilling. Several staff also described rapidly improving their skills when exposed to acutely ill patients. This suggests that exposure is an important part of developing and retaining skills. This was described as needing to be balanced with patient safety and wellbeing of staff.				
Access to Specialist Services				

<table>
<tr><td>CCOT key support</td><td>Commonly specialist advice for managing AF was not sought.
Most patients were reviewed by CCOTs but were often discharged from the service on day one.</td><td>Multiple specialist teams involved in post-ICU care, commonly failure or delay to referral was identified.
Failure to seek specialist input resulted in poor management of problems outside specialism of ward team.
CCOT co-ordinated specialist input and offered support with management.</td><td>Specialist teams rarely discussed but peri-operative team described positively for surgical nurses and doctors.
CCOT key in offering support, including advice, training and escalation of concern.</td><td>Not identified</td></tr>
<tr><td colspan="5">Reflective response:
Specialist input was assessed as important in the management of problems outside of the clinical team for the ward, however, referrals were often delayed or not undertaken. The reason for this failure to review is likely to be complex but included failure to recognise a problem was present, failure to recognise a need to source external advice, and delays in the process of referral including responsibility.</td></tr>
<tr><td colspan="5">Team Work and Trust</td></tr>
</table>

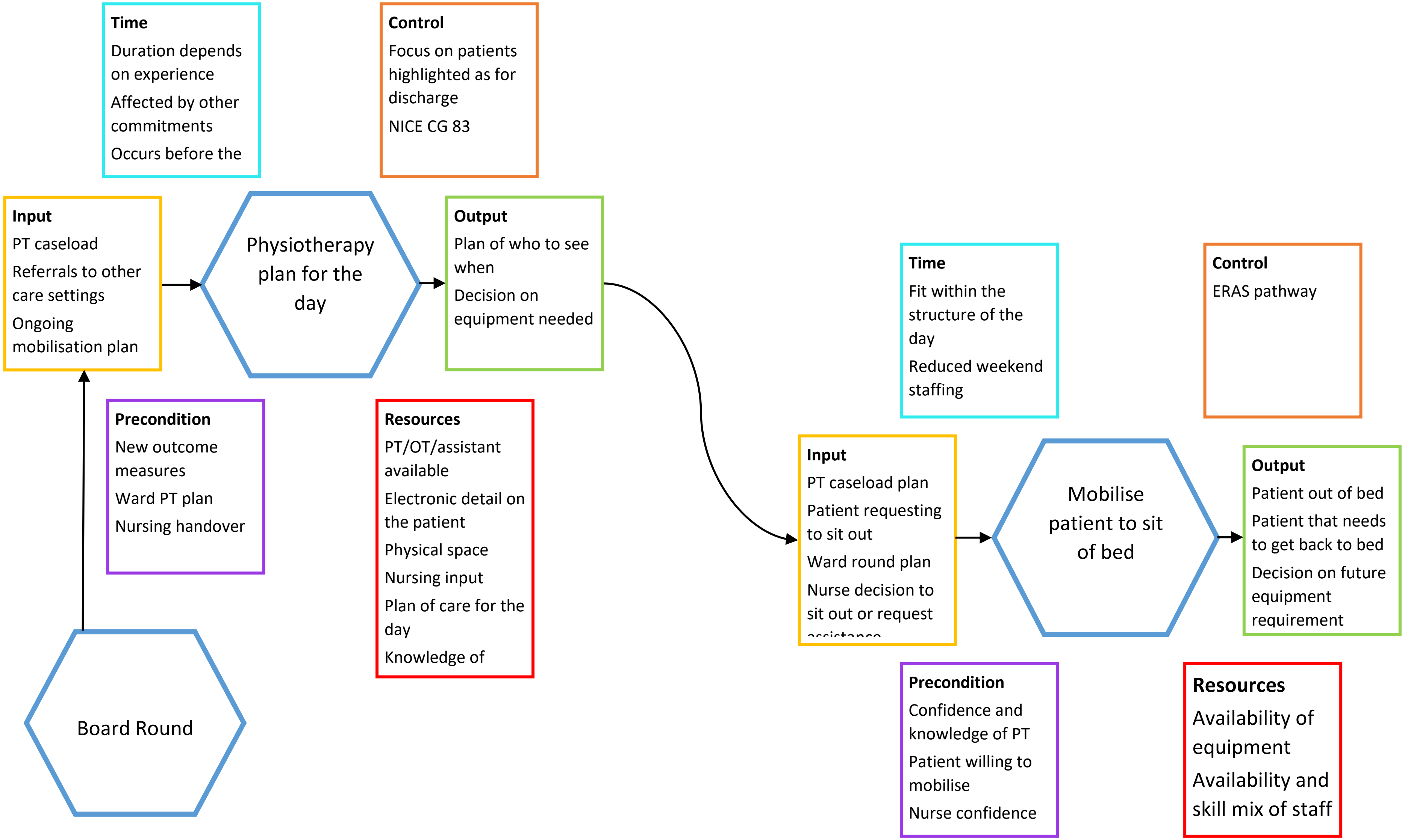
Not identified	Not identified	Not directly identified by may underlie failure to respond to escalation	Relied on previous experience of appropriate decision-making. Was difficult for newly qualified doctors who were not in post for long enough to develop clear trust in teams. Outreach approachable and responsive.	Patients described trust in staff as important
Reflective response: Teamwork underlies care delivery especially where this relies on judgement of decision-making such as in response to escalation.				
Resource Management				
Staff perspective: Identified in interviews with nurses – low staffing impacting ability to provide adequate care.	Not directly indicated but may result in poor rehabilitation provision.	There was little or no physiotherapy input at weekends at all sites.	Out-of-hours discharge was perceived as unavoidable due to ICU bed pressures.	Staffing was also perceived to be insufficient by patients.

		Physiotherapy rehabilitation delivery was poor in patients who required high staff numbers to mobilise. Reduced medical presence at weekends was identified in several cases. Two sites had no on-site microbiology service, contributing to poor infection management.	Staffing and skill mix were perceived to be poor, impacting on staff ability to provide care. Bank staff were described as negatively impacting on clinical care delivery.	Patients described being unable to access information about their care, suggesting poor skill mix on the wards.
Reflective response: Linked to staffing and skill mix, including within medical teams impacted on care delivery. This was particularly apparent out-of-hours (both at night and weekends), compounding the challenges to care delivery.				
Out-of-hours Care Provision				
Meta-analysis: 39% increased risk of dying if discharge from ICU out-of-	67% of patients discharged after 4pm (76% in probably avoidable deaths)	Patients discharged after 4pm were less likely to be seen by a doctor before the next day.	Out-of-hours discharge was described as unavoidable at times due to bed pressures.	Patients described out-of-hours discharge as frightening and chaotic.

hours, and 30% more likely to be readmitted to ICU. Suggestion in literature that this is due to a higher proportion of palliative patients being discharged at night.	Most 'problems in care' occurred in the first 24 hours following ICU discharge.	Five cases of premature discharge followed by death within 24 hours of discharge. No acknowledgement and no plan in place to manage ongoing issues. In one site outreach routinely visited patients discharged overnight. Many problems in care delivery were worse at night or at weekends, including premature discharge, poor handover, failure to escalate, physiotherapy provision, medical review on arrival, and presence of consultant on ward rounds.	Staff were very worried about receiving patients from ICU out-of-hours due to reduced staffing, lack of senior medical staff to review patient on arrival, increased workload due to ward routines, reduced availability of support if something went wrong.	Out-of-hours discharge was one aspect of overall relocation anxiety experienced by patients.

<table>
<tr><td></td><td></td><td>Outreach on one site visit patients overnight to check the ward was coping.</td><td></td><td></td></tr>
<tr><td colspan="5">Reflective response:
Out-of-hours discharge was common, despite being associated with poor outcome. Premature discharge out-of-hours may sometimes be unavoidable due to system level pressures. Where this occurs, it should be acknowledged to support both patients and staff. Problems in care were more frequently identified at night. This may indicate staffing and skill mix as the underlying reason for poor outcome when discharged at night.</td></tr>
</table>

Appendix 17. Functional Resonance Analysis Method (FRAM): Mobilisation



Time

Duration depends on experience

Affected by other commitments

Occurs before the

Control

Focus on patients highlighted as for discharge

NICE CG 83

Input

PT caseload

Referrals to other care settings

Ongoing mobilisation plan

Physiotherapy plan for the day

Output

Plan of who to see when

Decision on equipment needed

Precondition

New outcome measures

Ward PT plan

Nursing handover

Resources

PT/OT/assistant available

Electronic detail on the patient

Physical space

Nursing input

Plan of care for the day

Knowledge of

Board Round

Time

Fit within the structure of the day

Reduced weekend staffing

Control

ERAS pathway

Input

PT caseload plan

Patient requesting to sit out

Ward round plan

Nurse decision to sit out or request

Mobilise patient to sit of bed

Output

Patient out of bed

Patient that needs to get back to bed

Decision on future equipment requirement

Precondition

Confidence and knowledge of PT

Patient willing to mobilise

Nurse confidence

Resources

Availability of equipment

Availability and skill mix of staff

Appendix 18. Dissemination

Published papers (included in earlier appendices):

Vollam S, Gustafson O, Hinton L, Morgan L, Pattison N, Thomas H, & Watkinson, P. (2019) Protocol for a mixed-methods exploratory investigation of care following intensive care discharge: the REFLECT study. *BMJ Open* 9 (1), e027838

Vollam S, Petrinic T, Lamb S, Young JD, & Watkinson P. (2018) Intensive care, in-hospital mortality and intensive care readmission rates: a systematic review and meta-analysis. (2018) *Intensive Care Medicine*, 44 (7), 1115-1129.

Vollam SA., Dutton SJ, Young JD & Watkinson PJ. (2015). Out-of-hours discharge from intensive care, in-hospital mortality and intensive care readmission rates: a systematic review protocol. *Systematic Reviews*, *4*, 93.

Published paper appended here:

Vollam SA, Gustafson OG, Young JD, Attwood B, Keating L, Watkinson P. (2021) Problems in care and avoidability of death after discharge from intensive care: a multi-centre retrospective case record review study. *Critical Care, 25*(10).

Conferences:

October 2018: ESICM poster presentation
November 2018: Thames Valley CRN Conference presentation
December 2018: ICS poster presentation ‘Out-of-hours discharge from ICU’
December 2019: ICS Gold Medal finalist: ‘REFLECT’

Invited talks:

January 2018: CRN regional meeting: REFLECT
November 2018: ORICS invited talk: Out-of-Hours Discharge From ICU
December 2018: Regional ICS teaching: Out-of-Hours Discharge From ICU

Other:

Blog post reporting results of meta-analysis of out-of-hours discharge:
https://www.thebottomline.org.uk/summaries/icm/vollam/

Vollam *et al. Crit Care (2021) 25:10*
https://doi.org/10.1186/s13054-020-03420-5

Critical Care

RESEARCH

Open Access

Problems in care and avoidability of death after discharge from intensive care: a multi-centre retrospective case record review study

Sarah Vollam[1,2*], Owen Gustafson[2,3], J. Duncan Young[1], Benjamin Attwood[4], Liza Keating[5] and Peter Watkinson[1,2]

Abstract

Background: Over 138,000 patients are discharged to hospital wards from intensive care units (ICUs) in England, Wales and Northern Ireland annually. More than 8000 die before leaving hospital. In hospital-wide populations, 6.7–18% of deaths have some degree of avoidability. For patients discharged from ICU, neither the proportion of avoidable deaths nor the reasons underlying avoidability have been determined. We undertook a retrospective case record review within the REFLECT study, examining how post-ICU ward care might be improved.

Methods: A multi-centre retrospective case record review of 300 consecutive post-ICU in-hospital deaths, between January 2015 and March 2018, in 3 English hospitals. Trained multi-professional researchers assessed the degree to which each death was avoidable and determined care problems using the established Structured Judgement Review method.

Results: Agreement between reviewers was good (weighted Kappa 0.77, 95% CI 0.64–0.88). Discharge from an ICU for end-of-life care occurred in 50/300 patients. Of the remaining 250 patients, death was probably avoidable in 20 (8%, 95% CI 5.0–12.1) and had some degree of avoidability in 65 (26%, 95% CI 20.7–31.9). Common problems included out-of-hours discharge from ICU (168/250, 67.2%), suboptimal rehabilitation (167/241, 69.3%), absent nutritional planning (76/185, 41.1%) and incomplete sepsis management (50/150, 33.3%).

Conclusions: The proportion of deaths in hospital with some degree of avoidability is higher in patients discharged from an ICU than reported in hospital-wide populations. Extrapolating our findings suggests around 550 probably avoidable deaths occur annually in hospital following ICU discharge in England, Wales and Northern Ireland. This avoidability occurs in an elderly frail population with complex needs that current strategies struggle to meet. Problems in post-ICU care are rectifiable but multi-disciplinary.

Trial Registration: ISRCTN14658054.

Keywords: In-hospital death, Avoidable harm, Critically ill

Background

For patients discharged alive from an intensive care unit (ICU), the subsequent in-hospital days are high risk. Post-ICU in-hospital mortality rates are 4–13% worldwide [1–3] and 6.6% in England and Wales [4]. Around a

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third of in-hospital mortality in those treated on an ICU occurs between ICU and hospital discharge.

Risk factors for post-ICU in-hospital mortality identifiable whilst in ICU have been investigated using ICU databases [1–3, 5, 6]. These studies show older, sicker patients are more at risk. However, there is little work identifying either what proportion of these deaths are avoidable or how post-ICU care could be changed to decrease mortality. Recent studies attempting to improve mobility or nutrition post-ICU have not changed outcomes [7, 8] emphasising the need to better understand where successful interventions could be directed.

Hogan et al. used retrospective case record review (RCRR) to investigate preventability of deaths in English hospitals [9]. This work established the RCRR methodology for mortality review, since refined into the Structured Judgement Review method (SJR) [10]. The SJR approach standardises critical assessment of care delivery, splitting a hospital stay into defined care periods. The SJR has been used internationally [11] and implemented throughout NHS hospitals in England [12]. It is advocated as the mortality review method for all UK NHS ICUs [13]. However, to the best of our knowledge this approach has not previously been used to examine deaths following ICU discharge.

This work is part of the REFLECT project, with the overall aim of developing a multi-component intervention to reduce post-ICU in-hospital mortality [14]. The primary aim of this study was to quantify the avoidability of deaths in patients on hospital wards following an ICU admission, using RCRR methodology. We also report care areas that could be changed to improve outcomes in this vulnerable patient group.

Methods

We report our study according to the STROBE statement [15]. We obtained ethical approval (Wales REC 4 reference: 17/WA/0139) and Confidentiality Advisory Group support (reference: 17/CAG/0063). We published the protocol [14] and registered the study (ISRCTN14658054).

Setting

We conducted SJRs in three UK hospitals in separate NHS trusts, in adjoining regions: a large tertiary referral centre, a large university-affiliated district general hospital and a small district general hospital. We selected sites representing different clinical settings both within and outside the ICUs (Additional file 1: Table S1). All sites had nurse-led ICU outreach/follow-up services who visit patients discharged from ICU to the ward.

Sampling strategy

Non-survivors

We pre-specified a sample size of 300 consecutive patients who had died post-ICU in hospital prior to April 2018 in our published protocol [14] based on a previous audit. From this we anticipated around 10% of deaths reviewed would be avoidable and that 300 patients would be available from participating hospitals within approximately three preceding years, allowing us to represent recent practice. We excluded patients with missing medical notes or who were transferred away from study hospitals.

We selected cases using electronic hospital records in reverse chronological order from March 2018 until 300 eligible cases were identified across the three sites. We excluded cases where medical notes were unavailable (e.g. missing) or the record was incomplete (e.g. key documents such as observations charts or sections of medical documentation were missing from the record of care). We reviewed ward care following the first discharge from an ICU.

Survivors

A convenience sample of cases was selected from participants interviewed as part of the REFLECT study. Details of the approach are included in the published protocol [14]. We reviewed an equal number of survivor cases as 'probably avoidable' deaths to offer a comparison of care.

Variables

We collected summary data on all patients discharged from each ICU during the study period including age, sex and Clinical Frailty Scale (CFS) prior to hospital admission [16], type of admission (surgical/medical and elective/emergency), Acute Physiology and Chronic Health Evaluation (APACHE II) score on ICU admission [17], ICU length of stay (LOS) and post-ICU ward.

Detailed data on deaths following discharge from ICU were collected using the SJR methodology [18]. The SJR form [12] categorises care into distinct periods: initial management; ongoing management; care during a procedure; end-of-life care; and overall care. For each period, a short narrative account of care is written, including 'judgement statements'. A quality of care score is assigned to each period on a scale from 1 (very poor care) to 5 (excellent care). Scores for each care period contribute to a final overall score of quality of care, derived from and supported by the judgement statements. Following review of care, an 'avoidability of death' judgement score is assigned, considering any problems in care identified as contributing to the outcome. This is a 6-point scale from 6: definitely not avoidable to 1: definitely avoidable.

We piloted the published SJR Case Report Form [12] resulting in minor adjustments to fit the post-ICU cohort. We changed the focus of the 'initial management' section from 'first 24 h in hospital' to 'first 24 h following ICU discharge'; added more detailed demographic data; and included focused data capture of pre-identified care issue areas obtained from literature review [3, 19, 20] and a previous local audit. These included discharge from an ICU out-of-hours; mobility and rehabilitation; nutrition; and management of atrial fibrillation (AF) or sepsis. We also collected information on the provision of ICU outreach/follow-up care for each patient.

We recorded when patients were discharged for end-of-life care (EOLC) following ICU discharge and whether death occurred from progression of a chronic disease. We collected additional data on the pre-identified care issues. We recorded problems in care where they were judged to result in harm to a patient. The pre-identified care issues were not defined as a 'problem in care' unless they were judged to have resulted in harm to the patient. Data sources and rules (where interpretation was required) were defined for each variable (Additional file 1: Tables S2 and S3).

In line with previous work we defined 'avoidable deaths' as those classified 'probably avoidable' or greater levels of avoidability (score 1–3). We also calculated a wider 'relaxed' definition of preventable deaths (including 'possibly preventable but not very likely', score 1–4) [9, 11]. We classified all deaths other than those that were 'definitely not avoidable' (score 6) as having some degree of avoidability.

Data extraction

We extracted summary data for all discharged patients from electronic records. Sources of data included nursing and medical notes, laboratory results, vital signs documentation, therapy documentation, and drug, food and fluid charts. We defined data sources and rules (where interpretation was required) for each variable collected (Additional file 1: Table S3). We extracted data onto paper case report forms. These were then transcribed into a pre-piloted spreadsheet (Microsoft Excel version 16, Microsoft Corporation, Redmond, USA).

We accessed anonymised population descriptive data for patients discharged from an ICU in England, Wales and Northern Ireland over the study period (excluding the study sites) from the Intensive Care National Audit and Research Centre (ICNARC—the national audit covering all general ICUs) case mix programme, to assess the comparability of our sample.

Bias

Three reviewers (two nurses and a physiotherapist) with clinical experience of both ICU and general wards completed the reviews. All three reviewers attended SJR training, run by the Clinical Governance team in the lead hospital. Reviewers also studied published SJR guidance [21]. To improve agreement, 10 initial cases were dual reviewed and discussed by two reviewers (SV and OG) to develop extraction approaches. Uncertainties and complex cases were discussed and scores agreed. Where uncertainty remained, cases were discussed with an ICU consultant (PW). To assess inter-rator reliability, 15 undiscussed cases were dual reviewed and scores for each care period, overall quality of care and avoidability judgments compared.

Statistical analyses

The primary outcome measure was the proportion of in-hospital deaths following ICU discharge that were probably avoidable. Secondary outcomes included the proportion of in-hospital deaths following ICU discharge with lesser degrees of avoidability, characteristics of post-ICU non-survivors and survivors, quality of care scores for deaths by avoidability and data on pre-identified care issues and delivery of outreach/follow-up services. Data are presented as mean (95% CIs), median (inter-quartile range) or proportion (%, 95% CI), as appropriate. Confidence intervals of proportions were calculated using the Clopper–Pearson method. Agreement between reviewers was assessed using linear-weighted Cohen's Kappa with confidence intervals calculated using bootstrapping (10,000 samples). Comparisons of proportion were undertaken using Fisher's exact test. Analyses were undertaken in R [22].

Results

Participants

Between January 2015 and March 2018, 352 of 7434 (4.7%) patients consecutively discharged from the study ICUs died during the same hospital admission. We excluded 52 incomplete (16 records) or unavailable records (36 records). Of the 300 eligible cases, 50 patients were discharged for end-of-life care (Additional file 1: Fig. S1). We reviewed the care of 20 patients who survived to hospital discharge, matching the number of avoidable deaths.

Descriptive data

Baseline characteristics for study patients were similar to national findings (Table 1). However, the APACHE II scores appeared higher in the study population,

Table 1 Patient characteristics

Characteristics	Study data Non-survivors: EOLC *n* = 50	Study data Non-survivors: excluding EOLC *n* = 250	Study data Analyzed survivors *n* = 20	Study data All survivors *n* = 7082	Study data ICU discharges excluding EOLC† *n* = 7332	National CMP†† data ICU discharges excluding EOLC *n* = 437,586
Age median (IQR)	73 (65–82.75)	74 (63.25–80)	66 (55–69.5)	62 (46–73)	62 (47–73)	63 (48–74)
Female n (%)	18 (34.6)	90 (36)	7 (35)	3075 (43.4)	3165 (43.2)	198,319 (45.3)
APACHE II median (IQR)	21 (18–24)	21 (17–26)	16 (14–22)	15 (12–20)	16 (12–20)	13 (10–18)
Admission diagnosis n (%)						
Surgical	14 (28)	112 (44.8)	13 (65)	3529 (49.8)[a]	3641 (49.7)[a]	209,098 (47.8)[d]
Medical	36 (72)	138 (55.2)	7 (35)	3194 (45.1)	3332 (45.4)	228,439 (52.2)
Type of admission n (%)						
Emergency	50 (100)	233 (93.2)	17 (85)	4352 (61.5)[b]	4585 (62.5) [b]	313,790 (71.7)[d]
Elective	0 (0)	17 (6.8)	3 (15)	1702 (24.0)	1719 (23.4)	123,747 (28.3)
Clinical frailty scale n (%)						
1–4	23 (46)	128 (51.2)	15 (75)	5471 (77.3)[c]	5599 (76.4)[c]	339,919 (77.7)[e]
5	12 (24)	57 (22.8)	3 (15)	1218 (17.2)	1275 (17.4)	73,822 (16.9)
6	5 (10)	44 (17.6)	2 (10)	185 (2.6)	229 (3.1)	17,631 (4.0)
7–9	10 (20)	21 (8.4)	0	105 (1.5)	126 (1.7)	4459 (1.0)
ICU LOS (hours) median (IQR)	72 (48–144)	96 (48–168)	312 (138–534)	72 (48–120)	72 (48–120)	57 (26–120)
Post-ICU LOS (days) median (IQR)	1.5 (0–4)	9 (5–21)	15.5 (6.5–24.5)	8 (4–17)	8 (4–17)	8 (4–16)

EOLC end-of-life care, *LOS* length of stay

† Excluding 52 ward deaths not included in the review

†† Case Mix Programme

[a] 359 (5%) missing

[b] 1028 (14.5%) missing

[c] 103 (1.5%) missing

[d] 49 (0.01%) missing

[e] 1755 (0.4%) missing

suggesting the overall severity of illness and probability of in-hospital death were greater in the study hospitals.

Patients discharged from ICU for end-of-life care who died before leaving hospital were numerically more likely to be male medical patients and tended to be older, frailer and with higher APACHE II scores than survivors (Table 1). By the 9th day following discharge 50% of deaths occurred (Additional file 1: Fig. S2).

Avoidability of death and quality of care

Overall agreement between reviewers was good (weighted Kappa 0.77, 95% CI 0.64–0.88 for all scores combined) (Additional file 1: Table S4). During review of the 300 cases, only two were discussed with a third party (PW), where uncertainties could not be resolved between two reviewers. Death had some degree of avoidability (scoring one to five) in 65/250 (26%, 95% CI 20.7–31.9) of cases (Table 2). For 20 patients (8%, 95% CI 5.0–12.1) death was probably avoidable (more than a 50:50 chance of avoidability). For the more relaxed definition of avoidability, 44 (17.6%, 95% CI 13.1–22.9) patients qualified. Two case vignettes are presented below, illustrating examples of deaths judged to be probably avoidable and possibly avoidable.

Table 2 Overall avoidability of death scores

Scale used to judge avoidability of death *n* (%)	Discharges from ICU, excluding EOLC *n* = 250 (% [95% CI])
1. Definitely avoidable	0 (0 [0–1.5])
2. Strong evidence of avoidability	0 (0 [0–1.5])
3. Probably avoidable (more than 50:50)	20 (8) [5.0–12.1])
4. Possibly avoidable but not very likely (less than 50:50)	24 (9.6 [6.2–14.0])
5. Slight evidence of avoidability	21 (8.4 [5.3–12.6])
6. Definitely not avoidable	185 (74 [68.1–79.3])

EOLC end-of-life care

Vignette 1. Probably avoidable (more than 50:50) and poor care.

An elderly patient was discharged on a weekend evening with a high early warning score after a 1-day elective ICU admission following major intra-abdominal surgery. Their surgery was deemed high risk because of a past history of significant chronic obstructive pulmonary disease (COPD). As the patient was at risk of developing a hospital-acquired respiratory infection, a plan for immediate treatment with antibiotics in the event of respiratory deterioration was decided on by the ICU team. However, this plan was not included in the patient's ICU discharge document. The patient's low oxygen saturations worsened from the first post-discharge day but were attributed to fluid overload. Physical examination of the chest was not documented, and mobilisation did not occur. A chest X-ray was taken on the evening of the second day following ICU discharge but was not reported until a specialist respiratory team reviewed the patient on the afternoon of the third post-discharge day. The respiratory team diagnosed hospital-acquired pneumonia, commenced appropriate antibiotics and arranged chest physiotherapy (which had not occurred following ICU discharge). The patient deteriorated further. A decision was made not to escalate treatment, and the patient died from hospital-acquired pneumonia.

Overall judgement Discharge from an ICU late in the day with continuing physiological abnormalities leading to a high early warning score with inadequate information exchange at ICU discharge contributed to missed subsequent opportunities to prevent or manage hospital acquired pneumonia in a patient at risk for this complication.

Vignette 2. Possibly avoidable but not likely with poor care.

An elderly frail patient with cardiac and other co-morbidities was discharged from ICU during the day, following emergency abdominal surgery. A clear management plan was in place at the time of ICU discharge. They received no medical team review, physiotherapy assessment or critical care follow-up on the first post-ICU ward day. Hypotension was first recognised the next day, leading to an increased early warning score. The hypotension was not addressed in a consultant review, and they were discharged from the critical care outreach service. Worsening hypotension subsequently led to suspicion of abdominal sepsis and the Sepsis Six care bundle complied with, including administration of antibiotics. On the same day they were treated for a suspected myocardial infarction and subsequently developed atrial fibrillation. They continued to deteriorate until instigation of end-of-life care several days later.

Overall judgement Delay in the initial recognition and management of sepsis and myocardial infarction may have contributed to the outcome; however, the presence of co-morbidities and frailty suggests their death was unlikely to have been preventable.

We judged 185 deaths to have no avoidability: for 51/185 (27.6%) death was caused by progression of a chronic disease (such as liver failure, chronic respiratory disease or cancer); 14/185 (7.6%) were transitioned to end-of-life care within 24 h of ICU discharge and 5/185 (2.7%) died suddenly within 48 h of ICU discharge without ward-based problems in care. Of the remaining 115 patients: in 64/185 (34.6%) death was considered unavoidable despite having problems in care and 51/185 (27.6%) had no problems in care delivery (Additional file 1: Table S5). A case vignette is presented below, illustrating an example of a death judged to be probably unavoidable.

Vignette 3: Slight evidence of avoidability and poor care.

An elderly, very frail patient was discharged from ICU during the day, following a short ICU stay after elective abdominal surgery. There was a clear written handover from ICU including a management plan and ICU follow-up occurred. Over the next 3 days they deteriorated with increasing tachycardia, reducing haemoglobin concentration and abdominal distension. Sepsis was suspected and the Sepsis Six care bundle complied with. Although the symptoms of deterioration were treated, there was no investigation of the underlying cause of this deterioration or sepsis source until the fourth day after ICU discharge when a small bowel perforation was diagnosed with a CT scan. The patient returned to ICU but did not recover.

Overall judgement There was a significant delay in investigating the underlying cause of deterioration. Despite this, the high level of frailty meant the patient was unlikely to have survived.

Patients received poor or very poor overall care in 46/65 (70.8%, 95% CI 58.2–81.4) cases where death had some degree of avoidability, in comparison with 16/185 (8.65%, 95% CI 5.02–13.7) cases for patients with no problems in care contributing to death ($p < 0.001$). All cases judged to be probably avoidable were judged to have received poor or very poor care. Care was judged poor or very poor overall in 8/20 (40%, 95% CI 19.1–63.9) cases for survivors (Table 3).

Problems in care

The occurrence of problems in care by care period is shown (Table 4). The frequency of problems in a 24-h period was

Table 3 Overall quality of care scores

Score *n* (%)	Deceased patients with some degree of avoidability *n* = 65	Deceased patients without avoidability *n* = 185	Discharges from ICU, excluding EOLC *n* = 250	Survivors *n* = 20
1. Very poor care	8 (12.3)	3 (1.6)	11 (4.4)	0
2. Poor care	38 (58.5)	13 (7)	51 (20.4)	8 (40)
3. Adequate care	15 (23.1)	55 (29.7)	70 (28)	5 (25)
4. Good care	4 (6.1)	109 (58.9)	113 (45.2)	7 (35)
5. Excellent care	0 (0)	5 (2.7)	5 (2)	0

EOLC end-of-life care

greatest during the first 24-h following discharge, although problems in care occurred most frequently during the 'ongoing care' period, as this period was often long (median between 8 and 14.5 days across the groups).

Pre-identified care issues were common in post-ICU non-survivors (excluding those discharged for end-of-life care) (Table 5). ICU discharge occurred out-of-hours (after 4 p.m.) for 168/250 (67.2%) patients. In 155/250 (62%) cases, patients were unable to stand and step from bed to chair. Of 241 discharges where bed to chair mobilisation was appropriate, mobilisation did not occur in 167/241 (69.3%) on every day this was deemed possible. A new episode of confirmed or suspected sepsis was documented in 150/250 (60%), of whom 50/150 (33.3%) received the full 'Sepsis 6′ care bundle [23]. A nutrition plan was not documented in 76/185 (41.1%) patients requiring nutritional support. Pre-identified care issues also occurred frequently in survivors after ICU discharge. Follow-up practitioners reviewed 207/250 (82.8%) patients, 66/207 (31.9%) of whom were discharged from the follow-up service on the first post-ICU day.

Discussion

Worldwide, post-ICU in-hospital mortality rates are high, ranging from 4 to 13% [1–3]. Most of these patients are discharged with curative intent [1]. The reasons why these patients die are poorly described. To the best of our knowledge, this is the first study using the SJR method to describe the patient population who die in hospital following ICU discharge.

Around 1/6th of post-ICU in-hospital deaths were discharged to the ward with an end-of-life care plan. In over a quarter of the remaining cases, death had some degree of avoidability. Death was probably avoidable in around 8% of discharges, when those discharged for end-of-life care were excluded (6.7% of all the post-ICU in-hospital deaths) rising to around 18% (or 14.7% of all post-ICU in-hospital deaths) using the more relaxed definition. In 2017–2018, the national case-mix programme reported 8272 deaths in hospital following discharge from adult general critical care units [4]. Our figures suggest 551 (95% CI 346–827) of these deaths were probably avoidable, rising to 1213 (95% CI 903–1578) cases using the more relaxed definition.

In total, 155/250 deaths were judged to be unavoidable despite the presence of problems in post-ICU ward care. Although not the focus of the study, this finding suggests there may be a problem with ICU triage. For some patients for whom survival was highly unlikely, an ICU admission may have prolonged suffering. Nearly half the (small number of) survivors studied were judged to have received poor care, suggesting

Table 4 Number of problems in care by period following discharge from an ICU

Phase of care *n* (%)	Deceased patients with some degree of avoidability Total problems in care = 189	Deceased patients without avoidability Total problems in care = 90	All discharges from ICU, excluding EOLC Total problems in care = 279	Survivors *n* = 20
First 24 h	43 (22.8)	39 (43.3)	82 (29.4)	13 (33.3)
Procedure	1 (0.5)	2 (2.2)	3 (0.43)	0
Ongoing[a]	132 (69.8)	38 (42.2)	170 (60.9)	26 (66.7)
Perioperative	0	0	0	0
End of life	13 (6.9)	11 (12.2)	24 (8.6)	0

EOLC end-of-life care

[a] Median length of stay following the first 24 h after discharge was 9 (IQR 4–18) days for deceased patients with problems in care, 8 (IQR 4–22) days for deceased patients with no problems and 14.5 (IQR 5.5–23.5) days for survivors

Table 5 Pre-identified care issues

Problems in care	Deceased patients with some avoidability *n* = 65	Deceased patients without avoidability *n* = 185	All discharges from ICU, excluding EOLC *n* = 250	Survivors *n* = 20
Discharged *n* (%)				
16:00–08:59	50 (76.9)	118 (63.8)	168 (67.2)	14 (70)
18:00–08:59	36 (55.4)	76 (41.1)	112 (44.8)	8 (40)
22:00–08:59	8 (12.3)	38 (20.5)	46 (18.4)	2 (10)
Mobility				
Unable to stand and step from bed to chair on ICU discharge *n* (%)	39 (60.0)	116 (62.7)	155 (62.0)	6 (30)
Not mobilised to a chair *n* (%)	46 (73.0) (*n* = 63[b])	121 (68.0) (*n* = 178[b])	167 (69.3) (*n* = 241)	7 (35) (*n* = 20)
Not mobilised away from bed *n* (%)	42 (84) (*n* = 50[b])	106 (73.6) (*n* = 144[b])	148 (76.3) (*n* = 194[b])	11 (61) (*n* = 18[b])
Atrial fibrillation				
New diagnosis *n* (%)	9 (13.8)	31 (16.8)	40 (16.0)	1 (5)
Initial management assessed as not appropriate *n* (%)	5 (55.6)	7 (22.5)	12 (30)	0 (0)
No investigation of underlying cause *n* (%)	6 (66.6)	11 (35.5)	17 (42.5)	1 (100)
Sepsis				
Diagnosis/suspicion *n* (%)	43 (66.2)	107 (57.8)	150 (60)	4 (20)
Sepsis 6 not completed *n* (%)	19 (44.2)	31 (29)	50 (33.3)	3 (75)
Nutrition[a]				
Plan required and not documented on discharge from ICU *n* (%)	24/53 (45.3)	52/132 (39.4)	76 (41.1)	8/14 (57)
Follow-up/outreach				
Seen by follow-up/outreach *n* (%)	53 (81.5)	154 (83.7)	207 (82.8)	15 (75)
Discharged *n* (%)	30 (56.6)	72 (46.8)	102 (49.3)	14 (93)
Day discharged med (IQR)	1 (1–2)	1 (1–2)	1 (1–2)	2 (1–2)
Not re-assessed *n* (%)	21 (70)	53 (73.6)	74 (72.5)	13 (93)

EOLC end-of-life care

[a] n = 185 requiring nutritional plan

[b] Number for whom this was clinically appropriate

substantial problems exist with providing good post-ICU care, regardless of the patient outcome.

Problems in care occurred disproportionately in the first 24 h following discharge from an ICU, suggesting focusing on improving safety in this period is important. Effective handover of care requirements between ICU and the ward requires identification of a clear plan for how these requirements will be met [24, 25]. The RCRR classifications of poor or very poor care occurred commonly in avoidable deaths, reflecting the complexity of care required. Importantly, all three organisations studied had average or above performance in the ICNARC Case Mix Programme during the period under study. Our findings therefore do not represent poor-performing institutions and so are likely to be generalisable.

Comparison with previous work

Unlike previous work in entire hospital populations, we found no cases where death was definitely or strongly likely to have been avoidable. Conversely, 18% of deaths qualified for the more relaxed definition of avoidable, in comparison with 8.5% in general hospital populations [9]. Similarly, 26% of cases had some degree of avoidability, more than the 6.7% reported in general hospital populations [11]. Hogan et al. [9] classified 5.2% (95% CI 3.8–6.6) of deaths in the general hospital population they studied as avoidable, similar to Rogne et al. at 4.2% [11]. Although the numerical proportion in our post-ICU cohort was higher at 8% (95% CI 5.0–12.1), with a higher lower confidence limit, it remains possible that overall rates are similar.

It is possible the differences we found are explained by the population in our study. Inherent in having been to intensive care may be the understanding that there has been a risk of not surviving, making classifying subsequent death as entirely avoidable difficult. However, the complex care required by this post-ICU population may mean there are more aspects of care to be missed. We cannot exclude the possibility that the differences result from other differences between the studies.

Our study investigated the post-ICU care period. As problems in care may occur prior to ICU discharge, our findings may underestimate the overall in-hospital avoidability of death in this patient group. Further work is also required to investigate whether problems in care whilst in ICU contribute to adverse outcomes after ICU discharge.

Less than adequate care occurred rarely in patients where death was judged not avoidable, in common with previous work [9]. In contrast, less than adequate care occurred in over 70% of those with a problem contributing to mortality—double the rate seen in Hogan et al.'s previous study [9]. Whilst again this may suggest differences in the study rather than the population, it seems possible that our findings may reflect the difficulties presented to general wards in caring for the complex post-ICU population. In this cohort, non-survivors were considerably frailer at ICU admission than survivors (Table 1). Frail patients are known to be at higher risk of adverse events in hospital [26].

Out-of-hours discharge is highly associated with in-hospital post-ICU mortality and readmission [1, 2, 19]. In part this has been suggested to result from a higher proportion of patients with an end-of-life care plan in place being discharged at night [1]. However, we found discharge out-of-hours to be very common in patients who were not discharged for end-of-life care.

In this study, physical dependence at ICU discharge was high. Our findings are in line with a previous small study of patients who had spent 48 h or more on an ICU [27]. Perhaps because of the severity of dependency, delivering daily rehabilitation for this cohort occurred rarely on the ward, despite being essential to maximise physical recovery from critical illness [28, 29].

Both ongoing nutritional support needs and new episodes of sepsis were common post-ICU, with problems with ongoing management frequently identified. Previous studies have also demonstrated poor delivery of nutrition in post-ICU patients [30, 31] which has been linked to poor physical rehabilitation in the medium and long term [32, 33]. Sepsis is known to impair nutritional status and therefore may impact ongoing rehabilitation [34, 35]. In addition, new onset AF, also identified in this study as poorly managed, is a common complication of critical illness [36] where onset is known to be associated with sepsis and may be triggered by systemic inflammation [37].

Previous studies have suggested follow-up visits from specialist ICU outreach nurses may improve post-ICU survival and reduce adverse events [38–40]. However, in this study patients were frequently discharged from this service in the first 1–2 days following ICU discharge. There was no difference in the proportion of patients experiencing early discharge between possibly avoidable and unavoidable deaths, suggesting future opportunities to focus this service on those patients who would benefit the most from such visits.

Patients frequently had more than one problem in care [for example, over half the patients studied had severe mobilisation difficulties and over half developed sepsis, demonstrating that problems frequently overlapped (Table 5)]. Future interventions will need to address multiple needs to impact outcomes for these vulnerable patients.

Strengths and limitations

Our study has several strengths. Data collection was undertaken by a small multi-disciplinary team. This provided a wider insight into care delivery than in other studies where reviewing teams consisted solely of medical staff. Reviewers also worked collaboratively, were able to communicate freely and discuss uncertainties in cases. We piloted our data collection forms and defined each of the variables collected in standard operating procedures. As a result, in undiscussed cases, our inter-rater reliability was at least as good as previous studies [9, 41, 42]. Our multi-centre design, with population descriptors mainly comparable to national data, suggests our findings should be generalisable, at least within the UK. Additionally, undertaking the same process on a small number of survivors helps place our findings in context.

However, several weaknesses should be acknowledged. RCRR relies on documentation from a variety of sources, which risks missing information due to omissions or inconsistencies in documentation. During the review process this was acknowledged. Care was taken to ensure all potential sources of documentation were carefully reviewed to assess actions in care delivery. In addition, 52/352 cases were excluded due to unavailable or incomplete records. This was likely inevitable due to the reliance on paper documents but may have introduced a degree of selection bias. It is also possible that documents in the included cases may have been missing but not detected where they did not form a clear part of the chronological record. As with all retrospective case record reviews, a problem of hindsight bias must be acknowledged [21, 43]. Knowledge of outcome severity has been shown to affect assessment of the quality of (anaesthetic) care [43]. However, it is not realistic to blind the reviewer from the (likely) outcome without removing key information for the analysis, and this has not been attempted in major studies in the field [9, 11].

Our sample size was larger than in similar studies of specific patient cohorts [44–46] but smaller than in previous work focused on general hospital populations, where a smaller proportion of deaths were anticipated to be modifiable [9, 11]. As a result, our estimates of the rates of avoidable deaths have relatively wide confidence intervals. However, we chose instead to record greater detail on specific pre-identified care issues to inform both clinicians and future work on how such deaths could be prevented. Our sample of 20 hospital survivors is small, as this was not a key focus of the overall REFLECT study. Importantly, it shows that problems in care are common post-ICU, regardless of outcome, but further work is needed to allow comparisons with other groups to be made.

Specific pre-identified care issues were chosen following literature review and findings from a previous audit. There may have been other problematic aspects of care, for which we did not collect quantitative data. We focused our investigation on patients who did not survive, so cannot determine whether similar problems in care occur in those who survive to hospital discharge. As part of the overall REFLECT project, we will undertake in-depth analysis of the care received in those deaths judged to be avoidable in comparison with an equal number of patients who survived to address this issue.

Conclusions

There is significant avoidability associated with death on the ward following ICU discharge. This avoidability occurs in an elderly frail population with complex needs that current strategies struggle to meet. Our work highlights opportunities to address common problems in care delivery which could improve both patient outcome and quality of care. Problems in care occurred disproportionately in the first 24 h following discharge from an ICU, suggesting interventions to improve safety should concentrate on this period. Recognition and management of sepsis, mobilisation and provision of nutrition were frequently sub-optimal and could be improved. Targeted CCOT input may assist in delivering these improvements but would require regular ward review beyond the first discharge day.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13054-020-03420-5.

Additional file 1: Additional data.

Abbreviations

AF: Atrial fibrillation; CCOT: Critical care outreach team; CFS: Clinical Frailty Score; EOLC: End-of-life care; ICNARC: Intensive Care National Audit and Research Centre; ICU: Intensive care unit; RCRR: Retrospective case record review; SJR: Structured Judgement Review.

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Authors' contributions

SV, PW and JDY conceived the project. SV and OG collected the data. SV wrote the first draft of the manuscript. All authors contributed to and revised the final manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Ethical approval was granted by Wales REC 4 (reference: 17/WA/0139). Surviving patients consented to their involvement in the study. Details of the approach are included in the published protocol [14]. Confidentiality Advisory Group support was sought to access the records of deceased patients (reference: 17/CAG/0063).

Consent for publication

Not applicable.

Competing interests

Peter Watkinson co-developed the System for Electronic Notification and Documentation (SEND), for which Sensyne Health has purchased a sole licence. The company has a research agreement with the University of Oxford and royalty agreements with Oxford University Hospitals NHS Trust and the University of Oxford. Sensyne Health may in the future pay Peter Watkinson personal fees. Peter Watkinson was Chief Medical Officer for Sensyne Health.

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