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Implementing Regional Citrate Anticoagulation in Continuous Renal Replacement Therapy

A case-study investigating how cultural and behavioural factors influence practice change within an intensive care setting

Easton, Jack

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Bangor University

Masters by Research (MRes)

Implementing Regional Citrate Anticoagulation in Continuous Renal Replacement Therapy-

A case-study investigating how cultural and behavioural factors influence practice change within an intensive care setting

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MBBCh, BSc

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Declaration

‘Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw’r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o’r blaen ar gyfer unrhyw radd, ac nid yw’n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy.’

Rwy’n cadarnhau fy mod yn cyflwyno’r gwaith gyda chytundeb fy Ngrichwyliwr (Goruchwylwyr)’

‘I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.’

I confirm that I am submitting the work with the agreement of my Supervisor(s)’

Signed: J. Easton (candidate)

Date: 21/6/21

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Thesis Abstract

Title

Implementing Regional Citrate Anticoagulation in Continuous Renal Replacement Therapy-

A case-study investigating how cultural and behavioural factors influence practice change within an intensive care setting

Background

The success of change in healthcare is highly dependent on the complex network of human interactions, which collectively can broadly be considered as “Organisational Culture”. Culture is known to be highly context specific, and hospitals are structured such that individual specialised units present different contextual environments. This thesis aims to investigate how the unique cultural context of a critical care environment influences the success of change initiatives.

Methods

This research was carried out as two separate studies.

Firstly, a scoping review was carried out to review existing literature discussing the impact of cultural and behavioural factors on implementation in a critical care context. All identified sources from Ovid MEDLINE, EMBASE and ASSIA databases which discussed the influence of culture on implementation in adult critical care settings were included, and inductive thematic analysis of the literature identified and modelled key themes.

Secondly, a retrospective qualitative case-study was carried out to investigate the impact of organisational culture on a major implementation project which introduced citrate anticoagulation in renal replacement within critical care units in 3 Welsh District general hospitals in 2015. The themes identified within scoping review data were used to structure an interview template. This template was used to carry out semi-structured interviews with 9 participants representing different staffing groups directly involved in this project. Interviews were carried out at a fixed point 5 years after implementation, and further thematic analysis was performed on the transcripts from these interviews.

Results

21 literature sources were included in the scoping review, and analysis identified the key themes of Education/Knowledge, Multidisciplinary Communication, Leadership, Effective Documentation and Buy-In. These themes were synthesised into a model exploring how each of these factors can be considered as resources which contribute to a “Culture permissive to Change”.

Further models were generated from the thematic analysis of the case study to expand on this, demonstrating that change occurs in multiple phases which are not necessarily sequential or well-delineated, and that each of these phases present different resource demands. Critical care units are initially dependent on external resources and administrative backing before becoming more self-sustaining.

Additional models provide additional insight into how culture interacts with a process-focused, resource-driven understanding of change, illustrating the progression from deficit to re-accumulation of local experience, and exploring how leadership figures derive their credibility from multiple sources.

The development of “Culture of Openness and Approachability” was extremely important in promoting unit level staff ownership and facilitating input into the feedback processes, and the significance of cultural distinctions between staff groups is also addressed, as the impact of senior medical leadership is seen to be particularly pronounced in the critical care setting. The interpretation of broader shared values and deeper assumptions surrounding safety varied between staff group, which has implications when addressing barriers to buy-in, particularly that of anxiety within the nursing sub-culture.

Discussion

Despite the limitations of sample size and time delay between implementation and data collection, this study generated several useful models which may be generalisable to other critical care contexts.

Recognising these how contextual factors influence the quality of communication within critical care, and understanding how this culture navigates through different phases of change represents an opportunity for improved planning and adaptation in future critical care implementation projects.

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List of included Acronyms

AKI- Acute Kidney Injury

CKD- Chronic Kidney Disease

CRRT- Continuous Renal Replacement Therapy

EBME- Electrical and Biomedical Engineering

GMC- General medical council

HDU- High dependency Unit

ITU- Intensive Treatment Unit

KDIGO- Kidney Disease Improving Global Outcomes

NHS- National Health Service

PEO- Population, Outcome, Exposure

Chapter 1: Background and Context

1.1 Introduction

This thesis aims to explore the research question:

“What is known about how behavioural and cultural factors influence the implementation of practice change, specifically within a critical care setting?”

This question intends to provide insight into the context specific factors found within the critical care setting which affect the success of implementation. Through examination of the ways in which people communicate and interact within this environment, this thesis aims to develop a deeper understanding of these factors to inform and improve future implementation projects carried out in similar settings. These benefits may include increased likelihood of success, improved acceptability of these initiatives to staff members involved, and better guidance regarding how best to direct limited resources to where they might be utilised most effectively.

Chapter 1 aims to provide additional background and context to the areas explored throughout the paper- firstly the relevance and importance of good quality studies into change implementation within healthcare, as well as an explanation and definition of what exactly is meant by “culture” in the context of this research. This research question will then be focused through a scoping literature review set out in Chapter 2, and then further explored in Chapter 3 through a retrospective qualitative case-study. A series of semi-structured interviews are analysed to investigate staff perspectives of a specific example of an implementation within critical care- a change to the way renal replacement therapy was managed in a Welsh District general hospital.

Chapter 1 will also provide some information to put the case study presented in chapter 3 into clearer context, including an explanation of Continuous Renal Replacement (CRRT), the significance of citrate anticoagulation, and the geographical and organisational position of the hospital unit being studied.

1.2 Implementation Science, and its role within the National Health Service

Although advancement through research and new technologies has long been recognised as highly important for the provision of effective healthcare, the methodology and strategies behind the process of incorporating and embedding these changes has historically been sporadic and inconsistently tied to theoretical foundations. One review in 2003 demonstrated that as few as 10% of implementation projects which incorporate up-to-date guidance cite recognised implementation rationales to justify their methodology (Walker, 2015).

However, in recent years there has been a relative boom of research seeking to address this systemic issue, with healthcare implementation sciences increasingly emerging as a well-defined specialist area in its own right. The result is an increasing body of high-quality research striving to maximise the effectiveness of translating innovations into clinical practice.

The first journal dedicated to this discipline, “Implementation Science”, only entered publication as recently as 2006 and provides a useful formal definition: Healthcare Implementation Research may be considered as *“the scientific study of methods to promote the systematic uptake of research findings*

and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services.” (Eccles & Mittman, 2006).

Nilsen’s 2015 review, also published within this journal, describes three broad aims which are targeted to a greater or lesser degree within the models and frameworks developed by implementation scientists:

- Describing/guiding the translation of research into practice
- Understanding or explaining what influences implementation outcomes
- Evaluating implementation efforts

(Nilsen, 2015)

Contextual factors are extremely relevant within this discipline, as practice changes are necessarily influenced by the setting and circumstances into which they are being introduced. Peters et al. (2013) also highlight that implementation research is especially concerned with its applicability to end users, and this also shapes the specific questions asked by these studies. This has the consequence that actors within the context being studied often are, and should be, involved in the development of implementation studies at all stages to ensure that the results generated can be translated into practical benefit.

1.3 Organisational culture and its implications for Healthcare Institutions

This thesis aims to explore how individual beliefs and shared “culture” within organised institutions impacts on the success of implementation.

For clarity, it is important to define exactly what is meant by “organisational culture” in this context. Frequently this term is used vaguely within implementation research, often simply as an acknowledgement that wide-reaching complex and contextual social factors exist within any large organisation or institution. These social aspects can be seen to influence almost every aspect of organisational operation, but bodies of modern implementation research increasingly flag “culture” as a target which needs to either be overcome or nurtured for the purposes of effective quality improvement and innovation within the context of healthcare provision (Mannion & Davies, 2018).

Within this discussion, two broad schools of thought exist, tending to either frame an understanding of culture either as an intrinsic attribute that a given organisation “has”, or instead as a more wide-reaching idea which describes the experience of life within an organisation- i.e., a description of what an organisation “is” (Scott et al., 2003).

The framing of culture as a distinct and quantifiable objective attribute an organisation possesses is understandably an attractive one, as this lens provides a clear target for individuals aiming to address organisational shortcomings through directed efforts to overhaul or repair negative cultures. However, when culture is explored using the latter approach, as a context in itself through which other attributes of the organisation are expressed, the feasibility of interventions seeking to fundamentally alter culture are arguably cast in a more pessimistic light. Here, culture is thought of as a more subjective context arising from the complex web of social interactions experienced uniquely by each individual existing within the organisational structure, and subsequently “culture” becomes less predictable, less directed, and less homogenous, making the design and understanding of change initiative much more difficult (Mannion & Davies, 2018).

This broad and nebulous concept is so vast that it is useful to examine some of the existing theoretical frameworks which have previously been developed in an attempt to break down how culture manifests within organisations.

Dahl (2004) summarises the evolution of understanding of culture as consisting of multiple conscious and subconscious layers, shared by groups. For example, Hofstede (1991) describes culture as a core of values: *“broad tendencies to prefer certain states of affairs over others”*, supported by observable *“rituals, heroes and symbols”* and tied together by *“practices”* with subconscious and deeper shared meanings (Hofstede & Hofstede, 2004).

Similarly, Spencer-Oatey (2004) proposes a model of onion-like layers, describing culture as a core of basic assumptions and beliefs supported by successive layers, each representing concepts such as attitudes/conventions, systems/institutions, artifacts/products and rituals and behaviour. This model is quick to point out that the distinctions between each of these levels is not clear, and lines between each is indistinct as these concepts are highly interlinked.

One of the most popular theoretical frameworks exploring the expression of culture within an organisation or group is that developed by Edgar Schein (Schein, 2010). Mannion & Davies (2018) summarise Schein’s description of culture as three overlapping layers, each becoming increasingly difficult to observe, quantify and study. Schein’s framework is particularly useful in its clarity and broad applicability to multiple organisational contexts, including but not limited to the healthcare setting.

The first and most overt layer within Schein’s model is that of artefacts and arrangement. This layer describes visible, easily quantifiable systems and practices, which are often overtly codified in policy documents. Included under this umbrella are standard accepted practices, such as patient routes through the hospital, scheduled team meetings and demarcation of different staff groups by uniforms. Also included are formalised communication norms, such as utilisation of pager systems and structured handover systems, as well as administrative pathways such as those directing patient or staff complaints or allocation of annual leave. In implementation efforts, this level of culture may manifest within processes required for ethical approval, the presence of pathways, protocols and staff arranging training, or existing structures for evaluating the efficacy and efficiency of an innovation.

More obscure is the second layer: shared values, beliefs and vision. Emphasised here are the thought processes and common ideas which are used to justify the artefacts and arrangement seen above. This might manifest as a shared prioritisation of patient safety and dignity, or organisational attitudes towards patient autonomy or staff responsibility. These ideas may also manifest within implementation. For example, a shared organisational belief that innovation itself is a worthwhile endeavour, or a shared understanding and expectation that a certain strength of evidence is needed prior to a change being made are both examples of mutual values.

The final layer is that of deeper shared assumptions- these are typically unspoken and may not be consciously recognised even by those individuals acting on them. These include shared biases and expectations, and since these are typically not openly acknowledged or discussed these are usually regarded as the least straightforward to study and address within implementation. Often these sorts of assumptions are shaped over years, and may be influenced by upbringing, societal norms, or education. One such example of this would be in assumptions of the expected levels of authority an individual member of a team carries, or how a particular staff group is expected to conduct themselves within the hospital. As hypothetical examples of how this level of culture might apply within the implementation setting: team members may have unconscious and deep-seated biases towards or

against certain sources of evidence, or an unconscious assumption that newer tools are more beneficial than modification of existing resources.

Similar to Spencer-Oatey, (2004)'s model, Mannion & Davies (2018) argue that each of Schein's layers are not independent but intricately interlinked with the others. Unconscious assumptions manifest as actions which may then become established processes. Formalisation of responsibilities and expectations may reinforce existing beliefs about what a particular discipline should be able to offer, and their position and status within a team.

Literature surrounding and discussing Schein often refer to his work, and other similar frameworks, as the "Iceberg model", referencing the conclusions that the vast majority of information pertinent to the understanding of organisational culture is not readily apparent on first examination. This understanding highlights a particular strength of qualitative research as tool to study this phenomenon, where other research modalities may be less well equipped to explore deeper and more obscured data hidden within opinions and beliefs of organisational staff.

Subcultures within Healthcare

In a similar vein, culture within healthcare does not exist as a singular entity- the specific beliefs and assumptions described above are held by individuals, with the observable "culture" existing as the result of an amalgamation of broadly similar but individual views within a social network. Within the broader network of the individual hospital and the wider NHS, observable "sub-cultures" may develop as shared values begin to diverge in differing contexts.

Subcultures as a set of shared values amongst a subset of members may be framed relative to their relationship to an overarching "dominant" culture. Through this lens, subcultures may be considered as "enhancing"- holding or espousing views which are an amplification of the dominant culture, "orthogonal"- generally accepting values of dominant culture while expressing their own separate values, or "counter-culture" which hold views opposed to the dominant culture. Although this terminology is useful, in reality the relationships and values held by a given subculture may be more complex, somewhat limiting the utility of this classification (Scott et al., 2003).

To refer back to Schein, (2010)'s framework, the fundamental arrangement of an NHS hospital is such that individuals are divided into multiple subgroups which are deeply ingrained into the normal working function of the institution. Amongst the most obvious of these divisions are, firstly, the presence of multiple distinct specialist units and departments, and secondly, the presence of multiple distinct interacting disciplines. Although these distinctions exist artefactually, the complex and interlinked nature of culture typically resists neat categorisation. Culture develops from individuals in context, and so this thesis intends to examine the nature of cultures which develop within the framework of these existing institutional divides, and how this impacts on how change occurs within these environments.

The case study methodology detailed below had been selected and employed with the initial intention of looking at a snapshot of multiple critical care units undergoing a similar implementation project at a distinct moment in time, with scope to compare and contrast these contexts. Unfortunately, due to limitations related to the COVID-19 pandemic, the scope of this study was adapted and narrowed to encompass a single critical care unit within a district general hospital in Wales, which will hereout be referred to as "the case-study unit" .

The aim of this thesis is to interrogate the influence that the interaction of individuals within this specialist unit have had on the success of the implementation of an ambitious intervention- that of a switch from heparin based anticoagulation to citrate used in continuous renal replacement- and consider how this information correlates to what is already known about how these factors influence the success of implementation processes within critical care.

1.4 The Case Study Unit- Geographical context:

Following the reorganisation of NHS Wales in 2009, Wales is geographically subdivided into 7 regions, each of which is served by a single local health board whose role it is to provide and oversee delivery of all healthcare services within that region. The health board in which the study is situated assumes responsibility for healthcare provision for a community of approximately 678,000 people. 3 district general hospitals operate across this region, in addition to multiple networked community hospitals, and employs 18,000 staff members.

Situated within one of these three acute hospital sites, the case-study critical care unit encompasses a high-dependency unit (HDU) and intensive treatment unit (ITU) with combined capacity for 12 adult in-patient beds.

1.5 Renal Replacement and its position within The Case-Study Health Board

Continuous renal replacement therapy (CRRT) is amongst the acute organ support services offered by the Case-study Critical Care Unit, and is primarily utilised as one of the therapy options for patients who have developed severe acute kidney injuries (AKI). This treatment has replaced the use of intermittent dialysis for this acute patient cohort, although intermittent dialysis is still carried out within a separate and distinct dedicated unit for other patient groups with chronic kidney disease (CKD).

Broadly speaking, CRRT treatment involves the continuous removal of large volumes of blood from a patient through a large vascular catheter inserted into a vein within the groin or neck. This blood is run through an extra-corporeal circuit containing an extremely large surface area and simultaneously uses ultrafiltration and dialysis techniques to correct biochemical abnormalities and remove accumulating toxins. The filtered blood is rebalanced using a replacement fluid, and then transfused back into the patient. Although this process does not in itself act as a treatment for the cause of the abnormal biochemistry, the aim is to allow sufficient time for the diagnosis and treatment of the underlying conditions causing the life-threatening impairment of kidney function (Tandukar & Palevsky, 2019).

The large surface areas required for this technique results in a reduction in blood velocity within the extra-corporeal circuit, which in turn leads to an increased chance of platelets adhering to the artificial tubing and subsequently triggering the clotting cascade. If this occurs, a blood clot may form within the circuit. If this clot becomes large enough to occlude the circuit, the entire circuit will need to be discarded, along with the blood contained within it, and a new circuit attached to the patient.

The failure of a circuit in this way has multiple consequences. A substantial amount of blood is lost from a patient each time a blocked circuit is removed, and the anaemia which may result from

repeated circuit changes is detrimental to recovery and increases the likelihood of the patient requiring a blood transfusion. Transfusions of blood are expensive, time consuming, and not without their own risk. In addition to patient safety there are further direct and indirect costs, including the economic cost of replacing the blocked circuit, and that of additional workload pressure put on staff responsible for recognising the failure and then subsequently configuring a new circuit (Al-Dorzi et al., 2019; Morabito et al., 2003).

To minimise the frequency of clots forming within this system, the circuit is anticoagulated through addition of a drug. Prior to 2015, the standard and established drug of choice within the case-study unit was heparin. In 2015, a project was undertaken with the aim of implementation and standardisation of a new method of anticoagulation across all 3 critical care sites within the health board: regional citrate anticoagulation. It is this implementation project which is used as the case study basis for the qualitative study presented in chapter 3.

1.6 Constructivist approach and researcher positioning

As a student of healthcare sciences, my intent to develop my own skill as a researcher formed a key driving force behind the development of this thesis. With this in mind, I would consider my education and self-improvement to be amongst the major outcomes of this project. Further to this, my own appreciation and understanding of relevant theoretical frameworks, qualitative research approaches and methodology has changed significantly throughout the course of the planning, development, and write-up of this final thesis.

As such, it seems important to address this reciprocal relationship at an early stage- how my own positioning and subsequent academic journey has influenced this piece of work, and also how this exercise has gone on to influence my own current and future approach. Furthermore, it is also relevant and appropriate to consider how my own social, cultural and academic positioning might influence the shape and quality of the work produced.

Constructivism is an epistemological philosophy which emphasises both the importance of existing knowledge, and the role of relevant but dissonant ideas which challenge pre-existing cognitive frameworks in supporting the development and understanding of the student (Cakir, 2008; Walker, 2015). von Glasersfeld (1989) argues for a radical interpretation of this idea, arguing it is impossible to objectively interrogate how accurately human knowledge actually models and interfaces with the external world, because the nature of human knowing itself makes objectivity impossible. Knowledge, it is argued, does not exist until it is individually constructed within the mind of an individual, and therefore any scientific endeavour cannot be fully removed from the biases which are inherent to how human minds process and interpret new information.

This viewpoint poses a challenge to a fundamental underpinning of objective scientific research- the removal and minimisation of bias. If we do accept that some degree of inherent bias is effectively unavoidable, even with every effort to systematically minimise sources of bias within the study design, the next step is to attempt to at least address this through acknowledgement of my own background and values, and factor this into any interpretation of the literature collected. It is also important to recognise that inherent bias will also manifest in any information or knowledge communicated by others. I strive to interpret both the data collected indirectly within the scoping review and the primary data collected from interviews with the understanding that it is being viewed through at least two filters of human experience- the participant's/authors', and my own.

Researcher Preface and Reflexivity

This section aims to address my own positioning through a process of researcher reflexivity.

At the time of writing, I am undertaking my third year of work as a junior doctor employed by the NHS, with all my clinical experience having been almost exclusively within Welsh hospitals and General Practice surgeries. I also completed the entirety of my undergraduate medical training across 6 years based within Welsh hospitals, and my own positioning within healthcare provision within the NHS has undoubtably has an influence over my own unconscious assumptions regarding culture; to an extent I am viewing many of the social and cultural systems described below from the inside.

The majority of my literature research and primary data collection was carried out on a part-time basis alongside the additional clinical and educational commitments required to complete the second year of UK foundation medical training. The academic component of this post was also supported by a suite of lectures and supporting educational materials which allowed me to explore and question my own understanding of the theoretical underpinnings of research methodology and study design.

My own clinical interests lie within haematology and intensive care. As the core premise of this thesis evolved gradually under the guidance of both clinical and non-clinical supervisors, the study of a practice change involving anticoagulation within an intensive care setting provided an appealing bridge between these two disciplines.

Although the broad concept of qualitative research was not new to me, my first instincts were to direct my research towards an analysis of objectively collected data using a quantitative and statistical approach- an impulse likely arising from the heavy emphasis towards randomised controlled trials and numerical data within my own formal and informal education within medical school, with limited opportunities to explore qualitative methods. I think it is worth acknowledging that my own viewpoint up to the point of graduation was relatively ignorant and dismissive towards qualitative research- certainly my own experience amongst my peers was that of a culture which generally considered empirical data as inherently of higher value and of more scientific and practical merit (The prevalence of this deep assumption in graduating medical students perhaps merits its own exploration in a separate research project!).

However, despite the clear utility and importance of effective application of quantitative learning, I found my first years practicing clinically been defined firstly through development of intrapersonal interactions and an improved ability to navigate unspoken and untaught institutional cultures, which I quickly realised are at least as important to delivering safe and effective care to patients as being able to cite the statistical mortality benefit of any given intervention.

In a sense, my own clinical development mirrors the evolution of the scope of the thesis and definition of research aims; as the project title developed and access to new educational resources were made available, I realised that dedicated and protected academic time offered a unique opportunity to expand my own understanding of qualitative methodology, and especially those methods which allow for more insight into a largely underappreciated social and cultural element.

One of the outcomes and standards set out by the General Medical Council in their 2009 publication “Tomorrow’s Doctors” is that of the “doctor as a scholar” (GMC, 2009). By shifting my focus to the study of individuals and their interaction, working to understanding how human beings function within the constraints of healthcare systems, I aimed to meet this standard more effectively through

becoming a more rounded researcher and taking these lessons forward into my academic and clinical careers.

The primary data collected during this study entailed the collection of interview data from a variety of participants acting within the Welsh healthcare system. My own role as an academic junior doctor within the hospital being studied is likely to have had a significant impact on how I was perceived by interview participants and therefore has potentially influenced the data which I collected. My qualifications as a doctor, and position of being supervised by one of the senior intensive care consultants may have led to easier access to interview certain participants based on this, and some answers may have been given on the basis of presumed knowledge and a shared understanding of expected social norms within this hospital.

However, many of the questions that I asked were specifically interrogating the nature of intra-disciplinary communication. I think it is also likely that the perception of my own position within this cultural landscape may have led to certain participants, particularly those positioned outside of the medical team, phrasing answers in a way that avoids talking about doctors in a negative sense out of a sense of respect or politeness, or to avoid casting themselves or their colleagues in a negative light for fear of judgement or direct repercussion. Likewise, when interviewing participants who are senior clinicians, it is important to acknowledge that many of these participants have at some stage acted directly or indirectly as my superior colleagues, and that I may have interacted or continued to interact with them within a professional clinical capacity during the time I was collecting this study data. My relatively junior position within the medical team may have influenced their own perceptions, and my own approach to questioning these individuals is likely to have been influenced by my own unconscious considerations about working relationships.

1.7 Summary

Implementation science within health care is a rapidly evolving discipline, and one that merits further study utilising theoretical underpinnings. Organisational culture is intimately linked to the shape and success of all implementation efforts within the NHS, but inherently layered and complex structures make its study difficult and highly context specific. This thesis aims to investigate the influence of the Organisational Culture within a single critical care unit in a Welsh district general hospital on an ambitious implementation project, and correlate this to existing evidence surrounding implementation in critical care contexts. In addition, as a student of Healthcare Sciences, a major aim of the project is development of my own skill and technique in literature review and qualitative research techniques, and in identifying and minimising my own biases.

Chapter 2: The Influence of Cultural and Behavioural Factors on Practice Change Within a Critical Care Setting- A Scoping Review

2.1 Introduction to Chapter 2

The aim of this chapter is to further contextualise and focus the research question through investigation and analysis of what is already known about the ways in which an organisational culture within critical care impacts on the success of change initiatives. To achieve this, a literature review was undertaken utilising the scoping review methodology and framework described by Arksey and O'Malley (2005), with the intention of "mapping" the existing literature and identifying opportunities for further research.

Through this analysis, the idea of a broader "Culture Permissive to Change", facilitated by the input of key resources and drivers is inductively identified. This chapter breaks down the ways in which each of these key drivers appears in the text and discusses how they act to influence the implementation process in combination with the other drivers and resources.

In the discussion and synthesis of these findings in the later sections of this chapter, a model is presented to describe how the interrelated interaction of these drivers achieve the state of consensus which is required for effective change. This model forms the basis of a template of interview questions designed to cover each of these key domains, which was subsequently used to provide a loose structure for interviews carried out in the data collection phase of the case-study described in chapter 3. In addition, the key drivers of change identified withing this scoping review are subsequently used to inform the design of the case-study carried out in chapter 3 by informing the broad structure of an interview question template around each of these domains.

2.2 Background

Modern healthcare delivery relies on a constantly evolving evidence and technology base, which informs shifting ideals of what represents current best practice. However, it is not simply sufficient to demonstrate that any given change is theoretically beneficial- before patients and institutions can benefit from new treatment practices, such changes need to be effectively and sustainably implemented within whichever context that the intervention is to be delivered.

Ensuring that patients actually receive the highest quality of evidence-based care requires a more detailed understanding of the additional contextual factors which influence the implementation of change. This discipline is known as implementation science, more formally defined as "the scientific inquiry into the act of carrying an intention into effect." (Peters et al., 2013).

Artiz & Walker, (2010) succinctly sum up the generally accepted definition of culture as "*patterns of deep level values and assumptions concerning societal functioning, shared by an interacting group of*

people" (p22). Frequently this is used in the context of international cultures, shared by individuals with similar national experiences. However, the idea of shared and accepted social norms and values may equally be applied to organisational contexts.

This being said, it would be overly reductive to consider healthcare as one single organisational context where change implementation occurs. In addition to practical variation defined by the geography, availability of resources and services provided by any individual healthcare unit, each individual hospital, and indeed each single medical unit contains further layers of more complex organisation and cultural complexity. Any healthcare intervention will typically require input from multiple groups of providers, spanning multiple professions. Each provider works with different skill sets and cultural perspectives, shaped from their own individual experiences training and working within a diverse set of environments.

Estabrooks et al., (2006) liken this inherent complexity to a terrain which can be "mapped" through our application of multiple theoretical frameworks. They suggest that no single theory is sufficiently nuanced to fit any given context, instead each requires a tailored combination of multiple perspectives to fully appreciate. "Social network analysis" and "Community of practice" theories recognise that any healthcare environment represents an extremely dense social network, where information is disseminated both through top down "cascading information" and horizontally, through negotiation, observation and collective creative solutions to shared problems.

These models recognise that implementation within healthcare is not a linear and predictable process but is instead highly unpredictable and extremely dependent on local context. They advocate the importance of exploration within this social context, highlighting that critical relationships between organisational groups and key individuals tend to either drive or block the success of implementation efforts (Paina & Peters, 2012).

However, it should be noted that existing scoping reviews on the topic recommend a degree of caution for those looking to adopt these approaches- to say that a lack of consistency and consensus exists in precise definition and application would be an understatement (Thompson et al., 2016). Even when not viewed specifically through these lenses, it is important to recognise that organisational social cultures themselves influence how clinicians operating within them approach their own implementation of changes by defining what types of outcomes are most highly valued (Scott-Findlay & Golden-Biddle, 2005).

Critical care represents one such extraordinary cultural landscape. Here, a focus on intensive management of high-acuity conditions translates to a unique environment within the hospital, where one-to-one nursing, sedated and unconscious ventilated patients, and use of sophisticated machines to provide extrinsic organ support become the norm. Despite its position as a clinical speciality dependent on its ability to rapidly adapt to emerging evidence and new technologies, relatively little dedicated study has been carried out on how implementation of these changes is affected by social context within this highly specialised environment.

This scoping review aims to investigate what is already known in existing literature surrounding the cultural and behavioural environment influencing the implementation of change within the specific context of intensive and critical care settings.

A preliminary search was performed to assess whether similar literature reviews exist. A MEDLINE search for papers defined as either a "scoping review" or "literature review", which contained key words relating to both "critical care" and either "implementation science" or "organisational culture" and yielded 0 results.

2.3 Methods

Design

This literature search has been designed with a “scoping review” structure, as defined by Arksey and O’Malley (2005). Where a systematic review aims to address a well-defined research question utilising a narrow range of studies which have undergone a process of quality assessment, a scoping review functions to collate a wider variety of sources on a broader topic. The purpose of this exercise is to map an overall picture of the extent of literature available, and then utilising this information to provide a context in which to structure future study. One advantage of scoping review methodology is that the design is intentionally more dynamic than a systematic review, allowing for modifications of the precise research question, dependent on what data is already available

Arksey and O’Malley (2005)’s framework identifies 5 distinct steps, which the study described within this chapter follows:

- **Identifications of Primary research question**
 - A clear question guides the search methodology
- **Identification of relevant studies**
 - This should be as comprehensive as possible in identifying primary studies from a wide range of sources, while remaining within practical constraints
- **Study selection**
 - Similar to other forms of literature review, inclusion criteria are used to eliminate studies which are not directly relevant to the defined question. However, with a scoping methodology, these criteria are developed post-hoc.
- **Charting of Data**
 - Included data are charted to include general information of the study and key points related to the research question.
- **Collation, summarisation and reporting of results**
 - The intention of this stage is to present an overview of data, without placing emphasis or weight on specific pieces of evidence or determine quality of study.

There is some debate as to whether the quality of the individual sources included should be evaluated within a scoping review itself. This thesis follows the clear framework set out by Arksey and O’Malley (2005) which intentionally avoids evaluation of quality to allow for more comprehensive mapping, aiming to include the entire breadth of available information. However, other schools of thought advocate that while low quality sources should not be discounted from the review, some degree of evaluation after collection is appropriate to support the overall legitimacy of the study (Levac et al., 2010).

Primary Research Question

“What is known about how behavioural and cultural factors influence the implementation of practice change, specifically within a critical care setting?”

Identification of Relevant Studies

Preliminary search

Based on the identified research question, initial limited searches were performed on the database MEDLINE 1946 to present. Key concepts were broadly defined utilising combinations of keywords and relevant subheadings. The intention was to identify as broad set of data as possible which included sources discussing change and organisational culture within the context of critical care, by including combinations of synonyms and acronyms.

Where inputted terms mapped to pre-defined subject headings within the database search tool, those subject headings were also included within the final list of search terms used (**Table 1**).

<u>Key concept</u>	<u>Search terms</u>
The context of “Critical Care”	Intensive care or Intensive treatment or Intensive Care units or ICU or ITU or Critical Care or High dependency unit, or HDU
AND	
Implementation of change	Implementation or Implementation science or Change management or Organisational innovation or Organizational models or “diffusion of innovation” or Health Plan Implementation or Social Change or organizational innovation
AND	
Organisational culture	Culture or Organisational culture or hierarchy or communication or communication barriers or interdisciplinary communication
Table 1: Key concepts and mapping to search terms	

Study Selection: Inclusion criteria, and Data-Sifting

After initial data were gathered, A PEO format (Population, Exposure, and Outcome) was used to produce preliminary inclusion criteria. Here, a framework was outlined to facilitate sifting of sources according to direct relevance to the primary research question by including only papers which directly describe or discuss culture with respect to implementation projects occurring within critical care.

Initial Inclusion criteria (as directed by PEO format)		
Population	What user group is affected?	Must include members of a multidisciplinary healthcare team working within the context of intensive/critical care
Exposure	What are these groups exposed to during the study?	Must describe or evaluate implementation of a change in practice
Outcome	What conclusions were drawn?	Must comment on communication or cultural factors relating to implementation of the change.
Table 2. Initial PEO inclusion Criteria		

Screening and Collection of Further Search Terms

As guided by PRISMA-ScR reporting guidelines item 9, a narrative description of the process of source selection is presented below (Tricco et al., 2018).

Following input of preliminary search terms, a process of data sifting was performed independently by the primary researcher (thesis author) acting as a single reviewer. The titles of all sources identified by the preliminary search were manually read by the primary researcher, totalling 408 sources from Ovid MEDLINE, 233 from ASSIA and 660 from EMBASE. Any titles which clearly indicated the source did not fall within the initial PEO inclusion criteria, for example titles which did not describe implementation within critical care, were excluded from further rounds of sifting. At this stage, duplicate titles were also excluded manually.

During the abstract-screening process of the first database, OVID MEDLINE, it became clear that there was scope to refine the inclusion criteria. Many of the changes implemented in critical care settings are directed at influencing rather than evaluating human factors, for example aiming improving the efficiency of handover process between staff. Much of the interpretation and discussion within such studies comments on how effectively their change has influenced culture and communication. However, the aim of this review is to establish the reverse of this, seeking to identify how these cultural and behavioural factors might influence the implementation process itself before any change becomes established.

Furthermore, many of the returning results described paediatric critical care units. Although there are likely to be many similarities between adult and paediatric critical care units, one aim of this paper was to inform the design of a future case-study which examines a district general critical care unit which exclusively treats adult patients. Paediatric intensive care is a nuanced subspecialty typically offered by units within sub-specialised tertiary centres, and therefore, sources referring to paediatric care were removed to try to maintain a more constant and comparable cultural context.

For practical purposes, studies where full text is not available in English were also excluded. In addition, study protocols relating to studies yet to be carried out were excluded, as were results relating to clinical conference presentations and posters where adequate contextual details were not available.

With these factors in mind, the inclusion criteria were refined to those seen in **Table 3**:

Refined Inclusion criteria (as directed by PEO format)		
Population	What user group is affected?	Must include members of a multidisciplinary healthcare team working within the context of adult intensive/critical care
Exposure	What are these groups exposed to during the study?	Must describe or evaluate implementation or pre-implementation of a change in practice, also within this context
Outcome	What conclusions were drawn?	Must comment on how identified behavioural factors or organizational culture specifically influence the implementation of the change before a change becomes fully established

Table 3: Refined inclusion criteria

This structure helped to focus the sources and the refined criteria was applied to all abstracts. The text of sources not excluded following application of refined inclusion criteria to the abstract were read in full by the primary researcher, and sources not meeting the refined inclusion criteria were again excluded.

On reading the reference lists of all papers at this stage, one further source, which had not been identified by the database search, was identified as meeting all inclusion criteria, and was subsequently also included in collected sources.

Between all databases, 45 sources met the refined inclusion criteria following manual screening of full text. To reduce included sources based on practical constraints, sources published more than 5 years before the time of this study (i.e., before 2014), were excluded. This had the additional benefit of focusing on sources which reflected the context of a contemporary critical care setting. This is particularly relevant, as the case study presented within Chapter 3 looks at the implementation of citrate anticoagulation within the studied hospital, which occurred in 2015. **Figure 1** presents and summarises this process of sifting of data sources as a flow chart.

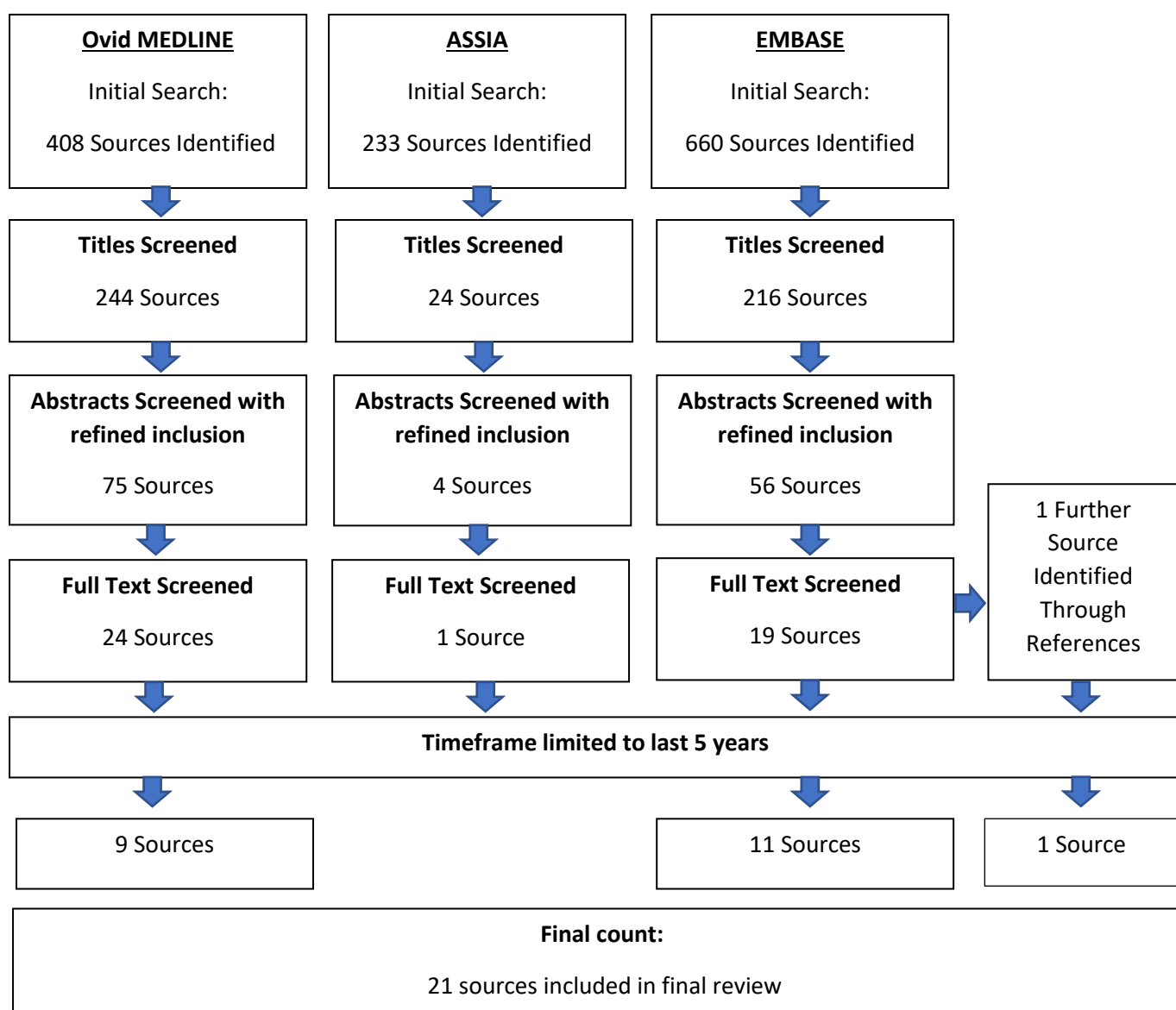


Figure 1: Flow chart of data sifting through manual text screening and application of inclusion criteria

Collation and presentation of data:

Reporting of the data charting process has been informed by item 10 of the PRISMA-ScR reporting guidance (Tricco et al., 2018). Included sources were charted independently by the author within Microsoft Word, with sources listed in order of identification. The full data chart can be found in **Appendix 1**, which includes the reference and URL, and a summary of the full text of each source: brief descriptions of the type of research, the change implemented and discussed, the group studied, and identified drivers and barriers to implementation. Included sources can also be found in the bibliography.

Thematic analysis

Definition thematic analysis terms used within this chapter

- **“Data corpus”** represents the entirety of text collected across the study.
- **“Data set”** comprises the subset of text within the data corpus being analysed, where relevant text is isolated according to a set of criteria.
- **“Data items”** refer to each individual piece of data included within the data set.
- **“Theme”**- a recurring and significant pattern of responses or meanings identified within the data set- open to researcher interpretation
- **“Code”**- a label applied to sections in data items which reflect or include information relative to an identified them
- **“Coding framework”**- a list of codes which can be applied to data items where a theme is seen to be expressed
- **“Data extract”** a text extract within a data item which has been coded and extracted from a data item

Methodology and rationale

Thematic analysis methods as described by Braun & Clarke, (2006) have been selected, with the aim of organising the recurring ideas highlighted by the coding process into more structured inferred themes and conclusions. Braun and Clarke (2006) advocate thematic analysis as a particularly adaptable methodology for the study of patterns across an entire data set, without being implicitly bound to any individual pre-existing theoretical framework.

(Braun & Clarke (2006) discuss two primary ways in which themes can be identified from the data set: inductive vs theoretical. Inductive approaches are “data driven”, where data is coded without attempting to fit the data into pre-existing coding frameworks- coding frameworks are generated as the text is read and patterns are identified. Theoretical analysis is guided towards a more specific research question, and analysis the data based on a pre-determined question and coding framework to provide a more detailed but narrower analysis.

The primary purpose of this scoping review is investigative, aiming to highlight conceptual areas which present opportunity for further study. For this reason, a “bottom-up”, inductive approach was favoured, using dynamic identification of patterns throughout the charting and coding processes to guide and generate new codes as researcher familiarity with the text is built up over repeated reading.

Thematic analysis in 6 steps

Braun & Clarke, (2006) also provide a clear structure for thematic analysis in 6 phases, which were followed throughout this study.

- **Familiarisation with data**
 - Data is read multiple times in entirety, early notes are made
 - If data is being transcribed, this is often incorporated into the familiarisation process
- **Generation of initial codes**
 - An initial list of relevant ideas and concepts which are interesting to the analyst is produced
- **Searching for themes**
 - Initially coded data is organised and refined into a list of candidate themes and meaning- understanding of how codes may relate to each other is developed
- **Review of themes**
 - List of initial candidate themes are reviewed, and mapped according to their relationships to each other.
 - These are compared to collated data sets to assess whether a coherent and consistent pattern exists, or whether themes need to be re-defined
- **Definition and naming of themes**
 - “Define and refine” where data describing each theme is organised into a consistent account
 - A detailed account of each theme is presented with consideration of how it fits into the “narrative” of the context of the rest of the data
 - Sub-themes identified and also discussed
- **Reporting findings**
 - Selection of key findings from above analysis for presentation and discussion within report
 - Arguments and discussion of data presented

At all stages, the importance for reflexivity in decision making is emphasised- the analysis themselves act as the tool of analysis, and therefore carries all the individual biases and unconscious pre-assumptions inherent to human decision making.

Coding and refinement of codes

Data corpus from PDFs of each scoping source was manually copied to Microsoft Word in an unabridged state, and quotes, sentences and relevant paragraphs were isolated to form a data set according to the refined inclusion criteria detailed in **Table 3**, striving to keep the enough of surrounding context of the excerpts to interpret these in isolation to main body of the text.

After repeated readings of these bodies of text by the primary investigator, multiple recurring concepts and ideas reflecting commonly occurring barriers and drivers to implementation efforts were identified inductively within the data set. To allow for quick reference and further analysis, a short code was inserted alongside text segments expressing these early themes. This inductively generated coding framework can be seen within **Table 4**, and encompass the themes of resource availability, knowledge and education, leadership, multidisciplinary involvement, and the use of documents, protocols, and guidelines.

Frequency of the codes appearing within the data set was recorded as a crude indicator of relevance and significance of each theme. However, Braun and Clarke are quick to point out that the “keyness” of a theme is not necessarily reflected in these quantitative values alone. (Braun & Clarke, 2006)

Code	Ideas encompassed	Frequency code appears within all Sources	Number of sources in which code is seen (Out of 21 sources)
(_RES)	Availability of resources	97	17
(_KNW)	Staff Knowledge and education	93	19
(_LDR)	Leadership	85	17
(_MDT)	Multidisciplinary involvement	81	16
(_DOC)	Use of Documentation/ Protocols/ Guidelines/ Checklists	67	17

Table 4: Initial coding framework using in scoping review analysis

During this process, the concept of resources reflected by the (_RES) code was the most frequently identified code. However, on further readings during the process of appending these codes to the text the theme of “resources” was refined and subsequently split into (_TME): “Time and Workload”, (_PHY) “Physical and environmental assets” and (_STF) “Staffing”, to allow for more nuanced analysis of the influences of these separate resources.

Likewise, a recurring idea of internal power-structures and hierarchy emerged- although thematically related to leadership, this idea was sufficiently conceptually distinct that a separate code, (_HRC), was assigned. This was later recoded as (_AUTH), as the topic was better described as “Authority”, a resource which is typically conferred by senior leadership.

During recurring reading, multiple additional codes were added based on additional ideas noted to commonly occur throughout texts. These included (_BUYIN) “Staff belief in importance of intervention and prioritisation of implementation”, (_SFTY) “Perception of physical or psychological risk to staff, patient or family”, (_RTN) “Relationship of implementation to existing routines and workflow processes”.

Finally, two additional codes, (_CHANGE) “Change of circumstance/ resource/ context, staff turnover, change of environment”, and (_AUT) “Desire for Autonomy” were added- although low total frequency they were felt to be particularly important in understanding the implementation process in sources where this code applied.

Following this process, a final framework of codes was developed and extracted text was coded as below (**Table 5**).

<u>Code</u>	<u>Themes/concepts encompassed</u>	<u>Frequency code appears within all Sources</u>	<u>Number of sources in which code is seen (Out of 21 sources)</u>
(_KNW)	Staff Knowledge and education	93	19
(_LDR)	Leadership	85	17
(_MDT)	Multidisciplinary communication	81	16
(_DOC)	Use of Documentation/ Protocols/ Guidelines/ Checklists	67	17
(_TME)	Time + Workload	46	16
(_BUYIN)	Staff prioritisation of intervention/ belief in importance of intervention	42	13
(_AUTH)	Authority/credibility/Hierarchy/Power structures/Empowerment	35	11
(_PHYS)	Physical assets- equipment, room layout,	31	14
(_SFTY)	Perception of Risk of harm to Staff or Patient psychological wellbeing/Comfort	28	11
(_RTN)	Incorporation of intervention into existing routines/ workflow	24	13
(_STF)	Staffing levels	22	14
(_CHANGE)	Change of circumstance/ resource/ context, e.g., staff turnover, change of environment	9	5
(_AUTO)	Desire for Autonomy	6	3
Table 5: Refined Coding framework used in scoping review analysis			

Each text extract was sorted into a data set by its code, and these data sets were further analysed to search for deeper themes and relationship emerging from the text.

2.4 Results and Findings

Overview:

Data set documents were produced from each of the 13 codes set out above. Analysing each of these sets in turn, a pattern of relationships emerged as the interactions between each of these thematic concepts were highlighted. In mapping these concepts, a consistent and desirable state of “consensus” between team members involved in the implementation process was seen to be critical to the success (or lack) of success of projects being implemented.

The theme of **consensus** emerged early during the thematic analysis process, linking multiple code domains as a unifying common goal. Referred to explicitly in some sources as “shared vision” (Bjurling-Sjöberg et al., 2018) or “shared understanding”, these data point to a collective agreement and understanding in both the goals and processes of implementation as being critical to the success of implementation regardless of the intervention. Likewise, many of the barriers to implementation can be fully or partially explained as a failure to achieve this state of consensus. Bjurling-Sjöberg et al., (2018) point to “diffuse vision” as one of the key barriers which needed to be overcome.

Although the degree of consensus seen in literature sources was variable, the 4 codes identified most frequently within the literature, as demonstrated within in **Table 5**, were seen to be particularly important in achieving this state of consensus.

4 of these central themes were identified as “Key drivers” of consensus: Staff knowledge and Education, Multidisciplinary communication, Effective documentation, and Leadership. Of note, during the analysis process, leadership was further subdivided into “Unit Level Leadership” and “Senior Leadership”, as each provided related but distinct benefits.

Development of these 4 drivers of change through consensus was commonly seen to be supported by the presence of a wider “Culture Permissive to Change”. This culture is supported by the input of “resources” which feed and support this environment of shared values and belief. Examples of resources identified include “Staffing”, “Time”, “Staff buy-in”, “Authority” and “Physical assets”, and these themes also correlate closely to codes identified in **Table 5**.

This analysis section will first present an exploration of each of the 4 key drivers as they are seen within the context of common threads within the literature sources, followed by a similar exploration of 2 Key resources, Time and “Buy-In”, and their role in supporting this culture. **Table 6** presents an overview of findings. Finally, a pictorial model of this relationship is presented as **Figure 2**.

Overview of Results and Findings	
<u>Consensus</u>	<ul style="list-style-type: none"> • Collective agreement and understanding in both the goals and processes of implementation • Critical to the success of implementation regardless of the intervention • Achieved through 4 key drivers (see below), which foster culture permissive to change

<u>Overview of 4 Key Drivers</u>	
<u>Knowledge and education</u>	<ul style="list-style-type: none"> • Baseline knowledge varies between staff groups and educational background • Knowledge gap exists between senior and junior staff • Staff understanding of evidence base fosters buy-in and consensus • Education addresses knowledge discrepancies and is bolstered by “champion educators” • Barriers to education include resource deficit, staff awareness, and pre-existing deep assumptions
<u>Leadership, Hierarchy and Authority</u>	<ul style="list-style-type: none"> • Distinction between senior and unit level leaders • Senior leaders support culture permissive to change through resource provision, and leverage authority as a resource to embed change • Well defined hierarchy identifies senior medical staff at top, and subsequently this group particularly influential in implementation • Breakdown of trust in leaders, blame culture and role ambiguity undermine consensus • Unit level leaders acting as champions particularly effective where multiple disciplines represented • Champion effectiveness limited by context and resource availability
<u>Multidisciplinary communication</u>	<ul style="list-style-type: none"> • Collaboration and engagement of multiple staff groups identified as driver of change in a large number of studies • lack of resource, particularly time and staffing were shown to limit development of good MDT communication • Different clinician groups were seen to play different roles within the implementation process • Senior physicians- able to provide authority and legitimacy • Nurses and physiotherapists: task-orientated roles, particularly vulnerable to blame culture
<u>Effective documentation</u>	<ul style="list-style-type: none"> • Effective documentation drives change, • However poorly designed documentation acts as a major barrier • Supports education and processes • Data collection for feedback fosters buy-in • particularly effective when incorporated into existing workflow and adapting existing documents and guidelines • Failure to integrate and standardise hinders information flow • Pitfalls of document burden and pop-up fatigue, and excessive standardisation must be navigated
<u>Overview of important additional factors</u>	
<u>Time as a limited resource</u>	<ul style="list-style-type: none"> • Lack of nursing time very commonly cited barrier • Opinions of documentation utility heavily influenced by the perceived impact on their workload • Perception of time and psychological impact of time constraints influenced by critical care context

Buy-in	<ul style="list-style-type: none"> • personal investment, conceptual agreement • acts as a driver of change, and also as a resource which sustains change • motivates staff to bypass other barriers • may change based on anecdotal and personal experiences • Fostered by ownership •
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Table 6: Overview of Results and Finding of Scoping review

Key Driver: Knowledge and Education

The most frequent code seen was _KNW (93 instances, 19 of 21, 90% of sources) which was used to identify the influence of knowledge and education surrounding the implementation process.

When analysed for discussion surrounding consensus or lack of consensus, variation in the level of knowledge is frequently referenced directly or indirectly. This can be understood due to variation in baseline knowledge: variation in pre-understanding of evidence base was thought to contribute to a “diffuse vision” (Bjurling-Sjöberg et al. 2018), baseline knowledge was also seen to vary between different clinician groups (Lin et al., 2020), and in those who had different educational backgrounds, with those of higher educated backgrounds reporting fewer overall barriers to implementation (Kim et al., 2019). Seniority and experience within the team was also significant, with large discrepancies between junior and senior team members leading to “failure to plan for failure” (Kydonaki et al., 2019), and juniors feeling overwhelmed (Parry et al., 2017), and disempowered (Barber et al., 2015).

Effective education was the main tool in addressing these knowledge deficits and discrepancies. As mentioned above, an important distinction can be made between knowledge pertaining to the evidence base of the implementation, and the more practical knowledge surrounding the pragmatic points needed to implement in the context of a working critical care unit. Education surrounding both of these types of knowledge are important, with each being shown to serve different purposes.

Staff understanding of the evidence base was demonstrated to foster conceptual agreement- “buy-in”- with the protocols and guidance being issued by senior management. Multiple sources demonstrated staff resistance where a poor evidence base or poor understanding of the evidence base existed to back up changes to existing practice (Holdsworth et al., 2015; Parry et al., 2017).

Staff involved in delivery/provision of the intervention value practical knowledge which allows troubleshooting of issues which arise (Kim et al., 2019; Spooner et al., 2018a), particularly where a “learning curve” period is available where clinicians are able to test guidelines before full implementation (Costa et al., 2017), although this is limited by the availability of time. Additionally, practical/technical knowledge is required for the teams to utilise some types of practical resources and equipment (Barber et al., 2015).

Consensus surrounding education was frequently shown to be bolstered through the role of the multidisciplinary team, and particularly where unit level leaders within multiple disciplines act as “champion” educators. Bjurling-Sjöberg et al. (2018) and Mørk et al. (2018) suggest different benefits are seen as different multidisciplinary groups are recruited as educators; physicians are useful to recruit in education as they may be perceived to be more authoritative, while nurses tend to play a greater role in peer education and reminding other disciplines of changes in the day-to-day workflow.

Conversely where intra-professional meetings do not occur, key actors are not engaged in the development of educational resources (Kim et al., 2019).

Multiple barriers to effective education exist, and these correlate to the absence of tangible and non-tangible resources. Kydonaki et al. (2019) demonstrate that lack of time is limiting for both educators and students, with adequate time being required for students to leave the ward, for development and deployment of the full curriculum during pre-implementation period, and for completion of e-learning (Spooner et al., 2018b). Furthermore, high staffing turnover limits knowledge as educated members are replaced.

Lack of awareness of education resources was also cited as a barrier, as multiple sources demonstrated instances where educational leaflets or guidance were overlooked despite their availability (Bjurling-Sjöberg et al., 2018; Rees et al., 2020). This issue may be compounded by larger hospital sites, as larger departments with more staff members make it more difficult for champion educators to approach key individuals (Bjurling-Sjöberg et al., 2018; Rees et al., 2020).

It is also worth noting that multiple studies referenced staff members' own beliefs and perceptions, particularly surrounding safety, as overriding barriers, with individuals being reluctant to implement changes they believe are unsafe even if evidence suggests otherwise (Holdsworth et al., 2015; Lin et al., 2020). Similar concerns were seen in another example, where staff showed reluctance to issue leaflets due to worries about potential distress to patients or families (Rees et al., 2020). This issue was also addressed by Lin et al. (2020), who saw some limited success in addressing this through targeted protocols and education around this.

Key Driver: Leadership, Hierarchy and Authority

The second most frequent code was `_LDR` (85 instances, 17 of 21, 86% of sources) which was used to code for examples of leadership. During the coding process this was separated from `_AUTH`, the code relating to authority, credibility, power structures and hierarchy. Although related, leadership here takes on a role as a developing driver, whereas authority is modelled here as a non-tangible resource which feeds into a "culture permissive to change"- its absence hinders development of effective leaders.

An early distinction was made between management leadership, and unit-level leaders. Managers play a role in directing the overall direction of the change (Rees et al., 2020) (Bjurling-Sjöberg et al., 2018), but often depend on multidisciplinary champions acting at the unit level to support the practical implementation and embed these changes (Rees et al., 2020).

Senior managers support the development of the culture permissive to change through provision of resources, such as support and funding (Eakin et al., 2015). Success was seen where these leaders were visible and supportive of unit level leadership. Mørk et al. (2018) saw benefits where nursing management sent a supportive memo to unit staff recognising contributions towards improved patient care, and in Bjurling-Sjöberg et al. (2018)'s study, senior unit staff cited a particular morale boost attributed to emotional support provided by an identified manager at a point where implementation was putting stress on these leaders.

Senior management typically use current research to build the evidence base for the change in practice (Phelan et al., 2018), which can foster buy-in when effectively disseminated and communicated (Eakin et al., 2015). They also leverage their primary resource, authority, either directly, as seen in Rees et al. (2020)'s case, where the clinical director was able to alter workflow by

introducing their new referral form into the admission process with defined prompts, or through lending their authority to multidisciplinary champions which are able to embed changes.

When unit level leadership was analysed, it became evident that a well-defined hierarchy exists within most critical care units, acting as a lens through which professional and social interactions are filtered. Kydonaki et al. (2019) identify this within their own unit, identifying the senior medical staff at the top, echoed by Bjurling-Sjöberg et al. (2018): “although all staff categories could express views, final decisions were largely those of anaesthesiologists”. Due to this authoritative position, participation of these physicians was seen a particularly important for overall success. These senior physician leaders were shown to value autonomy, and this led to tension where this autonomy was threatened by proposed changes “I don't want to be inundated with palliative care consults and meetings requested by other providers. I would rather approve the consult—not a nurse,” (an attending doctor quoted by Wysham et al. (2017)). As first-line managers typically do not have direct authority over these senior physicians, there was a degree of complexity over decision-making at the interface of senior and unit level leadership, although this barrier was overcome by the “willingness of consultant anaesthetists to change”, i.e. their buy-in (Kydonaki et al., 2019).

Breakdown in trust of leadership within this structure was seen to act as a barrier to change in multiple instances, as “blame culture” was shown to develop, leading to disempowerment of junior members and “impairment of trust and communication” (Eakin et al., 2015; Kim et al., 2019). Poor working relationships were shown to limit individual motivation even where first line barriers were overcome: *“I need to ask the doctor for their opinion and I don't have a good relationship with that person, or I think the other things I need to do are more important”* (Holdsworth et al., 2015). Perception of these cultural barriers differed by discipline, with doctors tending to cite leadership and accountability as greater barriers than nurses and physiotherapists, who cited more practical barriers (Barber et al., 2015).

As mentioned above, consensus amongst team members was almost universally important in achieving successful implementation. This can be seen within the structure of leadership roles- teams with shared mental models were highlighted as a facilitator to change (Phelan et al., 2018). Stakeholders in Halvorson et al. (2016)'s study saw benefit from outlining key implementation steps and then assigning accountability for each of these. The converse of this was commonly identified as a barrier. Kim et al. (2019) concluded “Role ambiguity” limited prioritisation of implementation, as clinicians did believe they had primary responsibility for provision of the intervention. Likewise, unclear roles were cited as a barrier (Bjurling-Sjöberg et al., 2018; Costa et al., 2017), leading to frustration and insecurity in team members, and of the studies examined by (Dubb et al., 2016), 25% reported unclear roles and responsibilities as a barrier. Without clear allocation of roles, staff who are senior in some respects, for example doctors, may feel unqualified to deliver change which they feel falls outside their professional role (Parry et al., 2017). Critical care may be particularly vulnerable to this, as high rates of staff turnover were and contextual change within critical care are seen as detrimental to both integration and sustaining of change (Bjurling-Sjöberg et al., 2018) (Dubb et al., 2016), seen as leaders move to other assignments as project time frames extend. However, a counter-benefit to prolonged time frames may be extended time for unit level staff become used to the idea of change (Bjurling-Sjöberg et al., 2018).

The clear allocation of unit-level leaders as “champions” of the change was a common theme amongst sources. Champion groups were frequently found to be effective where they incorporated multiple disciplines (Eakin et al., 2015), although the specific composition varied across studies (Phelan et al., 2018). Multiple sources highlight the position of unit level nursing champions within the workflow as particularly useful to integrate changes and address practical barriers, especially those relating to time

and workforce deficit (Kim et al., 2019; Mørk et al., 2018; Spooner et al., 2018b). In this instance nursing champions' role as peer educators was particularly useful, as was their role in leading by example and adapting to constructive feedback as "healthy conflict" to win over opponents to the change.

Rees et al. (2020) give the most detailed account of issues encountered by champions, demonstrating their effectiveness of champions is influenced by both context and the availability of resource. As mentioned above, champions were more easily able to approach key individuals at smaller sites. They found their implementation of documentation limited by both workload and time, and by financial limitations on provision of education. Furthermore, perceived authority was significant; registrar champions felt less empowered and comfortable in authority compared to their consultant counterparts *"It's difficult to disagree with people who are our consultants and are signing our feedback form; there's only so much opposition or contrasting opinion I can vocalise."*

Dafoe et al. (2015) present an interesting counter point to many of the other sources, initially identifying lack of leadership as a barrier, but showing no benefit to addressing this through development of multidisciplinary champions. They suggest that because their unit already had a proactive stance which was already well integrated into multidisciplinary workflow, introduction of champions alone did not address other co-existing institutional/ resource-based deficits such as time and funding, supporting the conclusion of this scoping review that multiple multifactorial drivers must exist simultaneously to facilitate lasting change.

Key Driver: Multi-Disciplinary Team (MDT) communication

_MDT was the 3rd most frequent code (81 instances, 16 of 21, 76% of sources), encompassing references to communication between multiple disciplines. The key role of incorporating multiple disciplines in educational and unit level leadership roles has already been discussed above. However, collaboration and engagement of all MDT members was specifically identified and addressed as distinct driver of change in a large number of studies (Bjurling-Sjöberg et al., 2018; Holdsworth et al., 2015; Kim et al., 2019; Lin et al., 2020; Parry et al., 2017; Phelan et al., 2018; Tayyib et al., 2016). These benefits are realised in sharing of skill sets and experience, both in team meetings and workshops (Bjurling-Sjöberg et al., 2018; Kim et al., 2019; Phelan et al., 2018), and on ward rounds where multiple team members were present (Parry et al., 2017). Conversely, unequal team involvement was seen to be detrimental in Bjurling-Sjöberg et al. (2018)'s study, as failure to include senior physicians early lead to their limited involvement in pathway development later into the project.

As with other key drivers, lack of resource, particularly time and staffing were shown to limit development of good MDT communication.

As highlighted in the analysis of knowledge, differing levels of baseline understanding was seen in differing clinician groups (Kim et al., 2019), and these differences in opinion can impede a shared vision of intended endpoint of the implementation (Bjurling-Sjöberg et al., 2018). These differences were suggested to stem from differences in education surrounding evidence (Bjurling-Sjöberg et al., 2018), differences in personal beliefs regarding patient safety (Lin et al., 2020) or differences in perceived social norms (Holdsworth et al., 2015).

Again, lack of consensus surrounding roles and goals between multiple teams was seen to act as a barrier (Bjurling-Sjöberg et al., 2018; Kydonaki et al., 2019), with some clinicians unclear on who was to provide the rehabilitation implemented in Parry et al. (2017)'s case study. In some cases, lack of

accountability between teams was attributed to interventions not being carried out (Parry et al., 2017).

Different clinician groups were seen to play different roles within the implementation process. Senior physicians are able to provide authority and legitimacy *“Actually, all staff categories are equally important. But, of course, there is some kind of chain of command, so to speak.”* (Bjurling-Sjöberg et al., 2018), but may feel underequipped or underqualified to perform some tasks such as rehabilitation personally (Parry et al., 2017).

Nurses were more frequently seen in a task-orientated role, and their role within the team seemed to vary between sources, being dependent on their degree of empowerment within the specific culture of the unit. Blame culture amongst nurses was cited as a barrier multiple times (Kim et al., 2019) (Kydonaki et al., 2019), and lead to disempowerment and trust issues between nurses and medical staff. To further emphasise this disempowerment, Wysham et al. (2017) found physicians (48%) were less likely than nurses (73%) to endorse a system in which both could initiate referrals. These barriers are compounded in units where few interprofessional meetings occur, further distancing these disciplines (Bjurling-Sjöberg et al., 2018).

For physiotherapists, culture within units was described as both a barrier and an enabler. Parry et al., (2017)’s study concerned implementation of early mobilisation interventions, and interviews with physiotherapists also describe a similar blame culture, where they experienced a lack of respect from medical and nursing staff, although they did acknowledge this was less frequent now than historically. Physiotherapists also identified nursing staff as the “gatekeepers” to patients, occasionally blocking the goals of physiotherapists. However, in the same series of interviews medical and nursing staff identified physiotherapists as the main drivers of rehabilitation in their units. Interestingly, in this study it was primarily physiotherapists who identified and raised discussions surrounding patient safety concerns.

Key Driver: Effective Documentation

The code encompassing the production and use of new documentation, _DOC, (67 instances, 17 of 21, 81% of sources), represents the final of the 4 identified key drivers of change. However, it is important to note that although **effective** documentation was commonly seen to facilitate change, poorly designed documentation was frequently identified as a major barrier to implementation. For documentation to truly act as a facilitator, it must avoid the multiple pitfalls detailed below.

As seen with previous drivers, examples of effective documentation seen within the sources frequently reference how it supports other key drivers. For example, education and staff knowledge base may be supported through documents provided by senior leadership, and multiple sources highlight the utility of bundles and protocols in standardisation of care, facilitating communication between multidisciplinary teams and allowing for development of shared goals (Costa et al., 2017; Dubb et al., 2016; Kydonaki et al., 2019; Lin et al., 2020; Phelan et al., 2018). Kim et al. (2019) found staff were “significantly less likely to recognise barriers to [the intervention] when a protocol or guidelines were in place”.

A further benefit of documentation is seen in its utility for data collection and reporting. Where timely and actionable feedback systems were in place, these were seen to foster staff buy in and “contributed to the sustainability of the projects by promoting staff support and multidisciplinary team

engagement.” (Eakin et al., 2015; Phelan et al., 2018). In addition, collection of data allowed for revision to implementation plans as problems were identified and also in securing additional funding from hospital administration (Eakin et al., 2015; Phelan et al., 2018).

Documents were noted to be particularly effective when incorporated into existing workflow and adapting existing documents and guidelines, (Phelan et al., 2018), or through addition of prompts and checklists (Halvorson et al., 2016; Rees et al., 2020; Spooner et al., 2018a). However, increasing obligatory documentation may also have negative consequences on the context of an already heavy documentation burden- nurses interviewed in Wysham et al. (2017) expressed concerns regarding “trigger overload” and “pop up fatigue”.

This relationship of documentation to the resource of time was frequently addressed. Staff, most frequently nurses, expressed concerns that documentation would be time consuming, increase workload and/or duplicate effort (Bjurling-Sjöberg et al., 2018; Mørk et al., 2018; Rees et al., 2020; Spooner et al., 2018a). Difficulties were also observed in securing sufficient time to both develop documents and incorporate them into the workflow within the timeframes set out by the project. This process also requires clear leadership to define who is responsible, steps needed to take, and expected standards for protocol implementation (Costa et al., 2017; Rees et al., 2020).

Further, failure to provide consistent and standardised documentation was seen to hinder information flow between disciplines (Kydonaki et al., 2019) and leading to a more trial-and-error approach to new situations arising (Lin et al., 2020), leading to inequalities of care depending on competence and confidence staff members on duty at any one time (Bjurling-Sjöberg et al., 2018). Failure of guidelines to address practical knowledge deficits at unit level with troubleshooting advice was an identified barrier (Spooner et al., 2018b). Where multiple vague or conflicting guidelines exist, there is increased potential for knowledge deficits and inaccuracies within key communication process such as handover, potentially leading to dangerous consequences (Spooner et al., 2018a).

Poor accessibility of documentation was also highlighted as a problem by some sources, with documentation related barriers including documents being difficult to locate (Bjurling-Sjöberg et al., 2018), not being user-friendly, “cumbersome” and containing irrelevant information, while missing key content (Costa et al., 2017; Spooner et al., 2018b) or challenging to access and print due to existing contextual technological infrastructure such as poor Wi-Fi connections within the unit (Mørk et al., 2018). In addition, in multiple studies, poor awareness that the key documents existed at all also hindered implementation. (Mørk et al., 2018; Rees et al., 2020).

Interestingly, multiple examples were seen where clinicians showed concern that overuse of protocols and excessive standardisation of complex care issues such as palliation may cause distress to patients and care givers, and negatively influence both patient care and relationships with family members. (Lin et al., 2020; Rees et al., 2020; Wysham et al., 2017). Nursing staff interviewed by Kydonaki et al. (2019) felt that some protocols formed a “tick box exercise”, which undermined their autonomy. These issues may be somewhat mitigated by allowing for some scope for tailoring of protocols to local contextual need needs (Kim et al., 2019). Barber et al. (2015) showed that specific patient inclusion and exclusion criteria increased overall adherence to the implemented protocols.

Additional factor: Time as a limited resource

The code _TME was used to code for references to time and was later expanded to encompass staff perceptions of their own workload as these two factors are closely related. Lack of nursing time was a very commonly cited barrier- “lack of time and limits to the ICU nursing workforce are more significant barriers for implementation than patients, patients' families, and departmental leadership” (Kim et al., 2019), with other sources identifying time demands as the most significant of all barriers to implementation (Lin et al., 2020; Tayyib et al., 2016).

As seen above, time constraints were noted as barriers to development and implementation of educational resources (Kim et al., 2019; Kydonaki et al., 2019; Tayyib et al., 2016), utilisation of documents (Bjurling-Sjöberg et al., 2018; Costa et al., 2017; Mørk et al., 2018; Rees et al., 2020; Spooner et al., 2018b), and in development and sustainment of implementation processes at a senior leadership level (Bjurling-Sjöberg et al., 2018; Costa et al., 2017; Rees et al., 2020).

The above analysis of the role of documentation already indicate that the impact of time is also significant from a psychological point of view, with study participants’ opinions of documentation utility heavily influenced by the perceived impact on their workload. When the _TME code is analysed separately, this psychological influence is also seen across additional sources. Lin et al. (2020) showed staff perceived the implementation as prolonging their workday, and subsequently contributing to increased general stress at work. Staff concerns about increased workload were also specifically identified as major barriers in (Costa et al., 2017; Eakin et al., 2015; Holdsworth et al., 2015).

Perception of time was also tied to the acuity of the unit and subsequent beliefs around patient safety. Nurses interviewed by Kydonaki et al. (2019) referenced instances where implementation of sedation breaks and early mobilisation were put on hold as workload was fluctuated with new patient admissions. Battistella et al. (2017) demonstrated one barrier to compliance with new hand-washing guidance was the perception that this takes too long within an emergency situation. This study suggested that incorporation of interventions into a routine and habit can reduce the subjective perception of time.

Additional factor: Buy-in

The code _BUYIN was used to encompass the theme of staff “buy-in” i.e., personal investment, conceptual agreement and prioritisation of the change being implemented. In the model constructed by this scoping review, Buy-In is placed on the periphery of the culture permissive to change, as it acts as both a driver of change generated by the developing culture, and also as a resource which positively feeds back into its sustainment.

As noted above, education around evidence base may promote buy-in though conceptual agreement with the proposed change, while conversely poor understanding or discordance in opinion surrounding the evidence base leads to poorer buy in (Holdsworth et al., 2015; Parry et al., 2017). Low perception of importance of the intervention leading to low prioritisation were seen as barriers to change (Barber et al., 2015; Dubb et al., 2016; Tayyib et al., 2016). The contextual environment of intensive care may also form a barrier to buy-in as “Shifting premises with limited resources meant that the staff continually had to adapt and juggle competing priorities” (Bjurling-Sjöberg et al., 2018).

The buy-in of staff members was consistently seen to facilitate implementation and motivates staff to bypass other barriers (Barber et al., 2015; Eakin et al., 2015; Lin et al., 2020; Luiking et al., 2016; Parry et al., 2017). This can take the form of enthusiasm amongst unit-level staff offering practical and psychological support for the core project group (Bjurling-Sjöberg et al., 2018).

Eakin et al. (2015) describe a shift in attitudes and culture of the unit changing from “wariness and scepticism” following observation of the efficacy, safety and feasibility of the programme. This then fed back into driving the change allowing expansion to encompass more multidisciplinary team members and larger patient group. Team meetings allowing staff to air negative experiences were seen to assist in shifting unit culture towards acceptance of the intervention (Kim et al., 2019).

Luiking et al. (2016) give an example of fostering buy-in amongst unit level staff by giving them the opportunity for input into the protocols developed by the core project team. Although the unit staff did not make any large changes, the final protocol was seen as more acceptable to unit staff who perceived a degree of ownership over the implementation, resulting in high compliance with the implementation (in this case a new insulin protocol).

Synthesis and Modelling the development of consensus through a resource driven “Culture Permissive to Change”

As coding and analysis progressed it was recognised that multiple social and environmental factors must exist concurrently for a state of consensus to be reached. Together, these factors contribute to an overall culture which is permissive to change.

The factors driving this culture can be thought of as the supply of resources which are necessary for the development of key change drivers. These resources may be tangible and measurable: staffing levels and access to adequate physical assets (e.g., equipment, arrangement of space/beds) were both frequently cited within data sources. However, at least as important to generation of this culture are more abstract non-tangible resources, including Staff time and Authority, which also perhaps provide more insight into the behaviour and cultural factors at play within the unit level of critical care.

As discussed above, this “climate” of resource allows for the development of 4 interrelated key drivers important for successful implementation: Education, Leadership, Documentation and Multidisciplinary communication.

A pictorial model is presented as **Figure 2**, which illustrates this relationship visually. Here Key Drivers are indicated by dark blue circles, whereas resources feeding the culture are illustrated as grey boxes.

Of note, “Senior Leadership” is distinguished from “Unit-Level Leadership”. Senior leadership was seen to provide a greater role in the collation and provision of tangible and non-tangible resource to the “Culture permissive to Change”, whereas “Unit-Level leadership” played a role as a more direct Driver.

“Buy-in” was seen to act as both a driver which exists as both an outcome of achieving consensus, and as a non-tangible resource which positively feeds back and helps sustain the culture. Likewise, the non-tangible resource of time and its perception by staff members is itself informed by the quality and state of the existing culture within the unit and is therefore represented as a feedback arrow on the left of the diagram.

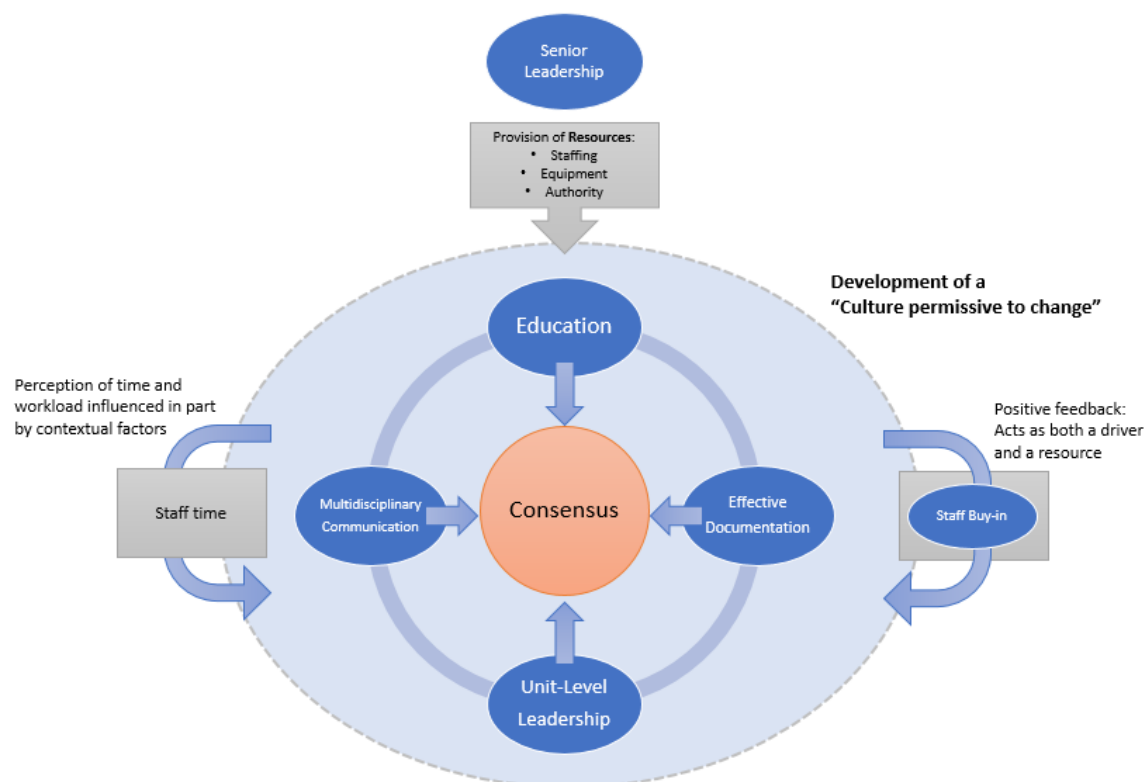


Figure 2: Modelling of drivers of change and the development of a culture permissive to change.

Literature source characteristics

Of the sources reviewed, the most common type of implementation project studied were rehabilitation and early mobilisation interventions with 8 sources (38%). This is likely to have had an influence on the specific lens the team dynamic being studied has been viewed through- notably a relative emphasis is placed on the role of physiotherapists and nursing staff in these interventions, compared to relatively little discussion surrounding the role of pharmacy. In contrast, only 2 sources (9.5%) studied the process of intensive medical/ organ support interventions, with none of the sources addressing renal replacement or dialysis. This could be seen as a limitation in the sense that it provides limited contextual information to base the subsequent exploration of culture surrounding CRRT implementation in chapter 3. However, it also suggests that there is an opportunity for novel research as there may be contextual factors which have not been fully examined within the existing research.



Figure 3: Geographical distribution of sources collected within scoping review- size of dot indicates relative frequency of study included

Breaking down the geographical context of primary sources, Oceania was the most frequently represented continent, with 7 (33%) of the data sources collected primarily within Australian critical care units.

Europe was the second most frequently represented continent, with 5 (23%) collected within European units. Of these, 2 were collected within NHS hospitals within the UK, 1 in Sweden, 1 in Italy and 1 in the Netherlands. However, despite 2 studies within the broader NHS, it is of note that of the data collected in any sources reviewed was collected from Welsh hospitals.

4 (19%) of sources were primarily collected within the United States, and 2 (9.5%) studies were Asian in origin (1 from Saudi Arabia and one from South Korea).

The remaining 3 sources consisted of literature reviews, each compiling multiple studies from a variety of geographical locations- primarily English-speaking countries including USA, UK and Australia. The geographical distribution of included sources is represented pictorially in **Figure 3**.

This geographical context is useful when considering culture- both in terms of geographical context of how healthcare units are organised within different nations, but also in communicative national cultural norms. Aritz and Walker's (2010) analysis of multicultural and intracultural communication within organisational settings highlights how national cultures may affect communication within this setting. They draw a distinction between regions where the majority are members of a collectivist culture vs those where the majority have a more individualistic culture.

It is also worth noting that the exclusion of studies which do not have a freely available body of text in English has likely biased the studies reviewed towards English speaking cultures and primarily Western communication styles and values. However, I would argue that this exclusion criteria does not necessarily compromise that contextual relevance of this review, as this scoping study intends to inform further research on a Welsh hospital which likely also expresses these values to a degree. Nevertheless, there may be more subtle but relevant differences from British (and more specifically Welsh) cultural communication norms differing from other English-speaking nations which are not reflected within this review.

2.5 Discussion

The primary purpose of this scoping review was to assess what information already exists within the literature regarding the relationship of cultural and communication on change implementation within a critical care context. As discussed in Chapter 1, culture is a difficult concept to encapsulate within a single study and remains extremely dependent on contextual factors.

Critical care does not exist in isolation to other specialist units- its existence is fundamentally and inextricably integrated with other areas of a functioning hospital and subsequently the culture within any ITU necessarily shares core values within the broader context of wider healthcare organisational culture. Therefore, it is perhaps unsurprising that the broad driving factors within the model generated by this scoping review are not dissimilar to those seen within existing implementation guidelines and modelling within other healthcare settings, and to a wider extent other organisation within the business world. Factors like education, documentation, leadership and multidisciplinary teamwork are so deeply engrained into the artefactual and arrangement levels of all these networks that a failure to acknowledge them would undermine their fundamental importance.

It is important to re-iterate the limitations of scoping review methodology compared to more structured systematic review design. In “mapping the landscape” of data available, this review makes no effort to evaluate, critique or weight for the quality of data collection included within (Arksey and O’Malley 2005; Estabrooks et al., 2006). Even within this design philosophy, it is apparent that there was a great deal of variance within the sample sizes and degree of theoretical grounding incorporated into the subset of sources sampled. Many of the conclusions reached have already undergone a degree of analysis by the source authors, and therefore will have already filtered through a layer of inherent assumptions, bias and beliefs held by the individuals publishing the data. As such, the model produced is not intended to be a rigorous theoretical statement of fact, but rather a summary and jumping-off point to guide further study and exploration within this topic.

Having said this, the fact that the final model generated in this review closely matches those already proposed within other implementation science research is in many ways a useful and positive finding- the similarities with other contexts mean that lessons learned within other contexts might be successfully adapted and integrated into critical care- a far more optimistic conclusion than the alternative: that to address change in this setting we would have to develop a completely novel implementation approach from the ground up. Further, looking within these broad similarities, it is possible to highlight some interesting and more subtle contextual nuances which may provide direction on how these approaches might be adapted to have maximum effect. Although it is more difficult to extract and make comment on deeper layers of culture through secondary data, it is still possible to catch glimpses into the deeper held assumptions and beliefs of those studied through the inclusion of some direct quotations of participants and the analysis and discussions surrounding organisational culture provided by the source authors.

Critical care units manage a small cohort of patients at an extremely high level of acuity and intensity. This review suggests that we should recognise the way in which teams and individual staff members respond to this acuity results in additional strain on some of the drivers of change. Examples of this include the impact of high acuity patient care needs on nursing time and their fluctuating workload, as well as the knock-on effect this has on the buy-in of this staff group. Interestingly, Tayyib et al. (2016) discuss the concept of being psychologically “time-poor”, suggesting that environmental factors influence perception of time at least as much as quantifiable minutes and hours. The authors suggest that staff who quote a lack of time as barrier may be basing this perception due to difficulty problem-

solving, low confidence or lack of experience. If this is the case, the impact of nurturing a culture permissive to change could feasibly improve the *subjective* availability of time by facilitating more efficient use of time through improved education, leadership, communication, and documentation.

Other areas where this acuity and complexity of care factors into implementation was seen in its influence on the relationships between staff members and the relatives of patients. As discussed above, it was highlighted that avoidance of additional distress to family members became a high priority and influenced both decisions making and the acceptability of certain changes (Holdsworth et al., 2015; Parry et al., 2017). Although this behaviour may be common to other areas within healthcare, it seems likely that more extreme emotions surrounding critical care situations make this a particularly intense barrier within this setting.

An additional domain which arose during later rounds of coding was the concept of change. Although it was seen relatively infrequently within the text, a high staff turnover and shifting premises and bed demands represents another stress point. Again, these considerations are clearly not completely unique to this setting, but it is interesting that this issue is perhaps particularly prominent within this specialty.

In modern healthcare, almost all units are multidisciplinary to some extent. What was striking from this review is the impact of team integration on implementation success and the high degree of variation in how successfully this was achieved within each of the critical care unit cases reviewed. A well-integrated team does **not** seem to be a constant factor between units, and unit-context specific activities such as regular team meetings were seen to be important in determining whether this was achieved.

As discussed in the analysis, failure to integrate multidisciplinary team members can hinder communication, reduce buy in and foster a sense of disempowerment and animosity amongst junior staff- all unfavourable to implementation success (Parry et al., 2017). However, this variation when compared to the examples of high-performing and cohesive units implies that this presents a particularly promising target for improvement of future implementation efforts in those contexts where issues surrounding intra-disciplinary culture exist, although the next challenge may be in a robust way of identifying and flagging these units.

The second major goal of this scoping review was to help to shape the case study design discussed within chapter 3 of this thesis. Despite the role of senior leadership within the model developed by this scoping review, only 4 of the sources included explicitly interviewed or examined the role of those non-clinical senior management positions in any depth, while none of the sources reviewed the impact of external industry representatives on implementation efforts. To address this, the recruitment strategy within the case study design discussed in chapter 3 was modified to include multiple stakeholders who had roles in senior management level.

The drivers and resources identified during this study were each incorporated as broad topic headings within the framework of a structured interview schedule (**Appendix 2**), and these were used as the framework for deeper exploration into the connections and subthemes.

2.6 Summary

In summary, this scoping review identifies several key factors which influence the success of implementation and suggests a preliminary model through which they might exert this effect. This model indicates that 4 Key Drivers- Education, Multidisciplinary Communication, Effective Documentation and Leadership support the development of a state of consensus which is highly important to success of implementation initiatives within critical care. These drivers depend on a “Culture Permissive to Change” which itself is dependent on multiple tangible and non-tangible resources for its development and sustainment.

This review has also highlighted areas in which a paucity of data provides opportunity for further study. Both of these outcomes have informed the design of a case study exploring cultural and communication factors in a district general hospital intensive care, and this case study will be explored in the next chapter. Notably, Key drivers and Resources identified within this scoping review form the underpinning of an interview template utilised for data collection in Chapter 3 which covers each of these domains.

Chapter 3: Implementing Regional Citrate Anticoagulation in Continuous Renal Replacement Therapy-

A Case-Study investigating how cultural and behavioural factors influence practice change within an intensive care setting

3A: Background and Methods

3A.1 Summary

Following the scoping review presented in Chapter 2, Chapter 3 intends to further investigate how culture in critical care influences change through a retrospective Case-Study. This study examines staff perspectives on a project implementation a new form of anticoagulation in renal replacement which occurred in 2015 within a District General Hospital Critical care setting in 2015.

Chapter 3A will detail the background surrounding this implementation, and the study methods, which can be broadly summarised as data collection through 10 retrospective cross-sectional interviews, followed by further thematic analysis of interview transcripts. These semi-structured interviews are directed by an interview template developed from the findings of the Scoping Review presented in chapter two, using the Key Drivers and Key resources highlighted to form domains of directed questioning to explore how these relate to the context of the case study.

3A.2 Background

Up to 2015, the standard practice for providing anticoagulation to patients receiving CRRT within the studied health board was based on delivery of systemic heparin. In 2015, an implementation project was carried out within the critical care units within each of the 3 district general hospitals encompassed within the health board. The aim of this project was the transition towards introduction and standardisation of a new method of anticoagulation to these patients- regional citrate anticoagulation. The scope of this project was extremely broad and presented multiple logistical and technical challenges to multiple staff groups.

Safe and effective provision of any type of anticoagulation in renal replacement settings is a specialised skill requiring trained and knowledgeable individuals in the prescription, procurement, logistical management, technical delivery, administrative and troubleshooting aspects. In addition, multiple new documents were produced and distributed during the course of the project, including new protocols, prescription proformas and educational workbooks.

The complexity of this effort required significant upheaval to the normal working practices of multiple internal staffing groups and involved the input of external groups including commercial

representatives from medical technology industry, and critical care network management groups. 5 years on, citrate anticoagulation is considered the standard of care within the Case-Study unit, which could be considered one metric of implementation success.

As such, this implementation effort presents an excellent opportunity for retrospective study into how the organisational culture of a critical care unit, and staffing subcultures within, plans for, adapts and responds to major implementation efforts. As an academic junior doctor based within the hospital in which the critical care unit is situated, I found myself well-placed to carry out this case-study.

3A.3 Aims and Objectives

This study aims to examine the implementation of citrate anticoagulation within the case-study critical care unit, and subsequently investigate the broader relationship of implementation processes within intensive care with organisational culture.

3A.4 Methods

Case study methodology

Case study research represents a systematic inquiry into a phenomenon occurring within a bounded context. This style of research is especially useful in cases where contextual conditions are likely to be highly relevant to the phenomenon being studied, and where the boundaries between context and the studied phenomenon itself are not clear (Yin, 2017). With this in mind, a case study approach has been adopted based on its strength in analysing phenomenon within their own context.

In determining and constructing the boundaries of the case itself we need to consider how best to answer the specific research question. As an inquiry into how cultural factors within a critical care unit influence the success of implementation, the boundaries of this case were set around one specific implementation project (introduction of citrate anticoagulation in continuous renal replacement therapy) within a single critical care unit located in North Wales. In defining the case as the implementation project, itself, it is recognised that the complex context may extend outside of the critical care unit itself to encompass the wider hospital and beyond into external organisations, while retaining focused and bounded around a single phenomenon which can be studied in detail.

As this study looks to explore the impact of staffing group sub-culture, a “Single Case with Embedded Units” approach as described by Baxter and Jack has been adopted. This approach allows for additional depth of analysis as collected data can be compared **across** all subunits, but also compared and contrasted **between** them (Baxter & Jack, 2008).

Sampling and Recruitment

As discussed previously, organisational culture within healthcare settings is often considered to be made up of numerous smaller and interacting sub-cultures. Each of these groups will have its own contextual nuance, but much of these cultures will be influenced or even defined through their interactions with other overlapping groups. Although there are likely thousands of arbitrary ways in which these cultural groups could be subdivided, to reduce ambiguity this study has chosen to use two clear and codified cultural borders, the structure of which would be positioned at the artefact and arrangement level described by Schein's framework (Schein, 2010).

The first border is that of the case-study critical care unit- that is, all sampled individuals were working for or contracted by this hospital unit at the time of change implementation. This intends to focus discussion and experience to that within the borders of the case study

As previously mentioned, one aim of this study is to assess culture through capturing a cross section of the communication and interactions between the various staff groups within the critical care unit. Further to this, one of the key drivers of a culture permissive to change identified within Chapter 2 was effective multidisciplinary communication. For this reason, the second set of borders defined was that of disciplinary specialty- this is clearly and explicitly defined as job role within the NHS. To maximise coverage of as many professional interactions as possible, each sampled individual was selected from a different multidisciplinary group- an advantage over the majority of studies included within in the scoping review, which typically focused solely on either one or two disciplines- primarily clinicians, physiotherapists or nursing staff.

Purposive sampling techniques were utilised to identify and approach participants for this study. The nature of this is well described by the SAGE encyclopaedia of research methods (2008):

"A purposive sample, also referred to as a judgmental or expert sample, is a type of nonprobability sample. The main objective of a purposive sample is to produce a sample that can be logically assumed to be representative of the population. This is often accomplished by applying expert knowledge of the population to select in a non-random manner a sample of elements that represents a cross-section of the population." (Lavrakas 2008).

Utilising this strategy, one of the project supervisors- a consultant within the case study intensive care unit- acted as a gatekeeper for the purposes of identifying and approaching these staff members. This individual was approached with the primary research question, and the goals of the study, including providing perspectives of multiple staff groups was explained. A list of email addresses of individuals spanning multiple staff groups who were present within the case-study unit during the implementation of citrate anticoagulation was provided to the primary investigator. Individuals known to be knowledgeable about the change to citrate anticoagulation were further identified using a contact list found on the citrate protocol education documents, which are publicly available online. Within these documents, a list of citrate "superusers" spanning multiple disciplines were identified for multiple sites within the studied health board.

The above individuals were approached via email correspondence by the primary investigator, along with an information sheet and consent form. Exclusion criteria were any participants who did not respond to initial email. Participants declining to consent to interview, or those who subsequently withdrew consent at any stage.

Modification to study design due to COVID-19 pandemic

Yin (2017) generally considers design containing multiple cases to be more rigorous, and comparison of responses between multiple settings allows for comment to be made on generalisability of results. This allows a greater degree of insight as to whether identified themes are specific or may be expected in multiple similar but distinct social contexts.

Initially, the design of this study was to examine and compare the differences in implementation between multiple intensive care units within Wales, ideally all three sites within the health board. As the intervention being implemented would have been the same at each site, this may have provided additional insight into more subtle contextual differences.

Unfortunately, the scope of this study design was limited by the influence of the COVID-19 pandemic, which affected both the accessibility of intensive care staff members, and increased staff sickness rates. In addition, my own workload as a member of the medical team was increased, and subsequently the decision was made to reduce the inclusion of staff members to those accessible directly through the case study intensive care unit. Instead, the study focus was reframed, using the distinction of staff roles within the single unit as the individual cases which overlap and interact.

Case Characteristics

Of the staff members within the case study unit identified and approached through the gatekeeper, 8 individuals responded to the initial email providing more detailed information and a consent sheet (These are included as **Appendix 3 and Appendix 4**). Of these, 2 (one member of junior medical staff, one member of nursing staff) did not respond to further follow-up correspondences and were subsequently excluded from the study. Of the remaining 6, the range of staff roles represented is as follows in **Table 7**.

Two further individuals were identified through initial staff interviews as playing important roles in this project despite not being employed as staff directly within the hospital. The first was an industry representative with involvement in training and support surrounding the CRRT delivery equipment, the second was the manager of the regional Critical Care and Trauma Network- an organisational entity providing close support and guidelines with regional critical care units, while remaining distinct from the unit staff. These individuals were approached via NHS email and subsequently consented to interview and inclusion.

Total Participants recruited and included: **n= 8**

<u>Critical Care Unit Staff Roles Represented</u>	<u>Code used in Text Quotations</u>
Project Chair: Intensive Care Consultant	CONS1
Clinical Lead for Intensive care: Intensive Care Consultant	CONS2
Senior Nurse: Intensive Care Unit Sister	SISTER
Staff-grade Nurse: Intensive Care	STFN
Senior Pharmacist covering Intensive Care	PHARM
Housekeeper: Intensive Care	HK
<u>Additional Roles external to unit staff</u>	
External: Industry Account manager	IND
Critical Care and Trauma Network Manager	CCTNM

Table 7- Interview participants and coding key for quotations

Data Collection: Semi-Structured Interviews

Research interviews are a common data collection method used for qualitative healthcare research and are structured around a dialog between the research interviewer and participants, either as a group or individually. (DeJonckheere & Vaughn, 2019)

Semi structured interviews are “organized around a set of predetermined open-ended questions, with other questions emerging from the dialogue between interviewer and interviewee/s” (DiCicco-Bloom & Crabtree, 2006). This method of data collection was favoured here for its flexible structure and has the benefit of allowing for deep exploration into personal beliefs and assumptions, while retaining a loose structure which allows prompting of key themes and topics (DeJonckheere & Vaughn, 2019).

A topic guide was developed, outlining 8 broad thematic headings which were selected and developed based on facilitators of change identified by the scoping review carried out in chapter 2.

The broad headings included within the interview topic guide were:

- Awareness and knowledge
- Skills and Education
- Motivation, Acceptance and Beliefs (“buy-in”)
- Leadership
- Contextual factors
- Practicality and available tangible resources
- Communication amongst multidisciplinary teams
- Documentation

See **Appendix 2** for the full topic guide used.

All interviews were conducted by the thesis author, exclusively using video conferencing software (Microsoft teams or Skype) due to COVID-19 restrictions on face-to-face contact, and thus were conducted from a location of participants own convenience and privacy. During these interviews, the interviewer was either situated in a private home office, or in a small meeting room which had been booked for sessional use within the case study site.

Care was taken to structure questions as open ended conversation prompts, and participants were encouraged to speak freely with minimal interruption or leading questions. Each participant was interviewed for approximately one hour, exploring these topics through the structural framework above. Although each topic within the guide was covered during the one-hour period, conversation surrounding the themes was allowed to flow naturally from topic to topic, such that the interviews themselves did not follow a strict sequence but allowed participants to draw their own connections between themes.

Due to COVID-19 restrictions, all interviews were carried out over Skype and Microsoft Teams, and recorded with each participant's consent. These audio recordings were then manually transcribed in full by the primary investigator (thesis author) into Microsoft Word to prepare for thematic analysis. At no stage in the data analysis did anyone other than the interview participant or the primary investigator have access to the audio recordings, and these recordings were deleted once a written transcript had been typed.

Coding

A modified version of the coding framework developed in Chapter 2 was applied to the interview transcripts (**Table 8**).

During the initial passes of the data, additional sub-codes were added to many of the existing codes to facilitate more specific thematic analysis with the increased information density available in the primary data set. As an example, under the _MDT code, a sub code was created for each staff group, allowing data to be further separated.

During the coding process, several additional themes were identified inductively- Anxiety, worry and blame culture amongst staff members was collectively coded as _ANX. Mention of the impact of money or funding was coded as _£. The influence of industry or its representatives was collectively coded as _IND.

Main Code	Sub-codes	Themes/Concepts
_MDT		Multi-disciplinary communication
	_MDT-C	Consultant
	_MDT-N	Nurses
	_MDT-D	Junior Doctors
	_MDT-P	Pharmacy Staff
	_MDT-H	Housekeeper
	_MDT-A	Allied Healthcare Roles
_EDU		Education and training
_EVID		Evidence base/guidelines/
	_EVID-K	KDIGO guideline
	_EVID-A	Anecdotal evidence
_EXP		Knowledge from experience
_DOC		Documentation/Protocol
_ORG		Organisational factors, administration, bureaucracy
_LDR		Leadership
	_LDR-S	Leadership from seniors
	_LDR-U	Leadership at unit level
	_LDR-Auth	Authority/credibility of leaders
_ANX		Anxiety, blame culture
_SAFE		Concerns regarding safety
	_SAFE-P	Concerns about patient safety/wellbeing
	_SAFE-S	Concerns regarding staff safety/wellbeing
_IND		Influence of industry
_TME		Time
_STF		Staffing
	_STF-T	Staff turnover
_WRK		Workload
_£		Money/funding
_PHYS		Physical resources, equipment, storage
_BUYIN		Buy-in
	_BUYIN-O	Staff ownership of changes

Table 8- Modified coding framework for qualitative study

Ethics

Ethical approval was sought and received following review by the Bangor University Healthcare and Medical Sciences Academic Ethics committee, with further approval from NHS Research and Development.

Participant consent and care

The main study procedures were explained to participants prior to their decision to take part, and this verbal explanation was supplemented with a hard copy of a participant information sheet- this sheet is provided as **Appendix 3**. As part of this consent process, it was made clear to participants that their participation in the study was voluntary, and that they could withdraw consent for any or all information that they had provided at any stage of the study without repercussion. In addition, all participants were aware they had the option of omitting any questions they did not want to answer.

Participants received a short debrief following the interview process, where they were advised that if they found themselves upset by any issues raised during the interview that they should contact their line manager or occupational health, although this was not expected considering the content of the interviews.

Data management, Governance issues and Risk assessment

Participants were informed that their data is treated as confidential and underwent a process of anonymisation at the point of analysis such that they cannot be personally identified from the data they provide.

Participants were made aware that the Interviews conducted were to be recorded and saved on a password protected laptop. No confidential information was available to persons outside of the lead investigator and academic supervisors at any point, and identifiable data will be deleted within 12 months following completion and publication of the study

A certificate of employers' liability insurance was provided by Bangor University, and was valid through the duration of this study. Between ethical application and review, new restrictions were put on research based on an evolving risk assessment of face-to-face interview techniques in the COVID 19 pandemic. As such, the initial application and methodology were revised to accommodate this, which included a move to remote interview techniques over video conferencing software

Other ethical issues identified- Researcher Reflexivity

The researcher's own employment within the studied health-board at the time of writing this study and professional relationships with multiple interview participants should be acknowledged. While I have endeavoured to approach this study with as little personal bias as possible, it is possible that my own proximity to studied unit and position within the clinical hierarchy have led to unconscious bias- both in my own approach to data collection and analysis, and in the responses of participants to me as a colleague and team member. Although this may present a limitation, it also presented multiple opportunities and a degree of candour from some participants which may have not been afforded to a completely external observer. A more in-depth exploration of my own role within the studied unit can be found within Chapter One- researcher preface and reflexivity.

Chapter 3B: Results and Findings

3B.1 Summary and overview of findings

In Chapter 3B, the findings of the thematic analysis are presented. Text segments from each transcript were arranged by main code, and then arranged into subgroups as inductive subthemes and concepts arose within the text. Although a separate analysis was performed for each code, each of the themes are highly inter-related and as such resist organisation into neat categories. As such, many of the main themes have been or partially explored in other sections of this chapter through their relationship with other themes.

Broadly, the themes examined in this Case-Study closely map to the Key Drivers and Resources identified within the Scoping Review presented in Chapter 2 due to the structure of the interview template being informed by this study. However, each of these topics is explored in further depth, and the 5 broad topics explored (Multidisciplinary Communication, Knowledge, Buy-in, Documentation and Leadership) are each broken into further subthemes.

Due to the intrinsically interlinked nature of the topics, there is a great deal of overlap between some themes- for example, the presence of an educational workbook spans the Knowledge and Documentation themes, while also contributing to Communication and Buy-in. At the start of each thematic section, a short summary of key findings is presented.

3B.2 Screening for subjectively important factors

As with the scoping review discussed in Chapter 2, thematic analysis methodologies described by Braun & Clarke (2006) in section 2.3 have been applied to organise and examine the data collected from interviews.

However, in contrast to the inductive method utilised in the scoping review, the nature of the interview structure means that the data naturally follows the existing descriptive framework as set out by topic headings (which were each informed by the results of the scoping review). Therefore, analysis proceeded as a theoretical analysis, aiming provide a more detailed but narrower analysis than inductive methodology.

As previously discussed, although a high frequency of a codes within the data set does give some indication of its relevance, this is not a particularly sensitive or reliable method for identification of core themes. Within the scoping review, for example, some of the themes identified as contextually important, such as high rate of change within intensive care, arose at a low frequency but had high subjective impact. A simple screen to identify factors with high perceived importance to the interview participants was carried out at the end of each interview in the form of the following 2 questions:

- *What factor do you feel had the greatest influence in driving this implementation project?*
- *What factor do you feel presented the largest barrier to this implementation project?*

Of the 8 participants interviewed, 7 of them gave answers to these questions, with the remaining participant declining to comment further than *"I just couldn't say"*. **(HK)**

Interestingly, when applying the coding framework to these 7 responses to each question, themes were more consistent amongst the driving factors than for the barriers.

When asked to identify the most influential driving factor, "Buy-in", which encompasses the concept of stakeholder engagement, enthusiasm and prioritisation of implementation efforts, was the single most consistently seen thematic code seen in 5 of the response (71.4%). Example responses:

"I think enthusiasm from key people. If you don't then it becomes difficult." **(STFN)**

"I think we had a clear idea of the expected benefits, a clear vision, and then good buy in because of it." **(CONS2)**

"I think it was the buy in of the critical care network." **(CONS1)**

The two remaining responses which didn't directly acknowledge "Buy-In" instead both cited factors related to multidisciplinary communication. Allowing for the fact that multiple codes may apply to the same answer to this screen, the "MDT" code was seen across 4/7 of responses (51.7%).

"The collaborative spirit" **(IND)**

"Good chain of communication between different professions." **(PHARM)**

More variation was seen when participants were asked about significant barriers. This may also indicate that the barriers were more multifactorial and the subjective perception and influence of these were felt more variably amongst the range of disciplines interviewed.

The most frequent barriers were related to knowledge base, education or lack of experience:

"I think it might have been my own confidence and experience at the time" **(IND)**

"The biggest challenge was trying to get a critical mass of nurses sufficiently trained up in a short space of time, taking into account their shifts" **(CONS2)**

"Overwhelming information. Yeah, huge. Guidelines, teaching sessions to sit through, then you had the actual practicalities of going through the documentation, prescription, fluids, checks. That was huge, we have never done anything like that before." **(SISTER)**

An inherent resistance to accept change was quoted by 2 participants:

"The main barrier was to get people to accept change" **(STFN)**

"Probably institutional inertia and people's natural resistance to change." **(CONS1)**

If this concept is more broadly interpreted as a **lack** of investment or motivation to change, it is consistent with the perceived importance of “Buy-In” as a driver that resistance to change is a subjectively important barrier.

Finally, one participant cited lack of storage as the largest barrier they faced:

“Storage of the fluids. We did overcome it though.” (PHARM)

As a member of pharmacy staff, this response highlights that practical and logistical barriers are most felt by auxiliary staff, and their relative importance to success may not be similarly appreciated with other staff members until they fail to the point where their own job roles are impaired.

3B.3 Multidisciplinary Communication

Summary

- Senior consensus was formed in steering meetings, and information was subsequently cascaded down to unit level staff through internal channels.
- Unit level staff coordinated good internal communication through routine multidisciplinary meetings which establish trust, whereas external factors including industry members are more dependent on the quality of pre-existing communication to operate effectively.
- The acute patient cohort and high degree of authoritative medical oversight in critical care has potential for development of adversarial relationships in senior medical staff
- A high desire for autonomy in medical staff was tempered by an existing culture of trust and approachability in unit level staff

Theme: Multidisciplinary Communication

The scoping review in chapter 2 sets out the idea of “consensus” as key to a successful implementation effort. Collective agreement amongst key actors spanning multiple staffing groups is necessarily dependent on the nature of how these cultural subgroups interface with each other. Indeed, multiple interview participants cited effective communication and collaboration between disciplines as the single most important factor in driving the success of this project.

Steering meetings as the locus of multi-site communication and senior consensus

While the scope of this study focuses on the implementation process based in a single site, it is important to recognise that this project spanned 3 separate intensive care units sited across 3 distinct hospitals within wider organisation of the health board. The first instance of formalised multidisciplinary communication examined is the inception of a multi-site “task and finish group”

chaired by a lead consultant (**CONS1**). These meetings were attended by senior medical, nursing, pharmacy and administrative staff.

“What he did was bring in teams of people at each individual site and therefore we’d all coalesce once ever few months, get our ideas together, discuss protocols, strategies, pricing, things like that” (IND)

I was asked to attend a meeting by a senior nurse manager and told this is coming and the rep from [Industry]. They had organised a session to let people know what they were going to be doing. (PHARM)

These steering meetings served multiple purposes- firstly to promote education and shared alignment amongst a senior level leadership group. During these strategy meetings, shared understanding was refined, and a senior consensus was reached, facilitated by exchange and iteration of documentation.

“I think of probably everyone in the health board from consultant, nurse, pharmacy, everyone was probably zero or dim awareness that this was something which could be used. But I think the task and finish group we gradually bootstrapped each other up.” (CONS1)

These meetings also facilitated communication of changes to key staff members and “superuser” champions who subsequently cascaded information down to other members of unit staff within each site. Steering meetings formed the key locus of intra-site communication- interviews with more junior staff revealed that discussion between the case study site and the other two critical care sites at the unit level was minimal. The degree of consensus that was achieved within the case study unit was more dependent on the **internal** cascade of multidisciplinary communication.

“I remember that we were told that it was rolled out across the 3 sites, but communication between the other teams wouldn’t have been brilliant, I think we had conference calls in the morning but that was mainly about how many beds we had in case we needed to transfer. But not in detail” (SISTER)

Participants of these senior meetings highlighted the important role of the Critical Care Network. This group was a wider part of the health-board-provided administrative support networks in coordination and structuring of these groups, as well as liaising with senior nursing at multiple sites to facilitate unit level staff training.

“My role was coordinating groups, appointing a chair” (CCTNM)

“The critical care network at the time was part of [the health board]. They were useful because they act as a natural facilitator of communication between the sites, as a catalyst for change.” (CONS2)

“Liaising with nursing staff on the various units in [Region] to make sure we had nurses allocated on the training days” (CONS1)

Subsequent cascade and dissemination of information

Following the development of senior consensus in steering meetings, updates and information were communicated to the unit level via both **CONS1**, the consultant chair, and the super-users: a group of volunteer multidisciplinary stakeholders. These individuals provided a bridge between management decision-making and the staff responsible for the patient-facing changes occurring at the unit level.

“If I had any issues or saw something that needed changing I could communicate this to [CONS1] who would then cascade this down.” (IND)

The effective cascade of information was partly facilitated by a high baseline of trust amongst nursing staff in the competency and expertise of bridging communicators. Practice development nurses formed the core of nursing representation on the steering group.

“We have a big staff group and we’ve got quite good at implementing change at the top and then it gets filtered down from superusers across each band who are identified at being really good at picking up things and cascading it down through the nursing team.” (STFN)

“When change is implemented and it comes from one of your senior consultants, we listen, we sit up and we take it on board. Cause we respect their expertise” (SISTER)

Subsequently, daily communication in the form of regular multidisciplinary meetings at multiple points in the day allowed dissemination of information, and solidified consensus between the nursing staff and other disciplines working on the unit.

“The morning meetings include nurses, physio, doctors- not so much pharmacy, that’s later in the day, we’ll sit down and discuss issues or safety briefings.” (SISTER)

Close and regular nursing communication with pharmacy was facilitated through regular drug rounds, and effective two-way communication between these groups was required to solve practical and logistical stock issues as they arose. Nursing staff relied on pharmacy staff to ensure adequate stock was available to the unit, while pharmacists utilised the influence of senior nursing staff members to secure storage space to facilitate this need.

“Communication with pharmacy was paramount because they were supplying the additional bags, they needed calcium ordering. We work very closely with pharmacy in intensive care, we have 2 to 3 drug rounds a day and stock for hemofiltration was a big issue and continues to be a big issue, and pharmacy are instrumental in solving those problems.” (SISTER)

“The system was put in place with dialogue from the senior nurses. The issue is the sheer quantity needed and you need the space to store it. This was the problem, we told the senior nurse manager, he found the space but that was a struggle.” (PHARM)

Pharmacy also relied on effective communication with housekeeping and portering support staff to overcome these logistical challenges.

“She was quite crucial because if we didn’t have sufficient quantities of the fluids it wouldn’t happen” (PHARM)

“You need to include everybody into this equation. The portering staff are key, they have to transport the stuff from the ground floor. It’s quite the logistic issue and it’s to make sure patient treatment is not interrupted at all.” (PHARM)

However, despite rating communication within the unit as “generally good”, the housekeeping staff interview participant interviewed suggested that they found themselves siloed away from other communication, which had impact on efficiency and cost-effectiveness. This separation from other unit staff groups was also seen during analysis of other themes and is explored later within this chapter.

“I don’t think they’re very good at communicating the stock levels to me. I mainly communicate with EBME (hospital equipment technicians). But what the nurses should be doing when

machines alarm is phone the hotline. But they won't, and we've been telling them for years that, but they will swap the filter out and then go through more consumables and then the machine is out of use." (HK)

Interviewing one of the industry representatives involved in the project revealed that this individual put a very high emphasis on initiating and maintaining communication relationships with other staff groups. Representatives of external commercial interests are positioned outside the pre-existing working culture of the unit, and as such these interactions were generally more direct and focused towards overcoming specific barriers to this implementation, particularly those surrounding finance and spending.

"We sometimes have to teach the consultants to produce a business case to formulate arguments to push the implementation through" (IND)

"And the pharmacy team need to do the ordering of the fluids. The pharmacy can be massively important in the business case. In this case the fluids were purchased by pharmacy, but the sets by ITU. And the relationship can be quite complicated" (IND)

This external position means that representatives of medical industry are particularly at the mercy of the pre-existing cultural landscape. Having been involved in multiple similar projects at a variety of critical care sites, their early focus was on rapidly assessing the quality of culture, and adapting the support offered to the specific cultural needs of the unit.

"The best thing you can do is communicate, network network network" (IND)

"It taught me to be more conscious of the people that we are working with, what is the emotional scenario in intensive care at that time." (IND)

"There's a phrase we use: 'culture eats innovation for breakfast'. It's something we're mindful of, particularly in the NHS. It is an incredible task to change anything in the NHS." (IND)

Critical-care and unit specific factors and their influence on communication

Several features were highlighted in the scoping review as being more specific to communication critical care compared to other speciality units. The smaller cohort of patients and higher staff to patient ratio facilitates communication and continuity.

"I think complexity is challenging, but if you get that right it works quite well because of the high nurse and doctor to patient ratio means the continuity is there. If a consultant rounds once a week on a geriatric ward then they may struggle to see through a change. A consultant walking round every day, as long as they're engaged, then there is more oversight." (CONS1)

However, this degree of authoritative senior medical oversight with high-stakes, high-acuity problems leave this environment particularly vulnerable to the personalities of these individuals, which can have a significantly negative impact where these personalities clash. However, interviews with consultants indicate that (at least from the participants' perspective) these adversarial relationships were not felt to be present within the case study unit.

“Intensive care is a team game in a way that other wards aren’t. In intensive care you can find yourself- and we’re lucky we don’t have this on our unit- you can find yourself in a war over the patient’s management.” (CONS1)

“I think our unit is reasonably harmonious, but I am aware of other units in the United Kingdom where there are 2 or more groups of consultants and changes are bedevilled by personality conflicts and care becomes secondary to people playing out intrapersonal issues.” (CONS1)

Communication and interaction between individual groups is necessarily tempered by the perception of hierarchy and authority- these relationships may be defined and codified at the artefact layer or be deeper and more subconsciously held beliefs.

In one scoping review source, examples of tension in communication between senior medical staff and other staff groups arose due to their high subjective value on autonomy, leading them to perceive changes to working practices as a threat (Wysham et al., 2017). However, amongst nursing staff, the case study unit was viewed to have a higher degree of nursing autonomy, even compared to other sites within the health board.

“We’re quite nurse-lead, we will make decisions that benefit our patients without necessarily waiting for someone to tell us to do that, and the consultants are in agreement that if we can move a patient forward in a way within the scope of our practice then we should do that. We’re a more pro-active nurse-lead unit compared to other sites.” (STFN)

This high level of implied trust may go some way towards explaining the lack of adversarial relationships seen in this context. Part of this trust is based on established reliability amongst certain staff groups, and pharmacy buy-in seemed to be particularly motivated by pride in maintaining this trustworthy reputation.

Is there anything that facilitates that culture of communication?

“It’s built on a history of trust. If we say we’re going to do something then we do it. We don’t let people down. If you’re given a task you have to deliver, not give excuses. And we have to have that culture.” (PHARM)

“Our relationship with ITU was quite important and I don’t think we let them down at all.” (PHARM)

Both the industry representative and senior pharmacist were quick to identify an existing culture of approachability and cooperation. Part of this culture was fostered by open and accessible staff of all grades, and this was felt by many participants to be a particular strong suit of this particular unit.

I wanted to ask you whether you felt that there were other factors that were more unique to intensive care as opposed to other areas of the hospital?

“I think it was the teamwork, the close cooperation of the pharmacy staff. The whole teamwork from the pharmacy team, the nursing, the medical team. All that, easy approachability, know who to contact, know how to sort problems out.” (PHARM)

“I interacted with all grades of staff, I had no qualms to talk to senior managers, the housekeepers senior nursing staff, and even the consultants, I could talk to anybody. I was fortunate in that respect” (PHARM)

“We had a lot of support from one of our consultants who was the one who implemented citrate and he was very hands on and answering any questions.” (STFN)

3B.4 Knowledge

Summary

- Local staff experience accumulates slowly over time, and trickles down from senior to junior unit level staff
- Experience is important in troubleshooting and problem solving and supports staff confidence
- Implementation of new ways of working lead to a sudden lack of local experience, contributing to nursing anxiety
- An educational workbook supported practical knowledge in nurses and helped to mitigate this anxiety
 - Effective multidisciplinary communication and feedback facilitated iterative improvement of this document based on staff experiences
- Education in consultant and pharmacy groups was more self-directed and based on practical experiences, while other support staff were siloed off from education processes
- The provision of effective education is constrained on coordination of limited resources of time, funding and staffing

Theme: Knowledge

Knowledge Subtheme: Experience

During the coding process, an additional important knowledge subtheme was inductively identified: that staff experience. This concept reflects both knowledge and associated confidence which has developed over time due to repeated exposure to similar problems.

Sources of experience can be seen to be drawn on from within the unit, with senior medical, nursing and pharmaceutical staff acting as loci of knowledge. However, during the inception of the project, the consultant initiating the implementation first drew on the experience accumulated by other units. Here, previously accumulated knowledge and demonstration of success in other contexts was used to help drive the buy-in of senior staff, and adaptation of their existing resources helped to jumpstart the dissemination of this knowledge into unit-level staff through the creation of the workbook (see below).

"I went up to [English Critical Care Unit] and spent a day in this sort of education centre where people came along and learned from the people who were doing it. I very much parasitized and plagiarised and adapted stuff that I had got from places that had implemented already."

(CONS1)

Senior medical staff may also seek experience from outside bodies such as industry representatives, who are motivated to help clinicians formulate business arguments which favour the implementation of their product.

“And we sometimes have to teach the consultants to produce a business case to formulate arguments to push the implementation through.”

Interviewed nurses highlight the presence of a positive unit culture resulting in trickle-down of practical nursing experience from senior to junior staff within their own discipline. In addition to information being conveyed, experience in the knowledge resulted in confidence, and this confidence is also disseminated.

“We were a group of nurses with a good understanding of the machines, who could troubleshoot and were confident in using them. When we had staff who were less experienced then we would work together with them, teach them, make sure they were safe. We would be there when they started using it on their own” (STFN)

“As it filtered down to nurses, the people who are confident are those who have been there for 10-15 years. We’ve been through multiple machines and their confidence filters down to other team members” (SISTER)

However, this reservoir of experience within the unit takes time to build up, evidenced by the fact its presence is now more evident where nursing staff revisit the unit now, years after the implementation.

“How do you feel like your awareness and your knowledge changed over time- it sounds like that’s mostly based on experience?”

Oh definitely! I’ve recently returned back to intensive care due to the pandemic and we have a lot of our patients on haemofiltration, and you can now see the experts in the team who are happy to use it, happy to guide you... I feel the expertise is there now and we’re much more confident with it.” (SISTER)

“we have a big staff group and we’ve got quite good at implementing change at the top and then it gets filtered down from superusers across each band2 (STFN)

The sudden local lack of existing accumulated experience resulting from the introduction of a complex new way of working presented a major barrier to all staff members on the unit, particularly nursing staff who are responsible for much of the practicalities for troubleshooting and high personal stake due to the severe consequences of error.

“It was difficult with the implementations because everyone had to learn at the same time.” (STFN)

“It was scary, and you’re afraid of making an error, double checking and triple checking with people who were in charge but... none of us knew. No one was an expert in it. And it took a while for people to become experts in the machine. “ (SISTER)

This was a significant contributing factor to nursing anxiety, which has been highlighted as a barrier to implementation. This was particularly evidence in older nursing staff members who had generally accumulated the most experiential knowledge with the previous way of doing things, and therefore have the most to lose.

“There is resistance to change. It tended to come from the older generation of the team who had been there, done it, were a little tired maybe. Definitely there was an older cohort of nurses who needed more persuading.” (CCTNM)

“when something’s new, people who have been there for a long-time struggle with it” (CONS1)

In this case, this lack of local experience was at least partially mitigated by the presence of industry support. Industry representatives from the medical technology company supporting the implementation were utilised as an external source of experience which the unit was able to draw on-effectively “scaffolding” the unit’s experience during the time it took to accumulate naturally within unit-level staff members.

“having the rep in was unique. There was an educationalist who came in and I think that worked very well.” (CCTNM)

“We are on site to physically support people.” (IND)

Unfortunately, a high degree of educational support from industrial companies does not seem to be a reliable factor when planning implementation efforts, in this case partially due to their detachment from the ward structure combined with the unpredictable timings that their support was needed.

“hemofiltration machines can go on at midnight, any time, unsociable hours and then you’re there ringing the rep on the phone, this alarm is bleeping, and that just leads to more anxiety.” (SISTER)

“I think this company gave us a good service but there are other manufacturers that do not provide the same degree of educational back up” (CONS2)

A further barrier which needs to be overcome for successful re-accumulation of experience is seen in the form of staffing turnover. One senior physician referenced difficulties posed by these factors, as experience and training are sapped from the unit as staff leave, and training becomes challenging to organise.

“to have the superusers you have to have a stable tier of nurse who are still going to be here in 6 months’ time because there’s no use training people who are just going to disappear” (CONS1)

However, turnover was also seen to be of benefit in some cases, as the lack of experiential culture-shock caused by the loss of the previous system facilitated higher buy-in and willingness to learn the new processes.

“even though the nurses took time to get used to that, for a new nurse that’d be a whole lot easier to get your head around.” (CONS1)

Knowledge Subtheme: Education

Following the clear importance of education, which was highlighted in the scoping review, the interview structure explored the participants’ perceptions of the education which took place during the implementation process.

Workbook as an educational tool

Several educational resources were developed to support the implementation, most notably a workbook which senior medical staff developed and provided to nursing and medical staff to support their knowledge base during implementation.

This document was generally well received and appears to support the success of the implementation in several ways:

- Firstly, the document assisted in supporting practical knowledge and troubleshooting processes, directly and indirectly through dissemination of experience
- Secondly, the physical document served as a tool to mitigate one of the major barriers identified to change: anxiety. Anxiety as a theme is explored in more detail later in this chapter.

A key element of success of this booklet appears to be its evolution and iteration over the course of the implementation project. The first version of the educational workbook was provided by the senior medical staff chairing the implementation, and initially other staff groups found the document did not completely fulfil their needs.

“What [the lead consultant] would say is that what he would think to put in would not cover everything the nurses need to know because it’s such a practical thing and there are probably very few medical staff who have a good understanding of how it actually functions as a machine” (STFN)

However, in this instance these knowledge barriers were overcome through effective multidisciplinary communication, with the implementation strategy allowing for both nursing and pharmacy groups to input into the design of the workbook based on the practical knowledge these individuals obtained through their own practical experiences. In part, this was facilitated by a culture of approachability and open discussion between staff groups.

“And if we approached [The consultant] with a question that we couldn’t find the answer to in the workbook then when he produced the next version of the workbook that the answer to what we’d ask was added in” (STFN)

“As we came across mistakes, different versions were made, ‘cause I remember saying “we need a picture”, I remember taking a picture on my phone of the calcium line and saying “this needs to be in the workbook”, and we printed it and laminated it and put it on each machine so that everybody was confident attaching those lines. So it got better over time.” (SISTER)

“The consultant designed the treatment charts and I think we had to amend and redesign it a few times.”

“-And that came from your experiences in-house?”

“Yes.” (PHARM)

“So, the doctor will write this and then say “can you check this over” and you’ll tick it over and find multiple faults in that protocol, and therefore what we do as the therapy specialists will analysis this and support.” (IND)

This reactive, unit-level staff lead iteration facilitates a more indirect dissemination of experience of troubleshooting amongst peers, which is resilient to barriers such as staff turnover/staff shortages/sicknesses and improves support out of hours.

“I do think the supporting paperwork was exceptionally good, and it helped in the middle of the night to troubleshoot things.” (CONS2)

Interviewed staff considered these workbooks to have demonstrated continued utility and are recognised as useful resources for new and returning nursing staff members at time of interview, 6 years post implementation.

“it’s been implemented for 6 years now, we’ve got the workbooks, on the unit, which are brilliant, a good refresher and there’s a question and answer section in the back.” (SISTER)

In addition to facilitating the dissemination of practical information, the workbook also had an important psychological effect in helping to mitigate nursing anxiety. As seen in the scoping review, education surrounding the evidence base helped to foster buy in amongst senior nursing staff, providing reassurance that the intervention had scientific basis of benefit to patients.

However, multiple staff members reference the physicality of the workbook as an object:

“We were also given booklets with a series of questions at the end- that was helpful because it was something we had to keep.” (STFN)

“It has weight, it’s something you can wave around” (CONS1)

The consultant goes on to describe how this physicality turns the content of the educational course into a physical manifestation of competence and leading to empowerment of those staff who complete it.

“it’s a rite of passage. I’ve earned my ticket... more like a passport actually, to do renal replacement therapy, and in some ways the content is less important than the fact it exists.” (CONS1)

Education amongst different staffing groups and the relationship with the multidisciplinary team

As the staff group responsible for the vast majority of the technical management of continuous renal replacement therapy, much of the formal resources and training sessions were directed at nursing staffing groups. However, the influence of effective multidisciplinary team communication on propagating a culture permissive to change has been indicated by the scoping review and it is interesting to review the different relationships that differing staffing groups held with education at differing stages in the implementation project.

Much of the experience gained by pharmacy staff was a result of internal troubleshooting and managing practical issues as and when they arose. In contrast to nursing staff, there seemed to be less provision of formalised training surrounding the implementation and a higher reliance on internal dissemination of experience within the specialty. Despite some mentorship within their own discipline, Pharmacy tended towards indirect dissemination of experience to other disciplines through input on written protocols and proformas with less emphasis on direct interactions with other specialties.

“It was reactive, it was only when we practiced it with real patients that we picked up all the nitty-gritties of the actual needs of the different types of fluids.” (PHARM)

“I did get involved in holding hands for the pharmacy colleagues coming in, not so much with medical or nursing.” (PHARM)

“Were you required to complete the workbook?”

No, our role was mainly to ensure the information printed in the protocol was correct, I didn’t have hands on experience of putting the system together. I didn’t ask for it because I didn’t really need it.” (PHARM)

There was no formalised education for consultants, and the knowledge base in this group relied heavily on research, drawing on experience from external sources and other similar units. Interestingly, a significant motivational factor was the use of education and knowledge to support their own authority and credibility. This non-tangible resource was highlighted in the scoping review- individuals leveraging authority were more readily able to make changes to established systems and foster buy-in and consensus from colleagues.

“I was acutely aware that I had no first-hand knowledge of the use of citrate at all and I felt that if I was going to lead a task and finish group across the healthboard that I would lack credibility if I had never seen it” (CONS1)

“[my education] was sort of self-directed. When I went to [other units] I explored the issues in my own head and thought through the process of adapting the workbooks and all that sort of stuff. That served as my educational basis. So I’m aware that I had a more, slightly deeper education in this than anyone else in the healthboard, because I felt the need to seek out for my own credibility the education side of it.” (CONS1)

Much of the formal training provided was practical troubleshooting information, and multiple interview participants described an obvious separation of junior and senior medical staffing from this technical process. However, there were conflicting perspectives from different groups as to whether this presented a barrier to the implementation- the industry education provider felt this represented a lack of engagement from medical staff, whereas senior medical and nursing staff highlighted the different expectations of knowledge within these staff groups.

“It’s seen as a nursing role because they are the ones who look after the machine, and therefore there is a divorced response from the doctor. It’s frustrating to try and support them, because you know this is training that they’ve never had before” (IND)

“The thing is that as a medic vs a nurse, the roles are quite different. I think from a medic point of view the expectation is that you set some parameters, and maybe help with some of the troubleshooting. There was never an expectation that you have to set up the machine. The sessions were a practical session, so was aimed mainly at the nursing staff. It was moderately useful but because I didn’t ever have to put the practical information into use I wouldn’t have recalled that information for very long.” (CONS2)

“The consultants they wanted to know different things to the nurses, the nurses wanted to know about the practical side of it, how we monitored it, while the medical team were more interested in the way it worked.” (STFN)

Members from other staffing groups found themselves separated from education completely, despite feeling that they may have benefited. This was met with a lack of conceptual agreement amongst housekeeping staff and may have led to increased wastage as to failure to include these staff groups reduced communication and consensus between housekeeping, medical and nursing staff.

“You know I think I probably would [have benefited from training] to be honest because the more you know about the product the easier it is to order and help other new members of staff who are unsure. To be honest I didn’t have anything to do with it. I didn’t get any training, all I got told was can you order X product and that was it. They make all the decisions and bring in training and away we go.” (HK)

“We have an awful lot of staff through who are new to it and they waste the products, that are really expensive. I think they go into a panic and then they lose confidence and I think that’s probably an education issue.” (HK)

Influence of availability of resource on provision of education

Although effective education has been demonstrated to drive implementation efforts, its provision is itself dependent on the availability of both tangible and non-tangible resources.

In this case-study, formal education and training sessions were held with the intention of training “superuser” champions whose role it is to disseminate knowledge to colleagues: a common strategy within healthcare implementation which was seen in multiple studies included within the scoping review in chapter 2. However, multiple external constraints were seen to influence the quality of the education provided.

Time (and lack off) was consistently mentioned by multiple interview participants as significantly limiting the quality of education initiatives during the implementation, and this was seen at both a unit level and at management level.

As described earlier, much of the flow of information at unit level is led by dissemination of knowledge and experience amongst closely working colleagues, particularly within the nursing staff group. This natural culture of education was supported by initiatives to train “superuser” champions. However, this process was partially limited by a perception of time pressure and imposition of an unrealistic training timeline by senior management and medical staff. This went on to drive anxiety amongst nursing staff, reducing buy-in and cohesion.

“We have a process of implementing change from a nursing perspective, we like to train champions who can then filter down to their teams at a nice gradual pace until people can absorb it. But this particular consultant, he just wanted it all done within weeks. But it just doesn’t happen like that. Cause then when you meet resistance, people will drop off, be too frightened to nurse a patient on it, and we’ve had staff members say “I’ve had no training on that, I’m not confident, I’m not using that machine.” (SISTER)

This drive by senior medical leadership for accelerating the education strategy was again driven by a further time pressure- this time driven by a desire to compromise between multiple competing timelines.

“We had the training and we had the go-live date, we worked hard to make sure the go-live date was as soon after the training as possible so we wouldn’t get the skills fade or the decay of knowledge.” (CONS1)

“to run the training when it’s convenient, when [industry support] is available, when rooms are available... there’s that timeline and there’s also the timeline of when are we going to introduce this, because once the machines have been upgraded, they syringe drivers have been modified, once the fluids have arrived you’ve kind of got to go live because you can’t have all this stuff sitting in a cupboard going out of date. But the problem is that those two timelines have to gel” (CONS1)

Coordinating the availability of tangible resources- educators, machines, and rooms for training and perishable resources with education delivery was further constrained by nurse staffing and shift patterns. Inconsistent staffing availability was a barrier to the accumulation of knowledge and expertise in champions, which then has a trickle-down effect reducing support for junior staff.

“It’s quite hard to deliver formal teaching to 60 or 70 members of nursing staff who are all working different shifts. I’m not sure we quite got it right.” (CONS2)

“You could have 4 people on a shift for 2 weeks, then nobody for 6 months, so you could just get happy with it and then you might not see someone for months and then it’s like starting all over again.” (SISTER)

“And even then we had people dipping in and out because they were working clinically. I think that’s an issue with the NHS” (CONS1)

Unit staff and managers had to juggle competing obligations- staff actively providing care to patients currently admitted on the ward, were also required to find time for education to support safe provision of the new intervention being implemented. This also reflects on staffing constraints, as there are no additional reserves of staff available who would be able to cover an immediate deficit created by a training session.

“Right, we’ve got 3 hours and then you need to be back on the unit, here’s an hour and a half, then get back on the unit. That’s not productive.” (SISTER)

These competing obligations are also seen at a senior project management level- the managing consultant found that his ability to dedicate attention to training resources was limited by his commitment to other requirements for the implementation:

“Documentation, approvals from health board, pharmacy expenditure and training seemed very much one of those boxes that needed to be ticked. We got the box ticked but we could have done better.” (CONS1)

“One of the biggest issues we have is that all of this is being done in addition to a full-time job looking after patients.” (CONS1)

Predictably, at root of many of these resource constraints is an overall limitation of financial funding. In the context of a functioning unit limits on money led to management decisions to a culture of focus in care provision in the moment, limiting the reserve of resources available for education.

“What’s so insidious about austerity is you can easily sacrifice today at the expense of tomorrow. The resources we had for training we had to scratch together. The rooms we used for training were wholly inadequate, too small, didn’t have the right stuff in it, to provide lunch we were going to ASDA ourselves” (CONS1)

External Support for education

In this circumstance, these deficits in funding available through NHS channels were partially compensated for by the utilisation of outside industry resources. This system had clear benefits including the scaffolding of nursing expertise during the initial implementation phases. However, it does introduce ethical and business challenges through introducing an external entity with a vested financial interest.

Do you feel that the resources allocated to education were adequate?

“No... there isn’t a huge resource you can draw on within the NHS, it’s not like I can make a phone call and have people parachuting in to provide anything. The nearest we had was [the industry] offered to put on a training day which meant they turned up with one of their trainers and machines.” (CONS1)

“we’re relying on industry partners to provide training which is arguably a conflict of interest. We made the best of what we had available.” (CONS1)

External support networks were also drawn on to provide assistance during the provision of educational services. The leading consultant reached out to the North Critical Care Network at an early stage, and their administrative support appears to have been extremely influential in the project’s ability to overcome the resource limitations discussed above:

“Paperwork and version control and organising training and engaging with industry and finding dates, and venues and lunches and, you know, liaising with nursing staff on the various units in [Region] to make sure we had nurses allocated on the training days. As chair of the group I sort of had a substantial influence there but in terms of actually delivering the training it was the critical care network.” (CONS1)

3B.5 Buy-in

Summary

- Conceptual agreement and ownership was high in senior leadership due to their high influence over project direction, while other staff groups were “fatalistic” in view of the inevitability of change
- However, a high degree of trust in leadership had already been previously established within the unit over time, leading to strong unit level alignment with consultant vision
 - Unit-level ownership was also driven by personal and professional stake in consequences for project failure
- Individuals in leadership were able to leverage anecdotal evidence of success at other sites to foster local buy-in at an early stage
- Drivers of buy in differ between staff groups based on differing role expectations, and relative potential for career advancement
 - Nursing staff particularly vulnerable to anxiety due to high emotional stake along with “blame culture” presenting severe consequence for failure
- A desire for improved patient safety motivated multiple groups, but understanding and interpretation of what this concept means differs between staff groups
 - Nursing staff perspective generally more focused on individual outcomes
 - “Bigger picture” thinking seen in leadership staff

Theme: Buy-In

The scoping review highlighted “buy-in” as another important factor in generation of a culture permissive to change. This concept encompasses the degree of conceptual agreement with the goals of the project, and personal investment of individual staff members in the project’s success. Further, the scoping review suggested that successes facilitated by high early buy-in drove more overall investment, leading to a positive feedback relationship which results in the generation of longer term sustained buy-in.

As discussed above, the consensus generated by provision of educational resources, including the workbook, were important in supporting unit level staff through mitigating barriers to buy-in, particularly unit level staff anxiety.

Ownership

Multiple sources within the scoping review made reference to the degree of perceived “ownership” felt by staff members over the project, and so this concept was coded for during the thematic analysis process. Interestingly, the degree and nature of ownership between different staff groups varied greatly, and this had significant influence on buy-in.

Predictably as the project lead, **CONS1** had a particularly high buy-in and sense of project ownership. The examination of multidisciplinary interactions earlier has already highlighted the impact of consultant personalities, and the potential threat that a clash of these personalities can present to the culture of communication through adversarial relationships. As previously mentioned, senior medical staff place a high subjective value on their own autonomy and influence, and this was seen to be significant motivator in this project’s inception.

*“My motivation was really... when you’re a new consultant you want to let the world know who you are, test yourself a bit. As a trainee you find yourself in a subordinate role- even if you lead a project there’s always a consultant who can put the stoppers on if they felt like it. To chair something which had lasting change felt real. I wish I could say “I just care so damn much about my patients, I was desperate for them to get the treatment and that motivates everything I do”. No, this was very much to make my ego feel better”. (**CONS1**)*

Consultant personality seems to have a significant impact on the culture of the whole unit. This is explored in more detail in the thematic analysis of leadership. Within the studied unit, staff members were highly aligned to this consultant’s vision, and with high levels of pre-existing trust in the expertise and motivations of other seniors, this fostered buy-in across unit-level staff.

*“When change is implemented and it comes from one of your senior consultants, we listen, we sit up and we take it on board. Cause we respect their expertise and we know things change... things change a lot in intensive care, there are always new gadgets, new pieces of equipment or new drugs, and we listen to advice, we take it and we run with it (**SISTER**)*

And where did that alignment come from?

*You have senior people, you trust them, they want to make a change. They executed it. They have buy-in from the senior team around them who then talked about the positive benefits. (**IND**)*

Comparatively, other members of staff had relatively little impact on the overall direction of the project, and this was received as a degree of fatalism amongst pharmacy and unit-level nursing staff. From their point of view, this implementation was inevitable.

*Once the pharmacists realised this was something that was going to happen they obviously went away and read about it and became quite expert about it (**CONS1**)*

*I think my opinion was that the decision had already been made that we were going to change and that we were going to have to live with this decision. I think they were going to get about 6 machines or so and I think we just had to go along with it. (**PHARM**)*

*“To be honest I didn’t have anything to do with it. They make all the decisions and bring in training and away we go. I was new at the time and I didn’t feel like it was my place to worry about it. It was a change that the bosses were bringing in.” (**HK**)*

In these groups, buy-in was primarily driven by the potential for serious consequences in the event of failure. Nurses found themselves as deep stakeholders due to a culture of blame and punishment. From this group's point of view, any changes to the status-quo depletes the unit of experience which would otherwise act as a safety-net against patient safety incidents. This drove early buy-in to the project's success, which spurred proactive demand from unit-level staff for provision of education and support to mitigate this risk. However, this situation also led to increased levels of anxiety amongst individuals in these groups.

"They were going to have to get used to a new way of working and one that carried risk, because nurses are punished for error in a way that doctors aren't, so they are understandably anxious about a new system in which error is going to be possible...I think the nurses were deeper stakeholders with more to lose." (CONS1)

"The senior nurses, once they realised it was going to happen, they had a definite clear interest in it being successful, because they needed it to work so that there weren't patient safety incidents. And again, I wish I could say the nurses care so damn much that they wanted it to work, but I think a big aspect of that is self-preservation, they could see the complexity and were like "hang on a minute, if we're gonna do this we need proper training and proper support and documentation" and that, more than anything else got them to unite behind it and to make sure that those things happened." (CONS1)

Although these groups did not have broader ownership over the overall decision to initiate change, drive amongst nursing and pharmacy staff members to avoid incidents led to their investment in the quality of documentation produced. One example of this is in the iteration of the educational workbook produced, with nursing and pharmacy groups feeding their own technical experiences back to the senior staff producing the documents and making troubleshooting modifications to the working environment to suit their own needs. Through this, the workbooks became more effective teaching documents, and an increased sense of individual accountability amongst more junior staff members help to sustain further buy in. Staff also had input into treatment charts and protocols, versions of which are still used in practice in the unit today.

"It's difficult when you feel like you have no say in it, and really we didn't have a say in it, but we did have a say in how it was taught. And we do have a say in how the education going forward goes. It's always good when someone from another group listens, and in reality it's the nurses on the unit who are the only ones who really understand the day to day function." (STFN)

"The consultant designed the treatment charts and I think we had to amend and redesign it a few times." (PHARM)

"the people who actually contributed to the versions of the paperwork that were being used became leaders in that sense, and were therefore invested in it" (CONS1)

"What's beautiful about [Case study unit]'s protocol is when I spoke to John Glen about the protocol he said "the nursing teams have started taking responsibility, they've altered it to suit their needs". So there was a shift in accountability and I think that gave people a sense of ownership and that is incredibly powerful." (IND)

“There was a lot of tweaking in the early stages and I was delighted to see that happen because what it meant were the nurses were gaining ownership of the document, engaging with it and finding that it complemented what they did in real life” (CONS1)

As seen in the analysis of the education theme, support staff were somewhat separated from this process with very low ownership. Drive mainly came from an existing and more generalised trust in the motivations and expertise of seniors, which partially stems from their own perceived status within the organisation hierarchy.

Involvement and inclusion of staff members in leadership roles also lead to an increased investment and buy in to the project. In the early steering meetings, a “superuser group” was defined- these champions included visible members from multiple disciplines- medicine, nursing and pharmacy. In addition to facilitating the effective cascade of information from the steering meetings and providing educational support, as mentioned previously, the act of nominating these champions created a “mid-level” leadership tier with a level of ownership and personal investment in project success. This procedure of implementation through champions was already established as a norm within the unit, and an expectation of involvement of senior nurses in improvement projects facilitated the recruitment of individuals into these groups.

“The idea of creating superusers was to create a leadership tier of people who were bought into and embedded in this process. That was something that initially seemed a bit silly to me, but it later dawned on me that having these individuals meant that they were invested in the success of the project and therefore in a sense had to be leaders.” (CONS1)

“I think historically there has been an expectation that senior band 5 and 6s will contribute to quality improvement. So there’s kind of a culture there which embraces change.” (CONS2)

Leveraging anecdotal evidence from external sites to generate local buy-in

CONS1 and **CCTNM** sought anecdotal evidence of benefit for nursing time and general acceptance at other sites where this change had been introduced and used this as a predictor of similar nursing satisfaction at within the case-study unit.

“So, by looking into it we discovered the nurses prefer it because it is more streamlined and straightforward, and once they’ve done citrate for a while, it turns out they don’t want to go back to using heparin, or the other benefits.” (CONS1)

“There was some resistance to change for other projects, but with citrate they knew that one of the main benefits was their nursing time.” (CCTNM)

As nurses continued to have positive experiences, accumulated experience and saw these benefits on their time first-hand, the initial buy-in driven by anxiety and threat of consequence gave way to a more positive and self-sustaining investments in the unit-level benefits.

“I think overall the feeling was quite positive. My understanding that it was also less work due to the filters blocking. I think opinions did change over time, and this did reinforce the success of the change.” (CONS2)

“It’s not even thought of now, it is our mainstay treatment. We’ve seen it work, we’ve seen patient survive because of it and we’ve seen less bleeding.” (SISTER)

“But we were seeing all these benefits, efficiency, lack of filters going down, people being really happy” (IND)

“I think that people were afraid that they would make mistakes but in reality, we saw very few actual mistakes. I found myself feeling positive towards the change actually.” (STFN)

Anecdotal evidence of success at other external sites within the NHS was also important in driving early buy-in amongst leadership and senior medical staff. The enthusiasm of **CONS1** effectively instigated the project, and early consultant buy-in was largely supported by word-of-mouth and presentations from respected colleagues at other sites shared at conferences.

“[CONS1] had come back from a conference and he was all revved up and armed with information. I had discussed with contacts in West Wales and heard from a nursing perspective they were all loving it so I think that was one of the main drivers.” (CCTNM)

“I had heard that there were potential cost saving from reduced use of filters, they should last longer. The big advantage was the alternative to systemic anticoagulation, rather circuit anticoagulation so for patients with a bleeding tendency there was improved patient safety” (CONS2)

These success stories were leveraged by **CONS1** to support arguments for change in with other senior management and amongst project steering meetings, providing him with influence and authority to initiate local change.

“Medicine is naturally conservative isn’t it, and innovation is always viewed with a certain amount of scepticism, especially if it involves money, if involves things with potential serious side effects,- so to be able to point to a success story in another hospital and to be able to reassure people that “yes there might be teething troubles, but look at how happy they are 6 months on, and look at the data they’ve got and look at how well it works”, and it’s hard, people can’t really come back against that because this is a similar hospital, in the United Kingdom with similar patients, similar nurses, there’s absolutely no reason that we can’t replicate what they’ve done” (CONS1)

Different role expectations amongst staff groups leads to different drivers of buy in

Drivers of buy-in were seen to vary between staff groups, as differing expectations and duties influence personal stake. For example, compared to nursing staff, medical staff view themselves as detached from the more technical aspects of the intervention and therefore felt less immediate personal stake.

“For other changes in [case study unit] we didn’t always get good representation with the medical staff... I was never quite sure whether they were too busy, that they weren’t invested in it.” (CCTNM)

"The majority of the time the docs don't join in. Because CRRT is seen as a nursing role, not as a medical role. And that's quite a problem. It's seen as a nursing role because they are the ones who look after the machine, and therefore there is a divorced response from the doctor" (IND)

"I'm a bit unclear about the bedside troubleshooting aspect. I knew about it as a theoretical prospect, but there was a lot to learn to manage it safely, that developed over time." (CONS2)

However, this also buffers medical staff from anxieties about logistical practicalities, with a greater emphasis on "big-picture thinking". A high emphasis is still placed on patient benefit, but where nurses focus on patients as individuals and are strongly swayed by their own personal experiences, consultants tended towards referencing projected benefit on a population scale.

"Different medical staff were probably more supportive in terms of they could intellectually see that this was a positive change and that someone else was doing the donkey work to make it happen and so they were very much happy to applaud from the side-lines" (CONS1)

"From a medical point of view there was greater buy in from an earlier stage because we could appreciate the advantages without getting bogged down in the minutiae of how it would actually work in practice." (CONS2)

"We now live in a world of bundles and marginal gains and there's just a feeling that we... because you don't necessarily see the gains in any individual patient... we don't actually know which patient's we're benefiting, but we trust the guidelines that if we follow best practice then overall our unit will be the better for it" (CONS1)

"I don't think we necessarily embarked on this expecting it to be of immediate benefit in any way, in fact I think we embarked thinking that this is going to be difficult for a while, that there is going to be risk attached as we try and embed it." (CONS1)

As seen in the quotations above, big-picture thinking was seen in reference to delivering marginal benefit to larger patient numbers- however, it also extended to greater consideration of the impact of change over time. Those in leadership and management roles more frequently referenced the impact of barriers on sustaining longer term patient benefits and anticipating the impact of limited resources going into the future.

"We were halfway through a decade of austerity and people were barely happy for us to use a colour photocopier. Lip service is paid to continuing professional development but ultimately if someone stops you going on a training day then a patient doesn't die as a result. At least not today, maybe in 5 years' time because you don't know what you're doing." (CONS1)

One driver of individual investment was the promise of the benefits of career-focused "success", particularly within the nursing cohort.

"There's a cohort of band 7 nurses and band 6 nurses, and some band 5 nurses who were pushing to progress to band 6. So there were naturally this group of people who had some experience and enthusiasm for taking part in a new project." (CONS2)

"It's an incentive for the nursing, you know you're gonna get your certification and your CRRT training you'll come out of there and be able to complete your ICU competency course, something like that." (IND)

For other staff groups, the immediate benefits for success were less immediately tangible, but stem in part from a personal pride in demonstration and delivery of competence within their role.

“Yeah, I want to be seen as successful, because it’s a goal to achieve, to me it’s a sign of competence that you can perform these within the business.” (IND)

“I was keen for it to work and reasonably invested. At the stage I was new as a clinical lead, and I was quite keen that we were able to adopt best practice from elsewhere. This seemed quite forward thinking. So I was keen from that administrative perspective in my lead role.” (CONS2)

In addition, further collaborative buy-in was gained based on a collective desire to outperform the other units within the health board who were also implementing citrate anticoagulation.

“What was interesting was having a bit of competition between the units. One would be seen as the best, and then the other units would go “oh no we can’t have that” and raise their own standard.” (IND)

Influence of opinion about patient benefit and safety on buy-in

Personal views surrounding the effect of the implementation on patient outcomes overall patient safety was seen to have a large influence on personal buy-in in multiple groups.

The benefit to the patient. The reduction in bleeding was a huge factor (SISTER)

“But really for me it was opportunity to reduce things such as blood transfusions. Every time a filter goes down because of that inefficiency, as several filters go down you then end up giving the patient a blood transfusion and the risk for a patient’s treatment increases.” (IND)

Belief that the goals underpinning the implementation held benefit for individual patients was seen to be a major driver of buy-in, particularly amongst nursing staff. This understanding was facilitated by effective education and cascade of information to nursing staff as discussed in earlier explorations of these themes. However, this strong emphasis on patient wellbeing can also have a negative impact in overall nursing buy-in where it manifests as anxiety regarding patient safety.

It is outside the scope of this paper to evaluate and comment on the degree of actual risk posed by any aspect of this project. However, it is clear that where nursing staff perceive a threat to patient safety, this has an extremely powerful negative effect on buy-in. This effect was particularly highlighted during interview with the participant representing external industry support, who recounts an instance of a failed implementation effort within the same case-study unit over a similar time frame:

“We have tried to implement carbon dioxide removal in [the unit], but it never took off. What happened was the culture, and the lack of alignment to the goal, and the focus on safety was not adhered to. If the nursing team haven’t got that, the process will fail. If the consultant hasn’t got the buy-in of the team then he is setting himself up for failure. The difference between the two implementations was the culture of safety was higher in the CO2 removal project vs the citrate.” (IND)

An early negative experience relating to a “near miss” safety incident was referenced by 3 of the interview participants as leading to an early barrier to unit-level as it resulted in nursing doubt and anxiety regarding patient safety and their own competence.

“There was a case where the machine was set up incorrectly, which lead to staff working about their own competence, that was the only bump in the road” (IND)

“it was a minor thing but again we just felt “oh my god, we could have caused this patient more harm” when we thought we were doing good putting him on the machine.” (SISTER)

A culture of nursing accountability for patient outcomes, coupled with a relative lack of local experience surrounding this change led to increased anxiety, but also generated a strong stake for improvement in this group. Personal experience of benefits to workload and patient safety was seen to be more influential in generating nursing buy in compared to other forms of evidence.

Impact of Anxiety on Buy-In

The large impact of anxiety on the buy-in of unit level nursing staff became increasingly apparent during the coding process. This subtheme was inductively identified and an additional code, (_ANX), was added to the coding framework. Excerpts of interview transcripts referencing nursing anxiety were further analysed to identify the important drivers of anxiety and evaluate the relationship to the implementation process. At its extremes, anxiety within the nursing subgroup was seen to resulting in complete refusal to engage with the intervention.

“When you meet resistance, people will drop off, be too frightened to nurse a patient on it, and we’ve had staff members say “I’ve had no training on that, I’m not confident, I’m not using that machine” (SISTER)

As mentioned above, although patient outcomes were seen to be an important consideration for all staffing groups, nurses were shown to have a particularly high investment in individual patient safety. Local experience of established treatments and methods of working is extremely highly valued by members of this group, as it is utilised to support decision-making and troubleshooting, and pro-actively anticipate and potential patient safety issues. As a result, novelty is seen as a threat to patient safety due to the lack of experience within the unit, and the subsequent anxiety surrounding change presents a barrier to early buy-in for implementation efforts, particularly in older staff members as they tend to have more experience to lose.

What was your perception of the other team member’s knowledge?

“I think they were quite apprehensive, quite scared. You’re adding in more complexity and I think people were worried about how the patients would react and of the risk of more problems.” (CONS2)

“These machines were a whole new world. And we’re not very recept- well... we don’t like change a lot in intensive care, you just get used to what you’re doing, you can troubleshoot it, you know what you’re doing and you’re confident in what you’re doing, and then you have this whole new concept.” (SISTER)

“But it was still new, and when you have something which is new and could harm patients it is scary.” (SISTER)

“When you’re using something for a long time you become comfortable and you can pre-empt problems. When you move to a new situation you don’t know what to expect, you don’t know what can go wrong.” (STFN)

“I think there were a contingent of older staff members who were apprehensive about any change because change involves learning.” (STFN)

Strategies were employed by senior implementation leadership to minimise novelty through adaptation of existing physical resources, and to support the development and re-accumulation of local experience through education and external industry support. However, additional anxiety was stoked by the inherent unpredictability of the need for support. This highlights a clash of culture at the interface of the “office hours” working of industry educators, and the 24-hour staffing demands of critical care provision.

These reps would finish at 2pm, but you could guarantee the filters would go on when they weren’t there... haemofiltration machines can go on at midnight, any time, unsociable hours and then you’re there ringing the rep on the phone, this alarm is bleeping, and that just leads to more anxiety. (SISTER)

In addition to more general anxiety regarding overall patient outcomes, particular fear was seen of personal errors, and of individual culpability for patient harm.

“Oh my god. What do I have to do next? When are the next lot of checks”, so- it was scary! It was scary, and you’re afraid of making an error, double checking and triple checking with people who were in charge but... none of us knew. No one was an expert in it.” (SISTER)

“There’s always an apprehension that if something happens to a patient is it something you’ve done. You are always wary.” (STFN)

As well as a high emotional and moral stake of nursing staff, anxiety surrounding error was also heightened by a culture of blame and culpability, above that which is seen in other staffing groups.

“Nurses are punished for error in a way that doctors aren’t, so they are understandably anxious about a new system in which error is going to be possible.” (CONS1)

“They had a definite clear interest in it being successful, because they needed it to work so that there weren’t patient safety incidents. And again, I wish I could say the nurses care so damn much that they wanted it to work, but I think a big aspect of that is self-preservation” (CONS1)

“It’s a well-known thing that punishment from nurses who make mistakes are quite severe and renal replacement therapy is really complex and a lot can go wrong, especially when you’re starting.” (STFN)

This adds additional weight to the consequences of failure and leads to the development of a defensive mindset, utilising other resources such as documentation as protection from the consequences of this blame-culture. In this way, nursing anxiety is revealed to have a more complex impact on implementation- although very high levels lead to disengagement, personal responsibility lead to increased buy-in and motivation to facilitate generation of supportive documents and drive safe and sustainable change.

However, initial acceptance of additional documentation was balanced by concerns surrounding impact of adding staffing time and overall workload, as well as the fear that documentation invites increased scrutiny and increased vulnerability to external blame.

"It's the time to fill it out, if it isn't filled out, we have a term in nursing which is that if it isn't documented it isn't done. So they were the 2 main fears, and making sure we fill it out correctly, because it's all evidence. And we're in a culture now if something happens, there's a blame culture, isn't there, and you can use the documentation to say "you didn't do this, you didn't do that" and there's this fear" (SISTER)

When modelling for factors contributing to a culture permissive for change within the scoping review, staff time was another important non-tangible resource. In interview, the subjective value of time was seen to be especially high within the nursing staff group, and this manifested as additional anxieties surrounding any perceived threat of an increase in workload. Likely in part due to the high-stakes, high consequence working environment discussed above, nursing stake in their own workload was quite emotionally charged.

"Before the change I was quite apprehensive, I was worried they were going to heap more work on us and it was going to become more labour intensive." (STFN)

"It was the toll of the workload, the failure rate of energies as a nurse" (IND)

The significance of workload was recognised by unit staff and industry training representatives, who used anecdotal evidence to promote buy in through demonstration that workload was actually likely to be improved. Although this was met with some initial distrust from junior nurses, long term realisation of these promises was seen, which lead to longer term sustained buy-in.

"There was some resistance to change for other projects, but with citrate they knew that one of the main benefits was their nursing time." (CCTNM)

"I was pleased, because sometime the reps will tell you, oh you're gonna see all these benefits when actually you're thinking that's their way of telling you that it's gonna be more work for you." (STFN)

In unit level leaders, including nursing superusers, personal responsibility for more junior colleagues lead to another threat to workload- both through the increased burden of peer-lead training of junior staff members, and through a more general burden of responsibility for the physical and mental wellbeing of junior staff members.

"I was in charge of the unit then, so I felt I had an additional responsibility, an added pressure that the staff looking after those machines needed additional support" (SISTER)

"I was very conscious of supporting the staff on the shift, and making sure the checks were done properly, the line was hooked up to the right entry port and it was, yeah I felt like a mistake could be made." (SISTER)

"The bags were heavy even the simple things like we had staff with shoulder injuries and stuff "oh I can't lift the bags can you lift the bags for me" (SISTER)

3B.6 Documentation

Summary

- Effective Documents facilitate communication between staff groups and support educational processes.
- Documentation within Critical care is highly interlinked, both to other documents and the established 24-hour routine
 - This makes introduction or modification of documents challenging
 - Effective documents integrate into existing routine and minimise unnecessary disruption
- Document design is extremely important, as aesthetics, ergonomics and physicality influence usability and acceptance by staff
- Documentation is most effective where it is adapted to context over time, and this iteration is facilitated by effective feedback from end-user staffing

Theme: Documentation

Documentation as a general concept was seen to have differing significance for different staff groups. As mentioned previously, documentation is intimately linked to nursing anxiety and buy in, where new paperwork is often viewed as a new potential source of scrutiny and blame, and represents a potential increase in workload, introducing the possibility for duplication of labour. However, as already discussed in the staff knowledge analysis, the educational workbook also represents a source of protection from anxiety and serves to support and scaffold early knowledge deficits, promote individual empowerment and supporting local buy-in and ownership.

Interviews with pharmacy showed they particularly valued the documentation's function to facilitate recordkeeping and processing of complex information required for prescription calculations. Pharmacist input was important in ensuring information in protocols was safe and accurate, and bought into documents as useful tools to allow this dense information to be communicated reliably between medical, nursing and pharmacy sub specialities.

"Had that document not been there we would have struggled quite a lot. It was needed for 3 things. 1, to find out how much citrate was going and adjust based on the calculation and monitoring that and recording this, and also for the infusion to know how much was going and how much they were removing. They needed to keep all those records separately because the ITU chart is quite complicated" (PHARM)

In a similar way to individuals staff members within the unit, each individual document within intensive care exists within a greater context. Documentation tools were demonstrated to be ingrained deeply within the culture of intensive care and frequently link to or reference other related

tools. As such, efforts to remove, adapt or introduce new documents also needed to consider the impact on other documents and processes.

“I think the degree of complexity in intensive care means any change has multiple ramifications which need to be considered. We are paperwork heavy and everything interlinks with everything else so it means if you change one piece of paperwork, 3 or 4 have to change”
(CONS1)

In early stages, availability and supply of newly developed treatment charts limited the ease of access to information contained within this tool, and presented potentially time-consuming searches for paperwork.

“I think there were teething problems. We didn’t have enough charts printed and this has continued when I’ve come in to cover subsequently. It’s difficult to find those charts if needed and to refresh your memory. The charts may be there but locating them was difficult.”
(PHARM)

However, the physicality of educational booklets was suggested to be beneficial in supporting the confidence of unit level staffing using them. This, alongside purposeful graphic design, served to lend credibility and authority to the document, helping to achieve its dual purpose of supporting educational and knowledge needs and supporting staffing buy-in.

A booklet is something you can wave and hold, it has physicality a ticket, a passport if you like, to renal replacement. And if it looks good and looks credible and has everything you need.
(CONS1)

When discussing the general theme of documentation through structured interview questioning, the importance of ergonomic, user focused design was referenced multiple times. Conscious effort from senior staff, and particularly the leading consultant, was put into designing documentation tools which keep the end-user in mind. This

“I think that something that is not paid enough attention to in healthcare is the quality of our graphic design. All you have to do is walk through the hospital and look at the walls and the notes and you will see how shoddy most of the graphic design is. Things done in Microsoft word- it’s not designed to make high end graphics. You see things which are designed really badly.” (CONS1)

“One of my pet projects is to try and make the documentation across our unit as something recognisable as such with consistent livery with form and function united so you are naturally drawn to do the correct thing with how the documentation guiding you.” (CONS1)

Recognition that the effectiveness of documents directly relates to the individuals using them lead to documents being generally well-regarded by unit level staff and their quick integration within the unit context. The quality of design of both treatment chart documents and educational tools were cited by both industry educators and unit nursing staff as particularly useful.

“If you can read it and understand it, you can follow it. The good thing about the [case study unit] documentation is that it was easy to disseminate across the whole Northwest. It was well produced; it was easy to follow.” (IND)

“the design of the treatment charts did assist quite a lot, was very useful to have that printed document with instructions.” (IND)

“But when you actually break it into chunks and follow the colour coding it is a guide and it makes it really fool-safe, and that we really appreciated, especially in the initial phase cause we had all these different bags and we had to label the machine.” (SISTER)

In addition to consideration of individual users, documentation also had to integrate into the existing unit routine- a cultural construct which structures both nursing and medical workload, with defined meetings and handovers which serve as key opportunities for multidisciplinary communication. The introduction of hemofiltration booklets formed part of a modification to this pre-existing routine.

“We have an existing routine, in the morning you do your A-E checks, equipment, pumps, and then as an add-on you have your hemofiltration booklets. Then with your hourly checks drugs, urine output, ventilator, the haemofiltration was just added on to that, it was an add-on to what we already did.” (SISTER)

A strong focus was placed on the integration of this document with this routine, aiming to embed change through streamlining changes to fit within existing organisational practices rather than fundamentally change the way staff planned their workload. Booklets were designed to integrate with context- both with respect to the schedule and with other pre-existing documentation also designed around the routine.

“Everything is important, from the fact it starts at 0800 and finishes at 0800, which is the same as the other ITU documents which means as patients go onto a new page in other documents they are also going onto a new page in renal replacement therapy booklet. The small things matter. For me the integration of paperwork with reality was really important.” (CONS1)

Consideration was also made surrounding integration into workflow of the user. The potential for documentation to increase overall workload was recognised as a major nursing concern, and a further design aim was to combine and unify multiple disparate documents into a single streamlined process. This was well received and supported early buy-in amongst nursing staff.

“Citrates was easier to manage from a systems perspective in it was a single integrated system of renal replacement, with a workbook that covered everything. Prior to that you have a prescription sheet, observations, a separate sheet for heparin, and there were 3 aspects of complexity which could potentially diverge and go wrong.” (CONS1)

“The prescription and recording chart were integrated and the prescription was unified so they were doing the same thing every time. So I think what we were trying to do was say “well there is a change in the unit with this stuff, but actually we’ve made it so streamlined that it’s going to be easier than what you’re used to” (CONS1)

In this design process, the consultant drew on pharmacy colleagues to advise on how to integrate drug prescription into the documentation. Through utilising this multi-disciplinary input, the consultant was able to draw on the authority and credibility of the pharmacy team to support the user acceptance of the document.

“Our role was mainly to ensure the information printed in the protocol was correct” (PHARM)

“So being able to [prescribe] on this dedicated booklet made it much easier, but crucially because pharmacy got behind it and described exactly what words were to be used gave it additional legitimacy” (CONS1)

After the initial versions were implemented, multiple iterations were subsequently released based on real-world feedback from end users. As pharmacy and nursing staff accumulated experience and identified troubleshooting questions and solutions, educational and treatment documents became increasingly refined and better adapted to serve their purpose within context. This flow of feedback was facilitated by the culture of approachability amongst senior leadership staff and supported unit level staff ownership, and therefore investment and buy-in. Individual experience gained during the early implementation was added to educational documents and subsequently disseminated back amongst junior staff, scaffolding their own learning and mitigating the initially low levels of local experience within the unit.

“We discussed and we shared documents and refined questions and refined workbooks, you could see people’s understanding becoming more and more comprehensive.” (CONS1)

“When I spoke to CONS1 about the protocol he said “the nursing teams have started talking responsibility, they’ve altered it to suit their needs”. (IND)

“it’s such a practical thing and there are probably very few medical staff who have a good understanding of how it actually functions as a machine. And we were going back and actually incorporating that into the next lot of training booklets” (STFN)

“And if we approached him with a question that we couldn’t find the answer to in the workbook then when he produced the next version of the workbook that the answer to what we’d ask was added in.” (STFN)

However, crucially, this early period of frequent modification and refinement occurred in a structured way, filtering back up to steering meetings and utilising administrative support from the critical care network. This allowed for stricter version control and allowed for a clearer consensus to be met prior to release of new physical documents.

“it was implemented the right way, through the critical care network group, with appropriate representation and endorsement. It did go through a proper process. There were minuted discussions rather than more ad hoc developments.” (CONS2)

“There was administrative support from the network manager and an administrator, so they held the ring in terms of paperwork and version control” (CONS1)

3B.7 Leadership

Summary

- Perception of hierarchy different amongst staffing groups; flatter hierarchy amongst seniors, steep hierarchy at unit level
- Senior medical doctors have particularly high importance in overall cultural tone in the critical care unit due to particularly high oversight
- This makes individual consultant personalities, and the interplay between them, highly important, and presents a vulnerability where adversarial relationships might exist
- The presence of unit level leadership “champions” supported the success of the project through fostering ownership, and mitigating anxiety through peer-support
- The credibility of Leaders was derived from multiple sources, with a degree of authority implicit in certain staff roles
 - Credibility was supported by drawing on both the anecdotal successes at other sites, and the existing credibility of established external organisations

Theme: Leadership

For the purposes of this implementation project, leadership was seen to be broadly divided into two main tiers- senior project management and unit-level leaders. The quality and style of leadership was seen to be a closely related factor in many of the themes analysed above, and therefore many examples of the impact of both of these sources of leadership on facets of implementation culture have already been discussed.

However, based on the importance of leadership on critical care implementation projects across the scoping review, a section of the structured interview questions was dedicated specifically to exploring participants perceptions, ideas and evaluation of the leadership present within the case study project.

Perception of Hierarchy

Interestingly, perception of hierarchy was significantly different between different staff groups and between members belonging to senior or unit level leadership tiers. Within the senior tier, a fairly flat hierarchy existed, with members of the steering group and individual medical consultants working as approximate equals. This flat structure permitted easy flow of information and ideas in development stages of the project. Leadership roles were not explicitly defined at an early stage, and members were offered the opportunity to volunteer for responsibilities appropriate to their skillsets.

Did you have a perception of hierarchy?

“No, it’s difficult because we are friends anyway, but I had a senior management role anyway, but everyone had an important role and I don’t feel it was hierarchical. [CONS1] listened to everybody, was sensitive to other sites and worked well with them. I didn’t feel there was a hierarchy. We never worked like that.” (CCTNM)

“At the first meeting we decided who was going to “lead” each site, and we identified a consultant and a nurse who would be the face of this, and so that was defined, and the superusers, people were invited to put their name forward, but other than that I don’t think there was defined explicitly. I think it was more organic than that, what do we need to make the citrate work rather than viewing this as a project which required project management.” (CONS1)

“At the consultant level it’s very flat, it’s not particularly hierarchical. There’s a more recognisable hierarchy amongst the nursing staff and between the medical and the nursing staff.” (CONS2)

However, between the senior and unit level tiers, and within the unit level tier of staffing groups a much more structured and steep hierarchy was present. This was partially ingrained at the artefactual level of the unit, with individual nursing and medical staff members falling into defined paygrades denoting responsibilities and seniority within the unit. However, even within this structure, nursing staff self-organised based on individual interests and skill sets, becoming more or less involved with various implementation projects suited to their own particular knowledge and experience.

It’s a very hierarchical system, especially in intensive care nursing because we have the 3 different levels. And it’s important to have the right amount of senior nurses with the right knowledge and experience. I think the success of implementation is very dependent on who leads that. We have a set of people who tend to be better at implementing clinical changes where if other senior members of staff were to take that on they may not have the same enthusiasm. But those staff members may be better at implementing other changes because they would have more sway there. (STFN)

Impact of consultant personality and leadership style: CONS1

As the chair of the steering group and a medical consultant practicing within the studied unit, the personality, leadership style and existing relationships with other staff members held by **CONS1** were seen to be extremely relevant and influential in the direction and success of the project. As an individual, they found themselves well-positioned professionally to initiate this change within the unit, with a high degree of career-motivated and outcome related buy-in.

“The final piece of the puzzle is that there was a new consultant who had started, i.e. me, who was naïve or whatever, who was looking for something to do, like a good opportunity to embed myself in as a consultant in the health board by chairing this task and finish board which looked like it was gonna be something which was doable because all the other pieces of the puzzle were present.” (CONS1)

As a personality, this individual used a high-energy, high enthusiasm approach to generate energy and enthusiasm in others, utilising this to manifest his own well-defined vision for the project. In addition, staff members of all grades referenced a high degree of approachability and support. Both these factors resulted in a high degree of early alignment within the unit.

"I think [CONS1] had a very clear idea what he wanted to achieve at all the different stages. It was introduced at a network level. A very clear idea how he would get a task and finish group, what the support and training and educational materials would look like and what the measurable successes would be. There was a lot of drive and certainly [CONS1] in his lead role did generate a lot of enthusiasm." (CONS2)

"The chairs of the steering group are usually picked as innovators who are enthusiastic about the project. He has a lot of respect across North Wales. Where he goes others sort of follow." (CCTNM)

"He's personable but he's not afraid to tell someone off. He has that leadership where he's not afraid to act. He has bundles of energy." (CCTNM)

"We had a lot of support from one of our consultant who was the one who implemented citrate and he was very hands on and answering any questions." (STFN)

Despite this, this energy and enthusiasm was tempered by real-world obstacles. High pressure was put on unit level staff to achieve time dependent goals, which lead to stress and frustration in unit-level leaders, who felt these timeframes were not practical to achieve.

"I think the consultant who implemented this he worked with it on another unit elsewhere in the country and was very, dare I say, Gung-ho, like a puppy, very excited, wanted to implement it, but I think that rubbed some people up the wrong way, it was a bit too much." (SISTER)

"I think there's a way of approaching things and a way of ... it was a bit over-zealous a bit too much and that basically he wished we would just get on with it. And we say "right we appreciate that", but there a tactful way of saying it and bringing it in and maybe giving us some facts and figures, I don't know." (SISTER)

"this particular consultant, he just wanted it all done within weeks. But it just doesn't happen like that." (SISTER)

Other consultant medical staff within the unit provided some oversight and emotional/moral support but had limited practical project input. Medical leadership remained centred around CONS1, who drew on existing trust and relationships, in addition to external and internal sources of influence and authority from other staff disciplines, to support implemented changes.

"I must confess I was quite passive in this process. I was there to lend moral support and enthusiasm to the consultant lead" (CONS2)

"I felt that different medical staff were probably more supportive in terms of they could intellectually see that this was a positive change and that someone else was doing the donkey work to make it happen and so they were very much happy to applaud from the sidelines. Which is important cause that helps other people get behind it, but it didn't cost them anything." (CONS1)

Overall trust in the decision-making of senior leaders was shown to be consistently high throughout the unit level staff between all disciplines. This culture is based on a general respect amongst staff for medical experience, and this underlying willingness to follow these leadership figures lead to a high degree of early buy-in.

“Some of the consultants have been doing this for 35 years. They know what they’re doing and it’s definitely for the good of the patient.” (HK)

“when change is implemented and it comes from one of your senior consultants, we listen, we sit up and we take it on board. Cause we respect their expertise” (SISTER)

Unit level leadership

A unit level tier of named “Superusers” was also formed from volunteers from multiple disciplines. This process was partially incentivised by an implicit long-term career driven benefit, as discussed in the analysis of the theme of buy-in described above.

“There’s a cohort of band 7 nurses and band 6 nurses, and some band 5 nurses who were pushing to progress to band 6. So there were naturally this group of people who had some experience and enthusiasm for taking part in a new project” (CONS2)

Creation of this sub-tier of “champion” leadership staff had multiple benefits, and greatly supported the success of the implementation. The process of becoming a superuser conferred a degree of ownership on this group, which in turn supported their own buy-in.

“The idea of creating superusers was to create a leadership tier of people who were bought into and embedded in this process. That was something that initially seemed a bit silly to me, but it later dawned on me that having these individuals meant that they were invested in the success of the project and therefore in a sense had to be leaders.” (CONS1)

In creating an identified port-of-call for unit level staff, the staff anxiety generated by experience deficit was partially mitigated. Specific effort was placed on ensuring knowledge was adequately scaffolded by adapting the rota to ensure at least one of these superusers were available to provide support at any time.

“We’ve got champions of haemofiltration and there’s usually one in each shift so if a filter went up and we had a junior member of staff we’d go “oh can you help that person and guide them through the calcium checks”, so I feel the expertise is there now and we’re much more confident with it.” (SISTER)

“We were a group of nurses with a good understanding of the machines, who could troubleshoot and were confident in using them. When we had staff who were less experienced then we would work together with them, teach them, make sure they were safe.” (STFN)

“intention that there will always be a super user on shift while we are implementing citrate” (IND)

And when you needed help, where would you have sought that in the early phases?

“So in the early phases, ideally it would have been that consultant but he was on a week on week off rotation so we might not see him for a couple of weeks. So it was up to the nursing staff who was on there 24/7.” (SISTER)

Leadership Subtheme: Influence, Authority, and Credibility

During structured interviews, a further non-tangible resource became evident, as multiple interview participants directly or indirectly referenced the impact of an individual’s ability to influence change through utilising the both hierarchical authority, and credibility between individuals and groups. Importantly, both of these properties were seen to be **transferable** to a degree.

Different staff groups were seen to have implicitly different levels of authority, which can affect the likelihood of success of the project. The interviewed representative from industry spoke about their own experience with seen multiple similar implementations at various critical care units and shared an opinion that he viewed consultants as generally more influential than other staff groups.

“It can be very much driven by an individual like a senior nurse but the power of that person can be very limited and you can lack that medical buy-in. And that will be a detriment to the success of the implementation.” (IND)

“But if we had a stronger role model like a consultant who is supporting things, I think things get done quicker. It really depends on the human element” (IND)

In addition to their implied authority through their own position within the hierarchy and decision-making role, consultants also rely on credibility- a resource representing the ability to foster trust and subsequently buy-in from other individuals.

Credibility was closely inter-related to the visibility of accumulated knowledge and experience, and confidence in the application of that knowledge. In addition to existing credibility through reputation and the pre-existing culture of trust within the case-study unit, CONS1 further fostered their own credibility through drawing on the credibility of external agents, including the KDIGO, the external body developing evidence-based guidance for management of renal disease.

“If not for their guidelines, of course we wouldn’t have done it at all. Of course, the only support from them was to write the guideline but I suppose that’s a form of validation. If it was just me being a very clever doctor who had read all the research and decided I don’t know how far I would have gotten” (CONS1)

Individual credibility was also gained through personal accumulation of knowledge and experience from external sites. In CONS1’s case, this was largely self-directed, and served to support influence at the steering meeting level, and at the unit level through demonstration of an evidence base.

“I’m aware that I had a more, slightly deeper education in this than anyone else in the health board, because I felt the need to seek out for my own credibility the education side of it.” (CONS1)

“I was acutely aware that I had no first-hand knowledge of the use of citrate at all and I felt that if I was going to lead a task and finish group across the health board that I would lack credibility if I had never seen it” (CONS1)

“Oh well the consultant knew exactly what he was talking about, very research focused, he had the evidence, complete confidence in his rationale. (SISTER)”

CONS1 also drew on existing authority and credibility of The Critical Care Network, further bolstering their own influence through demonstration of the explicit backing of a larger and established organisation.

“Manager of the critical care network provided an additional level of leadership and credibility which leant a degree of legitimacy and authority. Because she represented the network, she had the administrative support behind her and it goes on the All-Wales critical care website and so there’s that sheen provided by that entity. That was important, and that made her an important leader as well. (CONS1)”

This transfer of credibility also extended to staff groups as well, with members of each group having particular implicit authority over matters falling within their artefactual disciplines. For example, strong multidisciplinary communication ties to pharmacy facilitated the transfer of the authority and credibility of pharmacy in matters concerning safe prescription to the new documents generated through the implementation. This additional legitimacy made these documents more acceptable to nursing staff, supporting their buy-in and reducing anxiety.

“Ultimately, pharmacy became quite exercised about this in exactly how things were going to be written up, and that was really useful because once they started doing that it made them champions of the process as well, and that gives you more power if you’re asking a nurse to do something, that pharmacy have signed off that this is a legitimate thing to do the nurses are much happier.” (CONS1)”

The converse can also be seen to be true in other staff groups. A relative lack of knowledge and familiarity amongst more junior medical staff, especially in the early phase, lead to a low perceived credibility and authority amongst other unit level staff.

“We’d say to the doctors on the ward “this is the new guidance” they would have forgotten about it- they were on the backfoot too the same as we were it didn’t inspire confidence” (SISTER)”

Chapter 4- Synthesis and Overarching Analysis:

4.1 Introduction to Chapter 4

In this chapter, the findings outlined in chapter 3b are synthesised to answer the research question:

“How do cultural and behavioural factors influence practice change in a critical care setting?”

In Chapter 2, a model mapping the contribution of drivers of consensus within a developing “Culture Permissive to Change” was generated, and this idea of resource-driven culture is further explored and with respect to the Case-Study findings.

Further to the static model proposed in Chapter 2, the Case-Study indicates a more dynamic system of resource demands as the implementation process was seen to occur across multiple phases- Conceptual, Early and Established, each with different characteristics and resource demands.

Movement through these phases was seen to be closely tied to other dynamic systems within the critical care unit throughout implementation. Documentation underwent a cyclical process of improvement and adaptation to context, as exposure to specific challenges to end-users was filtered back to document authors with senior positions leadership.

Likewise, the broader knowledge base and experience of the critical care staffing is also examined as an important non-tangible resource. Movement through phases of change are partly characterised by a shift from sudden experience deficit to re-accumulation and dissemination amongst unit level staff, and the processes which facilitate this phenomenon are also explored and modelled.

The processes underpinning the iteration of documentation and re-accumulation of local experience are both facilitated by communication culture. The case study demonstrates the positive impact of a “Culture of Openness” and the characteristics of this culture are discussed. Notably, senior medical staff were seen to have a disproportionately large impact on this culture of communication, and the role of these individuals with respect to leadership styles is discussed. These individuals were seen to derive authority and credibility from multiple sources, which has significance with regards to securing the buy-in of different unit-level staff groups.

Finally, the role of additional influences on this buy-in are discussed, including the significance of different forms of ownerships amongst different staffing groups, and the impact of “Safety culture” and nursing anxiety on the investment of unit level staff members.

4.2 The lens of a resource-dependent “Culture Permissive to Change”

In Chapter 2, a scoping review was performed to identify what was already known about how behavioural and cultural factors influence the implementation of practice change within a critical care setting. The outcome of this study was the development of a descriptive model, illustrating the importance of the a “Culture Permissive to Change” supporting the consensus between staffing

members within the unit. In the model, the development of this culture was dependent on the supply of tangible and non-tangible resources feeding into the system, and key resources identified during the literature review informed the loose structure of the interviews carried out during this qualitative study.

Modelling environmental and contextual influences on the cultural systems of an intensive care unit as individual resources feeding into a larger system is clearly a simplification of more nuanced and complex overall effects. However, it is one useful lens through which to broadly describe and understand the multiple interacting chains of events which contribute to successful change.

Analysis of the interview transcripts collected during this study supports the general model of resource dependent change outlined by the scoping review, but also reveals some additional factors which can be used build on the previous model with a more nuanced understanding. In this qualitative case study, several additional key resources were identified as particularly important in understanding the development of change in a critical care environment- specifically an appreciation of the accumulation and dissemination of experience amongst unit staff, and the consolidation and transfer of authority and influence between leadership figures.

In addition, these data reveal that dependence on resource was not static, but rather that the culture of change within the unit shifted through multiple phases during the implementation - initially demanding more externalised sources of resources and support before becoming more self-sufficient as the changes became more established. The ties to this external support network were demonstrated to be extremely important in overcoming resource scarcity and in solidifying the administrative framework needed for iteration and improvement.

Specific examples of artefactual culture change were also explored, as the significance of key educational documents were highlighted by multiple interview participants. As with resource dependence, these documents did not remain static throughout the implementation, and the interactions involved in the iteration and evolution within context also gave some useful insights into the broader significance of documentation within the organisational culture of critical care and how these objects hold deeper levels of implicit significance for both document developers and their end users.

Leadership was identified as a key driver of change within the scoping review's model. Analysis of the interview transcripts also give some insights into how leadership styles and personalities on an individual scale can have disproportional influence on the "emotional landscape" and wider cultural climate of the critical care unit. The case-study unit, and by extension critical care units in general, hold some unique cultural features which exaggerate this phenomenon, and understanding the significance of this should be a consideration in future implementation efforts. Effective leaders utilise their credibility and authority to influence change, and the ways in which this credibility is accumulated and bestowed upon others are discussed below.

Understanding of the resource-dependent nature of cultural systems also allows for identification and mitigation of barriers to the development of these drivers. For example, in understanding the importance of unit level buy in as a driver of change, staff anxiety may be identified as an indirect implementation processes which can be addressed at an early stage. Overcoming these barriers was important to the development of sustainable internal resources, and the "culture permissive to change" can be better understood as the way in which interplay of other drivers of change, such as effective documentation and education, are able to mitigate and address the threats that these barriers present to the sustainable change.

4.3 Implementation and Culture Change occurs across Multiple Phases.

The implementation process within the intensive care unit was seen to occur over multiple phases, each with their own characteristics: Conceptual, Early and Established. Although it is useful to frame each of these phases as distinct stages occurring in sequence, in reality there was a degree of overlap and blurring as one phase transitions into the next. This is described further below, and represented pictorially in **Figure 4**.

Conceptual Phase

The Conceptual Phase occurred prior to the implementation process itself, as key leadership figures worked at an organisational and managerial level make broad decisions, both in terms of bureaucratic approval and in terms of gathering and development of resources to facilitate the transition into the early implementation phase.

This phase was characterised by communication and the achievement of consensus between more senior members of management, with relatively little involvement of more junior and unit level staff. The importance of this stage was recognised by industry representatives, who are acutely aware that unaddressed barriers within the conceptual stage can lead to a complete failure of the project to initiate entirely. Areas where these individuals focus support indicated particularly important hurdles- devising and presenting a business and financial case, highlighting and utilising persuasive external evidence sources and gauging the “emotional landscape” of the unit- a broad term for resilience and morale of unit staff which has a significant influence on the receptiveness of unit level culture to change initiatives. Documentation in its initial form was designed and prepared at the conceptual stage, although it underwent significant changes based on feedback generated during the early phase.

Early Phase

The Early Phase occurred during the initial weeks and months following the implementation of the change processes within the unit environment. During this phase, the status quo of the unit was disrupted, and existing processes were destabilised by sudden deficits of local experience and practical knowledge.

This stage was characterised by a high dependence on external support drawn from outside the unit. This demonstrated the importance of the wider context in which the unit sits, and the strength of ties to sources of external support was of high importance in influencing successes at this stage. External sources of experience were drawn on to supplement local deficiencies, and leadership figures relied on externalised anecdotal and research-based sources of evidence to support their own credibility.

The demand for specific troubleshooting knowledge within the critical care unit was unpredictable, with complex and safety critical decision-points occurring at any time of day, including outside of a standard 9-5 working schedule. This phase was vulnerable to inconsistent availability of support, as external support was not always readily accessibility out of hours, while presence of internal experience remained highly dependent on the staffing availability of a few local leaders.

Due to increased uncertainty, lack of experience, and higher perceived risk to patient and personal safety within the early stage, unit staff anxiety, particularly within the nursing staff group, formed one

of the major barriers within this stage. The management of this barrier was largely dependent on processes occurring at the conceptual phase, including nomination of unit level leadership in the form of champions and development of effective education sessions, and supporting education documentation. Management of this anxiety was key in sustaining unit-level buy-in during this stage.

The Early Phase was also characterised by rapid iteration and development as communication and feedback from unit staff lead to refinement and improvement of internal documents and troubleshooting processes. To support this period of development and adjustment, administrative support was drawn from bodies external to the unit, which supported the transition of these iterations into the established phase in a structured and controlled process.

Established Phase

Progression into the Established Phase occurred as an internal body of experience built up within the unit. This facilitated more robust networks of peer-led teaching, and the wider availability of unit level leaders with troubleshooting practical knowledge resulted in more consistent availability of knowledge spanning the whole critical care routine, including out of hours cover.

This phase was characterised by the reduction of reliance on externalised support as the unit's supply of resources became self-sustaining. First-hand experiences of positive outcomes from unit level staff lead to generation of local anecdotal evidence of success, improving collective buy-in which fed back into generation of more positive outcomes. In this way, a positive feedback loop of local buy was created, supporting and sustaining a culture permissive to change. Consensus between senior leadership, unit level leadership, and unit level staffing developed as senior vision at the conceptual stage was realised. Similar shifts in team buy-in supports data seen in the scoping review; Eakin et al., (2015) give an example of unit level staff culture progressing from a similar attitude of "wariness and scepticism" to wider acceptance and agreement following first-hand and anecdotal demonstrations of the efficacy, safety and feasibility.

During this phase, mature versions of documentation were released and became integrated into existing routines as the change became established into the normal working practices of the unit. These refined documents were increasingly tailored to the specific needs of the context and end-users through cycles of iteration occurring within the early phase.

New staff joining the unit during this phase had educational needs met locally, both by peer-lead teaching from established unit level leaders and champions, and from clear training documentation which was fit for purpose and tied into context. In this way, culture became solidified as incoming staff accepted the new status quo and the change became fully self-sustained.

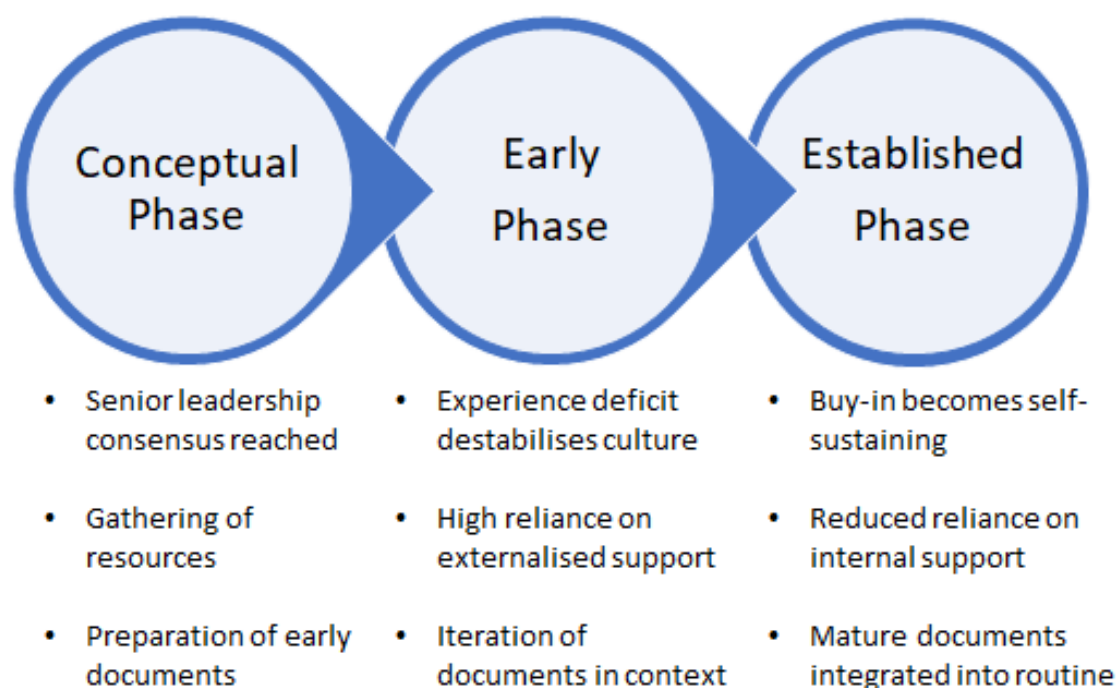


Figure 4- Description of key features of each of the 3 phases of implementation observed within the case-study

Nuanced relationship of unit with sources of external support in the Early Phase

During the early phase of implementation, the case-study unit was highly dependent on externalised support to cover for deficits in knowledge, experience and administrative structure.

A particularly significant relationship was seen between the unit staff members and representatives from industry. The scoping review in chapter 2 showed a relative blind spot within existing literature exploring the influence of this external group on implementation efforts within critical care, and navigation of the cultural interface between the cultural values of corporations and healthcare providers was seen to be both nuanced and extremely relevant for the outcome of the implementation.

The nature of interaction was necessarily seen to relate to resource- deficits within the unit. Industry was able to supply technical expertise with renal replacement machines and processes and assist in disseminating this knowledge through provision of training sessions and helpline support to unit level staff. In providing these sessions, representatives provided both a source of experience to scaffold the learning of staff members, and additionally provided indirect financial support to cover funding deficits; it was identified by multiple interview participants that inability to adequately fund training, including sourcing venues, catering and educators is and continues to be a major barrier to large scale implementation due to difficulty sourcing organisational funding.

Although this system shows a mutually beneficial relationship between different organisations, project leaders found themselves balancing the benefits of this source of resources with the ethical considerations of avoiding conflicts of interest, as clearly medical industries have a vested interest in changes which generate profit. Although it is outside the scope of this project to weigh in on this complex issue, it is difficult to see how such a project would have been able to progress from the conceptual phase without at least some degree of industry support.

This interface also goes two ways. As an external actor in the implementation project, the interviewed industry representative found themselves at the mercy of the pre-existing “emotional landscape” of the unit. This broad term was used to by this individual to summarise a culture of openness to external support, the general mental wellbeing, resilience and anxiety within the unit and overall receptiveness to change. Subsequently, industry staff put a high emphasis on creating and nurturing positive intrapersonal relationships with influential staff members.

However, despite these ties being made, the organisational cultures of medical industry and of critical care provision remain distinct, and the interface between the two is vulnerable to these differences. In this case study, this was particularly evident in the lack of support from industry out of hours- whereas the critical care unit must necessarily provide a 24-hour service, industry support was seen to follow a more traditional 9am to 5pm arrangement. In the early phase, this dissonance between routines left gaps in the support felt by unit-level staffing out of hours, increasing anxiety in these individuals in the early phase. As dependence on externalised support reduced as internal knowledge, experience and buy in became established, the vulnerability to cultural dissonance was reduced as internal support became more freely available.

Cyclical development of documentation throughout phases of change reflects an artefactual shift in critical care implementation

Schein (2010)'s framework for describing organisational culture identifies “artefacts” and “arrangements” as the top, most overt layer of organisational culture. Changes at this layer manifest explicitly as new policies, objects and schedules.

Introduction of new documentation or adaptation of existing documents represents perhaps one of the clearest examples of artefactual culture shift- these objects represent a physical codification of standard practices and working structures within the healthcare unit. However, the thematic analysis also begins to demonstrate the greater significance of documents within additional layers of culture as they relate to shared beliefs and deep assumptions. When examining the impact of documentation on culture, it is useful to recognise that the idea of “documentation” simultaneously exists within multiple states of being within the studied context, with each of these states having different properties:

Firstly, modern documents exist within a **design state**, saved as an intangible form within computer software. During this state the document is fluid and can be easily modified or iterated on by one or more designers. In this state, the document reflects a more idealised form of the intentions of the document authors, as it is not yet directly interacting with its end-user within context. Multiple digital versions may exist simultaneously, and these require control for consistency and clarity.

Secondly, documents exist in their **printed physical form**. As tangible snapshots of a single moment they have a different set of properties. Once printed, documents are difficult to adapt and rely on decisions made within the design stage. These documents have a finite supply and specific storage location within the unit context in which they are printed and used, and their actual utility is highly dependent on contextual factors and the specific needs of the end users.

This cyclical relationship of document development is represented pictorially in **Figure 5**.

This distinction was seen to be important in the data. Documentation within context of the critical care unit was seen to be closely related to the highly structured routine and schedule of the unit- itself an arrangement of the unit's culture. Protocol documents typically did not exist in isolation, but instead reference, refer to and link to other documents and bundles also positioned within this structured routine. In this regard, implementation of a new document requires a broader understanding of the impact this will have on the network of paperwork affected by the change, and how a new document will fit within the existing routine.

How effectively new documents are integrated has a knock-on effect on unit level staff buy-in, as deeper levels of cultural significance become evident. Nursing time and workload are perceived as extremely valuable and emotive resources to this staff group, and poorly integrated documents pose a potential threat to both. As such, the introduction of new documentation carries significant implications shared cultural values and deeper assumptions. Nursing concern regarding documentation burden was also an extremely common theme reported by nursing staff within the scoping review, with specific concerns surrounding both increase in workload and duplication of effort (Bjurling-Sjöberg et al., 2018; Mørk et al., 2018; Rees et al., 2020; Spooner et al., 2018a).

In chapter 2, documentation was noted to be at its most effective when integrated into the existing workflow and routine, rather than disrupting an established workflow (Phelan et al., 2018). Within the case-study implementation, the importance of document usability, aesthetics and ergonomics was recognised at an early stage by the lead consultant, and the care taken over design decisions was recognised and appreciated by end-user staff. Documents were designed with the 24-hour 8am to

8am routine of the unit in mind at the outset, and this was largely informed by this individual designer's own experience working within the unit itself.

Further to a time-burden, the emotional significance of documentation to nursing staff is made deeper as completion of documentation in its printed state is frequently significant for legal and professional accountability. Nursing staff feel vulnerable to scrutiny in a "blame-culture", and acceptance of documents hinges on whether they are viewed as a protective factor from this, or as a further threat. Staff wariness surrounding documentation as a threat to workload and source of scrutiny came to appreciate the clear structure of these treatment charts, and elements such as colour-coding consistency with other documents within the unit supported user buy-in by providing an additional level of safety guidance and support during the early phase. This was partly facilitated by early discussions with pharmacy and support staff to anticipate user needs and provided credible guidance which aimed to minimise opportunity for error. Although early versions were generally felt to be good, these troubleshooting considerations continued to improve as further iterations progressed.

The physicality of printed documents in the unit context was shown to be both a positive and a negative during different stages of the implementation. In the early phase, finite supply, limited storage and difficulty locating documents lead to unnecessary drains on staff time and poorer early engagement. This mirrors logistical barriers to effective documentation seen within the scoping review- multiple papers collectively name challenges in locating and/or accessing and printing documents as contributing to time demands and hindering user engagement with these tools (Bjurling-Sjöberg et al., 2018; Costa et al., 2017; Mørk et al., 2018; Spooner et al., 2018b). In some cases, there was poor awareness of document existence which unsurprisingly negated any positive effect of introducing documentation. (Mørk et al., 2018; Rees et al., 2020)

Consideration of the more mundane aspects of unit function, including that of document storage and accessibility is important. Dixon-Woods et al discuss a universal struggle of unit level staff against endemic issues of logistical and organisational hurdles not just in implementation, but in day-to-day healthcare provision; poorly integrated or accessible document, obstructive clinical pathways, and awkward IT issues. Staff were often seen to be aware of these issues, but felt relatively powerless to address, while responsibility for these issues was felt to be diffuse with poor accountability (Dixon-Woods et al., 2014). If we accept that effective documentation is a key driver of cultural change, then implementation must also consider these more mundane barriers. No amount of planning will be able to identify 100% of these practical teething issues, but crucially culture should be receptive to staff feedback from those best placed to highlight these issues.

In other circumstances, the tangibility of the training document was shown to be a psychological boon, as completion of a physical workbook supported staff empowerment, and supported this as "a passport to renal replacement".

Examples of mature documentation seen at the established phase of implementation represent multiple phases of iteration, as documentation cycles between design and printed states. As cycles of iteration progressed through the early phase of the implementation, the printed state of the document became increasingly tailored and adapted to context, and this supported the development of ownership amongst unit level staff members and leaders. This phenomenon of iteration and improvement of resources closely mirrors sources seen in the scoping review. Luiking et al. (2016) give a similar success story, where providing unit level staff the opportunity for input into insulin administration protocols lead to increased perceptions of acceptability in these staff members. As with this case study, promoting unit level input into the implementation fosters ownership and subsequently increased buy-in, and therefore overall consensus.

Iteration on these documents is necessary, as different staffing groups were seen to experience and interface with the context of the unit in different ways. Although senior medical and administrative

leadership had their own understandings of what was required from the documents, it was acknowledged by all sides that the subcultures of nursing and pharmacy staff held different understanding and implicit assumptions and ideas about what was required from documents to support the projects' safety and success. This supports a point made in chapter 2- differing baseline knowledge states exist across the cultural division between staff groups, and this affects the quality of educational resources shared amongst these groups. In incorporating these viewpoints and supporting medical expertise with the technical knowledge and experience of nursing and pharmacy staff, **CONS1** also supported the credibility of these documents as resources to be trusted.

As feedback was collected from the unit level, the specific changes were rolled out in a structured fashion coordinated by the administrative support of the critical care networks. This allowed stronger version control and further supported development consensus through clearer communication- helping to mitigate the barrier of “diffuse vision” described by Mørk et al. (2018) within the scoping review. The consequences of vague and conflicting guidelines were seen in Spooner et al. (2018a), who demonstrated how knowledge deficits and inequality can arise, especially where documents concern safety critical processes such as handovers.

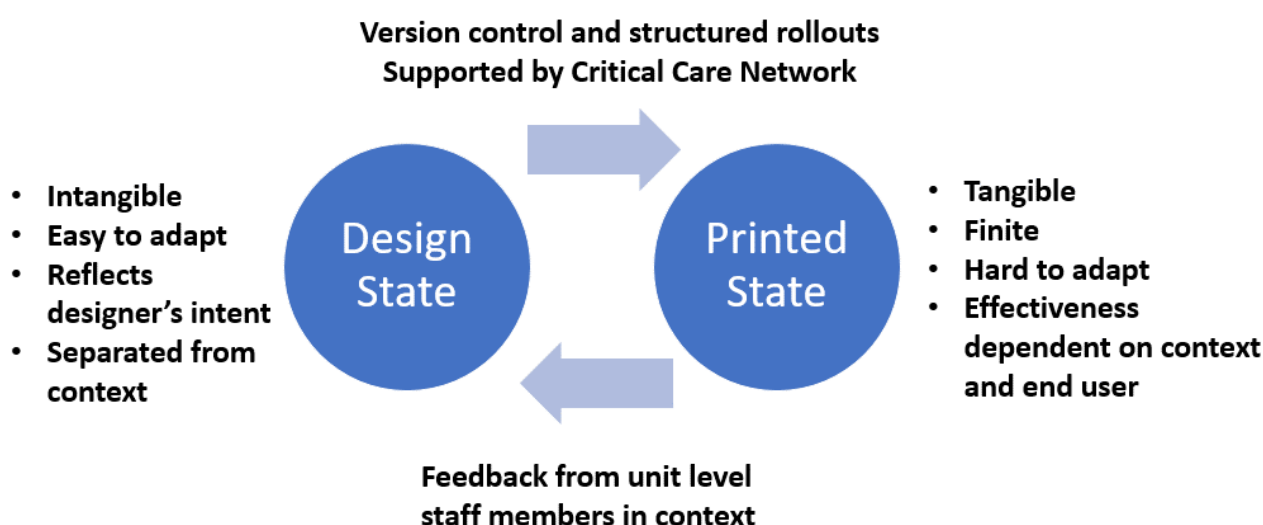


Figure 5: Cycle of document development between design and printed states

4.4 Modelling the transfer of Experience: Deficit, Re-accumulation and Dissemination

As the coding process progressed, it became increasingly clear that another valuable cultural resource was having a significant influence within the studied context which was not acknowledged by the model generated by the scoping review: staff experience. This concept describes the amalgamation of knowledge and confidence accumulated over time and previous exposure to similar problems.

This resource was seen to be particularly highly valued amongst staff who with roles that require technical knowledge, including pharmacy and especially nursing staff. As part of their role, these groups utilise their own accumulated experience to both anticipate and troubleshoot technical problems, and also draw on the experience of other senior colleagues and unit level leaders. As time progresses, individuals naturally form loci of experience, as certain members of staff gain reputation as having a particular interest or skill in respective areas, and subsequently support the unit's overall experience through peer lead teaching and mentorship.

Experiential knowledge is gained through repeated exposure to similar tasks and challenges. Subsequently, as the implementation process disrupted the status quo and introduced a new and unfamiliar process, the unit found itself with a sudden local lack of experience. The introduction of a new method of anticoagulation in renal replacement seen in the case-study was a particularly disruptive example, as the knowledge required to carry out the new process safely was both complex and held severe consequences for failure to adapt.

This local experience deficit was felt by all staff groups, but the negative impact was particularly evident within the nursing cohort. Buy-in to the project was threatened by anxiety, due to both the perception of increased risk, and the increased a fear of personal and professional consequences due to the existence of a "blame-culture" felt more heavily by this staffing group.

Experience deficit also had a particular impact on older and more senior unit staff members- these staffing members had accumulated a larger reserve of experience and subsequently were seen to rely on this resource more heavily than more junior members of staff. As a group with more to lose, this group were generally seen to be more resistant to change and required more support to secure their buy-in during the early phases of the project.

During the early phases of implementation, it became necessary for staff to re-accumulate the lost supply of experience. In part this was achieved through exposure- the critical care unit did not cease to provide care, and ongoing requirement to manage and trouble shoot new challenges meant that the unit environment formed an "arena of hands-on technical experience", and a slow and steady re-accumulation of experience amongst staff. However, this process is slow, and in the early phase of implementation, demand for experience was outstripped by what could be provided by exposure alone. Experience was therefore drawn on from external sources, essentially scaffolding this process and partially mitigating the negative effect of deficit during the transition.

Many of the early documents produced were heavily adapted from existing documents developed at other sites having undergone similar implementation projects. The leading consultant drew on existing external feedback and resources in other comparable contexts and these went on to be integrated locally- they describe the inception of the project as stemming from positive anecdotal evidence from these sites and the presence of an available pre-existing source of experience resource was a major driver in the conceptual phase of the project.

Industry support was also drawn on to supplement experience deficit, and this support was felt longitudinally across senior leadership, documentation and unit level staff. As an outside agent with experience of similar implementations at multiple sites, industry representatives provided staff training, a source of early feedback for training documents, and support through a helpline number.

As important as development and accumulation of this resource amongst individual staff members was, a major driver to implementation success was seen to be related to the effective dissemination of the subsequent “reservoir of experience” amongst multiple staffing groups, such that the whole cultural unit benefits. Re-examining the scoping review highlights examples where poor dissemination of accumulated experience led to failure, as large discrepancies between junior and senior team members lead to “failure to plan for failure and underequipped and overwhelmed junior staff members.” (Kydonaki et al., 2019)

In this case effective dissemination of experience was seen to occur through two main routes- directly, through peer lead training, unit level leaders and “super user” champions, and indirectly through document feedback and iteration.

Document-led dissemination of experience was focused around a key training document- the educational workbook, which underwent multiple cycles of development as unit-level experience was fed back from end users who had encountered problems in the technical arena, and subsequently incorporated into training documentation.

To summarise the information detailed above, the flow of experience has been modelled pictorially in **Figure 6**.

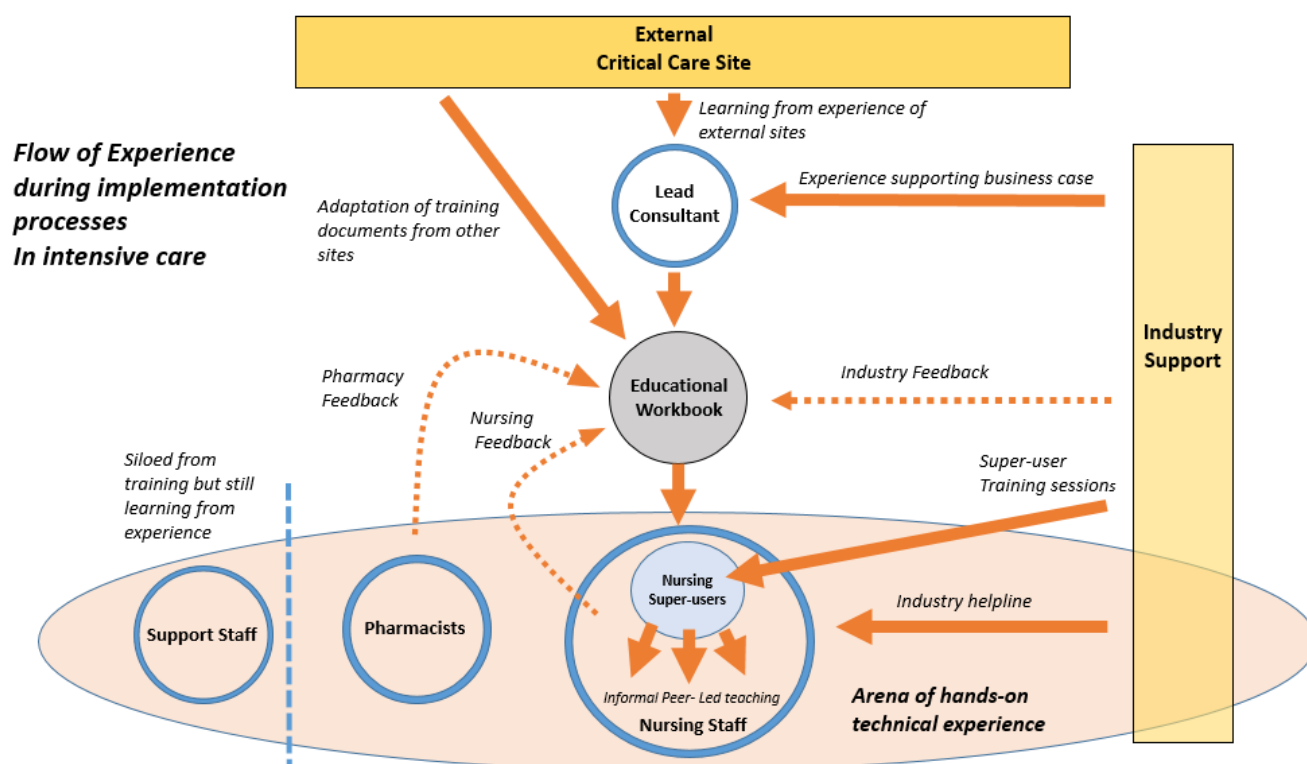


Figure 6- Modelling the flow of experience in the conceptual and early phase. Dotted arrows represent cycles of feedback as experience is fed back into documents and processes.

Differences in Knowledge-base and Education between staffing subgroups

Scoping review sources indicate that a wide discrepancy exists between the baseline knowledge of different individuals and within and between staffing groups. Education was seen as a major factor in levelling these differences and establishing consensus and shared vision. However, it is interesting to note that the nature of the education received within the case study differed significantly between staffing groups, and attitudes towards expected staffing roles certainly played a part in this.

The majority of formalised education was directed at nursing staff, including training sessions and educational workbooks, and this exchange of knowledge and experience was supported by peer-led exchange of technical and troubleshooting knowledge gained through exposure on the unit level.

In addition, multiple participants highlighted their communications with the pharmacy team as being particularly important in this case study. The increased emphasis on effective communication with these staffing groups compared to what was seen in the scoping review is perhaps unsurprising, considering this particular intervention concerns a fundamental change in strategy regarding drug administration, while a majority of interventions studies reviewed in chapter 2 concerned early mobilisation strategies and subsequently put a greater emphasis on physiotherapy teams. However, this does reinforce the idea that deep consideration of context is critical- not only that of the quality of cultural interactions within the unit, but also consideration of which specific disciplinary subunits need to communicate and adapt to any given insult to the status quo of that culture.

Members from other staffing groups found themselves relatively isolated and effectively siloed off from these internal communication and education pathways, despite feeling like they may have benefited from involvement in the training exercises. Housekeeping staff were noted by multiple unit staff members to hold a key role in the early success of the project, helping the unit to adapt to the new logistical and storage requirements the intervention demanded on the unit. Consequently, this group felt a low overall ownership in the process, with staff member's investment mainly driven by a broader overall investment and trust in senior leadership.

4.5 A culture of openness and approachability, and the importance of medical consultant personality

Modelling the importance of multidisciplinary communication in the arrival at consensus through development of a culture permissive to change was a key outcome of the scoping review in chapter 2. In this chapter, this was discussed mainly through an examination of the different roles played within different staff groups, and the importance of interface between these.

However, analysis of the qualitative study also demonstrates how the **quality** of inter- and intra-disciplinary communication is itself dependent on wider shared cultural values held by the unit. Within the context of the case study unit, multiple participants highlighted the importance of a culture of openness and approachability. In general, unit level staff felt comfortable communicating openly with senior colleagues, across disciplines and grades. This culture generally supported unit level ownership and reduced the presence of adversarial relationships.

A high degree of interprofessional trust characterised the “emotional landscape” of the unit. Staff of all grades noted the credibility of leadership, established not just through this implementation but

over years of accumulated goodwill. Senior staffing put trust in staffing groups to active targets and this led to higher degree of perceived autonomy amongst pharmacy and nursing staff. Staff members felt respected, and professional pride to meet expectations further supported buy-in.

The consequences of the absence of a culture of openness and approachability was evident in multiple examples of poor unit culture described within the scoping review, where a lack of approachable senior medical staff lead to perception of poorer intradisciplinary communication, staff disempowerment and subsequently poorer buy-in. (Eakin et al., 2015; Holdsworth et al., 2015; Kim et al., 2019)

Analysis showed a clear internal pathway for the cascade of information down from senior leadership to unit level leaders and educational documents, and subsequent dissemination to unit level staff. Critically, this culture of approachability facilitated frequent feedback about issues and targets for improvement from unit level staff back up to unit level leaders and senior leadership. In facilitating two-way communications, implementation became cyclical as feedback became incorporated into subsequent phases. Broader studies regarding culture in healthcare systems support this idea. Dixon-Woods et al. (2014) discuss the critical importance of “organisational intelligence”, and the “active seeking of uncomfortable and challenging information” from staff, rather than reliance on more indirect outcomes. Their research agrees that unit level staff are frequently more accurately aware of systemic problems within the organisation but are frequently find themselves relatively powerless to enact change, whereas those with authority find themselves more detached and ignorant of these real-world issues.

In the scoping review, senior physicians were identified as occupying an extremely important role in shaping critical care unit culture. Multiple sources identified these individuals as being positioned at the top of both implicit and explicit hierarchies, with their participation within implementation projects being viewed as extremely important for overall success (Bjurling-Sjöberg et al., 2018; Kydonaki et al., 2019). Although multiple staff members were able to express and contribute viewpoints, the scoping review data framed these individuals as final decision-makers, leveraging their authority to alter workflow directly, or by lending this to nominated unit-level leaders. The scoping review also touched on the subjective importance of autonomy amongst members of this group, with tensions arising where changes threatened this. (Wysham et al., 2017)

Analysis of the quantitative study data generally supports these broad ideas, but also provides some additional insights into the dramatic impact that senior physicians can have on the culture of a critical care unit. Importantly, it must be recognised that the demands of the high acuity environment of critical care leads to several key structural differences when compared to other care units within the hospital organisation. A relatively smaller number of patients are admitted onto the critical care unit at any one time, and these patients require more intensive management, typically of one or more life-threatening conditions. As such, a particularly high degree of authoritative senior medical oversight is seen in comparison to other hospital units, and subsequently the personality of individual medical consultants has a disproportionate impact on the culture of the unit as whole.

This presents a point of vulnerability, as multiple interview participants pointed to examples where personality clashes between consultants have the potential to impair communication within and between staff groups, and lead to factions of opposing opinion forming. A relatively flat senior hierarchy was perceived amongst consultants and senior administrative leadership, meaning that any conflicts of opinion are less easily resolved by deferring to codified organisational hierarchical arrangements. Instead, a stronger importance is placed on social resolution, emphasising pre-existing personal and working relationships. Where consensus is not met, this presents an extreme barrier to

development of a culture of openness and approachability and has the potential to hamper unit wide communication.

However, during the implementation of citrate anticoagulation the high individual impact of consultants was also seen in a positive context, where enthusiastic and charismatic leadership qualities within medical leadership was seen to shape and drive implementation culture. A combination of clear and consistent vision and enthusiasm from the lead consultant was important in inspiring buy-in from others at both senior and junior leadership levels. A high-energy hands-on approach allowed the project to overcome “institutional inertia” within the conceptual phase, and despite a degree of moral support and oversight provided from other consultant peers, the early implementation at the studied site was driven and sustained largely by one key consultant.

As a relatively new consultant on the ward, this forceful personality-driven approach did not completely align with unit-level staff’s understanding of the way change was typically introduced into the unit, and also lead to tension through the perception of senior dissatisfaction from more junior staff who felt high pressure to meet deadlines overcome practical hurdles at a rate which some perceived to be unrealistic.

This case-study examples demonstrates many qualities of “Transformational Leadership”, a leadership style characterised by idealised influence- manifesting as high charisma, and inspirational motivation. The culture of openness and approachability which this promoted subsequently correlates to the other two pillars of transformational leadership- intellectual stimulation and individualised consideration, where strong supportive relationships are established with followers who are encouraged to act autonomously to drive growth and improvement. (de Zulueta, 2016; Hickman, 2010)

Sources of authority and credibility, and transfer of this resource to support change.

An additional non-tangible resource which can be modelled and mapped is that of credibility- where does the trust in senior leadership which is important for the development of a functional culture of openness and approachability arise, and how is this transferred between different staff groups?

In essence, credibility was seen to arise from others’ perception of having professional competence and knowledge, and, importantly, having support from others who are perceived to possess these attributes.

For the purpose of modelling the accumulation of credibility in influential individuals within the case-study, sources of credibility can be sorted into 3 broad categories, although a degree of overlap does exist between these. These 3 categories are described below, and also summarised in **Figure 7**.

Credibility through association with credible external organisations

KDIGO (Kidney Disease Improving Global Outcomes) is a globally recognised organisation which produced a publicly available evidence-based guideline advocating for CRRT as a best-practice standard of care in patients requiring renal replacement. Association and alignment with these guidelines supported early arguments in the conceptual phase and facilitated the formation of senior consensus. More locally, the regional critical care network also provided credibility through existing reputation.

Credibility through Anecdotal Evidence

In early conceptual phase, CONS1 sought out first-hand and anecdotal experiences from similar sites who had undergone changes in CRRT anticoagulation, bolstering their own personal knowledge of practical challenges, outcomes and staffing opinions to support credibility at both conceptual phase and within early phase.

Furthermore, pre-established positive personal and anecdotal reputations of the medical consultants and other staff members including pharmacists lead to an increased baseline credibility, which would likely have been absent if this project had been chaired by an individual who was not already known and generally well-liked and respected amongst senior and unit staff.

Credibility through Cultural Position

Finally, credibility was also seen to stem from individuals' cultural position at the arrangement level of unit culture- staffing group. Staff members tended to associate members with these positions of responsibility as having an inherent authority and credibility. This source of trust and respect was seen most prominently in discussions with support staff, whose own investment was seen to stem heavily from shared belief and deeper assumptions that members within these positions of authority are generally trustworthy, with less reliance on the other sources.

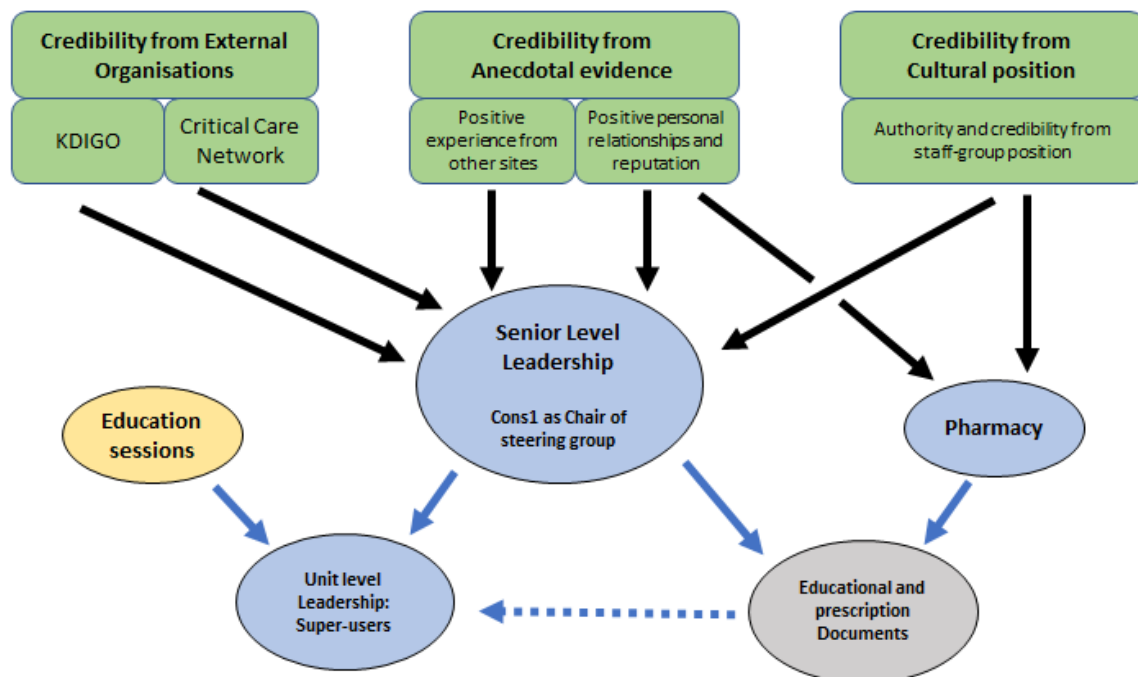


Figure 7- Modelling the transfer of authority and credibility in the conceptual and early phase. 3 key sources of credibility are drawn on by senior leadership, who then draw on the cultural other staff groups to support development of credible documents and unit level leadership.

Senior level leadership, and specifically CONS1, was the primary locus of credibility during the early phase. This individual accumulated the majority of their credibility before or during the conceptual stage, and then bestowed this credibility to nominated unit level leadership “super-user” champions. These individuals also supported their own knowledge (and subsequently credibility) from internal and external education sources- sessions provided by industry representatives, and the in-house educational documents. These documents gained additional credibility through support from pharmacy, whose cultural position and established and trusted reputation as gatekeepers of prescription safety made recommendations regarding drug dosages more acceptable to nursing staff who have a particularly deep investment in patient safety.

The credibility and authority awarded to consultants within critical care was highlighted by multiple sources within the scoping review, and Rees et al. (2020) in particular showed that project leaders and champions within less culturally authoritative positions were less empowered to voice opposition/ challenge to vocal opponents of change. It therefore seems likely that the fact a medical consultant headed this project rather than a more junior doctor, regardless of other factors contributing to credibility, was likely to have been a major factor in bypassing cultural barriers.

Different cultural subgroups recognised these sources of credibility to different degrees. Consultant and pharmacy groups interviewed were more likely to take external guidelines and organisational credibility into account during formation of their own buy-in. Nursing staff responded positively to credibility from externalised evidence, but also put a higher emphasis on credibility stemming from positive anecdotal and personal relationships and by cultural position, leaning on personal trust and the inherent and assumed cultural authority provided by the staff roles of consultant and pharmacist, respectively. Support staff, including housekeeping, derived trust primarily based on cultural position of authority, with little to no direct impact of credibility from external organisations. In this group, an understanding and assumption of knowledge and positive motives of senior consultant leadership was sufficient for personal trust and investment.

As such, it is possible to postulate that the success seen within the case-study stemmed from an appropriate balance of credibility sources to allow for a wider consensus of buy-in from all cultural subgroups. Similarly ambitious initiatives stemming from staff group positions considered to be less authoritative may lack the buy in of support staff, whereas an insufficient external evidence base or lack of an established personal reputation may struggle to gain support of nursing or senior medical groups.

It is also important to recognise that this credibility does not extend to areas which lie outside of expected technical competence associated with staff group position. In the scoping review, some sources indicated that staff may respond particularly well to physician educators due to perception as more credible and higher cultural authority from their staff position. However, within the case study, medical staff contributed to education primarily via documentation, but found themselves less equipped to educate on technical and troubleshooting matters due to separation of staff roles. As seen in the scoping review, nursing staff filled this role with peer-education amongst more credible unit level leaders, themselves backed with their own credibility as technical experts (Bjurling-Sjöberg et al., 2018; Mørk et al., 2018).

4.6 Buy-in and Ownership

Within the scoping review, the buy-in of multiple staffing groups was consistently seen to be important in establishing consensus and motivating staff to bypass other barriers to change. To this end, it is useful to further examine what factors contributed to the personal investment of members of differing staff groups.

As discussed above, ownership was an extremely powerful driver of individual buy-in, seen across multiple staffing groups. The qualitative review mirrors the conclusions of the scoping review, in that culture of approachability and effective multidisciplinary feedback structures presents opportunities for staff to feel heard and contribute their own experiences into educational resources which subsequently improved the relevance and quality of these resources.

However, the qualitative study data indicate that the nature of ownership and relative perceptions of agency to enact change within the critical care unit were felt differently amongst different staffing groups. Interestingly several members of staff reported a sense of powerlessness and “fatalism” as they came to the view the implementation was inevitable. Significantly, their perception shifted from **ownership of the change** to **ownership of the consequences** of a poorly executed implementation. The idea of ownership for these unit-level staff groups was framed as control of **how** the change in practice was implemented.

Generally low levels of ownership were seen in support staff including housekeeping. Members of these groups were generally seen to be siloed off from education and training, and despite also developing their own understanding of technical and logistical challenges involved in the implementation process, they were generally less involved in feedback processes, leading to increased resource inefficiencies. In these groups, ownership was seen to arise primarily from the direct and anecdotal credibility of unit-level leadership, and indirectly from trust in leadership from the medical consultant team.

The qualitative study also identifies another important factor determining buy-in which was not identified by the scoping review- that of motivation through professional and career advancement. This motivator was seen across multiple staff groups, and both medical consultants and industry representatives highlighted their own personal desire to establish and demonstrate their own personal competence within the role as a major driver for the project’s initial inception and driver in the conceptual phase.

A culture of engagement with quality improvement projects is “baked-in” to artefactual layer of NHS organisation to an extent. Implementation projects provide members of nursing staff with the opportunity to fulfil criteria necessary to their own progression within the hierarchy, with advancement to new pay bands (and the responsibilities within) partially gated by demonstration of engagement with quality improvement. This was certainly seen to extend to the critical care context, and conversely examples where nursing staff felt they were not able to secure career advancement opportunities through participation in implementation projects were discussed as one of the factors leading to an a poorer “emotional landscape” and generally lower unit level motivation.

“Safety Culture” and its different interpretation amongst cultural subgroups-

After artifacts and arrangement, Schein describes the second layer of culture as “shared values, beliefs and vision” (Schein, 2010). While shared values amongst all interview participants are certainly present within the data, interesting differences in how these values are interpreted were evident between different staff groups.

Differences in perspective were particularly evident with regards towards attitudes to patient safety and outcomes. All participants expressed improvement of patient outcomes as a driver of buy-in and a strong shared motivator towards the success of the project. However, deeper exploration revealed how this “Safety Culture” influences implementation initiatives and highlights a degree of nuance in the understanding of what success means for different staffing groups.

Nursing staff tended towards narrower focus towards individual patient outcomes and safety, likely due to their extremely high personal contact to patients. This phenomenon is likely to be seen in other hospital units but may be exaggerated in the context of critical care due to the one-to-one arrangement of nursing care, coupled with the acute, life-threatening conditions seen in patients receiving intensive care. Safety Culture as a focus on individual and anecdotal patient safety within this group had a complex influence on buy-in within this group- high drive to address perceived threats to patient safety lead to a high overall buy-in towards document iteration and in pushing for robust educational support during the early phase.

However, several interviewed participants described instances where an “overzealous” drive towards safety hindered implementation, both through staffing anxiety, resistance and at extremes outright refusal to accept changes. Interestingly this phenomenon also correlates with similar results seen in the scoping review. Holdsworth et al. (2015), Lin et al. (2020) and Rees et al. (2020) all highlight instances where nursing staff were extremely resistant to changes where there were perceived patient safety concerns, even if evidence did not support these concerns.

Consultant perspectives tended towards patient safety tended towards “bigger picture” thinking, where patient outcomes tended to be discussed at the level of population benefit, wider but more marginal improvements and volume of patients helped. A very different attitude towards risk was seen- whereas nursing staff were seen to be extremely risk-averse, interviews with the leading consultant made it clear that a period of increased risk, while not desirable, was considered to be expected and necessary for lasting and effective change. More focus was placed on sustaining changes and anticipation of future threats to established change, especially that of resource scarcity.

Although this potential issue was generally well-navigated through good communication and education within the case study, this example does highlight how poor consensus surrounding both what constitutes project success, and of underlying of the evidence base can lead to friction and resistance between staffing groups.

This difference in perspectives is not a new concept and has been recognised and explored in depth across previous literature. In their exploration of the role of “virtue-management” within the NHS, it was noted that the relative importance of an emphasis on compassion varies from context to context and between staffing role, with a generally higher relevance for nursing staff compared to an expected and “cultivated” emotional distance and dispassion held by surgeons (and in this case senior medical staff). Compassion within nursing staff was suggested to be venerated, and indeed expected, to such a degree that an excessive “continuous offering of self” was seen to result in stress and burnout (Harris & Griffin, 2015; Pedersen & Roelsgaard Obling, 2019). Pederson and Obling (2019) argue that while

overall delivery of compassionate care is important, the degree with which staff engage with compassion “must necessarily be a role-based and task-specific exercise”.

Clearly, these findings are generalisations of larger trends in contrasting attitudes, and do not imply that senior medical staff do not also consider safety on an individual level, nor that unit level staff never consider wider impacts of change initiatives. Speaking with a degree of reflexivity about my own conscious and unconscious beliefs about what should constitute safe care, I would not argue that the presence of a safety culture within any hospital unit is a negative attribute, and certainly would not advocate for a more reckless approach to change within critical care environments.

However, these data indicates that Safety Culture is also not a universally positive feature; instances where staff beliefs surrounding outcomes do not correlate with evidence base present strong barriers to consensus. Unfortunately, where this barrier existed in literature examples, it was able to override other facilitators and was only partially alleviated by targeted documentation and education (Lin et al., 2020). As anecdotal and personal experience tended to be particularly highly valued within the nursing cohort, strategies to emphasise and incorporate these evidence types when developing education and training initiatives may be more likely to be effective in navigating this barrier where nursing concerns around patient safety exist.

Important impact of nursing anxiety as a key cultural factor

Anxiety surrounding change was seen to be a significant factor impacting buy-in, especially that of nursing staff. Examining the sources of this anxiety, the three most commonly identified factors were fear of patient harm, fear of personal culpability and professional consequences for mistakes, and the threat of increases to personal workload.

Several cultural factors were seen to lead to particularly high levels of anxiety surrounding change in nursing groups; multiple interview participants acknowledged the existence of a “blame culture” within nursing, with higher perceived culpability for fault in this staff group and fear of severe punishment for mistakes. As mentioned above, unit-level nursing staff, particularly older team members, are especially dependent on peer-led sharing of accumulated experience within the unit as a mechanism for anticipating and troubleshooting problems and acting as a “safety-net”. Novelty is therefore seen as a threat to this experience, and subsequently nurses found themselves highly invested in securing additional sources of effective external support for experience. In this way, anxiety was seen to drive iteration and improvement, as implied cultural ownership of any failure of the project lead to high investment in project success.

Where anxiety was excessive, however, buy-in was negatively impacted, as staff members disengaged and refused to participate where they did not feel competent or safe to provide care. The potential of increasing anxiety amongst unit-level staff to lead to “burn-out” and staff shortages is extremely well-known, with an estimated global shortage of 3.2 million nurses being predicted by 2030. Anxiety was seen to influence nursing perceptions of documentation, framing some documents as time consuming, potentially representing duplication of effort and adding relatively little value, but frequently necessary to defend themselves from the threat of blame. This presents a potential barrier to acceptance of new documentation (Dixon-Woods et al., 2014).

The concept of “blame culture” within the NHS is well studied, and this phenomenon is certainly not unique to critical care with some considering this culture to be ubiquitous amongst almost all

healthcare contexts where a hierarchical organisational management structure exists. Existing literature discusses the impact of greater organisational management structures, which may broadly be divided into a control-based style or a commitment-based style (Khatri et al., 2009).

In control-based management, staff have limited autonomy and ownership, with an inherent belief that staff members should not be trusted to regulate their own behaviours. In commitment-based management, a focus is created on generating an “environment that encourages the exercise of initiative, ingenuity, and self-direction on the part of employees in achieving organizational goals” (Khatri et al., 2009).

It is postulated that in the latter style, blame culture is less likely to develop in favour of a more positive “Just culture” characterised by learning and honest and open sharing of information. When considered in the context of the case study, this concept correlates closely to the features of the “culture of openness and approachability” identified within the case study unit, and possibly points to a relative lack of oppressive blame culture in the studied context compared to comparable scenarios of toxic culture presented in literature.

It is somewhat outside the scope of this study to fully explore this component of nursing blame, which appears to have deep roots in the wider organisational hierarchical and political arrangement of the NHS, not limited to critical care. However, appreciation of the impact this additional pressure has on the nursing sub-culture is significant to critical care implementation, and the overall health of wider nursing culture should be considered when planning future implementation efforts.

Chapter 5: Conclusions and Recommendations

5.1 Introduction to Chapter 5

In this chapter, the final conclusions surrounding the influence of culture on implementation within a critical care environment are presented. The strengths and limitations of this study as a whole are evaluated, and avenues for further research projects are outlined in the context of the findings of this thesis. Finally, key conclusions and recommendations for future practice are summarised in bullet point form.

5.2 Conclusions and Recommendations for Future Practice

Changes in healthcare rarely (if ever) occur in isolation, and the study of cultural and behaviour factors is essentially the study of human context. In the same way that specialist hospital units function in different ways, people interact in different ways within these differing organisational constructs.

It is not new to suggest that factors such as communication, education, leadership, documentation, and local buy-in influence the effectiveness of implementation, both on a healthcare stage and amongst organisations more generally. However, in narrowing focus to the critical care unit, the results demonstrated by both the scoping review and qualitative study indicate several points of nuance which may be useful to consider for those enacting future implementation projects in similar contexts. During this project, the lens of viewing the critical care environment as dependent on simultaneous presence of multiple resources was used to model the change process and highlight these important contextual differences.

Several of the more unique cultural characteristics of the critical care unit present barriers and vulnerabilities to this resource driven culture which must be overcome. Due to the culture of high senior oversight, critical care units are particularly susceptible to the influence of individual medical consultant personality and leadership style. While it is unreasonable to recommend that these individuals fundamentally change their approach and management style, the high impact these individuals have on organisational culture should be taken into account, particularly during the conceptual planning phases of implementation. Medical consultants likely to be involved in leadership positions throughout the project should be identified and the design of the implementation should be informed by a consideration of the specific leadership styles and strengths and weaknesses of these key individuals. Although potentially politically and emotionally charged, the nature of personal and social interactions between these individuals should also be accounted for, as lack of consensus or personal friction between senior medics has the potential to be extremely detrimental to the unit culture of communication.

Approachable leadership depends on the subjective credibility of individual leaders and the ability of these individuals to support the credibility of documentation and of their nominated champions. The multiple ways in which credibility is accumulated and utilised is important, and different staff groups respond to these different types of credibility in different ways. During the conceptual phase, leaders should consider where they intend to derive their own credibility and strive to support this with a

balance spanning each of the three pillars of external evidence, anecdotal, and cultural authority to promote maximum buy-in across staff groups.

Even more so than other hospital units, critical care culture is arranged and structured around a rigid 24-hour routine. Existing documentation bundles are highly interlinked and tailored to this routine, and specific effort should be made at the document design stage to minimise unnecessary disruption to existing workflow. Documentation bundles must exist as specific and tangible objects within this environment, so more mundane considerations including storage, version control, and user-friendly graphic design use should not be overlooked when designing for context. Ideally, document designers should be very familiar with the use-case context and have open lines of communication for feedback from the end-users. The most effective documents are those which are not static but iterate and tailor to the specific needs of the unit, and this approach should extend to these mundane logistical considerations as well as the quality of content and integration into routine.

When considering implementation projects in terms of a progression through multiple phases, it should be recognised that different barriers to project success are present at different time points. At the conceptual phase, implementation must overcome barriers of evidence, funding and “institutional inertia”. During the early phase, the unit has an increased reliance on externalised support to cover relative deficits in experience and education, and to support administration and documentation. These needs should be anticipated during the conceptual phases, and planning should recognise that the availability and routines of external organisations may not match the demands of the critical care context. Local experience deficit presents the biggest vulnerability to project success and patient safety outside of traditional office hours. Where possible, clear plans should be made to ensure that some form of robust support is available out of hours.

Implementation culture within the critical care unit is at its strongest when it facilitates staff feedback and supports cycles of iteration and improvement as the project becomes established. Both senior and unit level leadership should design implementation projects to encourage frequent feedback from all staff groups, both positive and negative. Feedback is most effective when it is collected, reviewed and implemented in controlled and structured cycles, and sources of internal or external administrative support should be drawn on to provide this structure if this is practical and appropriate to the scale of the implementation.

In a broader sense, these iterative cycles were seen to flourish where a culture of approachable and credible leadership is present, as this environment empowers more junior staff to feed back their accumulated technical experience and develop personal ownership. Although this culture should be prioritised and nurtured during implementation cycles, it is important to recognise that cultures of approachability are established over longer periods of time, rather than simply being “switched on” during change efforts. As such, approachable leadership and constructive criticism should be encouraged at all times, not only during designated periods of innovation and change.

The personal investment of multiple staff members in project success is important for navigating predictable and unpredictable barriers. Although members of different staffing groups may share broad cultural values, such as promotion of patient safety, individual motivators and understanding of “success” vary between subgroups, and poor alignment between these understandings can interfere with success. Conversely, buy-in amongst almost all staff groups is strongly supported where existing organisational culture frames quality improvement as an opportunity for career progression and as pre-requisite to demonstrate career competence. Where possible, change initiatives should lean into this ideal from the design stage, looking for opportunities to offer staff members new skills,

competencies, “sign-offs”, portfolio building credits or other similar demonstration that an initiative can provide direct personal value to those involved.

Nursing buy-in is strongly tied to anxiety stemming from concerns surrounding workload, safety and personal culpability for error. This behaviour stems in part from a wider blame culture which is not unique to critical care but is endemic within NHS organisational structure. As a barrier to buy-in of this key staff group, critical care implementation efforts should acknowledge that novelty is inherently threatening to this staffing subgroup and seek to mitigate its effect on buy-in through emphasis on education surrounding individual patient safety and consideration and communication of how changes to workflow and documentation may affect nursing workload.

As seen in the highly interlinked network of documentation within critical care, similarly highly interlinked workflow processes exist between members of different staff groups, such that change has extremely wide-reaching consequences. Although knowledge demands on support-staff are clearly different to those of nursing and medical staff, opening additional channels of communication may have led to increased buy-in from these staff members, and created additional cycles of feedback during the early and established phases. One consequence of poor interdisciplinary communication seen within the case study is that of excessive wastage due to lack of understanding between nursing and housekeeping staff. The additional resource cost of including otherwise siloed staffing groups in training and feedback exercises should be weighed against potential cost of wastage and lower levels of ownership amongst these groups.

Summary of recommendations

- Identify senior medical staff likely to be involved in leadership positions throughout the project and adapt design to complement specific leadership styles and strengths and weaknesses of these key individuals
- Leaders should strive to support credibility this with a balance of external evidence, anecdotal, and cultural authority to promote buy-in across staff groups.
- Aim to integrate documents and interventions into existing 24-hour routines, and minimise disruption to workflow processes
- Maintain strong feedback channels for end-users to communicate problems to senior members of staff
 - These channels are most effective when they are also open between implementation efforts
- Implement changes to address problems in coordinated waves to maintain version control and consensus
- Identify external means of providing support to staff vulnerable to knowledge and experience deficit. Robust support should be accessible 24 hours a day in the early phase of implementation

- Align implementation goals with individual staff goals supporting opportunities for training, portfolio development and career progression
- Address nursing anxiety early and often during implementation- wherever possible, avoid increase of nursing workload or reduction to nursing staffing levels
- Consider ways to involve additional support and logistical staff including housekeeping, porter staff, and medical engineering into feedback channels to minimise unforeseen workflow disruption and foster investment and buy in within these groups

5.3 Strengths and Limitations

This study aimed to identify how both organisational culture, and individual behavioural factors influence the effectiveness of the implementation of change within critical care contexts, using the above case study as an example. As discussed in the introduction, while it is possible to examine and focus on individual elements of an organisational culture, such as leadership or communication, these elements do not exist in isolation. To effectively discuss the implications of these important factors, the wider context and interplay between the function of the unit must necessarily be explored, or at least acknowledged.

This has several consequences for the analysis and discussion of the qualitative data collected. Firstly, recognition that the scope of the question itself is extremely broad, and that to fully appreciate the complexity of culture in any case-study a researcher would have to develop an intimate understanding the day-to-day working of the unit, as well of each individual working within the unit and their own unique deep assumptions, biases and pre-existing relationships. Secondly, it is important to appreciate that this context extends beyond the organisational construct of the healthcare unit, into both the wider context of the health care unit's position within the hospital, and within the National Healthcare Service and beyond.

The strength of single case study with multiple embedded units approach as guided by frameworks set out by Yin (2017) and Baxter & Jack (2008) is that this methodology allows for an exploration of these cultural phenomenon while keeping the wider context in the frame. In limiting this study to the exploration of 9 people's perspectives within a single unit and project, it is recognised that the data collected reflects a snapshot of this overall complexity. However, in looking at how the interactions between these individuals was shaped by the existing culture and context within this critical care unit, and in turn, how the process of implementing change altered these interactions and inner workings of the unit, it was possible to identify several interesting findings which may be found to be useful when considering future implementation efforts within this or similar healthcare contexts, as well as identifying potential vulnerabilities in this system which may need to be considered.

Although efforts were made to make this study as rigorous as possible, there were multiple limitations to the study design which need to be considered when interpreting the results.

The implementation project being studied had occurred approximately 5 years prior to the interviews being carried out. Although this did have the benefit that the change in practice was demonstrated to have been fully established and sustained over this period, and also permitted some questioning on features contributing to this longevity, it did pose some challenges regarding data collection.

Interviews required participants to rely on memories which may be unreliable over this timeframe. Further, overall opinions about the implementation may have been tempered by participants' retrospective knowledge of the project outcome, rather than being a more accurate representations of opinions and emotions felt during the early implementation phases when success was more uncertain.

Although efforts were made to represent as many different staff groups as possible, there were some groups which are not represented by the study cohort. Notably absent are perspectives from doctors more junior than consultant level; although some interactions with these staff members were referenced within the interview, the lack of personal experiences from junior doctors represents a relative blind-spot in the data collected by this study. This was partially due to the relatively high turnover within this staff group as they rotate between multiple sites, specialities and sub-specialities during their training. Although a junior doctor was identified by the study gatekeeper, contacted and initially consented to a remote interview, they unfortunately failed to respond to further communications. Additional support staff groups exist within the critical care setting, including physiotherapists, dieticians, domestic and administrative staff. Time-permitting, interviews with members from these groups may have also improved overall understanding of the context of the unit at the time of implementation.

Inherent in qualitative research is the acceptance that personal biases of both the interviewer and participants will have an impact on the data collected to a greater or lesser degree. In interviewing a single individual from each discipline, there is the understanding that the collected data opinions and perspectives obtained are more vulnerable to influence of the personalities and opinions of each individual rather than being more representative of the wider staff group. If time and funding permitted, recruitment of a larger interview cohort would have mitigated this concern. However, it should be noted that as staff members in the studied unit, these personal biases and opinions within participants do make up part of the wider context and therefore have merit when examining unit culture.

As staff were required to comment on actions of past and current colleagues it is likely that a high degree of intrapersonal bias was present as participants may have avoided negative comments surrounding staff who they have good personal relationships with. Although this is a limitation in the sense that it may have interfered with the objective accuracy of the account of the implementation process itself, these intrapersonal relationships and interactions are key to underlying culture of the unit, and a design which removed this factor may have also lost this important factor in when considering these interactions.

As described in chapter one, I am also aware that while my position as an employee within the health board being studied granted me useful access to staff members and participants, my own working relationships with many of the participants is likely to have had a significant conscious and unconscious influence on the way in which the interview was conducted. My own awareness of maintaining relationships with interview participants, some of were my senior ranking medical colleagues at the time of data collection, is likely to have influenced specific lines of questioning. While this can be seen as a limitation, it is also true that having an existing professional rapport with some participants may also have been beneficial, as colleagues may have felt more comfortable speaking candidly from a professional who also exists within the system and shares some degree of understanding of the subtext of medical practice.

Between the inception and initial design phase of this project and the data collection period, the COVID-19 pandemic altered what was practical to achieve during this study. Staff from intensive care

units became harder to access, and new restrictions regarding distancing during interviews were put into place. As such, the scope of the study, which had initially been designed as an exercise to compare and contrast the implementation of this intervention at multiple sites was revised to focus on a single site. In addition, interviews were initially planned to be conducted in a face-to-face environment, but due to distancing restrictions these interviews were instead rescheduled to be conducted remotely via virtual conferencing software. It is difficult to say what impact this may have had on the quality of the data collected, but it is possible that there is additional nuance to the answers which was lost due to the inherent barriers of virtual interviews.

5.3 Avenues for Further Research

This study has gone some way into exploring how context-specific cultural features within critical care affect how change implementation processes occur within this environment. As indicated by the scoping review, there is still a relative paucity of literature which specifically addresses organisational culture in this context, and there are several appealing avenues for further research to build upon the data collected in this thesis.

The original design of this study was intended to encompass similar changes occurring within multiple hospital sites, although unfortunately these efforts were constrained by time and additional unanticipated circumstances. Further studies addressing organisational culture's influence on critical care implementation would likely benefit from a broader case study inclusion group to allow for sharper comparisons to be made.

Comparison between multiple comparable critical care sites would be useful to highlight contextual cultural variation and allow for better judgement on which cultural factors are more likely to be generalisable to the wider context of other critical care units. However, multiple case-studies looking at implementation of comparable interventions which are also occurring simultaneously in a non-critical care environment would also be extremely useful in demonstrating features which are more context specific to this unique hospital environment.

The impact of the scale and scope of implementation presents another interesting variable which could be studied. For example, the impact of authority and credibility on adoption of smaller scale changes such as individual quality improvement projects arising from more junior members of staff is likely to be significantly different to the major implementation examined in this case-study.

The qualitative study retrospectively explored an implementation project which was successful in terms of becoming embedded into the standard practice of the studied unit. This was useful in allowing examination of factors which lead to the change becoming embedded but follow up studies could also examine similar changes which failed during the implementation process or be designed to follow the implementation as it happened, as opposed to retrospectively, to reduce the influence of poor memory or outcome-bias in interviewed participants.

A significant body of documents were generated over the course of this single implementation, and this reflects a low-hanging fruit when it comes to the study of surface-layer culture of artifact and arrangement. Use of dialectical research methods on the language used within protocols, training documents and meeting minutes may be useful as an insight into this layer of culture and how it relates to some of the deeper assumptions discussed within this body of research.

Finally, this project was planned and initiated before the impact of the COVID-19 pandemic. As a researcher interviewing intensive care staff during the early stages of the COVID-19 response, it was clear that the unit was experiencing an unusually high degree of change and implementation, often over a rapid time scale of weeks/ days. An examination of how the pre-established cultural norms within this environment shifted and the differences in how implementation processes occurred during this period may provide useful learning points about areas of organisational and cultural vulnerabilities and indicate how future emergency/crisis implementation may be more effective.

Summary of Research Recommendations

- Scope for further study:
 - comparing the impact of culture on similar changes in multiple hospital sites
 - investigating whether cultural impacts differ with the scale of implementation
 - investigating cultural impacts on projects which failed to become established
 - exploring the impact of training documentation in more detail
 - exploring the impact of culture on implementation projects during COVID-19 and how these processes differ from pre-pandemic channels

5.4 Final Conclusions

- Implementation initiatives within critical care environments are highly culture-dependent, and the development of cultures which positively support change are themselves dependent on internal and external resources
- Change occurs over multiple phases, which each demand different types of resource. These phases are not well-defined, and movement through phases progresses gradually as the unit adapts to new demands
- Highly interlinked workflow processes exist between members of different staff groups, such that change has extremely wide-reaching consequences which may extend outside of expected areas
- Critical care culture is arranged and structured around a rigid 24-hour routine, and existing documentation bundles are highly interlinked and tailored to this routine.
 - Specific considered effort should be made at the document design stage to integrate into this routine and minimise unnecessary disruption to existing workflow
- Effective documentation must be highly adaptive to context, and the iteration and improvement of documentation is facilitated by cultures of communication facilitating feedback from end-user to designer
- It is important to recognise that cultures of openness and approachability are established over longer periods of time, rather than simply being “switched on” during change efforts.
- Critical care units are particularly susceptible to the influence of individual medical consultant personality and leadership style
- Credibility is accumulated by leaders through multiple routes, and different staff groups respond to these different types of credibility in different ways.
- The personal investment of multiple staff members in project success (Buy-In) is important in navigating predictable and unpredictable obstacles to change.
 - Staff anxiety presents a barrier to buy-in, and this effect is seen most prominently within the nursing cohort
 - Communication surrounding implementation should seek and address nursing concerns at an early stage and throughout implementation to foster consensus
- Buy-in is strongly supported where quality improvement provides opportunity for career progression and allows staff to demonstrate competence.
 - Change initiatives should look for opportunities to offer staff members new skills and provide direct personal value to those involved.

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Appendix 1 - Charting of papers included in Scoping review

EMBASE

Title/ Reference/URL	Type of research	Change implemented	Group Studied	Organisational/ cultural/ behavioural Drivers identified by authors	Organisational/ cultural/ behavioural Barriers identified
1. Nurses' perceived barriers and educational needs for early mobilisation of critical ill patients Kim C, Kim S, Yang J, Choi M. Nurses' perceived barriers and educational needs for early mobilisation of critical ill patients. Aust Crit Care. 2019;32(6):451-7.	Cross sectional and descriptive study of structured questionnaire	Early mobilisation interventions	155 Critical care nurses	<ul style="list-style-type: none"> Nurse educators present Relevant guidelines/protocols Presence of specialist nurse champions 	<ul style="list-style-type: none"> Absence of relevant education High workload Lack of time Inappropriate nurse/patient ratio
2. Early mobilisation of ventilated patients in the intensive care unit: A survey of critical care clinicians in an Australian tertiary hospital. Lin F, Phelan S, Chaboyer W, Mitchell M. Early mobilisation of ventilated patients in the intensive care unit: A survey of critical care clinicians in an Australian tertiary hospital. Australian Critical Care. 2020;33(2):130-6.	Cross-sectional questionnaire	Early mobilisation interventions	82 participants. Nurses, physicians, and physiotherapists who have a role in patient mobilisation in the ICU	<ul style="list-style-type: none"> Staff belief in benefits of change Clear protocols and set roles MDT staff meetings Key leaders and unit champions 	<ul style="list-style-type: none"> Discrepancy between staff beliefs on safety vs literature Role ambiguity between disciplines Lack of time, personnel, and resources Beliefs regarding risks to staff Over-sedation of patients
3.Challenges and barriers to optimising sedation in intensive care: A qualitative study in eight Scottish intensive care units. Kydonaki K, Hanley J, Huby G, Antonelli J, Walsh TS. Challenges and barriers to optimising sedation in intensive care: a qualitative study in eight Scottish intensive care units. BMJ Open. 2019;9(5):e024549.	Focus group interviews of staff	Three interventions for improving sedation: analgesia quality: analgesia management, and analgesia quality feedback	48 ICU clinicians, consisting of Nurses, Physiotherapists and Doctors working in 8 ICU	<ul style="list-style-type: none"> None specifically identified 	<ul style="list-style-type: none"> Lack of ongoing education past initial implementation Increased workload and lack of staff Rigidity of protocols as tick-box exercises Blame culture Lack of time for education Lack of space and arrangement of ICU Veteran staff adjusting to changes in previously established practices

<p>4. Implementing an intervention to improve decision making around referral and admission to intensive care: Results of feasibility testing in three NHS hospitals. Rees S, Bassford C, Dale J, Fritz Z, Griffiths F, Parsons H, et al. Implementing an intervention to improve decision making around referral and admission to intensive care: Results of feasibility testing in three NHS hospitals. J Eval Clin Pract. 2020;26(1):56-65.</p>	<p>Mixed method study including quantitative assessment of usage and staff interviews.</p>	<p>Implementation of a decision-making tool around referral and admission to ICU</p>	<p>39 ICU consultants, registrars and nursing staff acting as champions for implementation</p>	<ul style="list-style-type: none"> • Smaller sites- easier to reach all relevant staff • Integration with existing daily practice 	<ul style="list-style-type: none"> • Hierarchy limiting opposing or contrasting option to established practice • Lack of status/credibility of champions • Difficulty education all relevant staff in implementation period • Concern regarding increased workload/ duplication of effort
<p>5. Struggling for a feasible tool - the process of implementing a clinical pathway in intensive care: a grounded theory study. Bjurling-Sjöberg P, Wadensten B, Pöder U, Jansson I, Nordgren L. Struggling for a feasible tool – the process of implementing a clinical pathway in intensive care: a grounded theory study. BMC Health Services Research. 2018;18(1):831.</p>	<p>Staff focus groups, interviews and questionnaires</p>	<p>Clinical pathway for patients on mechanical ventilation</p>	<p>31 Nurses, 26 assistant nurses, 11 Anaesthetists, 1 physiotherapist, 3 management staff</p>	<ul style="list-style-type: none"> • Local Enthusiasm for change • Trust in implementation staff • Instilling sense of value and purpose in external facilitators • Clarity of roles, and prior negation of roles in core project group 	<ul style="list-style-type: none"> • Lack of staff knowledge • Staff shortages and high turnover • Limited patient numbers requiring intervention • Unclear roles in implementation group • Lack of emphasis on sustaining intervention post initial period • Prolonged gap between development and intervention- loss of motivation • Vague leadership/lack of ownership[
<p>6. Implementing early mobilisation in the intensive care unit: An integrative review. Phelan S, Lin F, Mitchell M, Chaboyer W. Implementing early mobilisation in the intensive care unit: An integrative review. Int J Nurs Stud. 2018;77:91-105.</p>	<p>Integrative Review</p>	<p>Early mobilisation in adult intensive care units</p>	<p>13 articles addressing QI projects on the implementation of early mobilisation in adult intensive care unit patients; requiring mechanical ventilation with an artificial airway (endotracheal tube or tracheostomy).</p>	<ul style="list-style-type: none"> • Local champions providing leadership from varied professional groups • Multidisciplinary collaboration • Tailoring of implementation to local context • Implementation tailored to identification of existing barriers 	<ul style="list-style-type: none"> • Lack of clear context-specific implementation theories • Lack of strategies to sustain change in project post-implementation

7. Implementation of an Evidence-Based Practice Nursing Handover Tool in Intensive Care Using the Knowledge-to-Action Framework. Spooner AJ, Aitken LM, Chaboyer W. Implementation of an Evidence-Based Practice Nursing Handover Tool in Intensive Care Using the Knowledge-to-Action Framework. Worldviews Evid Based Nurs. 2018;15(2):88-96.	Staff survey	Electronic nursing handover tool	100 Senior registered nurses involved in team leader handover	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> Lack of clear guidance on troubleshooting issues Knowledge deficits Disconnect between what different professions consider useful information Poor integration into existing infrastructure Technological failures e.g. failing Wi-Fi/ lack of integration with existing computers
8. Using Kotter's Change Framework to Implement and Sustain Multiple Complementary ICU Initiatives. Mørk A, Krupp A, Hankwitz J, Malec A. Using Kotter's Change Framework to Implement and Sustain Multiple Complementary ICU Initiatives. J Nurs Care Qual. 2018;33(1):38-45.	Descriptive article	2 complementary quality initiatives, bedside handoff and nurse-initiated interdisciplinary bedside rounds	N/A	<ul style="list-style-type: none"> Champions- early involvement and effective meetings Sense of urgency in MDT Involvement of multidisciplinary stakeholders Definition of clear vision for change Communication of vision Peer led mentoring during implementation Presence of "short term wins" Integration of behaviours into unit culture- formal and informal education of new members on unit 	<ul style="list-style-type: none"> None identified
9. Identifying Barriers to Delivering the Awakening and Breathing Coordination, Delirium, and Early Exercise/Mobility Bundle to Minimize Adverse Outcomes for Mechanically Ventilated Patients: A Systematic Review Costa DK, White MR, Ginier E, Manojlovich M, Govindan S, Iwashyna TJ, et al. Identifying Barriers to Delivering the Awakening and Breathing Coordination, Delirium, and Early Exercise/Mobility Bundle to Minimize Adverse Outcomes for Mechanically Ventilated Patients: A Systematic Review. Chest. 2017;152(2):304-11.	Systematic review	49 articles identifying barriers to the delivery of the ABCDE bundle	49 empirical qualitative or quantitative studies focused on adult ICU assessed ABCDE implementations and identifying barriers to ABCDE implementation.	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> Lack of knowledge and awareness about protocol Lack of conceptual agreement with guidelines Lack of self-efficacy and confidence in implementing protocol Unavailable/cumbersome or unclear protocols Clinician preference for autonomy previous execution associated with negative outcomes Lack of confidence that protocol will improve workflow or improve patient outcomes Perceived workload Lack of clarity in roles/ standards Staff turnover Competing priorities

					<ul style="list-style-type: none"> Limited physical resources/ space Barriers to interdisciplinary communication
10. Overcoming barriers to the mobilisation of patients in an intensive care unit. Dafoe S, Chapman MJ, Edwards S, Stiller K. Overcoming barriers to the mobilisation of patients in an intensive care unit. Anaesth Intensive Care. 2015;43(6):719-27.	Staff survey	Early progressive mobilisation	93 Permanent/semi-permanent ICU staff: medical consultants, senior registrars, nursing and physiotherapy.	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> Insufficient staff education Poor interdisciplinary communication Lack of defined leadership Insufficient funding/ equipment
11. Implementing and sustaining an early rehabilitation program in a medical intensive care unit: A qualitative analysis. Eakin MN, Ugbah L, Arnautovic T, Parker AM, Needham DM. Implementing and sustaining an early rehabilitation program in a medical intensive care unit: A qualitative analysis. J Crit Care. 2015;30(4):698-704.	Semi-structured staff interview	Early rehabilitation programme	20 Staff and clinicians involved In sustaining and implementing the early rehabilitation programme- doctors, nursing, physiotherapy, programme coordinator, rehabilitation services	<ul style="list-style-type: none"> Staff buy-in Inclusion of multiple disciplines Good multidisciplinary communication Local opinion leader involvement Champions from individual disciplines Dedicated personnel to deliver intervention Existing availability of resources Clear protocols Adequate funding and administrative support Staff education Utilisation of strong evidence base Awareness of positive outcomes Financial savings demonstrated 	<ul style="list-style-type: none"> Increased workload Concerns regarding patient safety

Medline

<u>Title/ Reference/URL</u>	<u>Type of research</u>	<u>Change implemented</u>	<u>Group Studied</u>	<u>Organisational/ cultural/ behavioural Drivers identified by authors</u>	<u>Organisational/ cultural/ behavioural Barriers identified</u>
12. What factors affect implementation of early rehabilitation into intensive care unit practice? A qualitative study with clinicians. Parry SM, Remedios L, Denehy L, Knight LD, Beach L, Rollinson TC, et al. What factors affect implementation of early rehabilitation into intensive care unit practice? A qualitative study with clinicians. J Crit Care. 2017;38:137-43.	Semi-structured focus group interviews of staff	Early mobilisation strategies	26 ICU staff members, including Doctors, Nurses, Physiotherapists.	<ul style="list-style-type: none"> • Clinicians' expectations and knowledge • Positive outcomes for patients who participated in rehabilitation • Effective interdisciplinary communication 	<ul style="list-style-type: none"> • Lack of knowledge and confidence in junior staff • Juniors overwhelmed within the high-acuity environment • Conflicting opinions regarding strength of the evidence • Staff and family concern regarding patient safety • Insufficient equipment • Increased workload • Lack of respect from those perceive as higher in the hierarchy • Lack of clear roles • Nursing staff "gatekeeping" patients from physiotherapy input • Lack of nursing time
13. Barriers and facilitators to the implementation of an evidence-based electronic minimum dataset for nursing team leader handover: A descriptive survey Spooner AJ, Aitken LM, Chaboyer W. Barriers and facilitators to the implementation of an evidence-based electronic minimum dataset for nursing team leader handover: A descriptive survey. Aust Crit Care. 2018;31(5):278-83	Staff survey	Introduction of electronic minimum dataset for nursing team leader shift-to-shift handover	39 Senior ITU nurses	<ul style="list-style-type: none"> • None identified 	<ul style="list-style-type: none"> • Non-user-friendly tool • Time consuming • Knowledge deficits

<p>14. Improving intensive care unit-based palliative care delivery: a multi-center, multidisciplinary survey of critical care clinician attitudes and beliefs. Wysham NG, Hua M, Hough CL, Gundel S, Docherty SL, Jones DM, et al. Improving ICU-Based Palliative Care Delivery: A Multicenter, Multidisciplinary Survey of Critical Care Clinician Attitudes and Beliefs. Crit Care Med. 2017;45(4):e372-e8.</p>	Mixed-methods	Integration of palliative care specialists within ITU	303 nurses, intensive care doctors, and advanced practice providers	<ul style="list-style-type: none"> Stakeholder engagement 	<ul style="list-style-type: none"> Concern of loss of autonomy from senior/experienced users Conflict between the goals of nursing team and senior medical team Concerns regarding increased workload Concerns that intervention is too generalised to work in specific cases Concern may detriment patient safety or relationship between patient/family and team Differing opinions about who should be responsible for new duties Lack of nursing empowerment
<p>15. Pressure Injury Prevention in a Saudi Arabian Intensive Care Unit: Registered Nurse Attitudes Toward Prevention Strategies and Perceived Facilitators and Barriers to Evidence Implementation. Tayyib N, Coyer F, Lewis P. Pressure Injury Prevention in a Saudi Arabian Intensive Care Unit: Registered Nurse Attitudes Toward Prevention Strategies and Perceived Facilitators and Barriers to Evidence Implementation. J Wound Ostomy Continence Nurs. 2016;43(4):369-74.</p>	Descriptive cross-sectional survey.	Integration of novel pressure injury prevention strategies	56 Intensive care nurses	<ul style="list-style-type: none"> Collaboration of a multidisciplinary team Easy of obtaining equipment and resources 	<ul style="list-style-type: none"> Insufficient equipment and resources Insufficient staff expertise Lack of authority in those implementing change Staff perceived lack of benefit Lack of cooperation from patients and family members Lack of staff knowledge Staffing shortages High staff turnover Lack time for education
<p>16. A multidisciplinary initiative to standardize intensive care to acute care transitions Halvorson S, Wheeler B, Willis M, Watters J, Eastman J, O'Donnell R, et al. A multidisciplinary initiative to standardize intensive care to acute care transitions. Int J Qual Health Care. 2016;28(5):615-25.</p>	Staff survey, Multidisciplinary summit	Structured handoff tool (checklist) for transfer from ITU	40 key stakeholders including physicians, house officers, nursing staff, and pharmacists, as well as representatives from transportation services, environmental services, and bed flow management.	<ul style="list-style-type: none"> Stakeholder ownership and accountability Regular stakeholder meetings Adoption of checklist 	<ul style="list-style-type: none"> None identified

17. Developing professional habits of hand hygiene in intensive care settings: An action-research intervention Battistella G, Berto G, Bazzo S. Developing professional habits of hand hygiene in intensive care settings: An action-research intervention. Intensive Crit Care Nurs. 2017;38:53-9.	Staff Interviews, questionnaire	Intervention to improve handwashing in clinical practice	16 intensive care staff members	<ul style="list-style-type: none"> • Optimisation of aesthetic qualities environment 	<ul style="list-style-type: none"> • Lack of time • Lack of respect for rules • Technical perfection requested by guidelines • Lack of integration into routine
18. Mobilization of ventilated patients in the intensive care unit: An elicitation study using the theory of planned behaviour Holdsworth C, Haines KJ, Francis JJ, Marshall A, O'Connor D, Skinner EH. Mobilization of ventilated patients in the intensive care unit: An elicitation study using the theory of planned behavior. J Crit Care. 2015;30(6):1243-50.	Staff Questionnaire	Mobilisation of ventilated patients	22 Intensive care staff (no demographic data collected)	<ul style="list-style-type: none"> • Adequate staffing • Communication between multidisciplinary teams • Patient stable and able to engage with intervention 	<ul style="list-style-type: none"> • Unstable patient physiology • Uncooperative, resistive, or disengaged team members • Staff workload • Inexperienced, untrained, or unskilled staff • Patient sedation • Insufficient equipment • Differences in opinion about the strength of the evidence • Reluctance to diverge from accepted practice
19. Intensive insulin therapy implementation by means of planned versus emergent change approach Luiking M-L, van Linge R, Bras L, Grypdonck M, Aarts L. Intensive insulin therapy implementation by means of planned versus emergent change approach. Nursing in Critical Care. 2016;21(3):127-36.	Quantitative Prospective comparative study of interventions in two ITU sites	Intensive insulin therapy	All (119) nurses working across two ITU sites	<ul style="list-style-type: none"> • Participation of unit staff in implementation process • Increased buy-in from staff involvement 	<ul style="list-style-type: none"> • None identified
20. Barriers and facilitators to early mobilisation in Intensive Care: A qualitative study Barber EA, Everard T, Holland AE, Tipping C, Bradley SJ, Hodgson CL. Barriers and facilitators to early mobilisation in Intensive Care: a qualitative study. Aust Crit Care. 2015;28(4):177-82; quiz 83.	Focus group of staff	Early mobilisation interventions	25 ICU clinicians	<ul style="list-style-type: none"> • Increased staffing • Integration into daily routine • Dedicated time and resources for the intervention • Good multidisciplinary communication • Good leadership • Adequate equipment • Adequate training • Linking intervention to patient centred outcomes • Clear guidance about patient population inclusion criteria 	<ul style="list-style-type: none"> • Reluctance to deviate from standard "culture" of unit • Low prioritisation of intervention • Poor communication amongst staff • Lack of staffing • Lack of time • Lack of equipment • Limited training • Patient specific precautions • Increased workload

Additional paper identified through references

<u>Title/ Reference/URL</u>	<u>Type of research</u>	<u>Change implemented</u>	<u>Group Studied</u>	<u>Organisational/ cultural/ behavioural Drivers identified by authors</u>	<u>Organisational/ cultural/ behavioural Barriers identified</u>
21. Barriers and Strategies for Early Mobilization of Patients in Intensive Care Units Dubb R, Nydahl P, Hermes C, Schwabbauer N, Toonstra A, Parker AM, et al. Barriers and Strategies for Early Mobilization of Patients in Intensive Care Units. Ann Am Thorac Soc. 2016;13(5):724-30.	Systematic Literature review	Early mobilisation strategies	40 studies	<ul style="list-style-type: none"> • Development and implementation of protocols-particularly interprofessional • Increased staffing • Purchase of equipment • Staff training • Regular inter-professional staff meetings • Changes in clinical documentation • Mobility champions • Timely feedback • Concerns regarding staff safety 	<ul style="list-style-type: none"> • Limited staff • time constraints • Lack of program/protocol • Inadequate staff training • Limited equipment • Lack of permissive culture • Lack of staff knowledge and expertise • Early mobility not a priority • Lack of support or staff buy-in • Lack of patient/family knowledge • low staff morale • Unclear job expectations, roles, and responsibilities • Staff turnover or change in leadership

Appendix 2- Interview Topic Guide

Awareness and knowledge

I would like to ask you about your awareness of the implementation of citrate-based anticoagulation in Renal Replacement Therapy within [Case Study Unit]

- How would you describe what actually changed?
- What was your understanding of why the change occurred- what were the expected benefits?
 - Probe: Were you aware of any evidence/recommendations around the change?
- Were you aware of similar changes having been done at other sites?
 - Probe: Successfully or otherwise
 - Did this influence how you viewed this change?
- How would you describe how your awareness/knowledge changed over time?
 - Do you think any factors were particularly important in influencing how your own understanding or awareness changed?
- How would you describe your perception of the awareness/knowledge of different members of the team?
 - Probe: broadly similar or different

Skills/ Education

I'm now going to ask you some questions about education and training surrounding the implementation.

- Did you receive any education or training?
- Can you tell me how education was provided?
 - Probe: Who provided it?
 - Probe: Do you feel it was adequate/effective?
 - Probe: Was it sustained?
- Did you play a role in provision of education?
- What was your understanding of the aim of the education?
- What do you think about the resources/time allocated for education?
 - Probe: Money/time- Were these adequate?
- How would you describe how the education and training provided has changed over time?
- Were any specific documents/ paperwork provided as training?

3. Motivations, Acceptance and Beliefs (“Buy-in”)

I would now like to ask some questions about your opinions and beliefs surrounding the change

- How would you describe your general opinions regarding the change?
 - Probe: generally for/against?
- What factor do you think had the biggest impact on your opinion?
- Did your feelings about the implementation change over time?
- How would you describe your initial thoughts about how the change would affect patients?
 - Probe: Positive or negative
 - Probe: Short term vs long term outcomes
 - patient safety, comfort
- How did you feel about how the change might affect you?
 - Probe: personal investment/buy in/ stake
 - Probe: effects on day to day life
- What was your perception of the opinions of other staff members towards the change?
 - Probe: Do you think opinions varied between different groups?
- Do you think staff opinions affected how successfully the change was implemented?

Leadership

I’m now going to ask about the impact of leadership on the project

- Did you know who was involved in leading the implementation?
 - Probe: Was it always clear who was driving the project?
- How were leadership roles determined?
 - Probe: were they defined? When?
 - Did everyone agree?
 - Did they change over time?
- Did you have a specific role in driving or implementing the change?
 - Probe: What was it?
 - Probe: Was it clear?
 - Probe: Has it changed?
- What was your perception of the impact of leadership on implementation?
 - Probe: management vs unit level
 - Probe champions/ super users
 - Probe: Credibility/ authority
- Do you think hierarchy amongst staff had any impact on the implementation process?

Contextual factors

Next I'd like to ask your thoughts about how the context of an intensive care unit influenced this change

- Do you think implementation of change in ITU differs from other areas of the hospital?
 - Probe: do any factors make it easier?
 - Probe: do any factors make it more difficult?
- Do you think there are any factors specific to this unit which affect how easily this change in practice was implemented?
- What are the differences between the ITU between **[Case study hospital]** and other units?
- Do you think any of these differences affect the success of the implementation of citrate anticoagulation?
- Some members of staff worked in multiple groups and had multiple roles during the implementation process. Do you think your position within the ITU influences how you interacted/ perceived the implementation process?
 - Probe: Management vs Frontline
 - Probe: Individual unit vs Super user between units
 - Probe: **[Case study hospital]** vs other units

Practicalities/ Resources

- Do you think the unit's resources influenced the implementation process?
 - Probe: Was anything you needed already in place?
 - Probe: Did anything need to be changed
- Do you think staffing affected how successful the implementation was?
 - Probe: Staffing levels/ staff turnover
- What impact did regulatory levers or financial incentives have influencing the change?
- Was there any support from external bodies present?
 - Probe: Industry support?
- Do you believe the change can sustained in the long term?
 - Probe: why?

Communication and multidisciplinary team involvement

- What can you tell me about the communication between staff and leadership during the implementation process?
- What can you tell me about the impact of communication between multidisciplinary teams?
- Do you think this communication has changed over time?

Documentation

- Do you think that documentation affected the success of the implementation?
 - Probe: protocols
 - Probe Education
- Any new documents developed?
- How were they integrated into existing context?
 - Probe successfully or otherwise?
- Did you identify any barriers presented by documentation?

Summary

Which one factor do you think was most important in driving the implementation?

Which one factor do you think presented the biggest barrier?

Appendix 3- Participant Information Sheet

Project Title:

Implementing Regional Citrate anticoagulation in CRRT: A case study investigating how cultural and behavioural factors influence practice change within an intensive care setting.

Project Background

My name is Jack Easton, I'm an Academic Foundation Year 2 Doctor working between the Respiratory team in **[Case Study Hospital]** and in Primary Care.

As part of a Masters by Research (MRes) project, I'm investigating how communication, culture within organisations, and behavioural factors influence how changes are implemented within intensive care units.

To investigate this, I am looking at the change from heparin-based protocols to regional citrate anticoagulation in continuous renal replacement therapy within the **[Case Study Health Board]**, which occurred in 2015.

You have been approached to volunteer to participate because of your own involvement in the implementation of this change.

How will the study be carried out?

I will be conducting semi-structured interviews with consenting participants. These interviews will last for approximately one hour, and will cover a variety of topics involving your experiences around the implementation process. A short debrief will occur off the record after the interview is completed.

Due to social distancing limitations imposed due to the COVID 19 pandemic, these interviews will need to be carried out remotely using video-conferencing. I will conduct these video calls from a private study within my own home, and participants are encouraged to engage from their side from a convenient and private location.

These interviews will be recorded, and transcribed. These confidential transcriptions will be anonymised, and only myself as the Principal Investigator will have access to identifiable information. Project supervisors may review anonymised information during the analysis, and anonymised quotations may be included in the final write up. Data will be stored on a secured laptop and deleted within 12 months of the completion of the study.

I will use qualitative research methods to analyse the transcripts for common themes and ideas which will support my final conclusions

Participation is optional, and consent may be withdrawn at any time up to publication- at this point any data/recordings/transcriptions from you will be discarded. You also withhold the right not to answer any questions asked.

How will we use data about you?

In this research study we will use information provided by you regarding your job role and recorded interview transcripts. We will only use information that we need for the research study. We will let very few people know your name or contact details, and only if they really need it for this study.

Everyone involved in this study will keep your data safe and secure. We will also follow all privacy rules, including those set out by GDPR.

This information will include your name and contact details. I will use this information to do the research and to check your records to make sure that the research is being done properly. However, people who do not need to know who you are will not be able to see your name or contact details, and your data will have a code number instead.

Once I have finished the study, I will keep some of the data for up to 12 months so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study.

What are your choices about how your information is used?

- You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.
- We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

Where can you find out more about how your information is used?

You can find out more about how we use your information:

- At www.hra.nhs.uk/information-about-patients/
- By sending an email to [Jack.easton2@wales.nhs.uk]

Care of participants

I do not anticipate that we will cover any emotionally difficult subjects during the course of the interview. However, if you feel that you would benefit from discussing any of the issues raised during the interview, I would encourage you to seek support from your line manager or occupational health representative.

Who can you contact for more information about the study?

I'm more than happy to be approached before, during or after the study to answer any further questions, and I can be contacted at Jack.easton2@wales.nhs.uk

Appendix 4- Participant Consent Form

Study Number:

Participant Identification Number for this trial:

CONSENT FORM

Title of Project:

Implementing Regional Citrate Anticoagulation in Continuous Renal Replacement Therapy: A case study investigating how cultural and behavioural factors influence practice change within an intensive care setting.

Name of Researcher: Dr Jack Easton

Please initial box

1. I confirm that I have read the information sheet dated 25/02/2020 (v0032.0) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. ☐
3. I agree to the interviews being recorded and written out in full; ☐
4. I agree that anonymised quotes may be published; ☐
5. I understand that relevant data collected during the study, may be looked at by individuals from Bangor University and BCUHB where it is relevant to my taking part in this research; ☐
6. I understand that the information collected may be used to support other research in the future, and may be shared anonymously with other researchers. ☐
7. I agree to take part in the above study. ☐

Name of Participant

Date

Signature

Name of Person taking Consent

Date

Signature