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How do healthcare workers understand and manage their work in relation to the use of an Early Warning Scoring System?

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How Do Healthcare Workers Understand And Manage Their Work In Relation To The Use Of An Early Warning Scoring System?

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Abstract

Background

Retrospective review of the care of patients who have suffered unanticipated clinical deterioration often reveals that there have been errors in their management. Many of these patients show minor changes in their physiology as premonitory evidence of catastrophe. This can be used as an Early Warning Score to secure earlier involvement of clinicians experienced in managing critical illness. Such systems have not been consistently associated with improved patient outcomes and audit has revealed that in as many as 60% of cases, where the trigger score is exceeded, junior doctors do not review the patient in person as required by the protocol.

Aim

To investigate how issues between professions, issues between disciplines, and authority patterns affect the medical and nursing team's responses to critical events in the context of formalised protocols for the management of adult patient deterioration.

It was hoped that this would help explain why clinical staff do not follow the protocol.

Method

The sample included doctors, nurses and healthcare assistants (n=40) who used an Early Warning Score. Sampling was initially purposive and restricted to clinical staff but was extended to include ward and trust managers in response to the early interviews. Data was collected by semi-structured interviews over a nine-month period starting in January 2015. The methodology was qualitative, using constructivist grounded theory. It was characterised by iterative development of interview questions, simultaneous data collection and analysis and theoretical sampling. Data was held in NVivo for Mac™ version 11.4 and analysed for themes, from which core concepts emerged, allowing the construction of theory.

Findings

A number of major categories emerged. Prominent amongst these was the theme of conflict between the requirements of the rapid response system and other aspects of the first-responder doctors' work. Another concept emerging was a disjunction between the medical and nursing teams in their understanding of the Early Warning Score. The doctors use the score as an indicator of the severity of disease, in order to help them manage their overwhelming workload, whereas the nurses and healthcare assistants use trigger events to secure the assistance of the medical team in resolving uncertainty. If the outcome of a call is an unchanged management plan the doctors consider this to be a wasted effort whilst the nurses see it as a positive contribution to care.

Conclusion

Discussion includes consideration of the idea that this dichotomy comes from the medical and nursing teams having different mental models of practice, and epistemologies of patient care. The importance of dissimilar mental models and philosophical paradigms in the context of teamwork is discussed. Such disjunctions may occur in other situations where different professions cooperate in clinical teams. Models of practice may differ between professions and reflect their different roles in patient care.

Acknowledgements

I thank my supervisors Reverend Professor Pauline Pearson and Dr Alison Steven for their constant support, advice and encouragement. At the start I was a total novice in qualitative methods. They guided me and helped me develop understanding of these new ideas and stayed with me until the end. To Mr. Hugh Gallagher, my thanks for supporting me through the lengthy process of obtaining clinical access to undertake this research and for convincing his colleagues that participating was worthwhile. I am very grateful to these doctors and nurses who gave interviews so frankly and honestly. Finally thanks to my family: my husband David for his advice and support and my children Alice, Tom and Daisy for their unquestioning faith that I was capable of accomplishing this work – even when things were not going well.

Writing in the first person

Medical, Scientific writing is conventionally in the passive voice and third person. Goodman and Edwards have commented that this results in ugly unwieldy English (Goodman and Edwards 2014). Webb has argued that in the case of qualitative research the use of the third person obscures the role of the researcher in constructing the data (Webb 1992). This position has been endorsed by Guba and Lincoln (Guba and Lincoln 2005). In accordance with this advice this thesis uses the first person and the active voice whenever appropriate.

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others. The work was done in collaboration with Newcastle-Upon-Tyne Hospitals Foundation Trust and Northumbria NHS Trust. Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the University Ethics Committee (4.5.2014) and the NRES (7.10.2014) external committee.

I declare that the Word Count of this Thesis is 81,399 words.

Name:

Signature:

Date:

CHAPTER ONE: INTRODUCTION

1   CHAPTER ONE INTRODUCTION

This study is an exploration of the perceptions and reflections of the members of the medical and nursing teams who used the Modified Early Warning Score to attempt to differentiate the few patients on the threshold of unexpected deterioration, from the many whose progress was uncomplicated.

The chapter comprises:

- An explanation as to why I chose to conduct this study.
- An introduction to the mechanisms of EWSs and RRSs. I will describe the use of 'Track and Trigger' Early Warning Systems and Rapid Response Systems to attempt to improve the management of unexpectedly deteriorating patients on general wards; and explain that the evidence that these interventions improve patients' outcomes is inconsistent.
- Adoption of RRS as a national policy
- The failure of the RRSs to improve patient outcome

1.1   Why I Undertook This Study

> *"It is hard to think of an intervention in the last two decades that has been implemented in such a widespread fashion, and so effectively, but with so little evidence, as Rapid Response Systems." (Buist and Mahoney 2014)*

During the course of my career I have had many opportunities to see first-hand how patient-management is complicated by hierarchies and professional boundaries between individual team members. As an ICU sister with responsibilities for coordinating the management of complex patients, requiring advanced therapies and multi-professional cooperation. I observed that, on some occasions, delayed responses due to problems with communication contributed to the severity of illness seen in the unit. One particular incident, which resulted in the death of a 58 year-old man, had a critical influence on my career. As a member of the cardiac-arrest team I was called to a ward to see a patient at 07.00 on a Sunday morning. The patient had been transferred to an orthopaedic ward earlier in the weekend after a period in Intensive care following a motorbike accident. Ten years previously he had had a laryngectomy for a carcinoma that had left him with a tracheostomy. On arrival on the ward I saw two Pre-Reg (year 1 of practice) House Officer, doctors trying to do an oral endotracheal intubation and failing to ventilate the patient. This was a terrible error, as the patient's pharynx was no

longer connected to the trachea. Ventilating the tracheostomy would have easily resolved the difficulty, in seconds. The ward nurses had quit the scene when the cardiac arrest team arrived, so there was no one present to tell the doctors about the patient's history. This case went to the Coroner's court and as a member of the team I was cross-examined by the families' barrister. This experience was sobering, and has stayed with me. I realised that there was inadequate team organisation around the resuscitation attempt. Had the ward nurses stayed, they would have told the doctors that the patient had a tracheostomy, and the major error of attempting oral intubation would have been avoided. Why had the ward nurses, who raised the alarm, left the scene as soon as the cardiac arrest team arrived? Was it because the resuscitation protocol did not allocate them a role in the resuscitation team? This incident helped direct my interest towards education and practice development on the ICU.

At this time, circumstances within my Trust demonstrated how troublesome lack of professional cooperation could be. Following a trust merger, the state of transition, required changes to staffing, and the development of joint management protocols and standards. The resulting tensions often delayed progress. Problems arose amongst both the medical and the nursing teams, precipitated by the need to work on two sites. Staff were asked to develop joint working practices. Joint management arrangements were developed to support this 'whole Trust' approach, with little time for staff to adjust. It was around this time that I began to understand how factors relating to staff relationships, teamwork etc could affect the progress of appropriate clinical care. Once more I observed that unclear responsibilities across hierarchies and between professions interfered with the management of patients.

One reason for these organisational changes was the introduction of a key NHS guidance – 'Comprehensive Critical Care' (DoH 2000). The re-classification of patient dependencies in Intensive care with the publication of this advice called for all staff in general wards to be educated in high-dependency skills. As part of the local trust response to I was appointed as a lecturer-practitioner with the brief to introduce inter-professional. Introducing a Trust-wide physiological observation chart with an integrated early warning score demonstrated, again, the impact poor inter-professional cooperation had on patient care, and introduced me to the concept of 'track and trigger' monitoring.

I came to understand that implementing change successfully required that it be deeply understood by the staff involved. I also arrived at a significant conclusion: that, no matter how beneficial a change of practice can be demonstrated to be, clinical teams will often resist it. I saw that this resistance was greatest where a new system of working cut across existing patterns of responsibility, and that an important factor in this was to be found in the sociology and culture of the groups of staff involved. A major change would cut across numerous teams and the dynamics of these would differ, so a good solution in one area would be unacceptable in another - for reasons that had little to do with efficacy. Ten years later, when I began to read about the failure of RRSs to work as expected, I was not surprised, and immediately suspected that a major reason would be the complexities of multi-professional teamwork.

Another aspect of my career that has shaped my approach to this research topic is my experience of the investigation of clinical errors. In 2009 I was appointed as a portfolio manager in the Northern Strategic Health Authority's Patient Safety Directive. My work involved reviewing reports of clinical errors with senior trust managers. The opportunity to review these cases in the Trust's context gave me a vital insight into system failure at micro and macro levels. In my investigative role I liaised with Trust governance departments and I often found that they would be resistant in giving the details of incidents. These experiences have taught me that, at the individual, middle management and corporate level, unpalatable truths about responsibility for errors will be denied.

At the national level I have also had experience of the investigation of clinical incidents through my work representing the Royal College of Nursing on the Steering Committee of the National Confidential Enquiry Into Patient Outcome And Death (NCEPOD). The literature relating to the assessment of missed deterioration, discussed at length throughout this thesis, almost always relies upon a third party, 'outsider' team deciding where clinical errors have occurred and defining their importance. I believe, on the basis of my experience, that the 'home team' will often not accept the designation of 'error', and will reject the conclusions of many investigations. This makes audit adversarial and the learning of lessons becomes a slow process.

Throughout my career I have also observed that managers supporting quality initiatives become obsessed with the system, and its application, rather than concentrating on

clinical outcomes. The Quality Care Commission has confirmed my beliefs, about the investigation of clinical mishaps, by finding that not one Trust in the UK was dealing adequately with the investigation of unexpected deaths (CQC 2016, NHE 2016).

I have set out these experiences in detail, both to show how they have prompted my investigation, and also to make clear at the outset that I came to these topics with significant experience of the field. I will explain the difficulties this can present for a researcher and describe the decisions I made to resolve these (Section 3.4.1.2).

When early investigations of the outcome of RRSs found little change this was attributed to technical issues in using the protocol. More recently some analyses have suggested that socio-cultural and professional issues might be affecting its function, in ways that I had myself observed on the wards. I hoped by this study to contribute to these understandings.

1.2 Early Warning Scores and Rapid Response Systems

1.2.1 What Is 'Unexpected' Deterioration?

The problem that the RRS seeks to address is that of patients, who were not expected to have problems, but who suddenly and unpredictably deteriorate. This deterioration is sometimes not recognised or is incorrectly managed. This is thought to worsen the prognosis.

Deterioration is the situation where a patient's condition worsens. In the context of Rapid Response Systems 'significant' deterioration is a major worsening of the patients status, which usually requires prompt intervention to prevent further decline. Patients known to be at greater risk of deterioration are generally more closely watched, whether on general rewards or specialised units. The context of this investigation is those patients whose progress is expected to be one of gradual improvement. As such they are customarily managed on general wards. Their level of dependency is 0-1.

1.2.2 Early Warning Scores, Rapid Response Systems and Medical Emergency Teams

In order to attempt to ensure rapid mobilisation to counter incipient deterioration, physiological scoring systems and associated algorithms have been developed. Over 30

different early warning scoring systems have been reported, and there are many more unreported local variations. The second step, the 'calling criteria' are also extremely varied. The EWS and calling criteria comprise the afferent side of the system and define how staff are alerted to a patient at risk.

1.2.2.1   Early Warning Scores

The early warning score is aggregated from vital signs data. When one or more criteria are exceeded the system 'triggers' and the nursing staff on the spot are required to inform the medical team. These systems are often called 'track and trigger'.

1.2.2.2   The Rapid Response System

The efferent limb of the RRS determines who will respond to a trigger event. This may be the doctor who is first alerted by the nurses. They may in turn call their 'home medical team', a nurse specialist led ICU outreach team or a specialised team with members experienced in recognising and dealing with critical illness. Figure 1 shows the elements of an EWS and RRS.

Figure 1 The Components Of An Early Warning System

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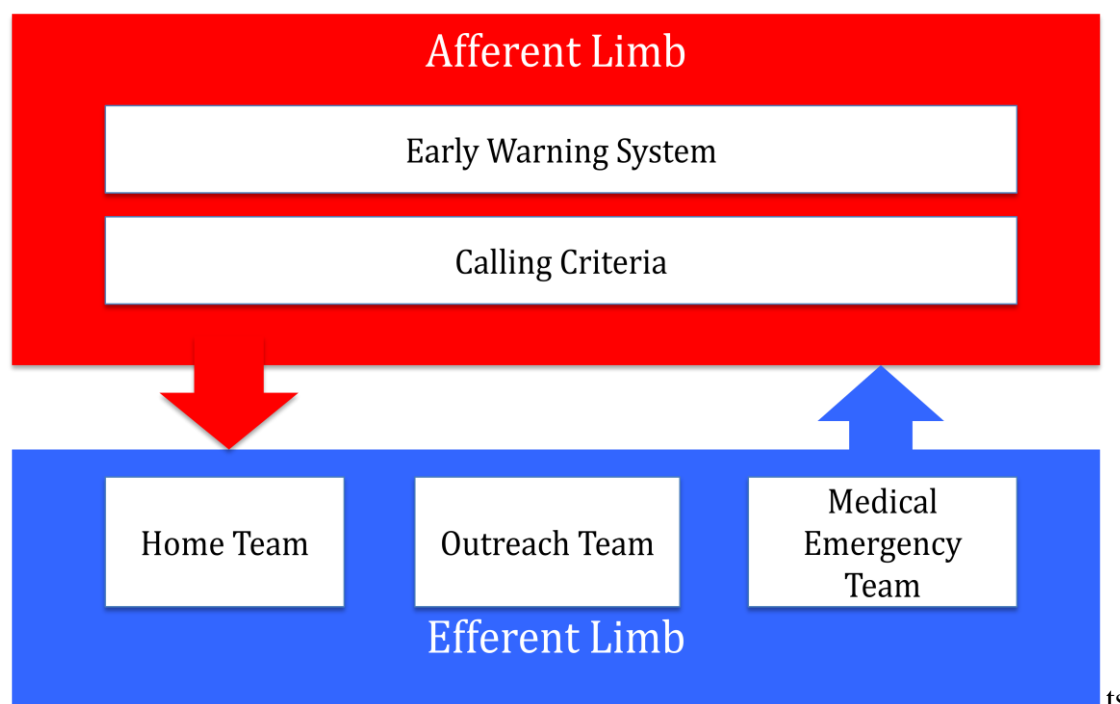
1.2.3 Which Patients 'Trigger'?

Figure 2 presents a diagram of the possible outcomes of patients who are being monitored by an EWS

Figure 2. The Possible Outcomes For EWS Monitored Patients

Patients who do not trigger	Patients who never deteriorate	
	Patients who collapse without	Need changes to the treatment plan
Patients who trigger	Patients who recover spontaneously	
	Patients who should not have been monitored by the MEWS system	
	True MEWS positives	Need changes to the treatment plan

Patients whose EWS reaches the calling criteria are a heterogeneous group. Some patients should not have been considered for resuscitation, and should have had a 'Do not attempt resuscitation' (DNAR) order in place. Some patients should have had their calling criteria changed, because some pre-existing condition means that they reach trigger values too soon. Some patients should have had their calling criteria modified to prevent a further alert following a trigger and review. Some patients are in the early stages of a potentially remediable deterioration and it is these individuals on whom the system is targeted.

1.2.4 Experience with EWSs and RRS

It was expected that a system that identified patients at an early stage of deterioration, thus permitting early intervention, would lead to better outcomes. However, audit of mortality, length of ICU admission and length of hospital stay has not shown consistent improvement. The literature relating to outcome is discussed in Chapter 2.4.

1.3   Recommendations to use EWS in practice

In the United Kingdom the National Institute for Health and Care Excellence has recommended that a standard, appropriate Early Warning System (EWS) be universally adopted in acute care (NICE 2007). The Royal College of Physicians has led calls for a standard system to be adopted by all hospitals, and has endorsed a National Early Warning Score (NEWS) that is largely derived from the Modified Early Warning Score (MEWS) - the subject of this study (Royal College of Physicians 2012). The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) is an authoritative medical charity that undertakes targeted reviews of healthcare practice and has, for three decades, been a major driver for the improvement of care. It has recommended that an EWS be used in the day-to-day management of acute medical and surgical care. (NCEPOD 2012, NCEPOD 2015).

In the USA similar advice has been given in a national campaign called "Save a Hundred Thousand Lives" (McCannon, Hackbarth et al. 2007) and in Australia as "Essential Element 3" in the management of acute care (Jones, George et al. 2008, ACSQHC 2010). In these days, when such store is laid on evidence, it is surprising that EWS and RRSs have been so widely endorsed in the absence of consistent evidence that they lead to improved outcomes.

Recently, however, it has been suggested that the use of EWSs and RRSs is supporting a model of care that is fundamentally unsound (White, Scott et al. 2015, Wendon, Hodgson et al. 2016). Indeed, one of the consultant intensivists interviewed in the course of this research expressed the opinion that the MEWS diverted attention from the real issue: that doctors who look after unstable patients do not possess the necessary knowledge and skills to recognise and treat the problems. She saw RRSs as a poor second to better staffing, and better education – a position that finds support in NCEPOD's 2002 report on cardiac arrests.

> *"It is inappropriate for the referral and review of a critically ill patient to be at SHO level or lower, and in such a situation, telephone advice without examining the patient is unacceptable."* (NCEPOD 2002)

1.4   The Evolution of RRSs

In 1997 Morgan published a very short paper (only 350 words), reporting the observation that many patients who suffered catastrophic deterioration on general wards

had abnormalities in their vital signs that portended the event (Morgan, Williams et al. 1997). The paper described a simple scoring system, based on routine vital signs monitoring, that was claimed to give warning of adverse events. One of its virtues was that, as it used data that was already being collected, so the process of recording and calculating the early warning score took less than 30 seconds (Morgan, Williams et al. 1997). Since then a great deal of effort, and resource, has been directed into identifying the optimal scoring system and the most efficient and effective way of responding to patients who show high scores. A variety of algorithms for detection and treatment have been devised, implemented and audited. They all comprise a scoring system for identifying 'trigger events', with associated instructions about reporting (The Afferent Limb), and a system for responding to alerts (The Efferent Limb).

Research publications and editorials from the years following Morgan's description reveal that many critical care specialists believed that a major cause of inadequate management of serious illness was that their specialty was not involved at an early stage (McQuillan, Pilkington et al. 1998, Buist, Jarmolowski et al. 1999, Goldhill, Worthington et al. 1999, Goldhill, Worthington et al. 1999, Walshe 1999).

EWSs and RRSs have disappointed the expectations that consistent, significant improvement of outcomes would follow their implementation. (Devita, Bellomo et al. 2006, Gao, McDonnell et al. 2007, Subbe, Gao et al. 2007, Winters, Pham et al. 2007, Chan, Jain et al. 2010, Jansen and Cuthbertson 2010, Karvellas, de Souza et al. 2012). A recent editorial in Intensive Care Medicine reiterates this lack of certainty that RRSs are effective (Wendon, Hodgson et al. 2016). Workers in the field have been puzzled by this limited success for Rapid Response Systems, as measured by outcome data, such a death rates, days in ITU, and hospital stay (Hillman, Chen et al. 2005).

Some have rejected the research on the grounds that it is methodologically flawed (Winters and Pronovost 2013). Others have noted that often the required response to a trigger situation does not occur, and have explored reasons for this (Litvak and Pronovost 2010). In 2005 Hillman and Chen reported that a third of patients meeting review criteria were not referred to the RRS (Hillman, Chen et al. 2005). More recently Shearer has reported that the RRS is only called to half of the patients who should trigger a review (Shearer, Marshall et al. 2012).

A prospective study comparing the outcome of timely and delayed referral to rapid response teams, found that, though the protocol required staff to call the RRS, they often failed to do so. Doctors were less likely than nurses to call for support from an emergency response team (Boniatti, Azzolini et al. 2014). Using focus groups for a case study approach it has been found that possible reasons for delay included differing intra-professional decision making pathways in medicine and nursing, and inter-professional communication barriers between doctors and nurses (Kitto, Marshall et al. 2015). Kitto Marshall et al describe the RRS as:

> *"....a set of formal rules that attempt to shape the behaviour of healthcare professionals."*

From this perspective it is easy to see that RRS is just one of many influences on the healthcare professionals behaviour and how they actually behave will depend on how they resolve competing influences.

1.4.1 The RRS as a protocol

A protocol is a system of rules that explain the procedures to be followed in formal situations, and in the current context, a plan for a scientific experiment or for medical treatment (NHSII&I 2008). Having an agreed, standardised way of performing a task is intended to make a process repeatable and reproducible. The EWS and RRS are an attempt to make the detection of patients at risk of deterioration a mechanical exercise, taking the decision away from the junior medical staff and nurses.

A guideline is an indication or outline of policy or conduct. Guidelines for clinical practice are "systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances" (Field and Lohr 1990). Their successful implementation should improve quality of care by decreasing inappropriate variation and facilitating the application of effective advances to everyday practice (Cabana, Rand et al. 1999). Whilst clinical protocols and guidelines are similar, the use of the term 'protocol' implies that the routine *must* be followed whereas a guideline allows more room for personal judgement (NHSII&I 2008).

The EWS is coupled with a protocol that determines the action that the medical and nursing teams should take in response to a 'trigger' score. If a protocol is understood as

described above by Kitto et al (2015), as a means of changing behaviour, then it is easily seen that, though it will be a factor in determining the doctor or nurse's behaviour, other influences may play a part.

Wolf (1999) discussed the pros and cons of guidelines and protocols (Woolf, Grol et al. 1999). The expected advantage is improved and more consistent patient care. Guidelines also influence local and national health policy, as the existence of a guideline is a driver for organising and funding its implementation. Improved outcomes following the introduction of protocols have been demonstrated in carefully conducted investigations, but it is not clear whether such improvements are seen with more general use (Grimshaw and Russell 1993).

Protocols also help clinicians by offering a clear course of action when they are uncertain how to proceed. This benefit might be expected of the EWS protocol. Inexperienced nurses and doctors are able, by calculating the score, to identify patients at risk and are provided with a clear course of action. It has been observed, however, that the clinical teams often do not follow the protocol (Shearer, Marshall et al. 2012, Guinane, Bucknall et al. 2013, Tirkkonen, Yla-Mattila et al. 2013). Cabana et al have discussed why, in view of their potential benefits, doctors fail to follow protocols and guidelines (Cabana, Rand et al. 1999). Seventy-six articles were found that described barriers to the use of guidelines. Within these articles 293 potential barriers to the use of the guideline were found! There was little consistency between surveys and the authors conclude that it is not possible to find general reasons why doctors do not use guidelines as they vary significantly with contexts. Others have found that distrust of guidelines is widespread, and in many cases guideline developers have been shown to favour their vested interests in their recommendations (Lenzer 2013, Ransohoff, Pignone et al. 2013). A recent paper demonstrated that more experienced physicians are more likely to use other sources of knowledge in conjunction with guidelines to make clinical decisions (Mercuri 2015).

Berg (1997) has analysed the reasons why clinicians may not follow guidelines (Berg 1997). He identifies factors relating to knowledge, attitude and behaviour and represents these diagrammatically (figure 3). He argues that there is an order in which change can occur progressing from knowledge to attitude and finally to behaviour, and that the

factors that influence a clinician not to use the guideline can operate at any of these levels.

Figure 3. Reasons For Not Following Protocols (redrawn from Berg, 1997)

Order of Behaviour Change
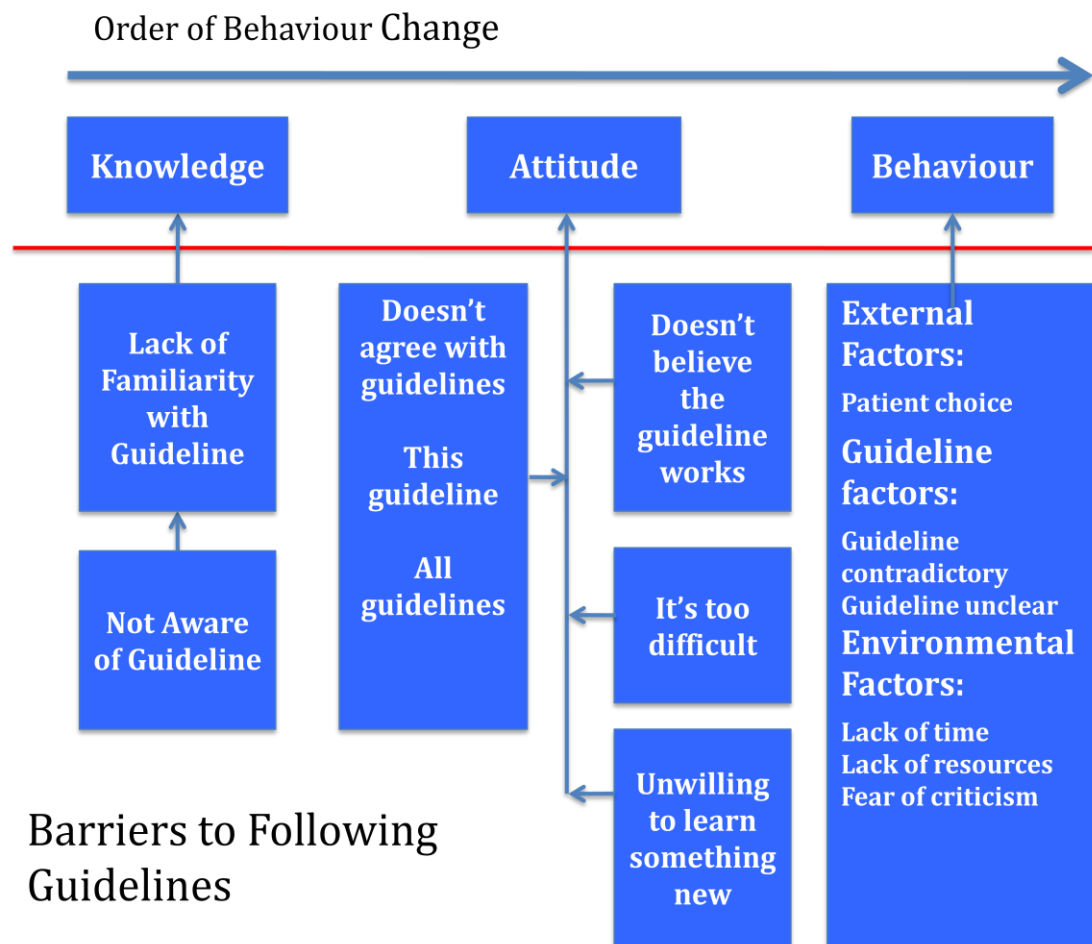
Systems using 'Track and Trigger' alerting are customarily formulated as protocols. These pre-empt clinical decision making by individuals and cut across existing hierarchies. The complexities of pre-existing systems may interfere with the expected mechanisms of a new, formalised way of working. This research project will present evidence that staff resist such impositions. The Australian Commission on Quality and Safety in Healthcare has described the ways in which systems can be constructed to comprise a RRS (Figure 4).

Figure 4. The Variety Of Structures That Can Be Used In A Rapid Response System (ACSQH 2008)
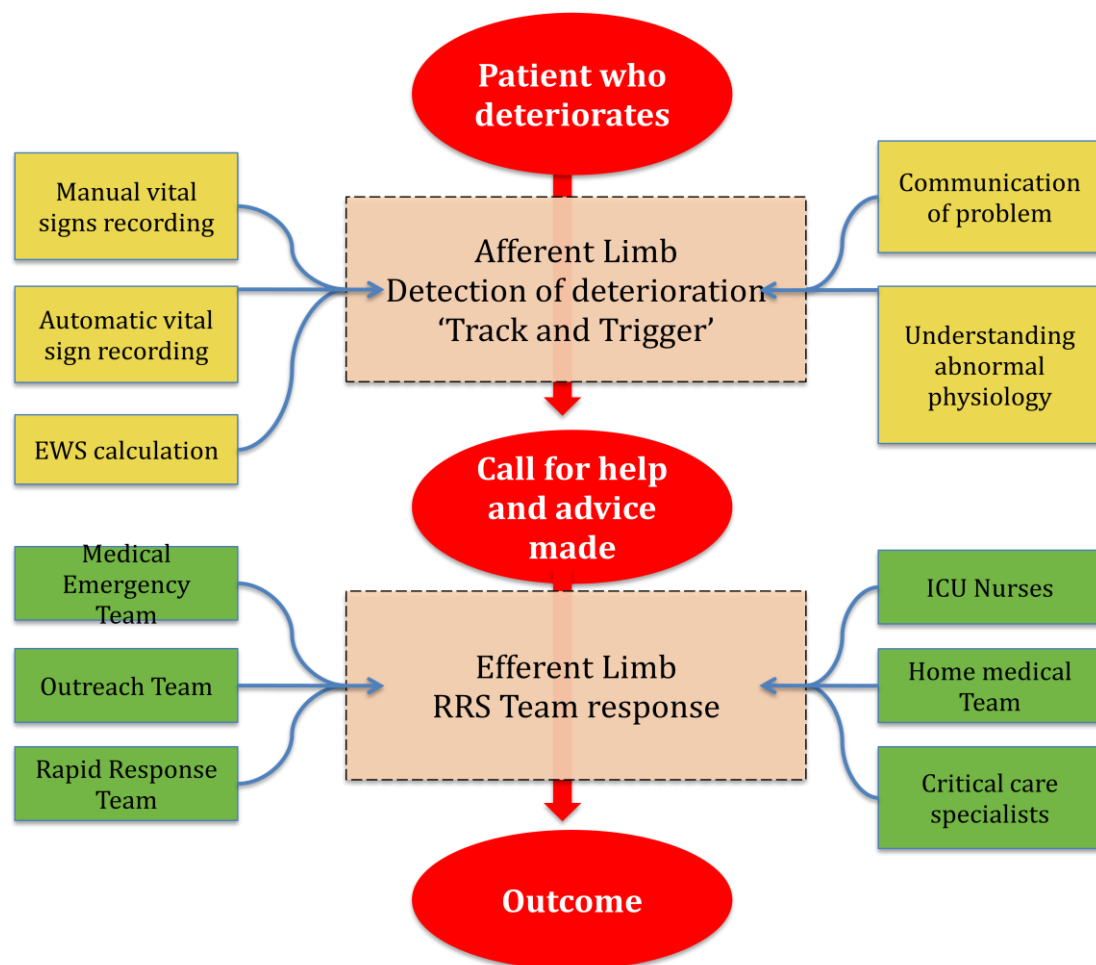
1.5 Failure of the RRS Protocol to Improve Outcome

Explanations given for the inconsistent benefit of RRS have included:

- The scoring is not correctly performed (Chellel, Fraser et al. 2002).
- Triggering scores are not always reported (Curry and Jungquist 2014).
- The expected assessment by a doctor does not take place (Yiu, Khan et al. 2014).
- Staff do not follow the protocol (Shearer, Marshall et al. 2012).

Research evidence exists for the occurrence of all these but the question of the relative importance of factors is unanswered. In response to the final point there is little evidence about *why* staff fail to follow the protocol. These issues are discussed in Chapter 2 (2.4.4.2).

1.6 How The Care of Critically Ill Patients Is Organised

The idea underpinning the use of EWSs and RRSs is that the early involvement of doctors and nurses experienced in the care of critical illness, and earlier transfer to ICU care (if necessary), will improve patient management. The protocols are also intended to standardise how the care of deteriorating patients is handed on from generalist to specialist teams. Some consideration must therefore be given to what these interventions imply and to the way that the medical and nursing teams are organised.

It has been estimated that the average ICU patient requires more than 180 decisions on their care every day (Gawande 2009). All these requirements cannot be met by one group of carers. Acute care in hospitals is therefore multi-professional and multi-disciplinary, and only by the use of complex teams can safe care be provided (St Pierre, Hofinger et al. 2008). This care is not in the hands of one professional group. There may have been a time when doctors 'decided' and nurses 'cared' but this simple division of responsibility has probably not existed for a hundred years. Greenfield discussed the development of the modern nursing role in the USA and showed that nurses and doctors have long cooperated in diagnosis, treatment and care (Greenfield 1999).

1.6.1 The Nursing Staff Who Operate the MEWS

The basic care of patients is the responsibility of the nursing team. The carer at the bedside has responsibility both for satisfying the patients 'domestic' needs; to be fed, watered, helped to keep clean and go to the toilet; but also for carrying out a large range of functions to identify and manage the patient's clinical needs. These primary carers have frequent, intimate contact with patients and are well placed to see how the patient's condition is changing. They are also wholly responsible for the periodic measurement and recording of the patient's vital signs.

In the UK those undertaking this role have a wider variety of backgrounds than might be supposed. Given that a nursing career can last forty years or more, qualified registered nurses working today may have been trained in a variety of ways. Eaton provided a history of Undergraduate Nurse Education for the Willis Commission (Eaton 2015) that describes the many changes in nurse education that have taken place in the last thirty years. Many older nurses studied in hospital-based schools of nursing and undertook the Nursing and Midwifery Council's Registered Nurse Exam to become

State Registered Nurses. Some undertook a shorter two-year training to become State Enrolled Nurses. More recently nurse training has been University based with less clinical time on wards. Students gained either a Diploma or Degree level qualification. Recently, the diploma-level courses have been closed and all training for Registered Nurse status has led to a Degree. Most State Enrolled Nurses have been able to extend their training to obtain RN status. The Willis Committee has recently reviewed the future direction of undergraduate nurse education and endorsed a policy of graduate status for all Registered Nurses (RNs) (Willis 2012).

The curriculum for nurse training has also changed during the working lifetime of many nurses currently in practice. The teaching of medical sciences has latterly been given less emphasis (Willis 2012). A registered nurse may thus have a wide variety of training and experience. In addition, many of the nurses working in the UK trained abroad. Their credentials must be recognised by the Nursing and Midwifery Council, but are diverse.

The 'qualified' nursing workforce is augmented by a large number of healthcare assistants. These workers often undertake the same role in patient care as the qualified nurses. In many wards they undertake most of the day-to-day care, with the qualified nurses acting as supervisors and managers. There are no mandatory education standards for healthcare assistants, and they are not, at present, subject to national regulation. Trusts have generally developed their own standards and training requirements (Spilsbury and Meyer 2004).

In general, it is the unregistered care assistants and the most junior qualified nurses who monitor the patient's vital signs. These least experienced and least knowledgeable nurses have the crucial task of recognising impending patient deterioration. The diversity of primary carers means that the staff's very different knowledge bases complicate any educational intervention, accompanying a planned development. A very recent cross sectional study by Griffiths, Ball et al (2016) is claimed to demonstrate that hospitals with higher numbers of Registered Nurses have lower all cause mortality rates (Griffiths, Ball et al. 2016). In an interview on 'The Today Programme' on the 16th November 2016 the lead author associated this with the fact that Registered Nurses are better trained to understand and recognise critical illness.

There have also been changes in the UK 'specialist' nurse workforce. Nurse-Specialists have training and experience that prepares them for more advanced roles. This is

important in the situation of crisis management on the wards, where the ward team often calls nurse-specialists in ICU outreach. Outreach is the term used to describe a system of liaison between ICU and ward. The outreach team will advise whether a patient needs to be transferred to level 2 or 3 care and also follow up the progress of patients being discharged from ITU.

More recently the UK workforce has been augmented by the development of Advanced Practitioners. Most Advanced Critical Care Practioners (ACCPs) are drawn from nursing but may have other backgrounds such as radiology, physiotherapy and pharmacy. They undertake a two-year course leading to an Advanced Postgraduate Diploma and Master's Degree. ACCPs do not have general nursing duties and contribute directly to patient management under the supervision of the medical team.

1.6.2   The Medical Staff Who Operate the MEWS

Consultants who specialise in the care of acutely ill patients come from a number of medical sub-specialities. These include – critical care medicine, anaesthetics, acute medicine and emergency medicine. In the UK doctors who manage critical illness, whatever their parent specialty, train for eight years following their five years at medical school. They have deep understanding of the basis of disease. Patients are often not admitted directly to the care of a specialist in acute care and many patients develop critical illness unexpectedly during their treatment, so a difficulty arises as to how and when their management is passed from the consultants initially responsible for their care to those specialising in the management of critical illness.

Undergraduate medical training has seen less fundamental change than nursing. There have, however, been significant changes in the organisation of general and specialist postgraduate training (GMC. 2012).

Table 1. Medical Training Framework for Specialist practice

Medical Student 4 or 5 years	
Foundation Programme of two years	F1 & F2
Core Training Programme of two or three years	CT1, CT2
Specialty Trainee of five or more years	ST3, ST4, ST5, ST6, ST7

The most junior doctors undertake a general 'foundation' programme that has a fixed two-year span. Full registration with the General Medical Council follows successful completion of the first year. Subsequent training is specialty based and usually lasts eight years (see Table 1). Doctors who fail their exams or assessments will ultimately leave the training ladder and may work in a variety of non-consultant roles. At the end of training successful doctors will be registered as specialists and can apply for consultant posts (Health Education UK 2014).

This rigid training framework has the consequence that all trainees are, at a given stage of training, similarly experienced and in command of a similar knowledge base.

It is the least experienced doctors (the foundation doctors) who are most frequently responsible for the immediate medical needs of the ward. They undertake the routine clinical care, such as admissions and discharges, organising investigations and prescribing treatments. They would also deal with any emergency situations that develop. These trainees are typically grades F1 and F2 – in their first and second years of clinical practice. More senior trainees supervise these junior trainees and more senior trainees or consultants supervise them. Such ladders of responsibility are typical in UK acute care.

1.7 Structure Of This Thesis

Chapter 2:

Literature Review

The literature review is divided into four sections.

The first section of the review discusses the rationale behind the literature search and explains the search strategy. There follows a discussion of the incidence of unexpected deterioration.

In the second section the history of the development of RSS is given, to set the various schemes in context and EWS parameters and calling criteria are discussed.

The third section of the review comprises a discussion of the validity and reliability of EWS, in predicting deterioration.

In the fourth section the literature relating to the outcome of patients following the introduction of RRSs is discussed. It is noted to be inconsistent and reasons for its unreliability are identified.

Chapter 3:

Methodology, Methods and Analysis

The methodology chapter explains the approach adopted in designing and implementing this study. The first section describes the choices I made in adopting a methodology; this includes a consideration of the theoretical perspective and my epistemological positioning. My academic 'journey' is described and consideration is given to how this influenced the study.

The choice of an interview method is explained and the sampling choices are described. The difficulties encountered over ethical approval and clinical access are discussed. There follows an explanation of how the interview participants were approached and the measures undertaken to obtain informed consent. The chapter closes with a discussion of problems and weaknesses.

This chapter describes the system of analysis used to code the data and how the codes were used to define major categories. The major categories are each discussed in detail.

Chapters 4

The Findings

The findings are discussed in this chapter. Firstly concentrating upon the opinions perceptions and activities described by respondents. This reveals how they use the EWS and how they incorporate it into their work routines.

Chapter 5

What is revealed about interpretations of the EWS

This chapter discusses how the EWS team interprets its use.

Chapter 6

The Effect of EWS on Team Dynamics

This chapter focuses on the way the EWS influences team dynamics and the conversation about patient care.

Chapter 7:

Discussion

In Chapter Eight the various theories developed from the findings are discussed in more detail and placed in the context of existing research. The reasons why doctors use MEWS as a severity score are considered. This is then developed in a discussion of models of practice and the epistemology of nursing and medical practice. Consideration is given to the effect of new protocols on existing team dynamics.

Chapter 8:

Conclusions And Reflections

In this chapter the importance, and applications, of the insights from the study are discussed. Consideration is given to what can be learned about the planning and introduction of technical measures to improve working systems when these are deeply influenced by socio-cultural and inter-professional dialogues.

1.8 Conclusion

Many patients who suffer unexpected deterioration have been found to have precursors in their physiological vital signs for some hours prior to their worsening condition being identified. Review of these patients by expert panels has consistently found that mistakes in their care have been made, and it has appeared that referral to critical-care specialists at an earlier stage might have avoided many of the subsequent problems. Retrospective review has shown that the deterioration of many of these patients could be predicted by a variety of early warning scoring systems but implementation of EWS and RRS has not shown consistent significant benefit in terms of improved outcome. Efforts to improve the accuracy of vital signs recording and the calculation of scores have had little impact. Adjustments to scoring systems to improve validity and reliability have also been disappointing in terms of outcome. Attention is now turning towards the problems of using a technical algorithm to try and change the behaviour of team members, and it is to this that this present investigation is directed. Recently, some authorities have suggested that a major cause for RRSs not improving outcomes is the failure of staff to follow the protocol as required following a trigger event. It has been twenty years since I was first shocked to see how chaotic multi-professional teamwork could be. I have had extensive, often frustrating, practical experience of attempting to improve these deficiencies by the organisation of teams, by education and training, by

the introduction of protocols and by critical analysis of adverse events. In this study experiences of managing patient deterioration were discussed with 'front-line' staff, in the hope of developing theory relating to the operation of the MEWS.

CHAPTER TWO: THE LITERATURE REVIEW

2 CHAPTER TWO LITERATURE REVIEW

Much qualitative research is essentially interpretative, and reflects decisions made by the researcher (Willis, Jost et al. 2007) p203. Glaser (1992) insisted that, when conducting grounded theory research, the researcher must set aside their beliefs and attempt to minimise his or her influence (Glaser, Strauss et al. 1967, Glaser, Strauss et al. 1968, Glaser 1992). As part of this process he recommended delaying any literature search to a later stage of the project, at which point emerging categories would be compared with existing knowledge (Glaser, Strauss et al. 1967). However, when using a grounded theory methodology with a constructivist perspective the prior experience of the researcher, and even their personality are considered to be useful influences in the way the research is interpreted (Breckenridge, Jones et al. 2012). This may be obvious as in the case of politically influenced interpretations such as Marxist or feminist, but even in more neutral research paradigms the position of the researcher will intrude and must be explained. Charmaz (2008) has stated that the researcher must understand the 'baggage' they carry with them and both understand it themselves and make their positions clear to their reader (Charmaz 2008).

In part because of my existing knowledge of the topics, I adopted the more recent practice of doing literature review early. Charmaz wrote that it was wrong to imagine that researchers were a blank slate and too open to influence. She advocates beginning a literature review early to orientate the enquiry, but concludes:

> *"The disputes over when to conduct the literature review miss a crucial point: any researcher should tailor their final version of the literature review to fit the specific purpose and argument of his/her research."*
> (Charmaz 2014 p 307).

This chapter is divided this into four sections because the exercise fell naturally into four tasks:

- Planning the literature review
- The development of RRS
- Review of Early Warning Systems
- Review of reports of patient outcome from Early Warning Systems

2.1 Defining what to search for

The process of searching the literature accumulates an enormous reading list and some system must be used to make sense of the kaleidoscope of ideas presented (Fink 2014). There are several methods available to undertake a structured review of currently available evidence. Grant and Booth (2009) identified the approaches and appraised them using the SALSA framework, examining the methods used for search, appraisal, synthesis and analysis to identify strengths and weaknesses (Grant and Booth 2009). They found fourteen methodologies.

For this project it was necessary to define core knowledge, but also to research some themes that initially seemed marginal to my research question. Grant and Booth suggest undertaking an initial rapid review (or rapid evidence appraisal), using systematic review methods, to understand the existing published research (Grant and Booth 2009).

A preliminary search of the Ovid Medline database – restricted to the terms Early Warning Score and Rapid Response System – found about 80 publications of particular relevance. Reading these provided a background against which to perform more extensive searches.

The aim of this study was to investigate how issues between professions, issues between disciplines, and authority patterns affect the medical and nursing team's responses to critical events in the context of formalised protocols for the management of adult patient deterioration. In order to address this question it was necessary to discover what was already known about the topic. In particular, the way healthcare workers approach the use of RRS, what their expectation of it is and how previous researchers have interpreted the effect that the behaviour of doctors and nurses has upon the operation of the protocol.

The processes of identifying patients needing transfer to Intensive Care Units (ICUs) has led to a diversity of approaches that can be categorised as either:

- Educational – teaching systematic methods to identify and manage patients at risk (Smith, Osgood et al. 2002)
- Clinical support services to assist the 'home team' manage critical illness – outreach from ICU, Emergency Medical Teams (EMTs)

- Identification of patients likely to deteriorate unexpectedly from an interpretation of their routine vital signs observation – Early Warning Systems

Even apparently similar reports show diversity because there is national variation in the processes for recognising and managing deteriorating patients within the definition of an RRS.

2.1.1 Deciding on the years to be searched

EWSs are a relatively recent development. It is generally agreed that Morgan published the first report in 1997 (Morgan 1997). It was not necessary to search prior to that date.

2.1.2 Sources of Literature

There are many databases containing literature that may be relevant to the detection and management of deteriorating patients. A search of Wikipedia in February 2012 revealed 129 searchable, electronic literature databases some of which are shown in Table 2.

Table 2 Some Databases of Relevant Publications

Ovid Medline
The Cochrane Database of Systematic Reviews
PubMed
Journals@Ovid Ovid Full Text
Allied and complementary medicine database (AMED)
British Nursing Index (BNI) Cochrane library
Cumulative index to Nursing and Allied Health literature (CINAHL)
Proquest Nursing and Allied Health Source
Health, Social Work and Education (HSWE)
Emerald
Health & Medical complete
Health management
Google
Google Scholar

2.1.3 Search Strategy

The literature was divided into three categories:

- Review articles – with a division between systematic reviews and others
- Reports of original research

- Discussions such as editorials

My starting point was to find and read systematic reviews of EWS and RRS, reading these articles first in order to immerse myself in the accepted understanding of the topic, and to identify issues about which there was controversy.

I then undertook a systematic search using MESH terms. Many themes produce tens of thousands of references and by combining terms, using the Boolean terms 'and' and 'or' the most relevant reports can be extracted.

Search Terms

The search terms used are shown in Table 3.

Table 3 Search Terms Used	
• Early warning score*	• Track and trigger
• Rapid response system*	• Emergency Medical Team
• "Early warning system"	• Outreach
• Deteriorating patient	• Patient outcome
• Patient deterioration	• Survival
• Rapid Response System*	• Team*
• "MEWS"	• "Teamwork"
• "NEWS"	• "Human factor*"
• "Track and Trigger"	• "Human Error*"

Two Advanced Ovid-Medline searches where undertaken in November 2012 and have been repeated at six monthly intervals to bring the data up to date. The most recent search being in January 2017. The first search combined terms to find literature relating to Early Warning Systems whilst the second targeted Medical Emergency Teams. Similar queries were implemented for the Cochrane Database of Systematic Reviews, PubMed, BNI, CINAHL and Google Scholar.

A further search was made for additional papers by key authors, and the reference lists of all the papers I reviewed were checked for additional material. The database of papers was held in Endnote™. By reading the summaries of these papers I was able to select those relevant to my theme and select those papers to read in full.

As my work proceeded I began to understand more clearly why Glaser and Strauss delayed the literature search until analysis was almost complete (Glaser, Strauss et al.

1967, Glaser, Strauss et al. 1968). As they predict, the process of analysis opens new avenues, and searches of the literature relating to these becomes important. Figure 5 shows how the literature search was organised.

Figure 5 Flow Diagram Showing How The Literature Search Was Organised

1500+ papers identified

Organised into themes, such as:

• **Efficacy of EWS**
• **Validity, Sensitivity**
• **Technical factors affecting EWS**
• **Human factors**

Summaries read to confirm relevance

Papers discarded as not relevant to this project

Papers read in full
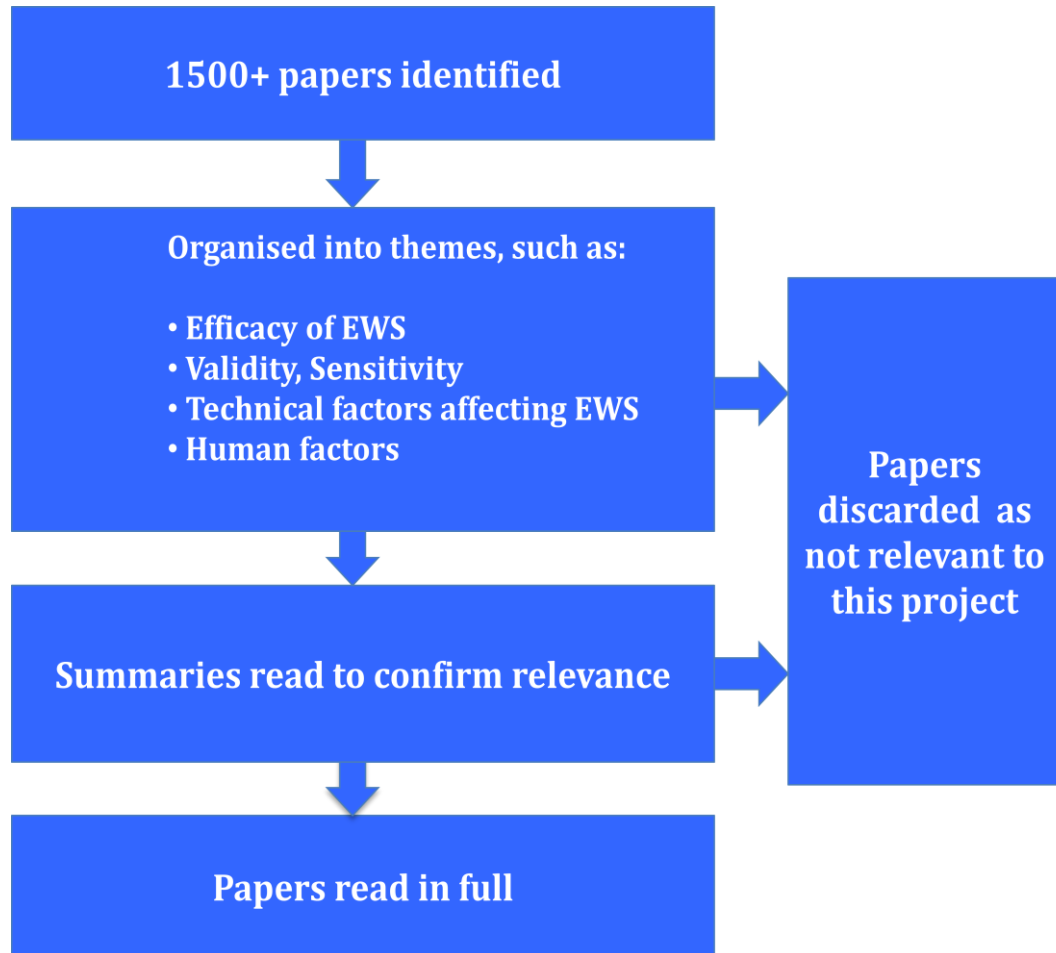
2.1.4   Review Strategy

In order to make sense of the large volume of potentially relevant literature a number of questions were asked and the relevant literature has been referenced in an evaluation of each issue.

2.2   The Development of EWSs and RRSs

The History of EWSs and RRSs has three phases:

- Morgan's (1997) finding that patients who will suffer catastrophic deterioration are identifiable by early physiological changes was exciting as it offered the opportunity

for early intervention and the prospect of averting collapse (Morgan, Williams et al. 1997). The early phase literature reflects this excitement, and by 2007 Gao, MacDonnel et al were able to find 36 reports of 25 different 'track-and-trigger' systems (Gao, McDonnell et al. 2007).

- In their second decade of use it was discovered that expected improvements in outcome were not being found. This led to a search for EWSs with higher validities and scrutiny of the operation of systems.

- More recently the emphasis is shifting to how staff use the information that a patient might be at risk. This is leading to inquiry into the motivations and actions of nursing and medical teams that can be shown not to follow the protocols.

Morgan, Williams and Wright (1997) were the first to describe an EWS for detecting the early deterioration of patients outside of Intensive Care Units (Morgan, Williams et al. 1997). They allocated values to physiological disturbances in patients' vital signs and added these up to provide a patient score. Patients whose score breached a 'trigger' value were reported to medical staff. The purpose of their system was to predict the possible deterioration of a group of patients who appeared otherwise well (Morgan and Wright 2007). Though they do not state why they chose their parameters, it is likely that practicalities directed them. Observations were limited to the vital signs already recorded for all patients. The trigger value was decided upon by applying the scoring to a historic cohort of patients. Morgan's group did not publish any data on patient outcomes.

Goldhill, Worthington et al (1999) described developing a 'patient-at- risk team (PART) that was called to see sick patients on the ward. The team was called if a threshold was breached in three of seven physiological parameters measured (Goldhill, Worthington et al. 1999). Their data suggested that patients reported to the PART had lower cardiac arrest rates, and lower severity of illness scores on admission to ICU. The score did not however reliably identify patients who would subsequently need ITU care.

In 2000 Stenhouse, Coates et al published a report of a modified early warning Score (Stenhouse, Coates et al. 2000). Following a trial period using Morgan's score (Morgan, Williams et al. 1997), the authors describe modifying the EWS by reducing the scoring sensitivity for temperature and adding a factor for urine output. No explanation for the changes is offered. Their grounds for asserting that the system is beneficial was that

patients admitted to ITU during the 9-month research period had lower average APACHE II (severity of illness) scores than the patients admitted during the preceding year. This they took as an indication that critical illness was being referred earlier.

Subbe, Kruger et al (2001) reported a modified EWS that they investigated in medical admissions to ICU (Subbe, Kruger et al. 2001). Again, no rationale is provided for their choice of parameters, scores or trigger criteria. They based their scoring and weighting on those previously published by Morgan, (Morgan, Williams et al. 1997) and Stenhouse (Stenhouse, Coates et al. 2000). They claim validity for their scoring system on the grounds that, in a cohort of 709 acute medical admissions, scores of 5 or more were associated with increased risk of death, ICU admission, and HDU admission.

Hodgetts, Kenward et al (2002) described an attempt to identify the risk factors for in-hospital cardiac arrest, and to select those factors that would best identify patients in advance of their arrest. They also sought to define the sensitivity and specificity of the system by calculation of the Receiver Operating Characteristic (ROC) (See 2.3.7.2). Analysis of the data of patients suffering cardiac arrest found three positive associations: abnormal breathing, abnormal pulse and abnormal systolic blood pressure. ROC analysis showed that a score of 4 has 89% sensitivity and 77% specificity for cardiac arrest; a score of 8 has 52% sensitivity and 99% specificity. All patients who scored more than 10 suffered cardiac arrest. (Hodgetts, Kenward et al. 2002). This data demonstrates the difficulty of setting a trigger threshold to capture most significant events without large numbers of false positives creating an overwhelming workload.

Goldhill, McNarry et al published a report of their system in 2005 (Goldhill, McNarry et al. 2005). They followed the outcome of patients with abnormal physiology scores to identify what level indicated high-risk patients. They recorded data from adult non-obstetric inpatients on a single day (respiratory rate, heart rate, systolic pressure, temperature, oxygen saturation, level of consciousness, urine output for catheterized patients, age and inspired oxygen). They also recorded the care required, and care given. Twenty-six patients (6%) died within thirty days. Mortality was shown to increase with the number of physiological abnormalities (P<0.005). Statistical Modelling identified level of consciousness, heart rate, age, systolic pressure and respiratory rate as important variables in predicting outcome.

Booth (2003) reported using an EWS, but was unable to draw any conclusions on outcome. He noted that the sample size was too small and that the data was incomplete. Once again there is no discussion of the choice of parameters (Booth 2003).

Duckitt et al (2007) developed The Worthing EWS (Duckitt, Buxton-Thomas et al. 2007). Respiratory rate, heart rate, arterial pressure, temperature, oxygen saturation, and conscious level were recorded for a cohort of 3184 unselected patients. Multivariate regression analysis showed that ventilatory frequency > or = 20 min, heart rate > or =102 min, systolic blood pressure < or = 99 mm Hg, temperature <35.3 degrees C, oxygen saturation < or = 96%, and disturbed consciousness were associated with an increase in mortality. This was then prospectively applied to a further 1102 patients. Excluding age from the score yielded a system with what they describe as 'good' discrimination, with an area under the receiver operating characteristic curve (AUROC) of 0.74, which was better than the performance of Morgan's system (AUROC 0.68) (See 2.3.7.2 Below).

2.3   Reports of EWSs and RRSs

2.3.1   Reviews of Early Reports of EWS

In 2007 Gao and McDonnell et al. undertook a systematic review of these early reports of track and trigger systems. First published as a conference report (Gao, Harrison et al. 2006) a more complete evaluation followed (Gao, McDonnell et al. 2007). They identified 17 reports of 'track and trigger systems' and all were judged to be methodologically unsound. They considered that no conclusions could be drawn about the efficacy of the various systems (Gao, McDonnell et al. 2007). The major difficulty was the heterogeneity of the systems, and of their outcome measures. Of five papers explaining the development of a 'track and trigger system' only one, the report by Hodgetts, Kenward et al, was judged to provide an appropriate statistical approach to the identification of trigger parameters and values.

In a similar review Jansen and Cuthbertson (2010) concluded that track and trigger systems showed low sensitivity, low positive predictive values, and high specificity. They often did not adequately identify patients who would deteriorate and could not be shown to improve outcomes (Jansen and Cuthbertson 2010).

2.3.2   Development of RRS

Further development and research into RRS was influenced by the failure of systems to adequately discriminate the patients at risk of deterioration. Curry and Junquist (2014) have described the rationale of "Track and Trigger" as three-fold. Firstly, it helps ward staff to recognise that a patient is deteriorating (even though they already measure and record abnormal vital signs). Secondly, it makes communication between ward staff and 'first responders' systematic, as this often fails where they are not provided with a simplified language to describe a patient's status. Thirdly, it raises the importance of routine monitoring, which may improve compliance (Curry and Jungquist 2014).

The 'Track and Trigger' may be used to alert existing specialist groups – such as the cardiac arrest team or ICU Outreach. Alternatively, a Medical Emergency Team may be organised to respond to hospital wide 'Trigger' events. The literature on 'Track and Trigger' is closely associated with that relating to these emergency response teams because they are often developed together (McNeill and Bryden 2013). This makes it difficult to know how much any change in patient outcomes is consequent upon the tracking and triggering, and how much it is consequent upon the activities of the response team.

There are a large number of similar, but different, "Rapid Response Systems" systems, many of which are institution and researcher specific, and about which little or no research has been published. McGaughey, Alerdice et al (2007) reviewed outcomes from Rapid Response Systems that combined EWSs with ICU Outreach Teams for the Cochrane Collaboration (McGaughey, Alderdice et al. 2007). They searched for reports where outcomes, using the combination of outreach and an EWS, were compared with outcomes in the absence of such services. Despite finding nearly 5000 reports, only two trials met the review criteria. These were both cluster-randomised controlled trials: an Australian trial randomised at hospital level (23 hospitals) (Hillman, Chen et al. 2005) and a UK trial randomised at ward level (16 wards) (Priestley, Watson et al. 2004). Neither trial demonstrated an improved patient outcome, in terms of mortality or length of hospital stay, from the use of an EWS and outreach service.

McGaughey, Alerdice et al draw attention to issues complicating the evaluation of EWS and RRS:

- The 'scoring' of patients focuses attention on their management plan and may lead to them being re-categorised as being unsuitable for attempted resuscitation, unsuitable for escalation of care or suitable for palliative care only. These decisions may lead to fewer attempts to resuscitate without a reduction in cardiac arrests, and less admissions to ICU without a reduction in the numbers of patients developing critical illness.

- This possible effect on the number of admissions to ICU may free up beds and permit earlier admission of deteriorating patients.

- The organisation of an RRS usually results in an increase in the number of doctors available. These are usually specially experienced in the management of critical illness. Improvements in outcome may simply be due to more staff being available, rather than being a direct result of the EWS and RRS protocols.

- The parameters used as outcome measures are often affected by subjective decisions by the medical and nursing teams. "Number of unplanned ICU admissions" and "length of stay in ICU or hospital" are measures that are greatly affected by workload and the availability of beds.

- Patient's care may be changed as a result of concerns other than a trigger score. Doctors and Nurses may become very worried about a patients progress, despite a low EWS. These patients are unplanned ICU admissions without high EWSs.

2.3.3 The Classification of Alerting Scores for Track and Trigger Systems

"Track and Trigger" calling criteria can be classified as Single Parameter, Multiple Parameter, Aggregated Weighted, or Multiple Scoring Systems depending on the criteria for issuing an alert. A UK Department of Health paper provided a classification of systems with examples of each (Department of Health and The Modernisation Agency 2003). Examples of the types of EWS are provided in Appendices A to E. The variety of systems used reflects the difficulty of designing a system with appropriate sensitivity and specificity.

2.3.3.1   Single Parameter Track and Trigger

Single parameter systems track multiple parameters but call for intervention when any *one* of these exceeds a trigger value (Department of Health and The Modernisation Agency 2003).

2.3.3.2   Multiple Parameter Track and Trigger Systems

In a Multiple Parameter Scoring System similar observations are made but the trigger event occurs when two or more parameters are outside their normal range (Department of Health and The Modernisation Agency 2003).

2.3.3.3   Aggregate Weighting Scoring Systems for Track and Trigger

An Aggregate Weighting Scoring System allocates points for level of derangement across several physiological parameters and triggers a response when a certain total score is exceeded. The Modified Early Warning Score is an example of an aggregated system and has been widely adopted (Morgan, Williams et al. 1997).

2.3.3.4   Combination Early Warning Scores for Track and Trigger Systems

Combination Early Warning Scores have elements of a single or multiple parameter system combined with an aggregated scoring system (Department of Health and The Modernisation Agency 2003).

2.3.3.5   The National Early Warning System

A working party of the Royal College of Physicians (RCP) of England has published a revised MEWS score in an attempt to bring about some consistency in the systems used to detect critical deterioration in UK hospitals. (Royal College of Physicians 2012). The RCP has urged UK hospitals to use the National Early Warning Score (NEWS) in order to provide standardised care. None of the hospitals involved in this study had done so.

2.3.4   Validation of Early Warning Scores

There has been surprisingly little research validating EWSs. A number of questions arise.

- How and why were the parameters chosen?
- How were the limits set to derive a point-score for each parameter?
- How was the trigger score decided?
- What was the sensitivity and specificity of the trigger score?

2.3.5 What Parameters, what weighting and when to trigger?

Early developments of EWS were discussed in section 2.2.1 above.

The UK National Early Warning Score (NEWS) uses six parameters: Respiratory Rate, Oxygen Saturation, Temperature, Systolic BP, Pulse Rate and Level of Consciousness. These were decided upon using an expert group consultation process (Duckitt, Buxton-Thomas et al. 2007). This recommended omission of urine output as a parameter because EWS systems are intended to forestall serious deterioration and many uncomplicated patients do not have urinary catheters in place. Monitoring urine output by spontaneously voided urine involves waiting for several hours before it becomes evident that urine flow is critically low – too late for an acute scoring system.

Oximetry was included despite the fact that many hospitals do not routinely monitor SaO_2. The expert group felt that including oximetry at the time of monitoring was an insignificant increase in work, that most units now possess at least one oximeter and that oxygen saturation measurements should be done routinely (Duckitt, Buxton-Thomas et al. 2007).

A number of possible additional parameters have not generally been used in EWSs. 'Age' was investigated by Smith, Prytherch et al. (2008) and correlated with higher MEWS scores (Smith, Prytherch et al. 2008). They recommended adding an age related score to MEWS. The RCP working group developing the NEWS, did not add an age factor, partly because of the fear that it would generate many 'false positives' in the elderly and partly because biological and chronological age are often poorly related (RCP 2012). The RCP also noted that pregnancy is associated with many abnormalities of physiological parameters but felt that scoring systems for pregnant patients should be specific. They recommended that the NEWS should not be used in pregnant patients (RCP 2012).

2.3.6 Reliability, Validity and Specificity

Many Track and Trigger systems have been reported, and even more locally developed, unreported systems are, or have been, in use. Amongst the most widely used in the UK are the Modified Early Warning Score (MEWS) and the UK National Early Warning Score (NEWS). In Australia single and multiple parameter systems have generally been

preferred to aggregate systems. The staff who operate RSSs are much affected by the validity and reliability of the systems.

2.3.6.1   Reliability

Is the score repeatable – intra-rater reliability? Is it affected by who does the scoring – inter-observer reliability? Are the measurements subject to interpretation by the observer? Does it vary significantly if the observations are repeated immediately – retake reliability?

Subbe, Gao et al. (2007) studied the intra-rater and inter rater reliability of three EWSs (Subbe, Gao et al. 2007). They found there was significant variation in the reproducibility of physiological track-and-trigger warning systems used by different health care professionals. All three systems examined showed better agreement on triggers than individual scores. Simpler systems such as the single parameter MET alert had better reliability than the more complex MEWS assessment.

Miller (2015) used a scenario-based evaluation to test the inter-rater reliability of NEWS and demonstrated high reliability amongst nurses and personal care assistants (Miller 2015).

The ideal EWS would have a trigger threshold that was reached by 100% of patients who were going to suffer a serious deterioration and by none of those that were not. This raises the problem of how to define 'a deterioration'. Much of the research and audit work surrounding EWSs and Track and Trigger uses data that relates only to patients who have suffered a major deterioration and been sent to the ICU, and omits data regarding the outcome of those left on the ward. These issues relate to the sensitivity and specificity of the trigger. Clinically a false negative is much more significant than a false positive. The former results in an unanticipated deterioration – a potential catastrophe – whilst the latter results only in an extra assessment of a patient who remains well. The track and trigger needs to have high sensitivity and its specificity is less critical.

2.3.6.2   Validity

The score must have face validity. It must measure what it is supposed to measure. The EWS is intended to draw attention to incipient deterioration that is influencing vital signs observation in a patient who still appears well. Are patients with deranged scores more likely to deteriorate than those with normal scores? From the perspective of users an EWS has low face validity. Only about one in ten of alerts genuinely presage clinical deterioration (Bell, Konrad et al. 2006, Campello, Granja et al. 2009, Bucknall, Jones et al. 2013, Kim, Koh et al. 2014). Doctors and nurses faced with a large number of apparently fruitless calls may begin to doubt its efficacy (Niegsch, Fabritius et al. 2013, Curry and Jungquist 2014).

2.3.7   Statistical Analysis of Track and Trigger Systems

2.3.7.1   Regression Analysis

The EWS is a composite of individual scores for six or more vital signs parameters. How well does each parameter correlate with the overall EWW score and how much does each parameter contribute to the scotomes

Burch (2008) used multivariate regression analysis to define the contribution of factors to the likelihood of hospital admission and mortality in a hospital emergency department. Five independent predictors of hospital admission were found: systolic blood pressure < or =100 mm Hg, pulse rate > or =130 beats per minute, respiratory rate > or =30 breaths per minute, temperature > or =38.5 degrees C and an impaired level of consciousness. Independent predictors of in-hospital death were: abnormal systolic blood pressure (< or =100 or > or =200 mm Hg), respiratory rate > or =30 breaths per minute and an impaired level of consciousness. This paper does not however provide evidence about the use of the EWS to predict unexpected deterioration in ward patients (Burch, Tarr et al. 2008).

2.3.7.2   Area Under the Receiver Operator Curve (AUROC) and the C Statistic

The performance of the Track and Trigger depends upon the extent to which the score and calling criteria jointly predict patient deterioration. This function depends on the number of true and false positives as well as the true and false negatives.

Figure 6. Sensitivity and Specificity

	Patient Deteriorated	Patient Didn't Deteriorate
Trigger Value Exceeded	True Positive (Sensitivity)	False Positive (Specificity)
Trigger Value Not Reached	False Negative	True Negative

Sensitivity: The sensitivity of the test is the proportion of patients who will suffer a deterioration who exceed the trigger value of the EWS score. It is a measure of the true positive rate.

Specificity: The specificity of the test is the proportion of patients who exceed the trigger value but do not suffer a subsequent deterioration. It is a measure of the false positive rate. Figure 6 shows the relationship between sensitivity and specificity for an EWS.

The Area Under the Receiver Operator Curve (AUROC) is a statistical manoeuvre that is used for demonstrating the sensitivity of a test (Cook 2007). If the system is perfect, plotting sensitivity of the test against specificity will produce a straight line at 45 degrees through the axis. False positives will result in a plot that is deviated upwards. The AUROC is the area under the plotted curve divided by the area under the ideal curve and is called the C-statistic. A relationship with no false positives will show a value of 1. The closer the AUROC is to 1 the better the test is at predicting true positives. The use of the C-statistic to evaluate the validity of an EWS has been criticised on the grounds that it is unreliable in situations where the prevalence of the observation being studied is very low. In this situation random variations in the observed rate of occurrence are amplified and can produce erratic values for the C-statistic. Romero-Brufau, Huddleston et al. reported the prevalence of unexpected deterioration as very low at about .02 per patient day (Romero-Brufau, Huddleston et al. 2015) and authors suggest that statistics such as the positive predictive value and the number needed to evaluate are more appropriate to the interpretation of an EWS than the C-statistic. Most publications that discuss the validity of EWSs have used the C-statistic to compare systems.

2.3.8   Validation of Calling Criteria

Morgan's seminal report of an EWS (Morgan, Williams et al. 1997) set the trigger score by examining a historic cohort of patients who had been admitted to ICU, and finding the level of score that captured most of these. This was used to set the sensitivity. No details of the maths are provided. The EWS and trigger score were subsequently applied to a small group of 100 surgical admissions to ensure that it did not generate an overwhelming load of false positives.

Subbe, Kruger et al (2001) developed a Modified Early Warning Score and investigated whether it would discriminate medical patients at risk of catastrophic deterioration in medical admission and Emergency Departments (Subbe, Kruger et al. 2001). Data was collected on 709 emergency admissions in the Medical Admission Unit. They concluded that MEWS scores of 5 or more identified patients at risk of deterioration - who require increased levels of care in the HDU or ICU. Subbe, Slater et al (2006) then went on to audit patients admitted to ICU and HDU from the Emergency Department and concluded that using an EWS added little to current triage systems (Subbe, Slater et al. 2006)

Smith and his team from Portsmouth, UK, have developed a large database of vital signs that they have used to examine the characteristics of EWSs (Smith, Prytherch et al. 2008, Smith, Prytherch et al. 2008, Smith, Prytherch et al. 2013). They undertook a systematic review, and used their database to investigate the performance of single parameter and Aggregate Weighted Scoring Systems (Smith, Prytherch et al. 2008, Smith, Prytherch et al. 2008). The systematic review found 72 reports of Aggregate Weighted Scoring Systems. A second separate review found 39 reports of single parameter systems. The various models were used to discriminate between groups in the real dataset of vital signs. The performance of many of the systems was 'poor', though 36% discriminated 'reasonably well'. The authors comment that further work is needed to improve the performance of both AWSS and SPSS. Their most recent evaluation submitted the National Early Warning Score (NEWS) to the same analysis and found it to be a little more effective at distinguishing patients at risk than its predecessors (Smith, Prytherch et al. 2013).

Santiago et al. reviewed the performance of the more common EWSs to investigate whether automated warning systems linked to the patient record system would be useful. They used a database derived from 34,898 consecutive patients. The EWS was applied to the data to see how accurately it predicted unexpected events: emergency resuscitation calls, RRS calls and unanticipated admission to the ICU. The positive predictive value of the EWS ranged from 0.01 to 0.21 and sensitivity ranged from 0.07 to 0.75. MEWS would have generated up to 50,446 false positive calls. The authors calculated that these would correspond to between 1040 and 205,020 false calls a year and that a better-performing EWS is needed before machine generated emergency calls could be used! More generally, however, whilst the best predicting EWS would have two true positives per ten patients reaching trigger value, it would not detect 92% of patients who would suffer deterioration.

2.3.9 Response Teams – the 'efferent' limb

The heterogeneity of RSSs is added to by the variety of ways of responding to a trigger event. The first EWSs were used as a screening tool to alert the patient's carers to the fact that they might be on the point of deterioration. These teams often do not have the more advanced resuscitation and critical care skills that are required and this has led to the development of specialised response teams. These developments have tended to differ between countries.

2.3.9.1 Outreach Teams

In the UK there has been an emphasis on the 'Critical Care Outreach Team'. Outreach teams generally use specially trained Intensive Care Nurses for first contact. They work with the ICU Medical Team – to whom they go for advice, and to organise the admission of patients to ICU or ITU. Outreach teams are much more Nurse led and nursing orientated than the other emergency teams.

In 1999, the Audit Commission report *Critical to Success* gave a "highest-priority recommendation" that acute hospitals "develop an 'outreach' service ... to support ward staff in managing patients at-risk" (The Audit Commission 1999).

In 2000 the DoH published a review of Critical Care Services by an expert working party. One of the recommendations was:

> **"Integration** – A hospital wide approach to critical care with services that
> extend beyond the physical boundaries of intensive care and high dependency
> units that house designated beds to provide support to and to interact and
> communicate with the range of acute services including specialist services."
> (Department of Health 2000)

This led to the development of a number of systems for widening the clinical influence of intensive care – amongst which was the development of Nurse Led Critical Care Outreach Teams. Specialist nurses are usually the first responders in outreach teams. Many centres have reported the beneficial use of Outreach Services (Fox and Rivers 2001, McArthur-Rouse 2001, Ball 2002, Goldhill and McGinley 2002). However, a review and meta-synthesis of reports undertaken by Endacott, Eliott and Chaboyer (2009) was unable to identify whether ICU outreach services had, per-se, a beneficial effect on outcomes, because of the wide variation in the organisation and activities of the services reported (Endacott, Eliott et al. 2009). Amongst the questions they asked was "What structures and activities underpin the role of the ICU liaison nurse?" They found that few reports attempted to detail the activities, and their list of activities supporting critically ill patients on the ward does not mention the role of responding to the EWS trigger or forming part of the MET team. It is therefore, not possible to say how widespread the use of an outreach team as EWS responder is.

2.3.9.2   Medical Emergency Teams

As long ago as 1967 it was suggested that, such was the urgency of the situation for a patient with shock, defined as severe hypotension, the doctors should come to them in the ward, rather than bringing the patient to a specialised care area. (Frank 1967). This historic article describes many of the principles of critical care that remain important today. The concept of a Medical Emergency Team was developed at the Liverpool Hospital in Australia in order to rapidly identify and manage seriously ill patients at risk. Hillman et al, in 1996, reviewed the charts of 1,027 patients in an Australian teaching hospital and identified 9 patients (0.8%) whose observations met their criteria for intervention (Hillman KM 1996). This, they concluded, was a workload that could be addressed by a specialist team. Also, there were sufficient patients in that category to make a specialist team worthwhile. Publication of these data was delayed and therefore

appeared after the publication, by Hillman's group, of the first implementation of the Medical Emergency Team (Lee, Bishop et al. 1995).

Goldhill et al (1999) published a description of a "Patient at Risk Team' (PART) that operates in a similar way to the MET (Goldhill, Worthington et al. 1999). The PART comprised the ICU consultant or deputy, a senior ICU nurse and the duty medical or surgical registrar as appropriate.

In subsequent correspondence the Australian team explained that a major development of the MET had been an extension of the calling criteria to allow a 'Worried' category. This had had a worthwhile effect on the effectiveness of the service (Fletcher and Flabouris 2000). The Medical Emergency Team is generally medically led and a typical constitution is: Intensive Care Registrar, Medical Registrar, Intensive Care nurse trained in ALS and a second Intensive Care nurse (Lee, Bishop et al. 1995). This group will assemble and attend immediately if called to a problem on a general ward. The team has the expertise to immediately manage critical illness.

2.3.9.3   The Rapid Response Team

As part of its 5 Million Lives Campaign the US Institute for Healthcare Improvement encouraged American hospitals to implement Rapid Response Teams. Many hospitals have done so and they have become an established standard of care (Dacey, Mirza et al. 2007, Halvorsen, Garolis et al. 2007). A Rapid Response Team is a specialised group of healthcare clinicians who can be assembled quickly to deliver critical care expertise. They differ little in organization or purpose from Emergency Medical Teams. Rapid Response Teams may consist of any of the following: a physician (senior resident or intensivist or hospitalist), a physician's assistant, a critical care RN, a clinical nurse specialist or respiratory therapist (Dacey, Mirza et al. 2007, Halvorsen, Garolis et al. 2007). Some of these roles are not found outside the USA. The team, however constituted, must be available immediately when called and possesses very advanced Critical Care Skills relative to most outreach or Medical Emergency Teams.

2.4 Patient Outcomes

In the previous section I have reviewed the literature surrounding the development and validation of RRSs. In this section the literature relating to the efficacy of EWS/RSS in

terms of patient outcome is explored. These issues of effectiveness form the context of this research project.

2.4.1   The Incidence of Unexpected Patient Deterioration

The incidence (on general hospital wards) of physiological instability that reaches the criteria for calling for assistance is around 4%. Bell, Konrad et al audited physiological data in a large Scandinavian hospital and found that 4.5% of patients fulfilled the criteria for calling the Medical Emergency Team (Bell, Konrad et al. 2006). Shearer found a similar figure of 4.04% of ward patients (Shearer, Marshall et al. 2012). Flabouris, Nandal et al found a prevalence of 4.1% (Flabouris, Nandal et al. 2015). Many such patients are known to be unstable. Unexpected deterioration is much less common, probably between 0.1% and 0.4% as estimated from cardiac arrest data (Nolan, Soar et al. 2014) and data relating to the unexpected admission of patients to Intensive Care Units (Bapoje, Gaudiani et al. 2011). Accurate estimation of incidences is complicated by the fact that most authors quote the number of incidents but do not provide a denominator.

2.4.2   Does Physiological Instability Precede Collapse in a Significant Number of Patients?

After Morgan's initial publication of an early warning score in 1997 (Morgan, Williams et al. 1997) a number of audits and research projects confirmed that many patients had had altered physiology for some time before their collapse. This topic has only been studied by retrospective review of patients who deteriorated unexpectedly. Unexpected deterioration is a subjective issue and the patients are usually selected as those who suffer sudden unanticipated cardiac arrest and those who are unexpectedly admitted to ICU. There are no cohort studies that prospectively compare the vital signs of a group of patients who can be defined as suffering unexpected deterioration with those who progress well. The studies of the antecedents of collapsed patients demonstrate that their physiology is disturbed, often for hours before their collapse.

Buist, Jarmolowski et al (1999) reviewed the vital signs data of 120 patients who suffered unexpected cardiac arrest outside of the ICU. Sixty percent of the cardiac arrests were preceded by a number of abnormalities of vital signs (median 2, range 1-9) that indicated physiological instability. The median duration of instability before a

cardiac arrest was 6.5 hours (range 0 – 32 hours), and in that time a number of medical reviews took place (Median 2, range, 0-13). They concluded that cardiac arrest might have been predicted in a high percentage of patients and that early transfer to ICU might have improved outcome (Buist, Jarmolowski et al. 1999).

Smith and Wood (1998) reviewed the physiological data of 47 patients who suffered cardiac arrest and found that 51% had preceding signs of instability, and that the mortality of this group was higher than those without preceding signs. (Smith and Wood 1998)

McGloin, Adam et al (1999) reviewed unexpected deaths on the ward and out of 377 they identified 20 in whom resuscitation was attempted. An expert panel considered that 13 showed worrying physiological instability prior to arrest that had not been acted upon (McGloin, Adam et al. 1999).

McQuillan, Pillkington et al (1998) investigated the nature, causes and consequences of suboptimal care before admission to intensive care units by means of a prospective confidential inquiry into 100 consecutive ICU admissions. A panel of experts reviewed the care prior to ICU admission. Assessors agreed that 20 patients were well managed (group 1) and 54 patients received suboptimal care (group 2). The assessors disagreed on quality of management of 26 patients (group 3). In groups 1, 2, and 3 intensive care mortalities were 25%, 48% and 23% respectively. Hospital mortalities were 35%, 56%, and 31%. Admission to intensive care was considered late in 69% patients in group 2. A minimum of 4.5% and a maximum of 41% of ICU admissions were considered potentially avoidable. Mistakes in care were a cause of morbidity or mortality in most cases (McQuillan, Pilkington et al. 1998). They identified five reasons for suboptimal care:

- Failure of organisational factors
- Failure of cognitive factors
- Failure to appreciate clinical urgency
- Poor supervision
- Failure to seek advice

Reports that review patients who have suffered collapse often rely largely on the judgement of an expert panel. There do not appear to be any control experiments where using a control group of patients who had good outcome, and blinding the expert group to the outcome. Knowing in advance that all the patients came to harm may influence

the panel's judgement of whether care was appropriate. If care *were* appropriate, as judged by the information available at the time, then the activities of the RRT would not be likely to improve matters.

Hillman, Bristow et al (2001) evaluated the care of patients dying in three Australian hospitals during a 6-month period. Excluding those identified as "not for resuscitation" there were 229 deaths. Of these 22% were preceded by cardiac arrest and 160 were admitted to intensive care. 50% of the patients designated as for resuscitation demonstrated severe physiological abnormalities prior to cardiac arrest or ICU admission, and 30% had comments recorded by nurses or junior doctors expressing concern about their status. The authors considered that hypotension and tachypnoea were common antecedents to death and that earlier intervention in the face of these findings might improve outcome (Hillman, Bristow et al. 2001). Again there is nothing to suggest that the ward staff were phlegmatic about the patients' status and access to ICU 'gatekeeper' staff might have been an issue.

Hodgetts, Kenward et al (2002), in the USA examined the prevalence of risk factors for cardiac arrest on general hospital wards by comparing 181 patients who arrested with 132 matched patients who did not. They found that the factors most consistently associated with cardiac arrest were cardiac dysrythmias, hypotension and respiratory abnormalities and considered that identification of these factors would permit beneficial earlier intervention in some cases (Hodgetts, Kenward et al. 2002).

These reports of the incidence of physiological instability prior to unexpected death or cardiac arrest are inadequate to definitively answer the question: "What proportion of ward patients who collapse unexpectedly have demonstrated physiological abnormalities for some time prior to their collapse?" The data discussed above suggest that up to 60% of patients who deteriorate suddenly do so without premonitory signs. On the other hand reports of expert audit have consistently found that patients whose death is considered to be potentially preventable have often been neglected and "under-managed" in the face of significant abnormalities (Wilson, Runciman et al. 1995, NCEPOD 1996, Vincent, Neale et al. 2001, NCEPOD 2002, McGlynn, Asch et al. 2003, Baker, Norton et al. 2004, NCEPOD 2012, NCEPOD 2015). The case reports in such audits are often very shocking and have highlighted major failings of staffing, inadequate knowledge and deficient clinical skills. For medical and nursing staff they

may have been a driver towards the development of RRSs even in the face of evidence that it was not possible to identify as many as half the patients who were on the threshold of collapse.

2.4.3   Does the use of an RRS improve patient outcome?

There have been two approaches to this question:

- Publications reporting before and after audit data, around the introduction of a RRS
- Systematic reviews and meta-analyses of published reports

2.4.3.1   Reports of the introduction of EWSs and RRSs

In the early 2000s a number of studies were published that showed significant reductions in cardiac arrest rates following the introduction of RRSs (Buist, Moore et al. 2002, Bellomo, Goldsmith et al. 2003, DeVita MA 2004, Tibballs, Kinney et al. 2005); and that it was feasible to identify patients at risk by means of a scoring system (Subbe, Kruger et al. 2001).

Whilst some reports emerged suggesting that overall outcomes (mortality, length of hospital stay, time in ICU) could indeed be modified by earlier intervention (Bristow, Hillman et al. 2000, Parr, Hadfield et al. 2001, Buist, Moore et al. 2002, Bellomo, Goldsmith et al. 2003, Bellomo, Goldsmith et al. 2004, DeVita MA 2004, Priestley, Watson et al. 2004); other reports were inconclusive or negative (Booth 2003, Subbe, Davies et al. 2003, Hillman, Chen et al. 2005).

Papers that record the influence of interventions on hospital-wide cardiac-arrest rates are defining a cardiac arrest as an attempted resuscitation, and this statistic depends largely on the number of patients pre-defined as unsuitable for resuscitation. Changes in this figure will reflect many factors other than improved care. Durations of stay in hospital and critical-care unit are similarly affected by subjective decision-making.

Priestley, Watson et al have reported the phased introduction of a UK outreach service, led by a Consultant Nurse, randomised across 16 wards in a single hospital. Outreach was alerted by the use of a patient-at-risk score. (Priestley, Watson et al. 2004). The

authors found decreased mortality during phases of outreach intervention, which may have been associated with increased length of stay. In a review of this research McGaughey, Alerdice et al considered that the enquiry was significantly underpowered and that the presence of the outreach team may have contaminated the data by being more widely available in the hospital than the trial demanded (McGaughey, Alderdice et al. 2007).

In 2005 Hillman, Chen et al reported the introduction of Medical Emergency Teams as a cluster randomised trial in 23 Australian hospitals. To be included hospitals had to have at least 20,000 annual admissions and have no pre-existing MET (Hillman, Chen et al. 2005). The MET system was introduced in 12 hospitals with 11 acting as controls. This has been the biggest, and one of the best-designed trials of an RRS. During the study period the rate at which specialised teams were called was much higher in the units with a MET (3.1 per 1000 admissions vs. 8.7 per 1000 admissions). Overall a reduction in unexpected deaths of 30% occurred between the baseline and study periods. It was not, however, possible to demonstrate a statistically improved outcome in the MET hospitals relative to controls. The relationship between events that should have triggered a MET call and the calls made was unreliable, being only 30% in the MET hospitals. In addition, it was found that the physiological data required for a timely call of the MET was missing in 62% of cases. The authors struggled to adequately explain the substantial (30%) reduction in mortality that occurred overall. One factor was the incomplete implementation of the MET system. It stretches a unit's resources to provide such a team continuously. A commentary from The Canadian Patient Safety Institute concluded that the study was underpowered. The numbers were set to show a 30% difference with 90% certainty on the basis of a MET event rate of 30 per 1000 admissions. The far lower rate observed would have required 100 participating hospitals to reach the 90% rate (CPSI 2006). A commentary by Chrysochoou and Gunn (2006) suggested that failure to alert the MET was a significant issue. They also remarked upon the fact that the use of a MET appeared to be much more complex than anticipated. (Chrysochoou and Gunn 2006).

This unexpected conflicting evidence prompted further trials, meta-analysis of existing evidence and expert review to derive a consensus on action. Consensus-conferences were held in 2006 and 2010 to clarify the status of RRSs according to the evidence available at that time (Devita, Bellomo et al. 2006, DeVita, Smith et al. 2010). Some

studies demonstrated that an RRS may improve outcome, but it was unclear what the benefit could be expected to be. At this time the only randomised trials available were those of Priestley in the UK and Hillman in Australia that reported very different approaches (Priestley, Watson et al. 2004, Hillman, Chen et al. 2005). The meeting considered whether all hospitals should implement an RRS. The consensus statement recommended that hospitals *should* implement an RRS, which has an afferent, "crisis detection" and "response triggering" mechanism and an efferent, rapid response team which should be always available. They also recommended that the RRS should have a governance/administrative structure to supply and organise resources and an audit and evaluation system. Crucially this prestigious group did not consider the issue of the demography of sudden patient deterioration and what improvements to outcome could be expected (Devita, Bellomo et al. 2006).

Bell, Konrad et al (2006) have published a study that strikingly demonstrates the difficulty of understanding the predictive valididity of an EWS (Bell, Konrad et al. 2006). They sought to make a preliminary estimation of the workload for a medical emergency team (MET) by recording physiological data on all adult patients (n=1122), to investigate whether the patients with altered physiology had an elevated mortality. They then studied the sensitivity and specificity of their test by lowering the calling criteria. 4.5% of the scored patients fulfilled the study criteria i.e. exceeded trigger criteria. These patients had a 30-day mortality of 25% (confidence interval 12.7 – 41.2) as compared to 3.5% (2.4 – 5) for the patients not fulfilling the study criteria. The use of extended simplified (lower score) calling criteria revealed 8 more deaths that breached the calling criteria than did the original study. However, 123 patients – equalling 13.8% of the cohort fulfilled these criteria, as compared to the 40 patients fulfilling the original study criteria. Even these modified, and simplified, MET criteria proved to be able to single out patients with elevated mortality as compared to the rest of the hospital population, but extending the criteria significantly lowered sensitivity and would increase the MET workload enormously. Restricting the criteria led to missing mortalities where intervention could be beneficial. The results suggest that using simple physiological tests can be of help in the identification of patients at risk – but that setting a score level for the trigger is difficult.

Mitchell, McKay et al reported the introduction of a track and trigger system along with a new purpose-designed ward chart and an education system (Mitchell, McKay et al.

2010). Crucially, wards were not permitted to participate in the scheme unless 50% of their nurses had attended the educational programme. They were able to show significant improvements in vital signs recording and an increase in the number of 'medical reviews' but these were not reflected in improvements to outcome measures.

Karvellas, de Souza et al (2012) reported the results of introducing an intensivist led MET between 2002 and 2008. Their study is complicated by the MET only being available some of the time, and by the fact that it did not always have an intensivist as a team member. They concluded that in their single centre trial, the initiation of a MET had not resulted in improved outcome, measured as in-hospital mortality and length of stay (Karvellas, de Souza et al. 2012). This report demonstrates the difficulty of drawing statistically significant conclusions from data obtained from the hurly-burly of busy services.

Konrad, Jaderling et al reported the incidence of cardiac arrest before and after the implementation of a MET (Konrad, Jaderling et al. 2010). They compared data from 2 years following introduction of MET with that from the preceding 2 years. Cardiac arrests per 1,000 admissions decreased from 1.12 to 0.83. MET implementation was also associated with a reduction in total hospital mortality by 10%. Hospital mortality was also reduced for medical patients by 12%, and for surgical patients not operated upon by 28%. For patients who reached the EWS trigger value thirty-day mortality pre-MET was 25% falling to 7.9% following MET introduction. The authors concluded that implementing the MET team was associated with significant improvement in both cardiac arrest rate and overall adjusted hospital mortality. Thus, introduction of the MET seemed to improve outcome for all groups of hospitalized patients. The authors comment that they were unable to account for the possibility that the existence if the MET might have increased the number of patients designated as unfit for resuscitation and might have increased elective ICU admissions.

Lighthall, Parast et al (2010) reported similar results in a study from the USA. They compared the incidence of cardiac arrest 9 months before and 27 months after introduction of a rapid response system. They also recorded mortality 3.5 years before the intervention and 27 months after the intervention. Cardiac arrests were reduced by 57%, amounting to a reduction of 5.6 cardiac arrests per 1000 hospital discharges ($p < 0.01$). Mortality was reduced during the intervention, but this was attributable to a

natural decrease occurring over all phases of the study. (Lighthall, Parast et al. 2010). These authors do not discuss other possible reasons for reduction of cardiac arrests.

Santamaria and Tobin (2010) found that following the introduction of the medical emergency team cardiac arrest rates decreased progressively from 0.78 per 1000 to 0.25 per 1000 and hospital mortality from 0.58 per 1000 to 0.30 per 1000. Only after 2 years did cardiac arrest rates achieve statistical significance, and it took 4 yrs for hospital mortality rates to change significantly. They concluded that the introduction of a medical emergency team was associated with a progressive decline of unexpected cardiac arrests within 2 yrs, and of unexpected mortality within 4 yrs. They suggested that changes to organizational practice take time and benefits may not be immediately obvious (Santamaria, Tobin et al. 2010).

Schoonhaven et al (2012) considered that medical revue, prompted by an EWS alert, led to patients being electively moved to the ICU with the consequence that their subsequent collapse is not included in the data appertaining to unexpected, on the ward deterioration. Also, very sick patients were being assessed as unsuitable for resuscitation leading to increased negotiation of Do Not Attempt Resuscitation (DNAR) status with patients and their relatives. They found that other parameters, such as durations of stay, and mortality are more refractory to RRTs (Simmes, Schoonhoven et al. 2012).

Howell, Ngo et al (2012) have reported the effect of introducing an EWS that alerted the patients 'home team' (Howell, Ngo et al. 2012). They reported a fifty-nine month period during which 1755 consecutive hospital admissions took place. They compared a baseline period of 6 months with an introduction period of 6 months and an intervention period of 31 months. During the intervention period the patient rate of unexpected death was found to have reduced relative to the baseline period (0.2% vs. 0.9%). The hospital mortality rate however was not affected. Though the p value for the observation is < .0001 the incidence of unexpected death is so low that the statistics are questionable.

2.4.3.2 Reviews and Meta-analyses

Gao, McDonnell, Subbe published two reviews of the use of physiological track-and-trigger systems in the UK. They found 31 systems, which differed widely. They reported that there was

"...little evidence of reliability, validity and utility. Sensitivity was poor, which might be due in part to the nature of the physiology monitored or to the choice of trigger threshold. Available data were insufficient to identify the best TT." (Gao, McDonnell et al. 2007 p 667)

Their second publication investigated the reliability of the various track-and-trigger systems and reported that of scores was poor, but the reliability of calling criteria was better (Subbe, Gao et al. 2007).

Winters, Pham et al (2007) reviewed published trials of rapid response systems that provided data on hospital mortality and cardiac arrest in control and intervention groups. From 10,228 abstracts meeting their search criteria they identified only eight relevant studies. They commented:

"We found weak evidence that rapid response systems are associated with a reduction in hospital mortality and cardiac arrest rates, but limitations in the quality of the original studies, the wide confidence intervals, and the presence of heterogeneity limited our ability to conclude that rapid response systems are effective interventions." (Winters, Pham et al. 2007) p1238

Chan, Jain et al (2010) reviewed reports of RRT performance between 1950 and 2008. They identified 18 relevant studies. They found that there was an average reduction in ward cardiac arrest of 38% but that this was not in proportion to the reduction of other adverse outcomes. This led them to suspect that the effect was due to the RRS revue leading to more patients being designated as unsuitable for resuscitation attempts rather than improved outcomes. They commented:

"Although RRTs have broad appeal, robust evidence to support their effectiveness in reducing hospital mortality is lacking. (Chan, Jain et al. 2010 p1238)

Jansen, Cuthbertson et al (2010) reached similar conclusions in an evaluation published as a discussion article and descriptive review (Jansen and Cuthbertson 2010).

Alam, Hobbelink et al (2014) have reviewed the use of EWSs in situations without a dedicated RRT in place (Alam, Hobbelink et al. 2014). They found only seven papers that met their inclusion criteria. All were before-and-after historical studies. The heterogeneity of the studies precluded meta-analysis. The studies mostly reported some positive, but inconsistent, impact on outcomes but the level of evidence was low – all being rated B on the Canadian Task Force Scale – Fair level of evidence for the recommendation (Woolf, Battista et al. 1990).

The most recent meta-analysis of studies reporting the effect of EWS on outcome is that of Maharaj, Raffaele et al. (Maharaj, Raffaele et al. 2015). They reviewed 29 adult and paediatric studies between 1990 and 2013 for the effect on hospital mortality and cardio-pulmonary arrest. They found reductions in in-hospital mortality at the 95% confidence level and similar reductions in cardiac arrest rates. Two of the controlled studies and six of the before and after, uncontrolled studies were published since the review by Chan, Jain et al, data for which ended in 2008 which may explain their different findings (Chan, Jain et al. 2010).

The key messages from their review are that the presence of a RRS in a hospital can be expected to reduce the hospital mortality and cardiac arrest rates but that it remains unclear which aspects of the systems are responsible for these effects.

The most recent assessment however lies with the publication of three parallel editorials in Intensive Care Medicine in April 2016. These were by researchers prominent in the field, with each expressing a different opinion:

- Jones, Rubulatta et al claim that the benefits of a RRT are proven. Their argument is not that RRTs significantly improve the management of patients who are at risk of catastrophe; rather they claim that the activities of the RRT improve general management and end of life care. (Jones, Rubulotta et al. 2016)
- Wendon and Hodgson et al find that the evidence is inconclusive (Wendon, Hodgson et al. 2016). They review the evidence of the Australian MERIT trial (Hillman, Chen et al. 2005) and conclude that it was statistically so underpowered that the likelihood of type 2 error was unacceptably high.
- Ritesh Maharaj, the lead author on the latest review (the only review to date with positive findings in favour of RRT), reviews the findings of his own recent meta-analysis, discusses the issues and concludes that despite their attractive appearance of face validity the benefit of RRSs remains unproven (Maharaj and Stelfox 2016).

2.4.4 Why is there little evidence that a RRS improves outcomes

- Are the premonitory signs detected?
- Are they detected but not acted upon

- Are they detected and acted upon, but the mistakes in management are made, owing to lack of capacity of the team to manage critical illness.

With ten years of experience of track-and trigger it had become clear that the hoped for improvements in outcome were at best elusive. Much of the research in this area now turned to explaining this, and improving systems to improve outcome.

Many reasons for outcomes not being consistently improved have been suggested, some of which are:

- Omission of routine measurement of vital signs or technical problems with their measurement or the calculation of the EWS – leading to failures to detect deteriorating physiological signs. This was believed to be significant in the MERIT study (Hillman, Chen et al. 2005)
- A significant number of patients deteriorating suddenly without a premonitory rise in the EWS. This may be up to 60% of patients admitted unexpectedly to ICU (Hillman, Parr et al. 2001).
- The nurse/healthcare assistant or doctor may not respond as required by the protocol (Hillman, Chen et al. 2005, Marshall, Kitto et al. 2011, Shearer, Marshall et al. 2012, Kitto, Marshall et al. 2015).

2.4.4.1   Errors in Data Recording

Van Leuvan and Mitchell (2008) performed a retrospective chart review of 1500 patients and found that whilst other observations showed similar consistency of observation, respiratory observations were significantly less well recorded. Full MEWS datasets were completed between 68% and 81% of the time, depending on the type of ward (Van Leuvan and Mitchell 2008). Improved accuracy of vital signs recording was observed following the introduction of a new MEWS chart coupled with an educational programme (Hammond, Spooner et al. 2013). Still, however, 25% of vital signs sets were incomplete or missing.

Handheld bedside computers have been used to collect vital signs data in the hopes that they would improve accuracy. The programme calculates the NEWS score automatically and the data is then available to junior doctors who carry similar devices.

This system hopes to prevent errors in calculating and recording the EWS and alerts the responsible medical team automatically.

A study has compared the data leading to Emergency Medical Team calls in locations with electronic monitoring and those without. The availability of electronic data improved compliance but errors in monitoring in both situations led to delayed MET assessment that correlated with increased mortality (Tirkkonen, Yla-Mattila et al. 2013).

A recent study involved a prospective observational study of 370 adult patients admitted to an acute medical ward. In 70 patients (18.9%) the NEWS score was calculated incorrectly. An appropriate response to the NEWS by the clinical team was observed in 274 patients (74.1%). After adjusting for confounders, an increasing NEWS score was significantly associated with an inadequate clinical response. The study was also claimed to demonstrate that the team response to NEWS score triggers was significantly worse at weekends (Kolic, Crane et al. 2015).

Another small, single hospital audit showed that 25% of 194 patients had incomplete NEWS data sets (Connelly and Bleasdale 2015).

Many UK hospitals record their NEWS compliance statistics and this compliance may be published as quality data (NHSII&I). Generally compliance is claimed to be around the 90% mark but the numbers of cases audited is usually very small and there is no indication how complete the patient datasets are.

Prytherch and Smith (2006) performed a study comparing the recording of the EWS dataset with pen and paper or with the VitalPAC™ hand held device. Errors occurred in 29% of records calculated by hand compared to 10% using the VitalPAC™ (Prytherch, Smith et al. 2006). Hands, Reid et al. (2013) studied the performance of the electronic VitalPAC™ Early Warning System (VIEWS). They discovered that even using this electronic system significant amounts of data were missing, particularly at night. They speculated that the missing data indicated competing clinical priorities (Hands, Reid et al. 2013).

In summary the literature reveals that about 25% of records of vital sign datasets are incomplete, missing or the EWS is incorrectly calculated. These errors may contribute

to the failure to detect patient deterioration. It was important for me to find out whether my subjects generally trusted the observations. If they felt they were often inaccurate this could result in them placing little reliance on the EWS.

2.4.4.2 Failure to Follow the Protocol

Failures of alerting when a 'trigger' score has been correctly recorded may occur for a variety of reasons:

- The bedside nurse may fail to recognize that a 'trigger' has been reached.
- The bedside nurse or the ward nursing team may decide not to alert the medical team.
- The medical team may not respond to the alert in the way that the protocol requires.

There has been little work done to differentiate possible reasons for teams not following the EWS/RRS protocols.

White, Scott et al (2015) have published a comprehensive review of the current status of Rapid Response Teams and possible explanations for outcome not being consistently improved (White, Scott et al. 2015). Their analysis is particular to the Australian hospital system but their more general conclusions apply elsewhere and can be applied to other aspects of EWSs. Though they believe that the problem of unexpected deterioration was properly characterised they draw attention to glaring deficiencies in the way RRTs were introduced some of which are:

- There was no preliminary testing of the systems to confirm the concept prior to large-scale implementation.
- RRTs are not standardised and their variety makes comparison and large-scale studies of outcome difficult.
- There are no agreed, standardised outcome measures to allow comparisons so outcome has not been rigorously studied.
- Data has not been collected to adequately test theory.
- There has been little search for associated adverse consequences

With regard to the question of human factors they assert that the introduction of Rapid Response Teams was not underpinned by a sound theory of behaviour change. They comment that though the number of RRT calls is increased by the use of mandatory criteria (Kansal and Havill 2012), and by the use of extra soft criteria such as nurse worry (Genardi, Cronin et al. 2008, Douw, van Zanten et al. 2016) no study has investigated the appropriateness of these extra calls. Their paper called for a reconsideration of the issues of EWSs and RRTs. They said that it was clear that many institutions had rushed to recommend adoption of a RRS on the basis of its apparent face validity and that more mature reflection on a decade and a half of research suggested that the problem of catching deteriorating patients before they collapse and reversing their decline is much more complex than it had appeared at first sight.

Marshall et al. (Marshall, Kitto et al. 2011) suggest that the difficulty in establishing the effectiveness of the RRS is in part due to the failure of clinical staff to call for help when a trigger is reached. Compliance rates vary between professional groups. Boniatti et al. found that 21.4% of patients to who the RRS was called, should have had an earlier call on the basis of recorded observations. Physicians had a greater incidence of delayed medical emergency team calls (47%) than nursing staff (29.6%). They found also that mortality at 30 days after medical emergency team review was higher (61.8%) among patients with delayed medical emergency team activation than patients receiving timely medical emergency team activation 41.9% (Boniatti, Azzolini et al. 2014). Despite patients meeting formal criteria, up to one-third of the RRS cases that should be activated are not actually called (Hillman et al., 2005), constituting a 'missed call'.

Donahue and Endacott (2010) interviewed nurses about the way they incorporated the track and trigger system into their practice in managing deteriorating patients. They found that nurses tend to rely on clinical skills to identify deteriorating patients but use the EWS to quantify their condition for discussion with the doctors. They attributed this to the nurses having less understanding of the value of the EWS. Their interpretation of the value of a 'trigger' occurrence was a probable cause of them not failing to report events (Donohue and Endacott 2010).

Beitler, Link et al (2011) reported a fall in hospital-wide mortality rates after the introduction of a RRS (Beitler, Link et al. 2011). They used a cohort study-design with historical controls between 2003 and 2008. The RRT was alerted partly in response to

breaches of multi-parameter criteria (track-and-trigger), but 47% of alerts were triggered in response to 'clinical concern' about the patient. They reported statistically significant reduction in death rate (15.5 to 13.74 per 1,000 discharges), out-of-ICU mortality (7.08 to 4.61 per 1,000 discharges) and out-of-ICU cardiac arrest (3.28 to 1.62 per 1,000 discharges). The authors concluded that introducing an RRT with clinical-judgement as one of the calling criteria had a beneficial effect on patient outcome. This study differs from most reported here, in that the track-and-trigger system alerted the RRS in only 43% of cases whilst 67% were due to "clinical concern". It describes a change of manpower (the RRT consisting of a senior doctor and nurse) and a change of culture (the ready presence of the RRT expertise). The results are significant, but this is not an EWS as originally conceived – to identify patients at risk who are currently showing few signs. Rather it shows the value of additional, experienced manpower attending patients who are already in trouble. The multi-parameter alerting criteria include a heart rate of >140, respiratory rate of >30 and O_2 Saturation of <90%. These criteria are quite extreme and will usually indicate a patient that has well-established deterioration rather than one on the brink. In the context of evaluating the impact of an EWS/RSS the significance of this study is doubtful.

Shearer et al (2012) carried out a multi-hospital study in three parts (Shearer, Marshall et al. 2012). A point-prevalence study was undertaken on a single day by reviewing the charts of all patients (570) not in ICU or other specialised unit. Twenty-three (4.04%) patients fulfilled the criteria for an RRS call and 40% (10) of these were missed (1.75% of the cohort). A subsequent prospective study of 36,760 patients showed failure to alert the RRS in 31 (0.84%) cases who subsequently went on to cardiac arrest or unexpected ITU admission. The final part of the study was to interview the staff responsible for the patient at the time that the RRS should have occurred. The majority of staff had recognised that the RRS calling criteria had been met, and 75% of those interviewed were 'concerned' or 'very concerned' about the patient at the time. 48.2% of nurses and 25.3% of doctors expressed confidence in being supported by colleagues. 13.3% of nurses and 26.5% of doctors were concerned about possible negative responses to their actions from colleagues. Interestingly 40% of doctors and 21% of nurses said that they did not call the RRS because they felt that they could deal with the situation on the ward. The authors said that a principal finding of their study was that the main reasons for staff not following the protocol are socio-cultural rather than technical failures of the scoring or failure to appreciate that a trigger situation existed:

"There are two important messages from this study. First, the main reason why staff did not follow the RRS activation protocol was not failure of cognition, but rather local socio-cultural factors and intra-professional hierarchies in the clinical areas. On this basis, we question the value of efforts to improve RRS effectiveness by making such patients more identifiable (e.g., colour-coded observation charts), the push for an increase in the frequency of RRS activation and even the suggestion that RRS protocols become mandatory. Instead, the results suggest that there should be more effort in understanding individual and bedside cultural issues that may be preventing staff from activating the RRS. For example, in this study, referral to or involvement of critical care teams, particularly when the critical care unit has no beds, may confuse the situation for the general bedside ward staff caring for the patient."(Shearer, Marshall et al. 2012 p 574)

The conclusion can be questioned on the grounds that staff were being retrospectively interviewed about a 'mistake' that they had made. Perhaps their responses indicate that a response of 'I thought we could cope,' is more acceptable to them than admitting other failings. The authors' second finding was that RRS alerting was in the hands of relatively inexperienced staff, who did not have the confidence of their convictions. It is important to note that the RRS was not called to 40% of cases that met the calling criteria in the point prevalence study, whilst the figure is 10% for the main study. This suggests that many more trigger events would be found if the whole dataset had been screened. This study indicates that socio-cultural effects within the teams are a factor in the correct operation of the track-and-trigger and RRS.

Kolic et al, (2015) in addition to reporting the high level of incorrectly calculated NEWS scores as described above, found that responses to trigger events were significantly lower at nights and weekends (Kolic, Crane et al. 2015). They also found that the response to higher NEWS scores, that call for a more senior involvement, were less likely to be dealt with as required by the protocol. Putting these two facts together it suggests that senior responders are less available out of hours and that this discourages bedside carers from making a call.

Tirkkonen et al. (2013) used a prospective observational study to compare the factors that were associated with delayed MET activation and increased hospital mortality for patients in monitored beds compared to those with conventional systems for gathering vital-signs data. They found that 41% of the reviews concerned monitored ward patients. These patients' vital signs had been more frequently documented during the six hour period preceding MET activation, compared to patients in normal ward areas (96% vs. 74%, p<0.001). Surprisingly however delayed MET activation was more frequent

for the patients in monitored beds. The authors conclude that the standard of recording vital signs is poor even though it improves with automated monitoring this advantage appears to be lost because the interventions of staff are not timely and do not follow the local MET protocol. They also found that delay in activating the MET was independently associated with increased mortality (Tirkkonen, Yla-Mattila et al. 2013).

Guinane, Bucknall et al (2013) retrospectively investigated a cohort of patients to determine what happened to those having a set of vital signs observations fulfilling MET calling criteria at any time during their admission and to compare them with the outcome of patients who never reached the calling criteria (Guinane, Bucknall et al. 2013). Of 568 patients, 82 (14%) exceeded the MET calling criteria at least once. The hospital length of stay for these patients was twice that of those who did not exceed the criteria (8.6 days versus 4.3 days). The MET team was called to only three patients. Of the 79 patients not reviewed by the MET, the bedside nurse escalated care for 36 patients (46%) and independently initiated treatment in 23 (29%). Only 20 patients were referred for medical review (20%) and 3 were referred to the MET. MET alerts were very infrequent and the reason for this appeared to be the nurses' decision-making. Though this research was conducted in a single centre its conclusions about nurse involvement in critical decision-making for the sickest group of patients is significant (Guinane, Bucknall et al. 2013).

Roberts, Bonafide et al. (2014) conducted a qualitative enquiry, interviewing 27 nurses and 30 doctors to identify themes relating to barriers that interfere with the working of the RRS in a children's hospital. The three principal themes to emerge were, firstly, self-efficacy in dealing with critical illness, secondly, the role of inter and intra professional hierarchies in causing delay and thirdly, the fear of personal consequences for the doctor or nurse stemming from activating the MET. The authors suggest that only by addressing such human factors can the potential of an RRS be achieved. (Roberts, Bonafide et al. 2014)

In a prospective observational study Yiu and Khan (2014) sought to identify 'patient and environmental' factors that affect whether or not nursing staff will call for assistance, and to identify patient and environmental factors affecting escalation by nursing staff. The study was conducted during 20 night shifts. 109 patients returned NEWS scores >6 at least once and nursing staff escalated only 18 of these patients. It

was suggested that the high level of false positive alerts had led to a mindset where staff were very accepting of deviation from the NEWS protocol and that nurses who were experienced in assessing and managing patients with NEWS scores >6 would use their clinical judgment when deciding whether to call the medical team. (Yiu, Khan et al. 2014)

This recent literature represents a shift in the preoccupations of researchers interested in the performance of RRS, away from quantitative studies attempting to refine scoring and calling criteria towards the role of human factors in modifying the actions of staff who are following a protocol.

Romero-Brufau, Huddleston et al (2014) have applied the calling criteria for an RRS call from commonly used EWSs (MEWS, SEWS, GMEWS, Worthing, ViEWS and NEWS) to a database of over 36,000 patients. They concluded following careful analysis that, if automated, they would result in between 1040 and 215,020 false positive calls per annum – depending on how the calling criteria were set. They conclude that the difficulty of sensitivity and specificity requires that staff must screen potential trigger events if an overwhelming workload is to be avoided. More work is needed before RRS activation can usefully be automated (Romero-Brufau, Huddleston et al. 2014).

At the time this research was begun in 2012 there was no reference to the issue of human factors in the operation of EWSs and RRS. Since that time research has begun to emerge reporting the sociology and complex teamwork of these systems. This has led to a number of observations and suggestions.

In Santamaria, Tobin et al (2010) audit of the incidence of cardiac arrest two and four years after the introduction of a MET (Santamaria, Tobin et al. 2010) the decline of unexpected cardiac arrests was progressive over 2 yrs, and of unexpected mortality over 4 yrs. The authors suggest that changing organisational practice take time and benefits may be delayed. They considered that problems of teamwork and communication might be present at the introduction of a system and that these would improve with time.

In Shearer and Marshall's report (2012) that is discussed above (Shearer, Marshall et al. 2012), a significant conclusion drawn by the authors came from interviewing staff who

were involved in care where a breach of the RRS protocol occurred. They found that despite organisational commitment to RRS the clinical teams were acting in accordance with local 'cultural' roles

They make the observation that:

> *"....implementing systems of care that significantly alter the traditional hierarchical referral model of care, regardless of their potential benefits, takes years to appropriately implement. ....we believe this may reflect the lack of 'face validity' that bedside staff may have for the RRS because of the perceived poor sensitivity and specificity of the activation criteria. The decision of whether to activate the RRS was often made by junior staff members who do not have the clinical experience to safely make this decision."*(Shearer, Marshall et al. 2012)

This is a recognition that team behaviours may be influenced by deeply embedded sociological and cultural factors that coexist within the community. These 'rules of behaviour' may not be easily changed following the introduction of new practices.

Mackintosh, Rainey et al. (2012) reported an ethnographic study of a RRS. A comparative case study lasted 12 months of the RRS in two UK hospitals. It used ethnographic methods, including observation; interviews with doctors, ward and critical care nurses, healthcare assistants, safety leads and managers; documentary review; and analysis of routine data. It was found that the RRS reduced variability in recording, recognition and response behaviour. The RRS formalised understandings of deterioration and provided a mandate for escalating care across professional and hierarchical boundaries. It was found however that signs of deterioration other than a high EWS were more difficult to express. It was harder for staff to escalate care without a raised the score. Junior medical staff described difficulties with referral upwards and across medical boundaries. The authors concluded that there is a need to widen the search for reasons why an RRS may fail from detection and initiation of escalation, to include social and cultural factors. (Mackintosh, Rainey et al. 2012)

Roberts, Bonafide et al (2014) conducted a qualitative enquiry by semi-structured interview of doctors and nurses who work on their paediatric MET. Four themes emerged. Firstly if staff recognised evidence of deterioration they were more likely to escalate care to the MET following a trigger score. Secondly, staff reported frequent difficulty in managing inter and intra-professional hierarchies. Thirdly, staff worried about the personal consequences of criticism if they escalate care. Finally, sub-specialty

doctors were concerned about mismanagement of their specialist area if the patient fell into the hands of ICU 'generalists' (Roberts, Bonafide et al. 2014).

Sociological and cultural issues are being repeatedly reported as influences on the function of the MET.

A similar study of nurses by Massey, Chaboyer et al (2014) found four themes that influenced MET use (Massey, Chaboyer et al. 2014). The themes were:

- Sensing clinical deterioration
- Resisting and hesitating
- Pushing the button
- Support and leadership.

These were all themes that included difficulties with inter-professional and intra-professional hierarchies.

Kitto, Marshall et al (2015) used a method involving ten focus groups of nurses and doctors from four Australian hospitals to investigate the social, professional and cultural factors that impact upon whether or not to call the RRS. These were explored from an interprofessional and collective competence perspective. They state that:

> *"Health professionals' reasons for not activating the RRS included: distinct Intraprofessional clinical decision-making pathways; a highly hierarchical pathway in nursing, and a more autonomous pathway in medicine; and interprofessional communication barriers between nursing and medicine when deciding to make and actually making a RRS call."(Kitto, Marshall et al. 2015)*

They reported that doctors and nurses fall back on the framework and vocabulary of the RRS when they were having problems with interprofessional communication. They described this as a form of collective incompetence.

Odell (2015) audited ward practice in relation to an EWS. She concluded that compliance with procedures had improved relative to earlier reviews, but added:

> *"The implementation of rapid response systems may have been an oversimplified solution to the highly complex problem of undetected patient deterioration". (Odell 2015) P203*

Douglas, Osborne et al (2016) investigated the perceptions of medical and nursing staff to a RRS. They found that rapid response system could be failing to address a hierarchical culture and systems level barrier to early recognition, and response to patient deterioration. (Douglas, Osborne et al. 2016). A significant number of RNs (17.1%) and medical staff (7.9%) said they were reticent about alerting the RRS in case the patient was found not to be critically ill. The authors found that nurses felt that they were required to alert the RRS on criteria predetermined by physicians but were often criticised for invoking an RRT attendance. The medical staff commented that far too many calls to the RRT were being made and that this had a 'boy who cried wolf effect' of devaluing all calls.

Stewart (2008) conducted a qualitative study of house officers (first postgraduate year) in 21 UK hospitals in a single Deanery (Stewart 2008). Her interviews reveal a highly charged atmosphere in the workplace where fear of failure, fear of looking foolish and fear of seeming ineffectual are potent influences on the young doctors decisions over whether or not to call for assistance. Stewart found that numerous factors including risk to the patients, themselves and their teams are taken into account when deciding whether to call for help. She concluded that no prescriptive protocol could have taken all these factors into account and that a system that ignored their social, cultural and professional beliefs would not be acceptable to them. This may well be the situation for F1/2 doctors using the RRS protocol.

In a grounded theory study Kennedy, Regehr et al (2009) found three principal factors that influenced whether trainee doctors called for help (Kennedy, Regehr et al. 2009). These were, factors relating to the clinical question (clinical importance, scope of practice), supervisor factors (availability, approachability), and trainee factors (skill, desire for independence, evaluation). Trainees believed that requesting frequent or inappropriate support reduced their credibility and used rhetorical strategies to preserve credibility. They concluded that junior doctors consider professional credibility as well as clinical issues when requesting support from clinical supervisors.

Radeschi, Urso et al (2015) used a multicentre, questionnaire based method to discover the factors underlying attitudes to the medical emergency team (MET) and barriers to its use by ward nurses and physicians. They found that the principal barrier to its use was that nurses preferred to refer to their covering physician rather than the MET. They

suggested that socio-cultural and issues of inter-professional status were influencing readiness to use the MET system. (Radeschi, Urso et al. 2015).

2.4.5   Conclusion

Understanding of this literature was crucial to my enquiry, as I wanted to discover whether these issues could explain some of the surprising failures of RRSs.

Despite these two decades of experience it is not possible to conclude from the literature that any of the variety of track-and –trigger EWSs, METs or RRSs are having a significant impact on outcome, in terms of ITU mortality, hospital mortality, days in ICU or days in hospital.

EWS, RRS and MET performance is of course determined by the validity and reliability of the instruments in detecting and responding to incipient patient deterioration. Until recently most research effort was directed towards establishing the optimum characteristics for a system. Evaluation of the performance of instruments is complicated by a lack of definitions of what constitutes an unexpected deterioration and by a lack of clarity about the status of the responses that may be made by the RRT. There is also the difficulty that many decisions (admission to ICU, changing DNAR status, length of stay in ICU) are subjective and are influenced by outside issues such as availability of ICU beds.

Research has also revealed that some failures of alerting are due to errors of recording and interpreting vital sign data. Retrospective case reviews often report missing data.

In the last five years attention has turned towards the operation of the system, and the social, cultural, professional and hierarchical factors that interfere with the its operation. There are probably a number of distinct factors, some of which will be specific to a particular healthcare culture or to a particular set of instruments. These factors have not been fully characterised. One critical issue appears to be the need for the medical and nursing staff to identify clinically, for themselves, that the patient is unstable – as well as observing that the trigger threshold for calling for help has been reached.

This literature review confirmed my intention to pursue a qualitative methodology in order to understand the interactions between team members that might to affecting their response to trigger situations.

In Summary, there are a number of similar EWS protocols. They differ in their details but share the objective of detecting patients who are on the threshold of serious deterioration. At this point in the patients progress their precarious status may only be obvious from the score derived from multiple parameters – each showing slight derangement. This study was conducted in an environment where one specific system was in use – The Modified early Warning Score (MEWS) as developed by Stenhouse (Stenhouse, Coates et al. 2000).

CHAPTER THREE: METHODOLOGY, METHODS AND STUDY DESIGN

3 METHODOLOGY, METHODS AND STUDY DESIGN

This chapter describes the methodology chosen for this study and how the study was designed. The first section describes some aspects of qualitative enquiry and why it is suitable for the purpose of the study. The second section describes the epistemology and theoretical perspective of grounded theory and describes why I chose to use an 'interpretivist' paradigm using a constructivist methodology.   The narratives from semi-structured interviews were used to develop theory. I will explain that I believe that constructivist grounded theory is underpinned by perspectives that are relativist, pragmatic and coherent with the ideas of symbolic interactionism. On epistemology, Charmaz has written:

> *"Postmodern challenges from without, combined with positivistic inclinations from within grounded theory, spurred efforts to reclaim its strategies for social constructionist inquiry. Those of us who adhered to a relativist epistemology never concurred with grounding grounded theory in Glaser's mid- 20th-century positivism, and imbued grounded theory with social constructionism, whether or not we articulated epistemological reasons for our actions." (Charmaz 2008)*

The rest of this chapter deal with the choice of method for data collection and the study design. It is divided into four sections. The first section deals with the choice of methods for data collection, the second section is concerned with the role of the research question, the third section describes the processes of setting up the study and the final section considers some possible weaknesses of the research and concludes by considering possible weaknesses of the approach.

3.1 Committing to a Qualitative Methodology and Choosing a Research Paradigm

> *Qualitative research seeks to describe a phenomenon. It may seek to explain the phenomenon and it may generate hypothesis regarding phenomena, but it often does not generally start from a hypothesis (Savin-Baden 2013).*

Pope and Mays (1995) have defined qualitative research as:

"The development of concepts which help us to understand social phenomena in natural (rather than experimental) settings, giving due emphasis to the meanings, experiences and views of the participants." (Pope and Mays 1995)

There are many qualitative methodologies that can be used to this end, and choosing how best to proceed is a difficult problem for novice researchers. The literature abounds with reports of difficult personal journeys in choosing an appropriate methodology (Giske and Artinian 2007, Ghezeljeh and Emami 2009, Markey, Tilki et al. 2014).

This research study explored the effect that socio-cultural, human factors might have upon the operation of the apparently mechanical 'track and trigger' response system. A qualitative methodology was appropriate because I did not seek to discover *what* happened. Rather, I was interested in *why* it happened. I have no data on the efficacy of the MEWS as used by the subjects of this research. My data is in the form of their narratives of their experiences. Table 4 (p67) shows some of the paradigms that shape research methodologies.

It is generally accepted that patient outcomes are less affected by rapid response systems than experts in the field had hoped and expected. My interest was not in the empirical data relating to outcomes, which have been extensively investigated, but in what the use of a MEWS protocol meant to the users. To investigate this aspect of clinical process requires a qualitative approach. Whilst quantitative studies can provide an empirical account of events; when outcomes depend upon the choices people make; this picture is incomplete, because it does not fully address all the factors influencing the way people make the choices they do (Bartunek and Seo 2002, Curry, Nembhard et al. 2009). Table 4 compares some features of quantitative and qualitative enquiry.

Table 4. Features Of Quantative And Qualitative Enquiry

	Quantitative	**Qualitative**
Research Question	Fixed in advance	Broader, contextual and flexible throughout the project
Outcome	Identified in advance	Not predefined, emergent research question
Order of Phases	Linear	Circular
Confounding Factors	Accounted for in study design	Emergent

In this study I will gather narrative data from users of an early warning 'track and trigger system', and through analysis, I will attempt to construct a description of what a trigger situation means to them, how they say they behave when a trigger situation develops, and why they behave in that way.

Initially I had considered a mixed methods approach; combining qualitative interviews with retrospective data from the nursing and medical notes to assess response times to trigger alerts of real deteriorating patients. I was beginning to understand that the use of MEWS was something complex, not merely down to the individual but something that is enacted within a complex setting and influenced by many factors. After some consideration I decided to narrow my focus to exploring the general concept of the RRS protocols and the experiences of team members. I analysed the participants' narratives to reveal how they used the RRS in practice and to discover the meaning it had for them as individuals. This avoided interviewing my subjects about actual failures and delays in alerting. My experience in investigating mishaps (see chapter 1) suggested that this might lead to defensive, and self-justifying, accounts that did not reveal the interviewee's real thoughts.

Glaser, in his original description of grounded theory said that it was particularly useful in situations where there is little existing theory (Glaser, Strauss et al. 1968). This was indeed the situation regarding explanations of the behaviour of clinicians using RRSs.

The more I read, the more convinced I became that a grounded theory enquiry stood a better chance of yielding useful theory than would an investigation of acknowledged failures and delays. The study design was discussed with senior research colleagues, who I felt could act as critics (this was prior to me being allocated formal supervision). They felt that the original mixed methods approach was very complicated and an approach that used a single methodology was to be preferred. I now understand that, as a novice researcher, moving through this phase of the study is important. Having a clearer understanding of the limitations, and the reasons why an unwieldy study is both impractical and lacks focus, is a step in every postgraduate student's journey.

The researcher must consider what they bring to their project in terms of their understanding of research in general, and their position regarding the particular issues of the study. Bias can be introduced at many stages of an investigation. Sackett (1979) described 35 ways that Bias can occur (Sackett 1979) and some of these, such as interviewer bias and assumption bias, stem from the pre-existing beliefs of the research team (Delgado-Rodriguez and Llorca 2004). In particular I was wary of allowing my personal understanding of reality to be at odds with the realities understood by others (Mays and Pope 1995).

I felt that a qualitative review of the meanings of MEWS to its users would complement the existing quantitative literature. Curry et al (2009) have argued that both qualitative methods should be used in outcomes research as well as quantitative methods because each makes unique contributions to understanding (Curry, Nembhard et al. 2009). Bartunek (2012) has emphasised that academic articles that suggest changes in practice, should be appropriately addressed to the different standpoints of the professionals who will need to implement those changes (Bartunek 2012). She suggests that qualitative research plays an important part in this process.

3.2 Ontology and Epistemology

Table 5. Some Paradigms That Shape Research Methodology (From various sources)
Positivism: A single reality exists that is objective and can be measured. Reality can be discovered by experiment such as empirical observation of the world. Positivist theory searches for causes and explanations and emphses generaliasiseability. Positivism arises from a realist ontology (Cruickshank 2012, Charmaz 2014 p229). Positivism dominated scientific thinking from the late eighteenth century to the middle of the twentieth century.
Neo-positivism: Developed in the first half of the twentieth century drawing upon parallels between physical and social phenomena. Uses, or attempts to use scientific methodology in sociological research it therefore has a positivist epistemology. Problems are investigated by setting up a hypothesis for empirical investigation. Theories are logically developed using mathematical principles (Isajiw 2016).
Post-positivism: The view that understanding reality requires context and that context free experimental design is insufficient. Based on the belief that most knowledge is speculation, this research paradigm stresses deductive logic in supporting theory generation. Post-positivism admits allows experience (for example, surveys), sociological or psychological experiments (where the data must be inferred from other phenomena) and observed human behaviour as data (Harvey 2012-16).
Critical theory: Ideas in relation to an ideology – knowledge is not value free and bias should be articulated – such as feminism or Marxism. Has a political agenda. Kincheloe and McLaren have discussed the issue of research that they describe as 'Partisan in a neutral research environment' (Kincheloe and McLaren 2002).
Constructivism/Interpretivism: Reality is subjective. Each individual constructs his/her own reality so there are multiple interpretations. This paradigm arises from relativist ontology. Cresswell (2013) has discussed the factors that must be considered in choosing a constructivist approach. (Creswell 2013)Chapter 2).
Postmodernism: Movements developed in the late twentieth century that rejected the principles of modernism. In philosophy it emphasises that truth is the construction of power relationships, personalisation and discourse.

The ontological and epistemic position that a researcher adopts will influence their choice of a methodology and subsequently shape the way they interpret and present their findings (Denzin and Lincoln 1998). Table 5 shows some of the paradigms that shape research methodologies.

3.2.1 Ontological Stance

Ontology is the fundamental belief about the way things are. The ontological stance of this study is relativist. For two thousand years the dominant perspective in science was idealism as set out by the Greek philosophers of the third century BCE. Understanding was often determined by religious belief. For science this meant that the use of analytical thought could fully determine the nature of reality, without having recourse to experiment. In the eighteenth century science began to work to realist ontology. Realism is the belief that aspects of reality exist independent of our ideas, perceptions, language and beliefs (and of the researcher). In the twentieth century the social sciences adopted a relativist position. Relativism is the belief that absolute truth is unknowable, and that people's interpretations of reality vary with contexts (Section 3.2.2.2.below). Today the two major ontologies of science are realism and relativism (Losee 2001)Ch 18.). By acknowledging a relativist stance I acknowledge that I am open to the idea that there may be multiple versions of reality expressed within my data, in response to the differing standpoints of my participants.

3.2.2 Epistemological Perspective

Epistemology describes the way knowledge is sought and organised.

3.2.2.1 Positivism

The basis of positivist epistemology is that there is a single reality. Positivism's tools are observation and measurement. Logical positivist theory maintains that the only meaningful propositions are those that can be reduced, through the application of logic, to basic propositions that can be empirically verified (Stevenson and Waite 2011). There exists therefore a single reality that can be verified by experiment.

3.2.2.2 Relativism

Relativist ontology is the view that knowledge is relative. It depends on factors such as time, place, culture and personal belief (Doppelta 1978).

According to this view there is no single account of reality, but a variety of truths. The relativist definition of theory concentrates on the interpretation of events and phenomena

3.2.2.3   Interpretivism

Relativist ontology is sometimes classed as interpretivist but interpretivism should properly be considered to be an epistemological perspective, within relativist ontology (Charmaz 2014). Interpretivist believe that the researcher is a social actor and that their interaction with their subjects is a critical element of research.

> *"(Interpretists)…view theoretical understanding as gained through the theorists interpretation of the studied phenomenon. Interpretative theories allow for indeterminacy rather than seek(ing) causality and aim to theorise patterns and connections." (Charmaz 2014)*

Table 6 shows the features of Interpretivism compared to positivism.

Table 6. Comparison of Positivism and Interpretivism

Assumptions	Positivism	Interpretivism
Ontology	Realism	Relativist/Idealist
Reality	A single reality exists	Reality is a social interpreted and constructed
Research Goal	To explain and strongly predict reality	To understand reality but is weakly predictive
Focus of Interest	The average – statistically focused	To find exceptions and deviations
What comes from research	Predictive rules	An explanation of events

3.2.3   Naturalistic Enquiry

The naturalistic paradigm presumes that there are many interpretations of reality and the objective of researchers should be to understand how their subjects construct their own reality - this reality being influenced by the social context of their experience (Harvey 2012). This research is a Naturalistic Inquiry and as such is based on a number of principles:

- Phenomena were studied in their natural context without experimental interventions.

- The object was examined without pre-existing ideas in the researchers mind
- The researchers findings were interpretive – despite trying to see the issue from the view of those being studied it is not possible to avoid making a personal interpretation of the findings.

Lincoln and Guba have advocated a method depending on this naturalistic paradigm, and based on what is described as a post-positivist epistemology (Lincoln and Guba 1985). My experience with the dilemmas and conflicts of critical care medicine inclines me towards naturalistic inquiry as a research method but in a relativistic framework.

3.2.4   Symbolic Interactionism

Symbolic interactionism is a theoretical perspective to which much qualitative research is attributed. It developed from Pragmatism (See Table 7), and was developed by George Mead in the first years of the twentieth century. Later, his student Herbert Blumer gave it the name symbolic interactionism (Blumer 1986). It is a theory of social behaviour that focuses on the personal meanings individuals give to the experiences of life. These meanings are understood as personal symbols and social interaction develops from the interplay of these symbolic meanings between individuals. Social interactionists believe that these interactions form reality and that each individual shapes their own version of reality.

Table 7. Some Of The Features Of Pragmatism (adapted from Harvey 2012)
Pragmatism treats knowledge, concepts and values true if they are useful. Pragmatists emphasise the practical function of knowledge as an instrument for adapting to reality and controlling it.
The pragmatists rejected the rationalist view that reality is static and fixed and preferred a view of a changing, dynamic reality.
Pragmatism is primarily empiricist inductive testing of hypotheses prioritising experience, although not assuming that facts exist 'out there' waiting to be discovered. Facts are carved out of reality depending on peoples' (scientists') interests and purposes.
Pragmatism adopts a relative approach: truth is modified as discoveries are made and is relative to the time and place and purpose of inquiry. This is not to say that we cannot know things rather that things have a variety of meanings, which are not directly understood, rather an object acquires meaning through encounters with people, who define it in practice. The function of thought is to guide action not provide timeless abstract truths; pragmatists interpret ideas as instruments and plans of action rather than as images of reality.
Thought is grounded in practical reality and has no real metaphysical significance, pragmatists protest against speculation concerning questions that have no application and no verifiable answers. They are explicitly action-oriented and instrumentalist.

3.3   Choosing an Analytical Method

Qualitative data is often in the form of narrative. An inductive or deductive process is used to analyse the data and reveal the underlying principles. These principles may in turn be used to suggest a theory of how and why systems operate as they do (Denzin 2005).

Inductive reasoning *"is a logical process in which multiple premises, all believed true or found true most of the time, are combined to obtain a specific conclusion".*

Deductive reasoning *"is a logical process in which a conclusion is based on the concordance of multiple premises that are generally assumed to be true. Deductive reasoning is sometimes referred to as top-down logic. Its counterpart, inductive reasoning, is sometimes referred to as bottom-up logic."* Research Methods Knowledge Base http://www.socialresearchmethods.net/kb/dedind.php Accessed July 2016

There are several methodological approaches to the analysis of qualitative, narrative data:

Thematic analysis identifies themes within qualitative data with the intention to provide a description of the observed phenomena. A thematic analysis attempts to summarise data into themes that can be explained, whereas grounded theory aims to develop a theory to describe the findings (Ryan and Bernard 2000).

Grounded theory The fundamental property of grounded theory is that it is inductive, and the inductive process is iterative. This means that the interpretation of the data, as it is acquired, is fed back to shape the ongoing enquiry. It has been observed that many studies published as grounded theory investigations do not use a grounded theory method at all (Denscombe 2014, Glaser 2015). Glaser's defence of his method has been fierce and his language vitriolic as in his comments on the relationship between symbolic interactionism and grounded theory.

> "*So the answer to Schreiber and MacDonald is two-fold. Yes, I am far more experienced than they are, and their connection of Symbolic Interactionism to GT is flawed! … Instead of their immaculate 12 page super-rethink on why GT is an SI method, they need only do a GT of the dozens of extant GT dissertations, to realize my points made ad nauseam in this chapter."* (Glaser 2005).

Abductive Analysis is an approach that accepts that the inductive reasoning from the data might be ineffective. The data is examined for aspects that do not fit with existing theory or are surprising. These discrepancies are then used as the starting point for new interpretations (Timmermans and Tavory 2012).

Narrative Analysis is yet another methods for analysing interviews. It differs from the previous methods in that analysis takes the stories as whole instead of dividing them into themes (Greenhalgh, Russell et al. 2005). A variety of systems for analysing the data are described (Thomson and Holland 2003).

This research uses grounded theory. In particular constructivist grounded theory as described by Charmaz (Charmaz 2014)

3.3.1   Grounded Theory

Grounded theory was developed by Glaser and Strauss in the nineteen sixties as a response to the pre-eminence of quantitative studies in the social sciences, and in an effort to improve the scientific rigour of qualitative studies (Kenny and Fourie 2014). Glaser and Strauss sought methods to extract theory from qualitative evidence that would be as reliable as the data from quantitative studies (Glaser and Strauss 1967). Fifty years on, there are a variety of methodologies that claim to be grounded theory. The differences between them often appear abstruse to novice researchers choosing how to progress (McCann and Clark 2003, Giske and Artinian 2007) and the internet forums abound with cries for help from novice researchers (Glaser 2015).

Glaser believed that theory was to be found within the data by application of inductive reasoning - theory could be discovered hence the title of his seminal paper with Strauss "The Discovery of Grounded Theory" (Glaser, Strauss et al. 1967). Grounded Theory came into being during the development, by Glaser and Strauss, of a study of the interaction between dying patients and their medical attendants in hospices (Glaser and Strauss 1966). This was a time when qualitative research was held in low regard in sociology. The focus then was principally upon the verification of theories that were developed from prior assumptions. Glaser, in particular, felt that this was the fundamental weakness of qualitative research, making it difficult to develop new, meaningful hypothesis. He and Strauss developed a series of techniques for identifying possible theory from within qualitative data, that comprised an inductive approach to research, with the goal of conceptualisation, rather than a deductive approach to a study with the objective of verification (Glaser, Strauss et al. 1967). The theory "discovered" by their technique was "grounded" in the data.

Glaser and Strauss described their method as both realistic and pragmatic (see below). Their papers have had little to say on the theory's ontology and epistemology, but others have categorised it as post-positivist (Atkinson 1997, Åge 2011). Post-positivism developed from the critiques of positivism of Karl Popper (Popper 1934) and Thomas Kuhn (Kuhn 1962). Popper developed the idea that propositions are unverifiable but may be disproved, and criticised the inductive derivation of theory from empirical observations. Kuhn discussed the provisional nature of theory and described how scientific theories were readjusted to accommodate observations that would not fit, until a paradigm shift occurred and a new theory replaced the old. Like Popper he believed that it was impossible to know whether a theory was true. Post-positivists believe that there is a reality, but that it cannot be fully known and must be treated as provisional. More recently, others have maintained that grounded theory is neo-positivist rather than positivist or post-positivist (Newman 2008). Neo-positivism is a philosophical perspective that favours a deductive approach. It arose from a group called the Vienna Circle in the early twentieth century (Annells 1999). Neo-positivists sought to unite the principles of enquiry of established sciences such as physics, with those found useful in psychology and sociology. They modelled their thought processes on the existing systems of positivism in particular by reducing statements about reality to their simplest form (Delanty and Strydom 2003). The arguments about the philosophical position of grounded theory have occurred partly because Glaser and Strauss were themselves unsure of its status. Glaser wrote that the struggle to fit grounded theory into a particular stance was fruitless, because the method was used successfully in many contexts and the contexts had influenced the underlying perspective.

> *"The point is that, as I said in "Doing GT chapter 3", the rhetorical wrestle is a waste of time regarding ontology and epistemology. There are too many different types of data involved, GT being possessed by no one theoretical perspective for any data type." (Glaser 2005)*

Understanding grounded theory is made more difficult for researchers by the fact that Glaser and Strauss diverged in their interpretations, and a fierce academic argument ensued. Strauss, working subsequently with Corbin, published a book outlining his concept of grounded theory (Strauss and Corbin 1990). This advocated a highly systematic method of analysis, eventually leading to computer-based techniques. They subsequently summarised and refined their approach (Strauss and Corbin 1994). Philosophically, this rigorous and meticulous coding framework was underpinned by pragmatism and symbolic interactionism (Blumer 1986).

> *"Symbolic interaction theory analyses society by examining the subjective meanings that people give to objects, events, and behaviours. Subjective meanings are given primacy because it is believed that peoples behaviour is based on what they believe, and not just on what is objectively true."*
> *Research Methods Knowledge Base*
> *http://www.socialresearchmethods.net/kb/dedind.php Accessed July 2016*

Glaser however vehemently rejected the proposition that GT reflects a symbolic interaction perspective:

> *"These authors have dealt with whatever is going on in their areas of concern with the "all is data" principal in mind, while doing laudable work as far as they can go: and being available to as many TCs as their current studies have allowed. Teasing out one particular perspective in these complex GT's would be a waste of time with futile results. Product proof is the goal for GT as a general inductive, rigorous method." (Glaser 2005).*

3.3.1.1   The Methodology of Grounded Theory

Grounded theory is characterised by the use of a suite of techniques, and it is from these that a true grounded-theory method can be recognised. Glaser and Strauss believed that by having a predetermined structure for analysis they were developing a system that was "scientific", valid and reliable. This is the feature of grounded theory that has led some to categorise it as neo-positivistic.

In grounded theory:

- Data collection and analysis occur simultaneously and are an iterative process.
- Coding is the process of identifying items of data.
- Theoretical sampling – is the process of chasing an emerging theoretical concept by recruiting data that is most likely to shed light on the issue.
- Memo writing – is the process of writing down inductive thoughts that occur to the researcher and supplementing the data with these insights. (Glaser, Strauss et al. 1967)
- Constant comparison – is a process of constantly looking for similarities and differences between related data. Comparison takes place within the data, with memos and with the existing literature.
- Saturation - is the process of continuing interviews and analysis until no new themes emerge.

3.1.1.2   Constant Comparative Analysis

The Constant Comparative Analysis method is an iterative and inductive process of reducing the data through constant recoding (Glaser & Strauss, 1967). Incidents or data are compared to other incidents or data during the process of coding. This process begins with open coding to develop categories from the first round of data reduction and further reducing and recoding allows possible core categories to emerge (Charmaz, 2001; Glaser, 1978; Glaser & Strauss, 1967; Strauss, 1987). Grounded theory and its allied methodologies all start with a process of coding. Hallberg (2006) has argued that this is itself the 'core category' of grounded theory, and provides assurance that any theory is a valid interpretation of the data (Hallberg 2006). He writes:

> "The constant comparative method, which can be seen as the "core category" of grounded theory, includes that every part of data, i.e. emerging codes, categories, properties, and dimensions as well as different parts of the data, are constantly compared with all other parts of the data to explore variations, similarities and differences in data. The constant comparative method of grounded theory is strict enough to be helpful to the researcher in exploring the content and meaning in the data, but not saddled with so many strict rules to be too rigid for a grounded theory researcher."

A code is an example of the data speaking to a particular issue. It does not matter how the issue is framed, or what an opinion is. In my enquiry an example of a code would be: "Speaking about colleagues" (note the use of the gerund)

All methodologies start with codes but the subsequent stages of analysis to categories, higher-level categories, core categories and theory are the subject of innumerable academic papers and can be very confusing. The codes can be analysed for underlying similarities from which a "category" can be developed. Glaser describes initial descriptive categories. Grouping these together in response to a concept reveals analytic categories. This process of grouping similar codes together identifies some codes that grow and pervade the data – these are core categories. They are ideas that your codes can demonstrate to be widespread in the narratives.

Glaser and Strauss described identifying categories of increasing abstraction by iterative revue and grouping of data. They suggested that decisions regarding data collection should not be fully determined in advance because, during analysis, the data will reveal the need for more data. In the first place gaps will become evident as the data are coded indicating need for further evidence to be collected (Glaser, Strauss et al. 1967). Secondly, during the collection and analysis of data, unexpected concepts may emerge

which change the direction of the study. Thirdly, as the underlying hypothesis begins to surface, gaps in the evidence relating to this emerging theory will become evident. Glaser and Holton indicated that as the researcher is collecting, coding, analysing and categorizing data simultaneously, three levels of comparisons are taking place (Glaser & Holton, 2004; Holton, 2010):

- Codes are compared with codes,
- Codes are compared with emerging categories, and
- Categories are compared with one another.
- Memos are included in the analysis.
- As the research becomes complete, Glaser and Holton suggest that analysis enters a fourth stage (that can be depicted as the fourth layer of the iterative process): (Holton 2010, Glaser and Holton 2014) - The emerging theory is compared with the literature.

An important aspect of the analysis proposed by Glaser and Strauss (1967) is the writing of memos. These are ideas promoted by and reflections springing from consideration of the data. Glaser stated emphatically that his new method was intended to prompt the researcher to think deeply and innovatively about their data. Glaser treats these ideas as a form of secondary data. I have found this aspect of analysis to be very useful.

Grounded theory offers a set of guidelines for building conceptual frameworks that specify the relationships among categories but the guidelines should be used as flexible tools rather than being seen as rigid rules (Hallberg 2006). The controversies around grounded theory have been fierce. It has been criticised on four principle grounds (Luckerhoff and Guillemette 2011):

- Its lack of a theoretical framework – characterised by Glaser's antipathy towards many of sociology's theoretical perspectives (Glaser 2004, Glaser 2005, Glaser and Holton 2014, Glaser 2015).
- The circularity of its processes.
- The possible bias that comes from having prior knowledge in the absence of a research hypothesis
- The danger of theoretical sampling increasing bias.

3.3.1.2 Prior Knowledge and Expertise in the Field of Study

Glaser has remained firm in the belief that prior knowledge of the subject area interferes with this process of hypothesis building (Glaser 1978, Glaser 1992, Creswell 2013). For this reason he even frowns upon the conduct of a preliminary literature review. His argument is that a researcher with an existing understanding of the field will arrange the data to satisfy their conceptions and will be insensitive to new concepts emerging through the data. Glaser's evocation of grounded theory makes central the process of identifying trends within the data. The purpose, then, of a Grounded Theory investigation, is to build an explanation or theory of why the events occur as they do by analysis of the data. Data collection, analysis and reading; by occurring simultaneously; are intended to guide further data collection and the slow development of theory. Glaser has advocated a process for minimising the effect of prior knowledge that is called 'Bracketing'. Tufford and Newman have described the processes of bracketing (Tufford and Newman 2012) and Gearing has devised a typology of methods (Gearing 2004). Creswell and Miller (2000) stress that the researcher must identify their 'beliefs and biases early in their research and make these clear to readers. They must then suspend or 'bracket' these beliefs, which introduce researcher bias (Creswell and Miller 2000, Glaser 2004).

This stricture to set aside expertise in the field, and not to do preliminary reading or a literature search has created difficulties for many researchers. Inevitably researchers are often experts in their chosen field. That is why they want to research it. This was one of the factors that led to the development of a Constructivist version of Grounded Theory by Charmaz (Charmaz 2008). I have found the process of bracketing complex, and I value my clinical experience. I believe that my knowledge brings insight to my interviewing and I do not want to set this aside as I believe this handicaps my data gathering.

3.3.1.3 Constructivist Grounded Theory

Constructivist epistemology is a branch of the philosophy of science that maintains that natural science consists of mental constructs that are developed with the aim of explaining sensory experience (or measurements) of the natural world (Piaget 1967). Accordingly, the scientific community, by seeking to measure and construct models of the natural world, constructs scientific knowledge. Social constructivism is based on a

relativist epistemology (Piaget 1967) as opposed to Glaser's positivism. Charmaz reconfigured grounded theory in line with constructivist epistemology (Charmaz 2006). In particular, she rejected Glaser's underlying philosophy that a single reality is waiting to be discovered in the data. She believes that:

"*Neither the data nor the theories are discovered*"

and insists that:

"*…..we construct our grounded theories through our past and present involvements and interactions with people, perspectives and research practices" (Charmaz 2006).*

A researcher with a constructivist perspective attempts to construct the world with interpretations from the standpoint of an individual, or more often a group of individuals who share a perspective (Lincoln and Guba 1985). In this study I am trying to understand if there are shared interpretations of reality amongst the clinical team, and whether these understandings are broadly consistent with professional and hierarchical boundaries.

Charmaz also diverged from Strauss' highly systematic coding process perceiving it to be too restrictive (Charmaz 2006). Instead she proposed flexible "guidelines". Thus she deviated significantly from both classic, 'Glaserian' and 'Straussian' grounded theory, both in philosophy and in coding process (Bryant 2002). Many researchers have found Glaser's grounded theory difficult to implement (Giske and Artinian 2007, Evans 2013). Moore has described the difficulties she encountered in attempting to apply classical grounded theory and has related these to some of its philosophical roots. (Moore 2010). Breckenridge, Jones and Elliott (2012) have provided practical advice on the decision to use constructivist grounded theory and stressed that its differences from classical grounded theory are fundamental. (Breckenridge, Jones et al. 2012)

The procedures of Glaser, Strauss and Charmaz differ in three principal ways:

- Coding procedures (Glaser 1992)
- Their philosophical positions (Kelle 2005, Aldiabat and Le Navenec 2011)
- Their use of literature (Charmaz 2008).

The differences and similarities are shown diagrammatically in Figure 7 (Kenny and Fourie 2014):

Figure 7. The Uniting and Differentiating Principles of GT (Redrawn from Kenny and Fourie 2014)
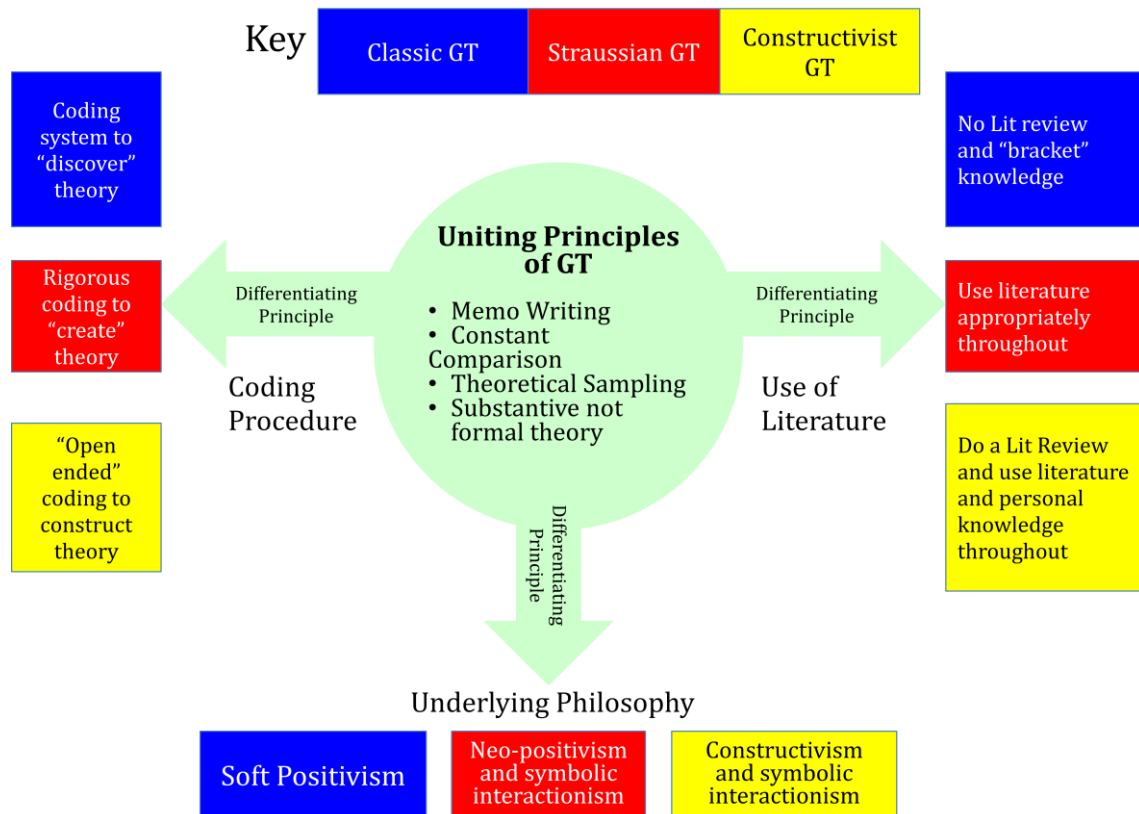
Charmaz also deviates from the views of Glaser in proposing that constructionist grounded theory is fundamentally a form of naturalistic inquiry. Naturalistic inquiry often uses grounded theory methods of analysis to extract data (Erlandson 1993). Glaser, however, finds that the ideas of Lincoln and Guba to be in conflict with grounded theory. He emphatically rejects their naturalistic paradigm on the grounds that what they describe as 'axioms' are:

> *".....just think-ups, ungrounded in research, but honouring idols (critical theorists) that Lincoln and Guba are enamoured by. They are of no use to GT." (Glaser 2004)*

Glaser's critique of Lincoln and Guba is principally of the way they claim to extract theory from the data.

Unlike Lincoln and Guba and others, Charmaz does not describe constructivist grounded theory as having a post-positivist epistemology. She prefers to use the description interpretative, and asserts that grounded theory rests within a relativist ontology (Charmaz 2014) p231). She does not believe that it is necessary for grounded theory to be related to any particular epistemology and contends that the data collection can be positivist or constructivist (interpretivist) and that it will produce different data depending on the epistemic beliefs of the researcher. She does not appear to think this matters, as long as the researchers perspective is declared. She believes the methodology to be relatively neutral but to be influenced by the epistemic stance and theoretical perspective brought to it by the researcher. She writes:

> *".....grounded theory contains both positivist and interpretivist elements because it relies upon empirical observations and depends on the researchers constructions of them"* (Charmaz 2014 p 232).

Charmaz differs from Glaser and Strauss in her attitude to literature searches and prior experience. Charmaz accepts that the researcher may have pre-existing ideas about their topic and that these will develop during the research process. This is a process similar to the later use of emerging concepts to drive theoretical sampling. Researchers using grounded theory often have pre-existing knowledge and assumptions that alert them to certain lines of inquiry. Blumer (1969) described such influencing as sensitising concepts (Blumer 1986) and Charmaz has absorbed these ideas into its theoretical framework (Charmaz 2006) and asserts that the researcher is an active participant in the construction of theory.

3.3.1.4   The Detail of Coding in Constructionist Grounded Theory

Coding in grounded theory has at least two principal phases. Charmaz (2014) recommends an initial line-by-line review followed by a focused coding that is used to sort the data according to what seems most significant or frequent codes. She states:

> *"During initial coding, the goal is to remain open to all possible theoretical directions indicated by your readings of the data. Later, you use focused coding to pinpoint and develop the most salient categories in large batches of data. Theoretical integration begins with focused coding and proceeds through all your subsequent analytic steps."(Charmaz 2006)*

Charmaz starts her analysis with the key question "What is the chief concern of the participants", and "How do they resolve this concern" (Charmaz 2014). She suggests that coding should concentrate on the actions of subjects as more important than

themes. She uses gerunds, to describe these actions because this exposes the processes the participants use, and where possible uses their own language as the code (Charmaz 2014). Figure 8 shows the principal ways that these coding procedures differ from one another.

Figure 8. Contrasting The Coding Procedures of Glaser, Strauss and Charmaz
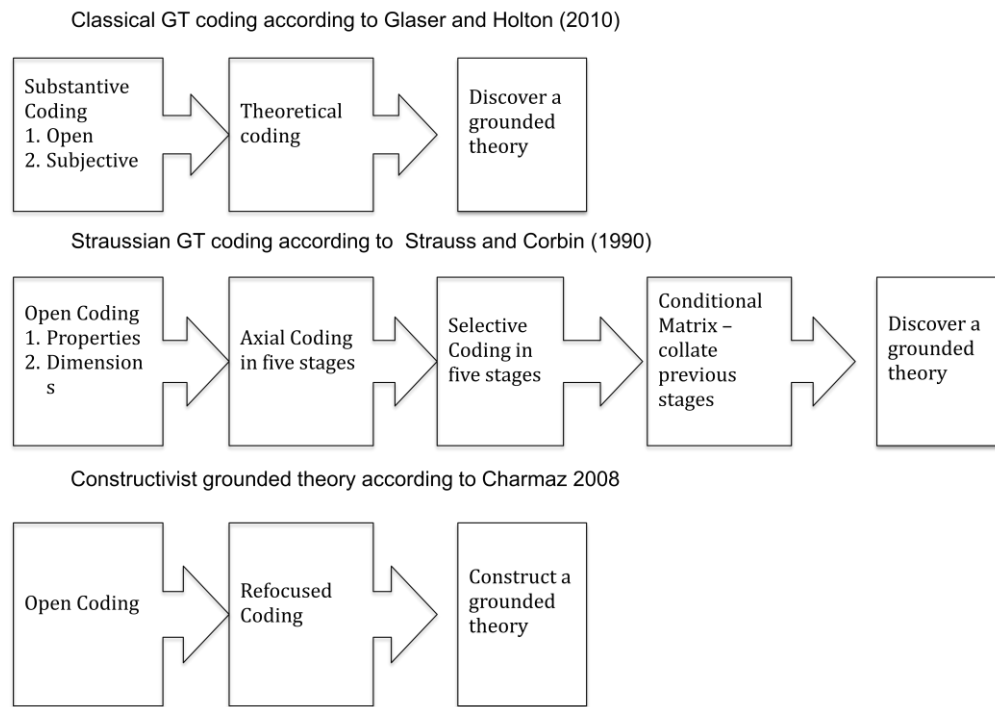
In the next stage of coding, those codings that "carry the analytic momentum" are elevated to categories. Subsequently theoretical sampling and memo writing are used to explore these categories. Charmaz gives memo writing special importance in bridging gaps in the data until appropriate data emerges (Bryant and Charmaz 2007). All these coding systems are ultimately dependent upon the technique of constant comparative analysis.

3.3.2   Choosing Grounded Theory

At the outset I was not familiar with the theoretical basis of grounded theory. I have chosen a constructivist approach because I came to this research through my observations of the understandings of colleagues as they managed critically ill patients. I saw that novice nurses and doctors struggled with the concepts of ICU, and lacked a vocabulary to explain their understandings. With time they could be seen to be adopting the 'group-speak' and honing it until it became similar to their colleagues. My

perception of the clinical world has been one where many interpretations of reality coexist. I am a relativist. As such, I lean towards naturalistic enquiry, seeking to understand the process by which MEWS data is interpreted by those who use it. I have described my methodology as grounded theory drawing upon the constructivist principles of Charmaz, rather than using those principles. There are so many versions of grounded theory promoted by the major authorities, each evolving with time, that it is difficult for a researcher to find a single account to follow as a recipe. The closest I can come is to say that I used a methodology principally drawing upon, or derived from the work of Charmaz (Charmaz 2014). The theoretical perspective of this study is summarised in Table 8.

Table 8 The Theoretical Perspective and Research Paradigm of My Research		
		Theoretical Perspective
Ontology	Relativist	Naturalistic Inquiry Symbolic Interactionism
Epistemology	Interpretivist, Social Constructivist	
Methodology	Constructivist Grounded Theory	
Method	Semi-structured Interview	
Analysis	Iterative Coding, Theoretical Sampling, Use of Memos in addition to categories.	

3.4 Deciding On Methods

Qualitative data for this study could have been gathered in a variety of ways:

- By the observation of work
- By observation whilst participating in the work
- By written reports in the form of diaries
- By questionnaires
- By asking people about what they do (interviewing)
- By asking people how they deal with typical situations (behaviour description interviewing)

The data would however vary with the method. The method must therefore be chosen in order to harvest data that is suitable for the intended purpose.

3.4.1 Observation

Observational techniques are frequently used in qualitative research and provide a 'thick' description of phenomena (Geertz 1973). These start from an observation of the phenomenon, with the recording of field notes. These are then analysed. Typically, the researcher would not approach the observation with pre-determined categories or questions in mind. Because of this openness, observation in more relativist research is often referred to as unstructured.

Research based on structured observations (such as counting or listing particular actions) are more likely to be carried out by those operating from a 'positivist' perspective, or who at least believe it is possible to clearly define and quantify behaviours (Curry, Nembhard et al. 2009). Unstructured observation is more likely to be carried out by those operating from an 'interpretive' or 'critical' perspective where the focus is on understanding the meanings participants attribute to events and actions. Positivist researchers are likely to be operating from a 'realist' perspective, namely that there is a 'real world' with 'real impact' on people's lives and this can best be studied by looking at social settings directly. I believe that a reality exists: but that it is constantly re-shaped by events. I believe that the sociology of the workplace is one such factor. I could have used an observational methodology to describe the general work practices of the teams I was studying, but the phenomenon of unexpected deterioration, which is under consideration, is very infrequent and is inherently unpredictable. In order to draw conclusions about behaviour that can be generalised, many episodes of practice would have to be observed, taking many weeks or months making this option unsuitable. In addition observational techniques do not provide good data on what meaning events had for the subject.

3.4.2 Participant Observation

In *participant observation*, the researcher becomes immersed in the environment they are researching. It has been much used in anthropology research particularly in the early twentieth century where researchers lived within the societies they were describing. Howell has described the stages of conducting Participant Observer Research (Howell

1972). Participant observation was unsuitable on two major counts. Firstly, becoming part of the ward team for a significant period would have presented formidable employment and ethical issues – even though I am qualified to undertake this sort of work. Secondly, ethical approval would have required me to declare my intentions and my experience, and the presence of an experienced, senior clinician, who was also a researcher, would be likely to disturb normal behaviour. An example would be the decision whether to refer or temporise. I could be variously seen as a source of expert advice or distrusted as a management spy – with unpredictable results!

3.4.3   Interview Techniques

Interviews are commonly used for qualitative research and there are various ways to use them. (Legard, Keegan et al. 2003, Britten 2007)

3.4.3.1   Behaviour Description Interviewing

Behaviour description interviewing is a structured interview technique in which the subjects are asked to describe their normal behaviour in response to a number of descriptions of situations that occur in their normal life. It has been considered to yield data of higher validity than unstructured interviewing. In a study of applicants for jobs as sales-persons, Orpen (1985) attempted to predict future success in terms of sales achieved. He compared unstructured with behaviour-description interviewing and found that future performance was better predicted by the latter (Orpen 1985). Janz (1982) has advocated behaviour description interviewing as useful when all participants play the same role in a process (Janz 1982). I decided not to use it because of the constraint of time on the interviews as I felt it would take significantly longer than thirty-minutes to conduct useful interviews.

3.4.3.2   Group Interviews and Focus Groups

Group Interviews require the assembly of the group to brainstorm and respond to an interview questions as a group (Janz 1982). As my focus is on the individual's perceptions and actions this approach is not appropriate. I do not want the team to be led to a consensus by dominant individuals; I want to hear the opinions and experiences of individual members. In addition it fails the test of practicability. Assembling

satisfactory groups out of normal work – without funding – would be a challenge. Assembling them during work would disrupt the ward.

3.4.3.3   One to one interviewing

The interview in qualitative research can be used to discover what meanings the subjects ascribe to events. Brinkmann and Kvale (2014) have categorised the task in interviewing as to understand the meaning of what the interviewees say (Brinkmann and Kvale 2014). A qualitative research interview covers both the facts, and the meanings of what the subject says. It is usually more difficult to interview so as to expose the meanings than to get at the facts (Brinkmann and Kvale 2014).

Interviews are particularly useful for getting the participants interpretation of the story behind their experiences. Seidman (2014) describes some possible approaches to the interview (Seidman 2014). .

- Informal, conversational interview - without predetermined questions, to remain as open and adaptable as possible to the interviewee's nature and priorities.
- General interview guide approach - the guide approach is intended to ensure that the same general areas of information are collected from each interviewee; this provides more focus than the conversational approach, but still allows a degree of freedom and adaptability in getting the information from the interviewee.
- Standardized, open-ended interview - the same open-ended questions are asked to all interviewees; this approach facilitates faster interviews that can be more easily analyzed and compared.
- Closed, fixed-response interview - where all interviewees are asked the same questions and asked to choose answers from among the same set of alternatives. This format is useful for those not practiced in interviewing.

3.4.4   Deciding on the Semi-Structured Interview Method For Data Collection

My method of data collection has been by semi-structured interview. My investigation was constrained by the time and effort my subjects are prepared to commit and particularly by the impact of my activities on the running of the ward. I discounted observation and diary techniques as unsuitable on the grounds that the subjects normal behaviour was likely to be significantly changed by knowing they were being watched,

by practical difficulties in getting a large number of staff to make the major effort of cooperating with this intrusive and time consuming work, and by the fact that it would take a long time to capture data relating to relatively infrequent events. Questionnaires and behaviour description interviewing are more appropriate to a deductive process, whereas I was hoping to use the data to develop theory by induction. I therefore settled upon interviewing to collect data. The interviews were semi-structured in that I directed the conversation towards a number of topics, but otherwise 'open' in the expectation that accounts were realistic, personal and nuanced. Britten has written that only if this is achieved will valid interpretation and theory building be possible (Britten 2007).

3.5 The research question

The research question is important in quantitative research where the philosophical stance is realist and positivist. For quantitative research, of the type that guides outcome studies for evidence-based medicine, the framing of a specific research question is crucial. In qualitative research there is much debate about the function and status of the research question. Bryman (2006) has stated that the conventional view, in many methodological discussions, is that research questions guide decisions about research design and methods. In interviews with qualitative researchers he found that there are two opinions. One group maintains that research is only valuable when a suitable research question can be framed to describe its aims whilst other researchers maintain that useful studies can follow from research – even in the absence of a formal research question (Bryman 2007). Denscombe (2014) has written that in qualitative research, conducted without a priori assumptions, the research question is still important in determining the scope of the enquiry (Denscombe 2014). Without a question in mind there are limitless ways the research may lead.

Corbin and Strauss (2008) have considered whether the qualitative researcher frames a research question to fit their methodology or whether the research question determines the methodology. They dismiss this point because the answer is elusive, as the processes of choice are often unconscious, or mandated by other issues such as the researchers training, background and their potential audience (Corbin and Strauss 2008). They say:

> *"Qualitative studies are usually exploratory and more hypothesis generating rather than testing. Therefore it is necessary to frame the research question in*

a manner that provides the researcher with sufficient flexibility and freedom to explore the topic in some depth". (Corbin 2008) p25

They consider that an important function of the research question in qualitative research is to set the boundaries of the investigation.

At the outset the stated aim of this project was:

To investigate how issues between professions, issues between disciplines, and authority patterns affect the medical and nursing team's responses to critical events in the context of formalised protocols for the management of adult patient deterioration.

As required by a grounded theory method, I approached the work without a defined hypothesis (Glaser, Strauss et al. 1967), but with a suspicion (sensitising concept) that the workings of the system were being affected by factors relating to the interactions within the team, arising from them belonging to different professional groups, and by their various expectations of the MEWS. I have sought to investigate their perceptions, how they relate to one another in their teams and how they organise the work generated by the EWS alongside the rest of their tasks. The MEWS system is fundamentally dichotomous in that the nursing team issues the alert and the medical team responds. MEWS itself is responsible for this division because there is no provision for the nursing team to change any management of the patient prior to calling the medical team.

In, "Constructing Grounded Theory" (2006) Chapter Two, "Gathering Rich Data", Charmaz describes the processes that the researcher should go through in collecting data without explicitly mentioning a research question in the sense that is used in much quantitative research (Charmaz 2006). She has suggested that the researcher asks themselves a number of general questions about their research situation and uses these to guide their data collection.

- What is the setting of action? When and how does action take place?
- What is going on? What is the overall activity being studied, the relatively long-term behaviour about which participants organize themselves? What specific acts comprise this activity?
- What is the distribution of participants over space and time in these locales?
- How are actors [research participants] organized? What organizations effect, oversee, regulate or promote this activity?

- How are members stratified? Who is ostensibly in charge? Does being in charge vary by activity? How is membership achieved and maintained?
- What do actors pay attention to? What is important, preoccupying, critical?
- What do they pointedly ignore that other persons might pay attention to?
- What symbols do actors invoke to understand their worlds, the participants and processes within them, and the objects and events they encounter? What names do they attach to objects, events, persons, roles, settings, equipment?
- What practices, skills, stratagems, methods of operation do actors employ?
- Which theories, motives, excuses, justifications or other explanations do actors use in accounting for their participation? How do they explain to each other, not to outside investigators, what they do and why they do it?
- What goals do actors seek? When, from their perspective, is an act well or poorly done? How do they judge action-by what standards, developed and applied by whom?
- What rewards do various actors gain from their participation?

(Charmaz and Mitchell 2001) p. 163

In discussing its role Bryman (2007) has also indicated a fluid approach to the research question. He believes that the initial research question will often need to be adjusted in the light of a comprehensive reading of the relevant literature, or in view of the emerging data (Bryman 2007). My intended methodology did not lend itself to a narrow research question and it was not likely to have a specific answer, rather, it sets out a basis for enquiry from which I was hoping that theory will develop that sheds light on the use of the MEWS protocol.

3.6 The Influence of Grounded Theory on Study Design

The adoption of a grounded theory method had a number of important influences on this study. The important feature of grounded theory, that shapes the whole study, is that theory is emergent, and its formulation occurs late, whereas in many other research methodologies theory determines the research question and is the prelude to starting work.

As shown in Table 4 (p 68) the study did not begin with a hypothesis or 'closed' research question, the research question was broader and remained flexible throughout the project. Grounded theory calls for concurrent data collection and analysis in order that an iterative process can be used to shape the enquiry. A feature of constructivist grounded theory is that the researcher is acknowledged to influence both the collection and interpretation of data. This requires preliminary reflection upon those experiences and beliefs. The processes of analysis and coding can incorporate reflections and interpretations from the researcher in the form of memos.

The particular purpose of a grounded theory method is that it is a flexible form of enquiry that allows or encourages the researcher to change direction and shape the study in response to the findings. Concepts and theories are emergent. This aspect of grounded theory requires the researcher to 'deeply' understand the data and to constantly strive to understand what the data is telling them.

Rigour is shown by constant attempts to 'triangulate' findings. That is to say, to reinforce a finding by searching for corroboration in other interviews. This is part of the basis for theoretical sampling – new participants being recruited because they will be likely to add information on a concept that is emerging from the data. Searching for reinforcement of evidence also requires modification of the interview framework.

3.7   Setting up the Study

My initial proposal was to perform this study within a single clinical team. As this was a study of the influences at play within a group, there was no reason to extend the data collection beyond this group – depth was more important than breadth. I did not believe that all clinical teams would have identical professional and social structures; indeed I knew from my experience that professional, clinical structures were very variable. I was not seeking to precisely define the influences on doctor and nurse behaviour. Rather, I had expectations that it would be possible to broadly define those factors. In the event the study had to be conducted in two Trusts, for reasons outlined below. Some of the concepts applying to the study are shown in Table 9.

Table 9. Some concepts applying to this study

Concept	Description
Natural Setting	Data was collected in a natural environment. No control over subject behaviour. No experimental intervention.
Holistic	The whole was more than its parts. The effect of contextual factors was considered.
Emergent Design	The study design evolved with the study data
Researcher Role	Researcher was responsive and adaptive at all stages
Saturation	Complete when new information ceased to be offered by participants

3.7.1   Ethical Issues

There are ethical challenges for researchers face at all stages of a study, including anonymity, confidentiality, informed consent, and the researchers' potential impact on the participants. The principal of beneficence in healthcare research calls for the researcher to always do what is best for the patients. This can come into conflict with responsibilities to the participant. The successful conduct of the research is dependent on a proper relationship between the researcher and the participant. This requires that consent be fully informed. In this study the participants were informed about the purpose of the research and about how the results would be used. It was made clear at this stage that questions might focus upon good and bad episodes of care and confidentiality of information was agreed. Participants were offered the opportunity to review the transcript of their interview. Some participants were particularly anxious that their managers did not see their opinions. All identifying information was removed from the research records and only grade and profession recorded for each interview. The date of interview was also removed. Following transcription the audio files were deleted.

3.7.1.1   Impact on the Participants

Clarke has described personal experiences in the pursuit of qualitative research and stresses the effect that being interviewed may have on the participant (Clarke 2006). The interviews required the participants to relate events that were sensitive and in some cases troubling. Several of the medical staff became upset as they recounted very trying

experiences where they felt isolated and unable to cope. This issue was discussed with the consultant surgeon who had oversight of my clinical access and it was agreed that I would offer a follow up interviews at the conclusion of the interview in order that they could talk through their experiences. All the medical staff were offered the opportunity to continue the discussion in the presence of the trust Clinical Tutor, who is responsible for their welfare. The members of the nursing team were also offered follow up discussions and the opportunity to discuss issues with a senior nurse who did not have responsibility for their management. Sanjaraji et al have reviewed the ethics of qualitative research and stress that such measures for dealing with emotional fall-out, must be in place prior to the study (Sanjari, Bahramnezhad et al. 2014).

3.7.1.2   Confidentiality and Disclosure of Sensitive Material by Participants

It was conceivable that interviews would reveal episodes of clinical malpractice and workplace problems such as bullying. At the outset of each interview the interviewer informed the participant that all material was confidential except in the case of any disclosures that related to criminal or grossly negligent events involving themselves or others. In the event of any such disclosure the course of action would be discussed with the participant before any further action was taken. It was explained that the researcher would be in breach of their professional code of conduct if they neglected to take action.

3.7.2   Ethical Approval and Workplace Access

It is the policy of the University of Northumbria that ethics approval needs to be granted internally, prior to applications to outside institutions. The ethics application to the University was a straightforward process. With the support of my supervisors I was able to begin the process of setting a suitably broad research question and applying a methodological approach to the study. I had chosen grounded theory as in my reading and understanding of the design I felt it offered the opportunity for me to generate theory from the grass roots of the data.

I set about applying to a large NHS Trust and met with the Research and Development team. The time from application to ethical permission was stated to be approximately four weeks. The Trust I approached insisted that a nominated medically qualified consultant led all clinical research. This presented difficulties because my being seen to be 'working for' one of the consultants altered the power dynamic. I was fortunate to

secure the support of a consultant surgeon who was interested in the care of deteriorating patients and understood the possible importance of human factors in clinical care.

The process of the Trust application and IRAS application was lengthy and, despite close contact with the Trust's R&D department at each stage of submission, it was rejected. The Research and Ethics Committee commented unfavourably on my use of a qualitative methodology, and in particular grounded theory. It has been noted previously that grounded theory is not favourably received by committees that oversee research quality, and by grant distribution bodies (Luckerhoff and Guillemette 2011). The process had taken 10 months. I was disappointed, upset and angry. I am however tenacious and determined. I sought the reason for the rejection and within a few hours had organised a meeting with the R&D department for a review of the application. The reason given for the initial rejection was that the Trust felt that the findings of the study might reflect adversely on its services. After negotiation they agreed to their involvement as part of a multi-site study. A problem I was encountering was that researchers were not permitted to directly present their proposals at this trusts ethical committee. I had to explain my proposal to one of the committee's administrative assistants, who then presented it to the committee. I found this remote form of application very frustrating. Having been rejected, I was able to further discuss my proposal and it became clear that if I did the work in more than one trust - making identification less likely - then a re-application might succeed. I immediately applied to a second trust and they agreed my proposal without complication. My re-submission to the first trust was then successful and I was granted access.

This process delayed my project by a year. Whilst I understand the need for trusts to be scrupulous in the research they permit, I was told directly that fear of adverse publicity was a major concern. This appeared to me to be a problematical attitude. If well-conducted research indicates that there are problems with any aspect of patient care and services then it is important for the trust to responsibly investigate in order to optimise their service. In the prevailing climate of suspicion of 'outsider' research such progress becomes difficult.

In my second trust I was not required to work formally through a member of the medical staff and I organised access to staff through the ward manager – a senior nurse.

My entire project almost foundered on the difficulties of obtaining access and ethical approval. Reflecting upon this time has provided me with deeper insight into the difficulties of navigating ethical approval across healthcare institutions. I suspected that a quantitative study would have been given more sympathetic consideration. Part of the problem appeared to be that some members of the Research Ethics Committee believed that qualitative researchers 'made up' their conclusions leaving them free to make public any bee that might settle in their bonnet, whereas a quantative enquiry would stand or fall by statistical measurement of empirical data. I can appreciate the safeguarding requirements of stringent processes and, although initially frustrated I felt that it added weight to my study and strengthened my resolve. Peers undergoing their own PhD and Professional Doctorate studies asked me why I had chosen such a difficult route to a PhD. I hadn't, not on purpose. I had chosen a topic and a question because I thought the answer was important and interesting. I would not have been able to concentrate this amount of effort on a trivial subject or one that left me cold. I felt more equipped as a result of these difficult experiences, and felt they were vital to my overall development as a postgraduate researcher.

3.7.3   Securing the Cooperation of Staff

The trainee medical staff, nurses and care assistants were initially cautious about participating. I presented the proposal in departmental meetings and a number of questions were asked about confidentiality. It was clear that the potential participants were fearful that issues might emerge that would result in them being criticised. With reassurance most of the staff agreed to participate. The exception was nurses recruited from the Philippines. They discussed the matter amongst themselves and all refused to participate. The effect of this decision on the validity of the data and subsequent conclusions must be considered.

3.7.3.1   Sampling strategy

The principles of sampling for qualitative research are shown in Table 10. This investigation focuses upon the perceptions and opinions of doctors, nurses (RGNs) and Healthcare Assistants. My expectation was that staff from different professional groups might have different opinions, and that within professional groups opinions may vary with seniority. In Charmaz's terms these were sensitising concepts (Charmaz 2006) p32).

Table 10. Principles Of Sampling for Qualitative Research

Aim	To generate a sample allowing the MEWS process to be understood
Technique	Purposive Sampling – selection of the most productive sample to answer the research question. Distinguish this from statistical sampling where any potential subject has an equal chance of being selected.
	Theoretical Sampling - selection is guided by the themes emerging from the simultaneous analysis.
Size	Continue until new themes stop being offered.
	Time and resources will limit
	Sample size is not statistically determined

The categories that emerge, and the theories constructed would not necessarily generalise to the whole sample - so a 'non-probability' sample was appropriate (all subjects did not have the same chance of being selected). The ward teams are small, and for some grades and professions a large percentage of the sub-group was interviewed. To sample such a heterogeneous group required an initial system of purposive sampling I had decided upon sets of six interviewees from each group. Selection was not randomised. The list of participants interviewed is shown in Appendix I.

The grounded theory methodology requires that sampling be adjusted as theory is constructed, in order to search for confirmatory data and to fill gaps. This 'theoretical sampling' directs the interviewing in ways that will provide additional data in the area where theory is being tentatively constructed. Theoretical sampling cannot occur until a category is emerging that prompts the researcher to begin to construct a theory. The researcher must not direct interviews in ways intended to confirm their developing theory, rather, they must direct the interviewing in ways that produce data relevant to the theory that may strengthen or weaken their argument. The procedure should then continue until new categories no longer emerge (saturation).

Often what is described as grounded theory is an abbreviated version of the method that uses the systems of coding and sorting the data, but little else (Denscombe 2014 p77). I have used methods derived from Charmaz but sampling was constrained by the availability of participants and by time. The requirement of clinical access was that my interviewing was done with minimal impact on clinical care. This determined my initial use of quota sampling. I was keen to be flexible enough to allow theoretical sampling if the analysis so dictated but the availability of interviewees often interfered.

As my theory was constructed additional subjects were recruited. Initially 'purposive sampling' was used, selecting cohorts to interview on the basis of their professional role. My justification is that the actions and responses of healthcare assistants, registered nurses and medical staff are to a large extent determined by their professional role in the team, as incorporated within the protocol. It was necessary to interview members of all the groups, because my interest lay in the group interactions. Subsequently, I increased the numbers of foundation doctors and healthcare assistants as my emergent ideas required. I had not initially intended to interview managers, but again emerging theory directed me to do so.

3.7.3.2   Access to Potential Subjects

All the staff in the multi-professional teams were provided with full written information. I attended four morbidity meetings at which I presented the proposed study to the teams and answered questions.

The great majority of staff agreed to be interviewed. The exception was the nurses from the Philippines. Both trusts have actively recruited qualified nurses from the Philippines - about 10% of nursing staff on both wards. None agreed to be interviewed. All the immigrant doctors and those immigrant nurses from countries other than the Philippines did agree to participate. I understood that the Philippine nurses had discussed amongst themselves whether to volunteer, and the decision was made within the group. I did not seek to discover what had led to the decision, but from some of the comments made it was clear that they were concerned that there might be adverse consequences from what they revealed in interview. The entire cohort of Philippine-trained registered nurses is therefore missing from this research. Consideration will be given later to how this influences the findings.

The information sheet and consent forms are provided in the appendices I and J.

3.7.3.3   The Clinical Context

The study was conducted in two acute healthcare trusts in the North of England. A general surgical ward and a medical admissions ward were used. These are both places where sudden unexpected deterioration in the patient's condition is a relatively frequent problem. Fortunately both sites used an identical system, the Modified Early Warning

Score (MEWS), alerting the patient's 'home' medical team to the possibility of deterioration, with the nurse-led ICU Outreach Team as back up.

The thirty bed surgical ward was organised into four bays of six with an additional six single rooms. This ward specialised in Lower Gastro-Intestinal Surgery but also had patients with other general surgical conditions that had been admitted as emergencies.

In the other trust the ward was a 30-bedded Emergency Admissions unit. This ward received patients who were admitted from General Practitioners or from the Accident and Emergency Unit. They stayed in the ward for a variable period before being moved to another ward appropriate to their condition.

The availability of monitoring equipment, the nurse staffing patterns and the medical cover was similar in both locations.

3.7.3.4   The Effect of the Study

Being the subject of a study has an effect on staff. The medical staff were very vocal in their critique of my proposal – both in preliminary meetings, and occasionally at the time of the interviews. Doubt about the usefulness of qualitative research was coupled with concerns about confidentiality and the possibility of criticism.

This research project was conducted by asking participants what they felt about the MEWS and what affect it had on their work. In particular I sought to discover what where the key concerns of the different categories of team member. Was there agreement about these between professional groups? I particularly hoped to shed light on why there have been so many published reports of frequent breaches of the protocol. I had an expectation that professional hierarchies might be a significant influence on team behaviours.

I chose a method using semi-structured interviews that were analysed using the systems of constructivist grounded theory. I used Charmaz's approach (Charmaz 2014) because it best fitted my own relativist beliefs and I was more comfortable with admitting to interpreting statements to develop theory, than with believing that a theory was waiting to be discovered if I analysed the data correctly. It seems to me to be more logical to offer interpretations as being my own, and to argue their justification, than to claim

truth for my interpretation based on the manner of analysing the data. In the event my data led me in unexpected directions.

3.7.3.5   How the MEWS was operated

Both units used the Modified Early Warning Score (MEWS). All patients had their vital signs measured every four hours, and from those a score was calculated. Further action depended on the level of the score.

In both these institutions the alerting process called the most junior doctor of the regular 'home' medical team. It was at their discretion whether more experienced help would be sought. Three alternatives were available to the more junior doctors. They might deal with the alert themselves, they could call for help from more experienced doctors in their own team, up to and including the consultant, or they could call the Intensive Care Outreach Team. In both trusts this would result in the prompt attendance of a Specialist Nurse closely backed up by a medically qualified Intensive Care Specialist who might be a trainee or a consultant.

If a trigger score were recorded the junior doctor would attend and decide upon further action. This alerting process is designed to be quite mechanical and relies solely on the vital signs. The carer who measures and records the signs is not required to make any clinical judgement about the patient and should always call the doctor if the score passes the threshold. The doctor is then expected to review the patient and make an appropriate response.

3.7.3.6   Monitoring Outcome

Neither trust was collecting and reviewing any detailed outcome data as a routine. Both units review patient outcomes at Mortality and Morbidity meetings at which MEWS data would be part of the information when discussing patients who suffered adverse events. There was no systematic definition or systematic means of identifying events as 'adverse'. The review was directed towards revealing any deficiencies of staffing, training, organisation and equipment that contributed to adverse events. Major errors resulted in the generation of a "Seriously Untoward Incident" report that was reviewed by the Trusts Clinical Governance department and seen by management, including the CEO. Managers would then take steps to facilitate any changes needed to prevent

recurrence. Early interviews revealed that the actions of clinical staff might be influenced by this managerial supervision and I extended my interviews to include these Managers. This is in accordance with 'theoretical sampling' as described by Glaser - the sampling being extended to follow a possible theory, rather than being based upon a pre-defined attempt to sample categories equally.

3.8   Data collection: understanding my position as a researcher

The interviews were conducted and data collected over a nine-month period from January to October 2015. Carrying out the data collection was an interesting, dynamic process. In preparing for the data collection I carried out a number of 'training' interviews with colleagues, to test the semi structured interview tool, and to test myself, and my interview technique. This piloting allowed me to refine my questions, and gave me an opportunity to follow and probe the responses. I found this experience valuable but it also made me anxious. I carried out a reflective piece of writing after my initial interviews as, I wanted to capture (in addition to field notes) why it was that I felt anxious and exposed as a novice researcher. Goffman's (1978) book on the presentation of self, allowed me to understand in more depth what my emotions were in connection to my interviews, how I consciously and unconsciously prepared, dressed and presented myself. (Goffman 1978). I was relieved after discussion with my supervisors that these feelings were normal in their experience of supervision and research.

During the data collection I was invited, by my clinical lead investigator, to attend a number of medical meetings that included a surgical morbidity and mortality meeting. The chair (senior surgeon) invited me to give a 5-minute overview of the research at the end of the two-hour meeting. My consultant sponsor of the study had arranged access to the meeting but did not attend. It had not been clear to the chair what was my role or my health background, and after a slightly confused start I was afforded the opportunity to address the meeting, and directed my attention to the group of mainly junior, trainee grade doctors. I was grateful for this opportunity, and I was able to follow up with a couple of interested junior doctors to take part in the study. However, I did feel that my status as a registered nurse carrying out qualitative research affected the level of interest shown by those present. A paper by Richards and Emslie demonstrated that the responses of medical staff to medically qualified and university academic interviewers,

are very different (Richards and Emslie 2000). My experience in explaining my study taught me a valuable lesson about my role, the response of potential interview subjects and the need for clear objectives for the study to be in place at subsequent meetings. The perceptions of others about my role of nurse researcher, real or imagined, were an issue to be addressed, and similar to those issues faced by Richards & Emslie (2000).

Unexpectedly, I found that my role as a registered nurse-academic also presented initial barriers to interviewing my nursing colleagues. Senior nurses and matrons were initially defensive during interviews, which I felt was a response both to the subject area of study and also to my title as senior lecturer. Unregistered Health Care Assistants (HCAs) and newly registered nurses were deferential in their manner. It has been difficult to negotiate those barriers and obstacles, such as nuances of behaviours that have created delays or stumbling blocks to the study. Responding positively in the field to negative attitudes, and adjusting my approaches to these attitudes, is a skill I have learned to meet these challenges, and which I will take forward in future research.

Another barrier was explaining qualitative enquiry to the doctors. In preliminary meetings and in the formal interviews several doctors took it upon themselves to explain how a useful enquiry into this topic ought to be conducted - using quantitative methods. They were hostile to qualitative research and doubted its value. I have had to take this deep-rooted scepticism into account in interpreting the data.

An unexpected issue that was related to feeling unsettled in my present role presented itself early in the data collection phase. As the interviews expanded and developed I felt an increasing resonance with the clinical issues to which I was listening. I felt empathy with the nursing and medical staff, as I could relate to my own clinical experience to theirs. Anecdotally, I have discovered that other postgraduate researcher colleagues have experienced this feeling. I have not yet developed a strategy to manage these feelings; moreover, they have been useful in motivating me to make use of my findings.

Approaching this study I was wary of making assumptions, but I had suspected that the medical and nursing teams might frame the controversies differently. The medical team is likely to express positivist ideas (Montgomery 2006) whilst the nurses are more naturally relativist (Baker 1997)

3.9 Possible Weaknesses Of This Research

3.9.1   The Size of the Study

Forty interviews were conducted. This might seem a very small sample size compared to the hundreds or thousands of patients included in many quantitative studies, but the data comprised over 20 hours of recorded interviews, amounting to many pages of transcript. Coding and evaluating this volume of data is a major undertaking. Constraints were: my time, the disruptive effect of taking staff away from normal duties for interviews, and the time and effort the interviewees were prepared to put into exploring the issues. Whilst the study was conducted in two hospitals in two trusts, they are adjacent, and the junior medical staff often rotates between them. They are also in the same Postgraduate Deanery and share undergraduate and postgraduate medical and nursing organisations.

The study should be seen as a snapshot of practice at a particular time in a particular pair of hospitals. As such, care should be exercised in attempting to generalise the findings. Particular issues that may affect generaliseability are:

- The staffing structures and working methods have features that reflect UK practice.
- The use of an EWS without a specific response team as is common in the UK. The literature suggests that having a MET or EMT may significantly affect the dynamics of responding to a trigger event.

The study does however suggest themes that are of interest and that are probably factors in the workings of any EWS and RRS.

3.9.2   The refusal of the nurses from the Philippines to participate

Both the ward areas used in this investigation had actively recruited nurses trained in the Philippines. They constituted about 10% of the nursing workforce and were all employed on grade 5 (the most junior RN role). None of these nurses agreed to be interviewed. I gave them extra time to think, and offered to discuss the issues with them individually. No one took up the offer, and all declined to take part. Several of these nurses said that they would give their decision after discussions with their friends and it

became clear that the decision not to participate was a joint group decision. The sample of nursing staff interviewed is therefore not fully representative and it is necessary to consider what affect this had on the study.

3.9.2.1   Does this distort the sampling?

The concern is that the whole of the group of nurses from the Philippines refused to take part. When there are significant numbers of staff that decline to take part in a study it is necessary to consider whether there is some unifying factor applicable to all and whether the lack of their evidence distorts the analysis. These nurses have a number of obvious factors in common.

- They are all of the same ethnicity and nationality
- They all trained overseas
- They are all immigrants
- They all speak English as a second language
- They are a tight knit social group outside of work.

I was not able to ask the other interviewees about the Philippine nurses 'opt out' as I did not have consent or ethical approval to conduct such a sensitive enquiry. During the interviews no interviewee referred to the overseas nurses either individually or as a group. None of the doctors, for instance, identified them as being more or less reliable.

3.9.3   The narrow focus on one Type of Protocol

The studied protocol, MEWS, was at the time of planning this research, the most widespread system in use in the UK. Since then, the Royal College of Physicians has led the development and promotion of the National Early Warning System (NEWS). The Trusts I studied adopted this new protocol in November 2016. There are differences in the alerting systems that will have impact upon how calls are cascaded but in most fundamentals MEWS and NEWS are very similar. Another development has been VIEWS that uses an automated system with hand held devices, and echoes the data to the medical team without the nurse having to place a call. This may have very significant impact on the dynamic between the doctor and nurse that merits additional study. The understandings and insights developed from the study are applicable to other systems than MEWS. Together with qualitative studies of the behaviour of teams using

METs they extend the understanding of the issues, personal and professional that influence the participants.

Though this is a study of a particular rapid response system a very similar system (NEWS) has been recommended for general adoption in the UK. Though the prescribed responses to scores are more structured in this system the fundamental dynamic is the same. Nurses detect patients at risk on the basis of a composite physiological score, they report this to a very junior doctor who undertakes a review and decides whether to call for advice. This is likely to remain the UK pattern of care because of the costs of a dedicated response team. The interpretations I have made using MEWS are likely to be valid for NEWS. In countries where dedicated response teams are common staff appear to have greater concerns about demonstrating self-efficacy, and greater fear of being criticised. This appears to inhibit reporting of events and introduces another socio-cultural factor. This research sheds no light on this.

3.9.4   Strategies to minimise these acknowledged weaknesses

Some weaknesses in study design are unavoidable and cannot be overcome in the context of the research but measures can be taken to reduce the impact of others.

Is This a Small Study? The amount of data needed for a qualitative study is often determined by observing a saturation of themes, i.e. as the interviews proceed, no new themes are emerging. In this study most major categories had been identified after four interviews in each major staff group. To achieve this the interviews had to be relatively lengthy. None was less than 40 minutes. The questions in the brief played a role in ensuring that all topic areas were addressed with each participant. When a participant expressed a new idea this was raised with subsequent interviewees from that group and also with other group members to allow triangulation. Charmaz (2006) suggests that the aims of the study are the ultimate driver of the project design, and therefore the sample size. She suggests that a small study with "modest claims" might achieve saturation quicker than a study that is aiming to describe a process that spans disciplines (Charmaz 2006 p 104). It is not unusual for saturation to be achieved quickly where interviewees are connected by a dominant overall theme that is the focus of enquiry – in this case, the MEWS (Jette, Grover et al. 2003). Mason reviewed 560 PhD studies that used qualitative interviews and found that the median for numbers of interviews was

31(Mason 2010). By this measure the overall number of interviews in the current study is typical.

Sampling: Could anything more have been done to persuade the nurses from the Philippines to take part? Withers and Snowball (2003) conducted a questionnaire survey of immigrant nurses from the Philippines at the John Radcliffe Infirmary in Oxford. They found that a minority of nurses had suffered what they saw as racial discrimination. Their response to this was not to complain, but to seek support within their Philippine peer group (Withers and Snowball 2003). In another study nurses from ethnic minorities reported similar episodes of prejudice and described avoiding situations that they feared might expose them to criticism, a response that might be relevant to this research (Kawi and Xu 2009). Yancey, Ortega et al (2006) have reviewed the problems of recruitment and retention of minority-ethnic subjects to public health research programmes. (Yancey, Ortega et al. 2006) Between 1995 and 2005 they identified 95 studies that addressed this issue and within them they found 20 themes. Four of these themes were believed to be particularly significant:

- Sampling approach/identification of targeted participants
- Community involvement/nature and timing of contact with prospective participants,
- Incentives and logistical issues
- Cultural adaptations

I have no evidence on which to base any conclusions about why this ethnic group of nurses declined to take part, but a reading of the literature discussed above suggests that fear of criticism and fear of stigmatisation of their group were likely to be factors.

It is disappointing that these foreign trained nurses declined to be interviewed because they could probably have provided a different outsider perspective on the EWS team operation. I do not think I had any alternative than to accept the Philippine nurses decision. Any attempts at further persuasion would have run the risk of including a group who felt coerced. I do not believe that their absence from the data is significant to the analysis and identification of themes relevant to the study. These events have flagged up a significant issue and call for further research to explain what is going on.

Generalisability - Focus on one system of EWS and RRS. Multi-professional teams working RRSs and EWSs are found in almost all wards where acute illness is managed. Each such team will have unique characteristics. These will be determined by the clinical context, team structures and the sociology of the group. The problem of whether it is appropriate to generalise theory derived from study of one sample is often experienced in qualitative research. Firestone (1993) categorised three approaches to generalisability (Firestone 1993).

- **Statistical generalisation** is seen most often in quantitative studies. The statistical characteristics of the sample are used to support the extrapolation of findings to other populations with similar characteristics.

- In **Analytic generalisation** the researcher attempts to generalise and apply theory developed from the findings in the study sample to broader populations. This rests upon careful scrutiny of findings to construct theory at higher levels of abstraction that can then be seen as applicable beyond the subjects and scrutiny of the initial sample (Ayres, Kavanaugh et al. 2003). Generalising to a theory or conceptualization requires identification of rich evidence in its support. This is the approach that I have used in developing theory in this study.

- **Transferability, or case-by-case transfer**, is a process whereby the researcher provides sufficient information for other researchers to infer whether the conceptualisation is applicable in their, alternative context. Campbell (1986) described this as the *proximal similarity model* (Campbell 1986). Readers would need to judge whether the reported findings and context sufficiently matched the reported findings for them to be transferable. In this study I have hoped to give sufficient information, and to indicate particular features of the study population and systems to allow such judgments to be made.

The findings and interpretations of this research report satisfy the criteria for analytic generaliseability and case by case transfer. This is partly secured by the richness of the evidence and verbatim quotes from interviews and partly by the care taken to describe the contexts of the data and the detail of the workplaces.

CHAPTER FOUR: ANALYSIS - FINDINGS

4 ANALYSIS AND FINDINGS

This chapter describes the findings from the interviews.

In the first section the process of interviewing, transcription and coding is explained. The major findings are then individually discussed. This discussion is divided into sections for each of the major categories that were constructed during coding.

4.1 Overview of procedure

The process for this research study is shown in Figure 9.

Figure 9. Diagram showing the research process for this investigation
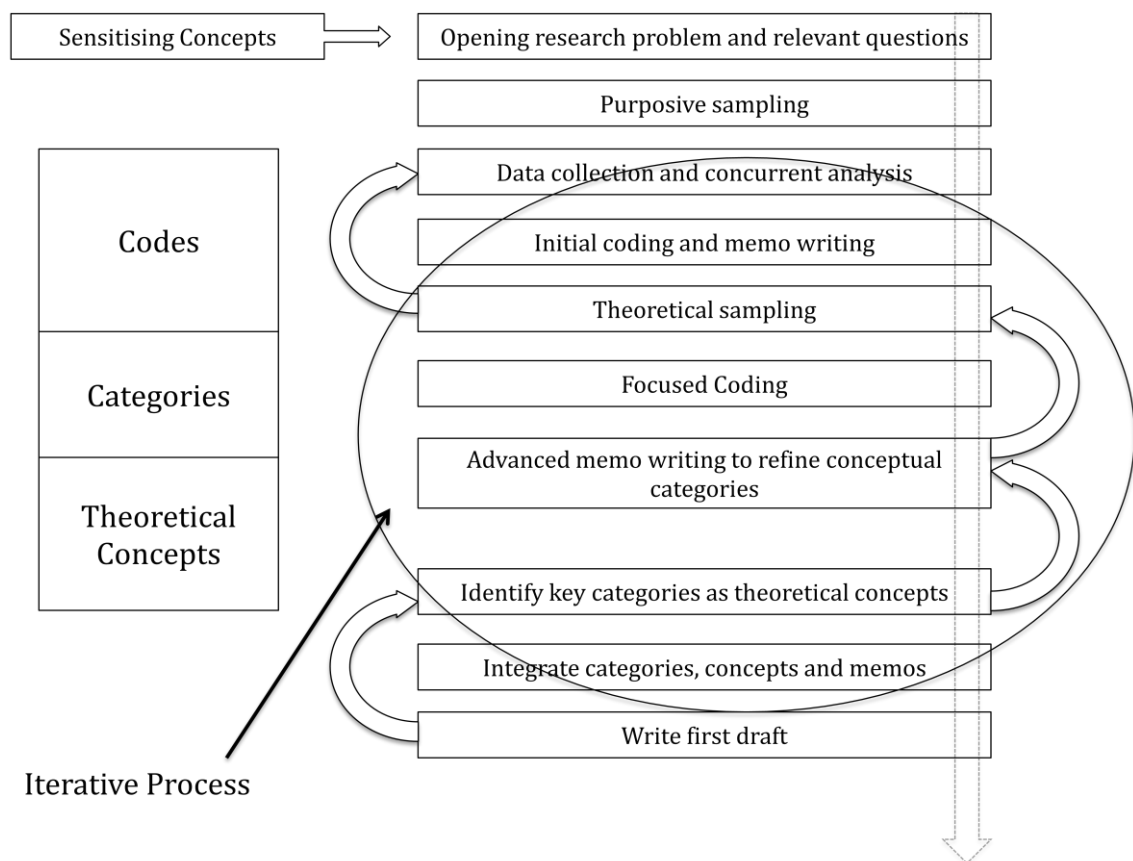
The process of interviewing yielded a great deal of information in the form of transcripts. Analysis is a process of seeking for relationships, consistencies and discrepancies in the narratives. The analysis draws largely upon the ideas of Charmaz (2014).

Corbin and Strauss have commented (2008):

> *"There are many different stories that can be constructed from the data. How an analyst puts together the concepts often requires many tries before the story or findings 'feel right' to him or her. Feeling right is a gut feeling."(Corbin 2008) p3.*

Their conception of what emerges from analysis is truly qualitative. They accept that the data can tell many stories, some spurious, some relevant. They further suggest that as analysis is both art and science. The art is constructing that interpretation of the data that feels right. Glaser has taught that the science of analysis is the task of ensuring that the analysis rests on concepts grounded in the data and not brought to the interpretation by the analyst (Glaser, Strauss et al. 1967).

The interviews were digitally recorded , and transcribed for analysis. I read each transcript a number of times, making notes and annotations. The content was then coded using NVivo for Mac® 10.1 (OSR International Pty). This software uses a database of fragments of text sorted under headings that it calls nodes. A number of coding strategies are available. As I had spent many hours reading and annotating the text I chose to draw up a list of nodes based on this experience. I then added new nodes whenever a topic emerged for which I had no coding. This list of nodes was used without developing a hierarchy. This was to avoid unintended imposition of my preconceptions on the data through allocating one node to be subsidiary to another early in the analysis. To facilitate analysis the list was divided into 'topics'. It must be stressed that these in no way equate to theoretical concepts.

As Charmaz suggests, wherever possible I described the node (code) using a gerund. (Charmaz 2014). The nodes were originally allocated to one of eight categories or topics. This was to bring similar pieces of information together and allowed me to have an overview of the data. My starting list of nodes was partly derived from the interview and was also influenced by my insider knowledge in the form of sensitising concepts.

The Eight Original Nodes

- Experience Level – allowing identification of categories
- Opinion of EWS
- Practical use of EWS
- Team Working
- Feelings and emotions
- Values
- Concerns about being watched

- Workload Issues

NVivo permits the coding of each interview subject as a node. Nodes are equivalent to codes in non-NVivo analysis, and the process is called coding. Demographic data can then be entered to these nodes. This allows all statements, or statements within a single node, or group of nodes to be extracted for a given set of demographics such as: gender, professional group, years of experience, hospital etc.

My original 8 nodes were not the same as grounded theory categories. Categories, as they emerged often included statements from several codes.

In due course the refined list of nodes can be amalgamated to derive 'categories'. Categories are more abstract and carry some theoretical 'weight' – they are already interpretations. These do not relate to the original 'Topics'. The topics are there to speed the process of coding by making it easier to find the relevant node; the themes cross 'Topic' boundaries and may, for instance, include an account of role; or events, along with comments, relating to values, feelings and reflections on team working. The challenge is to demonstrate relationships within the data. These analytic categories can then be used to draw out ideas that may constitute conclusions and lead to recommendations.

4.1.1   Preliminary Reading

In the course of my preliminary reading I have tried to understand deeply what I was being told. (see appendix F) The subjects were not deliberately hiding their meanings but as they talked their feelings and experience influenced what they said and how they said it. The process of being interviewed was for them an exploration of the topic, a topic about which they may not have thought deeply before, and thinking through the arguments with me they may have encountered a new insight. In this event they may return to the idea again during the interview. Many of the events discussed were associated with strong emotions and the emergence of these was an important indicator of issues that had great significance to the interviewee.

Having conducted the interviews, I experienced direct contact with each subject and remember the non-verbal language, and mood, in which the interview was conducted (subsequently written in a field diary and included in the data as memos). Some of the

interviewees appeared worried about being indiscrete. They sat in a 'closed' position not using their faces and body to give emphasis or display their feelings. Some of the doctors in particular made clear from their manner that they did not really want to engage with the process of interview. This is important data and I have recorded my feelings about the interviewee, where appropriate, as memos. NVivo allows these 'asides' to be entered as memos tied to the interviewee or a specific node – as required. I also listened to the interview recordings again to pick up on issues that emerge from the way the subject spoke, rather than the words they used. Generally the subjects were engaged with the topic and had opinions that they wanted to express. This allowed me to draw them into the discussion that generally made their attitude to the interview more open. Strong emotions during the interviews often appeared to lead to the interviewee being willing to openly discuss 'risky' issues.

Some interviewees arrived for interview with a point to make. The two commonest were: firstly, to reassure me about the quality of care on their ward and emphasise the smooth working of the EWS; and secondly, to air a particular grievance against a professional group. The statements of these subjects had to be interpreted against this background. Such evidence was recorded as an NVivo memo. Involvement with the topics generally led to the interviewee dwelling less on what appeared to be their personal agenda.

Comments made after the recording had finished are a difficult issue. King and Horrocks (2010) have remarked that the inhibiting effect of the digital recorder may only become evident when it is switched off (King and Horrocks 2010). I made clear at all stages of my interviewing that I would be using both the digital recording and my written notes as data for the research. If the 'of recorder' remarks had been emotional or otherwise sensitive I specifically asked for permission to use them. 'Off recorder' data was held as NVivo memos. On many occasions the subject relaxed and finally expressed a range of other views and perceptions. This was particularly the case with more junior staff, both doctors and nurses. They revealed feelings of conflict and were laden with emotion. Two interviewees were tearful. I made contemporary notes of these comments and the subjects gave permission for these inclusions. I made 'off recorder' notes as soon as possible after the interview as I did not want to distract the interviewee by writing whilst they were talking. 'After the Interview' data is often particularly rich.

Another issue that I reviewed in my preliminary analysis is the weighting of my questions. Clearly in an enquiry of this sort the scheme of questioning is all-important. As described previously, I field-tested my questions on a number of colleagues in the university whose clinical background made them familiar with the topic area. As part of this exercise I attempted to eliminate leading questions. However, where the scheme of questions for the interview is only partly structured, the interviewee may lead the discussion into unexpected areas that take the interviewer of guard. In particular I have searched for, and found, instances where, particularly in attempting to clarify an answer, I may have put words into the mouth of the subject. Where this has happened I have reviewed the comment against the rest of the interviewees statements to decide whether to accept it as authentic. The scheme of questions is in Appendix M.

Another use of memos is to hold fragments of relevant literature. If the interview prompted me to recall a relevant idea from a publication I would enter this as a memo tied to the interview.

4.1.2 Coding

Having conducted this broad review of the context of the interviews I proceeded to coding and constant comparative analysis. That is, allocating data to nodes/codes. Corbin recommends considering microanalysis as a start to coding. (Corbin 2008 p63). This constitutes a word-by-word consideration of the possible meanings of what is said. They assert that this provides a lever to begin breaking open the data. Charmaz advocates "line-by-line" coding followed by focussed coding to gradually move towards constructing theory (Charmaz 2006 p 46). Charmaz uses this analysis to elevate some data to the status of "core categories" (Charmaz 2006 p111). I have used an initial sentence-by-sentence approach. My initial pre-analysis list rapidly increased to close to 100. The codes used for preliminary coding are shown in Appendix G. Grouping and regrouping my codes, and adding in the data from my interview diary and memos I identified my core categories.

4.1.3 Identifying Analytical Categories

A number of positive feelings were immediately apparent. Examples being:

- Respondents believed that the EWS was useful – with reservations

- The nurses felt that it improved the management of sick patients

- The nurses felt that it helped the communication of a problem to the medical team.

A number of negative feelings were also immediately apparent. Examples being:

- The protocol is not treated as mandatory

- Workload interferes with the availability of doctors of all grades

- There is a 'disconnect' between nurse management and medical management of the patients

- There is a failure of communication of clinical decisions from the medical team to the nurses

The further analysis of categories seeks to find additional themes but also to show how the data coded at other nodes might be contributing. I have tried to treat comments neutrally. There are two aspects to every comment. Firstly, there is the face value of the words that have a meaning. Secondly, there is often a subtext that can be inferred. For instance, a nurse's comment that having a MEWS score available makes them more confident of their position when calling the doctor has the subtext that without it they feel less secure. Why could this be? A search of the data at other nodes may help illuminate relevant aspects of the clinical communication between the doctors and nurses. A comment from a 'first-response' (F1) doctor about how busy their Registrar is may indicate an acceptance of difficulty finding clinical backup and a search at other nodes may find comments about lack of support and the anxiety it provokes.

4.1.4   Other Strategies

I used the word search facilities of NVivo to find significant quotes within the data. The searches were often prompted by my comments in my diary or by a comment by one respondent that led to a search for similar ideas in other interviews. Word frequency searching allows exclusion of common words and therefore allows extraction of words that might be relevant to the analysis. The word collapse and the phrase sudden deterioration might occur when the practical aspects of EWS were being discussed. The programme allows the words to be followed to their occurrence in the transcript. This approach increases the amount of data in existing nodes and suggests new nodes.

Direct search for key words of low frequency such as 'fear' were used to find significant passages in the data. The search feature can also be applied to a node – drawing attention to the words used by all the interviewees who have commented on the issues coded to the node.

4.1.5 Hidden Categories

I have made particular efforts to find data relating to feelings, emotions and values. I have deliberately not asked questions about these influences but have sought to infer them from the subjects' broader answers. Feelings of anxiety, for instance, are often discussed in response to prompts about the work. Similarly, beliefs about the quality of care, patient safety and collegiality can be found. I have been careful to avoid over-interpretation of comments. For me to accept that a comment reveals an attitude it has to be explicit. By attitude I mean that the interviewee demonstrates a *predisposition* to respond in certain ways to particular events and that this predisposition comes from the way they evaluate ideas, events and people. I have then attempted to triangulate the data with comments relating to other issues within the subjects interview. I have become aware that some concepts are very concrete whilst some are more abstract. It is these abstract ideas that are most difficult to see in the data.

4.1.6 Constructing Theory

This study started without a hypothesis and is intended to suggest further questions that need to be asked rather than to demonstrate proof of an idea that emerges from the data. For instance, it might have been found that the junior doctors overwhelmingly believed that the nurses fail to report instances of EWS values reaching the trigger threshold. The theory that the EWS system fails to improve outcome because the nurses don't call the doctors cannot be proven from this data and would call for quantitative research to confirm the reported problem. It is however legitimate to raise such questions and formulate theory on the interview evidence. In other areas the data can generate an idea and go some way towards supporting it. For instance if all respondents volunteered the information that using EWS reduced their anxiety about diagnosing incipient patient deterioration then this would be a conclusion that could be supported from this data. How strongly it is supported would depend upon the breadth, depth and context of relevant comments. This research has suggested further follow up, both qualitative and quantitative to further substantiate the theories that are generated.

As the interviews and analysis proceeded I became aware that there were several stories in what I was being told. There was a story of the stresses of practice for inexperienced doctors and a story of the difficulty of keeping a grip on a 'firm' from more senior doctors. There was a story about the role of nurses in care, and a story about communication. I hoped in my analysis to do justice to all the narrative strands that I could see and at the same time bring together some ideas about how they influence the protocols for the care of deteriorating patients.

I did not immediately understand what Glaser meant when he described an emergent theory being discovered as I worked with coding I came to see how the data, the insights from memos and items from the literature all came together to generate concepts.

4.1.7   The effect of my role

I have previously discussed my role in the dialogue with the interviewees in terms of role, experience gender etc. Many of these factors continued to operate during analysis.

As part of the learning journey in gathering the interview data, I kept a field diary to make notations of all aspects of the interviews both verbal and non-verbal information from the interview process, which at times were formally presented as reflective accounts. The role of the researcher according to Charmaz work is particularly sensitive, as the researcher becomes part of the dynamic interview process. Challenges to this process included the need to support the interviewee when the subject matter became distressing (therapeutic listening) and remaining separate or outside of the process given that the instincts are to be supportive and empathetic. A small number of the interviewees did not make a move to leave after the formal end of the interview, after the recorder had been turned off, and began to talk more spontaneously. It was clear they were getting something off their chests and they spoke more personally about work and their work relationships.

4.1.8   Reflecting on the Analysis

The analysis is a protracted, potentially endless process. I used NVIVO for Mac©. This programme was not available for Mac on the University system so I had to buy it. I then had to learn how to use it which was not easy. I also had to organise transcription of the

interview files to Word. I was fortunate to find a secretary who was accustomed to the transcription process. The analysis process was however interesting, and learning how to do it has increased my repertoire of research skills.

Learning how to code data was the most straightforward, mechanical part of the process. I then had to learn the routines of coding as used for constructivist grounded theory in order to develop themes of greater abstraction and ultimately theory.

This process was perhaps the most surprising of the skills I have learned. To my surprise, unexpected theory began to be constructed. The proponents of grounded theory have asserted that this will happen and that it is the most valued part of their methodology. Nonetheless it was very surprising to find the extent to which the system was leading me to a new conceptualisation of the issues.

4.1.9   Rigour

Qualitative research is frequently characterised as unscientific, biased, subjective, anecdotal and person-dependent on the part of the interviewer (Kvale 1994). It is not appropriate in this study report to ignore such criticism. The methodology of this study, grounded theory, was developed specifically to bring rigour to qualitative research. Lincoln and Guba (1985 p. 290) asked, "How can an inquirer persuade his or her audiences that the research findings of an inquiry are worth paying attention to?" They compared rigour in quantitative and qualitative research and suggested that the appropriate qualitative equivalents of internal validity, external validity, validity and reliability, in quantitative research, are credibility, transferability, consistency and confirmability (Lincoln and Guba 1985). Charmaz has suggested that proper adherence to the principles of constructivist grounded theory will result in a study having the credibility, originality, resonance and usefulness, that she identifies as evidence of rigour (Charmaz 2014). Credibility represents how well the findings reflect the data. This was achieved here through the constant comparative analysis. As theoretically informed categories emerged they were tested with new participants and debated amongst the research team.

Rigour also requires that there is adequate data. Dey (1999) suggested that data should be collected until theoretical sufficiency is reached. In this way the investigation ends when theory emerges and finds support in the data through the underlying concepts.

Adequacy of data rests also upon its weight and depth; and upon the claim being made on the basis of the evidence, rather than upon the number of interviews (Charmaz 2014 page 215). These factors call for deep exploration of the data. The originality and usefulness of the study will be explored in the findings and discussion section below. Resonance has been demonstrated by the positive response to the theory when presented to national and international audiences of clinicians.

Credibility: Lincoln and Guba (1985) write that credibility in naturalistic enquiry rests upon the production of findings that are believable and that are recognised as meaningful by the participants. The credibility of the research rests upon:

- Rigorous techniques and methods for gathering high-quality data that are carefully analysed, with attention to issues of validity, reliability, and triangulation
- The credibility of the researcher, which is dependent on training, experience, track-record, and status
- The philosophical belief in the value of qualitative inquiry, that is, a fundamental appreciation of naturalistic inquiry, qualitative methods, inductive analysis, purposeful sampling, and holistic thinking (Patton 1999)

Rigour by itself does not assure high quality research. The topic must be worthwhile and the reporting must be sincere, demonstrating a sceptical approach, a commitment to the topic and clear concern to add to the way it is understood (Tracy 2010). Another determinant of credibility is the nature of the data. It must be sufficient and 'rich'. Richness relates to the engagement of the participants. Does the researcher succeed in provoking them to connect with the discussion and contribute honestly to the discussion? This can be demonstrated by the use of verbatim quotes and by the researcher using memos and field notes to include information on the participant's tone and any displays of emotion. Laughter or anger in response to a question are important evidence and can be incorporated into verbatim accounts from participants. In this study I used both a field diary and memos. Some participants became very concerned to express their views and there were several occurrences of anger, amusement and tears in response to the discussion. Quantity of data is another issue for credibility. There is no qualitative equivalent to a power calculation in quantitative research as a way to set the amount of data required. The analysis of interview data is so time consuming that the

handling of large amounts becomes unwieldy. In terms of quantitative research the use of 40 subjects is very small and for this reason those accustomed to quantitative evidence from hundreds or thousands of instances are often critical of qualitative research. The interviews in this study totalled nearly 24 hours of recordings and the transcripts stretch to nearly 300 pages. This is a great deal of evidence that must be interpreted line-by-line and paragraph-by-paragraph.

In the case of this study an aspect of the method that establishes credibility (genuineness and honesty of data) and confirmability (reproducibility and stability of the data) is the process of constant comparison. (Hallberg 2006) This is undertaken concurrently with the data being collected and the findings can be fed back into the ongoing interview process. Constant comparison is between participants, between professions and with the published literature (Fram 2013). In this study constant comparison by the researcher was complemented by frequent discussion with the research supervisors.

Triangulation is another method of ensuring the robustness of the data. It refers to the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of phenomena (Patton, 1999). Triangulation also has been viewed as a qualitative research strategy to test validity through the convergence of information from different sources. Denzin (1978) and Patton (1999) identified four types of triangulation: (a) method triangulation – using a variety of methods simultaneously (b) investigator triangulation – having interpretation undertaken by a number of researchers (c) theory triangulation – applying a variety of theories to the emerging concepts and (d) data source triangulation – comparing data from different sources..

In this study data triangulation took place across participants, professions and teams. This involved seeking further evidence for something by asking similar questions of other participants. For example in this study the medical team explained that they needed to triage MEWS calls because they were very busy. Subsequent questioning of the nurses and senior medical clinicians extended the evidence. Theoretical sampling may facilitate triangulation by introducing new participants who the researcher believes will assist in clarifying evidence. In this study the nursing staff appeared to be very concerned with the possible personal consequences for themselves – of a failure of care that was principally due to actions of the medical team. The sampling was therefore

extended to management, specifically to understand why the nurses had these worries. Triangulation was used extensively in this study to compare the ideas presented by the medical team with the nursing team and between the ideas of junior and senior members of both teams.

As data emerged from the coded scripts of the interviews, discrepant or outlier experiences and opinions were sought. Deviant case analysis is the process of examining such occurrences to see if reasons for the different opinions could be understood and whether this required readjustment of the ideas being constructed (Molnar 1967). Investigator triangulation was undertaken by extensive discussion of the data with the supervisors.

Transferability: The transferability of the findings is facilitated by the description of the setting of the research, the function of the teams and the sampling method. This would permit researchers to repeat similar observations and analysis and allows a judgement of how the findings might apply is other contexts and environments. Transferability is helped by adherence to established methodology because this allows others, who understand and use those systems, to read the study report and fully understand the nature of data collection and analysis.

Consistency: Dependability is a method used to show consistency of findings. Qualitative researchers describe in detail the exact methods of data collection, analysis, and interpretation. This is so the study could be auditable to describe the situation, and for another researcher to follow the study. In the present study the PhD supervisors fulfilled the role of data auditor, following the data, findings, interpretations, and recommendations and considering whether the study is supported by data, and is trustworthy.

Confirmability: Confirmability of the findings of the study is attempted through the description and critique of the way ideas developed from the data throughout the study. A common critique of research based on interview data is that the researcher, consciously or not, frames their questions and analysis to support a pre-existing idea – thus introducing bias. This problem is the basis of Glaser's insistence on researchers presenting as a blank slate, and later development of techniques for setting aside pre-knowledge. As an experienced worker in the field of study being studied I was very conscious of this problem. In the event, my confidence in my method was boosted by

the way the data failed to support my pre-existing ideas about social and professional conflict between doctors and nurses and presented me with unexpected lines of enquiry. An element important for confirmability is the development of an audit trail both in relation to the development of the methods and in the steps from raw data through analysis to hypothesis.   The use of direct quotation from participants throughout this study helps transparency of the processes. The reader is able to see the actual words used in the interview and compare these with the interpretation being placed upon them by the researcher.

It would have been valuable to be able to present and discuss the findings of the analysis with the participants either individually or as a focus group but the teams I had studied were widely dispersed by the time the analysis was complete. The data were presented informally to the senior medical and nursing members of the team who were still available and their comments were taken into account in the process of writing up.

To assure rigour the researcher must adequately explain their methods and openly reveal an audit trail from data to codes and categories. As categories are constructed towards core categories and finally to ideas that can be considered as new theory the role of the researcher, their philosophical standpoint and their experiences become increasingly important. The analytic methods of Corbin and Strauss (Corbin 2008) attempt to make this process more transparent whereas those of Charmaz (Charmaz 2014) accept the increased role of the researcher.

4.2   Findings

Interviewee reported believing that using the MEWS score with a track and trigger system improved patient management and strongly endorsed its use. However, the way that MEWS was used was strategic, and varied with the professional role and grade of the respondent. Each interviewee reported finding something in MEWS that assisted them in doing their job. These things varied with role, and sometimes one group's perception of a useful feature was perceived to be a weakness, or problem by another. Several interviewees volunteered that MEWS did expedite the discovery of impending deterioration. From the outset a number of themes appeared important. These along with related themes I identified as major categories. These categories along with descriptive definitions are shown in Table 11.

Table 11 Major Categories and Their Descriptive Definitions

	Name of Major Category	Definition
Category 1:	Understanding MEWS	Statements relating to what the participant believes to be the purpose and mechanism of action of the MEWS
Category 2:	Responding to workload	Statements relating to the impact of workload on clinical behaviour
Category 3:	Triaging and accepting delay	Statements showing that the participant engages in triage of MEWS alerts and will accept delay in responding as sometimes inevitable
Category 4:	Responding - medical staff	Statements by medical staff describing how they make decisions about what to do following their evaluation of a patient who has exceeded the trigger MEWS value
Category 5:	Responding – nurses and healthcare assistants	Statements by nurses and healthcare assistants about how they act in relation to the outcome of a medical review of a patient who has exceeded the trigger MEWS value
Category 6:	Communicating	Statements endorsing the value of MEWS in providing language to discuss deteriorating patients
Category 7:	Doubts about the predictive validity of the MEWS score	Statements describing the dilemma posed by the low specificity of the MEWS score
Category 8:	Participating – healthcare assistants	Statements about the role of healthcare assistants in the processes of detecting and evaluating patient deterioration
Category 9:	Monopolising the dialogue	Statements relating to the fact that clinical staff are reluctant to accept that a patient is unstable when faced with a MEWS below the trigger level
Category 10:	Not communicating	Statements relating to failure of the medical team to adequately explain their decisions to the bedside carer nurses.
Category 11:	Senior clinicians express general lack of satisfaction with systems for acute care.	Statements indicating that experienced doctors believe that early warning systems are necessary because of other deficiencies in how acute care is organised
Category 12:	Misunderstanding the operation of MEWS - managers	Statements from those with managerial responsibility for teams that indicated that they did not fully understand the purpose of MEWS and RRS
Category 13:	Isolation and indecision	Statements relating to the negative feelings of more junior doctors in managing the assessment of possible patient deterioration
Category 14:	Differing professional attitudes to an intervention following a MEWS trigger event	Statements indicating the different attitudes to responding to a MEWS trigger event of the nursing and medical teams.

The sources of data for constructing the major categories are shown in Table 12.

Table 12: Data sources for topics relating to changes in team dynamics		
	Major Category	Section Number
6.1.1 MEWS provides a common language for discussing patients at risk		
Medical and nursing teams speak positively of MEWS	4,5,6	4.2.4, 4.2.5, 4.2.6
Doctors contributions to patient care unpredictable	9,13	4.2.9, 4.2.13
Nursing dissatisfaction with discussions with medical team about patient management	9	4.2.9
MEWS provides nursing staff with a justification for patient review	6	4.2.6
MEWS vocabulary in their language	6	4.2.6
Medical staff report difficulty in understanding what the nurses calls mean	3	4.2.3
6.1.2 The medical and nursing teams have different objectives		
The nursing and medical teams describe their roles in different terms	10	4.2.10
MEWS calls are very time consuming	2, 3	4.2.2
Doctors prioritise MEWS calls along with other work	3, 7	4.2.3, 4.2.7
Doctors see many calls as false 'positives'	1, 7	4.2.1, 4.2.7
Doctors have a lot of uncertainty to deal with	4, 13	4.2.4, 4.2.13
Senior nurses will call senior doctors if necessary	4, 5	6.2.4, 4.2.5
6.1.3 The effect of MEWS on the dialogue between doctors and nurses		
Doctors believe nurses often exaggerate to get patient seen	2, 3, 14	4.2.2, 4.2.3, 4.2.14, 6.1.3
Doctors want to exercise their clinical freedom	3, 11,13,14	4.2.3, 4.2.11, 4.2.13, 4.2.14
Doctors only want to see patients where MEWS is a true positive	3, 4, 11,14	4.2.3, 4.2.4, 4.2.11, 4.2.14
Nurses have difficulty getting patients reviewed	5,10	4.2.5, 4.2.10
False positives are not a waste of time	5	4.2.5
Nurses say medical staff are over reliant on MEWS	1, 14	4.2.14, 4.2.1
Nursing team emphasises their clinical skill and intuition	5, 6, 8, 14	4.2.5, 4.2.6, 4.2.8, 4.2.14
6.1.4 Why do doctors and nurses march to different drummers		
Differing viewpoints	4, 5, 6,14	4.2.4, 4.2.5, 4.2.6, 4.2.14
Nurses express care perspective	5, 6,14	4.2.5, 4.2.6, 4.2.14
6.1.5 Multi-professional teams		
MEWS changes the way the medical and nursing teams work	4, 5, 11, 14	4.2.4, 4.2.5, 4.2.11, 4.2.14
6.1.6 Effect on the nursing team's clinical process		
Downgrading the clinical role of the nursing team	13, 14	4.2.13, 4.2.14
6.1.7 Frustration of healthcare assistants		
Healthcare assistants feel their clinical skill is disregarded	5, 8	4.2.5, 4.2.8

4.2.1   Category 1: Understanding MEWS

Reading the transcripts it became clear that many staff did not use the MEWS system in the way its originators intended it to work.

The intended purpose of MEWS scoring is to identify patients *at risk of* catastrophic deterioration where this is not immediately apparent to the staff undertaking their routine care. It is not intended to identify patients who have *already* suffered deterioration. MEWS is not designed, or validated, as an indicator of the severity of disease, or of prognosis. A very sick patient will almost certainly have abnormal vital signs that staff will usually identify. They will also have a high MEWS score, but the system is intended as an early warning of catastrophe in patients who, superficially, still appear well. Staff Nurse 3 described just such a situation. She described how the score drew the problem to her attention (as intended) but elaborates that the higher the score, the faster the medical team responds. This implies a slower response to MEWS scores just above the trigger value, and that is not how the system is intended to work.

"It is good in a way, because, to look at the patient they were laughing, talking and joking on, but because of the MEWS system, and the score the patient had, you could tell you had to refer up." Staff Nurse 3 line 100

"I don't know whether they have changed the Doctors reviews because now, the higher the score the quicker they respond." Staff Nurse 3 line 106

A very junior doctor, however, emphasised using the score to decide how ill the patient is:

"Do you find them personally useful, the scoring charts?" Interviewer

"Yes, I definitely do. We get a very high number of calls as Junior Doctors and hearing a number can definitely help us prioritise which patients need to be seen most urgently."Doctor FY1 3 line 28

Other F1/F2 doctors made similar comments.

The nurses were sometimes puzzled by the fact that the doctors do not seem to do anything, in response to a raised MEWS score.

"At times, where someone is consistently scoring high, and we're not seeing any improvement, you keep going to the Doctors and say, "Look they are still scoring a 10 on the MEWS score, what do you want me to do?" and they will say, "Keep doing the observations hourly". Hourly observations are fine but we are not actually doing anything." Staff Nurse 4 line 109

This nurse equated a score of 10 with the patient being very sick and needing active intervention, but for many patients such a score is consistent with being stable and adequately managed. This nurse was also seeing the Early Warning Score as a Severity of Illness Score, and believed that action should always follow a high score.

More senior trainees and consultants, have a deeper understanding of the role and limitations of MEWS. A senior Intensive Care trainee described the problem:

"I think that sometimes people become fixated on the precise numbers. …Often there hasn't necessarily been much thought into why they are scoring that. So I think they (MEWS scores) are good at flagging up changes and trends with time, which is what they are designed to do. But sometimes it triggers a reflex action – a score of X. Therefore we will escalate to Critical Care; rather than – a score of X. What is going on?"Doctor ST 7 Intensive Care line 26

This doctor went on to explain that his review may be triggered by the MEWS, but he then ignores the figures and undertakes a 'ground up' assessment of the patients status.

"To be honest I don't really pay any attention to their MEWS score when I am asked to review them.….. I often, over the telephone, go through what is going on with the patient. Go through all the observations in number terms not in terms of what they are scoring… I don't particularly pay much attention to what the MEWS score is." Doctor ST 7 Intensive Care line 42

The senior Acute Medicine trainee was of a similar opinion.

"In my opinion a score of 4 can be as worrying as a score of 10. It depends on the patient and the context." Doctor ST7 Acute Medicine line 35

The critical care trainee was asked how he/she prioritised the response to a MEWS alert.

"Are there any other factors which will determine whether you will respond immediately, given that history or the MEWS score or not?" Interviewer

"There are obviously some observations, extreme hypoxia for example, or significant oxygen support, or airway compromise that will require an immediate response." Doctor ST7 Intensive Care line 51

Another senior trainee made a similar point:

"The nurses don't seem to understand that the score doesn't correlate with how sick the patient is." Doctor ST 7 Acute Medicine line 131

In my interviews, however, junior doctors expressed this misunderstanding.

"I think now people are getting very used to a number, so they will say, "There is a MEWS of 6 that you need to respond to." But not actually say, " I'm not that worried because they are just a little bit tachy." It is often just a little bit of this, or a little bit of that, and you need to understand better what those numbers are telling you. So I think sometimes there is a lack of understanding about which part of that score is important for that patient." Doctor ST 7 Acute Medicine line 53

An Intensive Care Consultant described the way MEWS works:

"Early Warning Systems have some usefulness in that there are a good number of patients in whom these warning scores will flag up as a problem as it happens, but they are actually not 100% sensitive, and they are not 100% specific….. It can be a useful tool but it doesn't substitute for either the knowledge, or the experience of someone who does know what a critically ill patient is like and what is going on." Consultant Intensive Care line 24

This consultant described the paradox of using an early warning score that has inherently low sensitivity and specificity.

"I think the protocol is actually very unhelpful. The reason for using early warning charts comes unstuck because the more rigidly you apply it, the more it fails, both in missing people and in calling unnecessarily - having staff with the right knowledge and experience is a better way." Consultant Intensive Care line 152

4.2.2 Category 2: Responding to Workload

A topic in discussions about using MEWS is that it adds to an already high workload. The Foundation Year doctors who look after the patients day-to-day on the wards reported very high workloads. They attributed a significant part of this to calls from the nursing team generated by MEWS. The junior doctors described a heavy and chaotic task load.

"How many calls does MEWS generate?" Interviewer

"I would say on an average shift on General Surgery ....I would say, between 10 and 30 MEWS calls in one shift." Doctor FY1 1line 157

"There are a lot of MEWS scoring and usually we are too busy to see everyone." Doctor FY1 2 line 27

Discussing the burden of having too much to do caused several of the very junior doctors to become emotional both during recording and afterwards.

The more senior doctors providing supervision had the same problem of too much to do.

"As a Medical Registrar if you physically went to see everyone you got a phone call about – well, you physically couldn't do it. So you have to make a decision on who you are, physically, going to see and who you are not, physically, going to see." Doctor ST 7 Acute Medicine line 94

Another senior trainee accepted that, even when an urgent response is needed, other commitments precluded her immediate attendance.

"Some situations require an immediate response - assuming I have the capability to respond immediately". Doctor ST7 Intensive Care line 45

Several senior trainee doctors commented, with regret, that their inability to support their juniors, because of other commitments, was stressful to their colleagues and contributed to lapses in patient care.

The doctors' heavy workload was recognised by the nurses who acknowledged that it caused them problems in responding to MEWS alerts.

"Of those (doctors) that don't (attend promptly) what do you think is the factor there?" Interviewer

"I think it is may be other stress factors. Say you ring up a particular Doctor there may be other things they have going on…. they might have to prioritise their work in different areas so sometimes it is a bit frustrating." Staff Nurse 3 line 127

Another staff nurse described a situation where she was unable to get a doctor to urgently attend a patient.

"Did you feel frustrated trying to raise that cause for concern?" Interviewer

"Yeah, it was the medical team who reviewed him. Then I actually rang the Hospital at Night (Specialist Nurse) as I was getting nowhere with the medical staff." Staff Nurse 1 line 115

"Why do you think that was?" Interviewer

"I think they felt they had more important things to be doing and sicker people to see." Staff Nurse 1 line 118

"I think they have got a busy role to be honest and sometimes they are stressed doing other things" Staff Nurse 5 line 86

Another nurse described the pressures on the most junior doctors and also commented that in her view support from seniors is inadequate.

Sometimes their seniors, at weekends, can be operating, so the weekend is the real potential for problems. But in general they just need more support because some of the Junior Doctors are quite stressed especially when they have just come into a new job. So if surgeons are operating maybe more of a support structure is needed. Staff Nurse 3 line 149

The Healthcare Assistants recognised that their heavy workload does not leave them sufficient time to properly observe the patients.

"Yeah, because sometimes if you're busy you will notice if someone doesn't look well but you may not notice someone who looks OK but they are not." HCA 5 line 85

"So a Staff Nurse can potentially be looking after 8 patients you can't have someone scoring a 7 that is monitoring at 15 minute observations and it is just not possible." Staff Nurse 2 line 64

4.2.3   Category 3: Triaging and Accepting Delay

Nurses and doctors both reported that the demands of patient care were heavy. The context for MEWS is a workplace where everyone is, in the words of one nurse, 'flat out the whole time'.

The response to a MEWS trigger event is expected to be mandatory – as determined by the protocol. If the score reaches the trigger value, the nurse caring for the patient should report this fact to the medical team. The involvement of the nurse team and ward supervisor should be to confirm that the vital signs are correctly taken and that the score calculation is accurate. The doctor should then attend in person to review the patient.

The first response doctors described prioritising their response to MEWS along with the rest of their work.

"Normally, if a patient is unwell and triggers the MEWS score I will follow the protocol on the back (of the observation chart) and normally, if the score is a 4 the Nurse will

come directly to me. I will get a bit of information on the phone. ... I will normally be familiar with the patients, so I know the background already and they will explain what has triggered the score. I will get their (the nurse's) opinion, and then I will interpret the situation and go and see the patient as soon as possible within the remit of what I am doing." Doctor FY11 line 10

In this response the junior doctor accepted the possibility of delay in seeing the patient after being briefed by the nurse. He/she would attend as soon as possible and accepted that existing work may take precedence. The trainee's repeated use of the word normally is noteworthy. Does he/she mean 'sometimes' or is the reservation expressed indicative of something else? It appears to me that it indicates that his/her environment is complex and uncertainty is leading to the qualification 'normally'.

A second subject puts it differently, describing taking the score in the context of what else they know about the patient and the nurse's opinion. Again the doctor drew attention to the difficulty of deciding what to do in such a complex environment:

"I think it is very contextual actually, and it also depends on how well you know some of the other staff.....I think the best way is, when the Nurses call, to ask them whether they have concerns. The Nurses have a lot more contact with the patients than the Doctors. And it is quite helpful when you know some of the staff. For example, if I get called to my old ward at night I know the nurses there, and how they would react to someone with a high MEWS score. So you get a slightly different feel as to whether you need to go straight away or not." Doctor FY1 2 line 45

This doctor accepted that he/she would possibly delay attendance. He/she also indicated the role of the complexity and uncertainty of their environment that complicates decision-making. They described the importance of the MEWS score as being sensitive to its context. What he/she said indicates is that this context includes a consideration of the validity of the score in patients with pre-existing disease as well as a belief that the information provided by nurses must be interpreted. He/she appeared to believe that knowing the nurse as a colleague helps in the process of interpreting the urgency of a situation. Both these doctors described placing reliance on the nurses' judgements.

A third FY1 also described prioritising MEWS calls:

"Do you find them personally useful - the scoring charts?" Interviewer

"Yes, I definitely do. We get a very high number of calls as Junior Doctors and hearing a number can definitely help us prioritise which patients need to be seen most urgently." Doctor FY1 3 line 28

Another junior doctor described prioritising responses. He/she described how they are more worried and respond more quickly if the score is high. This response indicates that they are more relaxed about scores of four that the designers of the protocol intended to be taken equally seriously.

"What is your opinion of them? (EWSs)" Interviewer:

"I think they are a good thing. I think it gets people's attention for categorizing how sick someone is. So if the MEWS score is 7 you obviously get a little bit more nervous and you look a little bit quicker to respond to that." Doctor FY2 1 line 28

"So just to clarify you think depending on their physiological pattern you would be more concerned with some than others is that correct?" Interviewer

" Yes". Doctor FY2 1 line 36

The medical and nursing teams implied that the higher the score the sicker the patient and the quicker the doctor should get to the scene.

4.2.4   Category 4. Responding – Medical Staff

The MEWS protocol in use during this research left it to the first responder doctor to decide whether to call for help. The more senior doctors that support them have their own schedules that include activities that are difficult to leave in order to supervise the care of a deteriorating patient. Both parties accepted that this situation as inevitable. The F1 and 2 doctors who are covering the wards do not have the skills or knowledge to independently manage a critical illness. The unavailability of help may lead to under-management of serious problems and to anxiety for nurses and junior doctors.

"So if you're getting a persistent call because the scoring criteria says ring because it is above 3, would you want to know a bit more history before you said I'm coming?" Interviewer

"Yeah definitely, because it could be something like the temperature has dropped by 0.2 of a degree. That is not something we would really do anything about. If the blood pressure dropped a little bit but not a lot I will say check it again in an hour then let me know what it is then. It all depends on what else is going on, I wouldn't necessarily go and see the patient I would want to know more than if they have just changed a little bit I will advise them to check it in an hour then let me know." Doctor ST3 line 81

This doctor emphasised the importance of change in the observations as well as the absolute level. They went on to express their own dilemma over whether to go in person when the more junior doctor calls them. They also revealed a strategic approach to care. The small drop in temperature is not of itself requiring treatment, buts its occurrence may indicate that the patient is becoming less stable and that a full review might find aspects of treatment that need to be changed.

"If they give me a history of the patient, I ask them, 'What do you want to do? What do you think you need to do?' And then, kind of, judge where they are going with it. And often they are on exactly the right lines and I can say 'Yes that is exactly right. Do that and get back to me if you're worried.' I guess it is about judging on the phone how concerned they are, and sometimes you feel that they are just really out of their depth, so I will go and see them. I mean, I have only been a Registrar for a year, so it is definitely a learning process but it is knowing when to go and see that patient and when you can just give advice on the end of the phone." Doctor ST3 Medicine line 138

MEWS is designed to ensure that senior doctors are involved in the management of sick patients but there is an acceptance that circumstances will cause delay. These delays are such that they defeat the primary purpose of improving the early care of deteriorating patients. An FY1 doctor when asked about their feelings when referring issues to consultants spoke very revealingly about the way delay occurs and described tolerating long delays when his Registrar is not available.

"What about Consultants, do you raise causes of concerns up to Consultant level or is it generally through your Registrar?" Interviewer

"I would say rarely straight to Consultant level. Not almost ever. With it being a surgical job, obviously, sometimes the Surgeons are in Theatre, so it can be difficult to contact them. So I may wait an hour, obviously this is a patient who has deteriorated but they are stable, and I would try them again in may be another hour for the Registrar this is at a point where I am not concerned or I would call a Consultant". Doctor FY1 3 line 99

Another FY1 doctor described similar problems in getting help and accepts an 8-hour delay as inevitable given the circumstances.

"The patient over a, sort of, 4-8 hour period went from being relatively well to having some seizures - so that was what I was mostly concerned about. I wasn't concentrating on the score. The situation was that this patient did deteriorate, this was when I was on-call and the SHO and Registrar were in Theatre for an extended period of time probably about 3 hours" Doctor FY1 3 line 178

They went on to describe their frantic, directionless quest for assistance. The emotion generated by these events – as recorded in a memo – was anger. The doctor was very frustrated by being in charge as things went wrong and not knowing what to do.

……"We rang Outreach and, sort of, expressed our concerns, and then eventually having discussed it with Outreach they weren't impressed that the Registrar wasn't there. I am not pointing fingers, because I know that is how surgery on-calls work, you know if someone is scrubbed they cannot leave Theatre. So we discussed and called the senior on-call Anaesthetist who came and helped us, and that was when I, sort of, backed off, and this patient was still intermittently having seizures and vomiting, and in the end the Registrar did leave Theatre and came to see the patient. Neither patient had a good outcome the both good and bad example; I would genuinely not be able to say if the patient had been seen quicker if there had of been a different outcome." Doctor FY1 3 line 188

The doctor went on to blame the short staffing situation at the weekend and the demands of theatre on their senior for their unavailability and the delay. Interestingly, however, he/she made reference to his/her inexperience and suggests that they would not now tolerate that delay. They implied that it is necessary to be insistent, and push the senior doctor to attend. This is similar to the situation described by nurses in getting the first response doctor to attend.

"So what do you think the factors were then? You mentioned it was at a weekend, you were on-call, and the Registrar who you tried to feed up to was actually busy in Theatre" Interviewer

"Yeah those were absolutely the main factors. On-call, less staff around, only one Registrar to ring, whereas sometimes there are three. One will be in Theatre, one in Endoscopy, and one may be doing paperwork so they can come straight away. It was a little bit earlier on in my rotation as well and I think my confidence as well was pestering perhaps because now I will ring and ask if so and so is available. And if they say, "No they are scrubbed", I will say "How long is the case going to be? Can you put the phone to their ear? I need to ask them one question." Whereas it was very early on and I probably didn't ask those questions. I didn't get a specific time frame. Perhaps if I had of known they would be 3 hours I would have said "We need to do something quicker", perhaps said to the Outreach Nurse "We need to ring the Anaesthetist – now". I can't actually remember the specifics, but this was early on, and I am very confident with things like this now. Like "Would you please put the phone to the Registrar's ear for a quick word, if they are not too busy?" If they are mid-way through dissecting a colon or something I probably wouldn't. Doctor FY1 3 202

Nurses and healthcare assistants also referred to delays occurring in the management of patients who are deteriorating.

"It can be hours before the doctors get a plan sorted between them and we are left not knowing what is going on. Sister 2 line 70

" What do you want the doctor to do when you phone them about a score?" Interviewer

"I want them to take it seriously. They really should come and look. I know they have got a lot on, but when a patient suddenly scores its their job to sort out" Sister 2 line 75

This more senior nurse was actually more concerned about the position of the nursing staff, and being blamed for problems. The more senior nurses were generally used less sympathetic language about delay in getting the doctor, and were concerned about breaching the protocol – even if they themselves saw no sign for concern.

4.2.5   Category 5: Responding – Nurses and Healthcare Assistants

Responses from healthcare assistants, nurses and middle grade doctors indicated an acceptance of delay, by the first-responder junior doctors.

The interviews with staff nurses confirmed that the doctors might not respond to the MEWS score as quickly, or as consistently as they would like. This nurse explained how she would go further up the chain of command but her language reveals that she did not find such a situation exceptional.

"So what grade of Doctor would you generally report too?" Interviewer

"Initially the F1 then if there was no response from them I would then go higher either SHO or Registrar. If it was a night time I would go to the Hospital at Night Practitioner (a specialist nurse)." Staff Nurse 1 line 25

It was clear from their comments that delay in getting a doctor to attend is a cause of frustration and anxiety to the nurses. The doctors said that MEWS generated a lot of calls, few of which turn out to be a prelude to the patient deteriorating. They believed that delay is unavoidable and they appear to take it in their stride. The nurses recognised the problem but were less sanguine about its consequences.

Another staff nurse did not say directly that there was difficulty getting a response from the doctors but her reference to having to 'push' revealed that the process of getting a doctor to attend might not always go smoothly.

"So as a Band 5 Staff Nurse what role do you have in using the scoring system?" Interviewer

"Often we will be informed by a Health Care Assistant for instance they have done somebody's MEWS and they are showing a high score, we are always informed of any MEWS they might have but if it was a MEWS of 2 or above I would then have to escalate this to the Doctors and dependent upon how high they score it would be what level of Doctor and often we are having to push if the Doctors aren't acting upon it and escalating higher or to Outreach or to other groups of Nursing that might be involved with that. If the doctor comes we can sort things out for the staff – even if there's nothing new to do" Staff Nurse 2 line 25

And again:

"So of those patients that you have been personally involved in their care, have you been the person who raised that cause of concern to Medical Staff?" Interviewer

Many times, on a lot of occasions we push the Doctors to come and review a patient" Staff Nurse 4 line 76

"Do you often have to push?" Interviewer

"Well, we don't always push but then maybe no one comes" Staff Nurse 4 line 78

"What happens then?" Interviewer

"We don't know what to think. Sometimes the patient has a score but its okay but the doctor coming helps with the relies (relatives)." Staff Nurse 4 line 90

Another staff nurse noted that the medical team was sometimes slow to respond, and attributed this to 'stress'. She went on to explain that this stress is the pressure of work and implied that a process of prioritisation is taking place.

"Of those (doctors) that don't (attend promptly) what do you think is the factor there?" Interviewer

"Well I wouldn't say they don't take it on, I think it is may be other stress factors….the on-call Doctor could have other patients also scoring high, or admissions coming in and things like that. It is a bit frustrating in that way." Staff Nurse 3 line 127

In further interviews the nurses referred to doctors needing to be reminded to come, and attributed this to work pressure.

"What do you think are the factors there then when you go to the Doctors (and they don't attend)? What level of Doctor would you say this occurs?" Interviewer

"I think the factors are may be the level of Doctor and sometimes the lack of Doctors on nightshift ... they are tied up with someone who is also critically unwell for a good few hours and (we) are left with a more junior down here who is may be not making those decisions." Staff Nurse 6 line 113

"Do you think it is always busyness amongst the various grades of Doctors in their lack of response or is there something else"? Interviewer

"I would say 99% of the time it is busy-ness and other demands." Staff Nurse 6 line 139

Yet another Staff Nurse mentioned delay in medical staff attending. On this occasion she believed this delay contributed to a poor outcome for the patient:

*"Doctors should have been called, and initially I think the Doctor **had** been called, but there was a huge delay between the Doctor being called and the Doctor actually attending." Staff Nurse 6 line 158*

The healthcare assistants that were interviewed reported that their role was to inform the staff-nurse if a patient had a high score. They would occasionally go directly to a doctor and sometimes they report that there was delay in the doctor attending.

"With the scoring going higher I had to let the Nurse and the Doctor know straight away. They were aware she was scoring an 8 but it was obviously slowly creeping up to a 10 then 11 but the doctor hadn't come and I didn't feel happy about the results so straight away I spoke to the Doctor myself as her breathing had also changed" HCA 3 line 55

"I was on nightshift and I kept informing the Registrar that he seemed like he was short of breath and the Reg said when he got to see him he would decide. ....eventually when he did go to see him he put him on some oxygen because I thought his sats were quite

low and he wasn't COPD or anything, I mean they were only 92 or something but it just seemed that he wasn't right. In the morning he went to the bathroom so I got the oxygen bottle and attached him to that, he said he was a bit light headed so I walked him there and pull the buzzer when you're done so I continued doing the observations and I thought he was taking a while and I started to get a bit worried so I went to the bathroom and he was just white, clammy, sweaty and I got the chair pulled the emergency buzzer and took him back and did his observations and they were fine. The Doctor came and asked what his last observations were and I said "The same, but I did tell you he didn't seem right and was short of breath." We did the ECG, blood gases and an hour later he had a cardiac arrest and died. I will never forget that morning because he kept saying there was something wrong but he didn't know what it was and for all he was scoring he wasn't really scoring high it was just his sats. I don't know it is hard because we are not qualified it is as if they think we are sometimes over stepping the mark but we are not we are just trying to give our opinion. Sometimes I think a lot of Healthcares especially on this section / area they get frustrated especially if they have been here a long time." HCA 2 line 127

This incident is shown in full because it is a compelling illustration of a very junior staff member struggling to cope in the face of overwhelming difficulty. The failure to follow the protocol may have contributed to this patient's death.

One of the healthcare assistants was very articulate in expressing the dilemma that faces their grade. She described being very worried about patients and knowing that all is not well, and finding that there has been no response from the staff nurse or doctor to whom they report.

"If you were doing a set of observations and you noticed a patient was becoming unwell, to whom would you report?" Interviewer

"I would go to the qualified Nurse looking after that patient at the time. If I felt that I was getting nowhere with them I would approach one of the doctors." HCA 4 line 18

"You mentioned if you didn't get anywhere, what do you think happens sometimes on the Ward for you to feel that way?" Interviewer

"Sometimes it can be so busy that the qualified Nurses are listening, but they can't always take it in. So sometimes they will acknowledge that you have told them but then they might be busy with someone else so might not necessarily get to see them straightaway. They may say to me could I go and show a member of the medical team and I would go and do that. But it can be a worry if the doctors don't come quickly." HCA 4 line 24

Another healthcare assistant described the frustration of their being no response when they reported a high MEWS score:

"At the time it felt as though nobody was doing anything because you build up a relationship with a patient and it was a busy morning with lots of other jobs to do and you were having to give an awful lot of time to these two patients and you feel as though something should be done sooner than it was. It all worked out in the end but at the time it seemed an eon before anything was done." HCA 5 line 109

"Now do you think it was a big gap in time or did it just feel a long time?" Interviewer

"Well it probably was a couple of hours but I didn't know what was going on at the .....we don't always get to hear that side of it because you're the person looking after them you want something done instantly it doesn't always happen like that." HCA 5 line 115

The more senior nursing staff explained that a significant part of their role in relation to MEWS is ensuring that the medical team responds to alerts. When the more junior doctors did not respond they would go over their heads to the registrar or consultant.

"Then pushing the Medical Staff who can be quite dismissive especially if they think a patient is about to go home. With a patient they are discharging they don't really want to be bothered with if this patient has a bit of a fast pulse and they are sort of a bit dismissive of that. So with experience and a bit more authority means you can push situations like that. Like I have previously said I am quite happy to ring the Consultant" Sister 1 line 98

"Quite often it can be the medical staff responding where there can be a delay and I still think once they have passed that on they are still a little bit under confident with chasing that up whereas I have got no problems at all with escalating to the Consultant or speaking to Outreach." Sister 2 line 45

This Nursing Sister attributed the delay in getting a response from the doctor to inexperience and muddled priorities.

"We have some very junior staff it is sometimes they can't see the wood for the trees they are thinking about so many things that they have to do they think oh I have passed that one and that one has been dealt with and before they know it time has passed and they have got on with other things and come back. So I think it is a lack of prioritising due to lack of experience really." Sister 2 line 53

4.2.6   Category 6: Communicating

The nurses said that MEWS scoring was very useful and helped communication with the medical team. It appeared that this worked in two ways. Firstly, they reported that they often already recognised the signs of early deterioration, and the high MEWS score was a reassurance, enabling them to approach the medical team with confidence.

"I am just generally going to ask you as a Band 5 with 2 years experience how do you feel about raising causes for concern?" Interviewer

" I think if you had of asked me like a year ago I would have said no not at all. I knew when something was wrong but I don't think I would have had the voice to say it but as you get to know groups of Doctors that really helps and they know when you are worried that it must be something as you don't ring for everything and that has helped. I do feel more confident and also I know by doing everything that is set and by protocol that I am always backed up by that because that is the Policy and I am happy to raise concerns." Staff Nurse 2 line 131

"Using the charts gives you a bit more confidence when you are raising causes for concern, because it is, like, evidence" Staff Nurse 4 line 34

"I feel more confident now in approaching the medical staff now, and I am more assertive." Staff Nurse 1 line 126

"As a first port of call if we become concerned about a patient we would go to the F1. If we felt that they were out of their depth or they weren't responding quickly enough probably the junior Nurses would go to the SHO but I would tend to go to a Registrar or a Consultant probably because I have a better relationship with them and I feel able to ring them where as other people don't." Sister 1 line 51

They felt that having a trigger level MEWS made them less likely to be criticised for raising a concern.

" Yes, because prior to its introduction it was very difficult you get Doctors to respond to your feelings, because sometimes it was a gut feeling and sometimes things weren't always obvious from the observations. They were just slightly off and just slightly out of normal limits and the Doctors weren't too bothered if they were too busy or stressed or whatever they could be very dismissive of you. Now it is less easy for them to be dismissive because you have a score written down which is backed up by policy or protocol, whatever you call it, which the Trust demands they act in a certain way according to that score. So I certainly think it has backed us up, it doesn't always mean they will do what is required of them but it gives you back up and it gives you back up to take it to a higher level should they not respond in the way you want them to respond." Staff Nurse 2 line 42

The language of MEWS had become a mutually understood expression of a patient's general condition and the interviewees had absorbed the terminology into their professional jargon.

"I think it is good because the whole team uses it. So, if you say, 'Their MEWS is a one', everyone understands what that means. It is a good system because everybody uses it" Staff Nurse 1 line 44

Senior medical staff expressed positive opinions regarding the function of MEWS. It provided a template for expressing accurate causes for concern regarding deteriorating patients:

"Since the MEWS score coming in I think it has allowed Nursing staff and none qualified Nursing staff… it has given them a much better tool to say there is something wrong with this person they are not just a little bit off colour or there not quite right a vocabulary that was open to ridicule by Medical staff. I am trying to be honest with you, it often was inaccurate anyway so you had someone who didn't look quite right scenario and often they were fine and you got the cry wolf. Whereas the MEWS score in my opinion has been a huge step forward because it allows an actual number to be given and allows data to be tracked. I do a lot of court work and the MEWS score is particularly central to that so I think the MEWS score is fantastic" Consultant Surgeon line 32

4.2.7 Category 7: Doubts about the predictive validity of the MEWS score.

Doubts were not expressed about the reliability of MEWS. Nurses and Doctors both believed that the vital signs observations were accurate, repeatable and did not vary significantly between observers. However, all grades and professional groups of staff expressed doubts about the predictive validity of MEWS. The predictive validity of a scoring system is a measure of how well the prediction correlates with real outcomes. Firstly, they felt that there were significant numbers of false positives. That is, a MEWS score mandated review of the patient, but on analysis it appeared very unlikely that they were on the edge of a serious deterioration. This occurred in a number of situations:

Patients with pre-existing co-morbidities tended to have high scores. It was pointed out that those with moderate chronic respiratory disease might score 4 or 5 – even at their best.

Patients already known to be poorly might fluctuate backwards and forwards across the trigger score. Resulting in repeat calls. Also, this group of patients might trigger a call, be reviewed, and then re-trigger a call when their observations are repeated.

Patients in the sickest group, but in whom treatment has been limited to palliation may continue to trigger calls – even those with do-not-attempt-resuscitation orders in place.

"Are you saying then that these types of patients could be falsely scoring high?" Interviewer

"Yeah because they can be scoring like a 6 or a 7 but because they are COPD there sats are between 88 and 92, they're on oxygen so their scoring for the oxygen, their resps are high because of their breathing so they are scoring high anyway if they come it at night it takes until they see the Consultant the next morning before it is picked up" HCA 2 line 47

"Do you find it is always useful to use a scoring system?" Interviewer

"Yes. Sometimes though I find that if a patient is deteriorating it doesn't always appear on the scoring chart because they could be retaining oxygen but their oxygen levels are still quite high you wouldn't really spot this on the scoring system." HCA 3 line 42

"So when you talk about modifying it, can you just explain that a little bit more?" Interviewer

" Yeah, sometimes we have patients who might have high heart rates and that might be considered quite normal for them but for us it wouldn't be surgically so they trigger all the time and we would have to call the Doctors and get them to make sure that it is ok but sometimes it is not signed for so that will keep happening." Staff Nurse 2 line 43

"Yeah the main patients we find are the respiratory patients because of what is flagged up on the early warning scores. So for example if we have a COPD patient who is on home oxygen the very fact that they are on oxygen scores them a 2 the sats in a COPD patient you want them slightly lower so that will automatically score them a 2 or a 3 so straight away when they are at their norm and what is good for them they are may be scoring a 4 or a 5. Then if you add in a slightly low blood pressure or a temperature very slightly up and before you know it they could be scoring a 6 or a 7 which in another patient would be quite alarming but in a respiratory patient that can often be the norm for them." Staff Nurse 4 line 38

These alerts could have been avoided by using the system of making the variations that the MEWS system allows, but nurses and junior doctors felt that a major problem was the reluctance of senior medical staff to apply a variance or exclude a terminal patient from MEWS.

"Sometimes it is very hard to get a variance signed. So patients, because of the MEWS system, now tend to, whether it is right or wrong, to have observations done maybe hourly for in a tachycardic patient, because they have an idea of what it is related to but the Doctors aren't very keen to sign a variance." Staff Nurse 3 line 39

"Why do you think they are not very keen to sign a variance?" Interviewer

"I think some of them think that if they sign it, and they are missing something, it is their responsibility, which is true in a way." Staff Nurse 3 line 53

"So do you find in your capacity that you have to take that into account?" Interviewer

"Yeah, we have to push them if we want a variance." Staff Nurse 3 line 54

"What grade of Doctor do you find most difficult to get a variance signed or is it a standard grade on here that would sign a variance?" Interviewer

"The F1s won't sign a variance at all, and the Junior Doctors say they can't do it so it gets bumped up to Registrar level I would say." Staff Nurse 3 line 60

"When they say they won't do it is it because they are not allowed to do it?" Interviewer

"Well that is the impression I get. It seems to be it needs to be the next level up to sign it and they discuss it with the Registrar as well but the F1s tend not to really sign variances. I don't know whether there is a protocol in place in the Trust to say they cannot sign a variance and it has to be escalated up." Staff Nurse 3 line 63

Even if variations and exclusions were widely applied there would still remain a significant number of 'false alarms'. Given the high workload for the first-responder doctors it is unsurprising that they seek to triage calls before deciding what to do.

The nurses often thought that active treatment should be stopped. Not doing so leads to continual, inappropriate alerts.

"Obviously every time that patient scores that high we are ringing the Doctor every hour because we have to, but they are aware of that. I think it is because there is a very

fine line between it has always been the case yes a DNAR (a Do Not Attempt Resuscitation Order) is signed but nobody ever seems to want to stop that active treatment." Staff Nurse 5 line 89

Another Staff Nurse described what she sees as a similar problem and remarks that constant monitoring is unpleasant for the patient.

"I think maybe it is just us a culture and a society of human beings we never want to give up on anybody but sometimes I think we just need to look at certain things and say, "Right we have tried this for days, and maybe certain things aren't improving, maybe it is time to start making them comfortable". I don't think there is anything wrong with that I just think people have to make that decision." Staff Nurse 3 line 182

"So going outside of the protocol is difficult for some." Interviewer

"Yeah I think that has may be summed it up a little bit." Staff Nurse 3 line 188

One staff nurse elaborated on this issue after the recorder was turned off. She said that it was incredibly difficult to get medical staff to respond and sign patients in the notes as needing no further aggressive treatment. The Staff Nurse said this happened quite regularly with Senior Consultants and Registrars not documenting that a patient no longer requires active treatment and active observations. This failure means that patients, as in the example given by the Staff Nurse, have to undergo hourly observations, even though there is not an active plan and everyone around them in the team knows that the patient will die. She feels that this lack of clarity makes it very difficult for the Nurses looking after the patient and the more Junior Medical Staff to be able to respond appropriately. This is because the early warning score mandates actions, and all this activity is very inappropriate in the context of a patient who is dying. She said that, when the doctors do not make the decision to move to palliative care, it is principally the patient, their relatives and carers who bear the consequences. The doctors will leave and get on with their other work. It is easier to procrastinate than to make a decision. This staff nurse explained that MEWS triggers could cause worry to the nursing staff – even if the patient looked well they worried that they could be missing something. She added that this uncertainty unsettled the patients and their relatives.

4.2.8   Category 8: Participating – Healthcare Assistants

Staff reported that the majority of the routine monitoring of the patients vital signs is done by healthcare assistants (which is probably true) and they felt that this was acceptable, or even good practice. The HCAs described their role as being general patient care, but also to undertake routine monitoring.

"What is your role is for caring for these acutely ill patients?" Interviewer

"We kind of help with the washes, the observations, BMs if they are done and getting equipment things like that." HCA 1 line 13

"Obviously to assist the Nurse, to do observations and monitor the observations" HCA 2 line 12

"When they first get admitted onto the Ward the first thing we do is to check their observations which is their blood pressure, temperature, resps, sats and heart rate: an all round to check to see if they are scoring anything." HCA 3 line 11

"We would assist the qualified staff to do observations from the MEWS chart; the blood pressure, respiratory rate, heart rate, temperature; and using that to assess what care the patient needs from us. We also assist with any personal care within the day to day running of the Unit." HCA 4 line 13

The healthcare assistants themselves, and the supervising RGNs acknowledged that most of the routine monitoring for MEWS was done by healthcare assistants.

"What is your particular task in using the system?" Interviewer

"99% of the time we do the observations on the Ward." HCA 4 line 31

"In particular a lot, maybe most, of the time it is the Healthcares doing the observations. " Staff Nurse 4 line 32

Medical staff recognised that healthcare assistants play a principal role in monitoring patients:

"HCAs do a lot of the observations on Wards - if not all of them." Doctor FY 2 line 142

Healthcare assistants work under the supervision of an RGN who has responsibility for a number of patients. The HCAs said that they usually reported MEWS trigger events to their supervising Staff Nurse

"So what is your role in using those charts and scoring systems?" Interviewer

"Basically doing the blood pressure, scoring the patient and then going to the Nurse in Charge." HCA 1 line 24

"We have a blood pressure chart, so if the score is above a certain level we tell the Nurse. We tell the Nurses anyway but anything above a 2 we generally go and tell the Nurse straight away and they will then go to the Doctor to see if anything needs to be done." HCA 1 line 20

If the nurse were not available they would go straight to the doctor.

"So if a patient was becoming unwell, to whom would you report?" Interviewer

"The Nurse who was looking after the patient, or the Doctor - whoever is closest." HCA 1 line 16

"If I observe there is something wrong with a patient I would check the observations and report straight to the Staff Nurse and if the Staff Nurse wasn't available I would report to the coordinator (more senior nurse)." HCA 2 line 17

Sometimes the RGN asked the healthcare assistant to liaise with the medical team.

"Sometimes it can be so busy that the qualified Nurses are listening, but they can't always take it in, so sometimes they will acknowledge that you have told but not necessarily get to see them straight away. They may say to me could I go and show a member of the medical team and I would go and do that." HCA 4 line 24

The healthcare assistants also took it upon themselves to discuss a patient with the medical team.

"I make the Staff Nurse who is involved with the patient aware first, then I go straight to the Doctor because I know now a patient who is deteriorating to go straight to the Doctor and tell them. I know the Nurse can do that as well but I like to let them know as well." HCA 3 line 20

"Have you ever spoken to a Doctor about cause for concern or has it been through the Staff Nurse always?" Interviewer

"I have spoken to a Doctor about it as well" HCA 1 line 74

The Foundation Year (FY 1 & 2) doctors reported a different experience. They had little experience of healthcare assistants reporting MEWS triggers, though they were open to this happening in principle.

"Would a Healthcare report a concern directly to you?" Interviewer

"I think not because normally. Normally a Nurse would come to me .....I think very rarely Healthcare Assistants would, even if I know them and we get on well together, I think rarely they would come straight to me, but I don't actually know how it works they have a chain of command that they have to follow." Doctor FY1 3 line 143

The FY1 and 2 doctors said that they were happy to respond to MEWS reports from Healthcare Assistants. They did not express reservations about the Healthcare Assistants ability to accurately measure vital signs and calculate the MEWS score.

"How would you feel if a Healthcare Assistant did come to you and raise a cause for concern? How would you manage that?" Interviewer

"The fact is a MEWS is a MEWS. Whether a Healthcare Assistant or a Nurse reports a score of 5..... So I would like to think I wouldn't take it any differently from a Healthcare. " Doctor FY1 3 156

Another doctor had not had experience of MEWS reports from healthcare assistants but has no objections in principal.

"Do Healthcare Assistants directly tell you about causes for concern?" Interviewer

"No" Doctor FY 2 line 149

"Why do you think that is?" Interviewer

"I don't know. It may be a confidence thing, it is kind of the hierarchy in a way so I have overheard Healthcares coming back to Nurses with observations and then the Nurse will then go and phone someone but I am not sure why this happens." Doctor FY 2 line 151

Doctors may not know what grade of nurse was reporting to them – particularly on the phone, but thought that their grade is immaterial.

"Who reports? Is it from Registered Nurses or Healthcare Assistants?" Interviewer

"To be honest when we answer the phone calls the Nurses rarely identify themselves." Doctor FY1 3 line 35

"Do you think that is important for you being able to prioritise your workload?" Interviewer

"I don't think it matters who has made the phone call or who has done the observations" Doctor FY1 3 line 40

Another doctor explained that they had no experience of being phoned by healthcare assistants, but had been spoken to, in person, when they were on the ward.

"Have Healthcares reported concerns to you?" Interviewer

"They have, when I have been on the Ward, but I have never been bleeped by a Healthcare Assistant telling me about an unwell patient." Doctor FY1 2 line 141

The foundation doctor believed that the healthcare assistants measure vital signs reliably, but felt that they do not have as deep an understanding of the clinical situation as the registered nurses.

"Do you feel that Healthcares reporting causes for concern are generally reliable?"
Interviewer

"I think they are more based on numbers than actually on a patient's clinical condition. It is not taking anything away from the HCAs because they do a fantastic job and we couldn't survive without them but I think they have less clinical experience than the Nursing staff and a lot of their concerns will be based on numbers. Saying that, if it is an HCA who has been in the job for 20 years, there is a difference." Doctor FY1 2 line 150

Healthcare assistants sometimes had difficulty in getting their patient reviewed by the medical team and in that case they said they were happy to call the doctor directly. This healthcare assistant described an event where having reported a problem to a nurse, who in turn called the doctor, no one came to review the patient.

"With the scoring going higher I had let the Staff Nurse and the Doctor know straight away. They were aware she was scoring an 8, but it was obviously slowly creeping up to a 10 then 11 but the doctor hadn't come, and I didn't feel happy about the results, so straight away I spoke to the Doctor myself as her breathing had also changed" HCA 3 line 54

Another healthcare assistant described situations in which they have reported problems to the nurse, but there is no response from the medical team.

"I would go to the qualified Nurse looking after that patient at the time. If I felt that I was getting nowhere with them I would approach one of the medical team and tell them that the patient doesn't look as well as they did may be half an hour ago, or that their MEWS score had deteriorated." HCA 4 line 18

These healthcare assistants did not behave as though they only understand patient deterioration in terms of a MEWS score. They said they used experience and clinical skill to evaluate the situation in order to push for help, if they feel it is needed.

This healthcare assistant described not knowing what the medical team is planning for the patient. They did not know whether the doctors were not responding, or whether they had assessed the situation and were waiting to see what happened.

"You get some patients who might be scoring a 12 or a 13 and you kind of think what is going to happen? Are the Doctors just sitting on them, or where they are going? As Healthcares we can't really do anything. Sometimes we need to say, 'What is happening? Are they going to do anything?'" HCA 2 line 35

The healthcare assistants felt responsibility for coordinating the proper response to a patient's problems.

"How do you personally feel when you report a cause for concern?" Interviewer:

"I feel like I have a responsibility to go and tell the Nurse because they might not know if they aren't checking." HCA 1 line 68

The healthcare assistants understood that MEWS is just one indication of problems. They knew that was necessary to take into account other indications of the patient's condition.

"Do you think it is just another piece of paperwork?" Interviewer

"No I think it is really good. ….I think it is good, but even when you get a patient who is scoring a zero, there could still be something not right so you have still got to observe, even using the chart you can't just use the chart as the main thing." HCA 2 line 33

"Have you had much experience using this system?" Interviewer

" Yes, we have used it for quite a while now…. I could do it without even putting them (the vital signs) on the form. I can tell if they are scoring just by looking at the readings now." HCA 3 line 30

Interviewer: "So do you understand the purpose of the scoring system?"

"Yeah, the Doctors and qualified Nurses use it to see what treatment they may need"
HCA 4 line 36

Do you feel that your causes for concern are taken seriously? Interviewer

" Yeah I have never felt like anyone has said ah it doesn't matter." HCA 1 line 71

"That's good. Do you feel they believe you when you report a cause for concern?"
Interviewer

"Yeah I have never felt like not. (sic)" HCA 1 line 79

"I think, because the Healthcares are kind of frontline, patients are more willing to speak to us than they are to some of the Nurses, and especially the Doctors, so I think because we tend to be in the bays constantly looking after them. I think we observe more, especially when you think that person was fine this morning, now they are just lying on the bed they don't feel right but they can't put their finger on it. So you tend to go off what the patient is saying to you. Then I would do the observations and get the Staff Nurse. There have been lots of occasions where they have come round from A&E and I have recognised them from before (a previous admission) and I have thought 'The last time they were in they were diabetic and yet there is no BM chart and not BM done," and straight away I have done their blood sugar and it has been 2. It is just you get so used to the same patients you have got to have an understanding of the last time they were in they were totally different so I think you just learn things over the years."
HCA 2 line 20

"Are you frustrated with them? Just listening to what you are saying there are you frustrated sometimes that interventions aren't made?" Interviewer

"Yeah, I think just because we look after them and when you're doing hourly observations on a patient especially through the night constantly and they are poorly, and the families are asking ,"Why do you keep doing those (observations)?" All we can say is, "We are asked to do them," and there is no other answer we can give. The relatives think "We don't want you doing that, we can see you're disturbing them, and

you're causing them more pain, and it is awful." But we just go by what we are told to do. With the MEWS charts the new ones especially because you get your COPD patients and they score for their oxygen and because their sats are going to be low and their resps are going to be high I think it would have been nice to have something on them for COPD patients or even another chart you could put in if they are COPD." HCA 2 line 47

"Are you saying then that these types of patients could be falsely scoring high?" Interviewer

"Yeah because they can be scoring like a 6 or a 7 but because they are COPD there sats are between 88 and 92, their on oxygen so their scoring for the oxygen, their resps are high because of their breathing so they are scoring high anyway if they come it at night it takes until they see the Consultant the next morning before it is picked up." HCA 2: line 56

4.2.9   Category 9: Monopolising the Dialogue

It is the nurses, and particularly the healthcare assistants who are troubled by the problem of false-negative MEWS scores. Several of them discuss the problem of the patient that they believe is deteriorating, but whose MEWS score is low. They believe that their experience, clinical intuition and close proximity to the patient allowed them to identify some patients at risk, despite the low MEWS score. The nurses and healthcare assistants are saying things that lead to the conclusion that they believe that in these patients the MEWS score makes it more difficult for them to get their concerns taken seriously. The doctor inevitably asked what the MEWS score is, after listening to their story, and they felt that the doctor is mistakenly reassured when it is low. There is a widespread undercurrent of feeling amongst the nurses that their clinical skills, intuition and experience are ignored in the face of a low MEWS score. MEWS had become so fundamental to discussions about patient deterioration that the nurses had difficulty raising concerns about patients with low MEWS scores, when experience and intuition suggested problems were imminent.

"Even when you get a patient who is scoring zero, there could still be something not right, so you have still got to observe. You can't just use the chart as the main thing. But the doctor always focuses on the MEWS" HCA 2

"I tell them I'm worried and they say, 'What's the MEWS?' And if it's low they are not interested. It's annoying." Staff Nurse 4 line 100

Despite their very basic theoretical and clinical education the Healthcare Assistants also display clinical intuition and understanding.

Sometimes, though, I find that if a patient is deteriorating it doesn't always appear on the scoring chart – but that's what they (the doctors) look at" HCA 2 line 59

"I find sometimes as a Healthcare that Doctors don't take me seriously when I draw attention to a problem, sometimes, which I find really quite annoying." HCA 4

"Some people can look well in themselves, then you do their blood pressure and it is in their boots and you think that's not right but then other times they can look very unwell but the MEWS chart doesn't show that they are actually poorly." HCA 4 line 41

It appears that the MEWS is making it harder for the HCAs and Staff Nurses to get patients with low scores reviewed when their clinical skill tells them there is a problem. Difficulty in conveying concerns about patients who appear well, and also have low scores has also been expressed by junior medical staff:

"Can I ask you now about an episode that didn't go so well?" Interviewer

"Yes, it was actually on my current job. Recently we had a patient who has been, in my opinion, I would say, she has been quite unwell, however, her observation chart didn't reflect this. The kind of changes that alerted me to something being wrong were her deteriorating cognitive state and her blood tests. However, her blood pressure was maintained in a normal range and nothing else had gone off so it was a bit more difficult to ask for specific help, because she was stable from an observation point of view. It was more of a gut feeling that she wasn't quite right and that something needed to be done." Doctor FY1 1 line 77

4.2.10 Category 10: Not Communicating

The nurses repeatedly used language that indicated disconnect between themselves and the medical team.

This can be broken down into a number of issues:

The doctors did not respond by coming to see the patient when a trigger score is reached.

The doctors did not keep the nurses informed about their clinical decisions.

The doctors did not explain why they are apparently not doing anything to treat the patient.

The doctors did not document a variation for the MEWS criteria or change the care to palliation. This results in many spurious trigger events and is unnecessarily intrusive monitoring of the patient.

The nurses described what they will do when the 'first responder' doctor is cannot be contacted or failed to come.

"So what grade of Doctor would you generally report too? Interviewer

"Initially the F1 then if there was no response from them I would then go higher either SHO or Registrar. If it was a night time I would go to the Hospital at Night Practitioner" Staff Nurse 1 line 23

"A lot of the time the stumbling block is actually getting them to come and look at the patient." Sister 2 line 59

"If by some miracle a Consultant appeared whilst you were concerned about a patient we would tell them straight away." Sister 1 line 49

At some point during the interview I asked every interviewee to describe a case that went well and a case where things could have been better. I also asked many of the interviewees what constituted a good MEWS call and what constituted a bad call.

The F1 and F2 doctors were satisfied with episodes where the MEWS call drew their attention to patients who had clearly developed new physical signs that required intervention. The most successful events were those where they were themselves able to make a diagnosis and organise appropriate treatment, including escalation to ICU care. These doctors were least satisfied with calls when on examination they did not find that the patient's clinical condition had changed. They described such episodes as time wasted.

The nursing team said that they hoped the patient review would be negative – for the patient's sake - and expressed concerns about the anxiety of the patient and the relatives.

"Well, when they know there's been a call about them they get anxious. Sometimes the patient and relatives have got anxious because we have been checking and re-checking a lot. Then when the doctor comes and says its okay then its relief all round." Staff Nurse 1 line 103

"Its useful to us to have the medical team look at the patient, even when they find that there isn't a problem." Sister 1 line 64

"Many of the repeat calls are because the docs haven't made a variation but that's no comfort to us in looking after the patient. They should be more willing to make variations." Sister 3 line 32

4.2.11   Category 11: Senior Clinicians express a lack of satisfaction with the systems for acute care.

The opinion of the junior staff that actually use it the Early Warning Scoring system was that it was very useful, and that it improved the management of patients. They accepted it as a tool to help the most junior of medical and nursing staff to identify sick or deteriorating patients.

The opinion of the most senior medical staff as to the function and purpose of the MEWS score was also consistent. Whilst they said that it had value for junior staff, it was felt to have limitations and they cited a number of problems associated with accepting the score wholeheartedly. The view was expressed that, whilst MEWS was a valuable tool, the systems for identifying and managing problems on acute wards were unsatisfactory because of inadequate staffing, lack of continuity and inexperience.

An over reliance on the score has caused frustration in the dialogue between senior and more junior members of medical and nursing staff. One consultant's views showed that they had the same misunderstanding of MEWS that emerged from the discussions with more junior doctors – an expectation that it quantified illness as well as being an alert of problems to come.

"It is not entirely fail safe and I always want the components broken down. I think it is good but I think we get far too many calls saying this person has got a MEWS of this number and to me that doesn't necessarily mean anything because I need the breakdown of the components of it." Consultant Acute Medicine line 18

An experienced critical care consultant drew attention to this misunderstanding but did not appreciate that it extended even to senior doctors and managers.

"No, I think there is a big misconception, amongst Nursing staff, but also amongst relatively Junior Doctors, and Foundation Doctors in particular, that the trigger is the be all and end all. That the patient is fine if they aren't triggering and (that they are) unwell if they are triggering and at that point somebody should come and do something. I think there is a huge lack of understanding of the idea that these don't substitute for knowing what you are doing and they are never going to be 100% sensitive by a long way." Consultant ITU line 42

The operational differences in responding to MEWS trigger events out-of-hours at night and the weekend has an impact on its effectiveness. In the hospitals studied a MEWS call requires a doctor from the patient's care team to respond, but out-of-hours the responder may be a nurse practitioner, or a doctor with no prior knowledge or experience in that clinical area.

"No, the whole move to Hospital at Night has been a retrograde step partly because it is putting someone without diagnostic skills looking after a lot of patients. Partly because it is putting someone in care of an awful lot of patients in areas they don't know a lot about, whether they are a Doctor or a Nurse, they are coming from one particular area to cover a vast amount of specialties that are outside their normal experience." Consultant ITU line 169

Getting clinical experience under supervision, via a team approach, is seen as important in medical education. Fixed clinical teams, often referred to as 'firms' have disappeared with the reduction of doctors hours of work, required by the European Working Time Directive and the formalising of clinical rotations to make training experience broader and more consistent. This critical care consultant eloquently expressed the difficulty in providing feedback to juniors who did not regularly work on their team.

"Also, the changes in Junior Doctors (work pattern) that puts them on shifts is retrogressive in this aspect. They see less, and they see less as part of their teams - so they learn less. When an entire team or firm was on-call, the same junior doctor was calling the same middle doctor who was calling the same senior doctor. They knew what they were doing and they knew what each other was doing, and so, very Junior Doctors often learnt because the people slightly ahead of them were the same people every time, and they knew what they could do and what they can let them do, and they were there the next day to give them feedback. Whereas, on a shift system when people are on with people they don't know and don't see them again there is no way of giving anybody any feedback." Consultant ITU line 173

This consultant returned again to the failure to recognise deteriorating patients in a timely manner out-of-hours because of deficiencies in staffing. Whether a doctor or a nurse practitioner reviews the high MEWS may affect the ensuing management. The following transcript is in response the discussion of poor examples of identification and management of deteriorating patients.

"Again I can think of lots and lots (of missed deteriorations). I can think of numerous examples where there have been enough signs during an entire night, not recognised by the people involved, - until the next day when a relatively more senior doctor takes a look at the patient and says, "Oh my goodness!" and calls Intensive Care and we think.

"Why did nobody do something about this 5 or 6 hours ago?" You can see in the notes that people have been aware of what has been occurring, but didn't understand the significance of it." Consultant ITU line 71

"Why do you think that is? Interviewer:

"It is usually Hospital at Night, the instances I am thinking of. Usually the patient triggers on the MEWS chart. The Nurses call the Hospital at Night Practitioner who does something, usually following their algorithm. But actually that was never going to work, and they don't understand that the implications of what they are…. Sometimes there can be a couple of hours delay in sorting things out. But not a whole nights worth of delay." Consultant ITU line 83

The decision about when to contact senior staff for help has been a theme throughout this analysis.

"Some of the more Junior Doctors are reluctant to call their seniors, that is very well recognised, I teach regularly on this, and when I ask "Would you call your Consultant?" 99% wouldn't, and when we talk about why, they often say, "Well maybe I should," but then you don't know whether they will or not, so that is one issue. The issues for Nurses in particular, especially the Hospital at Night Nurses, is I think to do with not understanding actually what is wrong and what is missing. There is a concept of diagnostics that not all the Hospital at Night Nurses and Senior Nurse / Outreach Nurses understand. They are missing from their aspects of training and therefore they don't appreciate they haven't reached the answer. That actually the answer to this problem is, actually, not when this happens you do this, and when that happens you do this. It is actually when that happens you have to reach a diagnosis as to why that has happened and then you have to do something about the underlying problem because your other measures are holding measures. So that is an issue. And that is partly one of the specifics in that if you ask the Hospital at Night staff to look after a large number of specialties they don't know an awful lot about, they are never going to know about the underlying causes of that particular category of patient." Consultant ITU line 99

This consultant was suggesting that nurses with advanced roles might have been educated in accordance with a paradigm of care that is different from the medical routine of making a decision on the basis of a full evaluation of a patient's condition.

4.2.12 Category 12: Misunderstanding the operation of MEWS - Managers

The nurse managers made clear that MEWS was an excellent system, that it worked well in practice and that it had been introduced in association with excellent teaching. Furthermore they were willing to take responsibility and credit for the smooth operation of the system.

"The system works very well. It was brought in with training for all staff. And we are very pleased with the levels of compliance." Trust Quality Manager line 28

"The nurses have reported some difficulties in getting a response from the doctors. Have you identified this problem?" Interviewer

"I think, only infrequently. Mostly the MEWS works well." Trust Quality Manager line 60

"Where do you see the Trusts policy going next?" Interviewer

"The (Trust) Board has fully supported its introduction and have been very pleased with how it is working. I don't think we will be making big changes." Trust Quality Manager line 74

The Principal Nursing Officer gave a very positive account.

"The Trust has placed patient safety at the top of its agenda. The introduction of an Early Warning System has been an important development and all the evidence is that is working well. I have not heard of there being any significant problems." Principal Nursing Officer line 38

These interviewees did not voice any of the concerns that had been brought up by the staff who operate the protocol. They did not have data to show whether outcomes were being improved and repeatedly returned to their audit of compliance with the

paperwork. There did not appear to be specific quantitative audit of MEWS, whether at the ward or hospital level. What audit existed was of the quality of the documentation. Managers felt that case review in departmental specialty meetings was adequate – even though this did not include many of the staff that used the system. This enquiry has shown that Healthcare Assistants play a key role but they reported that their opinions and feedback were not sought. The lack of continuity of medical out-of-hours care means that many doctors attend discussion of patients they were not involved with and have no feedback about those they saw.

"I think the Matrons have been pivotal in rolling out the MEWS Charts ……. We have done quite a lot of work around reviewing competencies of Nursing Teams across the Wards and this includes Healthcares and Staff Nurses as well. We also audit the MEWS Charts every month, so we do a selection of ten MEWS Charts per Ward every month and that is fed into the Audit Department and that would be the correct recording of observations, calculating the MEWS score and checking the correct action has been taken, so this is done as a whole system approach." Modern Matron 1 line 45

"I would like to focus now on an episode that didn't go so well. Can you think if you have ever been involved in a situation where you felt that the systems for detecting deterioration did not work as well as you would have hoped? Again please don't tell me anything that will identify the patient or the staff involved." Interviewer

"I can't think of anything specific." Modern Matron 2 line 116

The ward level managers were very aware of problems and as the interviews went on they began to disclose their knowledge of the same difficulties that are raised by the doctors and nurses who routinely use the system.

"If you were called upon review a patient who is acutely unwell to whom would they report that they had a cause for concern with a patient?" Interviewer

"It would be the Senior Nurse but also the on-call Doctor either the F2 or the Registrar." Ward Manager line 46

"Right ok, so does it depend on your review of the case for who you would call or do you use something else to help guide your response?" Interviewer

"So, on the Unit that would be to Medical Staff. We have a Consultant, a Registrar and F2 Doctors on the Unit. If they couldn't immediately respond to that and I felt that a patient was acutely unwell I would go back to them and say I would really like you to come and see this person. They may then say to me that I need to contact somebody else like an Anaesthetist or Outreach but I would ultimately my first line would be to go to the Medical Staff." Ward Manager line 41

"So have you found the use of early warning scoring systems quite useful in your role?" Interviewer:

"I think they are only useful because the Ward Staff haven't got time sometimes to actually look at all of the parameters and I think sometimes they take away the role of the skill of the Nurse to be able to use their intuition and observation but because of time constraints and the business of the Ward they haven't really got time to use these skills. So the early warning scoring system is a useful tool but it is not the be all and end all I believe in my own opinion." Modern Matron 2 line 51

"Do you think this varies in different grades of staff?" Interviewer

"Yeah I think to be honest the more experienced staff it is a complete insult to give them an early warning score they must follow because if you can't use your skill and knowledge base to actually look at a patient to say you're not well then I think it is a disgrace. I think at grades of staff I think people are promoted far too quickly in grades anyway and they still lack the basic experience about a few years of developing their expertise and some people will stay on one Ward for all of their career and I would challenge their expertise and their knowledge and may be they need another system to be able to help them in their diagnosis and recognition of deterioration. So I don't think grades come into it as such but certainly experience yes as less experienced people need a guide where as experienced staff sometimes it is just a bit of paper which will work which they will fill in and get help anyway." Modern Matron 2 line 60

Another modern matron, whilst being very positive about all aspects of the Early Warning System, does however make one statement that implies that the nurses may have difficulty getting the attention of the medical team.

"I think the Matron role around this is very much about 'ensuring', and supporting the Nursing Teams to carry out procedures correctly, carry out the algorithm correctly and to support them to do their job. Again if they are worried about escalating they can come to us and we can escalate on their behalf if required. They possibly might need some support with some medics around this." Modern Matron 1line 121

It became clear from the conversation with the ward management staff that they were satisfied with its operation. They did mention the worries and frustrations of the ward nurses and junior doctors, and always suggested that the system was running perfectly. When they were asked if they had read that RSS did not improve outcomes they were sceptical that this was so.

4.2.13 Category 13: Isolation and Indecision

The Medical Staff

The F1 and F2 doctors were quite open about the limits of their capabilities. Typical comments were:

Interviewer: "How confidant is you that you will know what to do when you are called?"

"I used to be very apprehensive but I am getting more confident. Sometimes it's really difficult to know whether there is a serious problem or it's just something like analgesics wearing off." Doctor FY1 1 line 160

"I find it difficult when I am deciding that the patient is okay. All the responsibility is on my shoulders." Doctor FY1 3 line 117

"I think most of us feel out of our depth from time to time." Doctor FY2 2 line 67

Another difficulty for the F1 and F2 doctors is deciding when to ask for help.

"The MEWS score increases the pressure I feel, because when a patient is scoring, I need to get the issue sorted, but there's no rule about when I do it myself and when I get help. To be honest I feel I need help with all the patients. It's a big responsibility not to get help – but I don't want to be known as a 'no coper'"Doctor FY1 2 line 150

"The fact of a MEWS would pressure me loads because I need to decide whether to call the reg but in practice so many calls are false alarms that I get use to it." Doctor FY1 3 line 123

The operation of MEWS, as intended by its designers, is critically dependent upon team communication. There are a number of prerequisites.

- Staff can express themselves clearly enough to be understood
- The doctor or nurse on the next step of the patient management ladder is available and open to the communication
- All members of the team have the same objective

The opportunity to share anxieties made the participants become progressively more open. Some very junior doctors were finding the initial clinical years very difficult. The nurses were confidantes and sharers of the doctors' bad experiences and volunteered their opinions about the supervision of trainees even though the structure of the interviews did not lead them in that direction.

Staff Nurse at the end of the interview with recorder off (Memo): The Staff Nurse felt that the Junior F1s were under incredible pressure and that she knows of an incident recently where an F1 has been very angry and very stressed and has even considered leaving the profession. Despite asking for senior support within the medical team, this apparently has been not forthcoming and the F1 is now reconsidering their future.

Lack of support from senior medical colleagues was often cited as a major cause of stress for FY1 and FY2 doctors. They felt isolated, anxious, depressed and reported feeling lonely in their work. Difficulty communicating with their seniors was described

as anxiety provoking and knowing when, and how to ask for help was sometimes daunting. FY1s expressing their need for time to discuss a range of clinical problems, often complex and outside their experience or understanding, were at times frustrated by the responses from their seniors who focussed on asking, or responding to, specific questions. Whilst the more junior doctors accept the stress and busy schedules of their colleagues they feel they should be better supported.

"Do you sometimes find that when you are wanting to raise causes for concern or discuss patients that you are worried about higher up the chain, is it sometimes difficult?" Interviewer

"Yes it is" Doctor FY1 3 line 125

"Do you want to elaborate on that?" Interviewer

"Yes, I think a lot of it is to do with Consultants approachability and how they talk to junior members of staff. Quite a lot of Consultants don't remember things that you have said to them or take in your concerns. So I think that if you know a Consultant will remember what patient you are talking about, that will help, quite often they don't (know the patient) and you have to tell them the full story. They often think they want them to answer one specific question, but a lot of the time it is not just one thing you want an answer to, it's just general help and for someone just to come and give a general overview, and have a look at everything that has been done, and just check if we have missed anything. ....sometimes it is reassurance what we are looking for rather than we want you to do this one (specific) thing." Doctor FY1 3 line 127

"It sounds like your saying you need a little bit of time with them" Interviewer

"Yeah, time and attention, I guess. And I guess, just for them to listen, and understand what we are asking for is not necessarily an answer but a bit of support in our decision making." Doctor FY1 3 line 140

In this particular interview the FY1 became very upset and cried. At this point the interview was temporarily suspended. The contemporary Memo described the FY1, when a little more composed, as feeling lonely in the job, isolated from her peer group

because of the demands of the job, and depressed. They described feeling that they were "treading water" and unsure of whom they could ask for help when professionally they saw her more senior colleagues also stressed in their role. After ten minutes the FY1 asked for the tape to be switched back on.

"Would you say that is just at Consultant level or does that sometimes becomes a barrier as you are moving through the ranks." Interviewer

"I think it is at all stages to be honest. I have worked with Senior House Officers and Doctors at the grade just above me, and they will still have the same sort of guarded response when you ask for help. It is kind of like a communication barrier, when you're trying to give them the information, ……..and you kind of hoping that you will have a discussion about it. And you kind of come to the conclusion together about what is the best thing, or just for them to give you some reassurance, "Yes you have done the right things. But what we need to do now is wait". But they come back at you with "So what do you want me to do?" rather than, "Let's talk about this together". I find that happens all the way up, and also happens when you speak to Registrars on the phone and in person." Doctor FY1 1 124

"So how does that make you feel?" Interviewer

"I guess it makes me feel like I need to argue my case, almost to try and clarify, and I have to say it is serious, the patient is more ill I need to justify my reasons for speaking to them and I guess it gets a bit clouded from there." Doctor FY1 1 line 126

Trainees reported closed language used by senior colleagues that inhibited the junior asking for more detailed advice and physical help. The demeanour of senior colleagues, their general relationship with them, and the time of day were also noted as impacting on how readily the junior would approach the senior.

"So thinking about within your own profession when you're reporting causes for concern to more senior colleagues do you feel that your causes for concern are taken seriously?" Interviewer

"Yeah, I think most of the time yeah. I think experience shows a lot when you're talking to senior Doctors, and obviously we are Juniors we are still learning. I will phone the Registrar sometimes and say I am worried about this and they will ask, "Why are you worried about that it is normal……in that context". I can't think of an example right now but that sort of thing has happened a few times. I think that if you need someone more senior to assess a patient you can be quite straight with them." Doctor FY1 2 line 125

"For those occasions where you don't feel they are taking your causes for concern straight away or you're not being listened to can you explain why sometimes your causes for concern aren't taken seriously?" Interviewer

"I don't know if there is a specific context. I mean I think the main thing is the experience quite early on in a job a Registrar might say this person has got a CRP of 150, they may say, "Well that is okay given their history," I would say "I didn't know that I just thought that was quite high."" Doctor FY1 2 line 135

"Do you ever feel anxious about raising causes for concern to more senior medical staff?" Interviewer

"Initially yes. I think particularly throughout medical school you see the Consultants especially initially, when you start work here you probably pick up the phone less likely than you should, which I don't think is ideal, but I think that comes with not a fear per say but just being a bit unsure of ringing your Registrar or the Medical Registrar for the Hospital and that seems like a big deal. I have since found that it actually doesn't matter and everyone is really nice and we are there to look after the patients. So now I don't think twice if I need to ring someone I would just phone them whether it be a Registrar or a Consultant" Doctor FY1 2 line 142

The stress faced by the FY1 included the high expectations they placed upon themselves in their role as a junior doctor, and had a direct bearing on when they felt when they needed to raise causes of concern with their seniors. Their perceptions of self efficacy in coping with patients who were deteriorating ranged quite widely but junior medical staff generally felt that they ought to be able to cope independently to a certain degree.

Here we have an example from an FY1 discussing cases of patient deterioration with the emphasis on unacceptable delays in senior review.

"Was this overnight?" Interviewer

"No it was during the day on a weekend. The patient didn't get seen as quickly as they ought. I got there quickly. I was already on the Ward. But going up the chain of command was a lot slower. Before the Registrar arrived it was hours later, but in the meantime, I had discussed with the Nurses, and we rang Outreach and sort of expressed our concerns. Then, eventually, having discussed it with Outreach, they weren't impressed that the Registrar wasn't there. I am not pointing fingers because I know that is how surgery on-calls work, you know. If someone is scrubbed they cannot leave Theatre. So we discussed, and called the Anaesthetist, who came and helped us and that was when I sort of backed off. And this patient was still intermittently having seizures and vomiting. In the end the Registrar did leave Theatre and came to see the patient. I would genuinely not be able to say if the patient had been seen quicker if there had of been a different outcome." Doctor FY1 3 line 85

"So what do you think the factors were then? You mentioned it was at a weekend, you were on-call, and the Registrar who you tried to feed up to was actually busy in Theatre" Interviewer

"On-call, less staff around, only one Registrar to ring, whereas sometimes there are three. It was a little bit earlier on in my rotation as well, and I think my confidence about pestering was lower, perhaps, because now I will ring and say "Is so and so available?" and if they say, "No they are scrubbed," I will say "How long is the case going to be? Can you put the phone to their ear? I need to ask them one question." Whereas, because it was very early on, I probably didn't ask those questions. I didn't get a specific time frame, or perhaps if I had of known they would be 3 hours, perhaps I would have said we need to do something quicker, perhaps said to the Outreach Nurse, "We need to ring the Anaesthetist now." I can't actually remember the specifics, but this was early on and I am very confident with things like this now." Doctor FY1 3 line 202

"So I take from you that you were a little bit apprehensive sometimes at the beginning of the job. Now how do you feel about seeking senior help? Do you still feel apprehensive now? How do you feel about raising causes for concern?" Interviewer

"It is not like the hierarchy system that I was used to in my last job. There I'd have got the observation chart laid out in front of me because if they ask me what the temperature was three hours ago, I don't want him to shout at me because I don't know straight away. I have perhaps done other jobs where when I rang Registrars where this would be the case. For example, if I rang the Orthopaedics Registrar, I would have everything laid out perhaps, typically if you don't have everything there, you waste their time - and you will get an earful. Whereas, that would never ever happen here. ..... It is nothing personal against me, I always try to get everything ready, but I wouldn't not call them because I was worried about being told off, or making a fool of myself. I would just be a little bit more prepared for certain Consultants, if you like. And that is probably the same, wherever you work, for people higher up than." Doctor FY1 3 line 229

Immediately following the close of the interview (and captured in the field notes and Memo), the FY1 became emotional and described feeling very anxious in raising concerns to senior registrar and consultant levels at night. They felt that they should have greater coping abilities, and did not want to appear stupid or lacking in experience. Additionally, the FY1 felt that when they reported MEWS scores to the registrars and consultants their attitude was often dismissive. The FY1 stated that they often didn't know how to ask for help without 'loosing face'. Self-efficacy, and how to understand what they were expected to manage alone was a recurring theme amongst the most junior doctors. The very junior doctors were frustrated by the fact that their decision making was judged by the outcome without adequate guidance about what their limits of independence should be. This was complicated by their perception that they were expected to be continually pushing and extending those limits – but without making any mistakes. There was a culture that good trainees were those who acted alone and weak trainees were cautious.

The more senior medical staff, when called upon to give advice and guidance, offered an alternative view about supporting the junior. Interestingly the language used reflects

the narrative of an FY1 doctor expressing frustration at getting a more open dialogue with their senior.

"Yeah, time and attention I guess and I guess just for them to listen and understand what we are asking for is not necessarily an answer but a bit of support in our decision-making." Doctor FY1 1 line 118

"I try to always be friendly and open. If they give me a history of the patient I ask them "What do you want to do? What do you think you need to do?" and then kind …..judge where they are going with it, and often they are on exactly the right lines, and I can say "Yes that is exactly right. Do that and get back to me if you're worried." I guess it is about judging on the phone how concerned they are. And sometimes you feel that they are just really out of their depth, so I will go and see them. I mean I have only been a Registrar for a year, so it is definitely a learning process, but it is knowing when to go and see that patient and when you can just give advice on the end of the phone." Doctor SpR 3

The Nursing Staff

The nursing staff described situations where they were left feeling insecure about planning. The difficulties they experienced in getting doctors to attend have been described above, as has been the problem of subsequent communication failures, which leave them not knowing what has been decided or even whether a decision has been made.

Nurses described how the MEWS call is itself a cause for concern, and explained how a medical review helps reassure everyone.

"I sometimes think that the medical staff don't appreciate what the nurses do to look after the patients, and the MEWS is a way to get them involved." Staff Nurse 1 line 81

4.2.14   Category 14: Differing Professional Attitudes To An Intervention Following A MEWS Trigger Event

A theme that emerged from the interviews was that the doctors and nurses had different expectations of outcome when calling a doctor to a patient following a MEWS trigger

event. The attitudes are revealed by what the staff say, but also by what they do not say! When asked about their role in the care of the deteriorating patient the members of the medical team give very similar responses. Typical of these was:

"We are normally the first responder to a situation when a patient is unwell, I see my role as initially stabilizing the patients, going through an A, B, C, D approach, making sure I have done everything I can to get the most information about how unwell the patient is - and potentially what might be going wrong, before trying to put together a working diagnosis or a more specific management plan."FY1 1 line 11

" I feel my role alongside the F1 is to assess the patient, perform initial investigations; to do whatever I can to stabilize the patient for example put oxygen on pain relief. Like I say get the initial investigations together and coming up with an idea of what is going on before phoning the Registrar."FY2 1 line 11

Neither the medical nor the nursing teams mentioned joint evaluation of patients and joint treatment planning.

Asked if the nurse is involved in evaluating and planning for the patient one doctor responded:

"No not in that situation. I think Nurses assisted by putting oxygen on the patient, but otherwise I don't think they helped on the decision making process at all."FY1-1 line 128

The doctors described how they received a call from the nursing team and it then becomes a matter for the medical team. Three doctors described asking the nurse for their opinion but all these examples related to their efforts to determine a priority for the call and appeared to be motivated by a desire not to respond in person unless there was what they perceived as a real problem. They indicated that a genuine problem was one that required them to take action. Such action may be to increase the frequency of monitoring, make a clinical change to treatment or to seek additional advice. If no such problem is found they would often rate the nurse's call as being due to inexperience, or the fact that the nurse was 'covering their back'.

"Nurses very often want Doctors to take responsibility for patients who are constantly scoring and I feel that I am under pressure to review patients every time they do their obs. These calls are unnecessary." Doctor FY1 3 line 76

"The nurse is sometimes covering their back. They know there's no change but still make the call." ST1-1 line 128

"But again I don't think they look at the at the parameters. For example, on the Ward the other day there was a patient with a really high temperature, but that only meant they were scoring a 1 which meant repeat observations in so many hours, but actually it had been useful to know that - because we could do blood cultures on them. The nurses were stuck on the MEWS and didn't call. So sometimes it would be useful if they looked at the parameters more than just the score. That way they would not make unnecessary calls." Doctor Doctor FY2 1 line 56

The nursing staff seemed to accept the same implicit division of nursing and medical responsibility but they voiced wider concerns. These fell into three categories:

Lack of information about the 'medical plan'

The need for information in order for the wider nursing team to shape their care for the patient

The need for information in order to reassure and inform the patient and their relatives

The nurses said that even a review that finds nothing changed or no cause for concern is useful. The medical staff never referred to the nurses role in care and did not mention that reporting a MEWS trigger even might cause the nurse anxiety when he/she cannot see a cause for concern, both because they might worry that they are missing something and because it leaves them unsure of how to counsel the patient and their family.

In terms of anxieties expressed, the junior members of the medical team expressed concern about the problems of referring to more senior colleagues.

"Do you sometimes find that when you are wanting to raise causes for concern or discuss patients that you are worried about to doctors higher up the chain, is it sometimes difficult?" Interviewer

"Yes it is"FY1 3 line 123

"Do you want to elaborate on that?" Interviewer

"Yes, I think a lot of it is to do with Consultants approachability and how they talk to junior members of staff. Quite a lot of Consultants don't remember things that you have said to them or take in your concerns, so I think if you know a Consultant will remember what patient you are talking about that will help, quite often they don't and you have to tell them the full story. They often think they want them to answer one specific question but a lot of the time it is not just one thing you want an answer too it is just general help and someone just to come and give a general overview and have a look at everything that has been done and just check if we have missed anything. If it is one question we are junior staff we haven't been in these situations, patients are complex and sometimes it is reassurance what we are looking for rather than we want you to do this one thing." Doctor FY1 3 line 127

"Would you say that is just at Consultant level or does that sometimes becomes a barrier as your moving through the ranks?" Interviewer

"I think it is at all stages to be honest, I have worked be Senior House Officers and Doctors at the grade just above me and they will still have the same sort of guarded response when you ask for help. It is kind of like a communication barrier when you're trying to give them the information." Doctor FY1 3 line 145

The nurses, on the other hand, said they were unconcerned about calling the medical team and described other anxieties due to not knowing what the plan is and being unable to explain the situation to relatives. Even negative reviews are reassuring.

"Its useful to talk to the doctor when they do a review, even if they don't find anything, because I can tell the family what's happening and also I am reassured that I am not missing something." Staff Nurse 5 line 126

4.3 The Process of Developing Theory

The general purpose of qualitative enquiry is to develop 'theory'. Charmaz has defined theory: "A theory states relationship between abstract concepts and may aim for explanation or understanding." (Thornberg, Perhamus et al. 2012) p41) Theorists and users of grounded theory have disagreed about what theory means. Abend has enumerated seven meanings that have been given to theory and emphasises that definitions of theory are strongest when they allow latitude in the epistemological perspective of the researcher (Abend 2008). Timmermans has discussed theory in the context of grounded theory and urged that the process of development should be abductive rather than inductive (Timmermans and Tavory 2012). They note that inductive reasoning does not lend itself to discovering novel insights. Abduction refers to a creative inferential process aimed at producing new hypotheses and theories based on surprising research evidence (as discussed in chapter 3 Section 3.3). Charmaz (Charmaz 2000)and Glaser (Glaser 2004) have both written that the processes of analysis in grounded theory are relatively neutral relative to the epistemological beliefs of the researcher and that it is at the late stage of theory construction that the positivist / relativist division arises and that this is a continuum rather than a dichotomy. *"Interpretative theory aims to:*

- *Conceptualise the studied phenomenon to understand it in abstract terms*
- *Articulate theoretical claims pertaining to scope, depth, power and relevance of a given analysis.*
- *Acknowledge subjectivity in theorizing and hence recognize the role of experience, standpoints and interactions, including one's own.*
- *Offer an imaginative theoretical interpretation that makes sense of the studied phenomenon."(Charmaz 2014)p231)*

Charmaz particularly emphasises the intuitive imaginative aspect of developing theory. She says that "*Theories flash illuminating insights and make sense of murky musings and knotty problems. The ideas fit*" (ibid p233)

In analysing the interviews in this study I have selected those concepts that the participants have appeared to value. These have been those to which individuals have returned in their interviews and those that have recurred in several of the interviews. I

have also taken note of ideas to which participants have attached importance and to those ideas that have occurred to me as I read and re-read the evidence. This has been the process through which I have elevated minor categories to major categories and the reason has been because I suspected that these concepts would be used in theory building. By which process I mean the process by which I would understand what I was being told and perhaps start to explain how and why things happen as well, as well as what and when. I have chosen not to use more formal methods of theory development such as framework analysis (Ritchie and Spencer 2002) because the method is not consistent with the methods of constant comparison and simultaneous analysis and data collection that are called for in grounded theory. Chapters 5 and 6 describe the concepts that I have proposed from analysis of the interview data.

CHAPTER FIVE: WHAT IS REVEALED ABOUT PERCEPTIONS AND INTERPRETATIONS OF THE EARLY WARNING SCORE

5 WHAT IS REVEALED ABOUT INTERPRETATIONS OF THE EWS

The discussion of the findings of this study is carried across three chapters. In this chapter:

- In the first section key ideas from the narratives, relating to the use of the early warning score are discussed
- The second section relates to the MEWS impact on the medical and nursing teams.
- The third section considers whether, from the narratives provided, MEWSs and RRTs are really addressing the problem of delay in treating patient deterioration.

The literature relating to RRSs, reviewed in Chapter 2, indicated that its failure to improve outcomes has been a disappointment to enthusiasts. Recent publications have been tentatively working round to the conclusion that human factors may be significant in determining how deteriorating patients are managed (Marshall, Kitto et al. 2011, Shearer, Marshall et al. 2012, Buist and Mahoney 2014, Kitto, Marshall et al. 2015, White, Scott et al. 2015). My suspicion, borne of my experience of managing critically ill patients, and of undertaking official investigations into errors, was that social and cultural issues, and misunderstandings between medical and nursing teams, would be important. I have accepted this hunch as a sensitising concept as identified by Charmaz (Charmaz 2006 p11). The theories I have been able to construct from the data, and will describe in this chapter, contribute to this debate, and are consistent with the view that in this complex clinical situation too high an expectation is placed upon a planned, mechanical response system.

5.1 Human Factors and Teamwork

I discovered from the interviews, that, as previously found in a number of studies (Tirkkonen, Yla-Mattila et al. 2013, Yiu, Khan et al. 2014, Douglas, Osborne et al. 2016), the use of MEWS by my study teams does not always lead to the earlier involvement of doctors and nurses experienced in the care of critical illness. Both the nurses and the doctors described how a trigger event leads to the most junior doctor being called. All the nursing interviewees believed that 'if the patient triggered' the

doctor was called. It was evident that this call did not necessarily lead to the required, in-person, review by the doctor. It was also evident that the MEWS protocol did not help this junior doctor decide when to ask for more senior assistance. It was clear from the interviews that the high rate of false positive alerts undermined the trust the doctors have in the system. When a trigger is reported to them the MEWS is little help in resolving their principal dilemma: whether to seek help. As this research progressed I realised that the lack of concrete guidance on calling for help, and the lack of a formal RRT, complicated their decision making and was a weakness of this system as used in the UK.

With a formal RRS such as a Medical Emergency Team (MET) the doctor is *required* to call that team, solely on the basis of the trigger. Studies have shown that with a MET or RRT the doctors' desire for self-efficacy is a factor that influences how they respond (Fein, Mackie et al. 2016). Without a MET the situation becomes even more complicated as the doctor does not have automatic recourse to advice.

An EWS and a RRS use a multi-professional team to manage incipient patient deterioration. The separate medical and nursing teams both have hierarchies, and it has been suggested that rigidity of these structures might interfere with the operation of the whole system (Shearer, Marshall et al. 2012, Kitto, Marshall et al. 2015). In 2014 Buist and Mahoney wrote in an editorial in the journal 'Resuscitation':

> *"The whole issue with proving RRS efficacy is quite simply that the RRS is not an intervention amenable to most traditional forms of analysis. This is because the intervention is not 'Clean'. A RRS is very much a cultural system of change that is superimposed on a system of hospital care that is meant to be homogenous, but in fact has tremendous variation with respect to time, staff and geography."(Buist and Mahoney 2014)*

In Kitto and Marshalls (2015) investigation of the behaviour of RRS teams, they suggested that the RRS attempts to shape the behaviour of healthcare professionals by formalising the 'rules of engagement' for dealing with deteriorating patients. What sets their investigation apart from others who have made similar observations is their conclusion that professional backgrounds and cultures are various, and will have different influences. They found that nursing was more hierarchical than medicine and the nurses in their study felt more pressure to report problems up their management line than did the medical staff. In my study the interviews with more senior nurses and

managers revealed that meeting audit benchmarks for monitoring and reporting was their principal concern. They did not expect to be asked to intervene or help, and they did not understand any of the difficulties that junior staff was experiencing in managing MEWS. Their understanding of its role was shallow and their assessments had a 'rosy glow'. The problem appeared to be that MEWS was a new innovation and their role had been in implementation and education, without them having the opportunity to have practical experience of using it in the management of individual patients. I found no evidence that intra-professional reporting was causing delay in managing deterioration, and staff reported that it speeded recognition of problems. This was probably because there was no MET to call - an action that inevitably raises the stakes for the reporter.

All the junior doctors and nurses interviewed in this investigation said that the MEWS system was very useful and simplified their work, (Sections 5.1.1, 5.2.1) but the explanations they gave showed that many of the ways they found the system useful were outside its intended purpose (Sections 5.2.1, 4.2.2). The RNs and healthcare assistants expressed fewer reservations about MEWS than the medical staff. This finding is in line with the quantitative studies of Sarani, Sonnad et al who found that both nurses and doctors believed the RRS to be useful but that the nurses held this belief more strongly than the doctors (Sarani, Sonnad et al. 2009), and of Douglas, Osborne et al. who also found nurses significantly more positive than medical staff (Douglas, Osborne et al. 2016). It is also in agreement with the findings of Cherry et al (2015) who studied the attitudes of qualified nursing staff to MEWS. All their respondents believed that the MEWS was beneficial, despite there often being difficulty in getting medical staff to review the patient, even if the MEWS score was significantly high. (Cherry and Jones 2015). Similarly my respondents felt that a qualified nurse's seniority or 'the colour of his or her uniform' can affect the attitude of the medical staff and can mean the difference between the patient being reviewed or not (Section 4.2.5)

The medical team consultants' attitudes were more complicated. They agreed with their juniors about the value of the system but from time to time questioned the very model of care that it represents (Section 4.2.7).

5.1.1 Team members believe the MEWS data is reliable

The healthcare assistants perform the bulk of the vital-signs observations and calculate the MEWS score. The healthcare assistants themselves, and their supervising nurses, believed that the observations were done reliably, on time, and that the MEWS calculation was accurate. This is at odds with the quantitative literature where, upon review, many observations are found to be missing and there are significant numbers of miscalculations (Van Leuvan and Mitchell 2008, Hammond, Spooner et al. 2013, Hands, Reid et al. 2013, Connelly and Bleasdale 2015, Kolic, Crane et al. 2015). All that can be said about this is to remark that it is surprising that staff felt this confidence in the observations without the benefit of an audit programme. The nursing team were also satisfied that those making the measurements were properly taught and skilled in the task. The nurse managers stated that the system was reliable because of the care that had been taken to ensure that staff were properly trained.

5.1.2 Team members believe that trigger events are customarily reported as required

A consistent finding from both the medical and nursing interviews was that all grades of team member believed the nurses were conscientious in reporting high EWS scores to the medical team (Section 4.2.5). The nurses described being persistent in making referrals (Section 4.2.5), and no member of the medical team suggested that nurses were exercising discretion over whether or not to alert the medical team. This again is contrary to what is reported in the literature, where nurses dealt with the majority of alerts in some systems without medical review (Guinane, Bucknall et al. 2013). An important factor may be the relatively informal alerting structure that appears to have less possibility of adverse professional and socio-cultural effects on the alerter than does calling in a formal MET.

The teams that I studied had a very simple reporting structure. No METs were available, and staff described a tangled web of possible lines of escalation (Figure 10) There were no firm guidelines as to what seniority of nurse should report an EWS trigger event (Section 4.2.4). Nor was there guidance on what grade of doctor to alert (Section 4.2.5). The recruitment of the outreach ICU team was equally haphazard. The nursing team sometimes consult it without alerting their home medical team. The National Institute

for Health and Care Excellence (NICE) has recommended that doctors below the grade of Registrar should not undertake the assessment of sick patients (NICE 2007) but in this study it was found that many trigger events would stall at the F1 level, often without the doctor seeing the patient. The participants described a variety of possible routes for reporting and escalating a trigger event (Figure 10)

Figure 10. The Tangled Lines for Escalation of Care used by The Nursing and Medical Teams
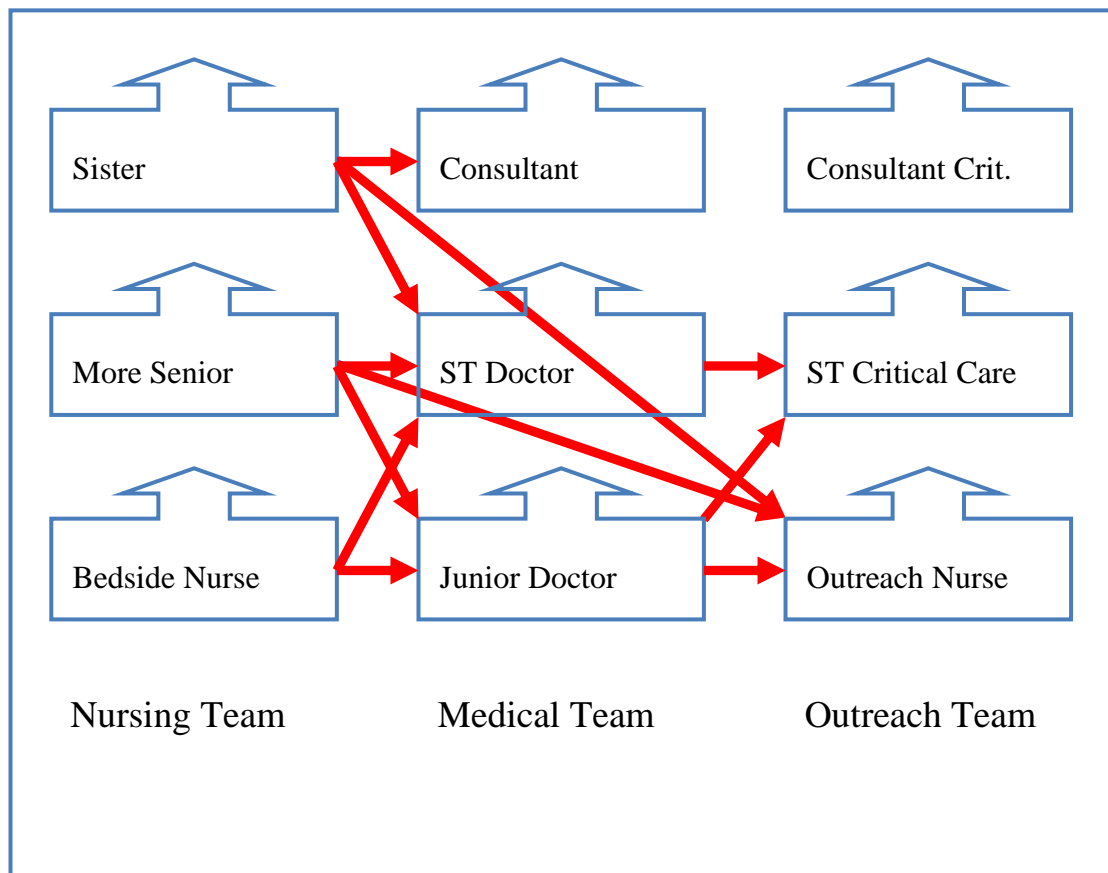
A recent study of nursing attitudes to MEWS also found that nursing staff were frustrated by the difficulty of getting what they considered to be an adequate response to their alerts (Cherry and Jones 2015).

During the interviews it emerged that the nurses and healthcare assistants will report a high MEWS to the doctor who is most immediately available. This will often be their 'first responder' foundation doctor, because they spend a lot of time on the ward, but they would also report to the registrar or consultant if they were passing (Section 4.2.6). Healthcare assistants and junior nurses would alert their home medical team, without consulting their own clinical supervisors. Some junior nurses also implied that they

occasionally developed 'special relationships' of trust with some of the doctors and would more readily call these doctors directly (Section 4.2.6). The nurses found reporting to these doctors less threatening (Section 4.2.6). They did not say that they believed these doctors to have superior clinical skills. This issue of clinical trust did, however, influence reporting lines. Several nurses - including all the senior nurses - described situations in which they did not trust the clinical judgement of foundation doctors and would 'go over their heads' to get more senior assistance (Section 4.2.6).

It is difficult to comment on the possible impact of this informal reporting structure on the operation of the MEWS. On the one hand it makes the response to a trigger event inconsistent. On the other hand the flexibility may be empowering nurses to exercise their clinical judgement. Another theme that I shall develop later in this discussion is the way that the high rate of false positive alerts affects responses. The impression from the nurse interviews was that they informally triage trigger events, and they may be jumping to a registrar referral when they have genuine concerns about a patient.

5.1.3   Hierarchies

Both medicine and nursing are hierarchical professions and it has been suggested that the rigidity and inflexibility that this introduces causes problems with RRS (Kitto, Marshall et al. 2015). Each tier of the medical and nursing teams has some responsibility for clinical supervision and if the reporting structure bypasses them they may feel offended that their 'junior' has decided that they do not have a useful contribution to make. This aspect of working relationships may perhaps be seen more often when the RRS involves a MET rather than the patient's home medical team. It would clearly embarrass the home team to find that the MET has been called without them knowing. It is also a professional threat to give another team sight of the plan they have been following. There seems to be evidence from the literature that RRSs requiring immediate referral to the MET are associated with delayed alerting. Examination of the data in such cases shows that these delays are often instances of the home medical team being called and then trying to manage the patient themselves (Boniatti, Azzolini et al. 2014, Roberts, Bonafide et al. 2014, Kolic, Crane et al. 2015). Given the high level of false positives generated by the EWS this filtering through the home team may be making the work of the MET manageable. Delayed MET referral is nonetheless

associated with increased mortality (Calzavacca, Licari et al. 2010, Boniatti, Azzolini et al. 2014, Barwise, Thongprayoon et al. 2016).

In this study there was no evidence of hierarchies interfering with referral, or causing problems within the nursing team (Section 4.2.10). None of the nurses and healthcare assistants reported having had difficulty with reporting directly to the medical team without consulting their nursing supervisors. More senior nurses said that they had confidence in their juniors and that they did not expect to be told about every trigger event (Section 4.2.8). This is a significant finding as it suggests that the nursing team sees decisions about patient management as belonging to the medical team and indicates a fracture line between the medical and nursing teams.

The role of healthcare assistants in my study was more complicated. They do not normally take it upon themselves to telephone the doctor. They do, however, call the doctor when told to do so by their supervising RN. Healthcare assistants will report directly to doctors without telling their supervisor if the doctor is immediately available in the ward (Section 4.2.8). Again, these relaxed attitudes seem to have developed because as many as eight out of ten alerts are not harbingers of collapse and need no changes to the treatments.

The medical team came across as being more concerned with its own hierarchy than that of the nurses who called them. The 'first responders' for the medical team were largely unconcerned about the grade of nurse that alerts them to a trigger situation. Some respondents said that they had no experience of being called by healthcare assistants and felt that this should not happen because the nurses had their own hierarchy of supervision (Section 4.2.8). All three doctors who said this added that they didn't think this would be problem anyway, because "a MEWS score is a MEWS score", whoever reported it, and contacting a doctor did not need any special skill or judgement (Section 5.7). In any case they also said that they did not know whether the person on the phone was a nurse or a healthcare assistant.

Several foundation doctors reported very stressful situations regarding reporting (Section 5.14.1). These stories always related to previous placements! Either their current relationships were better, or they were being guarded about what they said

because of fears over confidentiality. As three of the foundation doctors became emotional during the interview when talking about stress and isolation this is a significant issue. The problems were threefold. Firstly, self-efficacy; they had high expectations of themselves and experienced a sense of failure when they needed help. Secondly, there were problems in finding a more senior doctor who could help them and they sometimes felt out of their depth. Thirdly, the senior doctors were sometimes critical of them for asking for help (Sections 5.14.1, 5.15). The informality of the reporting system in action meant that the most junior doctor must decide whether to ask their senior for help, and they are not protected from criticism by a mandatory reporting system. So stressful were these situations for the foundation doctors that two doctors were in tears over their problems and a third was clearly emotional. This is in line with the findings of Stewart (2008) regarding the influences on junior doctors decisions about calling for senior assistance (Stewart 2008). She found that the doctors had to balance the imperative of safe care against the possible negative consequences of calling – which included criticism of their actions. Stewart concludes that their decision making:

> *"was a dynamic process exemplified by the need to create counterbalances between multiple consequences. As a result, no prescriptive action could have allowed PRHOs (F1s in today's nomenclature) to deal with the numerous configurations they faced and took into account."*

The RSSs is an example of such a prescriptive system failing - as predicted by Stewart.

Lack of support from senior medical colleagues was cited often as a major stress for foundation doctors (Section 5.14). Whilst they accept the stress, and understand the busy schedules of their colleagues, they nonetheless felt isolated, anxious, depressed, and reported feeling lonely in their work. Difficulty communicating with their seniors was described as anxiety provoking. Knowing when and how to ask for help was sometimes daunting. The foundation doctors expressed their need for time to discuss a range of patient needs, often complex, and outside their experience or understanding. They often felt that they didn't know exactly what questions to ask their registrar (Section 5.14.1). This was made more of a problem by the responses from their seniors, who were focussed on asking or responding to specific questions to solve the problem as quickly as possible – preferably without having to attend in person.

Another problem reported by foundation doctors was that their home team registrars expected to be consulted before the outreach team – despite their unavailability.

Shearer, Marshall et al have written:

> *"....implementing systems of care that significantly alter the traditional hierarchical referral model of care, regardless of their potential benefits, takes years to appropriately implement" (Shearer, Marshall et al. 2012).*

They believe that, in the case of RRS, the resistance is substantially due to the apparent low face validity of the EWS in predicting deterioration. The perceived gain for staff in witnessing improved patient outcome is small, whilst the socio-cultural factors that stand in the way of change are large.

5.1.4   Workload

All grades of doctor were very busy (Sections 4.2.2, 5.4). The foundation doctors were responsible for many patients. Out-of-hours this included many patients about whom they knew very little.

The foundation doctors estimated that MEWS calls resulted in up to 30 reports in a shift. Many of these were repeat calls. Were they to attend each call, dealing with this workload would occupy a lot of their time. They judged this to be both unnecessary and unachievable. This led them to deal with many calls by phone, and to call upon the clinical skills of the nurse on the spot to guide them (Section 4.2.3). As few as one in ten patients suffer deterioration following a MEWS call, so in practical terms this triage would seem reasonable. It will however have adverse consequence for the minority of patients because delaying the involvement of experts in critical illness is known to be associated with increased mortality (McArthur-Rouse 2001, Cardoso, Grion et al. 2011, Bing-Hua 2014).

The registrars were also occupied with their own work and were often not immediately available. Consultants reported that they were not available for *most* of the time. One consultant expressed very forcibly the frustration caused by being unable to closely supervise the team (Section 4.2.11). They were also concerned that often, when they

were on the ward, they found a problem that was being under managed. They worried that such under-management might be common.

5.1.5 The interface between the medical and nursing teams

As has been said, the nurses believed they were conscientious in reporting trigger events to the medical team. Close questioning showed that by this they meant that they either spoke directly to a doctor who was in the vicinity, or they telephoned the foundation doctor who had responsibility for that patient. This situation was insecure. The healthcare assistants described their reporting system via their RN supervisor (Sections 4.2.5, 4.2.8). If no doctor were in the immediate vicinity the healthcare assistant would discuss the patient with the RN. This nurse would then either telephone the doctor or ask the healthcare assistant to do so. The doctors believed that they were being spoken to by the RNs but added that they would not necessarily know what grade of team member they were speaking to. This system has a major disadvantage. If the doctor failed to attend, as was frequently reported in the nurses' interviews, the RN who had reported to them would not necessarily know, as it was the healthcare assistant who continued to care for the patient (Section 4.2.10). The healthcare assistants explained their frustration with this state of affairs. They were left not knowing what was going on. They did not know whether the RN had agreed with the doctor that he would delay seeing the patient or whether the doctor had forgotten to come. A further complication for the nursing team was that the foundation doctor might consult their supervising registrar and decide that no action should be taken. This information might not be passed to the RN and they in turn might not tell the healthcare assistant. These arrangements led to a system where the nursing team were not surprised that a doctor had not arrived to deal with an alert, and might not remind the foundation doctor. Sometimes these problems would lead to a delay of many hours before a doctor saw the patient. The nursing team would chivvy the medical team to attend in those cases about which they were concerned. If the factor of nursing and medical shift change is added to the mix it is unsurprising to find that many MEWS alerts never had a medical evaluation as has been reported (Marshall, Kitto et al. 2011, Shearer, Marshall et al. 2012, Kitto, Marshall et al. 2015).

It was clear from the interviews that the interface between the medical and nursing teams was haphazard and was very likely to undermine the whole RRS.

5.2 Is MEWS an appropriate way to deal with the problem of unexpected deterioration?

5.2.1 Inappropriate MEWS monitoring

A recurrent theme in the nurses' interviews is that of inappropriate MEWS monitoring. They identify three problems (Section 4.2.5). A number of categories of 'false positive' alerts are identified by staff (Figure 11).

- Firstly, some patients are not having active treatment and their terminal state has been recognised by all concerned. These patients may have been classified as not for resuscitation but they are monitored for MEWS. This results in additional work for the nurses, interference for the patients, and anxiety for the families.

- Secondly, many patients with co-existing diseases have chronic MEWS scores of 1 or more. A relatively trivial change of condition takes them over the calling criteria.

- Thirdly, many patients trigger a review and then re-trigger every time their observations are done. The nurses complain that the doctors are reluctant to set a raised threshold for further review.

Figure 11. Categories Of Patients Who Trigger MEWS

True Positives	False Positives		
Patients whose high MEWS presages deterioration and who need a change in their care	Patients who exceed trigger criteria and improve spontaneously	Patients who should have had a variation in calling criteria because of coexisting disease	Patients whose treatment should have been limited & DNARs

These problems contribute to the workload generated by MEWS. The issues are not easily dealt with. There can be no straightforward protocol for excluding a patient from MEWS monitoring; it requires consideration of the individual circumstances.

5.3   Are the responding doctors experienced enough?

NICE recommends that very junior doctors do not evaluate patients with critical illness (NICE 2007). The MEWS system in this study allocates foundation doctors to that role. In fact, this assessment task is more complicated than the evaluation of critically deranged physiology. Here the question being asked is, "Is this patient who has a minor physiological abnormality on the verge of a catastrophic collapse?' This decision requires experience of many similar situations and it is a mistake to expect the foundation doctor to be competent to make it. Other systems either alert a properly skilled MET (Hillman, Chen et al. 2005) or call more senior doctors if the EWS score falls into a higher band as exemplified by the NEWS more complex calling criteria (RCP 2012).

5.4   Conclusion

The junior medical and nursing staffs that use the MEWS system state that it serves a useful purpose. The way they use the system is however significantly different from the original MEWS conception. The interviews reveal that nurses, healthcare assistants, senior medical staff and the F1 and F2 doctors themselves all believe that the workload of the F1/F2 doctors is very heavy. The F1/2 doctors describe strategies for making it manageable that includes triaging MEWS calls and dealing with many without seeing the patient. They use the MEWS score as an indication of urgency and severity – thereby negating its purpose: to draw attention to impending deterioration in patients who appear well and have scores just above the trigger value. The problem for these very junior doctors is that they perceive themselves as too inexperienced to reliably make a judgement of risk. They constantly strive to demonstrate self-efficacy by getting the decisions right. In this environment it is questionable whether 'a false call' for senior assistance or a 'missed deterioration' are the greater concern to them. Their decision is weighted in favour of inactivity because only about one in ten patients who trigger subsequently deteriorate. In the absence of a MET and with only relatively informal instructions about how to elicit assistance the MEWS does little to help the doctor decide what to do. In fact, it generates a great many tricky clinical decisions that tax these junior trainees to the full.

Chapter Six: What is Revealed About Team Dynamics and Discourse

6 WHAT IS REVEALED ABOUT TEAM DYNAMICS

This chapter provides an analysis of the team dynamics surrounding the operation of the MEWS system, as revealed by this enquiry. I have investigated what members of the clinical team feel about using the MEWS protocol and how they understand its use. It might be assumed that professionals would all comprehend and use a clinical protocol in the same way – irrespective of their occupational background. This analysis suggests otherwise. There is a striking difference between the nurses and the junior doctors in how they interpret and use the MEWS protocol. This finding is consistent with the report from Kitto, Marshall et al (Kitto, Marshall et al. 2015), who found such a disjunction and suggested that it might be due to the differing decision-making hierarchies of medicine and nursing, or to communication difficulties in reporting and responding to alerts. I agree that these aspects are important, but suggest that a further underlying cause is that the doctors and nurses have fundamentally different expectations of the protocol. I suggest that this is an aspect of a wider phenomenon of doctors and nurses working to different models of patient care resulting from the differing epistemologies of medical and nursing practice.

6.1 How the MEWS affected the team discourse about the patient's condition and the actions needed

The respondents reported that the MEWS had changed the discourse between doctors and nurses about patients at risk of deterioration, but also beyond that, it had changed the shared understanding of how to manage sick patients. This was partly due to the scoring system but also resulted from a more formalised expectation that more senior members of the team should see the deteriorating patient.

6.1.1 MEWS provides a common language for discussing patients at risk

Respondents liked using the MEWS because it provided them with a common language for discussing patients at risk. This language was not available to them previously and they find it very helpful. MEWS was doing more than identify a group of patients at risk; it was changing the discourse between the nurse, who is caring for the patient, and the first responder in the medical team (Sections 4.2.4, 4.2.5 4.2.6.)

Issues of status, education, gender, knowledge, hierarchy and style may impede communication between doctors and nurses (Coombs 2004). In his inaugural address to the American Surgical Association, Greenfield discussed the history of relations between doctors and nurses and presented an investigation of the attitudes of doctors and nurses to the nurses' role in patient management (Greenfield 1999). He found that doctors were much more satisfied with doctor/nurse communication than were nurses. Using a sequence of group discussions about patients' care he had found that the doctors dominated early discussion, but that the medical and nursing contributions became more equal in later exchanges. He recommended that protocols for patient management should insist on daily discussions of care between the medical and nursing teams to improve mutual understanding.

Thomas, Sexton et al (2003) discovered similar differences in the relationships between doctors and nurses. They undertook a survey of doctors and nurses in an ICU, and investigated the perceptions of each group concerning the nurses' contribution to patient care (Thomas, Sexton et al. 2003). They described the beliefs of the two professional groups as 'discrepant'. Whilst the doctors largely thought that their attitudes towards nurse participation were positive, the nurses reported a more difficult climate in which to make contributions.

In *my* interviews I found that the doctors' contributions to patient care were unpredictable, and that the nurses input to medical management decisions was inconsistent. (Sections 4.2.9, 4.2.13) The nursing team were dissatisfied with their discussions with the medical team, about patient management. (Section 4.2.9) The medical team did not make any comments that suggested that they would welcome the nurses being more pro-active and were suspicious of the motives of the nursing team when they pressed for a medical review (Section 4.2.14)

Endacott, Kid et al (2007) sought to identify the cues that nurses and doctors use on acute wards to recognise patient deterioration, and to study their subsequent assessment and quality of communication (Endacott, Kidd et al. 2007). They used a mixed methods case study design (chart review and interviews) for cases admitted to ICU from general wards and found that doctors and nurses relied firstly on vital signs for initial identification of patient deterioration. Subsequently nurses used assessment of the patient's physical capabilities and activities, whilst doctors put their faith on clinical

investigations. The authors found that referral to more senior clinicians was often delayed. As in most such studies the authors found that 76% patients had well established clinical markers of physiological instability prior to ICU admission and 56% had these markers for >2h in the previous 24h. It is interesting that this study identified a similar dichotomy between the nursing and medical teams as I have found in my research.

Robinson, Gorman et al (2010) have used a process of expert buzz groups to identify factors that make doctor/nurse communication efficient. They found that effective communication depended on having a precise and clear message, verification of the message and joint involvement in problem solving (Robinson, Gorman et al. 2010). Discussions about MEWS meet the first 2 criteria but the RRS protocol may obstruct the joint involvement in problem solving. The nurses felt that they were often left not knowing what the medical team planned to do with the patient after a MEWS alert.

Doctors may respond to a nurse's suggestions aggressively or scornfully, making colleagues wary of approaching them for fear of ridicule. (Greenfield 1999, Rosenstein and O'Daniel 2005, Castel, Ginsburg et al. 2015) These factors have been shown previously to contribute to breaches of a rapid response protocol (Marshall, Kitto et al. 2011, Shearer, Marshall et al. 2012). Azzopardi, Kinney et al (2011) investigated a paediatric EWS (Azzopardi, Kinney et al. 2011). Using a questionnaire they found that the MET system was highly valued for obtaining urgent assistance for the seriously ill patients by 85% of nurses and 83% of doctors. However, they discovered a number of barriers to MET activation including; a preference to contact the covering (attending) doctors, by 80% of nurses and 45% of doctors; active discouragement of them activating a MET by 41% of nurses and 12% of doctors; and fear of criticism by team when it attended (if the patient was not deemed seriously ill), by 17% of nurses and 9% of doctors. They found that less experienced staff were significantly more likely to report barriers to calling a MET. This accords with the findings of Hart, Spiva, et al (2014) that nurses self-confidence in dealing with deteriorating patients correlated with their experience (Hart, Spiva et al. 2014). Both nurses (24%) and doctors (6.5%) described being criticised by MET members. Failure to recognize serious illness was revealed by the unwillingness of 47% of doctors and 32% of nurses to activate MET when activation criteria were attained, and by the retrospective realization by 30% of doctors and 15% of nurses that they had failed to activate MET when needed. The

authors concluded that cultural and behavioural barriers to MET activation, and inability to recognize serious illness might explain, in part, the failure of a MET system to completely eliminate unexpected cardiac arrest and death.

The nurses interviewed in my investigation did not describe negative attitudes, or fear of criticism. Indeed Healthcare Assistants and Nurses often said that MEWS reduced the chances of them being criticised by medical staff, by providing them with a justification for asking for a patient to be reviewed. (Section 4.2.6) When disagreement arose between the medical and nursing teams it usually originated in their different objectives in patient management (Section 4.2.10).

As remarked above, MEWS has provided team members with a new language. In my study the medical and nursing teams had absorbed a vocabulary of MEWS into their language (Section 4.2.4). They described patients in terms of a MEWS score and used the ungrammatical phrases 'the patient is scoring' and 'the patient has a MEWS', to indicate patients who reached the calling threshold. Both teams understood the language. The nurses found that it gave them a way to describe a patient at risk, and a way to justify calling the doctor about a patient (4.2.6). Some of the healthcare assistants explained how they had previously had difficulty in putting their concerns into clinical language and that the MEWS reduced this difficulty (Section 4.2.8). The foundation doctors found similar value in discussions with senior colleagues. MEWS has thus empowered nurses in their dialogue with doctors and gone some way towards providing a mental model of the detection and response to patient deterioration that the two professions can share (Section 4.2.6). MEWS generated calls are frequent, and provide opportunities for doctor/nurse dialogue that are welcomed by the nursing team. Whilst being effective in promoting doctor/nurse discussion, it is probably less effective in formalising doctor/nurse exchanges than the use of the very structured SBAR framework (See page 204).

These conclusions accord with those of Andrews and Waterman (2005) who conducted a study of the ways nurses arrive at an understanding of deranged physiological observations. In the course of this they made the observation that the use of the MEWS was providing them with a language and conceptual framework that improved their communication about problems (Andrews and Waterman 2005).

6.1.2   The medical and nursing teams have different Objectives

The patient care responsibilities of doctors and nurses are structured differently. The nursing team is divided into smaller units, each team being responsible for a small group of patients (between four and eight). These teams are focused on the continuing care of the patient, they are close to the patient and continuously responding to their needs. The nurses described their relationships with patients and relatives in terms that reflected involvement of their concerns, and their feelings (Section 4.2.10). One staff nurse said:

> *"If the patient knows we are flapping about re-doing observations they will get worried and that's something we have to deal with as well as what's clinically going wrong" Staff Nurse 2 line 169*

The doctors are managing up to sixty patients and they are less engaged with individuals. Those patients may be widely distributed around the hospital and are being cared for by many different nursing teams. Out of hours the most junior doctor will be responsible for even more patients, often over a hundred. The MEWS protocol required 'first responder' doctors to see all patients in person as soon as possible when a trigger score is reached. In this study they did not do this. None of the doctors attempted to excuse this. They saw it as a self-evident necessity, imposed by their overwhelming workload. They described skill in triaging patients who 'trigger' as an asset. If the doctors' estimates of the frequency of calls (Section 4.2.2) is correct, and each call takes ten minutes to sort out, they would spend up to five hours in a twelve hour shift dealing with MEWS trigger events. They do not think this is feasible or worthwhile, as their experience (and the literature) indicates that as few as ten percent of alerts require intervention. It emerges from their interviews that MEWS calls must take their turn in the queue in accordance with the priority the doctor allots.

Medical staff identify a number of influences that may be relevant in their attitude to MEWS triggers:

- Firstly, they have a lot of calls upon their time (Sections 4.2.2, 4.2.3). They are overcommitted and need to prioritise. It appears from the interviews that MEWS is not given automatic priority because so many of the alerts are not followed by patient deterioration. The doctors see calls that do not result in changes of

management as low priority, or even unnecessary. In their view MEWS generates few high priority alerts at the cost of many 'low priority' tasks. The literature on the development of MEWS makes limited reference to additional workload, or its interaction with existing ways of working (Morgan, Williams et al. 1997, Goldhill, Worthington et al. 1999). Bellomo et al described the introduction of an electronic alerting system for MEWS (Bellomo, Ackerman et al. 2012). The trigger value was pragmatically set to 5 because they discovered that an overwhelming workload was generated with the level set to 4. The MEWS system I investigated was triggered by a count of 4 and the workload reported is in line with the findings of Bellomo, Ackerman et al (2012). Bellomo provides a more detailed description of his methods on a proprietary webpage (Bellomo 2012).

- Secondly, in the doctors' responses in the interviews, there are references to the difficulty of understanding the clinical world around them. Their statements indicate an awareness of complexity and uncertainty that complicates the process of deciding what to do (Section 4.2.4). One doctor expressed this very clearly:

"I think most of us feel out of our depth from time to time." Doctor FY2-2:

- Thirdly, there is reference by the medical staff to the difficulty of interpreting the messages that they get from the nurses. They seem to believe that some nurses are shaping their reports in order to direct their (the doctors') actions (Section 4.2.3).

That doctors and nurses try to influence one another to meet their own narrow objectives was recognised by Stein nearly fifty years ago (Stein 1967). In this landmark paper he made the observation that nurses act out a passive role in a way that attempts to manipulate the doctor. Revisiting the issue thirty years on, he concluded that the situation had changed, and attributed this to nurses having an improved clinical knowledge and confidence (Stein, Watts et al. 1990). The nurses in my investigation clearly expressed their need to 'direct' the doctor's action and described a context in which they did not have power to do this.

The senior nurses described using the respect they received from the consultants as a lever on more junior staff (Section 4.2.5).

> *"Probably the junior Nurses would go to the SHO, but I would tend to go to a Registrar or a Consultant probably because I have a better relationship with them."* Sister 1 line 52

A complex game was being played out between the teams as well as between individuals.

6.1.3 The effect of MEWS on the dialogue between nurses and doctors

The environment in which MEWS operates is complex. Introducing MEWS and RRSs introduces a significant cultural change. Buist and Mahoney (2014) commented that the impact of this change on the attitudes, relationships and culture of staff has been largely ignored (Buist and Mahoney 2014).

The medical team members understood that the nursing team need to see them respond to a MEWS trigger, but did not appear to respect that need (Section 4.2.4). They repeatedly expressed the fear that Nurses exaggerate symptoms in order to ensure that they will visit the patient (Section 4.2.2, 4.2.3, 4.2.14). Their comments show that they feel that some nurses blindly follow the MEWS protocol and are unsympathetic to the doctor's need to prioritise calls in order to make their workload manageable. They want to be free to respond to a call in the way that they feel is appropriate, based on their clinical judgement, and do not want to work to a rigid protocol. No doctor seemed to consider that recording a high MEWS would, in itself, cause the nurse to be anxious, or that the anxiety would be compounded if the doctor appeared to be taking no action. In addition, no doctor suggested that their involvement would have a positive impact on the patient's management beyond the task of managing their medical needs.

Because of the pressure on their time doctors would like to see only those patients in whom a review leads to a change in treatment (Section 4.2.7). They are willing to see all 'triggering' patients about whom the nurses are worried, but would prefer not to see those about whom the nurses have no concerns (Section 4.2.3). This stance ignores the fact that many patient crises are presaged only by a pattern of minor physiological disturbances that may not be recognised as significant if the patient's progress is not systematically reviewed. The junior doctors believed that many of the calls were false alarms, generated partly by the lack of sensitivity of the scoring, and partly by nurses exaggerating urgency in order to ensure a response from the doctor. They are aware that

nurses are not expected to be flexible in interpreting the protocol but find this frustrating (Section 4.2.2). Doctors want to do a good job, but their immediate focus is on getting through their personal task-list. They use MEWS as though it were a severity of illness score, a purpose for which it is neither designed nor validated (Ho 2013). If they only review the group of patients with seriously deranged physiology they will miss the patients in whom signs of impending crisis are subtler.

Nurses expressed three major frustrations:

- Firstly, they have difficulty getting the medical team to review the patients (Section 4.2.5). They believe that doctors should abide by the protocol. They, themselves, are expected to do so, and they worry that when the medical team does not visit the patient, as required by the protocol, some of the blame for any subsequent clinical mishap will be unjustly laid at their door. Nursing practice is hierarchical and breaches of protocols are apt to lead to disciplinary action - they expect the doctors also to follow the protocol (Castel, Ginsburg et al. 2015). It causes them anxiety when they have correctly identified and reported a MEWS trigger event, and nothing appears to be happening.

- Secondly, they did not consider medical reviews to be wasted effort when they do not lead to changes in treatment (Sections 4.2.13, 4.2.14). They believe that the closer involvement of the medical team provides reassurance for the nursing team, relatives and patients. They see benefit in a joint nursing/medical review of the patient, even when this confirms the existing plans, or rules out a new complication. A medical analysis of the MEWS protocol might deplore the high incidence of false positive calls, whilst a nursing review may see these calls as useful teamwork, increasing the doctors' involvement in the problems of patient care.

- Thirdly, they believe that medical staff are over-reliant on the MEWS score, and are unsympathetic towards a nurse's opinion that a patient is unstable, despite a low MEWS score (Section 4.2.14). Many nurses see themselves as experienced professionals who use clinical intuition in evaluating patients, and trust that intuition even when the MEWS score is low. They are using their 'tacit' knowledge as described by Michael Eraut (Eraut 2000). A recent study has demonstrated that using the criterion of 'nurses worry' increased the validity of the EWS as measured by the area under the Receiver Operator Curve (Douw, Huisman-de Waal et al. 2016). The nurses interviewed in the present study did not believe that the medical

team understands that they are skilful in understanding a patient's condition. They find that doctors are reassured by the low MEWS score and are likely to disregard the nurse's concerns (Section 4.2.14).

6.1.4 Doctors and nurses march to different drummers?

The medical and nursing teams' different understandings of MEWS may be a reflection of the different viewpoints of the two groups, each seeing MEWS in the context of their own profession. Whilst both try to comply with the demands of MEWS by achieving the narrow practical objectives demanded of their *own* job, it may also reflect the different perspectives of 'care versus cure' often attributed to medicine and nursing (Baumann, Deber et al. 1998).

It has been suggested that a reason for the medical and nursing teams having different approaches to MEWS is the more hierarchical nature of nursing (Shearer, Marshall et al. 2012, Kitto, Marshall et al. 2015). This appears to me to be unfair. Medicine has been described as having a history of tolerating individuality, whereas nurses are expected to abide by the rules (and fear being disciplined if they don't) (Mason and Mason-Whitehead 2003). Schneider has discussed the relative merits of doctor and patient autonomy (Schneider 1998). He found that patients are prepared to set aside some of their rights because they understand that to function optimally the clinician must have some freedom of action. He believes that this freedom is 'in the fabric' of medical practice and this leads to a tolerance for individual expression by doctors. The medical literature of evidence-based medicine includes many critical analyses of the way it impedes this sort of personal clinical judgement (Fins 2016). These views are less apparent in the nursing literature (Rolfe, Segrott et al. 2008). Nevertheless the interviews with the nursing team reveal criticism of the doctors for departing from the protocol. McDonal, Waring et al (2005) undertook a review of the attitudes of consultants, junior doctors and nurses to the use of clinical guidelines and protocols. They found that whilst doctors had mixed feelings the nurses were critical of failure to observe the 'rules'.

> *"Doctors' views about the contribution of guidelines to safety and to clinical practice differed from those of nurses. Doctors rejected written rules, instead adhering to the unwritten rules of what constitutes acceptable behaviour for members of the medical profession. In contrast, nurses viewed guideline adherence as synonymous with professionalism and*

criticised doctors for failing to comply with guidelines." (McDonald, Waring et al. 2005)

The nursing team repeatedly expressed these attitudes in this enquiry.

6.1.4.1   Multi-professional Teams

Medicine and nursing usually have different roles in healthcare. The use of protocols may affect traditional roles and ways of working (Section 4.2.4, 4.2.5, 4.2.11, 4.2.14).

6.1.5   The Effect on Nursing's Clinical Process

The use of MEWS is changing the clinical process of nursing. Without MEWS the process of identifying patients at risk was one of clinical decision making.

Without MEWS scoring, both the nurse at the bedside and their clinical supervisor are required to make clinical judgement about the patient. They will call the doctor if they feel that the patient requires a medical evaluation, or adjustments to treatment that only the medical team can deal with. Introducing the MEWS and its calling criteria changes the working practice (Section 4.2.13). The nurses now call the medical team in response to a score without needing to understand the changing clinical situation. The nursing team were frustrated by the fact of having to call the doctor even if they felt that they could cope, and by their reduced opportunity to use their own clinical judgement, whilst at the same time welcoming the authority to call that a trigger event conferred upon them.

The study interviews revealed a number of consequences that followed from the protocol driven reporting of trigger events:

- The bedside nurse does not need to evaluate their patient and is required only to report the MEWS to their senior (Section 4.2.5).
- The supervising nurse does not need to evaluate the patient and is only required to report the MEWS to the doctor (Section 4.2.6).
- The supervising nurse does not need to assess whether their team can cope with the problem without the doctor's help and does not need to plan any changes of management (Section 4.2.2).

Thus using a MEWS downgrades the clinical process for nurses (Section 4.2.14, 4.2.13). This would be desirable if there were any evidence that the nurses' miss incipient patient deterioration; but this is not the case. On the contrary, adding 'nurse worry' to the criteria for calling a MET has been reported to improve its validity (Douw, van Zanten et al. 2016). In this study the medical and nursing teams were often using the judgements and intuitions of the nurses to decide whether the doctor should physically attend to see the patient following a trigger event, regularly undermining the protocol by negotiating an understanding that the doctor would not attend, despite the trigger event. Figure 12 shows the nurses actions in the case of a deteriorating patient with and without the MEWS.

Figure 12. The Nursing Clinical Process
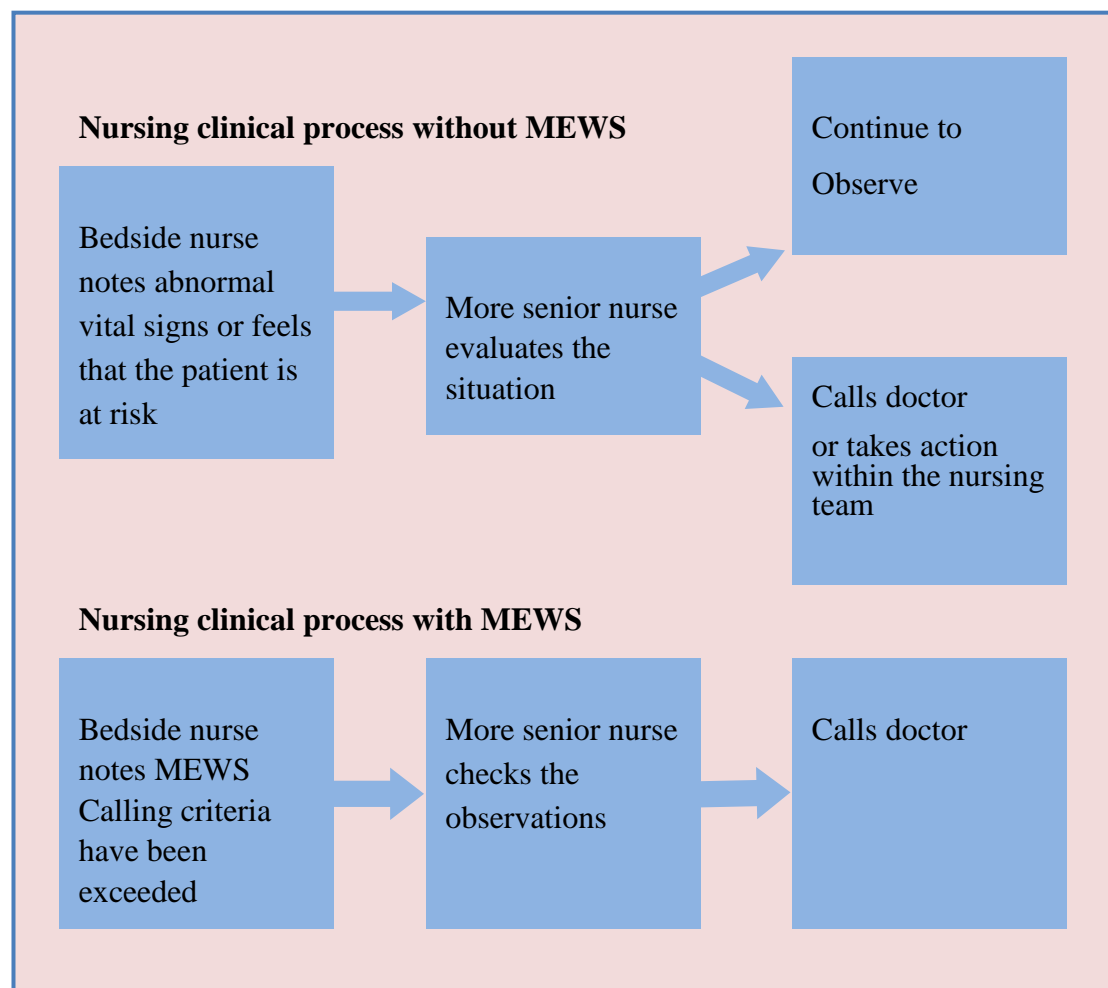
6.1.6 The Frustration of healthcare assistants

The issue of lost clinical autonomy also applies to healthcare assistants. Healthcare assistants often have many years experience of the care and monitoring of patients.

They are not registered, or regulated, nationally. In their interviews the healthcare assistants expressed frustration that their experience was disregarded (Section 4.2.8). They described how they understood the patient's condition from the physical findings and also from experience and intuition. They felt that their status as healthcare assistants made it more difficult for them to express concerns when the patient's state was not reaching the trigger criteria. They also found that, though they were at the bedside, talking to the patient and their relatives, they were often in the dark about what the senior nurses and doctors had decided. Healthcare assistants repeatedly made the point that their role in care gave them the best opportunity of tracking changes in the patient's activities and capabilities.

6.2 Constructing Individual Narratives

A wide range of opinions and attitudes were expressed by the respondents but within grades and professions there emerged a consistent narrative. This has enabled me to construct stories relevant to each grade. These brief sketches highlight the issues that dominate each professions preoccupation in using the Modified Early Warning Score. This is useful in providing a view of the operation of the RRS from the various perspectives of the professions and grades.

6.2.1 The F1/2's Tale

My day is dominated by my heavy workload and by the worry of clinical inexperience. I believe that the MEWS system, as used on my ward, is useful and effective. It is useful, when it brings to my notice patients who require changes to their treatment. I can also use the MEWS as an indicator of the severity of illness. I believe that a higher MEWS indicates a sicker patient.

MEWS flags up many patients who do not need medical review and do not subsequently deteriorate. Such 'false alarms' are usually a waste of my time. When I attend a patient in response to a MEWS call my priority is to detect situations that are amenable to treatment. If I can find nothing specific to treat I will usually adopt a wait and see policy and will endeavour to review the patient after an appropriate interval. I find false alarm calls a real problem because they fragment my working day and make it difficult for me to organise my work in a logical manner.

MEWS also generates many repeat calls. Attending to MEWS alerts constitutes a major workload. My workload is a great problem for me. The calls upon my time are many and various and it is necessary for me to prioritise my activities. I understand that a MEWS alert ought to be a high priority call and that the protocol actually requires me to attend all such patients, but the value of attending most alerts is low. I have a choice as to whether to treat MEWS calls as urgent emergencies or to attempt to sort out problems through the nursing staff. If I attended all patients triggering a MEWS call other tasks that I know are urgent and important would be neglected. I really have no alternative than to prioritise calls by discussion with the nurse. I will discuss with the nurse whether the MEWS score is backed up by her clinical judgement about the patient's condition. I will also try to understand whether the raised value is likely to be largely due to the patient's prior condition.

I do not yet have much clinical experience I often feel unsure of what to do. I am able to ask my senior's for help. Often, however, they are occupied with other important work and are unable to help. I am very inexperienced - I recognise that myself, but I try to appear to know what I am doing. I don't want to get a reputation for being an unsafe pair of hands with my seniors. I find that being trusted builds my confidence whereas being doubted makes me dither even when I am fairly sure that I am doing the right thing.

I am also conscious of being under scrutiny by the nurses, many of who have seen much more than I have. It undermines my self-confidence when the nurses look dubious about what I am doing. I feel that the nurses have a more straightforward task. They have to call me for all trigger events. They know that many are false alarms but I think that many of them don't try to help me by volunteering that they are not worried about the patient. I also believe that many nurses will exaggerate their concerns, believing that this will get my attention.

I am frequently out of my depth, and MEWS adds to my problems by drawing attention to a large number of patients, only some of who will deteriorate. When a patient I have seen does suffer a subsequent collapse I am in the hot seat for not having done more. This is constantly in my mind and causes me stress.

On paper I am very well supported but in practice my backups are often busy and some will be highly critical if I call them when they think it is unnecessary. I can't win. The patient might come to harm if I don't get help. If I do things myself and the patient gets worse – I get the blame, and if I call for advice and my senior thinks things are all OK – I still get the blame. I have good relationships with most of my seniors who understand and sympathise with my difficulties. I worry about being made to look foolish but I find that most senior doctors understand this and if I make errors they will not humiliate me in front of the team. I generally have good relationships with the nurses. They often know what action they want taken. If I disagree I have had some senior nurses go over my head.

I see the MEWS protocol as a chain in which I am a link. I am called by the nursing team in response to a trigger event, which I then either deal with or pass on to a more senior doctor.

6.2.2 The RN's Tale

I find MEWS scoring very useful. Most of the care of patients, including recording their vital signs, is done by the healthcare assistants and I find them very reliable. I will check the vital signs if they report a MEWS situation to me, but I rarely disagree with their findings.

I will always report a MEWS trigger score to a doctor. This will usually be the F1/2 but I am willing to talk directly to the Registrar or Consultant if the junior is unable or unwilling to respond. I do not have any difficulty in talking directly to the more senior doctors and I find they respect my clinical experience. I am not usually involved in further discussion and planning when I have reported a trigger event and this is a disappointment.

We all know that many of the trigger events are repetitive or due to patients having a prior abnormality of their vital signs. In that situation I am usually happy to agree further action on the phone, without the doctor seeing the patient. On the other hand I am very conscious that some of these patients may collapse and that I may be held responsible if I have not insisted on the doctor seeing the patient.

The patients with a raised MEWS score, but with no other indications of trouble are a particular difficulty for me because I am fearful that I am missing something. I tend to get more anxious about these than about the ones who have obvious problems. The doctor often asks me whether I have other causes for concern and this puts me on the spot. A related problem is that the patient and their relatives often pick up on the fact that something might be wrong and become very anxious. A visit from the doctor helps reassure them.

The big advantage of the MEWS is that it gives me a concrete reason for insisting on the medical team seeing the patient when I *am* worried. Without MEWS I have to explain why I think there is a serious problem and this can lead to me being ridiculed by the doctor. With MEWS if this is happening I can just fall back on the fact that the protocol says they should come, and if they don't the consequences are their responsibility. That said, I do see myself as a professional with experience, clinical skills and intuitions. MEWS also gives me a way to talk about the patient so that the doctor and I both understand one another's meanings. What I feel about the patient will influence my dialogue with the doctor. I know they are very busy and I will help them to manage their workload if they engage in a proper clinical discussion.

It is very frustrating that the medical teams are so reluctant to vary the criteria for a MEWS call in patients who are dying or who have underlying chronic problems that lead to high scores. This leads to inappropriate management of the patients and adds to everyone's work.

A problem with MEWS is that it can dominate the work. As carers with close knowledge of the patients, we see many who really need their treatment reviewing in order to make them comfortable, or to move forwards with management. Having a low MEWS can mean that the doctor ignores such calls for help. Many doctors don't see the need for their involvement unless there is something specific to do, whereas lots of patients benefit from the reassurance of a medical review.

I think I see the problem differently from the doctors because I spend so much time with the patients and their relatives and it falls to me to help them understand what is happening to them and how things will be in the future. In my opinion most MEWS calls to the medical team are a useful part of the patients' care. It is obvious that they

will benefit from the discovery of unexpected problems, particularly where treatment needs to be modified. I also believe that the involvement of the junior doctor is helpful in situations where no changes are necessary. Being reviewed reassures the patient and relatives and helps develop their confidence in the team. It is also a reassures me, and the nursing team. It gives a sense of involvement and of being empowered to act on the patient's behalf.

6.2.3   The Healthcare Assistants Tale

My work is dominated by the close relationship that I have with the patient and their family. As I generally deliver most of the continuing care I am in close contact with them. This enables me to recognise small changes in the patient's condition, such as sleepiness, confusion or pain, which the RGNs and doctors are not able to see. I acknowledge that I do not have much knowledge about diseases and treatments. I do however have experience and this leads to intuitions about the patient's progress. I am firm in my belief that I have a reliable intuition about the patient's condition.

I sometimes report a MEWS problem directly to a doctor, but mostly I tell the RGN who then calls the doctor. They are often telling the doctor what I have told them, not making their own observations and I don't know what they said or even whether they did actually call the doctor. The doctor may discuss the patient with the RGN who may not tell me what they have said. It is a big problem for me that I don't know what has been said, and what, if any plan has been made.

Unlike my RGN colleagues and the doctors, I am with my patients most of the time. They expect me to know what is going on and to be able to explain things to them. This is why it is important that I am kept in the loop and have things explained to me.

When I report that the MEWS score is high the nurse may repeat the vital signs observations but generally I am trusted and my findings are believed. I am frustrated by the fact that my opinions and judgements are not always taken seriously. I recognise the reasons why chronic abnormalities may lead to over-sensitivity of the MEWS instrument and I understand the futility of its repeated application when resuscitation is not to be attempted. These situations are very troublesome to me as the patients and

relatives will ask me why such regular observations are being made, and I cannot give a sensible explanation.

6.2.4 The Registrars Tale

I have two responsibilities with regard to MEWS. Firstly I supervise the F1/2s. They are often unsure whether a high score reflects a developing problem and they will come to me for guidance. It is annoying when they pester me for help in situations where they ought to be able to cope. I am sympathetic because I remember how scary it can be do have their responsibilities with little experience but I also have a very heavy workload to manage. Having a confident F grade makes a big difference to my work.

When I have to see a patient with a high MEWS I tend to ignore it and try to work from first principles as I have been taught on courses about emergency care. I am not an expert in critical care and if patients are seriously ill I need the support of such specialists.

Sometimes when problems arise I am not available because I am already coping with an emergency, in A&E or in the operating theatre. My F doctor may then call the ITU team directly.

Even though I may not be available it makes me look bad if the F1 seeks the opinion of the consultant or calls the critical care outreach team without telling me. Sometimes I am embarrassed to find that the clinical care planned by the nurses and the F1 is criticised by the critical care team. I can't win because if I make clear that the juniors have planned this care I am criticised for not knowing what is going on. If, on the other hand, I let them think I did know what was being done I will get blamed for making silly clinical decisions.

6.2.5 The Sister's Tale

I am very supportive of the use of MEWS.

I am very sure that my ward delivers a high standard of care and that MEWS has improved our outcomes. We do not do audit of this but I am confident that this is what audit would show.

I am confident that the healthcare assistants and staff nurses operate the MEWS efficiently. MEWS allows us to demonstrate that we are on the ball looking out for patients who may be a problem. Patients with higher MEWS scores are at greater risk of poor outcomes.

I rarely need to intervene with the practical management of MEWS. Sometimes I need to step in to push the doctor to come and assess the patient and sometimes I need to insist that the junior doctor gets a more senior supervisor to come and help. I am able to do this because I have lots of experience and I have a feel for how well patients are.

I am very concerned that my ward presents a good image to management.

6.2.6   The Consultants Tale

I am very supportive of the use of MEWS. The quality of care for my patients is a constant worry for me. There are several constraints:

- I am too busy to provide the supervision I believe necessary
- Year upon year I have to work with a smaller team of doctors and they are less and less experienced
- My junior team are too busy
- My trainees rotate too often, sometimes every six weeks!

From time to time I discover patients with problems that are being under-managed. As I am infrequently on the ward I worry how often such patients are not identified until too late.

The EWS has been a boon. It provides us with a language and it keeps the idea of deterioration and the need for vigilance at the front of people's minds.

6.2.7   The ICU Consultants Tale

I am a sceptic about MEWS. In my view the answer to managing critical illness correctly is to have enough doctors who have the correct knowledge and skills and for these doctors to have time to do their work properly.

In our current system we have overworked, poorly supervised staff lacking those necessary skills. My opinion is that MEWS distracts from these fundamental deficiencies and gives false reassurance. I believe that education in the skills and knowledge for identifying sick patients is to be preferred. We need sufficient consultants to deliver a 24 hour consultant ICU service to the wards

CHAPTER SEVEN: DISCUSSION

7 DISCUSSION

This chapter is a discussion of the concepts and theories that I have constructed from my analysis of the respondents' narratives. Section one summarises the reasons for this study and considers where its outcomes are placed in the continuing debate about RRTs. Section two is an account of how, and why, MEWSs is used as a severity score; a purpose for which it is not validated. There follows a discussion of the effect of the different models of practice and epistemic orientations of medicine and nursing. In the final section the relationship between existing working methods and an introduced protocol is discussed.

7.1 Setting This Study In Its Context

In the UK The National Institute for Health and Care Excellence has recommended that an appropriate Early Warning System be universally adopted in acute care (NICE 2007). The Royal College of Physicians has led calls for a standard system to be adopted by all hospitals (Royal College of Physicians 2012) and NCEPOD has recommended EWS in its reports on acute care (NCEPOD 2012, NCEPOD 2015). However, Wendon, Hodgson and Bellomo, prominent researchers in the field have recently written:

> *"We believe that the evidence available to support the introduction of RRTs is inconclusive and that we cannot be sure that such teams improve patient outcomes. Put in legal terms there is "reasonable doubt" about their effectiveness."*(Wendon, Hodgson et al. 2016)

When I began this investigation (in 2012) much of the literature on EWS and RRS was about evaluating the evidence on patient outcomes following the introduction of EWSs and RRSs. The evidence for improvement has been mixed and in the recent words of Douglas, Osborne et al:

> *"Despite decades of research on RRSs, systematic review findings are mixed and improvements in patient survival have fallen short of expectations"* (Douglas, Osborne et al. 2016).

Attention has largely been focussed on technical issues such as the accuracy of the vital signs data, the choice of parameters to score, the setting of a trigger value and the calculation of scores.

Whilst this investigation has been proceeding, two new directions of study have begun to emerge in the literature. The first of these relates to the role of human factors in the RRT's behaviour (Christofidis, Hill et al. 2013, Wendon, Hodgson et al. 2016). The second challenges the underlying assumptions of EWSs and RRSs, and suggests that it is the underlying model of ward care that is responsible for inconsistent outcomes (Litvak and Pronovost 2010). It has also being suggested that these proposed systematic systems of working ignore the complex cultural and social underpinnings of existing work practices (Buist and Mahoney 2014). It is to this perspective of RRS that this current investigation adds.

The use of EWS and RRS is underpinned by a belief that identifying deteriorating patients at an earlier stage, will lead to the more timely involvement of critical care specialists and that this will improve their care. In the face of inconclusive evidence it is appropriate, to ask whether this presumption is correct, or whether alternative approaches to care might be more successful.

White, Scott et al have drawn attention to the possibility that a simple interpretation of the design and operation of an EWS may be missing problems that arise from its use in real situations and might also be 'providing a fix' for systemic failure of patient management.

> *"While the concept of RRTs has considerable face validity, there is little high quality evidence of their effectiveness, and much uncertainty as to the optimal methods for identifying patients in need of RRT and calling the RRT (afferent limb) and how, and with whom, the RRT should then respond (efferent limb). Adverse unintended consequences of RRT systems and the opportunity costs involved in maintaining such systems have not been subject to study, amid concerns RRT may be compensating for other potentially remediable system of care failures* (White, Scott et al. 2015).*"*

7.1.1 What was the purpose of this investigation?

It has been demonstrated in a variety of settings that major patient outcomes are often little changed by any version of a 'track and trigger' system, despite evidence that many major deteriorations can be detected at an earlier stage, and expert opinion that mismanagement and under-management contribute significantly to morbidity and mortality (See Chapter 4.2.1). The search for explanations for this discrepancy has largely been focused on the technical factors affecting the operation of the protocol

(Guinane, Bucknall et al. 2013, Curry and Jungquist 2014, Subbe and Sabin 2014, Tirkkonen, Olkkola et al. 2014); and the solution has been sought in measures such as automated reporting (Opio, Nansubuga et al. 2013, Huh, Lim et al. 2014, Murray, Kellett et al. 2014, Smith and Prytherch 2014). Recently it has become clear that the reasons why MEWS scores are not acted upon may lie not in the scoring, or the sensitivity of the trigger, but in factors influencing the behaviour of the team members. The latest, and arguably most thorough, systematic review of RRSs reported small improvements in hospital mortality and in cardiac arrest rates, a result at odds with all previous reviews but the improvements could not be shown to be caused by the EWS and RRS (Maharaj, Raffaele et al. 2015). Introducing such schemes focuses attention on the issue of deterioration, and usually increases the number and availability of doctors skilled in the management of critical illness. This improved staffing would probably be beneficial even in the absence of a RRS.

7.1.2   What this investigation did

This investigation provided a snapshot of the experiences, expectations, attitudes and responses, of two multidisciplinary teams, working on general medical and surgical wards using a version of an early warning score. It reflected team dynamics in a system where trigger alerts are dealt with by the home team, loosely supported by critical care outreach teams. Analysis of the data allowed the development of ideas to explain the phenomena described. It was undertaken because unexpected elements of individual and team working, might explain some of the disappointing results of RRS implementation. Two ideas predominated at the outset of this study. Firstly, that socio–cultural issues influenced the reporting of problems, and, secondly, that the response to the EWS might be being affected by issues arising from the other demands on team member's time and attention.

It is a feature of qualitative research using the various methodologies of grounded theory that ideas emerge from the data that may surprise the researcher. In Glaser's original descriptions of the method he was insistent that the researcher should set aside prior understandings of the topic in order to clear the way for all possible threads that developed from the data (Glaser and Strauss 1967).

This study has been no exception. Starting from conceptions of socio-cultural issues complicating practice I have been unexpectedly led to the theory that interpretations of the goals of practice may differ according to team members professional backgrounds, and that professional backgrounds may differ in understanding practice on ontological and epistemological grounds.

7.1.3   What this investigation did not do

This investigation says nothing about the success of the early warning system in mitigating the effects of unexpected deterioration amongst patients being cared for on general wards. The system may be working as intended or it may be inefficient and ineffective.

7.1.4   What this investigation adds

This investigation confirmed and extended previous observations that doctor and nurse behaviour modifies the protocol for responding to unexpected patient deterioration (Kitto, Marshall et al. 2015). A disjunction was found between the ways that nurses and junior medical staff interpreted the protocol. This may reflect their different models of patient care. The data has strengthened the initially tentative suspicion that EWSs and RRSs is an attempt at a technical solution to managing patient deterioration, when a major determinant of patient management may be influences from the social, professional and cultural attitudes of the medical and nursing teams. It is not clear what the relative contribution of factors is in determining behaviour. The data also supports the observation of Endacott, Kidd et al in 2007 that there is a difference between the way the medical and nursing teams evaluate patients. (Endacott, Kidd et al. 2007)

7.2   MEWS is used as a severity score

The work of the medical and nursing teams would be simplified if there were a score that reliably stratified the severity of disease. Junior doctors have difficulty in assessing the severity of critical illness. From the interviews it was clear that they welcomed MEWS because it appeared to serve this purpose.

Most of the doctors interviewed selected which patients to see on the basis of their MEWS – the higher it was, the more likely they are to respond quickly, and in person.

One reason for this selection amongst patients who 'trigger' is their wide acceptance that MEWS functions as a severity of illness score. Morgan and Wright have defended their original scoring system against criticism from those who used it a severity score and found it inconsistent (Cuthbertson and Smith 2007, Duckitt, Buxton-Thomas et al. 2007). They wrote:

> *"We must re-emphasize that EWS was designed solely to secure the timely presence of skilled clinical help by the bedside of those patients exhibiting physiological signs compatible with established or impending critical illness." (Morgan and Wright 2007)*

Research has demonstrated that higher MEWS scores correlate with worse outcome. This may be so of pooled data but does not apply for individual patients (Morgan and White 2007). Subbe, Kruger et al performed a study that found that MEWS scores of 5 or more were associated with worse outcome (Subbe, Kruger et al. 2001). Goldhill et al. investigated the hospital outcome of patients scored with their Patient-at-Risk early warning score that differs slightly from the MEWS score (Goldhill, McNarry et al. 2005). They found that in-hospital mortality rose as the score increased, but this rise was significant only for patients with scores greater than 4, whilst significant numbers of patients with scores of 1 were sent to the ICU. Oscarsson, Reini et al found similar poor outcome, again limited to those patients with MEWS scores of greater than 5 (Oscarsson, Reini et al. 2008). The score is not being used, as intended, to predict and pre-empt catastrophic collapse in patients with few signs. No study has been published that attempts to validate the MEWS score, as an indicator of outcome that excludes patients who were already known to be at increased risk, or whose deterioration was already established.

Le Onn Ho, Shahidah et al, however found that the level of MEWS in patients seen in the emergency department correlated less well with outcome than other research had found. They suggested this might be because their Singaporean population had different underlying medical conditions than previously reported Western studies. (Le Onn Ho, Shahidah et al. 2013)

Some researchers *have* published work where the level of MEWS score is used primarily as an indication of severity of disease (Cooksley, Kitlowski et al. 2012). This makes it difficult to explain to staff that they should not use the Early Warning Score as an indication of severity of disease. Morgan and Wright (2007) made this point when

they defended their original EWS against the criticism that it was unreliable as an indication of severity or outcome. They were critical of its use for that purpose (Morgan and Wright 2007).

7.3   Doctors and Nurses work to different models of practice

When a patient triggers the EWS the ensuing protocol requires different responses from both the medical and nursing teams. The need for the nurses to evaluate and assess the patient is reduced and replaced by an automatic instruction to call the doctor. The subsequent cascade of difficult decisions for the doctor is little changed by the RRS protocol.

Nursing has often been conceived as being founded on the principles of caring whilst medicine is concerned with curing. Such broad distinctions are not now tenable, and have not been valid for many decades; however, it is possible to see that doctors and nurses have different mental models of their practice. Commentators have sometimes characterised this distinction in the objectives of practice as an attempt to belittle the contribution of nurses and 'put them in their place' (Davies 1995, Allen 1997 p134). It is not that nurses cannot evaluate patients in the way that doctors do. Rather, their different experience of care leads them to place different constructions on events. Coombs conducted a study of doctor/nurse relationships in ITU through a combination of participant observation and interviewing (Coombs 2003). She observed that nurses making clinical decisions in ITU used forms of knowledge specific to nursing and unacknowledged by medicine This included, "knowledge consistent with nursing's holistic, patient centred philosophy of care." (op cit, p120). She suggests that, "nursing holds specific knowledge for decision making that results from being at the bedside and being with the patient on a continuous basis." In this study, the nurses and healthcare assistants repeatedly expressed these views, and regretted that the doctors failed to see the unique value of this contribution.

In their interviews the junior members of the medical team explained that a high MEWS requires them to reassess the patient's status. They also described how the problem of a high workload led them to consider how important such a review was. In their interviews they described drawing upon past experience, their knowledge of the patients progress and the opinions of the nurses in order to decide whether to attend to review

the patient. They described an intention to approach the patient to investigate, diagnose and treat a current problem. In all cases when asked how they use the MEWS system the medical staff described a sequence of:

1. Decide whether to see the patient.
2. Examine and Assess
3. Investigate
4. Treat

The ST7 in Intensive Care is typical:

"To be honest I don't really pay any attention to their MEWS score when I am asked to review them. Although that is quite often the trigger …...I just think through the story and then the observations …...and I am trying to work out in my head what is going on and what I need to do about it. I will examine, then do whatever investigations are needed to clarify the problem" ST 7 Intensive Care

The more experienced doctors described how a MEWS trigger would prompt them to do a full review of the patient according to this system. They explain that if they find no problem to treat, this reduces the priority to be given to a repeat alert in this patient (Section 6.2.1). They consider negative reviews to have been 'false alarms' and a waste of their time.

The nurses saw the doctor's review as part of the teamwork involved in patient care. When they call a member of the medical team they expect the doctors to follow the protocol. They described being annoyed when they didn't. They fear for the patient and they fear adverse consequences for themselves if a serious problem is being missed. The nurses' initial response on being faced with a high MEWS score is to respond as required by the RRS. No nurse or care assistant volunteered that the trigger would stimulate them to review the patients status. Looking carefully at the nurses' responses however they show a broader underlying anxiety: anxiety for the patients' wellbeing, anxiety about needing to reassure the patient, and, sometimes, anxiety about the junior doctors competence and ability to cope. No nurse describes making a systematic personal assessment of the patient in the way the medical staff do. Rather, they describe the ways that intuition and experience ,tacit knowledge (Eraut 2000), help them know when a patient is unstable (Sections 6.2.6, 6.2.10). Figure 13 displays the different responses of the bedside nurse and the first responding doctor.

Fein, Mackie et al have discussed the importance of shared mental models in the teamwork required for the RRS. They have suggested that shared habits of thought assist in the development of a shared mental model (Fein, Mackie et al. 2016).

Six habits of work (from Fein, Mackie et al)

1. No surprises – principle of shared expectations
2. Know the endpoints – principle of shared goals
3. Back yourself – principle of self-efficacy
4. Confident leaders get hard things done – principle of team leader self-efficacy
5. Wisdom in asking questions – the principle of reflective practice
6. The value of 'mateship' – principles of team cohesion

The first of these habits is not seen in the operation of the EWS in my research because the nurses do not know and cannot predict what action the doctor will take in response to a call.

From the outset of this research it was evident that the doctors and nurses demonstrated different priorities in using the MEWS and that there was a disjunction between the medical and nursing teams in their views of its operation. It appeared that they might be conceptualising their practice differently. My first thoughts were that this was the result of the sociology of the team and my subsequent interviews turned towards exploring relationships, threats and fears. This led me to extend my interviews to managers as the ward nurses might see their oversight as a threat. This might influence their actions. Surprisingly, in view of other published literature on teamwork (Greenfield 1999, Rosenstein and O'Daniel 2005, Marshall, Kitto et al. 2011, Castel, Ginsburg et al. 2015, O'Connor, O'Dea et al. 2016) social issues and culture did not seem to be an issue between the medical and nursing teams in this study. In fact, as explained in the previous chapter, the nurses felt that the use of MEWS reduced the risk of them being criticised by the medical team.

As discussed earlier it is widely accepted that the medical and nursing models of practice are different. Bauman, Debner et al have discussed the stereotypical statement that nurses seek to care whilst doctors seek to cure (Baumann, Deber et al. 1998). They suggest that these models are not applicable to modern practice where care/cure exists as a continuum, with most healthcare workers appropriately adopting positions between

the extremes. They acknowledge however that doctors and nurses still inhabit different ends of this spectrum. Barrow, McKimm et al used a qualitative scheme of thematic analysis to investigate conceptual differences between doctors and nurses at the bedside and reported finding a dichotomy (Barrow, McKimm et al. 2015). Nurses were predominantly collectivist, protocol and systems-driven whilst doctors were more individualist and autonomy-driven. They concluded that unless such complexities were addressed in the development of teams and the teaching of teamwork, performance would fall short of expectation.

The recognition of the impact of different mental models on team communication prompted the development of a structure for communication in nursing and medical handovers between teams, known by the acronym SBAR from its component parts (Situation, Background, Assessment, Recommendations). Haig, Sutton et al (2006) stressed the importance of doctors and nurses having a shared mental model of patient care and described how the use of the SBAR tool improved communication (Haig, Sutton et al. 2006). They discussed the ways in which the style of communication used by doctors and nurses differ, and how this contributes to misunderstandings. They wrote:

> *"Many barriers can potentially contribute to communication difficulties between clinicians. A lack of structure and standardization for communications, uncertainty about who is responsible for the patient's care management (quarterback of the team), hierarchy, sex, and ethnic background may all be contributing factors.* (Haig, Sutton et al. 2006)

They noted that nurses and doctors had different styles of communication: nurses being detailed and descriptive whilst doctors used brief summaries of important issues. The authors suggested that having a standardised framework for communication would improve understanding. This was the function of MEWS as reported in the current study, and the interviewees felt it improved doctor/nurse communication.

De Meester, Das et al have also reported that both nurses and doctors felt that their communication had improved following the introduction of the SBAR system (De Meester, Das et al. 2013, De Meester K 2013).

Mental models of practice run deeper than the style of communication. They shape the way individuals conceptualise and prioritise problems (Burtscher and Manser 2012,

McComb and Simpson 2014). In the context of MEWS, in this research project, the medical and nursing teams articulate distinctive, disparate objectives of care. Little consideration seems to have been given to the effect this has on multi-professional teamwork. Manser has discussed the literature on teamwork in the context of patient safety (Manser 2009) and with Burtscher reviewed the relevant literature in 2012. The authors comment on the paucity of studies and the confused status of methods for assessing mental models (Burtscher and Manser 2012). They discuss teamwork and the relevant mental models in anaesthesia and ward nursing. Their analysis takes into account shared knowledge of objectives, and shared technical objectives. Neither of these reviews, however, addresses the issue of whether team members understand their work and its objectives in the same way. Brindley and Reynolds (2011) have discussed communication and safety in ICU care and stressed the importance of shared vocabulary and shared mental models but again there is no discussion of the congruency of overall objectives (Brindley and Reynolds 2011, Brindley 2014). In one study it was found that the surgeons perception of operating theatre teamwork and organisational safety was more positive than that of anaesthetists and nurses (Mills, Neily et al. 2008). The researchers considered the surgeons perceptions to be less realistic and to be founded on a narrower perspective of 'success'.

This observation finds a parallel in the present study where the doctors expressed greater satisfaction with the outcome of MEWS than did the nurses. This may reflect the fact that the doctors' objective (to identify and deal with a possible crisis) was narrower than that of the nurses (to care for the patient in the context of their illness). I have been made sensitive to the possibility that the medical and nursing teams have distinct models of care from my experiences as a senior sister in ICU. I repeatedly found that the nursing team was sceptical about what appeared to be heroic therapy, being openly concerned about the patient's ordeal, and believing (often incorrectly) that the treatment was futile; whilst the medical team appeared to be engrossed in the clinical problem and appeared insensitive to the plight of the patient and their relatives. Such occurrences were not uncommon and sometimes threatened to lead to confrontation between the teams. Interestingly, I saw a similar dynamic between the intensive care specialists and the even more technically focussed surgical team. I speculate that these are real examples of the separate cure/care models of practice. During this research a difference of attitude between the medical and nursing teams was evident in their attitude to palliation. The nursing staff often made reference to the doctors' unwillingness to

accept the futility of aggressive treatment and accept a policy of symptom control. The discussion about the difficulty of getting variances signed (Section 6.2.6) shows the nursing staff accepting palliation as something positive for the patient and attributing the medical teams reluctance to go down that route as being due to them seeing palliation as 'throwing in the towel'.

May and Finch have described a process by which new patterns of work or social interaction become 'normalised' as routines individually and within teams (May and Finch 2009). These routines may not be understood in the same way by actors from different professions and with different roles in a team process. In this case each actor or set of actors may proceed through the stages of normalisation and develop different conceptions of the practice without any of them being aware that there are distinct interpretations.

In some recent studies the teams appeared to be concerned about blame and criticism, and the effect this would have on their professional image (Kitto, Marshall et al. 2015, Douglas, Osborne et al. 2016). These studies took place in systems were there was a formal MET. The MET personnel seem to be perceived as judging the home teams performance, and the doctors and nurses feel that if their decision to alert the team is mistaken, their error will become widely known. Calling a MET is 'going public' and this is a threat. In my study fear of being found foolish or inadequate was less of an issue because the F1 and F2 doctors usually sought initial assistance from their home team seniors. This, of course, is their normal chain of responsibility, and they are accustomed to having their clinical practice scrutinised within the team. Several participants described being comfortable asking for advice from their home team, and being more worried about possible criticism when asking for help from 'outsiders'. A MEWS track and trigger review is therefore not an unusual situation for the doctors. It appears that the fact that the medical team is relatively relaxed about responding to MEWS triggers also relieved the pressure on the nursing team.

7.4 Differing Epistemologies of Medicine and Nursing

I suggest that the reason for the different mental models lies partly in the different epistemologies of medical and nursing practice. Medical practice springs largely from the logical-positivist tradition of scientific thought (Cruickshank 2012, Wootton 2015),

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whereas nursing is often said to have a relativistic, humanistic underpinning that is more open to the acceptance of multiple interpretations of reality (Rashotte and Carnevale 2004). There was no discussion of philosophical perspectives during the interviews for this research but five relevant memos were generated. These all reflected the logical-positivist stance of the medical staff. There were three occasions where, before or after the interview, the doctor questioned the validity of the qualitative nature research and went on to suggest that a quantitative review of outcome would be more productive. The other two memos relate to discussions arising in my meetings with the teams to explain the research and secure consent for taking part. Again, my methodology was criticised by some of the medical staff and a quantitative approach suggested.

The positivist/relativist conflict has been identified as a problem within several areas of nursing practice: in nurse education (Playle 1995), in the interface between nursing research and practice (Rodgers 2005, Warelow 2013), in the analysis of medical and nursing decision-making generally (Banning 2008), and in the context of critical care nurse practitioners (Rashotte and Carnevale 2004). This is unsurprising as the nurse is bringing their perspective into fields influenced, and sometimes dominated by positivist ideas. Banning (2008) discussed the positivist/ relativist influences on the nurses' clinical decision making, whilst Rashotte and Carnedale (2004) were attempting to understand whether different processes were involved when nurse practitioners and doctors addressed similar situations requiring a clinical decision. Neither of these papers addresses the problem I identify: members of a clinical team, working to a joint protocol, use different models of practice, have different understandings of care and express different values.

These different perspectives are not necessarily taught to doctors and nurses (Stein 1986), but arise from the different way the two professions are organised and conduct their business. Indeed, an essay written by two medical students has drawn attention to the defective example shown by their seniors in the workplace and the unrealistic, idealistic content of any formal teaching on ethics and professionalism (Brainard and Brislen 2007). This phenomenon has long been characterised as "Do as I say and not as I do!" From my experience as a teacher in multi-professional situations I suspect that neither the trainee doctors nor the nurses in the study have been taught formally about the philosophy underlying their practice, or have given it much thought. It is likely that the understandings of both nurses and doctors will have been absorbed from the

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attitudes of their trainers without explicit teaching about philosophy, but these epistemologies and ontologies will, none the less, be so embedded in everyday practice, that they will be almost invisible; and so taken-for–granted that they are not noticed.

Seeing these different attitudes to care and treatment emerging from the medical and nursing dialogues, and following a re-reading of the literature and study of the transcripts and memos, I began to suspect that the reason for the doctors and nurses expressing different priorities in the use of MEWS lay in different ways of understanding clinical care as practiced by their teams. Not only did they have different mental models of practice, but also these models were developed from different ontologies and epistemologies. By the time this idea emerged it was too late for me to use theoretical sampling to direct enquiry in ways that might shed more light on the issue. I do not therefore know what my subjects understand about the philosophy of their practice, and the way it is understood – its epistemology.

Medicine is often described as a principally scientific discipline (Pearson 2013). Its ontology is scientific realism: a real world exists separate from the mind. And it is positivistic: science can reveal the nature of the world and only that which science can demonstrate exists. This positivistic scientific method stresses empiricism and describes a deterministic discipline (Kothari and Mehta 1993). Doctors have been demonstrated to rely on a deterministic reasoning (phenomena are the outcome of causal influences) (Losee 2001, Findyartini, Hawthorne et al. 2016).

The epistemology of nursing practice is by contrast broadly relativistic: knowledge, truth, and morality exist in relation to culture, society, and historical context, and are not absolute. It has for thirty years pursued a different form of knowledge from medical practice that, whilst accepting and understanding the positivism of the scientific element of practice, has emphasised the humanistic framework of the patient and their environment as the context for nursing practice (Yorks and Sharoff 2001). Some nursing research has stressed the relativist basis of nursing knowledge as distinct from the positivist basis of biological science (Mitchell and Cody 1992). Nursing process is more probabilistic (based on experience) than deterministic (Young 1987, Pearson 2013, Robert, Tilley et al. 2014). Much of the practice of nursing in the UK derives from the ideas such as "The Activities of Daily Living" as developed by Roper, Logan and Tierney, which sets the nursing agenda as to preserve the individuals capacity to

maintain normal function in the face of illness (Roper, Logan et al. 2000), Orem's 'Self Care Model', stressing personal independence, and Peplau's 'Interpersonal Theory' that outlines the changing nature of the nurse/patient relationship with time (Comley 1994). All these theorists expressed a broad interpretation of nursing practice. Delanty and Strydom placed care at the centre of knowledge in nursing. They claim that it is through the processes of caring that nurses come to understand what nursing means and acquire the knowledge base for its practice (Delanty and Strydom 2003). They conclude that care is the ontology and epistemology of nursing.

The belief that many forms of knowledge are equally valid arose from postmodernism in the 1970s and what is known as American Pragmatism (Kagan, Smith et al. 2010). Carper has described a typology of nursing knowledge and recognises four domains: empirical, ethical, personal and aesthetic (Carper 1978). This typology has gained acceptance in contemporary nursing theory (Garrett and Cutting 2015). These issues have been considered, and incorporated, when developing competencies for nurse training; but most curricula do not explicitly teach the philosophy of nursing practice to undergraduates (Vinson 2000). There is no equivalent widely accepted interpretation of medical practice.

In all likelihood the nurses and doctors participating in this investigation approach the evaluation of a deteriorating patient without overtly understanding that the medical and nursing perspectives may be different. I suggest that in the case of a possible patient deterioration both medical and nursing teams are presented with uncertainty and approach the problem in different ways.

The data from this investigation indicates that medical team asks:

> *"What evidence is there that the patient is deteriorating? Do they need changes to their management and what changes are most likely to lead to improvement?"*

This is a problem solving approach. It searches for empirical evidence to plan future treatment. Its first response is often to seek additional evidence in the form of other investigations.

The nursing team asks,

"Why has this patients situation become uncertain and how can the uncertainty be resolved? How do the patient and their family understand this uncertain situation and how is it best managed on their behalf?"

The nurses then describe observing the patient's behaviours and capabilities, and how these are changing with time to confirm their opinion of the patient's status. This attitude makes nurses open to palliative options in care.

This difference has been commented upon previously. In their 2007 research Endacott, Kidd et al made the observation that whilst both nurses and doctors who responded to trigger events initially evaluated patients by interpreting their vital signs, the doctors then proceeded to investigations whereas the nurses refined their opinion of the patient's condition by considering their physical capabilities – both what they can do, and how this has changed (Endacott, Kidd et al. 2007).

The nurse's approach may be considered to be one of problem setting or identification (Schön 1992). Their focus is not only on changing treatments but also on assisting the patient and their family to comprehend their situation and to adapt their understandings and expectations to the changing situation. The medical team did not express these concerns in their interviews, being more focussed on assessing and treating the patient. I interpret these differences as showing that the doctors feel a primary responsibility for outcome whilst the nurses feel their primary responsibility is how the patient travels towards that outcome.

These differing points of view lead to different interpretations of the outcome of trigger events. The medical team often implied in interviews that if the patient does not have a problem that requires action, the trigger is a false positive, and a waste of time. Nurses on the other hand felt that the negative medical review had helped resolve the uncertainty: providing them, the patient and the family with reassurance.

The medical interpretation leads to the conclusion that 90% of MEWS alerts are a waste of time whereas the nursing perspective is that most patient encounters serve a purpose.

The doctors in the study also sometimes described the need for them to attend the patient, as being due to the nurses' lack of clinical knowledge, and said that they, by providing an informed evaluation of the situation, would resolve it (Section 6.2.2). It is clear from the nursing interviews, however, that they do not consider the doctors

assessment to be final. They interpret that assessment along with other factors of which the doctor has little experience. These include things they have understood from their more intimate involvement with the patient and their family and things that relate to future nursing care, and their intuitions regarding the patient's state and probable progress. It was clear that the nurses believed that their intimate involvement with the patient, experience and nursing perspective made them a partner in the clinical evaluation of the patient. A view that doctors in general were slow to accept (Greenfield 1999, Hojat, Nasca et al. 2001, Thomas, Sexton et al. 2003). Spiva (2014) has discussed the importance of self-confidence in nursing decision-making and the way it develops with experience (Spiva et al. 2014). In this enquiry the demonstration of the nurses confident self-image as clinicians, was that they were prepared to question medical decisions, and re-refer a problem to a more senior doctor if they were dissatisfied with the way events were unfolding, despite the negative effects for themselves that might result from this action being seen as a challenge the doctor's clinical competence. Lack of clinical self-confidence has previously been noted as a barrier to nurses calling for support, and it has been suggested that their decision to do so is helped by measures that increase their clinical assurance, such as de-briefing and appropriate teaching programmes (Cioffi 2000, S Astroth, M Woith et al. 2013, Hart, Spiva et al. 2014). As suggested by Spiva, it was the very experienced nurses who described challenging the medical team's decisions, but interestingly experienced staff of all grades from healthcare assistant to ward manager volunteered that they would be willing, if necessary, to go over the head of the most junior doctors - length of experience, was as important as grade.

Donague and Endacott   examined the factors used by nurses in the evaluation of deteriorating patients. They found that nurses looked at trends in the vital signs when making an assessment but used the EWS score as a means of rating the seriousness of the patients state (Donohue and Endacott 2010). This is another example of a track and trigger system being perceived as a severity score but we also see that nurses include information from their close, continuous, observation of the patient in deciding whether changes in their condition are occurring.

A recently published investigation of the quality of teamwork between doctors and nurses used a critical incident technique (O'Connor, O'Dea et al. 2016). The doctors and nurses were asked to describe a situation they had been in where teamwork was poor.

The interviews were coded against a theoretical framework of healthcare team function by three psychologists, and were also rated for risk to patients, by four doctors and three nurses. Thirty-three of the scenarios met the inclusion criteria. 63.6% (21/33) of the scenarios were attributed to 'poor quality of collaboration', 42.4% (14/33) to 'poor leadership' and 48.5% (16/33) to a 'lack of coordination'. Thirteen out of thirty three of the scenarios were described as being associated with the 'lack of a shared mental model'. This would be unsurprising if the medical and nursing teams had different mental models of practice, and did not share their epistemology of practice.

How could lack of a shared model of care interfere with the operation of an RRS? The use of an RRS protocol is intended to lead to rapid, in-person, review of a patient who has a score above the trigger threshold. The junior doctors know from experience that most alerts are, by their understanding, false alarms. They will negotiate with the nurse and will then decide whether to attend at the bedside. If the patient shows little evidence of being in trouble the nurse may be satisfied with this 'telephone consultation' - if it has provided them with a plan for advancing the nursing care. Thus both parties may be content with a negotiation that leads to a patient not being reviewed in accordance with the protocol – though the evidence from my interviews suggests that the nurses are less often happy with this outcome than are the doctors.

7.5 A new protocol must be tailored to the existing work and will be interpreted by users in ways that satisfy their individual needs

In the field of patient care, protocols are frequently used to make clinical management systematic, and to align it with the best evidence (Shaneyfelt, Mayo-Smith et al. 1999, Raine, Sanderson et al. 2005, Higgins 2007). The developers of guidelines and protocols often produce algorithms that affect the way that doctors and nurses work, increasing their workload and changing their work routines. Often, no consideration seems to have been given to how this will affect existing work (Cheung, Sahai et al. 2014, Kavanagh and Nurok 2016). A protocol that requires staff to perform additional tests, complete extra paperwork or make extra visits to patients may disrupt the current ways of managing work. It may, indeed, overload the work schedule (Kavanagh and Nurok 2016). The 'Evidence-Based-Medicine' movement has provoked a large amount of literature protesting that protocols and guidelines restrict the clinical choices of doctors, and may embed practice that is in fact not well supported by evidence

(Greenhalgh, Howick et al. 2014, Fins 2016). However, scant attention appears to have been paid to the possible disruption of other work. Kavanagh and Nurok have discussed the consequences of protocols in the ICU (Kavanagh and Nurok 2016). They describe two ways that protocols can disrupt practice: misalignment and misatributation. Misalignment occurs when the protocol is developed in one circumstance and then applied in another where the context makes its use problematical. Misatributation occurs when effects are attributed mistakenly to the use of a protocol. Misatributation may be common in the literature of RRSs. Many studies have included significant adjustment of teams, education initiatives and changes in practice that may be the true cause of any change in outcome. The Hawthorne effect is the phenomenon of individuals changing their behaviour because they are being watched and the scrutiny involved in conducting an outcome trial in association with an RRS is an obvious possible precipitant. Misalignment was evident in this study when the staff believed higher MEWS scores indicated that the patient was at greater risk. Many of the studies of RRSs may be guilty of misattributing the changes in practice seen with their introduction to the protocol itself when in fact they are due to other associated factors in staff and ward management.

MEWS requires the team to accord it a higher priority than other work. The doctors' behaviour, and the way they speak about prioritising, shows that they reject this imperative. They deal with every situation on its own merits and allocate priority on perceived clinical urgency. In the words of one interviewee:

> *I cannot put off seeing to a patient who I know has problems, to attend to another who might have (a problem). Doctor FY-1 2*

Cheung has discussed the risks to other work of the RRS imperative (Cheung, Sahai et al. 2014). He found that attending to alerts was very disruptive to other work but did not find any instances of patients coming to harm.

In this study it became clear that the MEWS could generate an additional workload, irreconcilable with the demands of existing work, and that the foundation doctors were resolving this conflict by contravening the protocol (Section 6.2.2). They negotiated with the nurses to deal with many MEWS alerts indirectly, without seeing the patient. The formal use of EWSs and RRSs are not isolated clinical developments. They have impact on ways of working and upon the complex sociological and cultural interactions

of the nursing and medical teams. It is probable that these unanticipated effects lead to the teams not using the interventions in the way that was intended.

This observation may be pertinent to the working of other protocols. Doctors who use a guideline or protocol will also have other work to do. Unless the benefit of the protocol is obvious, its users will adapt it in ways that allow them to best deal with their entire workload. Lack of time has been identified as a reason why doctors do not use an appropriate protocol (Berg 1997).

Cheung, Sahai et al have studied the effect of the operation of a MET and RRS on other work (Cheung, Sahai et al. 2014). They conducted 1490 structured interviews were, and analysed 279 written questionnaires. There were 378 incidents, but they did not discover any adverse events attributable to the distraction of a MET call. The severity of the incidents was assessed using a severity assessment code and 99.5% of them were classified as minimum. Most often these reported incidents were disruptions to normal duties, ward rounds, and patient reviews. However, 2 incidents were reported on institutional incident reporting systems. The authors concluded that disruption to normal work was significant but that this was not resulting in harm to patients. It is likely that such a high level of disruption will from time to time be associated with an adverse event.

My interviewees believed they were observing the RRS protocol, but were willing to mould it to their needs. In the current situation MEWS generates many calls to patients who are relatively well and who remain well. The doctor's find this frustrating and do not strictly stick to its instructions. In particular they minimise their input in the case of patients with low MEWS and about whom the nurses do not express concern. The use of an EWS is based on the observation that some patients exhibit a pattern of relatively minor physiological derangements before they deteriorate catastrophically. It is illogical to select a subset of patients for a less thorough review on the grounds that they show no obvious signs of impending collapse, other than a minimally raised MEWS. These are the very patients for whom MEWS was intended.

7.6 Registered Nurses and Healthcare Assistants demonstrate considerable insight into the issues of patient deterioration

The opinions of the more experienced nurses and healthcare assistants demonstrated a paradox. They like the MEWS because it takes away their need to make a clinical decision - the trigger score *requires* them to call the doctor. They feel that the MEWS justifies the call and relieves them of the possibility of criticism for independently evaluating the patient's condition. At the same time they stress that their experience gives them a feel for situations and is a valid adjunct to the empirical data from MEWS. This is a classic description of 'tacit knowledge' (Pope, Smith et al. 2003). They understand the situation and know what to do, but they can't explain how they reach their conclusions. (Eraut 2000).

It appears that the need to have recourse to MEWS makes two assumptions:

- That it would be difficult, or impossible to give the bedside healthcare assistants and RGNs the necessary clinical skills to recognise problems themselves and…
- …..that the most junior F Grade doctors possess these skills.

Neither of these positions is supported by evidence, and NICE and the NPSA has specifically recommended that the most junior grades of doctor do not make decisions about critical illness (NICE 2007, NPSA 2007). These recommendations are largely based on the many case reviews such as those undertaken by NCEPOD in its successive reports.

What effect is the MEWS having upon the clinical activities of nurses? EWS were conceived to solve the problem that critically ill patients were often discovered to have been showing minor signs that should have given cause for concern prior to the 'discovery' of their collapse. By providing a way to aggregate these minor physiological disturbances a more reliable marker of impending clinical deterioration was presumed to be obtained. As these previously stable patients were predominantly in the care of nurses, the EWS can be interpreted as a way of circumventing the necessity for them to be able to recognise a deteriorating patient from the application of basic clinical knowledge.

In their interviews the nurses did not accept that they were unable to identify deteriorating patients. They repeatedly referred to their clinical skills and experience as part of the team's armamentarium in evaluating physiological instability. Surprisingly none of them volunteered the thought that MEWS was undermining them as clinicians. This may be because the junior medical staff often try to avoid having to personally assess the patient and actively seek the nurses opinions when a MEWS call is made. Some versions of MET alerting criteria actually invite nurses to participate by including the extra scoring factor 'nurse concern'. This has been reported to improve the validity of trigger states (Douw, Huisman-de Waal et al. 2016). It is not clear from the literature what position the proponents of EWSs are adopting concerning nursing assessment of patients at risk, or whether there are a variety of views. From a nursing perspective it is not desirable to undermine the nurses contribution, or to see protocol-based care substituting for the teaching of basic clinical assessment.

Griffiths and Ball have published a review of NHS data on hospital mortality and correlated it with figures for RN, Healthcare Assistant and Doctor staffing levels. They found an association of higher levels of RN staffing with reduced mortality (p=0.02); higher levels of doctor staffing with reduced mortality (p=0.01); whilst *lower* levels of 'healthcare worker' staffing were associated with reduced mortality (p=0.04) (Griffiths, Ball et al. 2016). The authors write that is plausible to conclude that higher levels of RN staffing correlate with improved patient outcomes. Further, these data suggest that boosting staffing levels by increasing the Healthcare Assistant staffing at the expense of RN staffing does not have an impact on outcomes. However, none of these relationships can be shown to be causal.

7.7 Alternatives to MEWS

7.7.1 Do EWS and MET shore up a broken model of care?

It is possible that the MEWS system is shoring up a broken model of ward care (Litvak and Pronovost 2010). All of the consultants and some of the more senior STs interviewed in the course of this research were of the opinion that the MEWS diverted attention from what they identified as the real issue: that doctors and nurses who look after unstable patients do not possess the necessary knowledge and skills. This is a position that has been expressed by both NICE and NCEPOD (NICE 2007, NCEPOD 2012, NCEPOD 2015). One intensive care specialist who was interviewed for this study

was particularly emphatic. She saw RRSs as a poor second to better staffing and better education and regretted that the present focus on RRSs was diverting energies away from providing better training in the management of acute illness for doctors and nurses.

In their 2015 review of Rapid Response Teams White and Scott note that they may be compensating for deficiencies in the routine standard of care, such as lack of suitably experienced clinicians (White, Scott et al. 2015). Braithwaite and De Vita (Braithwaite, DeVita et al. 2004) found that 30% of RRT calls were for deterioration resulting from medical errors. Kaplan and Maerz reported that more than 75% of calls to a surgical unit were due to what they classified as avoidable errors (Kaplan, Maerz et al. 2009).

Ward patients *do* deteriorate unexpectedly and *retrospective* review indicates that many of them could have been better managed in the early stages. That they ended up being critically ill, in ICU, indicates that things did not go well and clinical reviewers have the advantage of hindsight. At the time however the outcome of a confused tangle of problems might not seem obvious. It is possible that, at the time the MEWS score rose, the necessary responses were not clear.

It can be speculated, on the basis of the inconsistent evidence discussed previously, that ICU care of the patient who collapses on the ward may not significantly alter the outcome in some patients. If this is the case the EWS will not improve outcome because the key element of admitting to ICU makes little difference. In retrospective reviews such as those by NCEPOD reviewers can seize upon an apparent error in management but they cannot know whether this would have changed the outcome. Perhaps the apparent failure of EWSs and METs to improve overall outcome reflects the fact that that the subset of patients whose course can be changed is small compared with those whose decline was unavoidable, and their improved outcome is lost in the data.

There is some evidence from retrospective reviews, however, that delayed activation of an MET is associated with worse outcome (Calzavacca, Licari et al. 2010, Tirkkonen, Yla-Mattila et al. 2013, Boniatti, Azzolini et al. 2014). If the argument that poor outcomes result from delay in involving the doctors with special skills in critical care is correct, then there is no consistent evidence that MEWS or MET reliably makes their involvement more timely. In the case of a MET, the evidence suggests that the 'home

team' will delay calling whilst attempting to resolve problems themselves (Marshall, Kitto et al. 2011, Shearer, Marshall et al. 2012, Roberts, Bonafide et al. 2014, Douglas, Osborne et al. 2016). In the current study of MEWS without an MET, the doctor to whom the nurses report a raised MEWS is too inexperienced to make the necessary clinical decisions (NICE 2007). There is no empirical data to substantiate the fact that inexperience led to indecision and delay but the F1 doctors reported not knowing what to do, and were concerned about delays that occurred because they were unable to get timely advice from their seniors. The nurses also said that they were sometimes worried because the medical decision-making could be slow following a trigger event.

Mews identifies a cohort of patients of whom 10% or less will deteriorate. In addition, a further large cohort of patients will deteriorate without warning. Therefore the validity of the MEWS score is low in finding those patients who will develop critical illness. Furthermore, MEWS does not necessarily deliver a suitably skilled doctor at the bedside. By formally handing the role of evaluating the patient to inexperienced doctors it may actually delay referral to critical care.

The responses in this research, and reports in the literature indicate that the use of MEWS to improve and accelerate the management of patient deterioration may be flawed. It appears to be an expedient measure dictated by the lack of availability of experienced doctors and of nurses with reliable clinical skills.

Kitto and Marshall have commented:

> *"We argue that the implementation of the formal RRS into a hospital structure and clinical processes is a technical solution to a problem that actually requires socio-cultural considerations"(Kitto, Marshall et al. 2015)*

They analysed the behaviour of RRTs using the concept of Collective Competence, common in the education literature, but adapting it to define a collective incompetence. My findings confirm the suggestions of Kitto, Marshall et al, that a form of collective incompetence was present (Table 13) , and I suggest that the disordered teamwork came from the existence of distinct profession-based mental models of practice, underpinned by different epistemologies.

Table 13. Collective Incompetence and Collective Competence

Collective Competence	Collective Incompetence
1. Making collective sense of events in the workplace	1. The existence of multiple profession-based understandings of events in the workplace that drive clinical behaviours
2. Developing and using a collective knowledge base	2. The practice of multiple profession-based development and usage of knowledge
3. Developing a sense of interdependency	3. A prevailing sense of profession-based intra-dependency

The positivist epistemology of medical practice has a tendency to prompt the development of technical solutions to problems that are deeply complex and depend, amongst other things, on the attitudes and behaviours of those who use them. Some of the 'evidence-based medicine' developments can be criticised in this way (Fins 2016). By their presumption that clinicians simply do not know the evidence they miss the point that even clinicians who do know the evidence will choose to respond to other, often socio-cultural influences on their practice. Timmermans and Mauk have noted:

"Studies show, however, that few guidelines lead to consistent changes in provider behaviour. The hopes, fears, and mixed record of EBM are rooted in the traditional professional perspective of the clinician as sole decision-maker. Multifaceted implementation strategies that take the collaborative nature of medical work into consideration promise more effective changes in clinical practice" (Timmermans and Mauck 2005).

Whenever any new development becomes generally available it will be modified and developed by third parties. Modifications and uses that can be submitted to evaluation will be more generally adopted, whereas adaptations that do not stand scrutiny will wither away. Sometimes however the users are less critical than the original developers, and it is tempting to accept research that validates a system for one purpose as validating it more generally. This is the misalignment error of protocols described by Kavanagh (Kavanagh and Nurok 2016). Measures of severity and outcome such as APACHE II were painstakingly developed and refined. They are relatively complex and time consuming, but still do not predict future progress with sufficient certainty to be used to guide the management of individual cases. It is unsurprising that analysis of MEWS scores demonstrates that patients with severe derangement of their vital signs do less well than those with minor abnormalities.

Mews is calibrated to detect these more minor signs. It is a mistake to draw any conclusion from the MEWS score other than that sicker patients do less well. Mews is doing its job when it draws attention to a patient with a score of 4, and that patient should be considered as promptly and as carefully as a patient with a higher score. In my study the medical team explained how they prioritised calls to MEWS triggers according to the figure. Two of the examples of MEWS use given by the nurses described patients that were not visited by the doctor in response to an initial low trigger score but who were subsequently transferred to ICU following a call for a higher MEWS. In these patients there had been delay in starting adequate treatment that the nurses attributed to the medical team not assessing the patient earlier. Such delays are associated with worse outcome. If such cases are common then they may contribute to the poor outcome of MEWS.

The question arises as to whether MEWS is useful but has a performance that is damaged by the way it is applied, or whether it will never work satisfactorily because it is an attempt to sustain a seriously flawed system. In old-fashioned Nightingale wards the patients were unofficially stratified in accordance with how Sister perceived their risk – sickest and most unpredictable, nearest to the nurses desk! In discussing the issues of nurse staffing Rischbieth has proposed a system that allocates resources according to risk as perceived by the nursing team. (Rischbieth 2006). If the ward staff has constant sight of the sick patients and patients suspected to be unstable then their worsening condition is more likely to be noticed promptly than if they are out of sight in a single room.

7.7.2   Education

Rapid Response Systems are protocols that attempt to secure earlier involvement of more senior doctors, and doctors with critical care skills when a patient is at risk of deterioration. This approach has been developed partly because nurses and junior doctors lack the necessary skills and knowledge. An alternative approach has been to improve training in the immediate management of acute illness by institution-wide initiatives for all staff that have the responsibility for the first response. This is the rationale for teaching initiatives such as ALERT™ (Smith, Osgood et al. 2002) and FIRST2ACT (Buykx, Kinsman et al. 2011).

Originally developed in 1999, ALERT™ is a multi-professional course helping staff to recognise and treat patient deterioration. Attending such a course has been demonstrated to improve confidence in the management of critical illness (Featherstone, Smith et al. 2005) but there are no reports of improved patient outcome following its introduction. In 2009 Spearpoint, Gruber et al. reported improvements in the prevalence of cardiopulmonary arrest and of outcome of resuscitation attempts following the hospital-wide introduction of Intermediate Life Support training (Spearpoint, Gruber et al. 2009). Their six-year audit, however, covered a period when significant changes in management of cardiopulmonary arrest were introduced.

FIRST2ACT is a simulator-based course for first responder nurses. It has been used as an accompaniment to introducing METs in Australian hospitals (Endacott, Bogossian et al. 2015, Cooper, Team et al. 2013). The Australian teams now deliver a specialised First2Act programme to staff as an accompaniment to their use of METs (Cooper, Team et al. 2013, Porter, Team et al. 2013). Preliminary reports suggest that this is finally beginning to bring about improvements in outcomes. A recent study has reported improved performance of the RRS afferent limb when associated with a targeted, web-based educational programme (Liaw, Wong et al. 2016). Subjects showed improved knowledge after the programme and performed better at assessing patients. Kinsman, Buykx et al found improved record keeping for vital signs and pain scoring after a First2Act course (Kinsman, Buykx et al. 2012) but no change in the use of timely oxygen therapy – a crucial element of early intervention for patient deterioration.

Connell, Endacott et al have recently published a review of the effectiveness of education on the management of patient deterioration. A systematic review of the literature from 2002 and 2004 was conducted. The review included twenty-three studies and concluded that educational interventions designed to improve the recognition and management of patient deterioration can improve learner outcomes. Use of medium to high-fidelity simulation in these programmes improved their effectiveness (Connell, Endacott et al. 2016). O'Leary, Nash et al found that education that included simulation improved knowledge and self-efficacy in nurses' recognition of patient deterioration (O'Leary, Nash et al. 2016). In another review of seventeen studies of education for detecting patient deterioration Massey, Chaboyer et al identified four themes: (1) assessing the patient; (2) knowing the patient; (3) education and (4) environmental factors. Three themes for responding to patient deterioration were found; (1) non-

technical skills; (2) access to support and (3) negative emotional responses (Massey, Chaboyer et al. 2016).

Liaw and Wong have conducted a controlled trial of the effect of a web based educational programme versus no intervention, on the performance of RNs in the simulated assessment of a deteriorating patient scenario in an intermediate fidelity environment (Liaw, Wong et al. 2016). The nurses also undertook an MCQ test. They found that the nurses who had undertaken the programme were better at remembering to record vital signs and had better theoretical knowledge than the no intervention group. They did not examine whether this effect persisted – which is the major point of interest as the 'intervention' group were in effect told the answers before the test.

Those who believe that the fundamental problem is the inexperience and ignorance of the bedside nurses and the first responder doctors favour this educational approach (Connell, Endacott et al. 2016). They point to the fact that glitches in the system and prevarication by the teams continues to obstruct the involvement of critical care specialists, even when mandatory protocols are in place. The only solution, it is argued, is to ensure that junior doctors and nurses are able to instantly recognise critical illness and fully understand the urgency of skilled intervention.

Specific teaching about the management of severe illness thus improves the performance and confidence of doctors and nurses who have undertaken it but cannot be shown to change hospital outcomes in terms of mortality.

Enthusiasts for RRS have observed that its efficacy improves with experience and persistence (White, Scott et al. 2015, Liaw, Wong et al. 2016). As experience with RRSs has increased, its advocates have stressed a number of issues:

- RRSs must be introduced with a full educational programme for staff.
- The full programme must be delivered to all new staff.
- Frequent updates are needed.
- Outcomes must be monitored.

Figure 13 shows how the automatic protocol affects the stages of evaluation of a patient following a 'trigger' score.

Figure 13. The Lines Of Referral For A Deteriorating Patient.

The blue boxes are stages in the process where decisions are supposed to be protocol driven. The red boxes show places where the decision is 'high risk' because the individual has no special experience of critical care. The green boxes are decisions by individuals
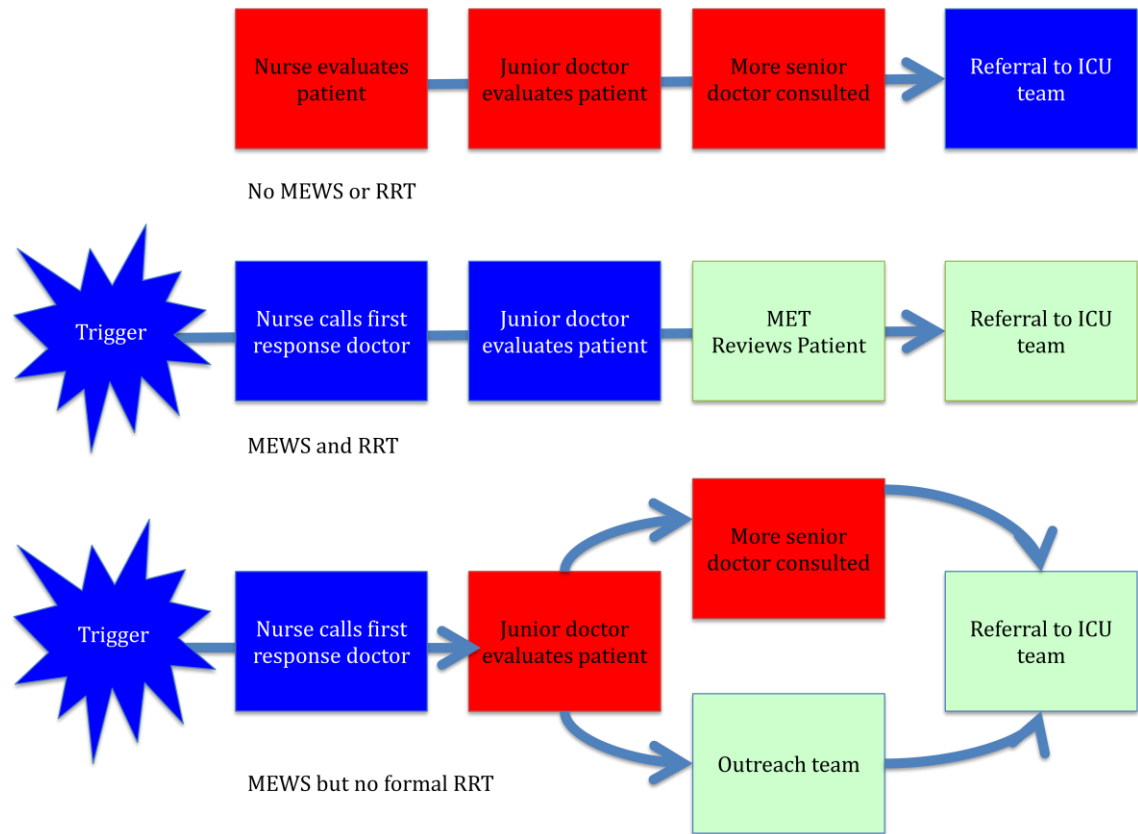
7.7.3 Does a MEWS/RRS serve its intended purpose

The various protocols used for RRSs are intended to draw attention to patients at risk. In hospitals that have emergency teams this should lead to the patient being reviewed by specialists in critical care.

This would eliminate the need for very junior doctors to make a very difficult clinical decision for which they are ill prepared. The diagram in figure 13 (page 224) shows how, whereas a full RRS can eliminate risky evaluations of the patient by doctors and nurses with no critical care experience the system in use during my study leaves the most junior doctor in a quandary – " Shall I get help, and if so who from?" From the evidence of the interviews in this study the medical staff are so busy they have to decide whether or not to visit the patient and then have to decide whether to refer the patient

for more experienced assistance. A protocol will not eliminate this difficult decision making, unless a trigger occurrence is treated as mandatory, and the system is well enough staffed for the junior doctor to have time to deal properly with each call, and for the specialist response team to be always available.

The development of MEWS was predicated on the belief that patient deterioration was missed either because the nurse did not grasp the significance of the patients' subtle physiological changes or did not make the necessary observations. This would lead to the signs of trouble not being reported to the medical team. There are more reasons for action not being taken than this:

- Missed vital signs observations
- Nurse Fails to understand the significance of observations
- Nurse fails to succeed in passing the information to the doctor
- Doctor does not act upon the information
- Doctor does review the patient but mistakenly thinks there is no cause for concern
- Doctor institutes incorrect action
- Doctor fails to succeed in recruiting more experienced advice

Only the nurse's failure to understand the significance of the observations is reliably eliminated by the MEWS protocol, and even this remains a consideration because the nurse's interpretation of the signs determines the level of urgency that is communicated to the doctor.

MEWS was developed because audit showed that signs of trouble had often been neglected in patients who reached ICU. So compelling was the argument that these patients could be detected earlier, that no studies were done to determine what factors had led to staff not acting at an early stage. It is possible that the MEWS and RRS does not address these factors.

7.8 Conclusions

The operation of the MEWS protocols in the populations studied was very far from being a simple application of an algorithm. Both the medical and nursing teams trusted the data. There were no opinions expressed or anecdotes told about problems with the

vital signs data collection and interpretation by the carers. It might, indeed, have been patchy, inaccurate or incorrectly calculated, but this research was not able to show that. The medical team, nursing team and managers were all satisfied that it was accurate, reliable and timely and doubts about the data were not a factor that the teams considered in making their responses. This confidence in the data is probably misplaced as studies have shown a high incidence of errors (Chellel, Fraser et al. 2002, Smith and Oakey 2006, Bellomo, Ackerman et al. 2012).

The first-responder, home-team doctors simply ignored the mandatory nature of the protocol and debated with the nurse whether or not they needed to attend in person. They prioritised MEWS generated calls below much of their other work. This was understood and accepted by their seniors. It was understood, but was a source of anxiety, by the nursing team.

The impact of a protocol on the routines of work can be profound, and the teams that develop them may not take their side effects into consideration. Indeed the effects may not be apparent prior to adoption. It is, on the face of it, reasonable to ask a doctor to drop what they are doing and hasten to help a collapsing patient. It is less reasonable to ask them to interrupt their possibly important work to hasten to the bedsides of patients with minor physiological signs who have a one in ten chance of serious deterioration some time in the next few hours. The MEWS does not appear to have high enough face-validity for the doctors to understand the necessity to prioritise it highly. The interviewees from the ward teams all supported the use of MEWS and spoke highly of its value. The actions of the doctor's were at odds with the positive opinions and attitude they expressed.

The research here reported leads to the suggestion that protocols that affect behaviour should be examined in the prior context of the attitudes and work habits of the staff affected. A new way of working, determined by a protocol, may reveal that staff has deficiencies in their knowledge and skills. At the same time the impact of the new way of working may require consideration of the systems in place.

One of the important aspects of this research was the snapshot it presented of the difficulties of conducting high quality medical and nursing practice in a very busy environment. Everyone I interviewed was positive about their part in caring for

critically ill patients. They were also strikingly supportive of the contribution of the whole team. What emerged was a picture of a workplace where the junior doctors considered themselves very over-worked, a view confirmed by their consultants and the nursing team. The junior doctors also admitted that on some important occasions they were out of their depth and that it was difficult for them to get help.

The lack of help reflected the fact that their clinical supervisors, the ST doctors, were themselves trying to do their own work whilst at the same time providing support. It also reflected the fact that the lines of communication and responsibility were tangled and the responsibilities imprecise. Though this project was not designed to investigate this issue it seems reasonable to conclude that a RRS cannot be expected to make good deficiencies in numbers of staff and lack of knowledge.

CHAPTER EIGHT: CONCLUSION AND REFLECTIONS

8   CONCLUSION AND REFLECTIONS

This chapter comprises reflections on the study. The chapter is divided into three sections. The first section describes the key understandings that I have gained. The second sets out the lessons that key professionals can learn from the work. In the third section I discuss how the theory I have developed can be further explored.

8.1   Theory Constructed From This Study

Unexpected, sudden patient deterioration is indeed unexpected, sudden and sometimes catastrophic, rapidly becoming irreversible. It occurs unpredictably amongst the cohort of apparently uncomplicated patients. The window of opportunity for treatment may be as short as a few minutes. MEWS attempts, in advance, to identify patients, at particular risk of collapsing, and to mobilise remedies in advance of catastrophe. The epidemiology of sudden major deterioration remains unclear, but its prevalence is low so that only by mobilising teams to many patients can these few patients be caught in the act of deterioration.

One of the functions of qualitative research is to generate theory. Grounded theory was developed to systematically 'discover' theory that was hidden within the data (Glaser 1965). Qualitative analysis allows the development of concepts that help describe and explain the phenomena observed, and some of these may be examined using other methodologies that confirm or deny them (Silverman 2013). One of the criteria by which the success of a qualitative enquiry can be judged is by the questions it raises and whether new theory is offered (Charmaz 2008, Charmaz 2014). Has my investigation raised significant questions and theory? The theory developed from this study is shown in Figure 14.

Figure 14 The Theory Developed From This Study
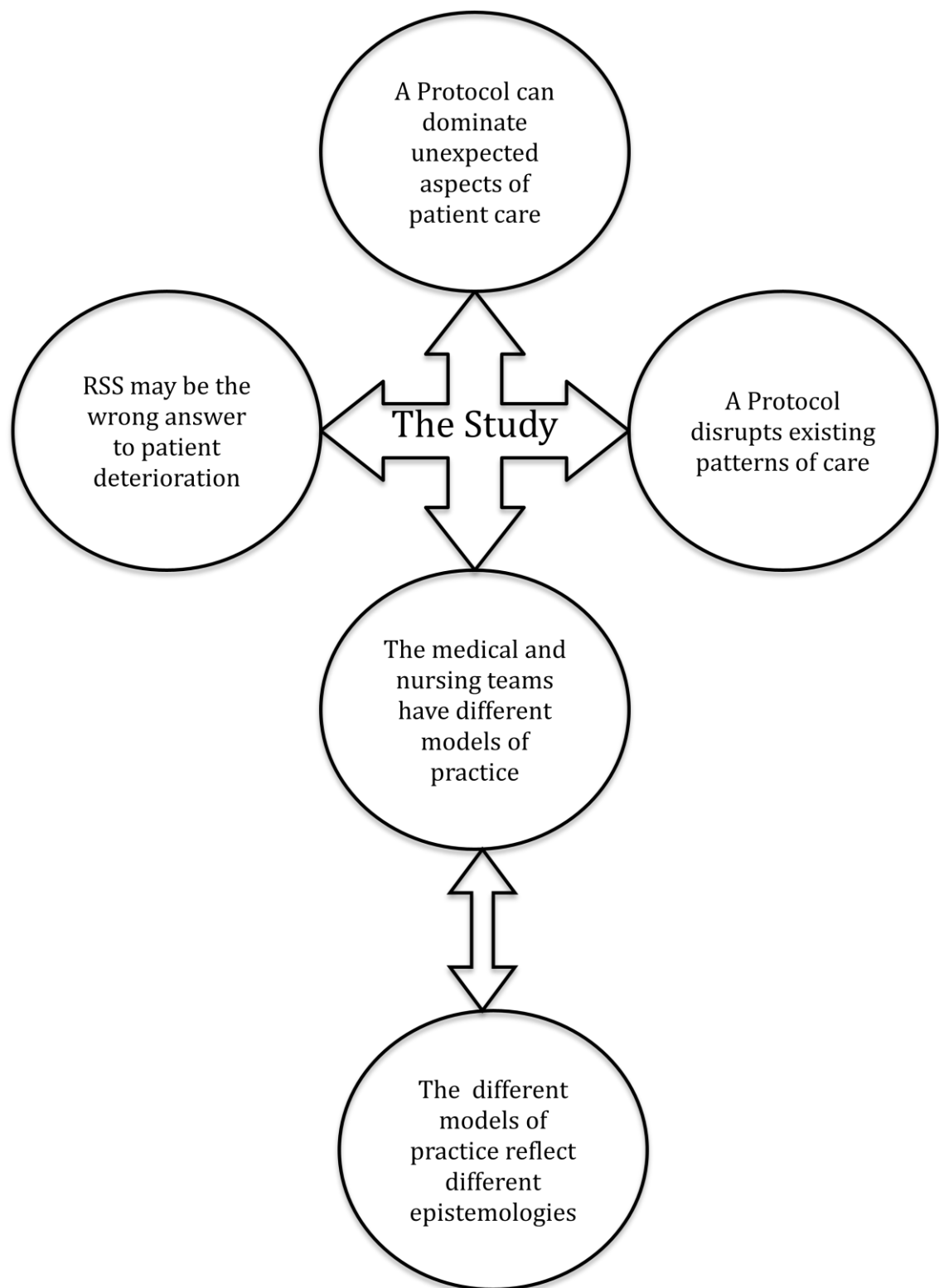
8.1.1   A protocol can unexpectedly dominate patient care

In this study the EWS protocol appeared, unexpectedly, to affect the way doctors and
nurses used other evidence. For instance, general indications that a patient was giving
cause for concern, such as worsening pain, were reported to be treated less seriously if
the MEWS score was low. Without a scoring system the nurse and doctor would discuss
the patient to decide if there was a problem. With a score to hand, the nurses reported
that the doctors would ask immediately what the score was and were slow to accept the
need for review if it was low. MEWS uses data that is available for all, or most, eligible
patients but individual patients may exhibit other, unusual signs and symptoms that
should be properly investigated and interpreted. The nurses and healthcare assistants
said they were frustrated by the way their intuitions about care were ignored. Those
with experience from before the introduction of MEWS said that they had more
difficulty getting their views heard than they did previously. The introduction of a
protocol for clinical management downgrades evidence that is not in the protocols
mainstream.

8.1.2   A New Protocol Disrupts Existing Patterns Of Work

Introducing a protocol cuts across existing relationships, socio-cultural and professional.
The major change of practice brings work covered by the protocol into a consistent form
but it may disrupt areas outside its remit. This can be seen to be the case with the
clinical work of nurses and care assistants. Even if the work within the protocol is done
well, the fact remains that their clinical contribution to assessing patients is less
regarded. For the junior doctors the MEWS appears to increase the number of patients
in their care about whom there is uncertainty. Most of these extra patients will have
uncomplicated courses but the protocol draws attention to them as patients about whom
the doctor needs to be concerned. Thus MEWS increases the task and cognitive load for
the doctor, which leads to increasing stress and anxiety.

8.1.3   The Medical and Nursing Teams Have Different Models of Practice

Only during the course of this research did I come to the realisation that doctors and
nurses had separate perceptions of the RRS. They appear to work to different mental
models. Further work is needed to discover whether they understand this disjunction.

Do they understand the mental model of the other professionals to be different, or do they believe that they have the same objectives?

8.1.3.1 The Different Models of Practice Reflect Different Epistemologies

It is unlikely that most doctors (Ruitenberg and Mayo 2014 page 1-4) and nurses (Bishop and Scudder 1990, Kozier 2008 page 38-49) understand philosophical concepts about the basis of the clinical practice, as there is little formal teaching (often none) about these issues in undergraduate or postgraduate education. During this research I have developed the idea that a reason for doctors and nurses working to different mental models is that there are different understandings of knowledge in their professions – different epistemologies. Nurses may hold ideas of clinical purpose in relativist terms whereas doctors hold them in positivist terms. Montgomery has argued that medicine is not practiced as a positivist, reductionist science, arguing that clinical process is much more nuanced than this (Montgomery 2006). Nevertheless the most junior doctors interviewed in this study expressed a strongly positivist response to MEWS alerts.

8.1.4 RSS May Be The Wrong Answer To Managing Unexpected Patient Deterioration

As discussed in Chapter 8 section recent studies and reviews have raised the issue of whether the RRS is the right answer to dealing with unexpected patient deterioration or whether it is supporting a fundamentally failing system of care. This study does not have anything to say directly about this issue but some ideas arise. From the interviews it emerged that rather than rapid referral of all patients to critical care specialists, the first responder doctors engaged in a difficult triaging exercise, for which they had neither the necessary knowledge nor experience. The number of alerts generated necessitated this approach. Researchers have attempted to improve the specificity of the trigger criteria without success. It is likely that any EWS that identifies most of the patients who are destined to deteriorate will generate a similar load of false positives.

8.2 Lessons From This Study

It is clear from the literature and from the evidence of the interviews in this study that national and international introduction of systems for dealing with sudden patient

deterioration are fragmented and that the local systems investigated were introduced without ongoing education and audit of their affects, both specific and in the wider field of work.

8.2.1 Lessons For Junior Doctors and nurses

This study has revealed something very important: doctors and nurses working together in multi-professional teams may have separate mental models of the tasks in hand. This results in them having different goals. In the case of detecting and managing incipient patient deterioration the goal of making the patient better is shared, but the nurses focus is otherwise on the continuing care and wellbeing of the patient; whereas the doctors focus is to understand the situation well enough to prescribe appropriate treatment.

Postgraduate medical and nurse education should include teaching about inter-professional working. Team members must clearly understand the roles of their colleagues in cooperative working. As a nurse attending patients with cardiac arrests and other critical events on general wards, I have been surprised and annoyed by the way the ward staff fade away. There could be a variety of reasons for this and responsibility may lie with the ward staff or with the specialist team. It is unlikely that such an abrupt change of carers is in the patients' interests and in the case I related in Chapter 1 (Section 1.1) it contributed to the patients death.

8.2.2 Lessons for Senior Medical Staff and Managers

When any change of practice is introduced it must be incorporated into existing systems by all professions and grades. Teaching staff to know the protocol is insufficient. They must clearly understand its objectives and how these are achieved. This will require education, planned over the period of introduction. The consequences should be audited. In the current case feedback should have been sought regarding the workload imposed by MEWS. Audit of how this was dealt with would have revealed that that junior doctors were unable to use the system as intended.

In this study the senior doctors expressed doubts about the way the system worked. The senior nurses and managers did not look beyond auditing the rate of alerting following a trigger score – which they claimed to be nearly 100%. They had no data on how staff

subsequently dealt with the event. There were no ongoing programmes reviewing and auditing MEWS. Such education probably needs to continue indefinitely.

8.2.3 Lessons for protocol developers

Two decades ago any clinician with the inclination could produce a protocol or guideline for management and promote it to colleagues. Often specialist societies would take up the cause and recommend it to their members (Mancia, De Backer et al. 2007). With the realisation that protocols can embed bad medicine as effectively as good, have come schemes of criteria for quality controlling the processes of development (Berg 1997, The AGREE Collaboration 2003 , Brouwers M 2010). When major specialist societies such as Royal Colleges and agencies with responsibility for quality of care, such as the National Institute for Healthcare Excellence (NICE) throw their weight behind recommendations their subsequent wide adoption is a big responsibility for the guideline developers.

Guidelines are often associated with the move towards 'evidence based care' and there has been criticism that they short-circuit careful clinical evaluation of care. Whilst this can be expected to improve the average quality of care there will be losers as well as winners. What has received much less attention is the process of guideline introduction and the effect that this has on existing systems of work. Such systems have socio-cultural elements as well as established therapeutic routines. Shearer, Marshall et al (2012) recently commented upon this, in connection with METs (Shearer, Marshall et al. 2012). I suggest that protocol development should be preceded by careful consideration of existing practice, asking:

- Is there a problem in existing patient care that often worsens outcome? This question should be addressed by a comprehensive review augmented if necessary by further research.
- How will the new guideline/protocol affect this problem?
- Is it certain that the changes in management imposed by the guideline/protocol will improve management?
- How will the changed work practices affect existing professional and socio-cultural structures within the community responsible for managing these patients?

- What will be the impact of the new working practice on overall activity?

Submitting EWSs and RSSs to this analysis we find:

- An assumption was made that patients experiencing apparently delayed admission to ICU would fare better with earlier critical care intervention. This remains unproven – despite the high face validity of the concept.
- MEWS/RRS should lead to earlier ICU involvement. After the fact analysis shows a high proportion of missed alerts. Were they predictable?
- The ideal of rapid, informed review of patients was likely to be subverted by the pressure of work on all staff.
- Existing work practices cause socio-cultural pressures on staff to cope independently. Professional training pushes trainee doctors and junior nurses to express and demonstrate self-efficacy. Nurses did not like being disempowered by the system.
- After the fact research has demonstrated that the balance of sensitivity with specificity produces a high workload of negative reviews when the system is set to discover most patients who show minor instabilities prior to deteriorating.

Protocol and guideline developers should pay attention to the socio-cultural and professional consequences of their proposals.

8.3 Evaluating the Role of the Researcher

A PhD study is simultaneously a learning exercise in research methods and an attempt to make original observations. The thesis itself is sometimes published as a book, but a more frequent approach is to write papers for publication in academic journals, drawing upon the materials in the thesis. In year three of my studies I was in possession of what I believed to be significant data and wanted to share my findings. This was however a rather intimidating prospect. Some of my theorising about mental models, epistemology and protocols is not represented in the literature and lies outside of my normal field of work. Presenting these ideas might be seen as presumptuous. As a nurse I was straying into fields more commonly reserved for doctors, and again I found the prospect of presenting these ideas in multi-professional forums scary.

At my first international conference in London (Dec 2014) I presented a poster and was highly commended for it. This was my first poster presentation for the study, and the experience itself was valuable. The challenging of my methodology, and the findings from the medical judges tested out my responses, and gave me insight into this arena. My confidence in my work increased as did my motivation to 'get it out there'. At the same time I was also feeling terrified by self-doubt, that, laid bare as a novice researcher, I might make a false step or find my arguments unravelling. This PhD has been a surprising journey from novice to a position where I am prepared to stand in front of a large, knowledgeable, professional audience and offer ideas from outside the mainstream!

My first attempt at a written submission to a journal met with an immediate rejection by the editor – within 24 hours. The reason given was that the journal rarely published qualitative research. This was disappointing as this journal is a major forum for articles relating to the subject field of adult deterioration from influential authors. I wanted my study to reach as broad a readership as possible. Following a further rejection by the British Journal of Anaesthesia I was invited by the editor to submit an e-letter which I did. This was later selected for journal publication. My submission of abstracts to conferences of professionals with specific interests in METs have led to invitations to submit posters but no invitation to make an oral presentation.

In April 2015 I made an oral presentation at the RCN International research Conference. This experience was valuable in terms of articulating my study to a wide audience and refining my thinking and learning to defend my arguments. In May I travelled to Amsterdam to present a poster at the 11th International Medical Emergency Teams conference. As one door closed with the Journal rejection, another door opened in Amsterdam and the audience I had sought were present and encouraging in their feedback. I realised how important it has been to get this feedback in year 4 when I was still in the process of analysis. The feedback from the two journal rejections (editor and reviewers) enabled me to consider new literature as well as to test some of my assumptions of the analysis. I would recommend dissemination at this stage as without it my study risked being narrow and unchallenged. In November 2015 I presented a poster at the National Confidential Enquiry Patient Outcome and Death (NCEPOD) 'surviving sepsis' publication launch. I was highly commended by the chair of NCEPOD and have in April 2016 being approached to submit my poster to their

website. During all of my experiences of dissemination to date I have received similar feedback to the study, that it is valuable, interesting and makes absolute sense to large organisations attempting whole systems change.

I have found the difficulty of disseminating my findings very disappointing. I believe that my data has revealed a phenomenon that has not been explicitly identified previously. That is: that members of a clinical team can hold different, profession dependent models of practice. This gives some insight into why team members behave as they do. My more tentative suggestion is that these models of practice stem from professions possessing different ontologies and epistemologies. If this finding were substantiated it would have impact on the way protocols and guidelines are presented to workers and how clinical teams operate.

These outcomes have been disappointing but from them I have learned that consideration must be given to how a work will be published at the time it is planned. The design must be suitable for a publication style suited for the target journal. Work from a PhD thesis is handicapped because it is designed to demonstrate proficiency in the field of research rather than to tailor make publications. I expected my findings to be as interesting to doctors as to nurses. The authors of the existing literature on social and cultural effects on EWS and RRS are predominantly medically qualified and their publications have been in journals that are considered to primarily target doctors. Such journals frequently publish nurse led research but authors are mostly doctors.

My research has been in an area of multi-professional practice in acute care. Journals catering to those with such interests are quite polarised as being aimed at a medical or a nursing professionals. Reaching both these constituencies presents difficulty for an author.

I remain convinced of the value of early presentation of suitable findings both in terms of the formative effect on the development of arguments within the project but also because finishing a thesis is a long technical process. Waiting until this is finished risks being overtaken by events and loosing primacy for original ideas.

8.4   Suggestions For Further Research

8.4.1   Statistics and epidemiology

A problem encountered during this research project was that there is insufficient data relating to the epidemiology of sudden unexpected patient deterioration. In the first place there is no clear definition of what it is. Without an accepted definition it is difficult to compare outcomes. Secondly, existing studies do not say how many patients are re-designated as unsuitable for further care, or have DNAR status agreed. These reduce the number of ICU admissions without affecting outcome. Thirdly, the number of patients suffering some sort of collapse is often given as the number of unexpected ICU admissions. No definition of an unplanned ICU admission exists and this figure is influenced by the availability of beds and also by the experience of the doctor doing the review. Inexperienced doctors are likely to admit patients if there is a bed available because they cannot confidently make the high-stakes decision not to admit. Finally the denominator figure is usually unknown, making it impossible to know the prevalence. A multi-centre study of prevalence and the use of standard definitions would clear up some controversies.

8.4.2   Inter-professional Understanding

Little is known about the mental models of doctors and nurses working in teams. A further project would be to interview clinical staff, asking questions about their beliefs, and to analyse the interviews for clues to how each group conceptualises the same clinical task. Having significantly different understandings of clinical knowledge, and of the clinical project, would be a complicating factor in inter-professional working. Another question would be how these understandings change with time, whether they become explicit with experience and what factors increase an individual's insight into their relationship with other professionals.

8.4.3   Protocols

If my observations about the introduction of protocols can be supported they have very wide application. I think this is particularly the case in the very many occasions where a clinician develops a set of guidelines or a protocol for use in their unit or hospital. Without the authority of a national society it is very likely that the staff will subvert the intended system, using it in the ways that seem to best simplify their personal needs. A

system for assessing the likely socio-cultural and professional impact of a protocol and for monitoring its effect on these might be a useful development.

8.4.4   The Nurses' Role As Clinicians

I did not explicitly explore the nurses' role in the evaluation and management of their patients. The EWS was reported to have the effect of diminishing their responsibilities in this area. The use of automated systems such as VIEWS risks further reducing their autonomy. More research is needed to investigate the consequences of de-skilling the workforce in this way. This is very relevant in the context of the research by Griffiths demonstrating that mortality rates rise as care assistants are substituted for registered nurses (Griffiths, Ball et al. 2016). This aspect of the work of registered nurses and care assistants needs more explanation.

8.5   My Claim to Originality

As I have discussed above (9.1) and in chapter 3, grounded theory by its nature discovers or constructs theory from the qualitative data. At the outset of this project I had ideas (sensitising concepts) developed largely from my experience. Most of these were, in the event, not supported by the data. Analysis took me in unexpected directions. The evidence from the study helped me to interpret the literature and sometimes draw conclusions from it. Two lines of thought do not seem to have been published before – at least not in similar contexts.

- There is a large literature about nurses' mental models and a much smaller literature on those of doctors. I cannot find reference to the consequences that follow from medical and nursing teams working together to accomplish a task, but with incongruent definitions of success.
- I can find no significant study of the problems of incorporating a new protocol into existing teams with well-established socio-cultural and professional boundaries. The consequences are probably similar to the introduction of advanced nursing and advanced practitioner roles that cross existing lines of responsibility.

At the start of this research it was hoped to find some evidence, and a possible explanation of why doctors do not always follow the RRS protocol as required. It

was also hoped that the work would add to current understandings of why RRSs often have no demonstrable effect on patient outcomes. Following this research it is possible to say that the most significant reason for lapses in the protocol is that the doctors are simply too busy. They prioritise *all* their tasks, and responding to MEWS alerts takes its turn along with everything else, frequently leading to delay in attending to review a patient whose observations have exceeded the MEWS calling criteria. This negates the objective of the MEWS: to jump such patients to the top of the queue. The consequence of this will be that some patients, whose other signs of deterioration were unremarkable; will not be identified until later.

The implication of this finding, taken in the context of what is already known about MEWS, is that patients who deteriorate without warning, patients whose scoring is omitted or miscalculated and patients who are not reviewed following a trigger event comprise a significant proportion of the cohort of patients who deteriorate. These groups of patients could not be expected benefit from the use of a RRS and this means that a larger overall sample would be needed to show statistically significant improvement in outcome following its introduction.

Turning to why the doctors and nurses behave as they do, the most significant theory emerging from this research is that the medical and nursing teams have different mental models of practice. Their overall model is shared and they aspire to the same outcomes, but their understandings of the mechanisms of the details of practice appear to be different.

I have characterised the medical approach as: evaluate then treat. The doctors' involvement was intermittent and targeted events. The doctors' narratives dwelt upon the difficulty of getting through the many tasks with which they were presented. These tasks involved many different activities with many different patients. Their day was very fragmented. It is easy to understand that their priority is to simplify this complexity by eliminating unnecessary activities – including patient reviews precipitated by MEWS. They described allocating higher priority to patients with higher MEWS scores and those about whom the nursing team had particular concerns.

The nursing approach emphasised the continuity of caring for the patient in which context a visit by the doctor was usually a useful contribution. For the nurse at the bedside a MEWS call and medical review was a part of a continuous process of care, and they were involved with a smaller number of patients. The nursing narratives dwelt upon the uncertainty created by an apparently well patient breaching the MEWS trigger criteria. Uncertainty creates anxiety for the nurse, the patient and the family. The nurse feels the responsibility for dealing with anxiety, and anxiety provoked by MEWS is part of this. False alarm or not, the knowledge that the doctor has been called raises everybody's anxiety and the ensuing review will probably be reassuring – even if, in the doctor's terms it is negative. The medical and nursing teams are both focused on a short-term objective following a trigger event but these objectives are not the same. This theory is amenable to further investigation to determine more exactly how the nurses interpret medical interventions in the context of their task of continuing patient care, and whether the doctors understand the task of nursing a patient following a MEWS trigger event.

If these differences in mental models come from differing *intentions* of the medical and nursing teams they will represent differences in the philosophies underlying the practice of the two professions. It is not wholly true that medicine manages the patient in acute care with the aim of ultimately 'curing' the disease, and that nurses manage the patient to minimise their ongoing experience of the disease. These attitudes are the extreme ends of a continuum and medicine tends towards the cure end whilst nursing favours care. These tendencies may be reflections of disparate epistemologies, medicine being broadly positivistic and nursing relativistic. The two professions may have different ontologies and epistemologies underlying their clinical processes. These differences stem partly from the nature of the experience of the two professions (Reed and Watson 1994, Tanner 2006) and perhaps partly from the intentional positioning of nursing as relativistic, precisely to distinguish it from medicine (Greenfield 1999).

What is the importance of this observation that medical and nursing teams may have different models of practice? Though a study of teamwork that has exposed it, it is less likely to be obvious in team situations than in less structured care. Highly structured teamwork such as that seen in cardiac resuscitation or operating-theatre practice have such clearly defined targets, and criteria for success, that differences

of approach are generally hidden. In the current investigation the differences in approach are visible because two aspects of management of the sick patient are taking place side by side: the medical staff seeking to investigate and treat, the nursing team supporting and attending to the patient. The progress is slow but steady. Suddenly, unexpectedly the vital signs call for urgent medical intervention. The tempo changes, everyone becomes anxious and the specialist team arrives. Nine times out of ten to then pack up its kit and go away!

9   APPENDICES

9.1   Appendix A: Single Parameter Track and Trigger EWS

A PATIENT WHO FULFILS ANY *ONE* OR MORE OF THE CRITERIA BELOW, OR IS CAUSING CONCERN, NEEDS URGENT INTERVENTION.

BREATHING

Oxygen saturation less than 90% despite oxygen

PaO2 of less than 8KPa on an arterial blood sample despite oxygen

CIRCULATION

Pulse of less than 45 or greater than 125/min

Systolic blood pressure of less than 90 or greater than 200 mmHg, or a sustained fall of greater than 40 mmHg from patient's normal value

pH of less than 7.3
Base Excess of lower than –7 mmol/l

RENAL

Urine output less than 30 ml/hr for 3 consecutive hours Evidence of deteriorating renal function

CONSCIOUS LEVEL

Patient does not respond to voice Glasgow Coma Score of 8 or less

OR

Patient looks unwell or you feel worried about their clinical condition

Single Parameter Track and Trigger System

Princess Alexandra Hospital, Harlow in 2003 (Department of Health and The Modernisation Agency 2003)

9.2 Appendix B: Multiple Parameter Track and Trigger EWS

Multiple Parameter Scoring System

Systolic Blood Pressure <101 >200

Respiratory Rate <9 >20

Heart Rate <51 >110

Saturation (room air) <90%

Urine output <1ml/kg/2 hours

Conscious level - Not fully alert

If a patient fulfils two or more of the above criteria OR you are worried about their condition BLEEP the Registrar from the admitting team and the Outreach Sister (899)

These two parties MUST review the patient within thirty minutes

Barking, Havering & Redbridge NHS Trust S.E.C.S. System for Evaluating the Critically Sick 2002 (Department of Health and The Modernisation Agency 2003)

9.3 Appendix C: Aggregate Weighting Scoring EWS

Score	3	2	1	0	1	2	3
RR		<8		9 - 14	15 - 20	21 - 29	<30
HR		<40	40 - 50	51-100	101 -110	111 - 129	>130
BP	<45%	<30%	<15%	Normal for Patient	>15%	>30%	>45%
CNS				Alert	Responds to voice	Responds to pain	Un-responsive
Temp		<35		35 – 38.4		>38.4	
Urine		<0.5 Ml/Kg/ Hr		1 Ml/Kg/Hr		>3 Ml/Kg/Hr	

Trigger Value – 4 for Surgical Patients with an adjustment for medical patients

The Modified Early Warning Score, Burton Hospitals NHS Trust (Morgan 1997)

9.4 Appendix D: Combination EWS for Track and Trigger Systems

Deranged Physiology Scoring: maximum score = 40, minimum score = 5
If ANY vital sign is in 'alert' zone or becomes significantly abnormal, complete
Deranged Physiology Score and follow guidelines regarding specific risk band

Score	8	4	2	1
Risk bands	Normal	Observe	Warning	Emergency
Coma score	Alert	Responds to Voice	Responds to Pain	Unresponsive
Respirations (min^{-1})	10-20	21-30 8-9	31-40 6-7	>40 <6
SpO$_2$ on air (%)	>95	90-95	80-89	<80
Systolic BP (mm Hg)	100 - 180	90 - 99	80 - 89	<80
Pulse (min^{-1})	50 - 115	116 – 125 45 - 49	126 – 140 30 - 45	>140 <30

- The most abnormal finding places the patient in the associated risk band.

- Always seek advice if you are concerned about a patient for any reason.

- Note re. BP: systolic BP >200 mm Hg requires consideration – is it normal for patient?

- Is pain a factor? A >25% drop from normal systolic BP places patient in 'Observe' risk band.

Risk band 'Normal'

Risk band 'Observe' – moderate deviation from normal.

Level I Action – PRHO/SHO from parent team should review in <60 mins.

Consider level II action. Re-review in <4hours.,

2-4 hourly respirations, SpO_2, pulse, BP, temp, urine

Risk band 'Warning' – significant deviation from normal.

Level II Action – PRHO/SHO from parent team (or any available doctor) should review in <15 mins. Senior doctor must re-review in <30 mins.

Consider outreach service

hourly respirations, SpO_2, pulse, BP, temp, urine ABG, FBC, U & E, ECG, ?CVP

Consider ICU (consultant to consultant); or if not, DNAR.

Risk band 'Emergency' – dangerous deviation from normal.

Level III Action – Registrar or equivalent from parent team (or any available Doctor) should review immediately, and request the urgent help of more experienced Doctor. Consider outreach service.
Note high risk of cardio-pulmonary arrest. Consider ICU; if not, DNAR.

Hourly respirations, SpO_2, pulse, BP, temp, urine ABG, FBC, U & E, ECG, ?CVP

Combination Track and Trigger Warning System: Kingston Hospital 2003. (Department of Health and The Modernisation Agency 2003)

9.5 Appendix E: NEWS (The National Early Warning Score)

Observation chart for the National Early Warning Score (NEWS)

NEWS KEY 0 1 2 3	NAME:		D.O.B.		ADMISSION DATE:	
DATE						DATE
TIME						TIME

RESP. RATE

	Score	
≥25	3	≥25
21-24	2	21-24
12-20		12-20
9-11	1	9-11
≤8	3	≤8

SpO₂

	Score	
≥96		≥96
94-95	1	94-95
92-93	2	92-93
≤91	3	≤91
Inspired O₂%	%	2	%

TEMP

	Score	
≥39°	2	≥39°
38°	1	38°
37°		37°
36°		36°
≤35°	1 / 3	≤35°

BLOOD PRESSURE — NEW SCORE uses Systolic BP

	Score	
230	3	230
220		220
210		210
200		200
190		190
180		180
170		170
160		160
150		150
140		140
130		130
120		120
110	1	110
100	2	100
90		90
80	3	80
70		70
60		60
50		50

HEART RATE

	Score	
>140	3	140
130	2	130
120		120
110	1	110
100		100
90		90
80		80
70		70
60		60
50	1	50
40		40
30	3	30

Level of Consciousness	Alert			Alert
	V / P / U	3		V / P / U

BLOOD SUGAR				Bl'd Sugar

TOTAL NEW SCORE				TOTAL SCORE

Additional Parameters	Pain Score			Pain Score
	Urine Output			Urine Output
	Monitoring Frequency			Monitor Freq
	Escalation Plan Y/N n/a			Escal Plan
	Initials			Initials

National Early Warning Score: July 2012

Please see next page for explanatory text about this chart.

Royal College of Physicians

NHS Training for Innovation

NEWS score	Minimum observation frequency	Clinical response
0	12 hourly	• Continue routine NEWS monitoring with every set of observations.
1 – 4	4 – 6 hourly	• Inform registered nurse who must assess the patient. • Registered nurse to decide if increased frequency of monitoring and/ or escalation of clinical care is required.
>5 or a score of 3 in any single parameter	1 hourly	• Registered nurse to urgently inform the medical team caring for the patient. • Urgent assessment by a clinician with core competencies to assess acutely ill patients. • Clinical care in an environment with monitoring facilities.
≥7	Continuous monitoring of vital signs	• Registered nurse to immediately inform the medical team caring for the patient–this should be at least at Specialist Registar level. • Emergency assessment by a clinical team with critical care competencies, which also includes a practitioner/s with advanced airway skills. • Consider transfer of clinical care to a level 2 or 3 care facility, i.e. high dependency or critical care unit.

9.6 Appendix F Example of initial coding

Interview HCA2

Initial Coding	Transcript
Interviewer establishing the subjects position within the care team. *Establishing experience*	Hello, thank you for taking part What professional group do you belong too? What kind of Nurse are you? I'm a Healthcare Assistant How long have you been working in that role? Nearly 6 years
Describing basic role in care of sick patients	How long have you been on this medical ward? About 5 and a half years I am going to ask you a question about your role as a Healthcare Assistant in caring for acutely ill patients, what is your role is for caring for these acutely ill patients?
Noticing a problem in the patients condition.Responding by checking the vital signs.Reporting up the chain.	Obviously to assist the Nurse to do observations and monitor the observations, sometimes we do them hourly, occasionally we have been known to do them half hourly on here but usually ITU is then brought in to assess the patient. If you noticed a patient was becoming unwell, what would your role be within that?
Asserting special position in observing change in patients condition because has constant close contact. *Describing benefit of close observation.*	If I was actually looking after the patient myself because we are set in specific areas and I observe there is something wrong with a patient I would check the observations and report straight to the Staff Nurse and if the Staff Nurse wasn't available I would report to the coordinator. Right ok
Recognising role of intuition. *Claiming ability to use intuition.* *Judging that previous care is defecient.* *Claiming benefit of experience.* *Endorsing the use of MEWS*	I think, because the Healthcares are kind of frontline patients are more willing to speak to us than they are to some of the Nurses and especially the Doctors so I think because we tend to be in the bays constantly looking after them I think we observe more especially when you think that person was fine this morning now they are just lying on the bed they don't feel right but they can't put their finger on it. So you tend to go off what the patient is saying to you then I would do the observations and get the Staff Nurse. There have been lots of occasions where they have come round from A&E and I have recognised them from before and the last time I have thought the last time they were in they were diabetic and yet there is no BM chart and not BM done and straight away I have done their blood sugar and it has been 2. It is just you get so used to the same patients you have got to have an understanding of the last time they were in they were totally

	different so I think you just learn things over the years.
	I just want to talk about the systems we have got on here for alerting you to the fact that someone is unwell?
	What do you think about that system?
Stressing the use of MEWS is part of multiple systems for patient assessment. *Wondering why medical staff take no action.* *Needing explanation from medical team.*	I think it is really good. It has changed again since I started on here. I think it is good, but even when you get a patient who is scoring a zero there could still be something not right so you have still got to observe, even using the chart you can't just use the chart as the main thing, but then you get some patients who might be scoring a 12 or a 13 and you kind of think what is going to happen are the Doctors just sitting on them or where they are going and as Healthcares we can't really do anything. Sometimes we need to say what is happening are they going to do anything
Understanding 'waitand see' policy. *Uncertainty about choice between treat, wait and see and no treatment alternatives.*	Why do you think that is? Obviously with some patients I presume they are waiting to see if they pick up and improve, but when they don't improve, I don't know it is quite a hard one. It is that thin line isn't it whether they are going to become very poorly and palliative or whether they are going to pick up and get better.
Regreting consequences to patient of hesitant decision making by medical team. *Regreting getting the blame for poor decision making.* *Understanding some causes of false positive MEWS alerts.* *Regreting that false positive scores are not discounted until consultant review.*	Are you frustrated with them? Just listening to what you are saying there are you frustrated sometimes that interventions aren't made? Yeah, I think just because we look after them and when you're doing hourly observations on a patient especially through the night constantly and their poorly and the families are asking why do you keep doing those all we can say is we are asked to do them and there is no other answer we can give. We don't want you doing that we can see you're disturbing them and you're causing them more pain and it is awful but we just go by what we are told to do. With the MEWS charts the new ones especially because you get your COPD patients and they score for their oxygen and because their sats are going to be low and their resps are going to be high I think it would have been nice to have something on them for COPD patients or even another chart you could put in if they are COPD.
Expressing uncertainty about patient care in face of dilemma over validity of scores. *Noting how change leads to*	Are you saying then that these types of patients could be falsely scoring high? Yeah because they can be scoring like a 6 or a 7 but because they are COPD there sats are between 88 and 92, their on oxygen so their scoring for the oxygen, their resps are high because of their breathing so they are scoring high anyway if they come it at night it takes until they see the Consultant the next morning before it is picked up.

uncertainty.	What do you think the risks are with that? You're obviously an experienced member of staff and you have looked after these patients for a long time so you recognise that they are going to be scoring / triggering. For someone who is not as experienced do you think there is a risk there? I don't know, I think it is one of those difficult things because most people when they come on here you do get a lot of training and you learn quickly on here I think you have to because the patients come from A&E and they are unwell when they come from A&E. It is one of those things it is hard because you used to score for not passing urine and things but you don't know which changes the whole scheme of it as well.
Noting uncertainty about the relevance of changes	Do you think that is a good thing? I think that is a funny thing as well because if you have got a patient, like today I have a lady who hasn't been to the toilet who has just been but she hasn't been since last night but she says that is normal for her but then is she drinking, do we know she is drinking. Whereas if she was scoring you would be constantly more aware of that because she was scoring so it is weighing it up. I think they thought the oxygen and things were more important at the time when they changed it all
Explaining reporting pyramid.	
Willing to report to junior doctor.	Can I just clarify now, if you were looking after a patient as you do day in day out who started to deteriorate who would you first raise your concerns to? Definitely the Nurse who is looking after the patient because obviously there who you are supposed to go to. If they weren't around the Coordinator, I would go to the Doctor but may be not a Consultant.
Expressing professional distance from consultant.	
Expressing personal insecurity and resentment at treatment. *Expressing resentment that their insight from consistent contact is unappreciated by consultants.*	Why would that be? Because I don't feel that they are very approachable. We have got a few on here that are nice because sometimes you get talked down to it is like you are not qualified and sometimes I think, yes I know a lot of people work a lot of years to become qualified but sometimes it is common sense and they don't see the patient from 7.30 in the morning all the way through the day and we are watching the patients and you can just see when something is not right with someone you can just see that they haven't eaten their lunch or their just sleepy or they feel light headed or their getting agitated because they have got dementia or their in pain or their feeling sick I mean people will tell you they will be lying there in bed and you go to speak to them and they will have chest pain but they don't want to bother you. So it is those little things that we pick up on that the Consultants don't pick up on.
Describing what she believes to be an appropriate use of MEWS	
	I am going to ask you about an episode of care that went well relating to the scoring system? So have a think, anything where you think a case went well and particularly because of the scoring system being used effectively. Can you think of a patient

Describing her role in this case. *Listing her responsibilities.*	obviously don't tell me any names of patients or staff of where the scoring system worked effectively and you were able to pick up on a patient deteriorating in a timely fashion. I think it happens quite a lot. There was a patient we had who had came round from A&E and they weren't scoring anything but I don't know what happened in between I think they went to x-ray then came round here and I did the observations but they didn't look right but you know sometimes when people have been on A&E. The patient looked very clammy and sweaty so I did his observations straight away and he was scoring about a 6 or a 7 and he was in AF but he hadn't come in with that, I can't remember what he had actually come in with but I know he ended up on Coronary Care. In that instance what was your role in managing the situation? Doing his observations, reporting straight away to the Staff Nurse that he didn't look right and I actually went to one of the Doctors and said there is something not right with him, I did an ECG and they saw the ECG and started straight away what they needed to do treatment wise.
Describing formal gaining of experience.	So in your opinion what do you think the factors were that went well with that patient? Observations just looking at the patient and then obviously doing their observations and they were shown as high, they have to be shown to the Doctors, Consultants or the Reg has to see it and we have a plan at the back and one thing led to another. So good communication Yeah
Describing using MEWS to get the doctors to abort a plan she disagreed with. *Accepting less satisfactory standards of working on night shift.* *Not accepting delay in doctor attending.* *Disagreeing with the doctors actions.*	Do you draw upon those experiences? All the time, I saws an incident that happened at Wansbeck and one of the Consultants did a little video on the internet and he had said different things that should have happened and weren't done and ever since then I always do peoples observations before they go home and sometimes people say what are you doing their observations for and I will say because I know when they left there wasn't anything wrong with them and it has happened a few times. I did a gentleman who was going back to a nursing home and his family weren't happy because he had been discharged and brought back in and they didn't think he should have been discharged anyway but they were really nice and I think we looked after him well and the Doctor said he could go and I said I will just go and do his observations before the ambulance arrives and he was scoring a 6. His temperature was a 9 so he was septic so obviously he was kept in and went to a Ward and since this incident I do it all the time now because I know sometimes people's blood pressure can go up and down a bit but where not concerned about that. If this gentleman had of gone back to the home you don't know what might have happened between his going back there and ringing and ambulance to bring him back.

	Can I ask you to think about an episode that didn't go so well? Again if you could think of a specific situation, but if you can't that's fine. Have you ever been involved in a situation where you felt the systems for detecting deterioration did not work as well as you would have hoped?
Expressing frustration about patient management by junior doctor.	Yes, I think it was a gentleman who had come in, I was on nightshift and I kept informing the Registrar that he seemed like he was short of breath and the Reg said when he got to see him he would decide. Obviously on nightshift everything is slower pace and it takes them longer and eventually when he did go to see him he put him on some oxygen because I thought his sats were quite low and he wasn't COPD or anything, I mean they were only 92 or something but it just seemed that he wasn't right. In the morning he went to the bathroom so I got the oxygen bottle and attached him to that, he said he was a bit light headed so I walked him there and pull the buzzer when you're done so I continued doing the observations and I thought he was taking a while and I started to get a bit worried so I went to the bathroom and he was just white, clammy, sweaty and I got the chair pulled the emergency buzzer and took him back and did his observations and they were fine. The Doctor came and asked what his last observations were and I said the same but I did tell you he didn't seem right and was short of breathe we did the ECG, blood gases and an hour later he had a cardiac arrest and died. I will never forget that morning because he kept saying there was something wrong but he didn't know what it was and for all he was scoring he wasn't really scoring high it was just his sats. I don't know it is hard because we are not qualified it is as if they think we are sometimes over stepping the mark but we are not we are just trying to give our opinion. Sometimes I think a lot of Healthcares especially on this section / area they get frustrated especially if they have been here a long time.
Expressing emotion about poor outcome.	
Expresses concern about 'overstepping the mark'.	
Willing to push on the patient's behalf.	
Expresses frustration about not being taken seriously.	
Persisting with the doctor.	
Feeling conflict with registrar.	
Learning from experience.	
Explaining why the registrar was 'sick of me'.	Because actually you had said there was something not right There was definitely something not right but he kept saying I am fine, he was so lovely. I kept saying no I want you to tell me and I think in the end the Reg got a bit sick of me pestering him but I knew there was something. Obviously there could have been something major gone on I didn't know and I got a bit of a shock obviously because I went home that morning then they said he had died half an hour later. Everything that happens on here that is like an incident it stays with me and it is in the back of my head trying to remember things.
Feeling that she has to take too much upon herself.	
Expressing apprehension about raising issues with RGNs and doctors	
Expressing uncertainty about team relationship and her role.	Why do you think the Reg got a bit fed up? I don't know if he was just having a busy night or whether too much, tired, sick of me pestering him because I think we do and sometimes you do feel sorry for them because it is just them and an F1 or an F2 then they may go through to A&E and they are stuck but you don't mind helping people as much as you can. It is like when you go to your GP it is like you expect them to tell you
Fearing humiliation.	

Recognising the role of status in relationships.	something you know what is wrong you don't expect to tell the GP what is wrong with you. So I don't know So we're leading just onto the last section now to talk about communication Are you ever apprehensive about raising causes for concerns to either Registered Nurses or the Doctors? Definitely, this gets brought up all the time especially with the Sisters because we have had Healthcare training and we have just filled in some sheets about how we feel about implementing things different charts would we go and get one and with some people you would and others would say what you doing that for it's not my job your here to assist me. There are some of the Consultants I would approach and others I would feel they would just knock me down in front of people and I don't think that is right so I wouldn't do it because I am not that confident. I think there is a lack of communication and I think that is half the problem, but then you just think are the Consultants just trying to get there workload done and they just want to get their round done on here and I think everyone has some pressure on them at some point. Do you think sometimes it is a case of status and position? Definitely with some of them, I wouldn't say they are all like that I would say some of them are yeah. That was all I was going to ask you, thank you very much

9.7   Appendix G: The codes after preliminary coding

Experience Level
First responder
Patient carer
Role in MEWS team
Supervisor of staff
Opinion of EWS
Action when no response
An example of harm averted
How does the EWS help management
Identifies failings of EWS system
Importance of also knowing the patient
Misunderstands EWS
Negative opinions about EWS
Positive opinions about EWS
Shows understanding of EWS
Practical use of EWS
Apparent failure to take action
Delay in putting a plan in place
Describes difficulty attending when called
Describes using own clinical skills
EWS used as a justification for calling doctor
Expresses personal commitment to quality
Finding unreported problems
Inexperience
Observations wrong
Prioritises EWS calls along with other work
Staff too busy
Identifies successful use of EWS
Over reliant on EWS
Technical failures of EWS
Uses EWS as a lever to prompt action
Willing to depart from protocol
Team Working
Attitude to hierarchy of reporting
Feelings about reporting problems
How workload impacts on the team
Negative feelings about being called
Positive feelings about being called
Who would you report to
Bullying
Has difficulty getting help
Inability of staff to prioritise the team's work
Refers to relationships
Refers to team relationship's impact on
willingness to report
Refers to team relationships impact on
willingness to report
Reluctant to report problems

Team Relationships
Importance of personal relationships
Negative comments about individuals
Negative comments about teamwork
Positive views about individuals or professional
Refers to relationships
Speaks negatively about the team
Speaks positively about the team
Willing to report problems
Feelings and Emotions
Describes embarrassing experience
Expresses Anxiety
Expresses anger
Expresses fear of ridicule
Expresses frustration
Expresses pleasure
Expresses pride in the team or the work
Expresses sadness
Expresses satisfaction with work
Fears ridicule
Feels unappreciated
Feels valued personally
Finds work frustrating
Values
Consideration for patient
Expresses pride in work
Quality of care
Safety
Tries to facilitate others work
Values collegiality
Values experience
Values intuition
Values own clinical skill
Concern about being watched
Worries about audit
Worries about being disciplined
Workload issues
Admits departing from protocol - workload
Blames delay on workload
Comments on high workload of others
Has too much work
Refers to prioritising tasks

9.8 Appendix H Coding from nodes to major categories (Constructivist Approach of Charmaz, 2014)

Nodes recorded in NVivo (Open Coding)	Sorted into Topic areas (Open Coding)
Action when no response	**Positive Opinion of EWS**
Admits departing from protocol because of workload	Shows understanding of EWS
An example of harm averted	Action when no response
Apparent failure to take action	An example of harm averted
Attitude to hierarchy of reporting	How does the EWS help management
Blames delay on workload	Positive opinions about EWS
Bullying	Importance of also knowing the patient
Comments on high workload of others	**Negative Opinion of EWS**
Concern about being watched	Misunderstands EWS
Consideration for patient	Negative opinions about EWS
Delay in putting a plan in place	Identifies failings of EWS system
Describes difficulty attending when called	**Practical use of EWS**
Describes embarrassing experience	Apparent failure to take action
Describes using own clinical skills	Delay in putting a plan in place
EWS used as a justification for calling doctor	Describes difficulty attending when called
Expresses anger	Describes using own clinical skills
Expresses Anxiety	EWS used as a justification for calling doctor
Expresses fear of ridicule	Expresses personal commitment to quality
Expresses frustration	Finding unreported problems
Expresses personal commitment to quality	Inexperience
Expresses pleasure	Observations wrong
Expresses pride in the team or the work	Prioritises EWS calls along with other work
Expresses pride in work	Staff too busy
Expresses sadness	Identifies successful use of EWS
Expresses satisfaction with work	Over reliant on EWS
Fears ridicule	Technical failures of EWS
Feelings about reporting problems	Uses EWS as a lever to prompt action
Feels unappreciated	Willing to depart from protocol
Feels valued personally	**Team Working**
Finding unreported problems	Attitude to hierarchy of reporting
Finds work frustrating	Feelings about reporting problems
Has difficulty getting help	How workload impacts on the team
Has too much work	Negative feelings about being called
How does the EWS help management	Positive feelings about being called
How workload impacts on the team	Who would you report to
Identifies failings of EWS system	Bullying
Identifies successful use of EWS	Has difficulty getting help
Importance of also knowing the patient	Inability of senior staff to prioritise the team's work
Importance of personal relationships in the team	Refers to relationships
Inability of senior staff to prioritise the team's work	Refers to team relationship's impact on willingness to report
Inexperience	Refers to team relationships impact on willingness to report
Misunderstands EWS	Reluctant to report problems
Negative comments about individuals or professional groups	Team Relationships
Negative comments about teamwork	Importance of personal relationships in the team
Negative feelings about being called	Negative comments about individuals or professional groups
Negative Opinion of EWS	Negative comments about teamwork
Negative opinions about EWS	Positive views about individuals or professional groups
Observations wrong	Refers to relationships
Over reliant on EWS	Speaks negatively about the team
Positive feelings about being called	Speaks positively about the team
Positive Opinion of EWS	Willing to report problems
Positive opinions about EWS	**Feelings and Emotions**
Positive views about individuals or professional groups	Describes embarrassing experience
Practical use of EWS	Expresses Anxiety
Prioritises EWS calls along with other work	Expresses anger
Quality of care	Expresses fear of ridicule
Refers to prioritising tasks	Expresses frustration
Refers to relationships	Expresses pleasure
Refers to relationships	Expresses pride in the team or the work
Refers to team relationship's impact on willingness to report	Expresses sadness
Refers to team relationships impact on willingness to report	Expresses satisfaction with work
Reluctant to report problems	Fears ridicule
Safety	Feels unappreciated
Shows understanding of EWS	Feels valued personally
Speaks negatively about the team	Finds work frustrating
Speaks positively about the team	**Values**
Staff too busy	Consideration for patient
Team Relationships	Expresses pride in work
Team Working	Quality of care
Technical failures of EWS	Safety
Tries to facilitate others work	Tries to facilitate others work
Uses EWS as a lever to prompt action	Values collegiality
Values collegiality	Values experience
Values experience	Values intuition
Values intuition	Values own clinical skill
Values own clinical skill	**Concern about being watched**
Who would you report to	Worries about audit
Willing to depart from protocol	Worries about being disciplined
Willing to report problems	**Workload issues**
Worries about audit	Admits departing from protocol because of workload
Worries about being disciplined	Blames delay on workload
Refers to prioritising tasks	Comments on high workload of others
	Has too much work
	Refers to prioritising tasks

Combined and expanded to Construct 54 Categories	15 major Categories Constructed

The no response from doctor scenario

Knowing the patient and past experience

Believes patients with low MEWS are not at risk

Shows understanding of function of MEWS

Expresses personal commitment to quality

Believing MEWS is a severity of illness score

Nurses frustration over doctor not responding

Nurse left in the dark

Nursing team concerned about information for relatives

Nursing team values relationship with patient and relatives

Negative opinion about doctors knowledge of care

EWS used as a justification for calling doctor

Prioritises EWS calls along with other work

Senior doctors say juniors are over reliant on EWS

Senior doctors going back to first principles to assess

Disregarding the MEWS when asked to see a patient

Doctors trust clinical ability of healthcare assistants

Healthcare assistants feel neglected

Values experience – all staff

Values intuition – all staff speak of tacit knowledge

Values own clinical skill – nurses and doctors

MEWS provides a language for discussing deterioration

MEWS dominates dialogue about sick patients

MEWS is compensating for staff and knowledge deficiencies

Apparent failure to take action

Attitude to hierarchy of reporting

Other factors considered along with MEWS score

Frustration of false positives

Admits departing from protocol because of workload

Comments on high workload of others

Has too much work

Triage and Prioritisation

Teamwork valued

Managing a trigger event

Who would you report to

Importance of personal relationships in the team

Delay in putting a plan in place

Describes embarrassing experience

Expresses Anxiety, fear and anger in response to isolation

Refers to team relationship's impact on willingness to report

Reluctant to report problems

Team Relationships

Tries to facilitate others work

High expectations of self

Safety culture

Values own clinical skill

Junior opinions about engagement of managers - negative

Feeling unsupported

No help available

Fear of personal and career consequences

Attitude to Protocols

Admits departing from protocol because of workload

Willing to depart from protocol

Effect of MEWS on team relationships

| Category 1:
Understanding MEWS	Statements relating to what the participant believes to be the purpose and mechanism of action of the MEWS
Category 2:
Responding to workload	Statements relating to the impact of workload on clinical behaviour
Category 3:
Triaging and accepting delay	Statements showing that the participant engages in triage of MEWS alerts and will accept delay in responding as sometimes inevitable
Category 4:
Responding - medical staff	Statements by medical staff describing how they make decisions about what to do following their evaluation of a patient who has exceeded the trigger MEWS value
Category 5:
Responding – nurses and healthcare assistants	Statements by nurses and healthcare assistants about how they act in relation to the outcome of a medical review of a patient who has exceeded the trigger MEWS value
Category 6:
Communicating	Statements endorsing the value of MEWS in providing language to discuss deteriorating patients
Category 7:
Doubts about the predictive validity of the MEWS score	Statements describing the dilemma posed by the low specificity of the MEWS score
Category 8:
Participating – healthcare assistants	Statements about the role of healthcare assistants in the processes of detecting and evaluating patient deterioration
Category 9:
Monopolising the dialogue	Statements relating to the fact that clinical staff are reluctant to accept that a patient is unstable when faced with a MEWS below the trigger level
Category 10:
Not communicating	Statements relating to failure of the medical team to adequately explain their decisions to the bedside carer nurses.
Category 11:
Senior clinicians express general lack of satisfaction with systems for acute care.	Statements indicating that experienced doctors believe that early warning systems are necessary because of other deficiencies in how acute care is organised
Category 12:
Misunderstanding the operation of MEWS - managers	Statements from those with managerial responsibility for teams that indicated that they did not fully understand the purpose of MEWS and RRS
Category 13:
Isolation and indecision	Statements relating to the negative feelings of more junior doctors in managing the assessment of possible patient deterioration
Category 14:
Differing professional attitudes to an intervention following a MEWS trigger event	Statements indicating the different attitudes to responding to a MEWS trigger event of the nursing and medical teams.

9.9 Appendix I List of Interviewees

F1 Doctors	6

F2 Doctors	**6**
ST Trainees 1-3	**4**
ST Trainees 4-7	**2**
Consultants	**4**
Staff Nurses	**6**
Sisters	**6**
Ward Managers	**2**
Care Assistants	**6**
Executive Director of Nursing	**1**
Executive Director of Patient Safety	**1**
Total	**40**

9.10 Appendix J: Invitation To Participate In A Research Study

Dear   …………

INVITATION TO PARTICIPATE IN RESEARCH STUDY

I am investigating the way people work together to manage patients whose condition deteriorates unexpectedly

You are invited to participate in this study. The study is to investigate the influence of human factors on the quality of management of patients who experience a sudden and unexpected deterioration in their condition whilst being cared for in wards not specialised for high dependency care. Before you decide you need to understand why the research is being done and what it would involve from you.

The research is not directly funded by Northumbria University however is part of a PhD.

You are being invited to participate in this study because you are member of the health care team within an NHS foundation trust. The survey will include 24 people in total from clinical teams working in acute medicine, surgery and emergency care across two Trusts.

Enclosed is an information sheet which details the research and what you will be agreeing to do if you agree to take part. Please read this carefully. In 2-3 days time I will contact you via telephone or e-mail to find out if you are interested in taking part in this research. If you are, I will make arrangements to meet with you to provide further information and to answer any questions you may have.

You will then be offered a period of one week to consider whether you wish to be involved. If you do get involved all of the information collected from you will be held in the strictest confidence. In addition, you will be free to withdraw from the study at any time without this affecting you in any way.

Thank you for taking the time to consider being involved in this study

Yours faithfully,

Mrs Jane Greaves

Principal Investigator / Lead Researcher

9.11 Appendix K: Research Study Information Sheet

I am investigating the way people work together to manage patients whose condition deteriorates unexpectedly

Before you decide you need to understand why the research is being done and what it would involve from you.

What is the purpose of the study?

The aim of this study is to investigate the influence of human factors on the quality of management of patients who experience a sudden and unexpected deterioration in their condition whilst being cared for in wards not specialised for high dependency care.

Why have I been asked to take part in this study?

You have been asked to take part in this study because you are a member of the Ward Team within an NHS foundation trust.

Do I have to take part in the study?

No, it is up to you to decide if you wish to take part. Jane Greaves will meet with you to discuss the study in more detail. You will also have an opportunity to ask any questions you may have.

If you agree to take part then Jane will ask you to sign a consent form to show that you have agreed to take part. You are free to withdraw from the study at any time, without giving a reason. Withdrawal will not affect you in any way and your decision to withdraw will not be shared with anyone.

What am I being asked to do?

If you decide to take part in this study all the staff will be asked to:

- Participate in an individual interview with Jane Greaves at a designated private space within the hospital that you work.
- The interview will last approx. 45 minutes.
- Prior to the interview Jane will confirm that you are willing to consent to the interview and that you have formally signed a consent form.
- During the interview Jane will clarify that you are comfortable with the process of the interview and give you an opportunity to withdraw consent and participation at any time.
- During the interview Jane will discuss her position as a registered nurse and the requirements of the code of professional conduct (NMC 2010)

Are there any disadvantages to taking part?

- There are two hospital Trusts chosen for this research study, your name will not be disclosed, and you will be provided with a unique identifier which will help to label any data generated.
- You may also experience the potential inconvenience of having to take part in an interview which may last for up to 45 minutes each.

What are the benefits of taking part?

- You will help contribute to an understanding of how perelationships between health care professionals from different disciplines impact upon care.

CONFIDENTIALITY

Collecting the data

The data for this study will be collected using a Digital Dictaphone Recorder during the interview. Once the interview has ended the recording will be transcribed and a written record of our discussions will be created. The data will not contain your name etc. and any paper based record will be securely stored.

Storage of the interview tapes, transcripts and other papers

Any paper based transcriptions will be kept in a locked cupboard at Northumbria University until the research is completed, however all digital recordings will be deleted

once the paper based transcriptions have been transcribed. These documents are anonymised and are marked by a unique identifier (allocated to you by Jane Greaves). The only individual who will have access to the tapes and papers is Jane Greaves.

Any information which is produced as part of the dissemination activities associated with the project will not bear your name.

What will happen to the results of the research study?

The results will form part of a report which will be completed by Jan 2015. A report will be disseminated by Jane Greaves and will be made available to study participants. The results will also be published in education and health care journals and within a PhD dissertation. You will never be identified in any publication although your words may be published exactly as you said them during the interview.

Who is funding this study?

Jane Greaves is funding the study but is supported and sponsored by Northumbria University through its programme of staff scholarly activity

Who has reviewed this study?

The proposed research has been reviewed by the School Research Committee and the NHS Trust Research and Development departments where applicable.

Where can I find further information about the research?

In the first instance please contact Jane Greaves:

If you are unhappy about this study please contact

The Rev. Professor Pauline Pearson - Supervisor

If I take part can I withdraw from the study at a later date?

You can withdraw from the study at any time. Simply contact Jane to tell her you would like to withdraw - her details are at the end of this information sheet. When you indicate your intention to withdraw from this study Jane will ask you if you would like her to destroy all of the data collected to the point of withdrawal or whether we can continue to use it in an anonymised form.

Complaints

If you have concerns about any aspect of this study please speak to either Jane Greaves, or Reverend Professor Pauline Pearson research supervisor (details below) and we will do our best to address these. If you remain unhappy you may wish to contact the sponsor of this research who is Professor Olivier Sparagano

Information disclosure

Jane Greaves is a Registered Nurse and is governed by the Nursing and Midwifery Council (NMC), she will inform you at the initial meeting of the NMC code (2008), and also the NMC raising and escalating concerns regulations (2010)

Research Team

Principal Investigator: Mrs Jane Greaves, Northumbria University

PhD Supervisor: The Reverend Professor Pauline Pearson, Northumbria University

9.12 Appendix L Consent Form: Ward Team

CONSENT FORM

How do interprofessional, interdisciplinary and authority patterns affect the carers response to critical events in the context of formalised protocols for the management of adult patient deterioration?

Please initial the boxes	Yes	No
1. I confirm that I have read and understand the information sheet dated …………		
2. I have had the opportunity to consider the information, ask questions about the study and these have been answered to my satisfaction		
3. I am willing to be interviewed		
4. I am happy for my comments to be recorded and my words used in the research		
5. I am happy for my comments to be audio recorded and my words used in the research		
6. I understand that my participation is voluntary and I can withdraw at any time without giving reason. And that withdrawing from the study will not affect me in any way		
7. I understand that relevant sections of the data collected during the study may be looked at by individuals from Northumbria University where it is relevant to my taking part in this research. I give permission for these individuals to have access to the data.		
8. I understand my name and details will be kept confidential, and will not appear in any printed documents		
9. I know that because of the study sample that I could be identified and that the researcher will attempt to maintain anonymity when writing reports		
10. I agree to take part in the above study		

I   ……………………………………   [name of participant]

understand the information presented to me by   ……………………………   and agree to take part in the research

Signature: [Participant]   Date:

Signature: [Researcher]

9.13 Appendix M: Semi-Structured Interview Themes

Preamble

The interviews will be with a range of those responsible for the acute care of patients on wards and departments where a track and trigger system of recording vital signs is used. The initial focus of the work is a discussion of attitudes to track and trigger and beliefs about their efficacy supplemented by enquiry into how each individual carer perceives their role, the role of those who report to them and the role of those to whom they report. The final discussion surrounds how perceptions of others in the chain of reporting affect the working of the alerting system.

These questions are prompts. The interviews will be conducted as conversations and many of the questions will emerge during the discussion. Where necessary a new topic will be prompted – not generally by asking the direct question as given below – by raising issues that should prompt the necessary reflection.

The semi-structured nature of the interview allows the interviewee to use their own words and it is from their choices and emphases that their opinions will emerge.

About You

What professional group do you belong to?

What is your present status?

How long have you worked in your present capacity?

About your role in caring for acutely ill patients

What is your role in caring for patients?

To whom would you report that a patient is becoming more ill?

About your knowledge of systems for the detection of serious episodes of patient deterioration

Have you heard of any systems for the timely detection patient deterioration?

Do you use such a system?

What is your task in using the scoring system?

Do you understand the purpose of the scoring system?

Have you personally found it useful?

Do you think track and trigger systems are just another example of more useless paper getting in the way of your real job?

About an episode that went well

Can you think of a case you were involved with where potential harm to the patient was averted by good use of the early warning system and good communication between team members? Please don't tell me anything that identifies the patient or the staff involved.

What did you feel were the risks to the patient?

What in your opinion were the possible adverse outcomes.

In what ways do you feel that the management of this case were successful?

What do you think were the key factors that contributed to this success?

What was your role in managing this situation?

Have you thought about these events since they happened?

How do you feel about this event?

Has this experience changed your practice?

About an episode that went badly

Have you ever been involved in a situation where you felt that the systems for detecting deterioration did not work as well as you would have hoped? Please don't tell me anything that identifies the patient or the staff involved.

What did you feel were the risks to the patient? What in your opinion were the possible adverse outcomes.

In what ways do you feel that the management of this case could have been improved?

What do you think were the key factors that contributed to this success?

What was your personal role in managing this situation?

Have you thought about these events since they happened?

How did you feel about this event?

Has this experience changed your practice?

About communication?

Do you find that workers who report them to you usually correctly assess 'Cause for Concern' situations?

Do you find that your reports of 'Cause for Concern' are taken seriously?

What do you feel when you have to report 'Cause for Concern'?

For care assistants and student nurses:

Are you apprehensive about reporting problems to the nurse in charge or a doctor?

Are your findings generally treated with respect?

Do you feel that you are not believed because of your lack of seniority?

For Registered nurses:

Are care assistants generally reliable in detecting 'Cause for Concern' situations?

If not, why not?

Are you apprehensive about reporting problems to the nurse in charge or a doctor?

Do you find that the Care Assistants cry wolf over 'Cause for Concern' situations?

If not, why not?

Do Doctors generally take your reports of cause for concern seriously ?

Are you satisfied that they take action – even if you don't agree with what they do?

For Doctors

Are nurses, care assistants, your junior medical colleagues - generally reliable in detecting 'Cause for Concern' situations?

If not, why not?

Do you find that Care Assistants and nurses cry wolf over 'Cause for Concern' situations?

About your experience of managing deteriorating patients

How much personal experience have you of early warning scoring systems?

What is your role in using the system?

How often do you find that the early warning system asks you to report the situation to a senior   colleague?

10 GLOSSARY OF TERMS

Intensive Care Unit (ICU) A specially staffed and equipped, separate and self-contained area of a hospital dedicated to the management and monitoring of patients with life- threatening conditions. It provides special expertise and the facilities for the support of vital functions and uses the skills of medical, nursing and other personnel experienced in the management of these problems (ICS/FICM 2013).

Levels of Patient Dependency in Acute Care (FICM/ICS 2015)

Level 0 - Patients whose needs can be met through normal ward care in an acute hospital. About 1 nurse per ten patients

Level 1 - Patients at risk of their condition deteriorating, or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from the critical care team. About one nurse per six patients

Level 2 - Patients requiring more detailed observation or intervention including support for a single failing organ system or post-operative care and those 'stepping down' from higher levels of care. One nurse per two patients

Level 3 - Patients requiring advanced respiratory support alone or basic respiratory support together with support of at least two organ systems. This level includes all complex patients requiring support for multi-organ failure. One nurse per patient

'Track and Trigger' is a system where regular observation of parameters is made and where breaching a threshold invokes a pre-set response.

Early Warning Score (EWS) A tool used to aid recognition of deteriorating patients. It is based on the physiological observations used for routine monitoring. The observations incorporated in this scoring system may include: temperature, pulse, blood pressure and respiratory rate, with oxygen saturations, level of consciousness and urine output. An aggregated score is then calculated from all seven parameters. There is an identified threshold score which, when reached, then activates an escalation pathway. This protocol may be categorised as the afferent limb of the Rapid Response System (RRS).

A Rapid Response System (RRS) is a team-response tool in hospitals, designed to identify and review patients with early signs of clinical deterioration outside intensive care units (RCP 2012). Referral is to a team of clinicians who respond to an alert. This may be an existing group such as the patients 'home medical team', the cardiac arrest team or the intensive-care outreach team. It may also be a specialised team of doctors and nurses: a rapid response team or emergency medical team. The rapid response team is described as the efferent limb of the Rapid Response System.

A Rapid Response Team (RRT) is a team of clinicians, with special knowledge, skill and experience in the management of critical illness, routinely tasked to be available and respond to referrals generated by the EWS.

Medical Emergency Team (MET) is a special purpose team of doctors and nurses with skills in the management of acute care that respond to an alert synonymous with Rapid Response Team.

Afferent Limb of the RRS – The process by which a patient reaching a 'trigger' value is identified as likely to deteriorate and potentially requiring adjustments to their management.

Efferent Limb of the RRS – The system used to respond to patients who reach a 'trigger' value.

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