

**Expecting the Unexpected: to what extent does simulation help  
healthcare professionals prepare for rare, critical events during  
childbearing?**

Angela Dawn Hewett

Submitted in accordance with the requirements for the degree of  
Doctor of Philosophy

The University of Leeds  
School of Healthcare & LIME

June 2016

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## **Acknowledgements**

*'The true champion, the true summiteer, hangs out with those who help and inspire them to be even better'*

*Bear Grylls (2012)*

This research has been carried out by me with supervision from a team which has included *Dr Janet Hirst and Professor Trudie Roberts*. My own contributions, fully and explicitly indicated in the thesis, have been study design, data collection, transcription of interviews and analysis. The other members of the group and their contributions have been as follows:

*Mr Mark Clowes (School of Healthcare Librarian) provided peer review of the search strategy for the systematic review.*

*Dr Zoe Darwin reviewed the coding of interview transcripts for quality assurance purposes.*

*Mrs Alison Ketchell reviewed the data extraction and quality assessment of studies included within the systematic review for quality assurance purposes.*

*Dr Rebecca O'Rourke provided support and guidance in relation to academic writing.*

*Professor John Creswell peer reviewed the Mixed Methods Research design.*

## **A word of thanks**

*I never really imagined that I would write this section; my personal background is not one that traditionally leads to postgraduate research study. I am a product of the widening participation agenda which has grown in strength over the past few decades and, to the University of Leeds, I am, and will remain eternally grateful for the opportunities afforded me.*

*Throughout my life I have been blessed with enduring and unconditional love from my parents Eric and Lynda Graves. Dad gave me a tenacious work ethic and from mum I inherited a dogged determination and resilience. All traits which, I suspect are pre-requisites to completing this thesis. Thank you both.*

*Over the past 15 years a long suffering husband and, more recently, two beautiful and exasperated children have endured my journey. Thank you for your boundless love and support. Darren thank you for being there on this journey! Maya and Eden, thank you*

*for putting up with your crazy mum. I am sorry that I abandoned you and promise that the dining table will be restored to its former use. I will make it up to you all, I promise.*

*To my fabulous friends, my cheerleaders and mobile off-licences, Helen, Sarah, Janet, Fee, Bex, Margaret and Richard; you have no idea how much I needed you so thank you for being there when you really didn't have to be.*

*Along the way there have been a number of colleagues from the School of Healthcare who have offered support and guidance in many forms. For generously supporting development opportunities and for providing critical feedback and guidance I would particularly like to thank Professor Andrea Nelson, Dr Kuldip Bharj and Jane Ridley.*

*I know that there are others; a sea of faces to whom I owe much. I am sorry if I did not name you here. Please know that I am grateful.*

*There is a popular on-line quote<sup>1</sup> which reads 'behind every successful woman is a tribe of other successful women who have her back'. Well I am not sure that I would call them a 'tribe' but my supervisors Professor Trudie Roberts and Dr Janet Hirst have been unfailing in their support, guidance, encouragement and critique. I could not have come this far without you both; you have always 'had my back' and I could not have traversed this path without the reassurance that you were there.*

*This isn't the end but the beginning of something new and exciting. I look forward to sharing it with you all. Thank you.*

---

<sup>1</sup> Uk.pintrest.com, #inspiration #motivation

## **Abstract**

Pregnancy and childbirth presents both rare and critical events for which healthcare professionals are required to acquire and maintain competent clinical skills. In theory, a skill demonstrated using simulation will transfer into practice competently and confidently; the strength of simulation appears to lie in its validity with clinical context. Evidence shows that some professionals have difficulty responding appropriately to unexpected critical events and, therefore, there were two main aims: 1) to learn more about how healthcare practitioners develop skills in order to prepare for and respond to rare, critical and emergency events (RCEE) during childbearing, 2) to uncover healthcare practitioners' experiences of simulated practice.

An explanatory sequential mixed methods approach consisted of a quantitative systematic review combined with a framework analysis of curricula documentation. Subsequently, a conceptual framework of simulation was explored through qualitative inquiry with twenty five healthcare professionals who care for childbearing women. Attribution theory proved useful in analysing these experiences.

Findings illustrated the multifaceted and complex nature of preparation for RCEE. Simulation is useful when clinical exposure is reduced, has the potential for practice in a safe environment and can result in increased confidence, initially. In addition, teamwork, the development of expertise with experience, debriefing and governance procedures were motivational factors in preparedness. Realism of scenarios affected engagement if they were not associated with 'real life'; with obstetric focus, simulation fidelity was less important and, when related to play, this negatively influenced the value placed on simulation.

The value of simulation is positioned in the ability to 'practise' within 'safe' parameters and there is contradiction between this assumption and observed reality. Paradoxically, confidence in responding to RCEE was linked to clinical exposure and not simulation and was felt to decay over time, although the timeframe for diminution was unclear. Overwhelmingly, simulation was perceived as anxiety provoking and this affected engagement and learning. Data highlights ambiguity between the theoretical principles of simulation and the practical application.

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## List of Abbreviations

ALS	Advanced Life Support
APH	Ante-partum Haemorrhage
BLS	Basic Life Support
CMACE	Centre for Maternal and Child Enquiries
CMO	Chief Medical Officer
CHFG	Clinical Human Factors Group
CMACH	Confidential Enquiry into Maternal and Child Health
CTG	Cardiotocograph
CRD	Centre for Review and Dissemination
DH	Department of Health
GMC	General Medical Council
HCP	Healthcare Professional
ICNARC	Intensive Care National Audit and Research Centre
ID	Identification
IJMRA	International Journal of Multiple Research Approaches
INASCL	International Nursing Association for Clinical Simulation and Learning
IUD	Intra-uterine death
JMMR	Journal of Mixed Methods Research
MBRRACE	Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK
MMIRA	Mixed Methods International Research Association
MMR	Mixed Methods Research
MSW	Maternity Support Worker
NHS	National Health Service
NTSB	National Transport Safety Board
NLS	Newborn Life Support
NMC	Nursing and Midwifery Council
PPH	Post-partum haemorrhage
QUAL	Refers to Qualitative Research
QUAN	Refers to Quantitative Research
OBSSR	Office of Behavioural and Social Sciences Research
RCEE	Rare, Critical and Emergency Events
RCOA	Royal College of Anaesthetists
RCOG	Royal College of Obstetricians and Gynaecologists
RCT	Randomised Controlled Trial

RM	Registered Midwife
RN	Registered Nurse
UKOSS	United Kingdom Obstetric Surveillance System
WHO	World Health Organisation

## Glossary of Terms

**Abruption:** separation of the placenta from the wall of the womb.

**Amniotic Fluid Embolism:** an embolism caused by the fluid surrounding the fetus (see embolism).

**Anaphylaxis:** an acute allergic reaction to an antigen to which the body is hypersensitive.

**Ante-partum Haemorrhage:** bleeding from the genital tract during pregnancy from the 24<sup>th</sup> week of gestation.

**Breech:** in which the baby exits the pelvis with the buttocks or feet first as opposed to the head-first presentation.

**Cardiac Arrest:** a sudden cessation of the heart's functioning.

**Cardiotocograph:** electronic recording of the fetal heartbeat (cardio) and uterine contractions (toco) during pregnancy.

**Cord Prolapse:** a slipping down of the umbilical cord into the vagina.

**Critical:** (of a situation or problem) having the potential to become disastrous; at a point of crisis.

**Eclamptic Fit:** convulsions occurring in a pregnant woman suffering from high blood pressure.

**Embolism:** obstruction of a blood vessel, typically by a blood clot or an air bubble.

**Emergency:** serious, unexpected, and often dangerous situation requiring immediate action.

**Fidelity:** the degree of exactness with which something is copied or reproduced.

**Haemorrhage:** a large flow of blood from a damaged blood vessel.

**HELLP:** a life threatening liver disorder characterised by **H**aemolysis (destruction of red blood cells) **E**levated **L**iver enzymes (indicating liver damage) and **L**ow **P**latelet count.

**Intrauterine Death:** the WHO definition is the death of a fetus during any stage of pregnancy. Those occurring before the 20<sup>th</sup> week of gestation are usually classified as a **Spontaneous Abortion**.

**Post-partum Haemorrhage:** a blood loss of 500ml or more from the genital tract within the first 24 hours of the birth of a baby.

**Practice:** the *noun* referring to the act itself, in this context refers to clinical practice.

**Practise:** the *verb* meaning to do something repeatedly to improve skill

**Rare:** (of an event, situation, or condition) not occurring often.

**Sepsis:** the presence of pathogenic organisms or toxins in the blood.

**Shoulder Dystocia:** obstructed labour whereby, after delivery of the head, the anterior shoulder of the baby cannot pass below the symphysis pubis. Additional manoeuvres are required to assist delivery.

**Simulation:** imitating the conditions of something, especially as a training exercise.

**Taxonomy:** a scheme of classification or naming in an ordered system.



### About the Author

My journey began in 1993 when I qualified as a Registered Nurse (Adult) and began my career in the field of cardiothoracic surgery. I became a Registered Midwife in 1995 and completed a BSc (Hons) in Midwifery Studies in 1998 followed by a Master of Midwifery in 2004. My focus was in normalising childbirth and the promotion and support of best practice in relation to infant nutrition.

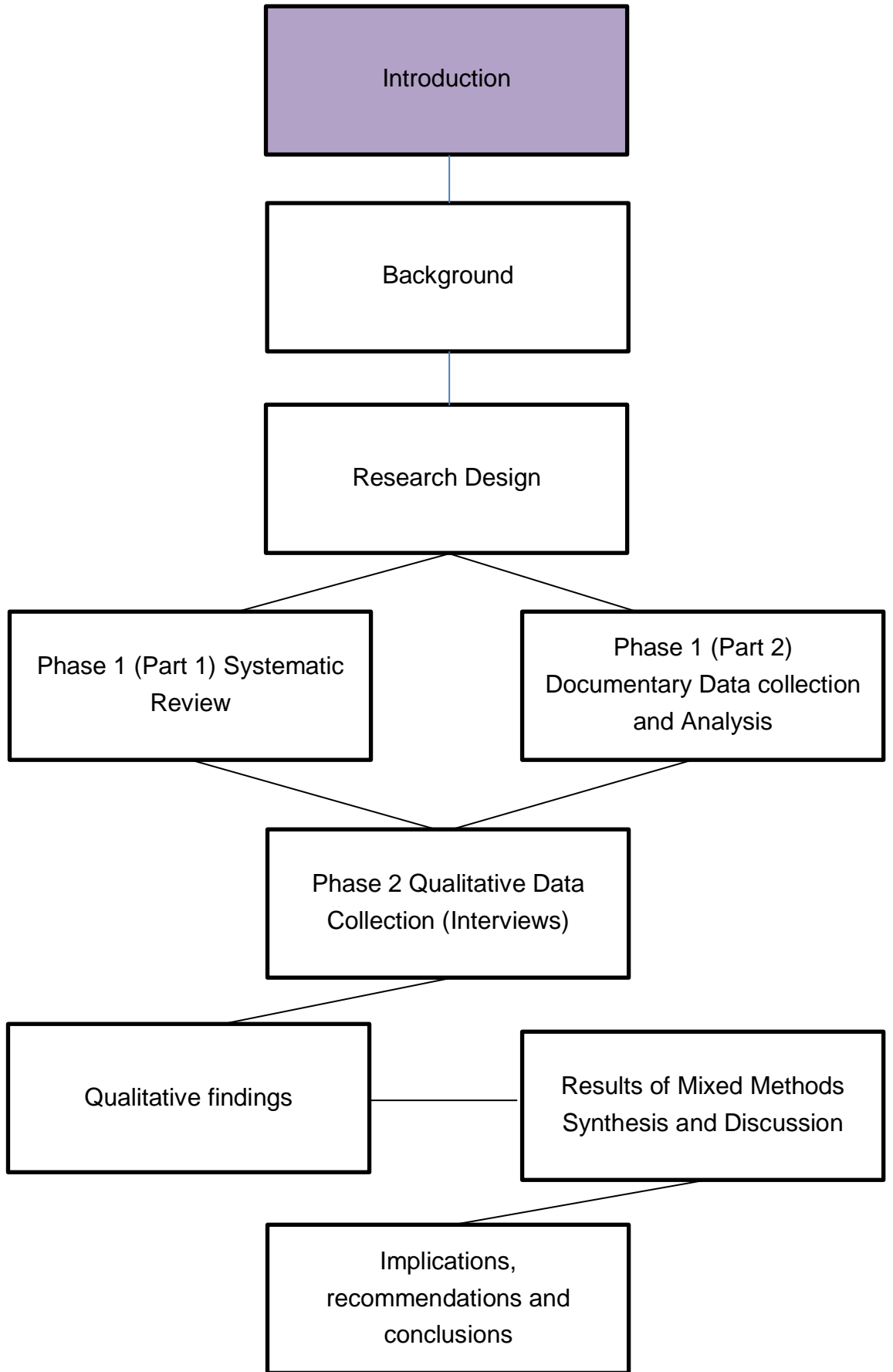
As an experienced midwife and supervisor of midwives I moved into higher education at the University of Leeds in 2006 with a special interest in the development of practice that has a robust evidence base, delivered in an innovative, progressive manner in resource constrained contemporary practice. My postgraduate research was borne out of an interest in juxtaposing theoretical and professional perspectives relating to professional training and education in preparation for rare, critical and emergency events.

The study has been accepted and/or presented at a number of peer reviewed conferences and these are detailed as follows;

- |                |   |
|----------------|---|
| August 2016    | AMEE, An International Association for Medical Education – Barcelona. To what extent does simulation help healthcare professionals prepare for rare, critical events in childbearing? (Abstract accepted for presentation)  |
| August 2016    | Mixed Methods International Research Association – Durham. Using mixed methods to explore how healthcare professionals prepare for rare, critical events during childbearing (Abstract accepted for presentation)   |
| August 2015    | Mixed Methods International Research Association – San Antonio, Texas. Research Roundtable. I had a discussion with experts in the field.   |
| February 2015  | Maternal Child & Family Health Research group Meeting – Spotlight On series – University of Leeds. A critical exploration of assumptions relating to simulated learning and training programmes/ (Presentation)   |
| December 2014  | University of Leeds Research Conference. University of Leeds.<br>Expecting the Unexpected: to what extent does simulation help professionals to prepare for rare, critical events in childbearing? (Abstract & Poster)  |
| October 2014   | University of Leeds, School of Healthcare Postgraduate Research Conference. To what extent does simulation help professionals to prepare for rare, critical events in childbearing? Phase 1 of the study. (Abstract & Presentation) <u>3rd Prize awarded.</u>   |
| September 2014 | Society for Reproductive and Infant Psychology – Malta. To what extent does simulation help professionals to prepare for rare, critical events in childbearing? Behavioural aspects. (Abstract & Poster) The link to abstract <a href="http://dx.doi.org/10.1080/02646838.2015.1133158">http://dx.doi.org/10.1080/02646838.2015.1133158</a> Published online: 19 Jan 2016 |

October 2012 School of Healthcare Postgraduate Research Student Conference. University of Leeds. Expecting the Unexpected: to what extent does simulation help professionals to prepare for rare, critical events in childbearing? (Abstract & Poster) 1st Prize awarded.

June 2012 8th International Mixed Methods Conference. Leeds. Expecting the Unexpected; rare, critical events in childbearing. (Abstract & Poster)



## Chapter 1: Introduction.

*'He who never makes an effort, never risks a failure'*

*Anon (1832)*

Pregnancy and childbirth presents both critical and emergency events for which healthcare professionals are required to maintain competent clinical skills. The focus of this thesis is in exploring how healthcare professional develop skills in recognising and responding to those critical and emergency events which occur rarely, yet risk serious morbidities and/or mortality to women and babies.

In order to frame the thesis, this chapter will highlight the development of my interest in the topic area. There will be an introduction to the study and an argument for the importance of this exploration in terms of its contribution to wider debates and concerns within the field.

### 1.1 Prologue

At 12.10pm on Friday 23<sup>rd</sup> April, 1999, the patient in bed 19 spoke. "I don't feel very well" she said as her eyes rolled and her head fell back. Automatic actions followed in the process of attempting to resuscitate this 50 year old woman. I later reflected on why my responses had been so obvious to me. Was it the fact that I had recently attended an update on basic life support and subsequently, the necessary actions were recently simulated and fresh in my mind? Was it my experience of regularly responding to cardiac arrest during my nursing practise in a cardio-thoracic surgery department? This had certainly afforded me plenty of deliberate practice. Did my long held interest in the anatomy and physiology of the human heart and circulatory system play a part, where my applied knowledge may well have influenced my decision making? Am I an outlier? I have achieved more than was expected of me given my background and level of education and this is due, in no small part, to my tenacious appetite for knowledge and a great deal of hard work. Or, is it a sum of all of these parts? And, if so, how can professional preparation for such critical events be optimised?

My professional journey has taken me from nursing into midwifery where I have developed a long held interest in the notion of 'preparation'. Anecdotally midwives often speak of a 'sixth sense' a 'knowing' that events are about to critically change and this fascinates me. I wondered if it was possible to study this phenomenon. As a Supervisor of Midwives I was involved in supporting a midwife who had responded to a cardiac arrest. Reflecting on her practise she stated that she was thankful that she had recently attended a simulated training related to obstetric emergencies.

I was reminded of Friday 23<sup>rd</sup> April, 1999 when, at 12.25pm, I heard the words 'we have an output'. I questioned my preparation in responding to this event. On an emotional level I was ill-prepared. A midwife at the time and a visitor to the ward area I was not expected to respond. The patient in bed 19 was my mother<sup>2</sup> and I could have been forgiven for not responding appropriately; yet my actions were obvious, second nature, automatic. There was a team around me. Other professionals who had experiences which had led them to be called upon on this day; what were they?

My curiosity was ignited and the journey that eventually led me into postgraduate research study had begun.

## 1.2 Introduction

John F Kennedy famously said that the word crisis, when written in Chinese, is formed from the words *danger* and *opportunity* (Kennedy 1960). When related to childbearing it can be argued that crises presents both dangers for women and babies and also opportunities to learn and to develop practice, training and education.

The thesis contributes to knowledge by analysing professional preparation for rare, critical and emergency events during childbearing and determining how training and education might be improved.

The interest here is in the effects of simulated training and education on the preparation of professionals who prepare for events which happen rarely and unexpectedly and risk serious morbidities and mortalities. By examining the characteristics of simulation, and healthcare professionals' experiences of preparation and performance in critical events, the study identifies the behaviours of professionals in preparation, attainment, motivation and maintenance of skills for critical events during childbearing.

The study is important because healthcare professionals (doctors and midwives) are required to acquire and maintain clinical skills, yet evidence suggests that some have difficulty in recognising risk and responding appropriately to unexpected emergencies (Knight et al 2015). By tradition, education and training for critical events has relied on simulation for the development of clinical skills; the strength of simulation appears to lie in practice that closely resembles clinical practice without compromising patient safety. Ostensibly, practice makes perfect makes sense; yet empirical evidence to support its effectiveness within healthcare remains limited. The study examines this notion.

---

<sup>2</sup> Mum made a full recovery and has been my inspiration throughout this process.

### **1.3 Overview of the thesis**

This chapter introduces the thesis and situates professional preparation for rare, emergency and critical events as the key tenet.

Chapter two provides background to the wider debates and concerns within the field relating to the development of skills and expertise. When critical and emergency events occur, individual health and lives may be at risk. It is reported that those tasked with responding to and managing the event can suffer when things go wrong. In order to address this, training and education through simulated means has been adopted in healthcare from other disciplines and this is explored. Chapter two also provides an overview of the underpinning assumptions, methodology and methods chosen for the study, with the following subheadings;

1. Expertise
2. Expertise in rare events
3. Simulation to support the development of expertise
4. Human factors
5. The paradigm debate
6. Mixed Methods Research

Chapter three is an outline of the methods and the theoretical orientation underpinning them. There are three parts presented in two phases and, in each, the focus is on professional preparation for critical events and the utility of simulation in relation to this. The specific instruments for each phase are outlined along with a discussion of rigour in the research process. Ethical considerations for each phase of the study are identified and discussed within this chapter. Detailed information relating to the methods will be provided within the ensuing chapters.

The first part of the study (Phase 1.1) is presented in Chapter four which details a quantitative systematic review of the evidence relating to simulated preparation for rare, critical events. A key element of the review lies in the identification of studies where comparisons were made with other forms of training and education. Most notably, evidence from other professional groups which used a comparator could not be identified. This chapter highlights issues with the quality of evidence which inhibit any strong inference relating to the effectiveness of simulation.

Phase 1.2 is presented in Chapter five. This outlines a documentary analysis of curricula in order to explore the characteristics of programmes which adopt simulation as a training and education tool. The findings from this phase are synthesised with data

borne out of the systematic review in order to produce a conceptual framework relating to training and education through simulated means. The chapter ends with a diagrammatic representation of the synthesised findings; highlighting the characteristics of simulation as well as the questions which remain unanswered. As this is a sequential mixed methods study the interpretation of findings from phase 1 informs the development of phase 2; specifically the development of the topic guide for qualitative interviews.

Chapter six explains how qualitative interviews probed healthcare practitioner experiences of simulated practice and the development of skills and preparation for rare/critical events during childbearing. Samples of healthcare practitioners, from a range of professional backgrounds, were recruited from a large, regional teaching hospital. Important themes were identified in relation to the following;

- what professionals consider to be 'rare' in the context of critical events
- the notion of fidelity and realism within simulation
- motivation to prepare for critical events
- skill development and decay over time

The findings from phase 2 are detailed and discussed within Chapter 7.

Within chapters four to six the methods for each phase are presented first including data collection procedures and instruments.

Chapter 8 presents a synthesis of findings across both phases and, in order to address the central aims of the thesis, includes interpretation of these findings in relation to the literature and the wider clinical context. Following the tradition of explanatory, sequential mixed methods - evidence from the quantitative (Phase 1.1) and qualitative paradigms (phase 1.2) are synthesised and build to the qualitative data collection and analysis (phase 2). The product being an iterative synthesis of the extent to which the quantitative dimensions of simulated education and training are validated by, converge or diverge from qualitative findings.

The conclusion (Chapter 9) works through the implications of the findings in relation to professional preparation for rare, critical events and the contribution of simulation. Limitations of the study and reflections on judgements made throughout the process are addressed and potential for future research is identified.

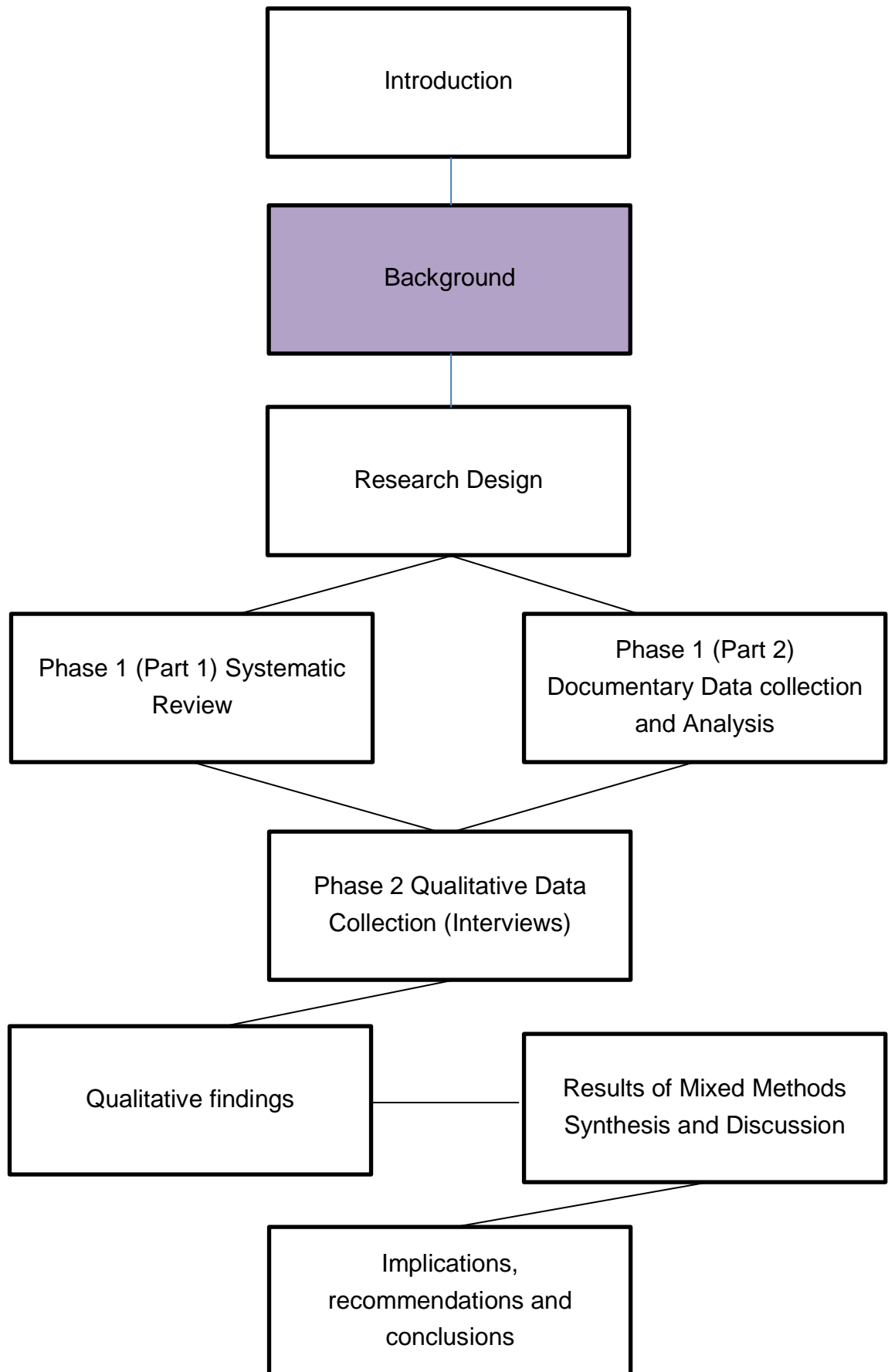
### **1.3.1 Summary of Introduction**

The thesis examines the concept of simulated learning and practice with the intent of understanding the role of simulation in real life management of rare, critical events during childbearing.

Essentially, to explore how we expect the unexpected!

The next chapter provides background to the wider debates and concerns within the field relating to the development of skills and expertise.





## Chapter 2 Background

*'Rem tene, verba sequentur'*

*Grasp the subject and the words will follow*

*Umberto Eco (1984)*

This chapter is in two parts. Part one explores the broader questions of how expertise is developed before considering how professionals develop expertise in responding to rare and critical events. The problems which exist within maternity care provision will be examined, as critical events continue to result in catastrophic consequences for all involved. The history of simulation and its adoption into healthcare education and training is considered. In order to re-problematise the concept of simulation, this chapter goes beyond healthcare provision to understand how simulation is utilised within a range of other disciplines.

Part two is an explanation of the underpinning assumptions (worldview), methodology and methods chosen for the study.

### Part One.

#### 2.1 Expertise

In all areas of life there are those individuals who appear to possess a higher level of knowledge and/or performance than others. Through investigation of learning in the workplace, Eraut (2004) challenged the assumed separation of 'learning' and 'working' and found that the majority of professional learning occurs in practice. In attempting to deconstruct learning from experience, Eraut highlights an interesting approach to how professionals tackle a problem or incident. By reflecting on accumulated experiences over time, pattern recognition from previous incidents would be utilised rather than scientific knowledge from education experiences (Eraut, 2004). This implies an acquisition of skill commensurate with experience, a notion for which there is a plethora of available literature (Schmidt et al 1990, Ericsson et al 1993, Ericsson & Lehmann 1996, Ericsson & Smith 1991, Ericsson 2003, Ericsson et al 2007, Feddock 2007, Edwards 2010 and Edwards & Nicoll 2011)

In his work over the past two decades, Ericsson has made a major contribution to the body of knowledge relating to the acquisition and maintenance of, what he terms, 'expert performance' within medicine and related disciplines. Ericsson (2003) draws on traditional skills acquisition theories of Fitts & Posner (1967) who suggested that

people initially focus their attention on avoiding errant mistakes and, as mistakes become increasingly rare and performance improves, they no longer need to concentrate as intensely to perform at a satisfactory level.

Cognisant of the early year's debate (relating to childhood), where accelerated performance is demonstrated in the young, Ericsson et al (1993) suggests that children who display exceptional promise may also receive early onset of training, greater accumulation of practice and hence 'performance'. The authors go on to reiterate the notion of deliberate practice as necessary for maintenance of many types of professional performance. This theoretical framework predicts that prior deliberate practice relates directly to current performance.

Empirical evidence relating to the development of expertise over time is imperfect. Ericsson & Lehmann (1996) suggest that the highest levels of performance in different domains are reached after approximately 10 years of deliberate practice. Ericsson (2003) presents a number of studies relating to the disciplines of physics, computer programming, clinical psychology and wine tasting; where assumed expertise developed over a period of time were not associated with enhanced performance in given tasks when compared with students in the same disciplines. An example given relates to the work of Reif & Allen (1992) where the performance of physics professors, at an Ivy League University, were not always found to be superior to those students taking introductory courses. Ericsson (1993) goes on to assert that traditional views of skills acquisition assume that people will reach a stable level of performance after sufficient years of experience.

Here, there is a theoretical challenge in attempting to delineate between these individuals who reach and attain a stable level of performance, and those perceived as 'expert' due to the ability to improve upon their level of performance commensurate with an increasing time frame. Ericsson (2003) theorises that it is through deliberate practice that basic skills, initially attained, become honed over the years; this is coupled with the increasing complexity of skills practised over time to produce an expert. The theory of *deliberate practice* has become influential in current debates around individual differences in performance. Ericsson et al (1993) proposed the view of deliberate practice as relating to engagement in structured activities with a specific focus on improving performance. More recently, Macnamara et al (2016), investigated the relationship between deliberate practice and performance in sports. This review found inconsistencies within the evidence for deliberate practice and elite performance. Whereas deliberate practice was found to account for some variation in performance (18%) Macnamara et al (2016) found a greater amount of variance to be unexplained. The review suggests genetically influenced and environmental factors as making an

important contribution to performance. This is echoed in the work of Gladwell (2008) who examined factors which contribute to high levels of success. Whilst agreeing with Ericsson's theory of deliberate practice over time, Gladwell also notes that opportunity to develop and a practical intelligence as being factors in achieving a superior level of performance and success. Ericsson (2016) responded to the critique by Macnamara et al (2016) by explaining the origin of the theory as optimising learning through practice with clear goals and immediate feedback which accumulates over time.

Senge (2006) reviews the theories around the practise of learning within organisations and cautions against the mistake of learning from experience and argues that to learn from an experience one must recognise and understand the consequences of actions. He argues that, over time, individuals may no longer observe the consequences of actions. One example given relates to management teams, which function well with routine, but where team organisation breaks down when faced with complex situations which are found to be inherently threatening. This then implies a degree of motivation towards the development of expert performance. Ericsson et al (1993) proposes that eminence in a field is achieved when an individual surpasses the achievements of recognized experts and, in addition, contributes innovatively to the discipline. Essentially, individuals are motivated to practise because practice improves performance. When relating this to eminence in the field of healthcare Ericsson et al (1993) go on to suggest there may be additional motivations in terms of fear of causing harm (to self and others) and/or a fear of failure.

An issue is that rare and critical events are, by their very nature, difficult to engage in from a deliberate practice point of view. Guest (2001) considers the differences between static tasks (e.g. knot tying and suturing), which are the focus of most writing on deliberate practice and those most likely to be recreated in a simulated way, and dynamic tasks which are more complicated and characterised by differences across situations and variations in the performance required (e.g. responding to an emergency event). Schurwith & Van der Vleuten (2006) suggests that one key element of deliberate practice is the opportunity for improving performance by repeatedly performing tasks. This concurs with Ericsson (2003) who also suggests that the performer can exhibit their superior performance in a consistent and reproducible manner. Guest (2001), in an essay about the life long challenge of expertise, proposes that dynamic tasks have components of static performance. An example being the dynamic task of surgery having a static task (requiring little or no improvisation) such as knot tying. These basic skills are practiced until they are 'automatic' thus allowing 'thinking processes required to deal with the complexities of the dynamic situation'.

However, there is a paucity of evidence relating to the form which this deliberate practice must take in order to develop higher level cognition.

Ericsson (2003) considered the field of medicine where, in comparison with other disciplines, it takes a relatively long time, (>5 years) for students to acquire the relevant knowledge and skills required for the profession. He highlights that there is a long period of supervised training where less experienced professionals gradually take on increased responsibility for the essential tasks in the domain, such as diagnosing and treating patients. He goes on to discuss the many differences in daily regimens of specialties e.g. ward rounds, and, therefore, there is difficulty in identifying causal factors that explain superior reasoning skills within a specialty.

In 1998, Holmes argued the concept of competency and skills development suggesting that, despite all the resources put into the deliberate practice of skills, localised schemes with limited transferable value were evident (Holmes, 1998). Correspondingly, Edwards (2010) considers the theoretical constructs of being an 'expert' practitioner; suggesting that individuals develop their professional practice through joint collaboration with others where interpretation of situations and 'sense making' are dependent on and shaped by the local history and culture of the organisation in which one works. Hodges (2006) concurs, suggesting that medical competence is 'culturally and historically contingent construction' and that this is able to change over time.

Within healthcare it is argued that expertise needs to be assumed by those accessing care in order to build trust and confidence in the professionals and care received. In a systematic review of the relationship between clinical experience and quality of health care, Choudhry et al (2005) suggest a negative association between experience and expertise. The issue of skills decay over time is highlighted, reporting that physicians who have been in practice for more years and 'older physicians' possess less factual knowledge, are (52%) less likely to adhere to appropriate standards of care and may also have poorer patient outcomes. This review is limited as dimensions of quality such as holistic approaches to care and clinical judgement skills, which may be developed over time and result in higher satisfaction for those receiving care, were not rigorously assessed as this was not the focus of the review. Hodges (2006) focuses on 'incompetence' within the medical professions which harm quality of patient care and argues that this is a 'side effect' of overemphasising particular models of medical education such as teaching and testing knowledge and skills separately and standardised testing through scenarios. Here Hodges suggests that knowledge and skills should be integrated and bound to domain-specific knowledge in order to embrace variance in clinical scenarios and cases. Schurwith & Van der Vleuten (2006) discusses the challenges for education and training within healthcare and argues that

there is an over emphasis on unstructured activities which rely on learning by doing i.e. practise makes perfect.

These arguments are paradoxical to the assumption that experience enhances knowledge and skills and, therefore, better patient care. There is a need to explore which elements, when practised, contribute to overall performance and which elements do not.

Ericsson (2003) makes the link to simulated learning and suggests that simulators offer the possibility of structured training and deliberate practice which would better prepare performers to deal with real life problems and emergencies.

## **2.2 Expertise in Rare Events**

A key issue here is that engaging in deliberate practice is not obvious for all tasks. Rare critical events are, by their very nature difficult to engage in from a deliberate practice point of view. As defined by the Oxford English Dictionary (OED) rare, critical and emergency events do not occur very often (Rare), have the potential to become disastrous; at a point of crisis (Critical) and are largely unexpected, often dangerous and require immediate action (Emergency) (OED, 2012). An example applied to aviation follows;

On 15 January 2009, US Airways Flight 1549 encountered a flock of birds' minutes after take-off and experienced an almost complete loss of thrust in both engines. The pilot demonstrated an absolute sense of calm and skill as he landed the plane on the Hudson River saving all 155 lives on board (National Transport Safety Board, NTSB 2009). Engine ingestion of birds is a rare occurrence for pilots however; they regularly rehearse engine failure in simulators. Within days of this rare yet critical event, the NTSB had issued an executive summary of the event with key safety recommendations to global aviation authorities where the crew rescue management procedures were also attributed to the 'survivability' of the incident. These rescue procedures are also regularly practised in a simulated way.

This example is given in order to illustrate a profession (aviation) who practise for critical and emergency events in a simulated way but for whom there are some events which are rare and risk catastrophic consequences for all involved. This can also apply to a range of other professions including, but not restricted to, emergency services, transport, engineering and healthcare.

In 2005 the United Kingdom Obstetric Surveillance System (UKOSS) began a project to study the rare disorders of pregnancy throughout the UK with a vision of capturing near-miss morbidities and thus guiding prevention and treatment of potentially life

threatening conditions (Centre for Maternal and Child Enquiries, CMACE 2011). In 2011 the Royal College of Anaesthetists (RCOA) reported on a project which focussed on critical and maternity care for critically ill women during childbearing. This report was complemented by data from the Intensive Care National Audit and Research Centre (ICNARC 2009) which focussed on female admissions to intensive care and recognised that there is currently no national data recording women requiring 'high dependency' care and suggests that this care is currently provided within maternity units.

Pregnancy and childbirth present critical/emergency clinical events which are uncommon and for which both midwives and doctors are required to acquire and maintain competent clinical skills. Rare and critical events include, but are not restricted to, myocardial infarction (heart attack), haemorrhage, seizures, thrombosis and thromboembolism, although the frequency of such events is difficult to report because they are not routinely reported unless women are admitted to adult intensive care (ICNASCL 2011) or die (Knight et al, 2015). There is some evidence to suggest that midwives and doctors have difficulty in maintaining clinical skills in this context as 70% of the direct maternal deaths reported between 2006-2008 were due to substandard care (CMACE 2011). In the recent review of maternal deaths and morbidity, between 2009 and 2013, Knight et al (2015) found that whilst, overall, there has been a statistically significant decrease in the maternal death rate within the UK, within all areas of causality there was evidence of fragmentation and gaps within care.

Substandard care included midwives and doctors not being able to respond appropriately to unexpected critical rare events. Indeed, in a recent investigation into the management and delivery of care at one regional maternity unit, Kirkup (2015) highlighted avoidable harm to mothers and babies and found serious failures of clinical care; lessons were to be learned regarding the clinical competency of staff, as well as serious flaws in communication, in relation to mismanaged incidents during labour and delivery.

At the turn of the century, the report 'An Organisation with a Memory' (DH 2000) claimed that, whilst healthcare teams were capable of caring for straightforward cases, they were far less likely to be able to cope with emergencies. At this point, simulated training with the emerging focus on human factors education was recommended. This was seen as having a direct impact on patient safety by allowing practitioners to rehearse for emergencies and transfer this effectively and efficiently in patient care.

### **2.3 Simulation to Support the Development of Expertise**

Simulation appears to have been specifically applied in the field of aviation, and has been adapted to use within the training and assessment of healthcare professionals. There is an accepted wisdom, within aviation, that simulation facilitates the habitual development of mental strategies allowing pilots to prioritise and make decisions rapidly and without panic and disorganisation (CMO 2008). To support the acquisition of clinical skills there is a consensus that a skill demonstrated using simulation will transfer into clinical practice competently and confidently (Ziv et al 2000). Clinical skills lie at the heart of medical practice and should be developed in an environment where patient safety is not at risk and through a variety of methods i.e. model and/or computer based simulation or role play (Kneebone 2003). However, evidence supporting the way in which, and to what extent, such skill acquisition occurs remains imprecise. Within the literature it is also unclear as to how skills, developed through simulated means, transfer to other similar events occurring in practice; a seminal point within the thesis.

Early work by Miller (1990) relating to the development of competence, performance and expertise, proposed that the learner moves through a number of stages (from knowing to doing) in developing competence and expertise. Miller suggests that it is in the ability to acquire, analyse, interpret and translate information gained from a variety of sources, over time, which is responsible for the development of skill in a particular task or duty.

Within healthcare the strength of simulation appears to lie in practise within a context that closely resembles clinical practice without compromising patient safety (Cleave-Hogg & Morgan 2002, Murray & Good 2002, and Kneebone 2003). So far, there is limited evidence reporting how simulation in this context leads to increased confidence and improved performance in the clinical setting or demonstrating whether learning through simulation is associated with improved patient outcomes.

Within medical and midwifery education there is a tradition of 'learning by doing' where the acquisition of skills takes place in a clinical setting under the watchful eye of a mentor. This 'apprenticeship' model of skills development is reported within medical literature (Kneebone 2003, Bradley 2006, Kneebone et al 2006, Okuda et al 2009) and reviews relating to nursing (McCallum 2007, O'Connor & Sperl-Hillan 2007, Cant & Cooper 2009). A number of qualitative and descriptive studies have been carried out investigating students' opinion of simulation as a learning tool. Medical students have highlighted positive responses, such as: rehearsal of skills in a safe environment and without endangering patients (Murray & Good 2002, Dow 2008) and opportunities to



apply knowledge in a realistic environment, again, without impacting upon patient safety (McIndoe 1999, Cleave-Hogg & Morgan 2002). Cleave-Hogg & Morgan (2002) also identified insightful reflections on personal learning by students such as realisation of what needs to be learned and the application of theory to practise. Van der Vleuten et al (2000) discuss this application of theory to practise and proposes that simulation offers a meaningful perspective for students. These studies were concerned with simulation in the field of anaesthesia and, crucially, did not consider performance and confidence in clinical skills at specified points following simulation i.e. skills decay.

As simulated learning is particularly developed in the field of aviation it seems appropriate to explore how professionals in this domain prepare for emergency situations. Aviation appears to rely heavily on simulation to train pilots. In a retrospective case study exploring the effects of deliberate practise on crisis performance McKinney (2003) found that those pilots with a greater amount of practise of specific emergency situations through simulated means (1355hrs vs. 478hrs) demonstrated significantly improved ( $p < .05$ ) decision making performance with a large effect size  $d = .89sd$ . Interestingly, this was linked to wholly practised situations. McKinney found no relationship between deliberate practise and crisis decision making performance when specific malfunctions were omitted from the scenario. This appears to contradict Ericsson's proposition of enhanced cognitive process and the ability to reason beyond presented data (meaning complex decision making) borne out of experience over time (Ericsson & Lehmann 1996). Here, Ericsson reports that those with developed 'expertise' are able to circumvent the need for rapid decisions due to their increased awareness of perceptual cues which lead to them developing a more accurate anticipation.

Klein (1989) discussed recognition-primed decisions within aviation and suggests that expert decision makers are able to respond to critical situations by retrieving an example from previous experiences or familiar cases. O'Hare (2004) draws on this theory when exploring the roles that case-based reminding play in real life decision making when confronted with a critical flight event. The study found that recall of previous cases were utilised by over 50% of pilots when responding to a critical flight event. These cases were useful in the assessment phase of response rather than option evaluation. The use of cases increased with age and experience which appears to negate skill decay. This means that previous cases, which may have been experienced many years earlier, were being considered when pilots were assessing

the situation at hand. O'Hare's study (2004) highlights a potential area of training development alongside simulation utilising case based learning to improve decision making.

Sohn & Doane (2004) examined the role of long term working memory capacity and expertise in flight situation awareness where memory was seen as crucial in the performance of tasks that require complex processing. They found novice pilots (total flight time less than 85 hours) utilised working memory in situational awareness and responses were largely verbal, whereas long term working memory skills (based on complex configurations) was most predictive for expert pilots (average total flight time over 1116 hours). 'Experts' were more likely to have stored relevant sequential patterns in long term memory and were able to retrieve this easily and also gave a largely 'spatial' reasoning to situational awareness. Long term memory was also found to correlate with flight hours which support Ericsson's view of deliberate practise. This also supports the work of O'Hare (2004) in terms of exploring the cognitive processes inherent in dealing with a crisis situation. Interestingly, there appears to be little empirical evidence regarding the role of case based reminding and its effect on real-life decision making for healthcare professionals.

Earlier in the chapter there was an example of an aviation incident which, whilst holding the potential for catastrophic consequences, was held up by the National Transport Safety Board (NTSB) as an example of enhanced decision making in a crisis situation. The pilot involved in the incident later reflected on what he was drawing upon when responding to this event and emphasised the importance of human skills and not just an over emphasis on technical skills. These were defined as skills that some deride as 'soft' (including communication, collaboration and co-ordination) which he viewed as holding the potential to save more lives than technical skills alone (*SullySullenberger.com Oct 2013*).

In 2005 Issenberg et al reviewed the literature relating to high-fidelity medical simulations in order to distil the features of simulation which lead to effective learning (Table 2.1). The authors report a critical summary of evidence relating to simulation and it is noted that none of the features of simulation appear in more than half of the reviewed literature; the authors highlight the limited quality of primary research in this field. In particular this related to unstandardized outcome measures and wide variation in the reporting of means, standard deviations and reliability coefficients; leading to

difficulty in quantitative synthesis. To note; the percentages given are related to coverage over the 109 articles reviewed.

**Table 2-1 Features of simulation leading to effective learning**

Provision of feedback (through self-assessment and provided by instructor) 47%
Repetitive practise on a simulator (shortens learning curve and accommodates learner schedule) 39%
Integration of simulators into curriculum (fully integrated = best effect) 25%
Learners practise with increasing levels of difficulty (leading to increased mastery of skill) 14%
Adaption of simulators to multiple learning strategies (large or small group or individual settings) 10%
Simulators to provide clinical variation (provide exposure to rare encounter) 10%
Learning should occur in a controlled environment (detecting mistakes without consequence) 9%
Provision of individualised learning on a simulator (learner is an active participant) 9%
Clearly defined outcomes for learners (appropriate to learner level of training) 6%
Ensuring that the simulator is a valid learning tool (learners prefer realism as this transfers to the 'real' patient) 3%

(Issenberg et al 2005)

This review is limited to high fidelity simulation and medical education only and does not evaluate the effectiveness of simulation when compared with traditional approaches.

The term 'fidelity', when applied to simulation, relates to the degree to which the strategy reflects reality. The International Nursing Association for Clinical Simulation and Learning (INASCCL 2011) in a directory of terminology, state that as fidelity increases so too does the realism of a simulation. Dieckmann et al (2007) specify the range of dimensions which go towards increasing the fidelity of a simulated environment. These included the physical dimensions, such as equipment, social dimensions, such as motivation, openness and trust, and cultural dimensions, such as the environment and the group involved.

Yuan et al (2011) offers a definition of low fidelity (less similar to reality e.g. training arms) intermediate fidelity (offering sounds without complexity and realism e.g. CPR mannequin) and high fidelity equipment which have actual physiological and pharmacological responses and recognises that the evidence to support transfer of the simulated experience into real life situations is limited. There are many studies which discuss the relative merits of high fidelity simulations, such as increasing confidence and competence (Blum et al 2010, Yuan et al 2011) decreasing anxiety (Erickson et al,

2012) improving clinical judgement (Lasater, 2007) and detecting error whilst limiting negative consequences to patients (Nagle et al 2009).

It is noteworthy that, given the focus on higher fidelity of the simulated strategy, within the literature, only 4 studies (out of 109) reviewed by Issenberg et al (2005) identified increased realism and fidelity of the simulator/simulation as enabling learners to improve their skills and responses.

Going back to the earlier illustrative example of a critical incident within aviation, reflections by the pilot involved highlighted a vital learning experience in exploring potential parallels between aviation and medical disciplines which hold the potential of improving patient safety outcomes and reducing avoidable harm (*SullySullenberger.com Oct 2013*).

### **2.3.1 Human Factors and Simulation**

Recent years have seen an emerging focus on the science of understanding performance within systems aimed at reducing patient harm. Those involved in service improvement to promote patient safety often refer to the work of Reason (1997) and the 'Swiss Cheese' model of how systems failures penetrate 'holes' in clinical safeguards. Veltman (2007) considers this model to be appropriate for the study of critical incidents in the field of obstetrics as it encapsulates the ever-present threat of weakening defences and safeguards. Catchpole et al (2011) considered aviation models and their application to healthcare and defined the 'human factors' of teamwork, task, culture, organisation and behaviour as important facets to understand in enhancing clinical performance. In 2009 the Clinical Human Factors Group (Carthey & Clarke, 2009) developed a guide to implementing human factors within healthcare and demand for more explanation led to further guidance in 2013 (CHFG, 2013). This guide recognised that humans are fallible and that performance within the clinical setting can be affected by a number of internal and external factors such as personal life, work pressures and training; subsequent recommendations included placing greater emphasis on teamwork within simulated training and education.

Overall, it appears that simulated training strategies, with the flexibility to include teamwork and in delivering training in a variety of settings, can support the development of skills, knowledge and expertise within a range of different professions where preparation for critical and emergency events is required. The ways in which simulated training has emerged and developed over time has been considered and this has highlighted limitations in the quality of primary research relating to how simulation works, for whom and in what circumstances.

## **Part Two.**

Part two of this chapter provides a background and explanation of the underpinning assumptions (worldview), methodology and methods chosen for the study.

### **2.4 The Paradigm Debate**

There is much ambiguity in the notion of research paradigms which range from beliefs about the nature of the world and how we come to know this (Blakie 2010) to methodological choices within research practice (Denscombe 2008 ). Guba (1990) uses the term 'paradigm' to refer to the beliefs which guide actions.

There are many paradigms espoused within research literature and, simplistically, a positivist paradigm (belief in one truth) traditionally underpins quantitative methods and a constructivist paradigm (belief in individual, subjective meaning) underpins qualitative methods (Tashakkori & Teddlie 1998). Positivist logic is deductive with a focus on measurable facts. The thinking after positivism (known as post-positivism) reflects the focus on discovering the causes which influence outcomes (Plowright, 2011). Emanating from the 1980's, where positivist approaches were not seen to be representing marginalised individuals, an advocacy/participatory worldview, holds that a political agenda should thread through inquiry (Creswell 2009). Paradoxically, constructivist logic is inductive with a focus on meanings. In this sense these approaches appear incompatible and philosophically oriented scholars have discussed the claim of incommensurability over many decades (Harritts 2011).

In an attempt to offer a resolution to the problem of paradigmatic incompatibility, Creswell (2009) uses the alternative term 'worldview' to describe the orientation which the research(er) holds about the world and suggests that worldviews are shaped by discipline area, beliefs and experiences. The solution to the problem of worldviews coexisting has been suggested in mixed methods where, conversely, pragmatism moves away from the notion of truth or subjective meaning and recognises singular and multiple realities which are open to inquiry and orientated towards practical problems (Creswell & Plano Clark 2007, Felitzer 2010). Pragmatism considers the research question to be more important than the worldview underlying it. Key elements of each worldview as presented by Creswell (2009) can be found in Table 2.2.

**Table 2-2 Major elements of each worldview**

Post positivism	Constructivism
<ul style="list-style-type: none"> <li>• Determination</li> <li>• Reductionism</li> <li>• Empirical observation and measurement</li> <li>• Theory verification</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding</li> <li>• Multiple participant meanings</li> <li>• Social and historical construction</li> <li>• Theory generation</li> </ul>
Advocacy/Participatory	Pragmatism
<ul style="list-style-type: none"> <li>• Political</li> <li>• Empowerment issues-oriented</li> <li>• Collaborative</li> <li>• Change-oriented</li> </ul>	<ul style="list-style-type: none"> <li>• Consequence of actions</li> <li>• Problem-centred</li> <li>• Pluralistic</li> <li>• Real-world &amp; practice oriented</li> </ul>

(Creswell 2009)

Onwuegbuzie & Teddlie (2003) argue that those engaging in the paradigm debate are confusing the 'logic of justification' with research methods and contend that the worldview held by the researcher should not impact upon data collection methods. Johnson & Onwuegbuzie (2004) go on to advocate the selection of pragmatic, pluralistic methods focussing on choosing the most appropriate methods and procedures for answering the research questions.

#### **2.4.1 Epistemology and Ontology**

Ontology is described as the assumptions in which researchers operate in their search for knowledge (Schwandt et al, 2007) or the nature of one's reality (Creswell 2007). From the background literature it is apparent that there are external and internal factors at play within the study problem e.g. environment, opportunities available, focus of attention and developing performance, meaning that there cannot be a singular truth. This study sought to explore transitory causal relationships; the area of interest being in the reality of preparation for RCEE in terms of the influence of social structures and processes and, therefore, the study draws parallels with **critical realist ontology**, meaning that reality is objective i.e. independent of cognition, and this is paired with a relativist epistemology. .

Epistemology is concerned with the theory of knowledge, its origins and how beliefs about the nature of one's reality can be justified (Dancy, 1985). A **relative social epistemology** asserts that an individual knowledge and understanding of reality develops and changes over time

The objective of the study is real-world and practice orientated therefore the study **methodology** is embedded in the philosophical foundation of integrated **pragmatism** as 'pluralistic approaches' will be adopted in order to derive knowledge about the problem and philosophical assumptions will be considered throughout. Pragmatism gives primacy to the research questions and values both objective and subjective knowledge (Morgan 2007) thus providing opportunities for employing a range of approaches and the integration of a range of theoretical perspectives in order to answer the questions (OBSSR 2011).

## **2.5 Mixed Methods Research (MMR)**

Debates about truth, embracing the spirit of western philosophy, continue today in relation to how we view knowledge and how we go about finding it (Johnson & Onwuegbuzie 2007). Discourse around combining both qualitative and quantitative is not new as this is seen as assisting in explanation of variance in phenomenon (Campbell & Fisk 1959) validation within the design, data collection or analysis phases (Sieber 1973) and the validation and explanation of results (Bouchard 1976). In 1978 Denzin defined the combination of methodologies within one study as "triangulation"; distinguishing combination *within methods* and *between methods* involving both quantitative and qualitative approaches (Denzin 1978, p291). Over the past two decades the mixing of methods has gained legitimacy as a methodology within social, behavioural and health sciences research; in contrast to one approach validating an element of design, both quantitative and qualitative data are integrated in order to interpret and understand a research problem (Johnson & Onwuegbuzie 2004, Teddlie & Tashakkori 2009, Bazeley 2015, and Creswell 2015).

### **2.5.1 What mixed methods research is**

Mixed methods research is described and defined in a number of ways which vary. Key authors in the field define MMR as a design which utilises both qualitative and quantitative approaches in gathering and integrating data (Tashakkori & Teddlie 2003, Johnson & Onwuegbuzie 2007, and Creswell 2015). Conversely, Bazeley (2015) refers to the use of more than one approach for research design but not specifically the methodological tradition (qualitative/quantitative).

Whereas Creswell (2015) adds the dimension of interpretation, based on the combined strengths of both data sets, as the main principle of MMR; Bazeley (2015) argues the case for analysis to be integrated throughout the program of study and not as an end point. Moreover, Greene (2006) recommends taking a broad view of what is meant by

the term 'method'; rather than focussing on methodological traditions there is an orientation towards the methods of data collection (e.g. interviews) research (e.g. experiments) and philosophical approach (e.g. worldview).

From a plethora of definitions these examples highlight that, essentially, mixed methods inquiry seeks to combine/integrate a variety of approaches in addressing the research problem

### **2.5.2 What mixed methods research isn't**

Bazeley (2015) draws a distinction between *mixed* and *multi* method research delineating that multi-method research, whilst adopting varying approaches, leaves the integration of these until the conclusion of the study. Creswell (2015) argues that MMR is not merely the addition of qualitative data to a quantitative study as the process can go either way (discussed further in Chapter 3).

MMR is not a 'trend' as there are specific scientific techniques necessary within the research process. In 2010 The Office of Behavioural and Social Sciences Research (OBSSR) commissioned the development of guidance in evaluating MMR. Pursuant to this, the leadership team developed 'Best Practices for Mixed Methods Research in Health Sciences (OBSSR 2011). There are specialist methodological journals actively fostering MMR (JMMR; IJMRA) and an international association of MMR founded ([www.mmira.org](http://www.mmira.org)).

### **2.5.3 Strengths and limitations of mixed methods research**

The rationale for choosing MMR is the ability to explore research questions and to benefit from the addition of a method which could overcome the weaknesses of another (Creswell, 2014). Where questions relate to the evidence surrounding simulation in preparation for critical events e.g. what works, for whom and in what circumstances, quantitative methods will illuminate frequencies, improvements in simulation and agreement between approaches. Qualitative methods lend themselves to exploring the experiences of professionals (of both simulation and critical events). The quantitative findings also serve to inform the purpose and design of the second phase of the study, facilitating the development of interview questions. The convergence of findings from quantitative and qualitative elements provides stronger evidence for conclusion, adding insight which may be missed with the use of one method only (Johnson & Onwuegbuzie, 2004).

Conversely, there are limitations to MMR identified by Johnson & Onwuegbuzie (2004) relating largely to resource considerations (e.g. researcher time, financial cost) and



practical considerations (e.g. researcher skills and understanding of the range of methods and how to mix them, the task of concurrent research). Most notable is the longstanding debate regarding the mixing of methods and the compatibility (sometimes referred to as 'commensurability') of research paradigms. In 1989, Guba and Lincoln suggested that philosophical debates could have been resolved some time ago if the nature of reality could be explained with a single truth. It is, therefore, incumbent upon the researcher to determine the methodology employed and provide warrantable assertions as to the decision making behind this approach.

## 2.6 Summary of Chapter 2

This chapter explored the broader questions of how expertise is developed and how professionals develop expertise in responding to rare and critical events. This exploration went beyond healthcare provision in order to understand how simulation is utilised within a range of other disciplines.

This highlighted an accepted wisdom that skill acquisition is commensurate with experience and deliberate practise over time. Literature highlighted a theoretical challenge in attempting to delineate between those individuals who reach and attain a stable level of performance, and those perceived as 'expert' due to the ability to improve upon this level of performance commensurate with an increasing time frame.

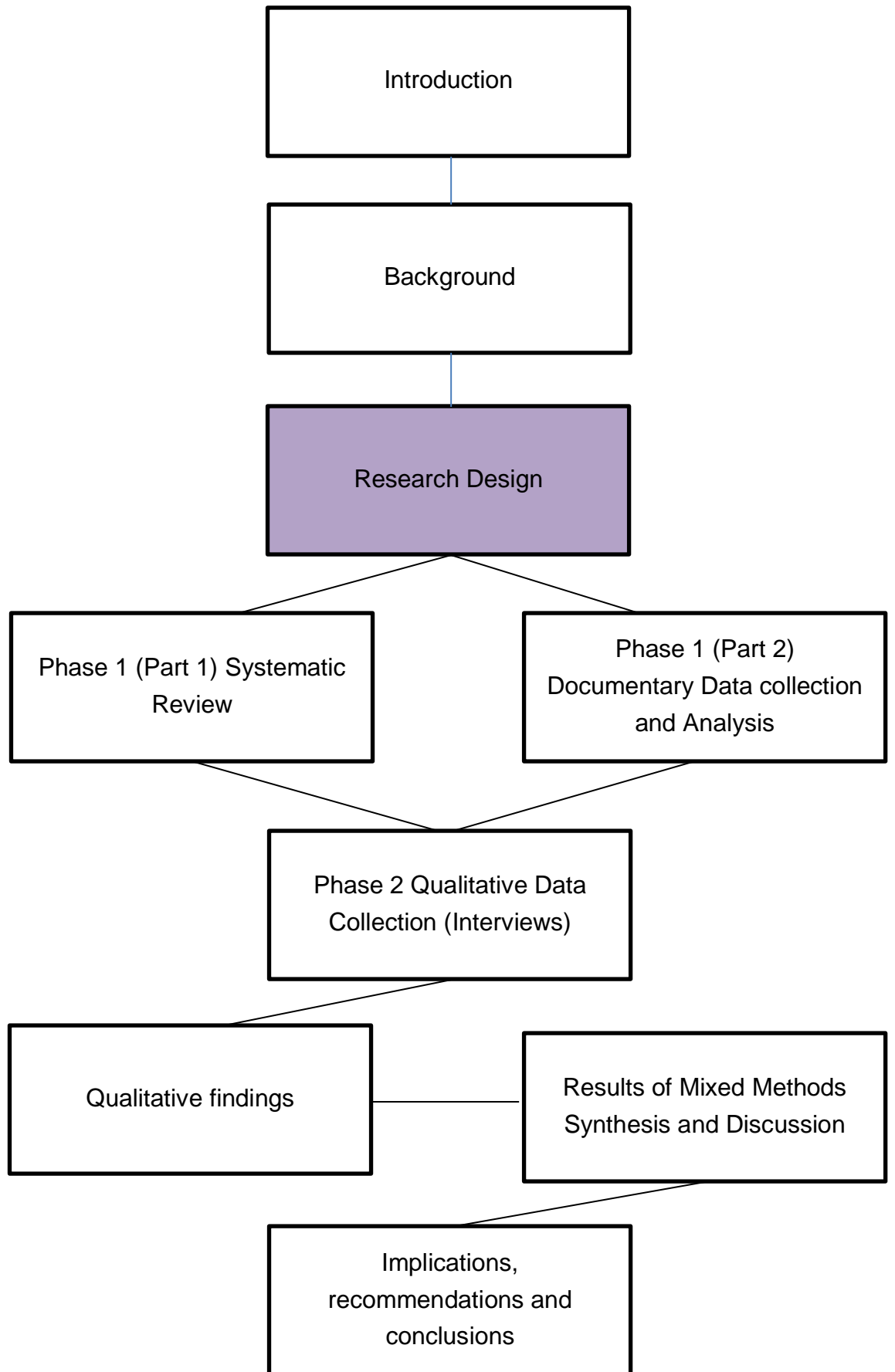
Within healthcare, simulation has been adopted as an approach to supporting skills acquisition through practise in an environment where patient safety is not at risk. There is a consensus that a skill demonstrated using simulation will transfer into the clinical setting competently and confidently. When considering a specific application to maternity care, there is evidence to suggest that midwives and doctors have difficulty maintaining clinical skills in the context of rare and critical events (Knight et al 2015).

To summarise, it appears that simulated training strategies, with the flexibility to include teamwork and training in a variety of settings, can support the development of skills, knowledge and expertise within a range of different professions where preparation for critical and emergency events is required. The ways in which simulated training has emerged and developed over time has been considered and this has highlighted limitations in the quality of primary research relating to how simulation works, for whom and in what circumstances.

The aims of the study emerged from gaps in the literature and the research evidence relating to healthcare practitioners responses to obstetric emergencies. In exploring the concept of simulated learning and practise the overall intent was to understand the role of simulation in real life management of critical events during childbearing.

As the emerging focus of the study was real-world and practise orientated the chapter went on to explore the literature supporting the underpinning assumptions (worldview), methodology and methods chosen for the study. This included consideration of the strengths and limitations of mixed methods as a potential approach to research design.

What follows, within chapter 3, is an explanation of the methodology employed for the study with a view to providing 'warrantable assertions' as to the decision making behind the chosen approach.



## Chapter 3 Research Design

*'If you can't figure out your purpose, figure out your passion. For your passion will lead you right into your purpose'*

*Bishop T D Jakes (2007)*

Chapter 2 explored the broader literature concerning the development of expertise and how this relates to preparation for recognising and responding to critical and emergent events. The ways in which simulated training has emerged and developed over time was also considered and this highlighted limitations in the quality of primary research relating to how simulation works, for whom and in what circumstances. The chapter also orientated the reader to the discipline of mixed methods inquiry and situated the study within the philosophical foundation of critical pragmatism.

Within this chapter the plans and procedures for the study (research design) are explained. The methods adopted are outlined with specific instruments being discussed further within Chapters 4, 5 and 6. Rigour in the research process is discussed and consideration is given to ethical issues inherent in the study.

### **3.1 Aims and Objectives of the Research:**

The aim of the study emerged from gaps in the literature and the research evidence relating to healthcare practitioners responses to obstetric emergencies. In exploring the concept of simulated learning and practise the overall intent was to understand the role of simulation in real life management of critical events during childbearing. The term 'childbearing' in this context means 'at any point in the antenatal, intrapartum or postpartum period'.

#### **3.1.1 The research questions:**

1. How do healthcare practitioners develop skills in order to prepare for and respond to rare, critical and emergency events during childbearing?
2. What are healthcare practitioners' experiences of simulated practise in order to respond to rare, critical and emergency events during childbearing?

### **3.1.2 Specific Objectives:**

**1a.** to identify the effects of simulation on the preparation of professionals who prepare for events which happen rarely and unexpectedly and risk serious morbidities and mortalities.

**1b.** to synthesise the evidence available and produce a taxonomy of the characteristics of effective simulated training programmes.

**2a.** to explore participants' experiences of simulated preparation and performance in critical events.

**2c.** to synthesise the evidence and determine the behaviours of professionals in preparation, attainment, motivation and maintenance of skills for critical events during childbearing.

The study was designed in two phases as different questions and range of objectives required different methods.

## **3.2 Study Design**

Sequential Mixed Methods procedures are chosen in order to elaborate on and connect the findings of one method with another method (Creswell 2009). The study is conducted in two phases.

In the first phase, a quantitative research question reports the relationship between simulation and professional preparation for rare, critical and emergency events. The development of a conceptual framework of simulation from this phase is explored further in a second, qualitative phase.

The purpose of phase two of the research is to add depth and detail to the emerging theoretical framework relating to simulation and applied to rare and critical events; to better understand and explain preparation for rare, critical and emergency events through simulated practise.

In this phase the taxonomy of characteristics of simulation is used to gain insight into preparation for rare and critical events using a qualitative approach. There are two elements of data collection within this phase specifically case note audit and face-to-face interviews.

Figure 3.1 is a diagrammatic representation of the proposed research.

### **3.2.1 Phase 1**

Phase 1 (detailed within Chapter 4) consists of;

- (a) Systematic review of the literature relating to preparation for critical events in simulated ways.
- (b) An analysis of local training and education programmes for Doctors and Midwives who look after childbearing women in order to find out the common characteristics of such programmes for recognising and responding to obstetric emergencies.

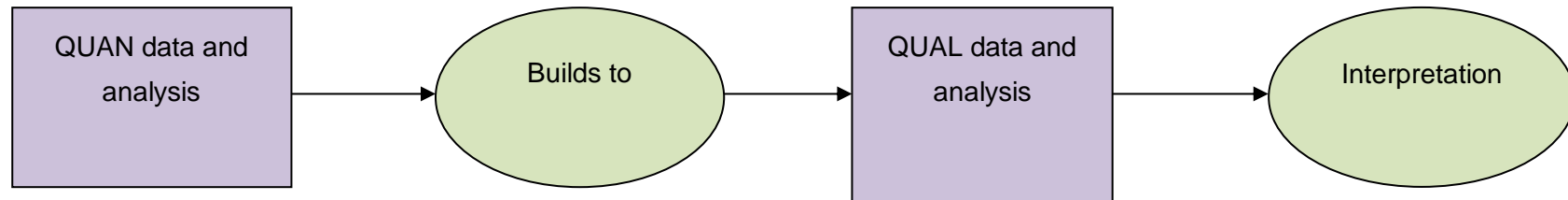
The four objectives of the systematic review were to (1) assess the effects of simulation strategies on the preparation of professionals for rare, critical and emergency events; (2) to compare simulation to other forms of training and education; (3) to synthesise the characteristics of simulation that impact on the preparation of professionals for rare, critical and emergency events and (4) to compare different forms of simulation. The methods for ensuring quality within the review process are based upon guidance published by The Cochrane Collaboration<sup>©</sup> where pre-specified criteria for consideration of studies is recommended (Higgins & Green 2008).

The quantitative systematic review leads to the production of a framework of the characteristics of simulation. Alongside this there is an analysis of local training and education provision relating to critical events in childbearing through documentary analysis of simulated training and education programmes.

The contextual conditions of training provision (simulation) are pertinent to the area of study (preparation for rare, critical and emergency events) and inform the development of subsequent phases. Documentary analysis involves the study of existing documents in order to gain understanding of the basic content or deeper meanings which may be illuminated by style and coverage (Ritchie & Lewis 2006). The two objectives of this second element of phase 1 were to (1) identify the characteristics of programmes which use simulation to train/prepare for critical events during childbearing and (2) to synthesise these characteristics with the data borne out of the systematic review. Documentary evidence included curricula documentation, lesson plans and evaluations from 5 programmes and data collection also included observation of training in three sites which were identified for ease of access due to practical locality.

Data management was achieved through a 'framework' approach as this includes indexing and sorting tasks customary in many processes of making data 'manageable' but adds the step of data summary and display. This information informs phase 2.

**Simulation and Professional Preparation for Rare, Critical and Emergency Events during Childbearing – A Mixed Method Study**



Procedures:

- Systematic Review of the Literature
- Documentary analysis of local training/education programmes (n=5) and observation of training (n=3)

Products:

- Taxonomy of characteristics of simulation
- Development of a theoretical framework
- Check face Validity of the taxonomy
- Identification of the current context of education/training
- Identification of challenges
- Identification of potential scenarios to inform phase 2 (through case note audit)

Procedures:

- Face-to face interviews with healthcare professionals (n=25)
- Presentation of vignettes during semi structured interviews

Products:

Testing of the taxonomy in the real world; Context, description, theme analysis, assertions and generalisation relating to simulation and rare, critical events will be highlighted.

Product:

Iterative synthesis of the extent to which quantitative dimensions of simulated training and education are validated by, converge or diverge from qualitative findings.

**Figure 3-1 Diagrammatic Representation of the Study**

### 3.2.2 Phase 2

In the second phase, qualitative interview was used to probe experiences of preparation for rare/critical events; the rationale being to add depth and detail to the emerging conceptual framework (detailed within Chapter 6).

Phase 2 consists of;

- (a) An audit of medical case notes relating to recent critical events in order to identify key and recurring themes and chronology of events to inform the interview schedule and shape the vignette. .
- (b) Face-to face semi structured interviews with Doctors, Midwives and Support Workers in order to explore training, experiences, actions and judgements

Data from clinical case notes relating to critical/emergency events were reviewed with a view to identifying key issues relating to an event as a means to develop the data collection instruments. These inform the semi-structured interview and are utilised in scenario (vignette) formation. Sampling of cases for audit was through initial access to the birth register within the clinical site. Critical incidents were identified from the start of the study as the impact of current simulated training practises are of interest.

Semi structured interviews were conducted with a purposive sample of healthcare professionals involved in the care of childbearing women. Questions were developed from the findings from phase 1 and also relating to the vignette. This was in order to develop a detailed and in depth picture of participant knowledge of, and preparedness for, critical and emergency events during childbearing based on their simulated education and training. Morgan (2007) explains this approach as 'abductive reasoning' as it allows for the translation of observations into theory and then exploration of those theories through action.

Approaches to sampling which help in representing diversity amongst midwives and medical staff involved in critical cases were used and are discussed further in Chapter 6.

When analysing the qualitative interview data attribution theory was chosen as scaffolding to align the way in which people attribute learning through simulation and preparedness for rare/critical events. Using an attribution lens, initial coding related to the broad principles of locus and stability. Data was considered as being related to internal and external characteristics relating to the utility of simulation or individual 'preparedness' for critical events during childbearing. Once locus was assigned elements of stability were considered (detailed within Chapter 6).



This then culminates in an iterative synthesis to better understand the phenomena of how to prepare for (expect) the unexpected and the role of simulation in this.

Essentially, the study comprises of the development of a taxonomy (QUAN) which is tested with a series of interviews (QUAL) – an Explanatory Sequential Mixed Methods Design (personal communication with John Creswell June 2012).

### **3.3 Methodology**

From the research questions it became apparent that a combination of both quantitative (quan) and qualitative (qual) standpoints would be needed as multiple viewpoints are explored. The objective of the study is real-world and practise orientated therefore the study is embedded in the philosophical foundation of critical pragmatism as ‘pluralistic approaches’ are adopted in order to derive knowledge about the problem and philosophical assumptions are considered throughout. Pragmatism gives primacy to the research questions and values both objective and subjective knowledge (Morgan 2007) thus providing opportunities for employing a range of approaches and the integration of a range of theoretical perspectives in order to answer the questions (OBSSR 2011).

#### **3.3.1 The relationship between qual and quan**

The rationale for using mixed methods is to explore the research questions, benefitting from the addition of methods which could overcome the weaknesses of another. Specifically, to add to quantitative information (relating to simulation and gained from systematic review of the literature) qualitative data regarding the setting, place and context of personal experiences relating to both simulation and preparation for critical events.

In 2007 Creswell & Plano Clark identified 12 typologies for classifying mixed method designs. These were later distilled into 3 basic designs central to all mixed methods studies; convergent (previously defined as concurrent), explanatory sequential and exploratory sequential designs (Creswell 2015). Creswell et al (2003) advanced several attributes which influence the design of study; namely timing (concurrent or sequential), mixing (how and when data is merged), weighting<sup>3</sup> (equality, dominance or

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<sup>3</sup> Mixed methods notations defined by Morse (1991) and developed by Creswell & Plano Clark (2007) refer to both the approach in shorthand (Quan = quantitative and Qual = qualitative) and the weighting where upper case shorthand e.g. QUAN + QUAN depicts equal weighting and priority. Conversely lower case shorthand e.g. QUAN -> qual depicts both lesser weighting and priority when preceded by an arrow.

priority of the data) and theorizing (perspective guiding the design) each with distinct advantages and disadvantages (as shown in Table 3.2).

Essentially a *convergent design* involves the results from two datasets, which have been collected and analysed separately, being merged in order to identify where they confirm (or refute) each other in answering the question; The advantage being the ability to consider a problem from multiple angles.

With sequential designs, data collection occurs in phases with either the quantitative or qualitative component coming first (Creswell 2009). *Explanatory sequential* designs begin with a quantitative component which is then explained by a qualitative component. In contrast, *exploratory sequential* designs involve the use of a qualitative component in order to inform the development of an instrument (or intervention) and the testing of this through a third, quantitative phase (Creswell 2015).

This study comprises of the development of a conceptual framework of simulation (QUAN) which is explored with a series of interviews (QUAL) – therefore an explanatory sequential design (see Table 3.1).

**Table 3-1 Characteristics of 3 Mixed Methods Research Designs**

	<b><i>Convergent</i></b>	<b><i>Explanatory Sequential</i></b>	<b><i>Exploratory Sequential</i></b>
<b><i>Purpose</i></b>	Separate collection of quan and qual data with the merging of results from qual and quan data analysis	Follow up quan strand with a qualitative strand in order to explain results	Develop an instrument or intervention in order to follow up the exploration of a problem through qualitative data collection.
<b><i>Timing</i></b>	No sequence	Sequential, quantitative first	Sequential quantitative first
<b><i>Weighting</i></b>	Equal	Quantitative	Qualitative
<b><i>Mixing</i></b>	Integrating	Embedding	Connecting
<b><i>Theorizing</i></b>	Explicit	Implicit	Explicit/Implicit
<b><i>Advantages</i></b>	Intuitive, efficient, different pictures	Phased Quan driven Manageable	Phased Qual driven Manageable
<b><i>Disadvantages</i></b>	Divergent data Challenges in data collection by single researcher.	Lengthy phases Not attractive to qualitative researcher	Lengthy phases Not attractive to quan researchers

(Adapted from Creswell et al 2003, Creswell & Plano Clark 2009 & Creswell 2009)

### **3.4 Rigour and the Research Process**

In order to demonstrate the study's ability to create new knowledge indicators of good research are shown. Ravitch & Riggan (2012) assert that rigour is related to a convincing argument for relevance throughout the research process. O'Leary (2004) explains the traditional quality indicators of quantitative methods (reliability, validity & generalisability) and their counterparts in qualitative methods (dependability, authenticity & transferability) and argues that researchers should examine their own worldview in selecting appropriate indicators. Lincoln & Guba (1981) advocate the building of 'trustworthiness' choosing credibility, transferability, dependability, and

confirmability as markers for quality appraisal. What follows is a description of these aspects of rigour in relation to the study.

#### **3.4.1 Credibility**

Consideration of trustworthiness (a qualitative analogue) and validity (a quantitative analogue) are defined under the umbrella of credibility if there is correspondence between the data collected and the way in which the researcher portrays this (Mertens 2005 p254). Transparency in explanation relating to each element of the study will be an indication of credibility (Bryman 2004). Credibility is also demonstrated through prolonged engagement with the process; triangulation techniques where interpretations and inferences are checked and compared by other researchers (Teddlie & Tashakkori 2009); and referential adequacy, where interview data is set aside and reanalysed in order to assess the initial inferences (Lincoln & Guba 1985).

#### **3.4.2 Transferability**

Transferability is concerned with illustrating the significance of findings to other contexts, settings and/or populations. (Teddlie & Tashakkori 2009, and O'Leary 2004). This is demonstrated through the provision of 'thick description' of the context of the study, research setting and participant population (Lincoln & Guba 1985) whilst balancing this with specific attention to confidentiality.

#### **3.4.3 Dependability**

Accepting that individuals experiences are complex and multi-faceted capturing 'reliable' or 'standard' results through qualitative interview would prove challenging. Dependability refers to quality assurance that the variation in phenomenon can be explained consistently. This is achieved through the description of logical, methodological protocols (O'Leary 2004) providing an audit trail of the decision making processes throughout the study. This will allow the reader to make decisions relating to the process of inquiry and appropriateness of inquiry decisions (Teddlie & Tashakkori 2009).

#### **3.4.4 Confirmability**

In order for the interpretation of results to be credible results must be grounded in data, inferences logical and inquirer bias identified (Lincoln & Guba 1985). Again, this can be confirmed through full explanation of the research process allowing confirmability audit. In order to explore potential bias (shaped by researcher motivation, history, experiences or expectations) continues critical reflection is demonstrated through a reflexive journal. This provides information for all four of the trustworthiness criteria.

### **3.4.5 Authenticity**

Beyond methodological rigour, Guba & Lincoln (1989) advocate the need for authenticity within research studies. This includes specific attention to ethical issues (outlined in 3.4.6) and in representing participant voices and views within the study findings (outlined in chapter 7).

### **3.4.6 Ethical considerations**

Consideration was given to the ethical issues inherent within the study design (Guba & Lincoln 1989). Ethical approval was granted by the appropriate Research Ethics Committee (SHREC/RP/314 – Appendix 13) and access approval through Research and Development processes within the NHS Trust. There were two amendments to the initial review forms and these related to a request to observe training programmes (detailed in chapter 5) and an extension of time available for qualitative data collection (phase 2).

Overarching issues relate to confidentiality, informed consent, anonymity, risk & benefit, data protection and inconvenience to interviewees. These were addressed following research ethics and governance guidance available from the Health Research Authority and University of Leeds Research Ethics Committee ([http://researchsupport.leeds.ac.uk/index.php/academic\\_staff/good\\_practice/university\\_ethics\\_policies/](http://researchsupport.leeds.ac.uk/index.php/academic_staff/good_practice/university_ethics_policies/)).

### **3.4.7 Confidentiality across multiple data collection processes**

All identifiable data relating to the data collection processes were scanned, uploaded and stored electronically with password protection. This included curricula documents and consent forms. When reporting all identifying features (names, locations) were removed. Within the workplace (during interviews) confidentiality was difficult to assure and participants were offered a location, date and time of their choice in order to minimise the risk of breach in confidentiality.

### **Case Note Audit**

No identifying features from case note review were recorded; this process was for identification of key themes within the management and sequence of events only. Medical case notes were not removed from the clinical site.

## **Documentary Review**

Training providers were informed that no identifying features were to be published. This also included discussion with training providers where information could not be identified within documentation. For observation of the programme it was reiterated that this was solely for the purpose of identifying common characteristics and approaches and, therefore, anonymity was assured.

## **Interviews**

Following interviews all names were removed and each recording given a participant number. The original audio recording was destroyed. All recordings were transcribed by the researcher only (this will be discussed further in Chapter 9).

All interview data were anonymised by the researcher prior to being reviewed and transcribed. The clinical site will not be identified within any ensuing publication unless express permissions are sought through governance processes.

Interviewees were assigned a participant identification number (ID). This was used to identify the recording of the interview; where names were recorded during the interview these were removed during transcription. Quotations are reported using a pseudonym or ID. The ID and contact details of participants are stored on a password protected computer separately to the transcribed interviews (Data Protection Act, 1998)

### **3.4.8 Informed Consent**

All identified training and education providers were fully informed of the purpose, advantages and disadvantages and process of the study (Appendix 1) prior to obtaining their written consent to access training and education curricula. (Appendix 2) Training providers were informed that no identifying features were recorded or are to be published.

Consent to access clinical case notes for audit purposes was agreed by the NHS Trust, Clinical Director and Head of Midwifery. There were no patient identifying details recorded from the case note audit as this was used for the identification of key themes within the management of critical events only as a means to develop a data collection instrument.

Invitations to participate in the study were distributed by the Clinical Director and Head of Midwifery. Those interested contacted the researcher by email and a participant information leaflet was sent electronically (Appendix 14). The researcher then contacted the participant and arranged a mutually convenient meeting. Consent forms (Appendix 15) were completed by the participant and researcher and a copy given to the participant.

### **3.4.9 Risk and Benefit**

All participants were fully informed of the study aims, risk and benefits and the nature of involvement. There were no physical or financial risks identified. Participants were informed that, should they become upset during the data collection process, they would be asked if they wish to withdraw consent. No participant became upset. Upon completion of the study a summary of the results will be available to participants and they may recognise themselves in quotations; it was reiterated that it was unlikely that others would.

The benefits of the study were limited as participants had the potential for developing a clearer understanding of the extent to which simulation enables professionals to prepare for rare, critical and emergency events and, therefore the potential to improve and develop education and training provision.

The University policy for fieldwork assessment was used because interviews took place in the participant's workplace and there was potential for lone and 'out of hours' working. The clinical site was visited during standard daytime shift patterns only. As an honorary contract is held with the clinical site, Disclosure and Barring Service procedures were complied with, along with relevant, mandatory personal safety training. The fieldwork risk assessment forms part of the University indemnity procedure for researchers in the field. This was discussed with and agreed by supervisors and the relevant Health and Safety officer.

### **3.4.10 Data Protection**

Storage of data complied with the Data Protection Act (1998) the Human Rights Act (1998) and University Code of Practice on Data Protection. All work was, therefore, stored on a University Secure Network Drive.

Data protection principles as outlined by the University Of Leeds Data Protection Code Of Practice ([www.leeds.ac.uk/secretariat/data\\_protection\\_code\\_of\\_practice](http://www.leeds.ac.uk/secretariat/data_protection_code_of_practice)) were implemented and clear boundaries regarding, data storage and security are identified. Data is stored on a University of Leeds firewall-protected secure server accessible via password for security and safety. Data will be removed from the students University Server on completion of the PhD (Upper limit September 2017) and stored on the password protected computer of the PhD supervisor for 3 years as per usual University procedures.

### **3.5 Summary of Chapter 3**

In this chapter the plans and procedures for the study summarised as follows;

The assumptions underpinning the study (worldview) are that it is real-world and practise orientated therefore the study is embedded in the philosophical foundation of critical pragmatism as 'pluralistic approaches' will be adopted in order to derive knowledge about the problem and philosophical assumptions will be considered throughout.

As the study will address professional preparation for rare critical events and the role of simulation in this, it became apparent that a combination of both quantitative (quan) and qualitative (qual) standpoints would be needed as multiple viewpoints were to be explored; mixed methods inquiry, which seeks to combine/integrate a variety of approaches in tackling the research problem, are used.

The rationale for choosing MMR is the ability to explore the research questions, benefitting from the addition of methods which could overcome the weaknesses of another.

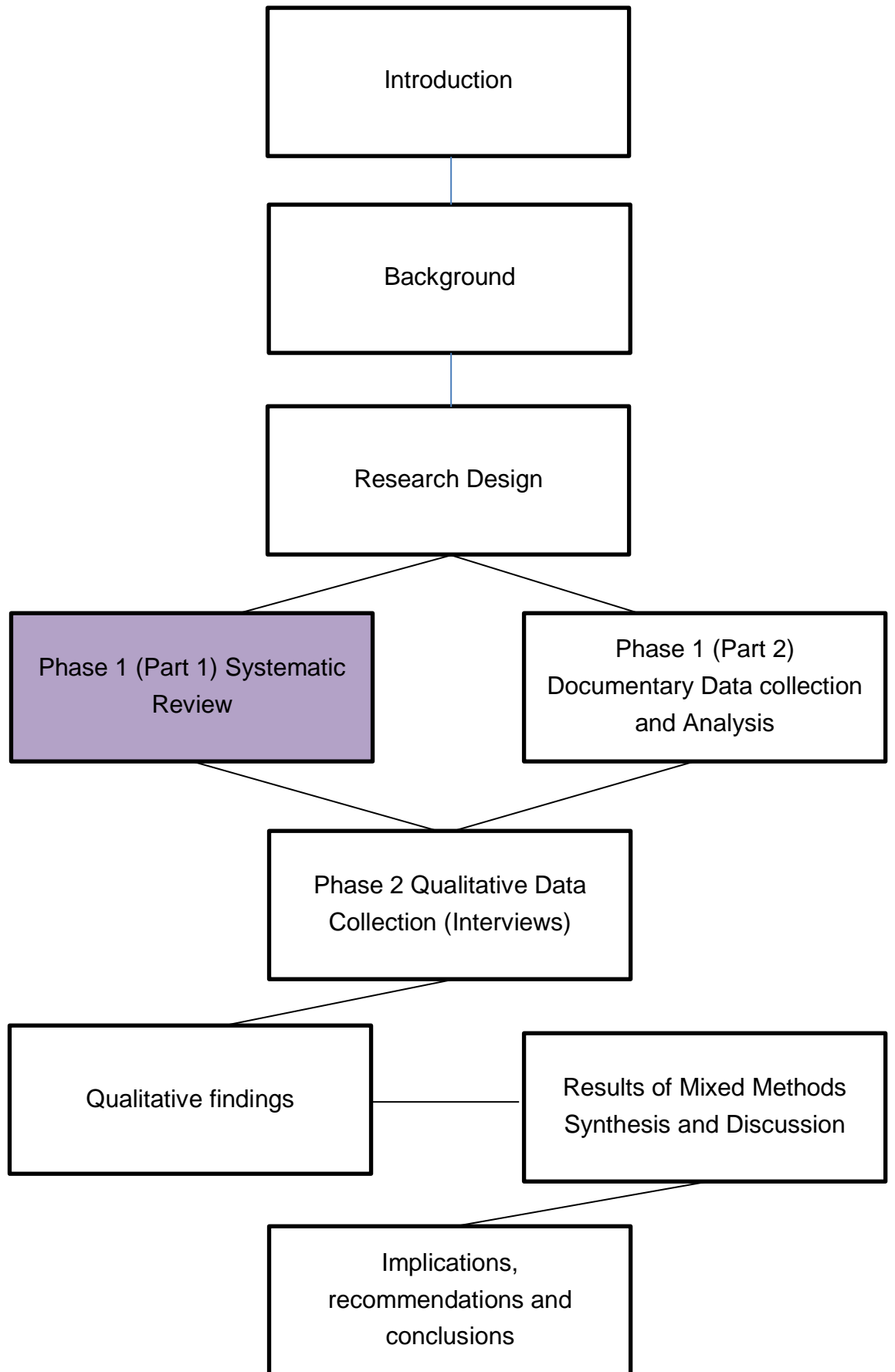
In order to demonstrate the study's ability to create new knowledge indicators of good research are shown; choosing credibility, transferability, dependability and confirmability as markers of rigour in the research process.

This study comprises of the development of a conceptual framework of simulation (QUAN) which is explored with a series of interviews (QUAL) – therefore an explanatory sequential design. The specific methods adopted are outlined.

In order to explore professional preparation for rare, critical events a systematic review of the literature was performed. The intention was to illuminate the quantitative dimensions in terms of what works, for whom, and in what circumstances with specific focus on those studies which compare/evaluate whether simulation is more or less effective than alternative methods; the comparators relate to passive learning.

The next chapter (Chapter 4) explains the methods adopted in phase 1.1, demonstrates the findings and discusses the implication of these as evidence to inform subsequent phases of the study.





## Chapter 4 Phase 1.1 Systematic Review

*'Take the first step in faith. You don't have to see the whole staircase.*

*Just take the first step'*

*Martin Luther King (1962)*

Chapter 3 set out the plans and procedures for this explanatory, sequential mixed methods study.

This chapter details of Phase 1 of the study. The first part of phase 1 is a quantitative systematic review of the evidence relating to simulated preparation for critical events; where comparisons with other forms of training and education were made. The aim here is to develop a wider appreciation of the characteristics of simulation which impact on professional preparation for rare and critical events.

The methods and findings are presented.

### Systematic Review

#### 4.1 Methods

##### 4.1.1 Aims and Objectives

The review question “what are the effects of simulation on the preparation of professionals for rare, critical and emergency events?” was developed using a PICOS framework which amalgamates the work of Sackett et al (1997) and Khan et al (2003). The acronym PICOS allows the review question to be specified through several key components, namely **P**articipants, **I**nterventions, **C**omparisons, **O**utcomes and **S**tudy Design).

The four objectives of this systematic review were to (1) assess the effects of simulation strategies on the preparation of professionals for rare, critical and emergency events; (2) to compare simulation to other forms of training and education; (3) to synthesise the characteristics of simulation that impact on the preparation of professionals for rare, critical and emergency events and (4) to compare different forms of simulation. The question is broader than healthcare in order to capture the experiences of those professionals for whom, similarly to healthcare, training for critical and emergency events is a necessary part of the role and where there is potential for those events to occur rarely yet risk catastrophic consequences for all involved. It was hoped that this would provide insight into where simulated approaches converge/diverge within different disciplines.

Systematic reviews require a focussed need for knowledge through the formulation of the review question (Counsell 1997, O'Connor et al 2008, Fink 2010). An early stage literature search was undertaken to identify material relevant to the theoretical concepts of simulation and deliberate practise. Early stage 'broad' searches were undertaken to familiarise myself with the available material, to focus the proposed research and develop key words and search terms for the review (Whittaker & Williamson 2011).

#### **4.1.2 Criteria for considering studies**

The methods for ensuring quality within the review process are based upon guidance published by The Cochrane Collaboration© where pre-specified criteria for consideration of studies is recommended (Higgins & Green 2008). The following criteria result from a combination of aspects of the question with the addition of indicating the types of study design suitable for answering the question "what are the effects of simulation (I & C) on the preparation (O) of professionals (P) for rare, critical and emergency events (summarised in Table 4.1).

##### **4.1.2.1 Types of studies**

All published and unpublished randomised controlled trials (RCT's) were eligible for entry. Trials with quasi randomisation or systematic methods of allocation, case control studies or cohort studies (provided data from a comparison group are reported) were included. Pope et al (2007) argues against the notion of an 'evidence hierarchy' within the review process when the emphasis moves beyond narrowly defined questions of effectiveness. From early scoping searches it became apparent that few RCT's were available, as the intervention (simulation) was rarely tested against a comparator, and these were appended with other pragmatic designs such as quasi experimental studies, case control studies and surveys.

##### **4.1.2.2 Types of participants**

The review considered a range of professions who train/prepare for rare/critical events in order to gain insights into simulation in other contexts. These professions included; medical staff, midwives, nurses, support workers, emergency care workers, obstetric nurses, obstetricians, pilots and petroleum engineers working within both statutory and non-statutory organisations. There were no restrictions relating to ethnicity, gender or age.

#### **4.1.2.3 Types of interventions**

Interventions required active involvement of participants in a simulation activity or other methods of training for rare critical events as an individual or group approach which included;

Flight simulation

Multi professional emergency training

Major incident preparation

Computer based models

#### **4.1.2.4 Comparators**

In order to compare and evaluate whether simulation is more or less effective than alternative methods the comparators relate to passive learning including;

E learning

Individual or group education/training without simulation

No training/education

Duration of experience and, therefore, perceived expertise

#### **4.1.2.5 Types of outcome measures**

The primary outcomes were; post training assessment of clinical skills acquisition; changes to baseline measures of performance (these may have been recorded over a period of time) measured with a reliable scale or self-rated measurement; qualitative data relating to professional views and experiences of simulation.

Secondary outcomes related to self-esteem, confidence, perceived performance and the cost effectiveness of the training/education strategy (as measured by the researcher).

In all instances validated methods of measurements were preferred and it was anticipated that outcomes may be measured over a number of time points e.g. immediate pre and post intervention, short term follow up (up to and including 6 months) and long term follow up (more than 6 months after the intervention). Any paper with a post-test measure was eligible at this point. Any adverse outcomes relating to the training/education strategy were also to be reported.

**Table 4-1 PICOS framework for systematic review**

<b>PICOS</b>	<b>Inclusion</b>	<b>Exclusion</b>
Population	Professionals (to include medical staff, midwives, nurses, support workers, emergency care workers, obstetric nurses, obstetricians, pilots and petroleum engineers working within both statutory and non-statutory organisations.) who train/prepare (to include education, learning, pre/post registration, qualification, continuing professional development) for critical, rare events (to include obstetric, medical, aviation and engineering emergencies and synonyms relating to rare/critical e.g. disaster, emergency & trauma)	Non-registered practitioners i.e. Doulas and commercial environments e.g. St John Ambulance.
Intervention	Simulation – may be individual or group focussed and include (but not restricted to) flight simulation, multi professional emergency training, major incident preparation or computer based models.	Comparison with other simulation e.g. high fidelity versus low fidelity.
Comparison	Other training and education within healthcare, aviation and engineering industries.	Comparison with other simulation e.g. high fidelity versus low fidelity.
Outcome(s)	Post programme measures of perceived effectiveness including (a) confidence (b) competence (c) performance (d) self-esteem and (e) cost effectiveness	
Study Design	Experiment and quasi experiment evaluations. It is not expected that many RCT's will be available (from scoping searches) therefore, case control studies or survey will be eligible provided that data from a comparison group are reported.	

### **4.1.3 Search methods**

A thorough search strategy (Appendix 4) was developed which included electronic databases, search engines/platforms, backward and forward citation chaining and hand searching. This strategy identified relevant studies and minimised bias in the review process and transparency in that this enables the reader to appraise and replicate if necessary (CRD 2009 p16).

The search timeframe covered 64 years due to digital access to literature available. Although seminal writing relating to simulation, within medical education, was first published by Abrahamson, Denson & Wolf (1969) the origins of simulated learning are widely attributed to the field of aviation. It was not deemed appropriate, therefore, to limit the search parameters in terms of timeframe in the initial phase.

The first search phase was focussed on 16 electronic databases. The central benefit of searching electronic bibliographic databases was that key words and concepts can be searched within titles and abstracts and by using standardised indexing terms relevant to specific databases e.g. Medical Subject Heading as reported by (Lefebvre et al 2008).

The selection and justification of electronic databases and search strategy was guided by the PICOS framework and careful consideration of information available from subject specific libraries and [www.csa.com](http://www.csa.com) (the URL for Cambridge Scientific Abstracts). Along with healthcare, the fields of aviation (transport) and the petroleum fuel industry (engineering, specifically within oil rigs) were identified as professions needing to prepare for critical events and, therefore, relevant bibliographic databases were searched and a diary of search activity recorded (Appendix 5).

The search strategy was developed from key words (Table 4.1). These are very broad search terms which, when combined, meant the search was highly sensitive yielding over 3000 citations. It was, therefore, important to reduce the number of irrelevant studies and search for papers with a specific focus. As specific databases vary in their use of filters and indexing systems e.g. Medical Subject Headings (MeSH terms) are utilised by and specific to MEDLINE, the search strategy needed to be adapted accordingly and be sensitive to this. In order to balance sensitivity with specificity the search included an expansion of terms related to the key words along with commands specific to the database e.g. 'adj3' (indicating that words can appear within 3 words of each other e.g. words related to obstetric emergency adjacent to words related to labour and delivery) and then combined using Boolean logic AND, OR.

In administering the electronic component several searches were performed (and saved) and terms expanded or refined in order to ensure that the final search activity

(Appendix 6) balanced a specific question with justifiable limits and restrictions (Fink 2010). The search strategy was peer reviewed by a subject specific librarian at the University of Leeds, in order to ensure that the controlled vocabulary and text words were appropriate and language bias minimised. Electronic database searching bore a primary pool of 808 papers. In addition to this published and unpublished evidence was obtained through scanning the reference lists of relevant studies, hand searching of key journals and electronic content lists and through searching of relevant internet sources for conference proceedings and unpublished dissertations (through Proquest®). This yielded a further 59 papers deemed potentially eligible.

Following removal of duplicates five screening criteria were then applied to 91 papers; (a) concerned with professionals who train for rare events (b) use of simulation as an education/training intervention (c) comparative research (d) learner outcomes measured quantitatively (e) review articles discounted in favour of empirical research. This was achieved using a pre-screen form (adapted from Table 1) advocated by Polit & Hungler (2006) as a way of establishing the relevance and appropriateness of potential references. This is reiterated by CRD (2009) who advocate explicit documentation and detailed decision making when applying the pre-screen protocol against the full paper (Appendix 7). This process reduced the initial pool to a focused set of 10 papers (approximately 1.3% of the initial set) deemed eligible for data extraction (figure 1 illustrates the process). The reason for exclusion (after duplicates n=453 and unrelated articles removed n=324) related to there being no comparator (or lack of reporting of comparator) with simulation ( n=80). A flow diagram is presented in Figure 4.1.

Although the literature searching phase of the review included databases relating to aviation and engineering disciplines it is noteworthy that none of the included studies relate to these disciplines and all are medically focussed. This could be attributed to the fact that aviation and engineering industries appear to use simulation strategies as the habitual approach to develop skills for disaster/emergency preparedness. Studies from the fields of aviation and engineering did compare different types of simulation and the search identified this but the introduction of a comparator at the screening phase, logically, excluded the majority of this body of evidence.

From the search activity (see Appendix 5) it can be seen that the medical, nursing and allied health databases (Medline and CINAHL) yielded the most studies with the additional databases (via Ovid) of MIC, Embase, HMIC, Psychinfo and Global Health yielding results which were largely duplicated from the initial search.

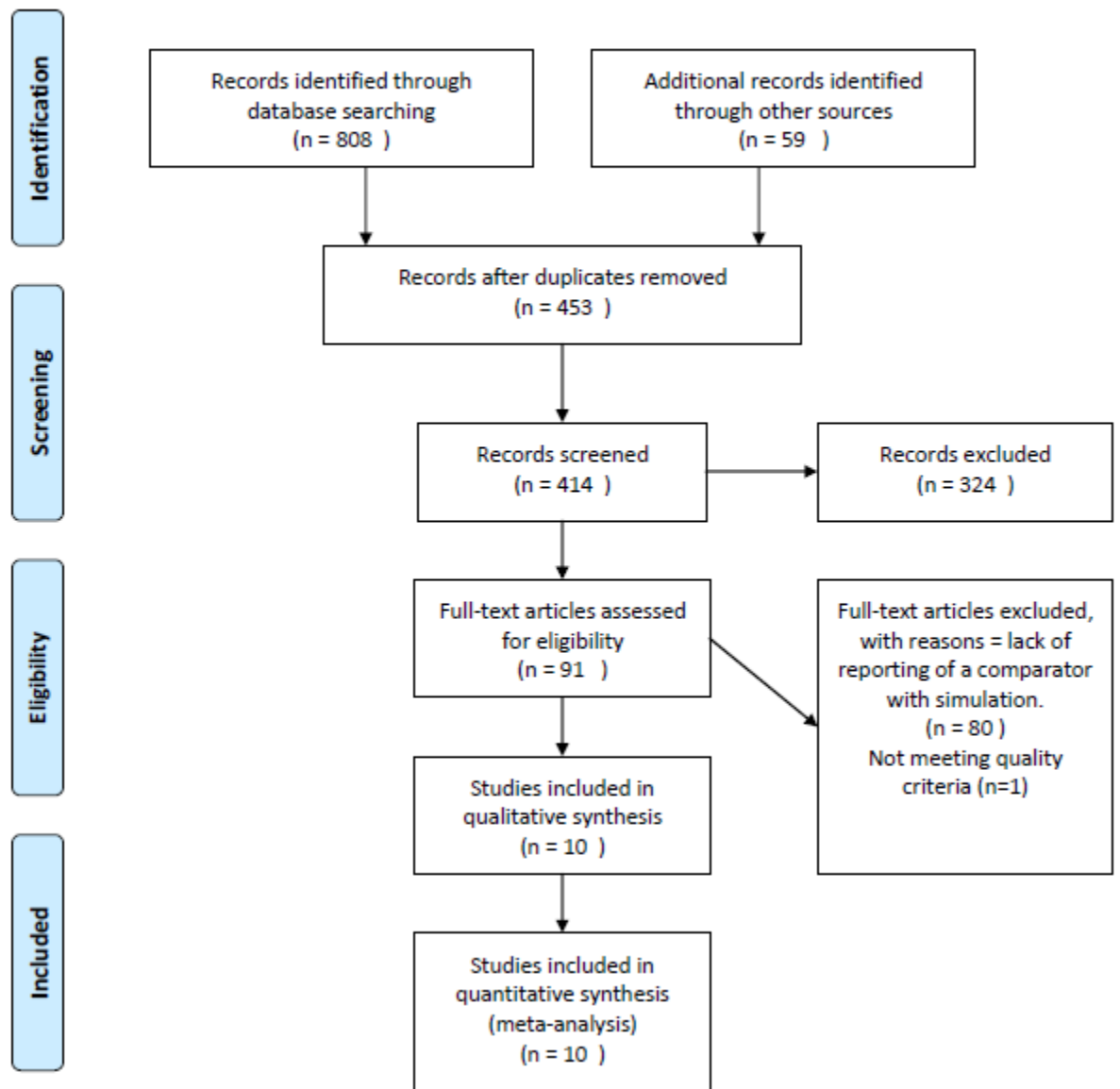


Figure 4-1 PRISMA Flow Diagram



#### **4.1.4 Data Collection and Analysis**

##### **4.1.4.1 Data Extraction**

A data extraction form acted as a repository of facts relating to study characteristics. This was adapted from an example offered by CRD (2009) and tailored to the review question (example of complete form in Appendix 8). Independent peer review was sought for quality assurance and the forms examined for precision and completeness (Appendix 9). There was high level of agreement. Study characteristics were inputted into RevMan® software and risk of bias easily tabulated for both quality control and presentation. This tool (recommended by Higgins & Green 2011) addresses six specific domains in relation to bias namely selection, performance, attrition, detection and reporting bias. This is achieved by answering the specified questions relating to the adequacy of the study where a 'yes' (indicated as a + within a green circle) indicates low risk of bias, a 'No' (indicated as a – within a red circle) indicates high risk of bias and 'Unclear' (indicated as a '?' within a yellow circle) indicates that there is unclear or unknown risk of bias. Table 4.2 highlights variation and inconsistency within included studies where limited and vague reporting lead to responses indicated as 'Unclear' risk of bias.

Higgins & Green (2011) go on to state that authors should consider the relative importance of different domains and to ask questions regarding quality control and justification of conclusions when undertaking a quality assessment of the included studies.

Table 4-2 Risk of Bias Summary

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Andrighetti et al 2011	?	?	-	?	+	+	
Baxter et al 2012	?	?	-	?	+	-	-
Birch et al 2007	?	?	-	-	?	-	
Daniels et al 2010	-	?	-	+	+	+	?
Deering et al 2004	?	?	-	+	+	+	
Fisher et al 2010	+	+	+	?	?	?	
Morgan et al 2002	+	+	-	?	+	+	-
Ruesseler et al 2010	-	-	?	+	+	+	+
Schwid et al 2009	?	?	?	?	?	-	
Summerhill et al 2008	-	-	-	?	+	+	
Wang et al 2011	?	+	?	+	+	?	

#### 4.1.5 Quality Assessment

The quality of the studies are reported overall and Table 4.3 highlights the benchmark for total quality scoring of studies. The quality was assessed as good for 2, acceptable for 6 and low for 3. Studies were assessed by means of a scoring system developed by Kleijnen et al (2004) and adapted for this study utilising the data extraction form and the risk of bias tables as follows;

- A: well defined inclusion criteria.
- B: Participants reflective of power calculation.
- C. Random allocation procedure described.

- D. Presentation of relevant characteristics.
- E. Attrition described and effect noted.
- F. Intervention well described (nature, number and duration).
- G. Masking of assessors/investigators.
- H. Effect measurement relevant and well described.
- I. Presentation of results in such a manner that analysis can be checked.

Kleijnen et al (2004) developed the scoring system for application to randomised controlled trials where double blinding of participants is considered as a high quality marker. Information relating to blinding was, however, considered as a possible source of heterogeneity and bias. As learning/training in a simulated way does not lend itself to blinding, criteria were adapted to reflect the importance of masking of the assessor/investigator to the intervention status of the participant. This means that assessors were unaware which groups participants were assigned to in only 4 of the studies which could result in an increased risk of performance bias (CRD 2009).

According to CRD (2009) in order to reduce the influence of confounding factors on the outcome of interest the groups compared within studies should be similar in key characteristics. Allocation bias was included as a quality indicator as details relating to participant characteristics were vague or omitted in 9 of the included studies. Higgins & Green (2011) explicitly discourage the use of scales for quality due to the lack of supporting evidence for this approach however, as Kleijnen et al (2004) developed the scale to report on conduct (and not reporting) of studies the approach was utilised for initial simplicity in representing methodological rigour.

Baxter et al (2012) calculated a required sample size of 67 when only 27 were recruited which suggested a lack of power. Although included within the results of the review this, along with limited reporting of results, negatively affected the quality of the study; Similarly, the quality of the study conducted by Birch et al (2007) was significantly reduced by the lack of transparency in reporting of analysis and results but, more significantly, by the recruitment of only 6 groups when power calculations suggested a sample size of 25 groups being necessary to limit error. Attempts were made to contact the author in order to ascertain analysis of variance and scores, with no response. The study is, therefore, excluded from the results section of the review.

**Table 4-3 Methodological Score Assigned to the Study**

Study	Methodological criteria (Studies scoring 7-9 = good; 5-6.9 acceptable and less than 5 = low)									
	A: well defined inclusion criteria. B: Participants reflective of power calculation. C. Random allocation procedure described. D. Presentation of relevant characteristics. E. Attrition described and effect noted. F. Intervention well described (nature, number and duration). G. Masking of assessors/investigators. H. Effect measurement relevant and well described. I. Presentation of results in such a manner that analysis can be checked.									
	A	B	C	D	E	F	G	H	I	Total
Andrighetti et al 2011	+	±	±	+	+	+	-	+	±	6.5
Baxter et al 2012	+	-	±	±	+	+	-	-	±	4.5
Birch et al 2007	+	-	-	±	-	+	-	+	-	3.5
Daniels et al 2010	+	±	±	±	±	+	+	+	±	6.5
Deering et al 2004	+	-	±	+	+	+	+	+	±	7
Fisher et al 2010	+	±	+	±	±	+	+	-	±	6
Morgan et al 2002	+	±	+	-	+	+	-	±	±	5.5
Ruessler et al 2010	+	+	-	±	+	+	+	+	±	7
Schwid et al 2009	+	±	±	-	±	+	+	±	±	5.5
Summerhill et al 2008	±	±	-	±	+	+	-	±	±	4.5
Wang et al 2011	+	±	±	-	+	+	+	+	±	6.5
+ item scored			- Item not scored				± item is partly scored if description is unclear			

## 4.2 Findings

From the outset the objective of the review was to compare simulation to other forms of training and education. Once data were collected, however, variations between the studies were identified. Deeks et al (2008) contend that this is inevitable within a review and recommend that consideration be given to how variations (heterogeneity) affect the

approach to analysis and synthesis. Differences between the studies are shown in terms of participants, interventions and outcomes (clinical heterogeneity) and in intervention effects (statistical heterogeneity).

#### **4.2.1 Description of studies**

Data synthesis included ordering and grouping of findings (CRD 2009) and the initial approach was the formulation of a descriptive summary of the main characteristics of included studies (Table 4.4). The principle design of studies represented in the review is before-after with control group (n=9) which is expected as the focus is to compare and evaluate whether simulation is more or less effective than alternative methods. One study (Morgan et al 2002) used a double cross over approach which Deeks et al (2008) describe as being where participants are randomised to an ordering of interventions.

Presentation of results within the studies was vague. Table 4.3 (column I) highlights that none of the studies could be scored positively in this respect with 100% being equivocal. It is noteworthy that similar findings were revealed by Issenberg et al (2005) in the systematic review of high fidelity medical simulations. Methodological heterogeneity relating to factors such as blinding and concealment of allocation are identified (see table 4.2) and highlight inconsistencies which could be attributed to limited and vague reporting.

Table 4.4 presents an overall summary of the included study characteristics.

#### **4.2.2 Participant characteristics**

The number of research participants entered into the studies ranged between 27 and 144 with 8 studies (73%) including less than 50 participants. Only 2 studies reported a limitation (lacks power) due to small number of participants. The modal research participant was a medical doctor (5/10 studies) with midwives/nurses and medical students being equally represented throughout the included studies. Medical students included within 2 studies (Morgan et al 2002, Ruesseler et al 2010) were in their final year and Baxter et al (2012) included nursing students in their final year. Andrighetti et al (2011) included postgraduate student nurses and Daniels et al (2010) included both labour/delivery nurses and obstetric residents as participants. The remaining studies included medical residents from varying disciplines (obstetrics, anaesthesia, emergency medicine).

Background information, other than year of study and profession, was missing in the majority of studies (9/10) with only Ruesseler et al (2010) describing the gender of participants. Information relating to age, socio-economic background and previous experience of different modes of training/education, was also lacking throughout the

included studies. These characteristics all hold the potential to influence the outcomes of training and education and mean that there is potential for selection bias (as there may be systematic differences between baseline characteristics) and/or performance bias (as there may be differences in exposure to factors other than the intervention of interest) as defined by Higgins & Green (2011).

#### **4.2.3 Types of intervention**

All studies included within the review adopted a multi-faceted approach to training which, along with a simulated learning environment, included lectures (n=3), debriefing (n=2), role play (n=1) individual or group feedback and written supporting materials (n=2). Three studies used simulation only as the intervention. Fisher et al (2010) and Baxter et al (2012) both studied two intervention groups against the comparison.

Comparators within the studies ranged from lecture only (n=3), video only (n=3), no simulation/discussion format (n=3) and hand outs related to the clinical cases (n=1). So the variation in simulated approach and in comparators could lead to a threat to the validity of findings as the range in how outcomes are determined may mean that findings cannot easily be analysed together.

#### **4.2.4 Types of measures used**

All studies included some degree of assessment of participant performance following the intervention. The initial post-test timing of these assessments ranged from immediate (n=4), 3 hrs (n=1), 2 weeks (n=1) up to one month (n=1) up to 4 months (n=2) and up to 6 months (n=1). There was no additional follow up in 7 of the studies. Both Morgan et al (2002) and Wang et al (2011) included a follow up assessment using 10 questions relating to learning at 6 weeks and 6 months respectively. Only 1 study (Summerhill et al 2008) included a long term follow up (self) assessment at 1 year (Table 4.4).

In the immediate post-test Morgan et al (2002) graded performance via a standardised checklist and also rated student enjoyment via a 5 point ordinal scale. Ordinal scales were used to measure performance and/or confidence in 3 additional studies (Andrighetti et al 2011, Deering et al 2004 and Summerhill et al 2008) and scoring of performance during simulation using a standardised checklist was the approach in 4 studies (Fisher et al 2010, Ruessler et al 2010, Schwid et al 2009 and Baxter et al 2012). Along with Wang et al (2011) Daniels et al (2010) used questions (MCQ validated by experts) in order to test knowledge following intervention.

All measures were standardised and assessed for face and content validity by experts through consensus.

**Table 4-4 main Characteristics of Included Studies**

Study	Design	Critical/rare event	Nature of Participant	Number (m/f)* Intervention	Number (m/f) Control	Intervention	Comparison	Measure	Follow up	Score	Comment
Andrighetti et al 2011	Quasi RCT	SD & PPH	Graduate midwifery education students. N=28	18 (m/f nr*)	10 (m/f nr*)	Simulation in realistic environment using static mannequin and role play between students and faculty. Scenarios build in complexity. SD n=9, PPH n=9	SD - video, discussion and demonstration (n=5)  PPH – discussion format (n=5)	Likert type scale 1 (strongly disagree) to 5 (strongly agree) 8 items measuring confidence. Pre & post test.	None	6.5	The author(s) acknowledge that the study is limited due to small sample size. (lacks power)  No details as to the number and nature of scenarios.
Morgan et al 2002	Quasi randomised double cross over	Scenario 1 = Myocardial Ischemia.  Scenario 2 = anaphylaxis  Scenario 3 = Hypoxemia	Final year medical students  n=144  Allocated to 3 scenarios (S)	(m/f nr*) S1 = 26 S2 = 29 S3 = 37	(m/f nr*) S1 = 22 S2 = 27 S3 = 46	1.5 hour session in simulation centre expanding on material covered in pre-test scenario	1.5 hr video demonstration expanding on material covered in pre-test scenario	All underwent simulator pre-test and 3 hour post test (5 mins graded performance via a checklist with maximum 3 points per section for potential 12 points)  Student rated enjoyment on a 5 point Likert type scale where 1= strongly disagree 5 = strongly agree.	6 weeks post-test written exam. 10 short answer questions marked using standardized marking guide.	5.5	Intervention and Control covered a 2 week period with 5 participants in each session at any one time.  No control for students sharing their experiences over the two week data collection period.
Summerhill et al 2008	Quasi controlled study	Biodefense and disaster preparedness	Medical residents n=60	30 (m/f nr*) (10 in each of 3 years)	30 (m/fnr*) (10 in each of 3 years)	4x1hr didactic session  1 simulated real time scenario  4 hr training seminar  All scenarios videotaped followed by debriefing by faculty.	No simulation	Self assessment of knowledge pre and post testing  Ordinal scale from 1 (poor) to 4 (excellent)	1 year	4.5	
Deering et al 2004	Quasi RCT	Shoulder dystocia	Obstetric Residents n=33	m/f nr* Year 1 n=5 Year 2 n=3 Year 3 n=3 Year 4 n=5	n=5 n=3 n=4 n=5	Simulation (obstetric birth simulator)	Regular scheduled academic meetings	2 weeks post-test simulated shoulder dystocia scenario. Evaluated using standardised evaluation checklist and graded using a 9 point Likert scale.	None	7	It is unclear as to whether the control group received any instruction relating to shoulder dystocia.  Total overall scores ranged from 4 to 36.
Ruessler et al 2010	Quasi controlled blinded study	6 emergency medicine scenarios (acute coronary, stroke, asthma, trauma, CPR, CPR with AED)	Final year medical students n=44	m=13 f=9	m=12 f=10	Simulated training n22  3 days. 1 day Basic Life Support, 2 day advanced (cardiac) with additional common emergencies.	theory based curriculum n=22  3 shifts in emergency department	OSCE of 6 emergency scenarios. Scored via standardised check list dichotomous data done/not done	Post-test within 4 months of exposure. No additional follow up	5.5	Required sample size of 17 per group estimated. underpowered

Study	Design	Critical/rare event	Nature of Participant	Number (m/f) Intervention	Number (m/f) Control	Intervention	Comparison	Measure	Follow up	Score	Comment
Fisher et al 2010	Prospective RCT	Eclampsia and magnesium toxicity (rare)	Obs/Gynae Residents n=38	25 (m/f nr*) SL n=12, S n=13,	L n=13	Simulation followed by classroom lecture (SL)  Simulation only (S)	Lecture only (L)	post intervention simulation scored on standardised checklist for seizure management (total score =21) fetal eclampsia (total score =9) eclampsia management (total score =30) magnesium toxicity management (total score =6)	The post-test was at 3-4 months.  No immediate post-test.  No additional follow up.	6	No simulation baseline score recorded – assumed, by authors) same as pooled per median score of SL and S groups.  No detail as to precise timing of post-test for all participants or potential exposure during the 3-4 months.
Wang et al 2011	Prospective quasi controlled study	Contrast reaction management (rare)	Postgrad radiology programme years 2-5  n=44	n-23(m/f nr*)	n=21 (m/f nr*)	Attendance at lecture and simulation training at 4 months	Attendance at lecture and repeat lecture at 4 months	Pre and immediate post-test. 10 questions relating to learning points..	2 months after post-test (6 months after exposure).	6.5	Different questions in each test  No detail as to year of resident experience.
Daniels et al 2010	Prospective quasi RCT	Eclampsia and shoulder	L/D* nurses & obstetric residents n=27	m/f nr* L/D Nurse n=7 Obs Res n=7	L/D Nurse n=5 Obs Res n=8	Simulation - 3 hours including team training	Lecture (1.5 hrs) SD video (26 mins) hands on demonstration of manoeuvres (0.5 hrs)	Pre and post-test 20 point MCQ validated by experts. Post-test also incl. drill (videotaped for scoring). Scoring developed by experts - 1 to 1.	Post test one month post training.  No additional follow up.	6.5	Limitation note by author = number of participants limited and an uneven experience level. Underpowered
Schwid et al 2009	Quasi RCT	Emergencies related to anaesthesia	Anaesthesia residents (yr1)  n=31	m/f nr* n=16	n=15	Simulation (10 cases screen based) with debriefing from faculty. Three months allowed to study these.	Study hand out for 10 cases only. Three months allowed to study.	4 x Mannequin-based simulator testing. Videotaped and scored by two assessors using standardised point scale. 95 points possible.	Initial post-test 3-6 months following preparation.  No additional follow up.	5.5	Residents in clinical practice during this time and, therefore, different exposures over the 3-6 months' timescale possible.
Baxter et al 2012	Quasi RCT	Myocardial infarction	Student nurses (senior year of degree) n=27	m/f nr* Video n=10 Hands on n=11	N=6	Video (30 mins) of scenario with debriefing (15 min)  Or  Hands on simulation in hospital environment followed by debriefing (15 mins)	Introduced to equipment via a video with opportunity to ask questions only.	OSCE immediate post-test. 3x15 mins scenarios with 5 minute debrief. Scored by two assessors using a 7 point Likert Scale (1=poor, 7= excellent) to evaluate 5 key areas (as agreed through expert consensus)	No additional follow up	4.5	Reported limitation due to small sample size. 67 deemed necessary for statistically detectable results.
Nr=not reported L/D=labour and delivery m/f=male/female											



#### 4.2.5 Reporting

There is limited reporting in the majority of studies with non-standardised outcome measures and variation in details reporting amongst papers. The majority (Andrighetti et al 2011, Baxter et al 2012, Daniels et al 2010, Deering et al 2004, Morgan et al 2002, Ruessler et al 2010, Schwid et al 2009, Summerhill et al 2008 and Wang et al 2011) partially report continuous data and use means, standard deviations or scores (from ordinal scales or point scales) with one study (Fisher et al 2010) reporting mean interquartile ranges (IQR). A distillation of the findings within the studies is given (Table 4.5). Due to risk of bias identified within each study and variations in measurement, initial thoughts were that quantitative synthesis was impracticable and attempts at meta-analysis would be meaningless. Consideration was given to the extent of inconsistency within results and decisions made are detailed when considering heterogeneity.

#### A note on heterogeneity

Where there are differences between studies Gough et al (2012) advocate aggregative synthesis aimed at combining homogenous studies. Clinical heterogeneity was noted as participant characteristics, specific interventions and measures vary across the studies. Deeks et al (2008) makes clear that, with this in mind, the true intervention effect will be different within different studies and would be greater than one would expect as random chance or error; the term 'statistical heterogeneity' is applied.

Tests for measuring heterogeneity included the Chi-squared ( $\chi^2$  or  $\text{Chi}^2$  often referred to as Cochran Q) where a low P value or a large  $\text{Chi}^2$  statistic, relative to the degree of freedom (noted as *df* within the forest plot) is evidence of heterogeneity within the effects of intervention, as discussed by Deeks et al (2008). The  $\chi^2$  assesses whether the difference in results are due to chance alone. Figure 4.2 shows the combined results relating to performance and a low P value ( $p < 0.00001$ ) is shown alongside a large  $\text{Chi}^2$  (53.24) relative to the degree of freedom ( $df = 7$ ).

Thomas et al (2012) suggest that the  $I^2$  statistic (in the form of a percentage which quantifies inconsistency across the studies) is an appropriate test where there are small numbers of studies as the  $\text{Chi}^2$  statistic can have low power when studies have small sample sizes. Higgins (2003) explains the threshold for interpretation of the  $I^2$  with 50-90% representing *substantial heterogeneity* and 75-100% representing *considerable heterogeneity*. Deeks et al (2008) suggest that this should be considered alongside the p value for the  $\text{Chi}^2$  or the confidence interval for the  $I^2$ .

Nine studies within this review measured performance as an outcome but did so in a variety of ways. Following personal communication with a statistician at the University

of Leeds, the results of the studies were, therefore, standardised to a uniformed scale (standardised mean difference) in order to combine them. This approach assumes that differences in reported standard deviations within the studies reflect differences in measurement and not variation in study populations (Deeks 2008) and this is problematic given the diversity in participants amongst the included studies. Results were combined in sub-groups relating to the nature of the comparator with simulation (theory based, video based and no input). Figure 4.2 shows improvements in performance following a simulation strategy yet the I<sup>2</sup> statistic has a high effect here (87%) and quantifies the inconsistency across studies and its impact on the meta-analysis. It is inappropriate, therefore, to synthesise in this way as evidenced by the Cochran Q test and I<sup>2</sup>.

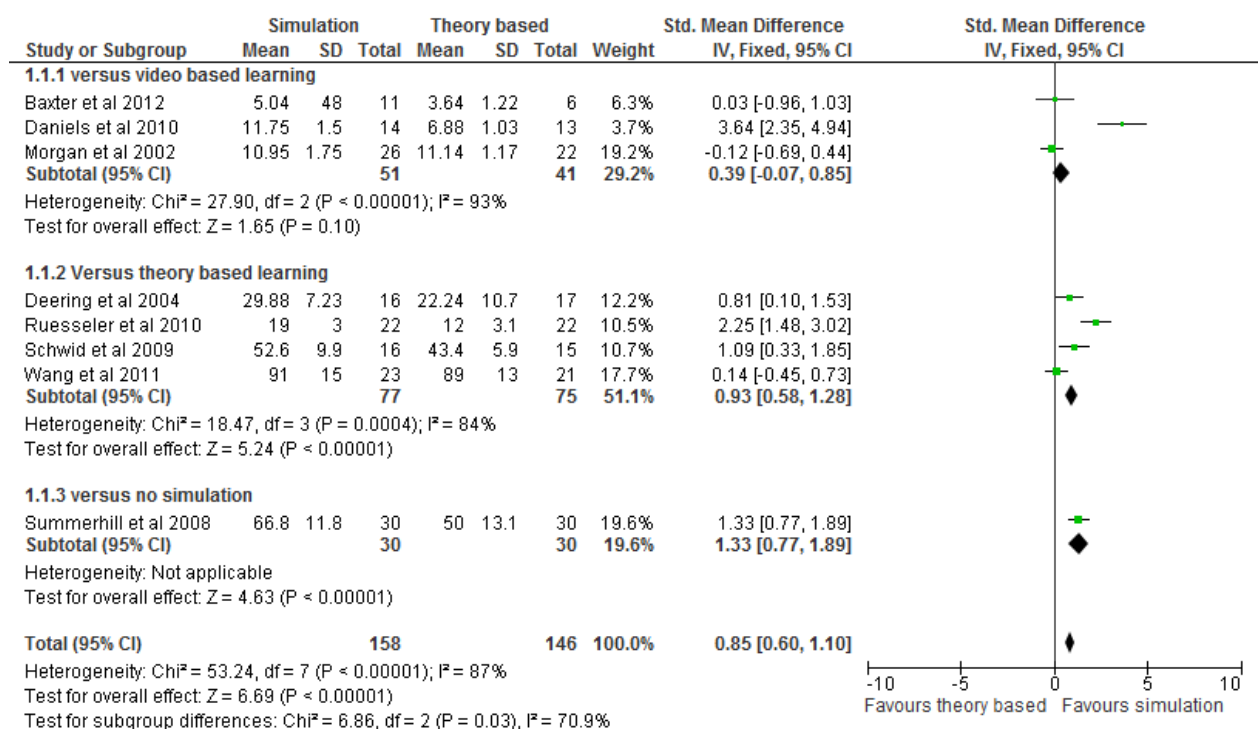


Figure 4-2 Combined results relating to performance

The approaches to simulation differed within and between studies yet all included an educational/training element in addition to simulation. Fisher et al (2010) found no difference when comparing practical simulation alone (Score 8 Mean IQR (6-8)) with simulation and the addition of a lecture (Score 8 Mean IQR (6-9)). Similarly Baxter et al (2012) found no differences in performance between video based and practical based simulation (Mean±SD 5.04±0.48 v 4.74±.88 p=0.007). These studies were deemed to be of acceptable or low quality (respectively) and were treated with caution due to limitations in reporting. Daniels et al (2002) found improvements in MCQ scores but this was not reported as statistically significant. Performance evaluation of a shoulder

dystocia drill did highlight significantly higher scores in the simulation group (Mean±SD 11.75±1.5 v 6.88±1.03 p=0.002) yet the authors recognise the limited number of participants and uneven experience level as having a potential to bias the results.

Enjoyment and confidence building are important aspects of education and training albeit with a limited evidence base within the scope of this review. Again, when combined within a meta-analysis (figure 4.3) inconsistency is quantified (I<sup>2</sup> = 69%) and this approach should not be recommended as an appropriate way of presenting results. Andrighetti et al (2011) report post-test increases in confidence within a controlled environment within both groups and this is significant within the intervention group (32.2 ±3.6 v 34.8 ±1.5 p>0.01). The study is limited by a small sample size (28) and the use of only 1 training programme. Morgan et al (2002) report no evidence of effect of the training modality and increased test scores but do highlight enjoyment in terms of a descriptive frequency for both groups. This was significant for the intervention group (Mean±SD 4.32 ±0.79 v 3.78 ±0.91 p>0.001) although mean values for both were high.

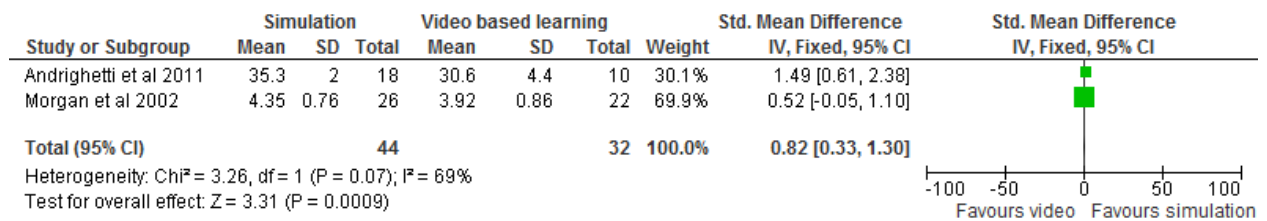


Figure 4-3 Combined results relating to value/confidence

All included studies contained a practical element through simulation and 4 studies tested participants at a time point not immediately post training (Daniels et al = 1 month, Fisher et al = 3 to 4 months, Wang et al = 3 months and Summerhill et al = 1 year). Although showing initial improvements in performance following simulation Summerhill et al (2008) highlighted no statistically significant difference amongst participants in either control or intervention group at 1 year (Mean±SD 55.7±14.6 v 55.7±13.1 p0.006). This suggested a trend towards diminution over time although the study did not identify the amount of repetitive practise of all participants (or lack thereof) regardless of the initial form of training

It is noteworthy that no study captured detail as to the potential for participant deliberate/repetitive practise during the noted time periods and this could influence the outcomes of the post training data collection.

Within this review there were no studies which examined outcomes based on difficulty level within simulation. Wang et al (2011) found no significant difference in immediate

or delayed post test scores between groups however, when tested with a new and unfamiliar scenario, the simulation group demonstrated a significant increase in performance ( $86.4\% \pm 8.1\%$  versus  $77.6\% \pm 8.8\%$   $p=0.001$ ).

During post-test debriefing respondents in the study by Wang et al (2011) also reported that a safe environment allowed them to identify mistakes with the potential to be cognisant of these when in a 'real life' situation. The reporting of qualitative dimensions is limited within the included studies as these were not the primary focus.

There are no studies which identify validity of the simulator or the level of fidelity as impacting on the outcomes. Andrighetti et al (2011) utilised high fidelity simulators in an environment closely resembling the clinical setting and reported an increase in scores relating to confidence following simulation but not attributed to the fidelity. One could question whether it is the multi-faceted approach and not necessarily the increased realism of the simulated approach which impacted on outcomes.

#### **4.2.6 Limitations noted within studies**

There is limited reporting relating to the demographics of participants outside of their professional groups. Ruessler et al (2010) are the only authors to report gender as a feature of participant groups. They do not, however, delineate the results in these terms. No study reports differences in scores between professional groups and, where year of study is reported for students, there are no differences found. The authors of the studies may not have explored these differences or this could be due to selective reporting of some outcomes, but not others, which introduces the limitation of outcome reporting bias as defined by Sterne et al (2011).

Five studies did not include an immediate post-test of participants and the timescale post-testing was up to 6 months. There are no controls for students sharing their experiences and learning during the data collection or for differences in exposures within the clinical setting over these time periods. Daniels et al (2010) highlights a limitation of the study as related to the uneven experience levels of participants which may risk the internal/external validity of the study. Both Andrighetti et al (2011) and Baxter et al (2012) acknowledge limitations of their studies related to small sample size. It is noteworthy that Baxter et al (2012) deem a sample of 67 necessary for statistically detectable results yet report statistically significant increases in performance based on a sample of 27.

**Table 4-5 Summary of Findings**

Study	Participant (n)	Scenario	Post test score Intervention	Post test score Control	Statistical comparison used	Conclusion
Andrighetti et al 2011	28	Shoulder Dystocia PPH	34.8 ±1.5 p=<.01 Effect = 0.54 35.3± 2.0 p=<.01 Effect = 1.68 <b>(Mean ±SD)</b>	32.2± 3.6p=.08 30.6± 4.4 p=.70	Wilcoxon signed-rank tests. Cohen's d used for Effect size comparing change from pre to post test scores.	Post test <b>confidence</b> increased in I & C groups but significantly in simulation group. Moderate effect size for shoulder dystocia simulations and large effect size for PPH simulations.
Morgan et al 2002	144	Anaesthesia S1 = Myocardial Ischemia S2 = Anaphylaxis S3 = Hypoxemia  S1 = Myocardial Ischemia S2 = Anaphylaxis S3 = Hypoxemia	<b>Post test scores (0-12)</b> 10.95±1.75 p=0.47 11.08±1.26 p=0.09 8.78±1.83 p=0.92 <b>6 week post test exam (0-10)</b> 7.34±1.7 8.10±1.35 8.28±2.31 <b>Student opinion (enjoyment)</b> 4.32±0.79 p<.001 <b>Student opinion (value)</b> 4.35±0.76 <b>(Mean ±SD)</b>	11.14±1.17 10.41±1.44 9.10±1.67  7.61±1.30 7.98±1.41 8.40±1.95  3.78±0.91 p<.001 3.92±0.86 p<0.001	Repeated measures ANOVA  Univariate ANOVA  Paired t test	No evidence of effect of training modality and improvement in test scores.  Reported as not statistically significant (no p value)  <b>Enjoyment and value</b> high for both but significantly in simulation.
Summerhill et al 2008	60	Disaster Preparedness	66.8±11.8 p=0.0001 (IPT*) 55.7±14.6 p=0.006 (1yrPT) <b>(Mean ±SD)</b>	50 ±13.1 p=0.0001 (IPT*) 50±13.1 p=0.006 (1yrPT)	Wilcoxon matched pairs signed ranks test	Intervention group showed significant <b>increase in performance</b> initially following simulation.  1 year later = trend towards diminution. The scores of the participants were higher but this was not significant (p=0.247)
Deering et al 2004	33	Shoulder Dystocia	Total overall score 29.88 ±7.23 p=0.012 Time to complete delivery 61±47.4s p=.003 <b>(Mean ±SD)</b>	22.24 ±10.7 p=0.012  146±93.0s p=.003	t test for continuous variables. Mann-Whitney U for ordinal date and x <sup>2</sup> analysis.	Significant <b>increase in performance</b> (smooth and timely) no difference in critical components performed or number of actions.  No significant association between residents year level and overall score.  No specific instruction to residents regarding discussion of training during the study period.
Ruessler et al 2010	44	Trauma Infant CPR	19 ±3 p<0.0001 10.5 ±1.5 p<0.0001 <b>(Mean ±SD)</b>	12 ±3.1 p<0.0001 6.3 ±1.6 p<0.0001	SPSs 12.0 Checklist score estimated using Cronbach's Alpha coefficient.	Significant <b>increase in performance</b> for simulation group. Mean scores in all OSCE stations showed performance following simulation significantly higher p<0.0001 to p<0.016. No pre-test data recorded. No details as to process of participant evaluations but data reported as 74% rating the programme as excellent.

Study	Participant (n)	Scenario	Post test score Intervention	Post test score Control	Statistical comparison used	Conclusion
Fisher et al 2010	38	Seizure management Fetal eclampsia Eclampsia management Magnesium toxicity	(SL) 16 (14-17) (S) 15 (12-19) (SL) 8 (6-9) (S) 8 (6-8) (SL)19 (17-21) (S)19 (16-22) (SL) 6 (4-7) (S) 5 (4-7) <b>Mean IQR</b>	12 (9-15) p<0.05 7 (6-9) p=non-significant 6 (13-19) p<0.05 5 (4-7) p=non-significant	Mann-Whitney U, Wilcoxon rank sum and $\chi^2$	Significant <b>increase in performance in total eclampsia management</b> following simulated strategy. No difference between simulation alone and simulation with lecture.
Wang et al 2011	44	Contrast Reactions Scores at 6 months Score for new scenario (6mth)	91% $\pm$ 15 p=0.06 86% $\pm$ 12 p=0.5 86.4 $\pm$ 8.1 p=0.001 <b>(Mean <math>\pm</math>2SD)</b>	89% $\pm$ 13np=0.06 84% $\pm$ 9 p=0.5 77.6 $\pm$ 8.8	Student <i>t</i> test	No significant difference in performance. When tested with a new and unfamiliar scenario the simulation group demonstrated <b>significant increase in performance</b> .
Daniels et al 2010	27	Shoulder Dystocia Eclampsia	11.75 $\pm$ 1.5 p=0.002 13.25 $\pm$ 0.95 p=0.032 <b>(Mean <math>\pm</math>SD)</b>	6.88 $\pm$ 1.03 p=0.002 11.38 $\pm$ 0.96 p=0.032	Between groups student <i>t</i> test and one way analysis of variance.	Significant <b>increase in performance</b> of manoeuvres following simulation.
Schwid et al 2009	31	Anaesthesia scenarios	52.6 $\pm$ 9.9 p=0.004 <b>(Mean <math>\pm</math>SD)</b>	43.4 $\pm$ 5.9 p=0.004		Significant <b>increase in performance</b> following simulation. Reported to pre-test scores for both groups as equal. Only outcome reported.
Baxter et al 2012	27	Myocardial Infarction	Interactive 5.04 $\pm$ 0.48 p=0.007 Video 4.74 $\pm$ 0.88 (no difference in ES between two interventions ES=0.35) <b>(Mean <math>\pm</math>SD)</b>	3.64 $\pm$ 1.22 (ES of 1.29 between control and video and 1.64 between control and interactive)	SPSS 15.0. Post hoc analysis of effect size (Newman-Keuls)	Significant <b>increase in performance</b> following simulation. (caution due to small sample size) No difference between video based and practical based simulation. No correlation between scores and prior experience noted.
*IPT = Immediate Post Test. 1yrPT = One year post test.						

### **4.3 Discussion**

The aim of this review was to synthesise the evidence relating to the effects of simulation on the preparation of professionals for rare, critical and emergency events. In contrast to the review of the features of high fidelity medical simulations conducted by Issenberg et al (2005) the review sought evidence where comparisons with other forms of education and training were made. The intention was to appraise the evidence relating to professionals from a range of disciplines, however, these final results relate solely to professions within healthcare. From the outset it was envisioned that the review would include literature relating to aviation and engineering industries as, in addition to healthcare professions, these were identified as requiring preparation for rare, critical and emergency events through a simulated approach. As comparisons could not be found within the literature, between simulation and other approaches to training/education, these disciplines could not be included.

The findings of the review appear to show beneficial trends relating to some aspects e.g. confidence and performance yet the evidence relating to what works, for whom and in what circumstances is unclear. There is a plethora of discourse around simulated approaches to learning and teaching and much of this extols the virtues of practise within a safe environment, without endangering public/patient safety. (McIndoe 1999, Cleave-Hogg & Morgan 2002, Murray & Good 2002, Issenberg et al 2005, Dow 2008). All studies reviewed set their simulation strategy with reality as an important facet of the study design; the value of simulation being seen as relating to realism and the ability to practise in a safe environment. The reality/validity of the simulation was not verified within the included studies. No study tested the impact of the environment on outcomes and this may be an important feature when considering training and education. Within healthcare there is a renewed emphasis on the need to train in a simulated way with simulation centres and improvements in models/mannequins being financed. The cost effectiveness of this, given the evidence base, should be reviewed against the cost of not adopting a simulated approach.

There is a lack of robust evidence relating to the effect of simulation on professional preparation for those events which occur rarely but may have catastrophic consequences for all involved. The literature does not tell us how often simulation should be repeated and there is some reservation around the longer term effect on performance and retention. If critical/emergency situations are not commonplace (rare) within professional practice, then it is questioned whether responses cannot be mastered through experience alone. Deliberate and regular practise appears to be

required. Ericsson & Lehmann (1996) attest to the importance of repetitive and deliberate practise for skills acquisition and maintenance.

The mechanism of simulation appears to be associated with the utilisation of multiple learning strategies alongside practical elements. It is evident that there are a number of approaches to this but the evidence does not delineate between the merits of different integrated approaches. The adoption of multi-professional working is reported as having value within simulated learning; the evidence to support this, however, appears largely anecdotal with no consideration of the transference into multi-professional team working or the ability to manage real life critical incidents in the clinical setting as this was not tested.

The data does appear to demonstrate improved performance initially following simulated learning as a main outcome. Questions relating to participant perceptions i.e. did they like it? are deemed as having significant consequences for learning. Possible *outcomes* are enjoyment of this approach, increased confidence and performance of key tasks and post intervention. Again, the literature does not tell us why or how this translates into safety within professional practise.

#### **4.4 Conclusion**

The review is limited by the quality of published evidence and meta-analysis highlighted the inconsistencies across the studies and, therefore, pooling of results through meta-synthesis was inappropriate.

Resource limitations (due the nature of undertaking the thesis) resulted in one researcher undertaking the majority of the review; potential bias was, therefore, mitigated by the data extraction forms being independently examined for completeness and precision.

It appears that the evidence underpinning simulated training/education for the preparation for critical events is based largely on (short term) post-test evaluations of performance. Studies were predominately quasi-experimental with qualitative methods used minimally and serving as complimentary. Further research should move towards understanding the processes and mechanisms of preparation for critical and emergency events. The patterns and conditions required for the operation of training/education programmes, whilst recognising that there may be discrete and unobservable elements, are not included within the literature.

In summary, there is much to be done in order to improve the rigour and quality of the evidence base underpinning simulated preparation for critical events and a further review of the characteristics of simulation related to these disciplines is recommended.



#### **4.5 Summary of Chapter 4**

In this chapter the procedures, analysis and findings from phase 1.1 of the study have been discussed. The intention was to report the quantitative dimensions in terms of what works, for whom and in what circumstances with specific focus on those studies which compare/evaluate whether simulation is more or less effective than alternative methods; the comparators related to passive learning and the key points are as follows; The data does appear to demonstrate improved performance initially following simulated learning.

All studies reviewed set their simulation strategy with reality as an important facet of the study design; the value of simulation being seen as relating to realism and the ability to practise in a safe environment. There is no data within the studies to corroborate this.

The literature does not tell us how often simulation should be repeated and there is some reservation around the longer term effect on performance and retention.

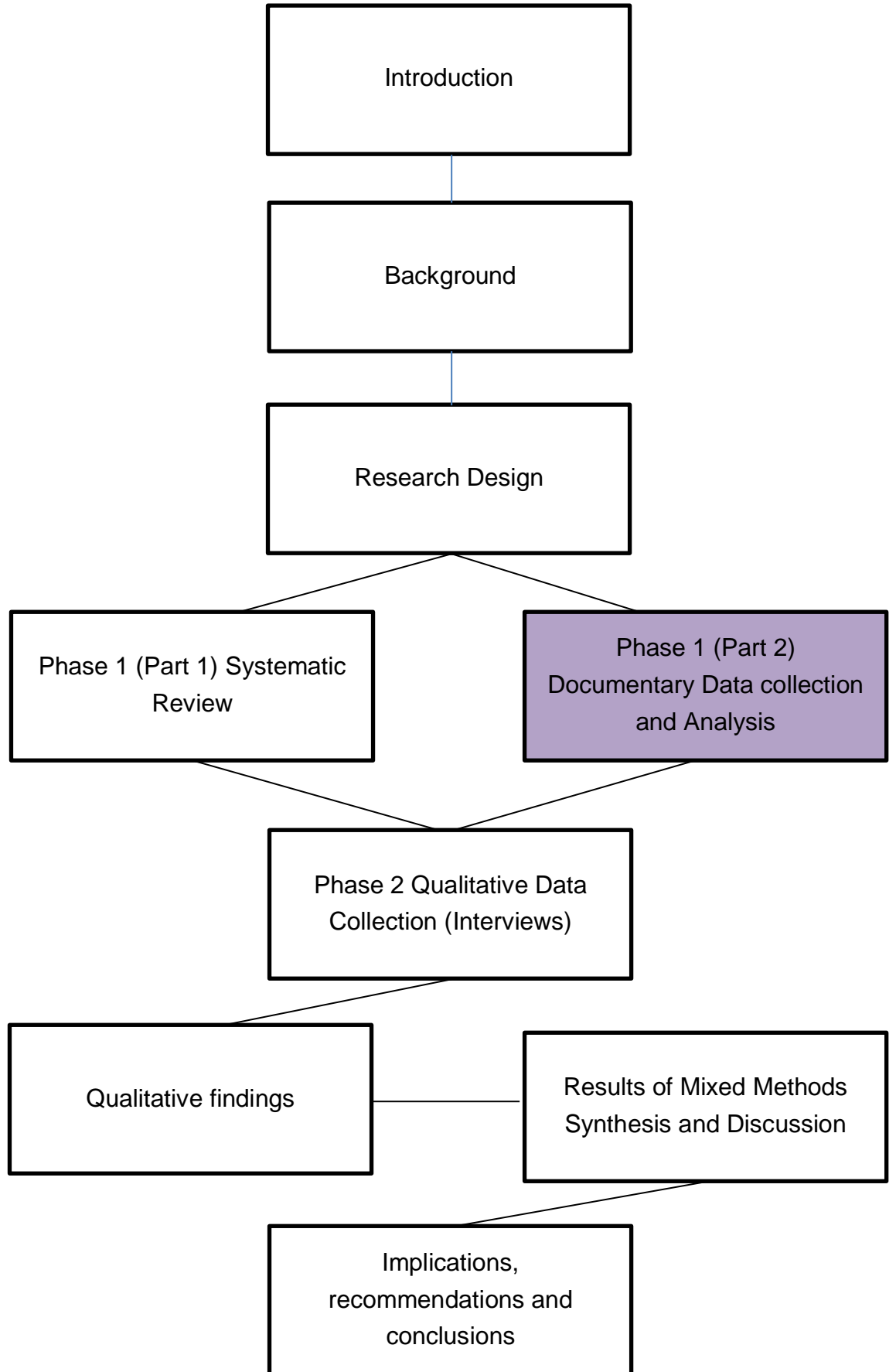
The mechanism of simulation appears to be associated with the utilisation of multiple learning strategies alongside practical elements; the evidence does not delineate between the merits of different integrated approaches.

There appear to be beneficial trends relating to some aspects e.g. confidence and performance yet the evidence relating to what works, for whom and in what circumstances remains unclear.

The quality of the evidence inhibits any strong inference about the effectiveness of simulation.

By revealing the limitations and inconsistencies within the evidence the review informs the next stage of the study by focusing attention on what works (within a simulated approach) for whom and in what circumstances.

The next Chapter will focus on the characteristics of programmes which use simulation to prepare for critical events during childbearing; detailing phase 1.2 of the study, findings borne out of a documentary analysis of training and education programmes will be embedded with phase 1.1 in order to inform the subsequent phase.



## Chapter 5 Phase 1.2 Documentary Analysis

*'Education is the kindling of a flame, not the filling of a vessel'*

*Plutarch (cited by Blackburn 2008)*

Chapter 4 evaluated the evidence suggesting that performance of key tasks relating to critical events may be improved (initially) following simulated learning. What the review didn't reveal was what works, for whom and in what circumstances!

This chapter details the second element of phase 1 of the study – an analysis of training and education provision relating to critical events in childbearing; the synthesis of both parts of phase 1 will inform the next phase of the study.

### 5.1 Methods

#### 5.1.1 Objectives

The two objectives of this second element of phase 1 were as follows;

- (1) To provide further insight into the characteristics of programmes which use simulation to train/prepare for critical events during childbearing; why the programme was developed, for whom and how this is measured/evaluated?
- (2) To synthesise these characteristics with the data borne out of the systematic review in order to develop a rich theoretical framework relating to training and education through simulated means.

The contextual conditions of training provision (simulation) are pertinent to the area of study (preparation for rare, critical and emergency events) and inform the development of subsequent phases. Documentary analysis involves the study of existing documents in order to gain understanding of the basic content or deeper meanings which may be illuminated by style and coverage (Ritchie & Lewis, 2006). Documentary evidence in this study included curricula, lesson plans and evaluations. To enhance consistency in researcher performance a data collection proforma was developed which contains the instrument, procedures and rationale for this phase of the study (Table 5.1).

### 5.1.2 Setting

Sampling criteria was linked to the research objective and it was envisaged that the documents would generate data relevant to the concepts which emerged from the systematic review.

Within the Yorkshire and Humber Region (chosen due to geographical proximity) 3 training programmes<sup>4</sup> relating to obstetric emergencies were purposively sampled. Purposive sampling involves the researcher making judgements as to whether the sample units have the necessary features to assist in answering the research question (Moule & Hek 2011 and Bryman 2012).

This non-random approach was not simply chosen for convenience; there was a criterion behind the decision making. The first was to ensure that the documents obtained would contain details relating to simulated training for obstetric emergencies. The programmes were, therefore, identified through a regional Deanery Simulation and Clinical Skills Network and through personal contact with a regional simulation centre and on-line searching. The second feature related to the diversity of the programmes in order that differing perspectives could be explored (Ritchie et al 2014). Two of the programmes (2 & 3) were identified as being relevant to a number of professional groups with the addition of a programme specifically aimed at anaesthetists responding to obstetric emergencies. All providers received information relating to the study and consented to a review of curricula documentation and observation of the simulated practise.

In order to respond to the potential of unwitting bias i.e. seeking a sample which may match any preconceived notion (O'Leary 2004 p109) documents were also retrieved from outside of the region; a regional Critical Care Network<sup>5</sup> and the course manual from a national provider of simulated training was purchased<sup>6</sup>.

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<sup>4</sup> OAES - Obstetric Anaesthesia Emergency Simulation Course (1) MOSES -Medical Obstetric Simulated Emergency Scenarios (2) and YMET - Yorkshire Maternity Emergency Training (3),

<sup>5</sup> AIM - Maternal Acute Illness Management (4).

<sup>6</sup> Practical Obstetric Multi-Professional Training

**Table 5-1 Documentary Analysis Proforma**

Study Objective	Study Question	
1b. To synthesise the evidence available and produce a taxonomy of the characteristics of effective simulated training programmes.	Q1. What are the characteristics of simulated training programmes for recognising and responding to obstetric emergencies?	
Data Collection Procedures		Rationale
Sites contacted	Obstetric Anaesthetic Emergency Course* YMET – Yorkshire Medical Emergencies Training (Obstetrics)* (MOSES – Medical Obstetric Simulated Emergency Scenarios)* Maternal Acute Illness Management – Critical Care Network ** Practical Obstetric Multi-Professional Training **	Purposive sample. Pragmatic access due to locality. *(Identified through regional Deanery Simulation and Clinical Skills). ** Materials identified through personal contact and on-line searching
Specific Documents to be accessed	Curricula documentation Simulated training plan - key aims and objectives and how delivered (e.g. lesson plans) Hand outs Evaluations of training	Stable: can be reviewed repeatedly. Unobtrusive: not created as a result of the study and, therefore, there is relative non reactivity of the researcher (Bowling 2009 p 449)
Outline of the report (factors to be included in the analysis)		
	<ul style="list-style-type: none"> <li>• The education/training practise in operation</li> <li>• Who delivers the practise</li> <li>• Prior knowledge of participants</li> <li>• The audience</li> <li>• Time the practise has been in operation</li> <li>• Innovations of the practise</li> <li>• Reason for the practise</li> <li>• Outcomes of the practise to date (if recorded)</li> <li>• Attachments (model for the practise and relevant curricula documents)</li> </ul>	
Case Study Questions		
	<ul style="list-style-type: none"> <li>• Describe the education/training in detail</li> <li>• What is the nature, if any, of collaborative efforts across disciplines or education providers which are necessary for the practise to be implemented?</li> <li>• How did the idea for the education/training start?</li> <li>• Process – are there specific goals, objectives, target populations and/or areas of practise?</li> <li>• In what ways is the practise innovative compared to other practises of the same kind?</li> <li>• Are there any planned developments to the practise evident from the documents?</li> <li>• Are there any key 'take home messages' from the practise?</li> <li>• How often should the practise be repeated (ideal)?</li> <li>• What are the challenges of operationalising the practise?</li> </ul>	
Evaluation		
Synthesis of data sources (data synthesis through use of a matrix) Synthesis of perspectives of the data set (theoretical synthesis) Synthesis of methods (methodological synthesis) Identification of rival explanations attributing to the outcome (bias).		Increases construct validity as multiple sources of data accessed. Thematic analysis used to identify, group and summarise findings (Pope et al 2007)

### 5.1.3 Data Collection

This investigation centred on how learning occurred compared to the assumptions within training documents in terms of learning outcomes. Clarification was also sought from individuals delivering the programmes (for accuracy) and permission was gained for obtaining documents for annotation. As the purpose of this phase was to review the credibility of training documents and interrogate the evidence within (O’Leary, 2004, p179) a data analysis worksheet was developed in order to record factors to be included within analysis. The document analysis worksheet was adapted from an APPARTS (acronym – see Table 5.2) principles and National Archives and Records templates (available from <http://www.facinghistory.org/resources/strategies/document-analysis-templates>). This approach was chosen as representing the key analytical outputs proposed by Spencer et al (2014) namely categories of things (themes) people or processes (typologies) and explanation of factors influencing processes (explanation).

**Table 5-2 Documentary Analysis Data Collection Form**

Type of document	
<b>A - Author</b> (who created the programme, who delivers the programme, what is their point of view?)	
<b>P - Place and time</b> (where and when is the programme delivered, could this affect the meaning? Time the programme has been in operation?)	
<b>P - Prior knowledge</b> (is pre work or prior experience a critical part of the programme?)	
<b>A - Audience</b> (for whom is the programme designed? Could this affect the reliability?)	
<b>R - Reason</b> (why is the programme produced?)	
<b>T - The main idea</b> (learning outcomes, subject, how assessed and how evaluated? Assumptions within the document)	
<b>S - Significance</b> (why is the programme important? Innovations in the programme over time? Evaluations?)	
<b>Date/time collected</b>	

### 5.1.4 Initial Data Management

Data management was achieved through a ‘framework’ approach as this includes indexing and sorting tasks, customary in many processes of making data ‘manageable’, but adds the step of data summary and display (Spencer et al 2014). Developed in the 1980’s, ‘framework’ is now widely adopted as a way of making qualitative data manageable for thematic analysis (Pope & Mays 2006). There are five steps central to this process (Spencer et al 2014) identified in Table 5.3.

**Table 5-3 Steps in Framework Analysis**

Steps in the Framework approach	Explanation
Step 1 – Familiarisation	Gaining a basic overview of the data and identifying topics of relevance to the research question?
Step 2 – Constructing an initial coding framework	An initial framework for organising the data into themes and subthemes with some level of generality.
Step 3 – Indexing and Sorting	Annotation of the data in order to identify elements which are similar.
Step 4 – Reviewing Data Extracts	Assessing the coherence of the data and identifying alternatives in the themes applied.
Step 5 – Data Summary and Display	What is being said, by each of the sample, about a particular theme.

#### 5.1.4.1 Familiarisation

Data was initially ordered and tabulated using the APPARTS categories in rows and training programmes in columns (Table 5.4). Spencer et al (2014) argue that this facilitates both across-case and within-case analysis; theme based approaches can lose the ‘thread’ of important facts throughout the documents and case based approaches can lose connection with original data not sufficiently linked to the source (through coding).

From this initial ‘familiarisation’ phase it became apparent that the data collection was thwarted by the gaps in data coverage from the curricula documents. As the rationale for this task is to identify topics of relevance to the research questions and recurrent in the data set (Ritchie et al, 2014) it was felt that an additional step in the data collection process was warranted; this was in order to gather important items of interest within the

data especially relating to the audience for whom the programme was intended and the significance of the programme.



Table 5-4 Initial Ordering for Documentary Analysis

Type of document	Programme 1	Programme 2	Programme 3	Programme 4	Programme 5
<b>A</b> - Author (who created the programme, who delivers the programme, what is their point of view?)	Consultant anaesthetists lead. Simulation is widely used as an education tool. Response to the decline in training hours. Specific training on obstetric anaesthetic emergencies is novel.	Not evident from document	Regional Obstetric Emergencies Training Steering Group. Based on strategic aims around patient safety and improved outcomes.	Maternity Foundation set up to improve awareness and facilitate distribution of effective obstetric emergencies training. Research by the foundation confirmed that leadership, multi-professional team working, appropriate knowledge and clinical skills are essential for best care.	Consultants in obstetrics and anaesthetics. Midwives, nurses and educators in critical care (Critical Care Network). Recognised that training and education are key to improving skills and knowledge required to care for acutely ill women.
<b>P</b> - Place and time (where and when is the programme delivered, could this affect the meaning? Time the programme has been in operation?)	Run across 4 sites within Yorkshire and Humber. Delivered in simulation centres. In operation since 2011.	Clinical simulation centre	Delivered within local Trusts. Not clear who delivers this. Not clear of time in operation.	Designed for local staff to provide in-house multi-professional obstetric emergencies training. Unclear how long the program in operation.	Developed in 2002. Unclear where the training is delivered.
<b>P</b> - Prior knowledge (is pre work or prior experience a critical part of the programme?)	Course manual outlining the recognition and management of 7 scenarios. Based on clinical algorithms. No pre-course test. No information as to how participants will be assessed.	No pre-work No information as to how participants will be assessed.	Pre-course reading relating to teamwork, shoulder dystocia, cord prolapse and vaginal breech delivery. Gives background to importance of the issue, recognition and management focus. Not clear as to how participants will be assessed.	Not clear. Course manual delivered pre-course. No detail as to expectation in terms of pre-reading or assessment.	Course manual provided as pre-course reading deemed 'essential' for candidates prior to attending the course. Prior experience not discussed. No details relating to assessment.
<b>A</b> - Audience (for whom is the programme designed? Could this affect the reliability?)	Obstetric anaesthetists. Not clear which level/experience?	Multi-disciplinary but not clear what this means.	Not clear from the documents.	The title – practical obstetric multi-professional training. Not clear from the document who is included within the 'multi-professional' approach.	Addresses components of training requirements to support competencies outlined in <i>recogniser</i> and <i>primary responder</i> roles.
<b>R</b> - Reason (why is the programme produced?)	A reliable assessment of anaesthetists' performance.	Obstetric simulated emergency scenarios is required	Obstetric Emergencies Drills Training is required	Practical training for obstetric emergencies.	Systematic approach to the assessment and management of acutely ill women.
<b>T</b> - The main idea (learning outcomes, subject, how assessed and how evaluated? Assumptions within the document)	Learning outcomes relate to recognition and management for each scenario. No information relating to assessment.	Scenarios and debrief	Understand role in an emergency situation. Appreciate what you do well. Consider additional ways you may be able to contribute. Recognise self-improvement/development. Safe learning environment. Assessment is competency based (self-assessment pre and post simulation)	Delivery of safe, high quality care. 14 modules. 1 related to team working and 13 related to specific elements of maternal/new-born care.	9 elements. 7 related to clinical skills and 2 related to communication and ethics. To optimise the outcome for women at risk. Enhance knowledge, confidence and performance of staff. Encourage team work and communication. Promote multi-disciplinary approach to care. Maximise efficient use of critical care services. Address clinical governance and risk.
<b>S</b> - Significance (why is the programme important? Innovations in the programme over time? Evaluations?)	Not evident from the course manual.	Not evident from information	Not evident from the pre-course reading or training manual.	Not evident from the training manual.	Not evident from the training manual.

### **5.1.5 Key revisions to Phase 1.2.**

Where features were not evident within training documentation, or clarification needed, additional information was requested from training providers. Permission was also sought to observe simulated training programmes. Observation is a common data collection approach within qualitative research and involves the gathering of data through visual means (Moule & Hek 2011). For this study non-participant observation was appropriate for the purposes of identifying common characteristics and capturing the operationalisation of the curricula.

All training providers within the region were contacted and, due to the timing of available programmes, three regional programmes were observed. The observation was non-participatory and participant performance was not the feature of interest; this was solely for the purpose of identifying common characteristics and approaches within the simulated training programme.

All three training providers consented to the observation of the training programme.

The three training programmes were observed and key characteristics were recorded using the same document analysis worksheet (see Table 5.2) previously completed. This enabled focused attention to the elements of the curriculum which were not evidence from the documentation.

Table 5-5 Initial Ordering Version 2

Type of document	Programme 1	Programme 2	Programme 3
<b>A</b> - Author (who created the programme, who delivers the programme, what is their point of view?)	Consultant anaesthetists lead. Faculty of consultant anaesthetists (n=8) and simulation fellow (n=2) Simulation is widely used as an education tool. Response to the decline in training hours. Specific training on obstetric anaesthetic emergencies is novel. Realism of the training linked to safety. Feedback from staff is that they 'love it'.	Simulation centre in operation since 2003 and the programme has run since 2005. Delivered since it's inception by Consultant Obstetrician who's viewpoint was that it is the feedback and not the simulation which is the key element to the programme.	Regional Obstetric Emergencies Training Steering Group.  Based on strategic aims around patient safety and improved outcomes.
<b>P</b> - Place and time (where and when is the programme delivered, could this affect the meaning? Time the programme has been in operation?)	Run across 4 sites within Yorkshire and Humber. Delivered in simulation centres. In operation since 2011.  4 bed ward environment with an obstetric theatre. Video recording controlled outside of room.	Clinical simulation centre  Purpose built centre with an ethos of team-working and not on competency  Ward environment. Scenario controlled outside of room.	Delivered within local Trusts. Not clear who delivers this. Not clear of time in operation. Delivered within the labour ward environment with scenarios videoed by facilitator. Focussed on realism of environment with the added stressor of a relative in scenario.
<b>P</b> - Prior knowledge (is pre work or prior experience a critical part of the programme?)	Course manual outlining the recognition and management of 7 scenarios. Based on clinical algorithms. No pre-course test. No information as to how participants will be assessed.  No assessment of compliance with the pre-course reading.  Attendees wear theatre scrubs in order to increase the 'realism'.	No pre-work – pre course reading relating to what to expect only.  No information as to how participants will be assessed.	Pre-course reading relating to teamwork, shoulder dystocia, cord prolapse and vaginal breech delivery. Gives background to importance of the issue, recognition and management focus. Not clear as to how participants will be assessed. Pre-test of true/false statements relating to clinical scenarios. Reiterated that this is informal with the facilitator talking through answers.
<b>A</b> - Audience (for whom is the programme designed? Could this affect the reliability?)	Obstetric anaesthetists. Not clear which level/experience?  Trainees at the start of their obstetric rotation (n=5)	Multi-disciplinary but not clear what this means from document.  Midwives (n=5), obstetricians (n=1) and anaesthetists (n=6) present on the day.	Not clear from the documents. Emphasis on multi-professional working. Participants book on-line with no monitoring of the skill mix. Midwives (n=5) HCA (n=1) students (MW = 1, Medic = 1) Medical staff (n=0)
<b>R</b> - Reason (why is the programme produced?)	A reliable assessment of anaesthetists' performance.  Identified need through clinical skills network. Trainees are commencing a new obstetric rotation.	Obstetric simulated emergency scenarios is required  Emphasis on practise in a safe environment, Debriefing helps to embed learning. Human factors focus	Obstetric Emergencies Drills Training is required  Practise in a safe environment. Focus on feedback from video recording
<b>T</b> - The main idea (learning outcomes, subject, how assessed and how evaluated? Assumptions within the document)	Learning outcomes relate to recognition and management for each scenario. No information relating to assessment.. est technical and non-technical skills – prompt sheet for faculty regarding no-technical skills which is fed back to participants at the end of the scenario. Self-reflection encouraged throughout the day. Scenarios were anaphylaxis, high epidural block, crash GA for LSCS, Eclamptic Fit, local anaesthetic toxicity, major haemorrhage and difficult airway (CICV)	Scenarios and debrief – scenarios were Eclamptic Fit, Post-delivery Sepsis, uterine inversion, local anaesthesia toxicity.  No specific learning outcomes. Cannot fail as not competency based. Focus is on learning through feedback.  Facilitator stated that over time participant recognition and responses have improved. No data to support this.	Understand role in an emergency situation. Appreciate what you do well. Consider additional ways you may be able to contribute. Recognise self-improvement/development. Safe learning environment. Assessment is competency based (self-assessment pre and post simulation). Scenarios Eclamptic fit and haemorrhage. Talked through breech and shoulder dystocia.
<b>S</b> - Significance (why is the programme important? Innovations in the programme over time? Evaluations?)	Not evident from the course manual. Development of scenarios based on feedback from trainees, recognition of clinical needs and liaison with clinical skills network. Immediate post exposure evaluation of objectives, relevance, perceived ability, improving patient safety, organisation, confidence, environment.. 5 point scale (Unsatisfactory to excellent)). 5 completed with all in the Good to Excellent category.	Not evident from information. Development of the scenarios has been based on participant feedback. Immediate post exposure evaluation of enjoyment, relevance, perceived ability, improving patient safety, organisation, length and repetition of the programme. 5 point scale (strongly agree to strongly disagree). 9 completed with all in the 'strongly agree' category.	Not evident from the pre-course reading or training manual or observation. Clinical skills competency form completed by organiser but not assessed at an individual level. Post course evaluation of enjoyment, relevance, scenarios, debriefing, preparation, patient safety, and organisation. 5 point scale (Unsatisfactory to excellent)). 5 completed with all in the Good to Excellent category.

## **5.1.6 Data Management Revisited**

### **5.1.6.1 Familiarisation**

Following additional data collection through observation the data was again ordered and tabulated using the same process of categories in rows and training programmes in columns. Version 2 relates to the three observed programmes (Table 5.5 where shading highlight additions). This further facilitated the 'familiarisation' phase where the task is to become thoroughly acquainted with the data so that recurrent and relevant themes can be identified (Spencer et al 2014).

### **5.1.6.2 Constructing an initial thematic framework**

The process of identifying the emerging categories is the next step in the framework approach which, Spencer et al (2014) argue, helps the researcher to hold onto the overall structure and organisation of data. In achieving this, the research objectives and questions were considered alongside the findings borne out of the systematic review; this was in order to ensure that any emerging categories would facilitate answering the question.

McDavid et al (2013) identify the key concepts in evaluating programmes and suggest that key questions should be asked about the *programme environment*, *intended outcomes* and *observed outcomes*. Programme context is connected to the environment as a conceptual boundary around inputs, activities and outcomes; Mechanisms encompass the intended outcomes of the programme as these are identified as the elements of the programme which are intended to make a difference outside of the programme itself (McDavid et al 2013); The outcomes of the programme relate to those which are observed i.e. the extent to which results of the programme are consistent with the intended outcomes. Essentially, how effective was the programme? With this in mind an initial thematic framework for ordering the data emerged as follows:

**1 Background**

- 1.1 Professional group
- 1.2 Level of experience
- 1.3 Pre-training preparation
- 1.4 Pre-test measure of performance
- 1.5 Reason for programme

**2 Approach to Simulation**

- 2.1 Intended outcomes
- 2.2 Environment
- 2.3 Scenario development
- 2.4 Type of feedback
- 2.5 Realism
- 2.6 Familiarity with simulation

**3. Outcomes**

- 3.1 Pre-test measure of knowledge
- 3.2 Post-test measure of performance
- 3.3 Participant evaluation
- 3.4 Patient safety

**5.1.6.3 Indexing and sorting**

As Spencer et al (2014) suggests, the themes are descriptive rather than abstract and grounded in the data; the next phase being the assignment of thematic referencing in order to locate where topics are being discussed (see example from programme 1 in Table 5.6). Spencer et al (2014) argue that the term 'indexing' be used instead of coding as it more accurately describes the action of simply highlighting where something is being referred to within a text. This was a paper based exercise with the thematic reference (index) in one column and the information contained within the programme documentation in another.

**Table 5-6 Assignment of Thematic Referencing**

INDEX	Programme = 1
1.1 Professional Group 1.5 Reason for programme 2.5 Realism 3.4 Patient Safety	Consultant anaesthetists lead. Faculty of consultant anaesthetists (n=8) and simulation fellow (n=2) Simulation is widely used as an education tool. Response to the decline in training hours. Specific training on obstetric anaesthetic emergencies is novel. Realism of the training linked to safety. Feedback from staff is that they 'love it'.
2.2.1 Environment 2.3 Scenario Development	Run across 4 sites within region. Delivered in simulation centres. In operation since 2011. 4 bed ward environment with an obstetric theatre. Video recording controlled outside of room.
1.2 Pre-training preparation 1.3 Pre-test measure of performance 2.5 Realism	Course manual outlining the recognition and management of 7 scenarios. Based on clinical algorithms. No pre-course test. No information as to how participants will be assessed. No assessment of compliance with the pre-course reading. Attendees wear theatre scrubs in order to increase the 'realism'.
1.1 Professional Group	Obstetric anaesthetists. Not clear which level/experience? Trainees at the start of their obstetric rotation (n=5)
1.5 Reason for programme 1.2 Level of experience	A reliable assessment of anaesthetists' performance. Identified need through clinical skills network. Trainees are commencing a new obstetric rotation.
2.1 Intended outcomes 1.3 Pre-training preparation 1.5 Reason for programme 2.4 Types of feedback 3.3 Participant evaluation 2.3 Scenario development	Learning outcomes relate to recognition and management for each scenario. No information relating to assessment Test technical and non-technical skills Prompt sheet for faculty regarding non-technical skills which is fed back to participants at the end of the scenario. Self-reflection encouraged throughout the day. Scenarios were anaphylaxis, high epidural block, crash GA for LSCS, Eclamptic Fit, local anaesthetic toxicity, major haemorrhage and difficult airway (CICV)
2.3 Scenario development 3.3 Participant evaluation	Development of scenarios based on feedback from trainees, recognition of clinical needs and liaison with clinical skills network. Immediate post exposure evaluation of objectives, relevance, perceived ability, improving patient safety, organisation, confidence, environment.. 5 point scale (Unsatisfactory to excellent)). 5 completed with all in the Good to Excellent category.

**5.1.6.1 Reviewing data extracts**

Throughout the process of indexing there was a gradual re-ordering of the themes which evolved from the a priori coding framework. Figure 5.1 shows the data driven final framework with the 3 main *a priori* themes identified in shaded areas; It was evident that sub themes could be re-classified; an example being *environment* which was categorised into sub-themes relating to the physical environment (theme 4.1) and the context of practising in a safe environment (theme 4.2). Participant familiarisation with simulation was not found to be contained within the documentation and, therefore, this theme (2.6) was removed.

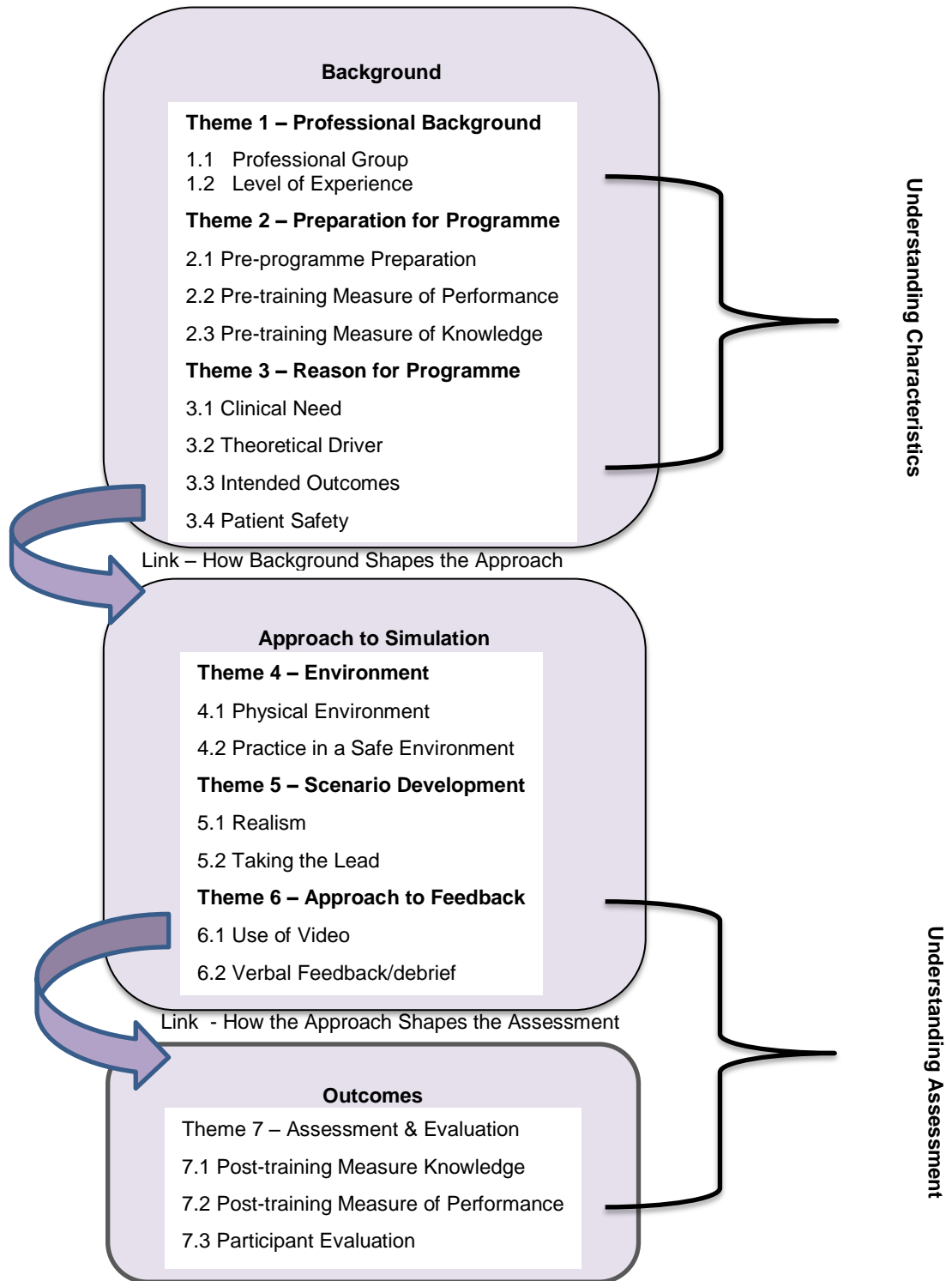


Figure 5-1 Data Driven Final Framework

#### **5.1.6.2 Data summary and display using Framework**

Once reviewed and finalised each theme was summarised and charted into its own matrix (appendix 10). As the data was not borne out of lengthy transcripts this summary process was achieved using Excel. This allowed each subtheme to be identified in a column and with the first column being case identification and demographics. Spencer et al (2014) argues deep immersion in the data occurs whilst working theme by theme across the dataset. The authors suggest that the overarching aim of this task is to ensure that all material has been reviewed and to identify whether data has been omitted or where detail is missing; In addition, Li & Seale (2007) caution against adding too much detail within the charts advising a succinct summary only. The challenge being in summarising data whilst being mindful of not losing context and omitting key points (Spencer et al 2014). The charts were reviewed against the whole (original) data set (curricula documents, evaluation forms, hand outs, assessment sheets and field notes) thus enhancing rigour (Ezzy 2002).

#### **5.1.7 Data Analysis**

Allowing for comparison of themes and sub-themes, this stage of mapping and interpretation is a necessary step in generating explanatory accounts and is thought to aid the development of a conceptual framework (Ward et al 2013).

Patton (2002) acknowledges that the approach to analysis is dependent on the research questions and purpose of the study; analysis therefore, related to the substantive content rather than observed discourse during the data collection process. The focus of this phase of the study being to provide further insight into the characteristics of programmes which use simulation to train/prepare for critical events during childbearing; why the programme was developed, for whom and how this is measured/evaluated. Essentially the focus was on the underlying pedagogy and the methods adopted based on this. Craig & Allen (2010) argues that effective pedagogy lies in the appropriate use of learning tools to meet objectives.

The approach to abstraction and interpretation was descriptive and focussed on the range of what was being said, within each programme, about a particular theme. Spencer et al (2014) argue that this is the basic building block of qualitative analysis. In summary, the whole process of structuring the data around the framework facilitated a deep immersion in the data allowing the identification of dimensions within themes and sub-themes. This was achieved through the recording of ideas, in note form, throughout the process of framing the data.

The next step was categorisation of typologies (Spencer et al 2014). Patton (2002) asserts that typologies divide aspects relating to the data into parts along a continuum.



Essentially, what follows, is a grouping of concepts which are about the same thing (single dimension typology) and an assessment of the relationship between the categories (Spencer et al 2014).

## 5.2 Findings

From the data driven framework (Table 5.1) the 3 *a priori* themes form the typological categories with the background (chosen for an exploration of characteristics) forming the typology of underlying pedagogy (Table 5.7) and two further typologies - approaches to simulation (Table 5.8) and outcomes (Table 5.9) leading the reporting structure. The resulting typologies locate the data into discrete positions along a continuum (Spencer et al 2014). The typology is presented first with examples from the data for illustration.

### 5.2.1 Typology of Underlying Pedagogy

The underlying pedagogy is obvious within the documents and relates to the evidence surrounding improving clinical outcomes and responding to identified training/personal needs.

**Table 5-7 Typology of Underlying Pedagogy**

Typology of Underlying Pedagogy		
Clinical Need	Training Need	Personal Need
Addresses Clinical Governance and Risk	Decline in trainee hours and identification that practical training is required	Training developed over time from participant feedback

#### 5.2.1.1 Clinical Need

The strategic aims which underpin programmes 1 to 3 are guided by a Regional Obstetric Emergencies Training Review (NHS Yorkshire & Humber, 2010) and, similarly to programmes 4 & 5, situates the clinical need in the evidence from successive Confidential Enquiries in Maternal Deaths (CEMACH 2004 & 2007 and CMACE 2011). These reports identify failings by health professionals in identifying and responding to deterioration and impending maternal collapse; highlighting direct maternal deaths which may have been prevented with better care.

#### 5.2.1.2 Training Need

The past decade has seen a reduction in working hours and changes in the clinical training environment for medical staff. In the forward to the programme (1) Russell (2011) argues that the medical staff have fewer opportunities to gain 'hands on' experience when compared with previous generations. Alongside this, the objectives of the programme are positioned, again, in the evidence from successive enquiries which identify that practical training relating to obstetric training is required. Likewise in all other programmes reviewed.

### 5.2.1.3 Personal Need

The aims which underpin programmes 1 to 3 are situated in developing an understanding of own role (what you do well and how you can contribute) recognising aspects of self-improvement and the opportunity to learn in a safe environment. Programme 1 was initially established with one clinical scenario and has developed into a programme of 8 scenarios based on participant evaluation and recognition of need over time.

## 5.2.2 Typology of Simulation

**Table 5-8 Typology of Simulation**

<b>Typology of Simulation</b>			
<b>Realism</b>	<b>Safety</b>	<b>Feedback</b>	<b>Multi-Professional</b>
Simulation developed to mirror reality	Emphasis on practise within a safe environment	Emphasis on feedback as the important factor	Emphasis on working as a team

### 5.2.2.1 Realism

Although not explicitly stated within the documents the introductions to the observed programs (1 to 3) positioned the key focus of the simulation as mirroring reality. The physical environment ranged from simulation centers (programs 1 & 2) which mimicked both ward (programs 1 & 2) and theatre (programme 1) environments to delivery of the programme within the clinical environment in which staff were working (programs 3 & 4).

There were additional approaches designed to add to the 'realism' of the programme including; attendees wearing scrubs as this clothing is required to attend an operating theatre environment (1), added stressor with facilitator enacting a distressed patient relative whilst the scenario is on-going (programme 3) and the mannequin response and telephone conversation being controlled outside of the room (programs 1 & 2) by facilitators.

### **5.2.2.2 Safety**

From the curricula documentation, one programme (1) explicitly states that the programme allows practise in a safe environment and asserts that this will enable practitioners to take a veteran approach when first meeting the 'enemy' that is a real life emergency. The programme also draws on the Chief Medical Officer's report (CMO 2008) stating that this approach improves training and preparedness where it is no longer acceptable to practise on patients. The implication being that the environment is both safe for practitioners and for patients.

Although not contained within curricula documents the web based advertisement for programme 3 states that the programme is designed to allow practise in a safe environment. There is no further expansion on this point.

### **5.2.2.3 Feedback**

Not contained within the curricula documentation the verbal introduction (given via presentation) to one of the programs was explicit in its emphasis on feedback and NOT simulation as the key learning approach for the training. Another programme introduction (1) stated that the focus was on both technical and non-technical skills and attendees were informed that facilitators would share their observation and feedback relating to non-technical skills following the simulation. The approach to training delivery within the 3 observed programs (1 to 3) used video recording to capture the simulation and stated (within introductions) that the focus was on learning through feedback. This information could not be gleaned from documents for programs 4 & 5.

### **5.2.2.4 Multi-professional**

Again the programs (1 to 5) are situated in the evidence from successive Confidential Enquiries in Maternal Deaths (CEMACH 2004 & 2007 and CMACE 2011) where recommendations relate to both multi-professional approaches to obstetric emergency training (2,3 & 4) and the inclusion of team work training (1, 4 & 5).

Programme 1 focusses on team working and not a multi-professional approach and programme 2 asserts that the team-working ethos helps embed learning throughout the training. The make-up of the teams differs between programs. Attendees within 1 & 2 can be a range of practitioners from within a region whereas 3 & 4 focus on delivery within own clinical environment with own team. Programme 4 is a nationally operated programme which delivers the program to teams who have specifically identified a need and invited the facilitators in. Although programme 3 is delivered within own clinical environment and, arguably, within own teams there was no monitoring of attendees on the day in order to ensure realistic skill mix.

It is unclear as to where programme 5 is delivered and to who although the document does suggest that team work enhances knowledge, confidence and performance.

### 5.2.3 Typology of Outcomes

Outcomes were multi-faceted and ranged from pre-training knowledge and performance through assessment of outcomes post training to participant evaluation of the training programme (Table 5.9).

**Table 5-9 Typology of Outcomes**

<b>Typology of Outcomes</b>			
Knowledge	Initial Performance	Long Term Performance	Enjoyment
Pre-training preparation required	Evaluated post simulation	Follow up and repetition of training	Participant evaluation of training

#### 5.2.3.1 Knowledge

Pre- course preparation in terms of reading through clinical scenarios was required in 4 programmes (1, 3, 4 & 5) with programme 2 distributing a schedule for the day only. The clinical scenarios which were provided pre-training included background relating to the importance of the training, clinical algorithms and physiology related to the scenarios. There were learning outcomes relating to the pre-course reading in terms of increased understanding.

Only programme 3 included a pre-training questionnaire administered to all staff. This consisted of 25 true/false options in 5 domains and 5 multiple choice questions related to the pre-course reading.

There was no assessment of compliance with the reading in any of the programs nor was there a pre-training measure of performance.

Within programme 3 the scores from the pre-training questionnaire were not recorded and correct answers were divulged by facilitators as a feedback mechanism. The questionnaire was designed as a test of developing knowledge (to be completed following training also) but, as answers had already been discussed, this was not achieved.

#### 5.2.3.2 Initial Performance

Only one programme (3) included a competency form completed by facilitators as a record of participant achievement. Within one of the domains of the competency form

there are 3 outcomes related to participant demonstration of skill yet this element of the programme was facilitated through discussion only. The programme facilitator stated that, theoretically participants could be unsuccessful in the training, but this was not the reality as there was no facility to test each participant's performance.

Programme 1 stated that participant self-reflection of performance was encouraged throughout the day, yet did not include a measure of performance.

#### **5.2.3.3 Long term**

Key issues which are emerging from the documentary analysis relate to the following; initial confidence immediately post training is very high (programs 1, 2 & 3). Perceived ability was also included within these 3 programmes as an evaluation point – also scoring highly. There is no long term follow up of attendees in order to establish how the training is relevant to the clinical setting.

#### **5.2.3.4 Enjoyment**

Participant enjoyment of the simulated training programme was captured on the programme evaluation forms. It was not clear, from the question, which element of the programme this 'enjoyment' related to; be it the programme structure, delivery, environment or hospitality. From participant evaluation three programs (1 to 3) included participant enjoyment (which was rated highly) yet there was no evidence as to why this is.

### **5.3 Discussion**

The objective of this part of phase 1 was to explore the contextual conditions of training provision through simulated means. Here, the first point to note relates to information gaps within curricula documentation. Specifically, there was minimal focus on learning outcomes within the programmes. The underlying pedagogy for the programmes was situated in the need to improve clinical outcomes and to respond to identified training/personal needs; yet there was no theory to support this.

Satava (2001), a key advocate for virtual reality learning, advised that the value of simulations lay in the context of the curriculum as a whole. Thus, the design and delivery of simulated education and training must move towards a focus on the intended learning outcomes, at an individual and practice level. According to Motola et al (2013) learning outcomes set the direction for content, instruction and feedback within simulation. Here curricula documents showed learning outcomes to be related to recognition of the clinical condition e.g. postpartum haemorrhage, and the appropriate management. The learning outcomes did not embrace the variety and diversity of

clinical experience amongst trainees. Motola et al (2013) advocate a tailored approach to the development of outcomes, giving attention to individual needs, and argues that this can lead to greater efficiency and effectiveness of simulations.

In terms of learning outcomes, there also appeared to be a worrying trend within the documentation as, theoretically, there was an assumption that individuals could fail the programme although the lack of performance measurement/testing following simulation meant that this was not a reality of the programmes. Okuda et al (2009) advocate assessment of competency using simulated strategies as an important way of distinguishing impaired clinical performance and highlighting where potential for remediation exists. Indeed, professional regulation of nurses and midwives (NMC 2015) and the medical professions (GMC 2014) stipulates that, in order to protect the public, practitioners are required to maintain a minimum standard of clinical competency. It could be argued that, if simulation is the accepted approach to developing and/or maintaining clinical skills, then this skill acquisition should be subject to testing/assessment.

An interesting finding relates to the simulation being situated in the context of mirroring reality. Within all of the programmes there were focussed attempts to design the scenarios with added realism e.g. wearing appropriate clothing/uniform and the set up of the environment to closely resemble practice. What is interesting is that this was not evaluated in any of the programmes; which leads to questions around the degree to which the realism of the simulated scenario affects the learning experience.

Another finding which links to the realism of the scenario relates to multi-professional approaches to simulation. Whereas the programs identified successive Confidential Enquiries into Maternal Deaths (CEMACH 2004 & 2007 and CMACE 2011) as underpinning the multi-professional ethos, all programs reviewed focussed on team working and not the multi-professional nature. Indeed, there was no obvious monitoring of the skill mix in order to ensure that this mirrored the reality of what would be available within clinical practice. Again, the usefulness of a multi-professional approach was not evaluated by attendees on the programs leading to questions as to the effectiveness and importance of this approach.

There was ethical approval to observe the training programmes in order to gather information of interest which was missing from the printed curricula documents. Ethical approval was not sought for focus on the discourse and participant performance; on reflection this would have yielded very rich data, especially in relation to the comments and reactions of participants and those responsible for training. There was an obvious mismatch in the evaluation of the programme and in the observation of participant and training team comments throughout the day. This presented a conundrum where

threats to methodological congruence were considered. Burns (1989) described this as ensuring that the ontology, epistemology and methodology of the study are all congruent and asserts that this is achieved through rigour in documentation, procedure, ethics and auditability of the study. Whilst thought provoking and raising interesting questions for further exploration, to include the observations within the findings would be to violate the methodological congruence of the study.

#### **5.4 Synthesis of Phase 1**

In this first phase of this sequential mixed methods study, quantitative and qualitative research questions addressed the relationship between simulation and preparation for rare, critical and emergency events. The strength of this design is that the findings from this phase are built upon and explored further in a second stage. The challenge lies in determining which results are to be examined further in the subsequent phase.

Logic models are utilised as a way of visually summarising the structure of programmes in order to demonstrate causal linkages between the inputs, activities and outputs of the programmes (McDavid et al 2013). The principle behind logic models lies in identifying intended results i.e. what is expected of a programme? is it implemented in the way planned? And does it work?

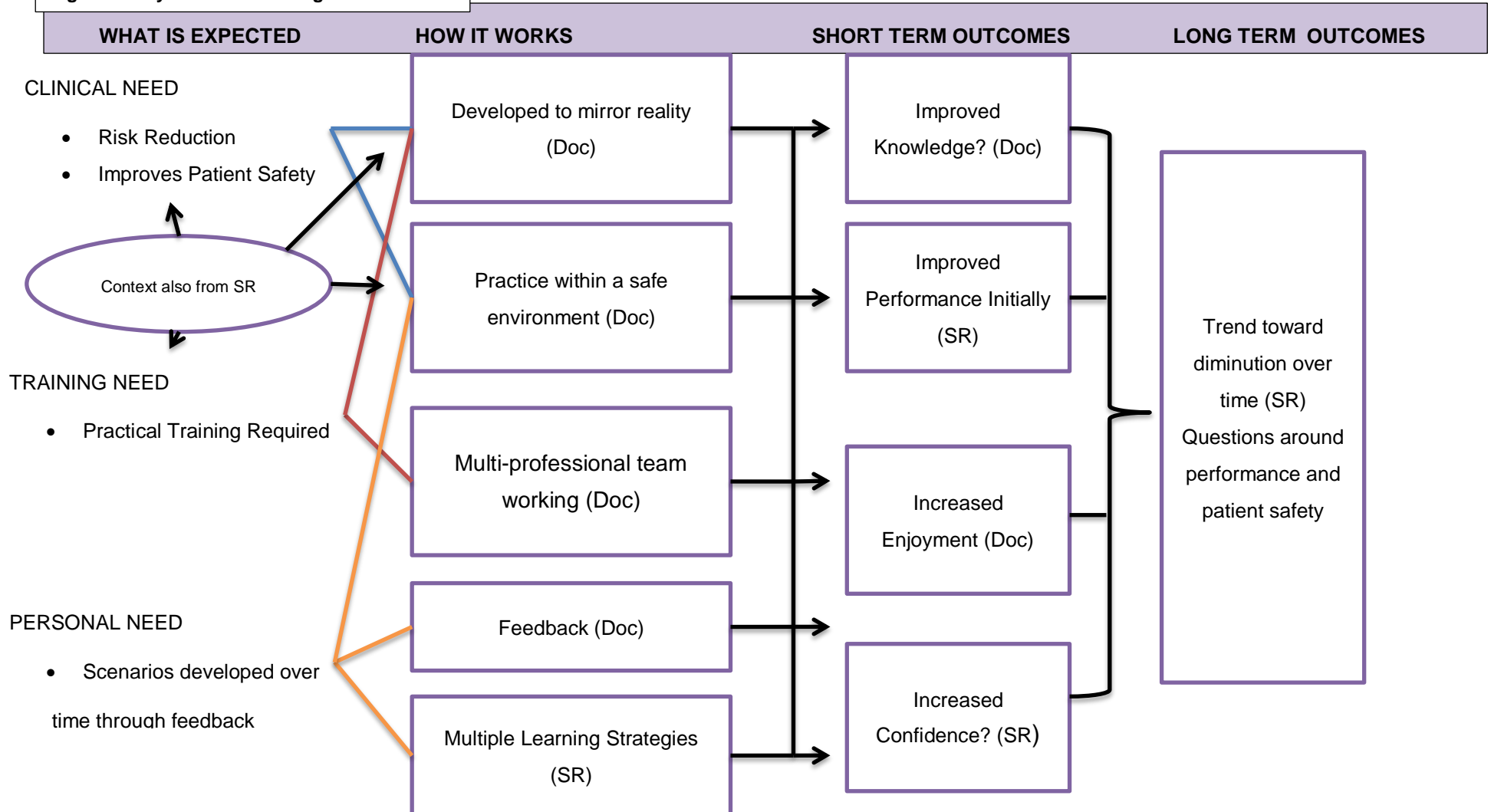
Using the principle of logic modelling Figure 5.2 is a diagrammatic representation of the synthesised findings from the systematic review and documentary analysis. This highlights the characteristics of simulation borne out of the data as well as questions which remain unanswered.

In summary, simulation appears to have been developed in order to reduce risk and improve patient safety with realism as an important facet of this approach. These assumptions are not verified within the data borne out of phase 1. The evidence does not identify how often simulation should be repeated nor does it illuminate the effects on long term performance and retention of skills/knowledge.

Review data does appear to demonstrate improvement in performance initially following simulated practise yet none of the training programmes measured performance following simulation.

Documentary evidence suggests that multi-professional team work during simulation enhances knowledge, confidence and performance but does not illuminate how or why this is the case.

Figure 5-2 Synthesised Findings from Phase 1



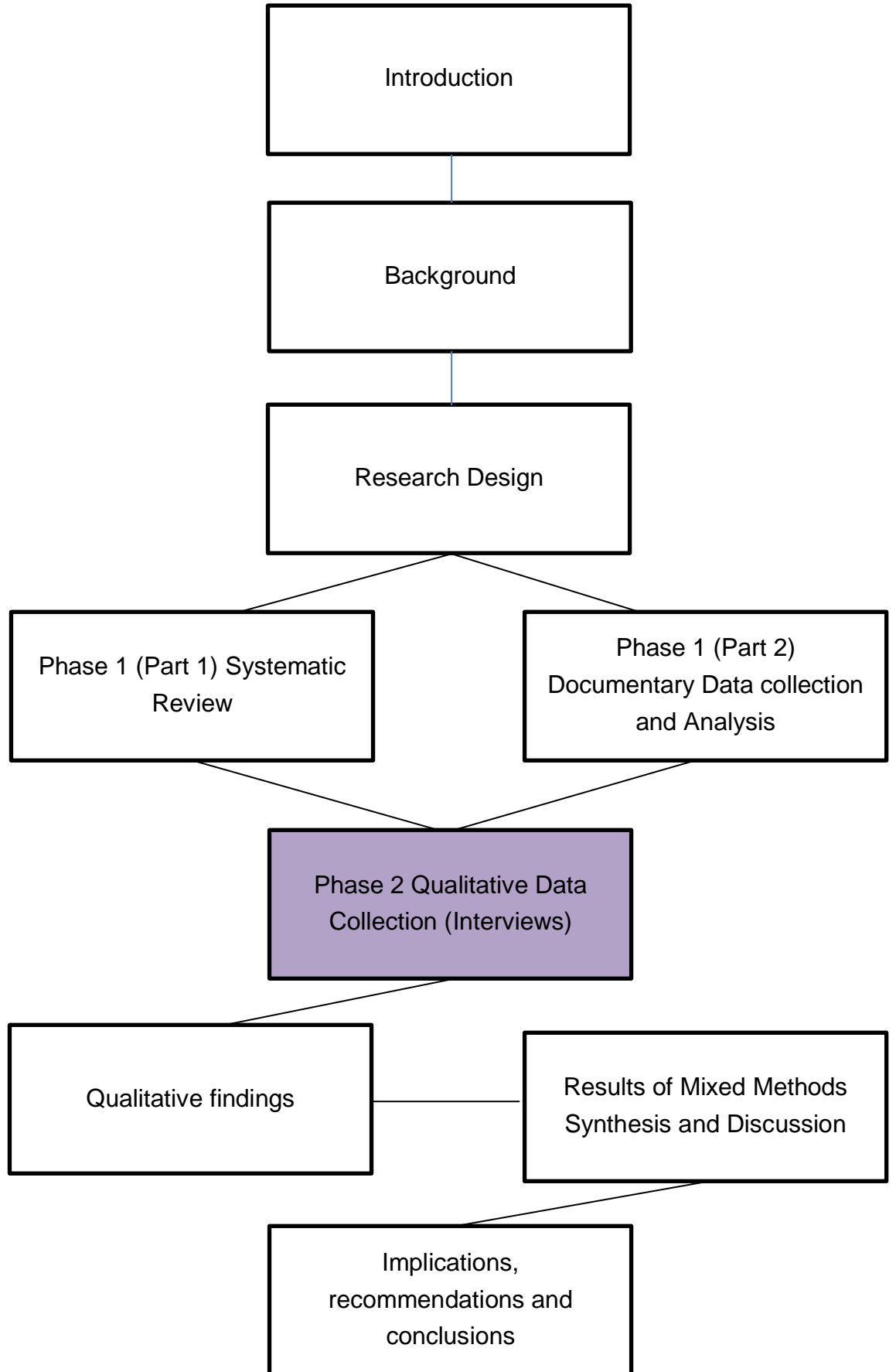


## 5.5 Summary of Chapter

Phase 1.2 of the study examined programmes which use simulation in order to train for rare/critical events through documentary analysis. Initial familiarisation with the documents highlighted gaps in data coverage and three programmes were subsequently observed in order to further explore the significance of the programme. Data was managed using a framework approach and analyses thematically using the data driven framework. Findings were categorised under the three typologies of underlying pedagogy (clinical need, training need and personal need), simulation (realism, safety, multi-professional working and feedback) and outcomes (knowledge, initial performance, long term performance and enjoyment).

The findings from this phase were synthesised with those borne out of the quantitative systematic review (phase 1.1). The evidence presents simulation as realistic and claims that it affords the opportunity to practise in a safe environment and translate this into improved patient care. Short term outcomes also suggest an improvement in knowledge and performance initially and questions remain as to how and when this diminishes. Qualitative dimensions assert that simulated training is enjoyable for participants and increases confidence although the evidence to support this is questionable.

What follows is an explanation of qualitative data collection procedures which builds upon phase 1 in answering the research questions.



## Chapter 6 - Phase 2 Qualitative Data Collection & Analysis

*'We carve out learning by leaving the disorderly parts out'*

*William James (1907)*

Phase 1 (Chapters 4 & 5) demonstrated the complex and multi-faceted nature of training for critical events using simulated approaches. Simulation has been developed to mirror reality and appears to be situated in the capacity to practise in a safe environment and translate this into improved patient care. Short term outcomes suggest an improvement in knowledge and performance initially and questions remain as to how and when this diminishes. Qualitative outcomes also suggest that simulated training is enjoyable for participants and increases confidence although the evidence to support this is questionable.

In order to add depth and detail to the emerging conceptual framework (figure 5.2) this chapter reports how qualitative interviews probed healthcare practitioner experiences of preparation for rare/critical events.

### 6.1 Methods

#### 6.1.1 Objectives

The purpose of phase two of the study was to:

- a. Add depth and detail to the emerging conceptual framework relating to simulation and applied to rare and critical events.
- b. Enhance understanding and explain preparation for rare, critical and emergency events through simulated practise.

To re-cap, the overall research questions were;

1. How do healthcare practitioners develop skills in order to prepare for and respond to rare, critical and emergency events during childbearing?
2. What are healthcare practitioners' experiences of simulated practise in order to respond to rare, critical and emergency events during childbearing?

### **6.1.2 Design**

The research questions were amenable to qualitative enquiry as this approach afforded the opportunity to explore the nuances, contexts and complexities of an issue in order to generate richness in our understanding (Mason and Dale, 2011).

Phase 2 consisted of;

- An audit of medical case notes relating to recent critical events in order to identify key and recurring themes and chronology of events to inform the interview schedule and shape the vignette.
- Face-to face semi structured interviews with doctors, midwives and support workers (n=25) with the presentation of a vignette in order to explore training, experiences, actions and judgements.

### **6.1.3 Setting**

The setting for qualitative data collection was a large regional NHS Trust. At the time of the study the site recorded approximately 11,000 births per year split between two clinical sites. In the same year there were 694,241 live births in England (Department of Health, 2013). As a teaching hospital with a developing clinical research environment, the site welcomed those undertaking research. As a tertiary unit; women, from a range of socio-demographic backgrounds, received midwifery-led care with those deemed to have high-risk pregnancies receiving consultant-led (Obstetric) specialised care. Due to the nature of the unit, critical events are more likely as women with complex care pathways are referred from within the region. Identified due to geographical proximity, there was also the potential that staff had been exposed to critical and emergency events during childbearing some of which may be considered to be rare.

### **6.1.4 Data Collection Instruments**

According to Lewis & McNaughton Nicholls (2014) decisions relating to data collection instruments flow from the research questions, context, structure and timing of the study. As the questions related to the development of skills for recognising and responding to RCEE and experiences of simulated practise, it was recognised that this data could be generated through verbal communication with healthcare practitioners.

The two key methods of obtaining verbal narratives, namely individual or group interviews (Lewis & McNaughton Nicholls (2104) were considered and decisions made on the relative merits of both. As reported by Green & Thorogood (2005) formal group

interviewing, or focus groups, hold the potential of generating data about participant interactions and perspectives, and also have the added advantage of producing high volumes of data in a short timeframe. Berg & Lune (2012) also argue that group interviews enable participants to share their views, listen, reflect and respond and this, in turn, generates data and insights. Pragmatically this would appear to be an obvious choice, however, as Bryman (2012) argues, data generated during group interviews can lack a depth and richness when compared with data borne out of individual interview.

Consideration was given to the potential of dominant voices within groups and to the local culture of the clinical site which, Green & Thorogood (2005) suggest, can limit the range of views expressed by participants. Flick (2009) also highlights a limitation in group interviews where the participants are known to each other as issues may not be fully elaborated. This could be due to the meaning of a subject area being the norm, and therefore taken for granted, or challenging and, therefore, not disclosed or discussed. The objective of this phase was to draw on individual motivation and experiences and the decision to undertake one-to-one interviews was borne out of a desire for participants to feel 'safe' to reveal their views and experiences. It was felt to be important that the potential of judgement or comment from others with whom participants may work should be avoided.

Having chosen individual over group interviewing the variations in type of individual interviews were considered. In their discussion of forms and features of interviews Yeo et al (2014) argue a preference for face-to-face over telephone contact and assert that this provides a stronger basis for the establishment of rapport with participants. Irvine et al (2012) counter this with a more nuanced view that one mode of qualitative interview is not superior over the other; thus telephone and internet mediated data collection hold benefits where access to participants is limited, due to geographical proximity for example. When initial contact was made with potential participants the choice regarding mode of interview (face-to-face or telephone) was offered and all participants opted for a face-to-face contact.

The interview design balanced the structure with flexibility as recommended by Yeo et al (2014) Structure was required as there were key topics and issues arising out of phase 1 which required exploration and sufficient flexibility was needed in order to enable participants to shape the conversation and for their responses to be explored further. Green & Thorogood (2005) recommend a semi-structured approach to interview as this allows the agenda to be set whilst participants responses determine the data generated. What follows are specific details of the data collection instruments used during this qualitative phase.

#### **6.1.4.1 Case Note Audit and Vignette Development**

Data from clinical case notes relating to critical/emergency events were reviewed in order to identify key issues relating to an event. These informed the semi-structured interview by the formation of a clinical vignette. Case notes relating to past events were purposively sampled through initial access to the birth register within one of the clinical sites. Critical incidents were identified from the past 5 years (2009 to 2014) as the impact of contemporary simulated training practises were of interest.

From 25,000 deliveries there were 9 cases identified where women required high dependency care within the delivery suite environment or were transferred to an intensive care facility (approximately 0.04%) and 2 maternal deaths (0.01%). Medical notes for 10 of these cases were available when requested and retrieved. The Intensive Care National Audit and Research Centre (ICNARC, 2011) report critical care admissions of pregnant (or recently pregnant) women as 2.4 per 1000 maternity cases (0.24%) and the rate of maternal death is reported by Knight et al (2015) as 9.02 per 100,000 maternities (0.009%). This highlights an apparent lack of congruence between the cases identified within the clinical site and the national picture. This could be explained by the rates provided by ICNARC (2011) and Knight et al (2015) being based upon surveillance over a two year period and cases from the clinical site being reviewed over a 5 year period. The clinical site was also a large, regional centre where the majority of the care provided to 'sick' women was provided in the delivery suite environment. Transfer to the intensive care facility was not commonplace.

#### **6.1.4.2 A note on vignettes**

A vignette was developed for use within the qualitative interviews. The central tenet of a vignette is that they are short stories or scenarios as supported by Finch (1987), Hill (1997) and Hughes (1998). Renold (2002) suggests that they are produced in written or pictorial form. As supported by Barter & Renold (1999), vignettes allow the exploration of actions in context and the clarification of people's judgements. Furthermore, Morgan (2007) proposes that this abductive reasoning approach allows for the translation of observations into theory and then measuring those theories through action.

Renold (2002) goes on to suggest that vignettes can be used as a less threatening way to explore sensitive subjects due to their hypothetical stance. Similarly, Poulou (2001) identifies the singular universal feature of vignettes as describing fictitious situations. Renold (2002) argues that, whilst retaining anonymity, vignettes should be derived from real situations in order that they are conceivable to participants. In addition, Stacey et al (2014) highlights the broad use of vignettes within education and health service research and argues that the central principle lies in participant responses closely

resembling actual behaviour in the clinical setting. Earlier, Barter & Renold (1999) identified this as a methodological limitation to using vignettes; the challenge being in drawing a parallel between what participants say they do and what they actually do in the clinical setting. The use of vignettes in qualitative interviewing can also be problematic when participants may not be able to identify with the scenario being presented or may recall similarities in personal experiences which may be difficult for them (Arthur et al 2014). Renold (2002) proposes that vignettes be used as a tool for eliciting meaning and interpretations used by participants in identifying their actions and possible outcomes of the scenario and this was the intended use of the vignette for this phase of the study.

For this study, clinical notes relating to real life critical events during childbearing were reviewed and the key characteristics of each event were noted. These related to obstetric history, symptoms on admission, clinical observations and the progress of a condition. The final vignette was an amalgamation of this data; evolved with a view to capturing a detailed, in-depth picture of participants interpretation of the scenario and the meaning associated with preparedness for critical and emergency events during childbearing based on their simulated education and training (see Appendix 11).

The final vignette was reviewed by the supervisory team to assess its believability. Reassurance was given that the clinical scenario was likely and believable.

#### **6.1.4.3 Interview Topic Guide**

The interview topic guide (Appendix 12) was designed to address the research questions presented in Chapter 3 (Research Design) and developed from the findings and unanswered questions from phase 1. In order to address the research question - *what are healthcare practitioners' experiences of simulated practice in order to respond to RCEE during childbearing?*, introductory questions focussed on the types of simulated training experienced and participants views on these. The plethora of literature extolling the virtues of simulation positions one of the key characteristics as closely resembling the clinical setting. Although not explicitly stated in the curricula documents, the introduction to programmes also positioned the key focus of simulation as mirroring reality and this was included within the typology of simulation developed in chapter 5 (see 5.2.2). Formally defined, fidelity relates to the degree of exactness with which something is reproduced and realism relates to the way in which it is true to life (Dictionary.com 2015). One could argue about the subtle nuances within these definitions, suggesting that they are one in the same as the terms are used synonymously. For this study, participants were asked about fidelity in relation to the products available to facilitate simulation e.g. mannequins and also about the realism

of the simulation in terms of its believability and authenticity. Making this subtle distinction, participant perspectives on the importance of the two was explored.

In order to address the question of 'How do healthcare practitioners develop skills in order to prepare for and respond to RCEE?' participants were prompted to consider how individuals develop skills, how these may (or may not) diminish over time and what they attributed this to. Specific questions related to how often, in an ideal situation, simulated training should be repeated.

#### **6.1.5 Reflections from Pilot Interview**

A pilot interview was conducted with one voluntary participant who was a healthcare professional with a background in responding to critical events. Information and consent procedures were completed and the audio-recorded interview lasted approximately one hour. The purpose of the pilot interview was to assess its logic, the efficacy of the vignette, overall style, scope and sequencing of questions and to reflect on personal interview style. This approach is recommended by several authors (Wengraf 2004, Kvale & Brinkmann 2009, Denzin & Lincoln 2013) prior to formal data collection as a means to develop interviewer skills as well as enhance the instrument.

As the participant was aware that this interview was a pilot, following the interview they were asked to reflect upon the process. Positive responses suggested that the questions were appropriate and non-threatening, sufficient time was afforded for answers and these were drawn upon in further developing the question. Areas for development included re-grouping the questions within the interview topic guide as it was apparent that the structure resulted in the need to refer back to the paper copy on a number of occasions thus hindering the flow of the conversation.

When listening to the recording there was an informal assessment of the subtleties; key elements from background reading and findings from phase 1 of the study were coming to mind and responses appeared to be lending weight to this. The vignette appeared to be helpful in moving discussion forward and allowing the participant to reflect on personal responses to critical events in a meaningful way. The timing of the vignette appeared appropriate. Vignettes have been identified as useful icebreakers for interviews and Hazel (1995) noted their utility in facilitating initial discussion with young people. Rahman (1996) explored caregivers' sensitivity to conflict and used the



vignette later in the interview as a means to broaden the focus and this was the approach adopted within the interview. It was noted that the recording should be paused when the vignette is presented in order to allow participants time to read. This was a judgement in order to make to participant comfortable and unhurried in their reading balanced against the potential of missing any utterances whilst reading.

Overall, aside from re-structuring of the topic guide, the structure, style, and scope of the semi-structured approach appeared appropriate in garnering meaningful responses in order to answer the research questions.

## **6.1.6 Interview Sample Size and Recruitment**

### **6.1.6.1 Eligibility**

All staff involved in delivering care to childbearing women within the delivery suite were eligible to be included as they were deemed as providing direct care to childbearing women.

### **6.1.6.2 Participant Information**

The invitation to take part in the study was sent electronically to all staff via the Head of Midwifery and Clinical Director. The rationale being both pragmatic, as they had group email contact for all relevant staff, and to afford individuals the opportunity to read about the study and decide whether they wanted to be involved without coercion. This is an important ethical principle as discussed by Wengraf (2004).

### **6.1.6.3 Sample Size**

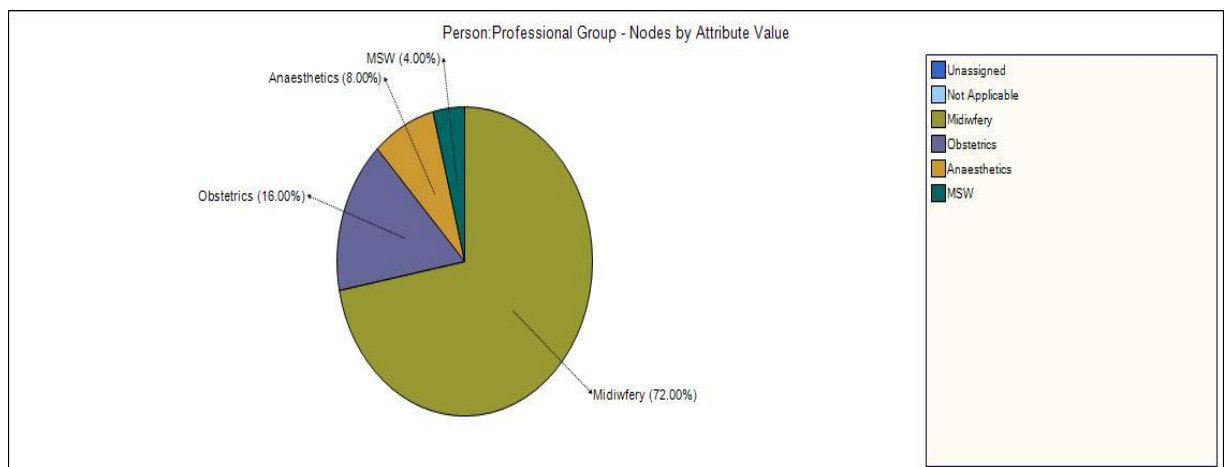
The adequacy of the sample relates to the quality of information collected, the population and the intended use of the data and there is much ambiguity, within qualitative inquiry, as to the adequacy of number needed to fully explore a topic (Flick 2009). Bowling (2009) proposes purposive approaches to sampling when a particular group of people or setting is the focus within a particular design.

The professional demographics of the site's delivery suite environment is approximately 70% midwifery, 20% medical (obstetric and anaesthetic) and 10% support workers (verbal communication from Delivery Suite Manager). The study required that the sample should closely represent these professional characteristics;

recognising that this is not necessarily representative (empirically or theoretically) of the wider population, as suggested by Mason & Dale (2011). Maximum variation sampling (a form of purposive sampling) of midwives and medical staff involved in critical cases was used to represent diversity in the sample cases. Creswell (2007) reports that this increases the likelihood that the findings will reflect the range of perspectives and differences amongst the participants

The sample size was a pragmatic approach arrived at when informational redundancy was balanced against the amount generated and the analytical task posed. Many authors agree that sampling until theory-saturation is reached i.e. continuing until an adequate idea and explanation of what is going on emerges, is a common practice in qualitative inquiry (Miles & Huberman 1994, Creswell 2007, O'Leary 2007, Bowling 2009, Mason & Dale 2011). Moreover, Mason (2011) asserts that pre-determined sample sizes cannot always be achieved as the point is often reached when the data ceases to reveal any new information, concepts or ideas.

Sample characteristics, in terms of professional group, are highlighted in Figure 6.1 and these are representative of the particular clinical area. Additional characteristics relating to the sample are reported with findings in Chapter 7.



**Figure 6-1 Professional Group of Interview Sample**

### 6.1.7 Data Management

Following initial introduction and information giving, consent was obtained. Interviews lasted approximately 1 hour (range 25 minutes to 2 hours). Following the interview participants were given a copy of the consent form and there was opportunity for questions relating to the study. All interviews were digitally recorded and transcribed by the researcher. This meant that there was engagement with the data from an early stage which allows the researcher to become close to the data (Charmaz 1995). The transcription was reviewed by a supervisor for quality assurance (Appendix 16).

Reflections relating to this process will be included within Chapter 8. The qualitative data was managed using a combination of NVivo and Excel software.

## **6.2 Data Analysis**

When analysing the qualitative interview data, attribution theory was chosen as scaffolding to align the way in which people attributed learning through simulation and preparedness for rare/critical events. Using an attribution lens, initial coding related to the broad principles of locus and stability where data was considered as referring to internal and external characteristics (personal/individual). Broadly these related to what was being said about the utility of simulation or individual 'preparedness' for critical events during childbearing. Once locus was assigned elements of stability were considered. In order to highlight the cognitive stages of data analysis an explanation of attribution theory and how it was adopted is given here:

### **6.2.1 Attribution Theory**

Originating in the discipline of social psychology attribution theory is concerned with individual explanatory inferences regarding the causes of events. The principle of mastery was a familiar motivational construct within the discipline (White 1959) where causal explorations into 'why' an event occurred (e.g. why a team might be experiencing sustained losses) were commonly considered.

Early analysis by Heider (1958 – cited by Gundlack et al 2003), in their work looking into the psychology of interpersonal relations, identified internal and external factors which individuals attributed to the causation of an event. Individual internal factors were attributed as being responsible for an event whereas external factors were attributed to an outside force or agent.

This theory was further developed by Weiner et al (1971) who, accepting the locus of causality, added a stability dimension. This synthesised theory postulated that performance can be interpreted as resulting from properties relating to locus (internal/external) and stability (stable/unstable). Weiner argued that within both internal and external causes some are relatively constant (e.g. ability/aptitude (I) task difficulty (E)) whilst others are open to fluctuation (e.g. mood/effort (I) luck (E)) and are, therefore, unstable. Weiner focussed this theory on achievement and highlighted the myriad of causal explanations possible within any activity; the most dominant of which being ability and effort (Weiner 1985). Conversely Weiner found the dominant causality of failure to be low ability and the absence of trying.

Rosenbaum (1972) argued that causal attributions such as effort can be controlled by the individual whereas attributes such as ill health are uncontrollable. A control dimension was, therefore, integrated within the theory (Table 6.1). Harvey & Martinko (2007) also argue the importance of recognising that attributions may not reflect reality. Illustration is given through the example of failure of a task which may be perceived as an internal result of own actions or erroneously blamed on the actions of others.

Attribution theory has been applied in a practical context. Dejoy (1994) advanced the theory and offered the example of reporting and investigating accidents as a process of making internal (e.g. unsafe behaviour) or external (e.g. unsafe conditions) attributions to the cause. Weick (1995) went on to describe internal (dispositional) and external (situational) attributions as the silent hands that guide sense making.

For illustration, an example (given in table 6.1 under the dimension of stability) relates to the field of anaesthesia. As an internal dimension the anaesthetist may believe that their skills in administering epidural anaesthesia to be developed and stable. Conversely other members of the multi-disciplinary team (external) could view their skills as lacking or haphazard (unstable) dependent on the complexity of the case (uncontrollable). The anaesthetists could put his tiredness down to the busyness of the environment (external, unstable and uncontrollable), or down to ill-health (internal, unstable and uncontrollable). If ill-health were indeed the culprit then this is controllable as there is a personal choice, and a professional responsibility, not to be at work if unwell. Thus there is an evident ambiguity in attributions dependent on personal (both internal and external) perceptions.

**Table 6-1 Dimensions for Attributions**

<b>Dimension</b>	<b>Definition</b>	<b>Example</b>
Cause	Causal relationships attributed to internal or external factors (Heider 1958)	The midwife did not feel competent in administering epidural analgesia (Internal) and the woman was unfortunate (external) that the anaesthetist was in theatre.
Control	The degree to which an individual can control the causality (Rosenbaum 1972)	The anaesthetist could administer analgesia (Control) but the delivery suite was busy and s/he was needed in theatre (Uncontrollable)
Stability	Internal and external attributes can fluctuate or remain relatively constant (Weiner 1971)	The anaesthetist had the necessary skills (Stable) but was too tired to focus on administering an epidural (Unstable)

Hewstone (1989) reported a number of sources of potential bias regarding attributions of causality including; the information individuals use to attribute cause (information bias) a person's situated position (observer bias) internal and external attributions (disposition bias) group processes (normative bias) and motives which influence behaviours (motivational bias). Kelley (1967) also highlighted ambiguity in attributions; arguing that, in attempting to discover causes of behaviour, individuals 'act like scientists' taking information from multiple sources perceiving a covariance of effect and its causes. Kelley argues that individuals may not have sufficient information to make causal attributes and will look at either of the following;

- a) Multiple necessary causes e.g. performance being based upon level of knowledge, deliberate practise and high motivation – all of which must be attained.
- b) Multiple sufficient causes e.g. performance based upon cheating, luck or unfair assessment – any of these reasons could be sufficient

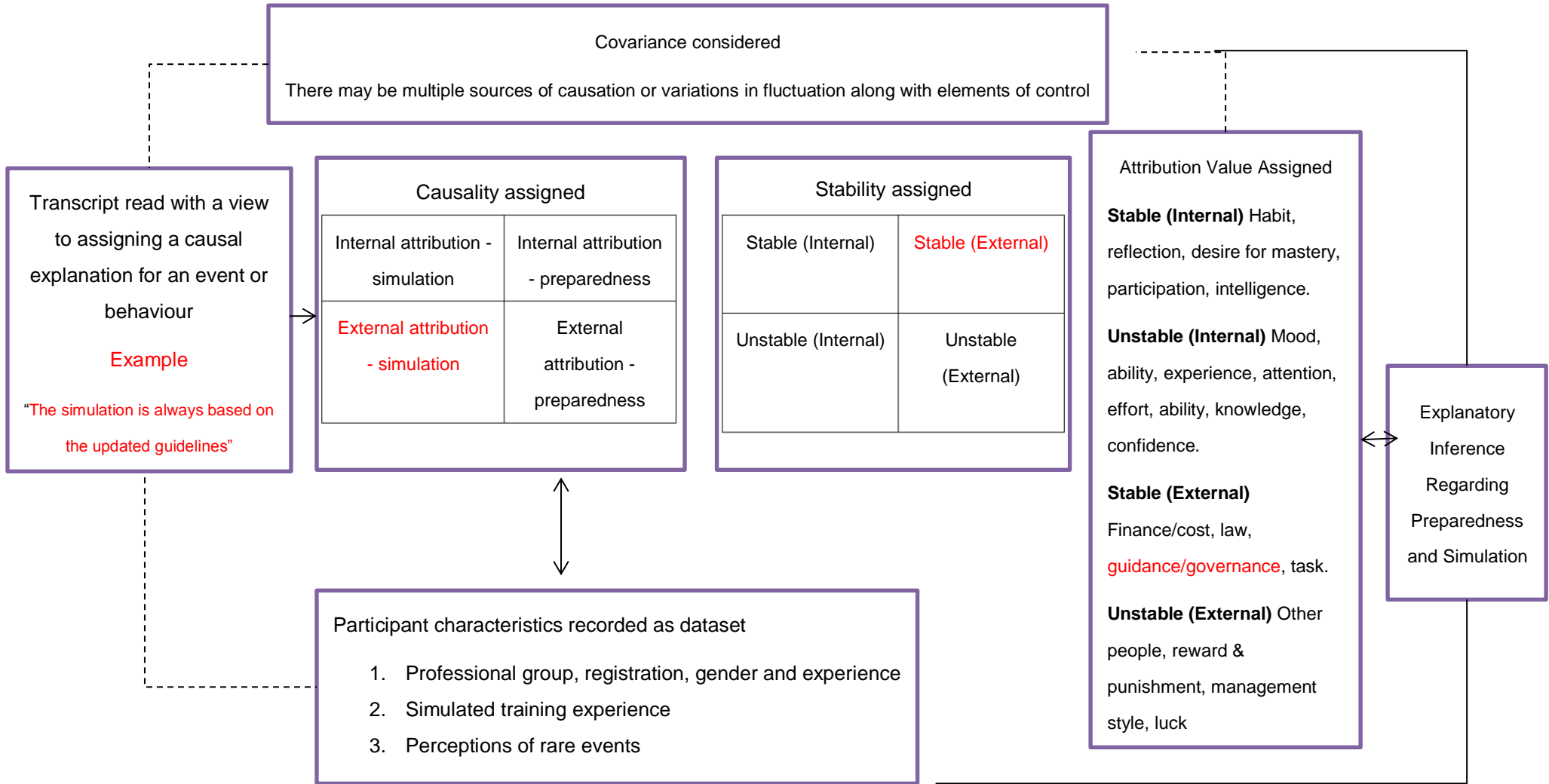
Kelley et al (2013) later extend Heiders theory to include non-human factors such as organisation, management styles or information systems as dimensions within stability.

There are examples of attribution theory being applied and maturing within organisation and management literature (Martinko 1995 & 2004) and to achievement behaviour in educational setting (Weary et al 1989). Within healthcare attribution theory has tended to be applied to studies reporting health related functioning such as smoking cessation (Harackiewicz et al 1987) and, more recently, to acceptance of clinical guidelines (Borowski & Allen 2010 and Morrow et al 2011). Meurier (1998) considered causal attributions made by nurses following an error. When rating their attribution to errors with differing severity of outcome the study found more internality amongst those involved in a serious error however all nurses perceived the cause of the error as internal, controllable and unstable. The studies failed to report limitations in applying the theory or potential blurring of attributions i.e. where attributions could be considered both internal and external, stable or unstable.

Palmieri & Peterson (2009) suggests that attribution theory has been overlooked in its ability to offer an important theoretical framework for causal relationships within healthcare. Within management theory Martinko & Gardner (1987) explored manager responses to adverse events and identified superficial inquiry of assumed patterns of behaviour driven by time constraints; and found human error to be guided by flawed processes and this was associated with people rather than organisational systems. Similarly Reason (1997) identified a culture of individual blame (the person) as a common causal attribution for error rather than an examination of a range of possible system and environmental explanations. There is an obvious parallel within healthcare, in terms of the culture of individual blame, yet there are limited applications to support a theoretically grounded explanation of responsiveness to critical events.

Figure 6.2 highlights the cognitive process of data analysis along with examples of the language used in assigning attributes.

Figure 6-2 Cognitive Stages of Data Analysis



### 6.2.2 Development of attribute coding

Ostensibly, this was an iterative process with two dimensions; 1, what was the data saying? 2, looking through the attribution lens what did the data relate to? As depicted in figure 6.2 the transcript was read with a view to assigning an initial causal explanation for an event or behavior prior to assigning dimensions of causality (internal/external) and stability (stable and unstable) and this culminated in an assigned attribution value e.g. simulation is based on guideline (causal explanation) which is produced through governance procedures (external and stable). Thus attribution theory was used to organise the data prior to thematic analysis.

As the interview recordings were transcribed by the researcher there was a familiarity with and an appreciation of the data as a whole. Frost & Stablein (1992) attest to the value of the researcher carrying out the transcription as helping to build a knowledge of the data; a process which they refer to 'handling your own rat'. The transcripts were verbatim in order to decrease the likelihood of misinterpretation during analysis, as suggested by Kvale & Brinkmann (2009) who add that decisions are required which weigh up capturing participant accounts versus the depth required. Bazeley (2008) adds that the goal of transcription is to be true to the conversation balanced pragmatically with dealing with the data.

Bazeley (2008) recommends considering the context of the whole document by reading it thoroughly prior to coding. Initial thoughts about what the transcript was revealing were made in the reflective journal and discussed with the supervision team. It was concluded that individuals were highlighting their motivations for and approaches to personal development and preparation. Attribution theory was, therefore, a scaffolding to align the way in which people attribute learning through simulation and preparedness for rare/critical events.

The transcripts were re-read and annotated by hand initially in order to capture thoughts on the data which later helped in developing the thematic coding alongside the literature on attribution theory. This approach is advocated as allowing the researcher to note their 'hunches' for further investigation (Miles & Huberman 1994 & Bazeley 2008).

Nvivo10 software was used for data management for pragmatic reasons. It was found to be intuitive to use with visual appeal, there was access to training and it holds the capacity for re-coding of data. Codes within this software are given the name 'nodes'. Parent nodes were coded deductively (which is a way of linking data to ideas and from ideas back to data discussed by Richards & Morse (2007)) giving four groupings. The



broad principles of *locus* and *stability* were considered leading to combinations of internal/external and stable/unstable. These four are each approached in terms of preparedness and simulation, giving a total of eight groupings which are called 'themes'. Within each of the eight groupings there are several further nodes which are considered 'sub-themes'. The process of assigning distinct attribute definitions (sub themes) to these broad characteristics (themes) was iterative in nature. Illustrative examples of dominant attributes were obtained from literature relating to theories, research and applications of attribution theory (Heider 1958, Weiner et al 1971, Weiner 1985, Weary 1989, Zelen 1988, Dejoy 1994, Weiner 1995, Palmieri & Peterson 2009) in order to ensure consistency in language.

In the initial stages of analysis new nodes were prolific (n=44) within the transcripts. Bazeley (2008) identifies this as a common feature and recommends re-categorizing those nodes which appear in only a few of the transcripts; questioning why there is an interest in a particular node and advocating no more than 10 parent nodes with 2 to 3 layers (sub-themes).

The initial coding was reviewed and it was evident that there were items which were evident in only one or two documents and would not advance understanding of the topic; an example being elements related to 'luck' which, whilst being an attribution appeared to be related to the outcome of care. There were five further interactions with the data where codes were expanded and/or changed. Coffey & Atkinson (1996) reiterates that codes are personally created organising tools which develop through this repetitive interaction.

The coding was then reviewed by an independent researcher who was experienced with the software and it's utility. Feedback confirmed a high level of agreement that the themes and sub-themes largely 'hung together'. There was discussion where themes which had been coded as stable could be considered unstable, and vice versa. There was also discussion around those themes where variation existed as to whether stable or unstable. Just as there was some blurring between stable and unstable, there is also blurring between internal and external. The complexities of this will be discussed later in the chapter. An illustrative example of the peer debriefing is given in Appendix 17 and a diagram of how the analysis developed is given in Appendix 18..

### **6.2.3 Final Coding Set**

There came a point in the analytical process where analytical saturation, in terms of the ability to both identify new codes and delineate between those already generated, was

reached. Bazeley (2008) identifies with this concept and suggests that this is the time to review a coding strategy and, in order for the process to remain open and flexible, consider other activities which can re-focus thinking. Field notes at the time (Appendix 19) highlighted the tendency to engage with the software and not with the data. Following a period of reflection and re-visiting the data borne out of phase 1, the initial transcripts were re-read and coding was revisited with fresh eyes and a re-focussed sense of the research objectives. A final coding set was generated (Table 6.2).

For clarity the codes are displayed separately and, where it proved difficult to segment the data, sub categories of sub themes are highlighted (in brackets). This highlights where categories within the data, whilst not commonly referred to, are helpful in illuminating the attributions within the text. Where there is blurring between coded themes these will be discussed when interpreting the data. An example of a coded transcript is included within Appendix 20.

What follows is a clarification of how the code was developed with an interrogation of the assigned data in order to generate meaning. Coffey & Atkinson (1996) advise that codes and data be presented together and assert this as a key element of the analytical process.

Table 6-2 Final Coding Set

Theme – Preparedness for rare, critical and emergency events			
Causal Attribution (Parent node)	Stability	Sub-theme	Illustrative Example (from the data)
External Attribution	Stable	<ol style="list-style-type: none"> <li>1. Experience and Expertise</li> <li>2. Guidelines</li> <li>3. Knowing the team</li> </ol>	<ol style="list-style-type: none"> <li>1. Dependent on clinical exposure and reduction in experience linked to changes in the working environment.</li> <li>2. Lessons learned from risk management and externally driven guidelines. External as the training needs to mirror the guidelines. Perceptions that training, especially use of algorithms and checklists, aids in keeping up to date.</li> <li>3. Preparedness associated with individuals within a team.</li> </ol>
	Unstable	<ol style="list-style-type: none"> <li>1. The Environment (encompasses competing priorities and familiarity with the environment)</li> <li>2. Timing (encompasses frequency of events and training (frequency and recency))</li> </ol>	<ol style="list-style-type: none"> <li>1. The need to update competes with working hours, pace of work and changing clinical roles. Knowing the physical environment is associated with preparedness.</li> <li>2. Perceived frequency of critical events and amount of exposure associated with preparation along with the recency of training and how often this is repeated.</li> </ol>
Internal Attribution	Stable	<ol style="list-style-type: none"> <li>1. Debriefing and Reflection</li> <li>2. Reliance on Self</li> </ol>	<ol style="list-style-type: none"> <li>1. Both following a critical incidence and following training. Approaches to personal reflection and recognising limitations.</li> <li>2. Understanding professional responsibility. Overcoming anxiety/fear.</li> </ol>
	Unstable	<ol style="list-style-type: none"> <li>1. Anticipatory Action (encompasses reading and confidence in ability)</li> <li>2. Experience and Expertise (encompasses skill decay)</li> <li>3. Knowledge</li> <li>4. Reliance on Others</li> </ol>	<ol style="list-style-type: none"> <li>1. Predicting critical events and continuing professional development through reading. Confidence associated with experience in practice and the ability to ask for help.</li> <li>2. Amount of experience, exposure and recency of training linked to preparedness and also associated with skills decay.</li> <li>3. Initially coded as 'remembering' responses highlighted depth of knowledge associated with ability to draw on personal memories and on training.</li> <li>4. During critical events there are perceived skills deficiencies where responsibility is devolved to others and an expectation that somebody else will take that responsibility.</li> </ol>

<b>Theme – Simulation</b>			
<b>Causal Attribution (Parent node)</b>	<b>Stability</b>	<b>Sub-theme</b>	<b>Illustrative Example (from the data)</b>
External Attribution	Stable	1. Fidelity and Realism	1. The fidelity of the mannequin along with the realism of the environment and the task posed.
	Unstable	1. Multi-professional working  2. Repetition of simulation  3. Simulation Choreography	1. Focus on working together as a team and the importance of the team dynamics. 2. Practise through simulation useful when clinical exposure is limited. Paradoxically confidence is linked to exposure in clinical practice. 3. The point of the simulation (learning outcomes etc.) and facilitation.
Internal Attribution	Stable	1. Approach to Learning (encompasses learning style and preparation for training)  2. Not Causing Harm	1. Finding the right tool for personal style of learning, willingness to learn, motivation because of testing and learning by doing along with the usefulness of pre-training course materials and the motivation to engage with them. 2. Originally coded 'desire for mastery' responses went beyond this and related simulation to practise in a 'safe' environment which translates into safety in practice along with providing reassurance in own performance. Engagement motivated by the desire to provide safe and effective care and not causing harm.
	Unstable	1. Application to Practice (encompasses feedback, making mistakes and theory into practice) Originally coded 'theory practice gap' this needed delineating;  2. Confidence Gained  3. Performance Anxiety	1. Feedback relates to the delivery of feedback and focus on what could be improved; making mistakes relates to being 'allowed' to make mistakes and developing training based on mistakes made in practice; theory into practice relates to learning the algorithms needed, recognising events in practice because of simulation and the intended learning outcomes of simulation. 2. Simulation increases confidence because of the practical element and perceived performance diminishes between training. 3. Perceptions of being watched, fear of making mistakes and ensuing judgements about personal expertise.

### 6.3 Reflection and Discussion

From phase 1 of the study there were many questions which provided a script, or topic list) for the qualitative interviews. A semi structured approach was appropriate as the purpose of the interview was to allow freedom and time for participant responses to develop and unfold. Kvale & Brinkmann (2009) suggest that, in order to achieve this, the researcher should continually clarify the meanings within responses. It was noted, within the quality assurance of transcription, that the response 'that's interesting' was used on more than one occasion in response to the participant voice. This was an attempt to convey to the participant that there was genuine interest and active listening; skills which are described as vital during qualitative interviewing (Holloway 2005, Kvale & Brinkmann 2009 and Mason & Dale, 2011). It is recognised that there may have been an unintended consequence of this terminology, where participants may have been stifled in unfolding their responses if they did not perceive it to be 'interesting' due to lack of this feedback.

The vignette was also developed as a non-threatening tool to allow exploration of responses to critical events in context. The questions were focused on allowing participants to discuss their thought processes in terms of what they were drawing upon in relation to the critical event (training, knowledge, experience etc.) and it was not envisaged that this would be a test of the appropriateness of their actions. Despite this being reiterated to participants it was obvious that the introduction of the vignette stifled the interview process. Participant responses were focused on making a clinical diagnosis and identifying how they would act rather than illuminating their thought processes. Interviews appeared stilted following the introduction of the vignette and depth of responses were lacking. Following the interview, each of the three participants stated that they felt intimidated by the vignette and enquired as to whether they had responded correctly. Non-verbal cues also indicated a heightened anxiety amongst participants. This is an acknowledged limitation when using vignettes, as Renold (2002) recognises that participants can focus on action and not on drawing meanings and interpretations. The vignette was used within the first three interviews and, following discussion with supervisors, was removed from the data collection process.

Throughout the process of data analysis, completeness e.g. ensuring that every element of the transcript was assigned a code, was reflexively balanced against cluttering the transcript. A consideration which Bazeley (2008) refers to as a necessary part of the decision making process.

Throughout the process the relevance of the data was reviewed against the research questions. This focused the purposefulness of the analysis and attribution theory added

to the consistency of how codes developed in terms of causal attribution (internal/external) and stability. During the initial stages of data analysis it was apparent that the majority of engagement was with the software and not the data. This was, in part due to unfamiliarity with the software. Transcripts were printed and analysed as a paper exercise first before starting to code using NVivo. Bazeley (2008) recommends this early review of the data along with the use of notations relating to early thoughts.

Following a peer review of the coding, analysis was considered as becoming 'routine' and no new ideas were being generated. Richards & Morse (2007) advocate time away from the process at this point and recommend that the researcher constantly ask 'why am I doing this?' This pause in analysis was necessary in order to allow a refreshing and revival of the approach. Earlier, Kelly (1995) advocated the 'contemplation of our contemplations' in order to address the effects of the researcher on the research. Similarly, Freshwater (2005) urges the researcher to acknowledge their influence on the data collection and analysis.

A reflective journal indicated that, whilst attribution theory was proving useful in identifying elements of preparedness for rare events and experiences of simulation, data relating to what individuals considered to be a rare event was not included within the coding scheme. Tools for managing the data needed to be explored as I was interested in patterns within the data i.e. the relationship between professional group, experience and what was considered to be rare in the context of critical events. This was achieved through tabulating professional groups and experience (in years) against the range of critical events, during childbearing, which participants considered to be rare. These findings will be brought into the results section for context.

Attribution theory as a tool for structuring analysis was not without its limitations. The key issue being the variation between individuals as to whether an attribution could be considered as stable or unstable. Similarly, there was identified blurring between external and internal attributions; an example being the shift in preparedness for critical events dependant on clinical experience. Responses relating to feeling of preparedness were viewed, initially, as external (related to the exposure in clinical practice) and stable (related to number of years of experience). Experience (in years) can also be viewed as unstable as this may be dependent on where the experience has taken place, access to training & development etc. There were also internal attributions relating to experience and preparedness such as those with more experience feeling removed from the clinical environment. As discussed earlier (6.7.1) Kelley (1967) recognised this ambiguity within the theory and postulated a covariance of effect and causes, arguing that there are multiple necessary and multiple sufficient causal attributions to be considered by individuals. Recognising that blurring exists, the multiplicity of attributions will be critically evaluated when presenting the results (Chapter 7).

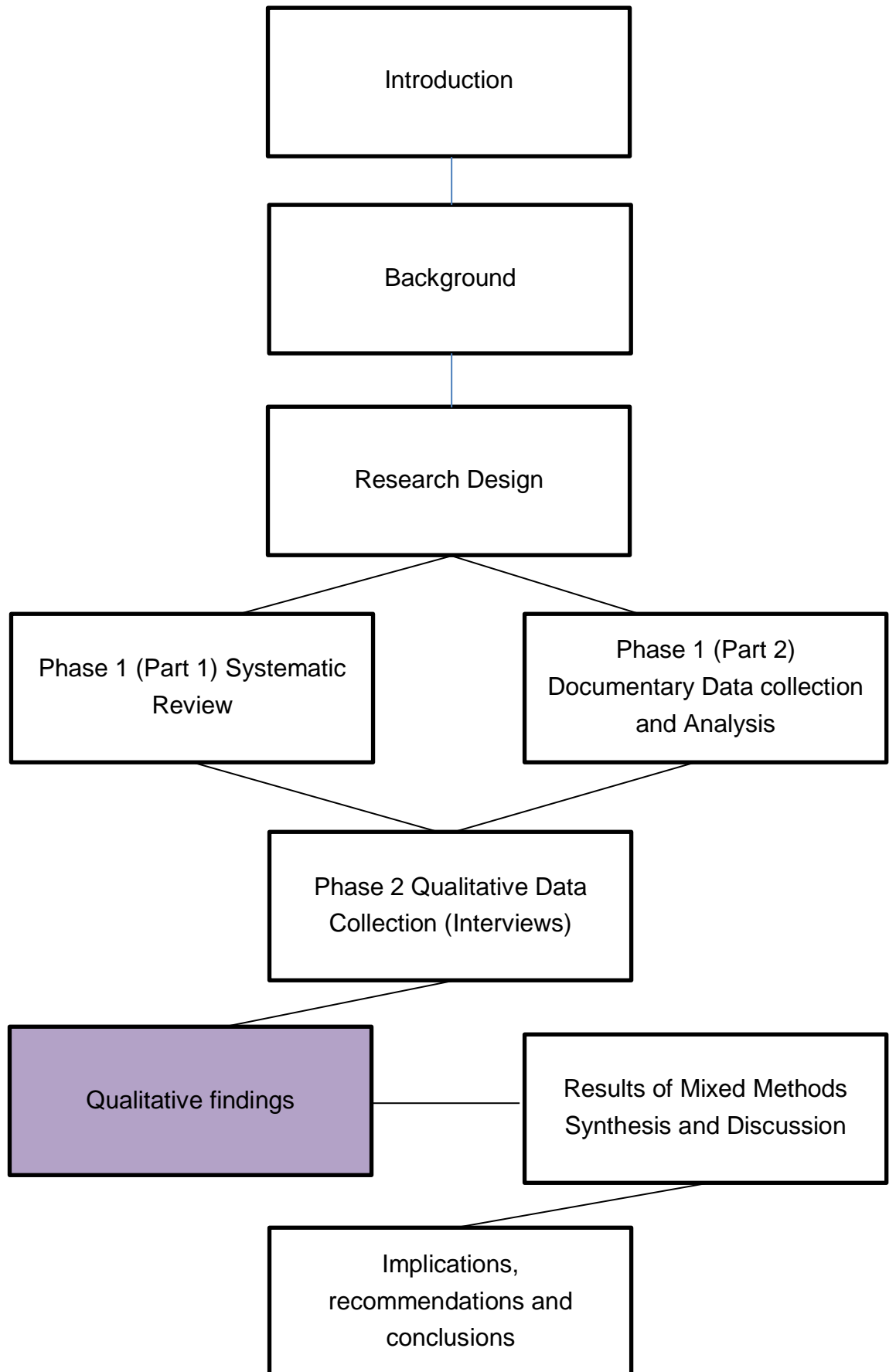
## 6.4 Summary of Chapter 6

This chapter explained the instruments and procedures adopted within phase 2 of the study. Semi-structured qualitative interviews were conducted with healthcare professionals (n=25) involved in the delivery of care to childbearing women within the delivery suite environment. The overall objective was to probe practitioner experiences of preparing for rare, critical and emergency events and to add to the emerging conceptual framework relating to simulation.

A clinical vignette was developed for use within the interview process; with a view to capturing a detailed picture of participants interpretations of their preparedness to respond to the scenario. After the first few interviews (n=3) this approach was reviewed as emerging data appeared very 'thin' with a lack in depth in participant assignment of meaning relating to the scenario. The vignette was not included within subsequent interviews.

Attribution theory was used as tool for structuring data analysis. Whilst this was an appropriate framework for assigning causal attributions there were identified complexities where analysis blurred. This will be illuminated within the examination of results.

The next chapter will illuminate the findings from qualitative interviews (phase 2) which helps in addressing the research problems. Themes will be identified, interpreted and quotes, from the transcripts, used as illustrative examples. The chapter ends with an overall summary of the findings.





## Chapter 7 Qualitative Findings

*'You don't get results by focusing on results. You get results by focusing on the actions that produce results'*

*Mike Hawkins (2009)*

The preceding chapter (6) explained the process of data analysis and highlighted the multi-faceted nature of professional preparation for rare/critical events. Using the lens of attribution theory and NVivo software to manage the process, a final structure of results (coding set – table 6.2 in chapter 6) was arrived at.

This chapter will illuminate the findings from qualitative interviews (phase 2) which shaped the attribution theory and helps to address the research problems relating to practitioner experiences of simulated practise in order to respond to RCEE. The chapter is divided into three sections.

For context, the chapter will begin with an explanation of findings in relation to the demographics of participants and an exploration of what healthcare practitioners consider being rare in the context of RCEE during childbearing. The second section reports participants' perspectives of simulation followed by perspectives on preparedness for RCEE. There will be a short discussion of findings at the end of each section and the chapter concludes with an overall summary and discussion before moving on to an overall mixed methods synthesis (Chapter 8).

### 7.1 Conventions used in presenting qualitative results.

Throughout this chapter findings are presented under the main headings of 'participant perspectives of simulation' and 'participant perspectives of preparedness for RCEE'. The chapter is presented in an embedded, rhetorical structure drawn from Czarniawska's (2004) approach whereby some participant responses are afforded more space than others to illuminate key points, but none are silenced. There was an on-going tally of quotations in order to ensure that all were included in illustrative examples drawn from themes. There were also relatively equal numbers of quotations used across the range of professional experience (in years, as shown in Appendix 21). The findings are summarised using themes and sub categories derived from data analysis as suggested by Smith et al (1995), giving exemplars (quotations) from the data. Some themes are metaphors, an approach described by Clandinin & Connelly (2000) e.g. simulation choreography for data which situates people, places and things within perspectives and attributions. Quotations are reported in order to bring the participant voice into the study as guided by Creswell (2007) and are presented in

speech marks and italic font. For transparency and anonymity each quotation is assigned a participant number along with an identification of professional group<sup>7</sup>. In order to ensure anonymity all names and identifying features have been removed. It is noted within brackets where identifying features have been removed from quotations. Where irrelevant words have been removed the notation '...' is given. The discussion will draw upon relevant literature where comparisons can be made with the findings of this study.

## 7.2 Participant characteristics

In Chapter 6 (see 6.1.6.3) it was shown that the sample characteristics, in terms of professional groups, closely represented the professional demographics of the clinical site. Table 7.1 reports the range of participants experience (in years) showing a relatively even spread. Of the 25 participants, 22 were female across professional groups and 3 were male doctors. There were four obstetricians, two anaesthetists, one maternity support worker (MSW) and from the eighteen participants from the midwifery profession, five were also Registered Nurses (who had subsequently undertaken a shortened midwifery programme) with the remaining thirteen being direct entrants.

**Table 7-1 Participant range of experience (in years)**

Range of Experience (in years)	Number of participants
1 to 4 years	6 (6 Mw)
5 to 9 years	4 (4Mw)
10 to 14 years	6 (3 Mw, 1 Msw, 1 Ob, 1 An)
15 to 19 years	5 (3 Mw, 1 Ob, 1An)
20 years and over	4 (2 Mw, 2 Ob)

None of the participants from medical professions had less than 10 years' experience. Participants were asked about their professional experience which included training, education and simulated approaches and to critical events. Midwifery spans a three year period (85 weeks for shortened programmes) medical training spans an initial period of 5 years. Due to the nature of the clinical environment, all medical professionals were at Registrar or Consultant level and, therefore, it was expected that their experiences would be in a range greater than 10 years.

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<sup>7</sup> Professional groups are presented as follows; Midwife = Mw, Obstetrician = Ob, Anaesthetist = An and Maternity Support Worker = Msw.

### 7.3 Participant Perspectives of Rare Events

As previously stated, rare critical events are, by their very nature difficult to engage in from a deliberate practise point of view. By definition rare, critical and emergency events (RCEE) do not occur very often (Rare), have the potential to become disastrous; are at a point of crisis (Critical) and are largely unexpected, often dangerous and require immediate action (Emergency) (Oxford English Dictionary, 2012). In order to explore how healthcare professionals prepare for events that are rare during childbearing the initial interview question probed individual perceptions of rarity in this context. The rationale was to further investigate whether approaches to preparation, including education/training programmes, were appropriate in the context of what is considered to be rare.

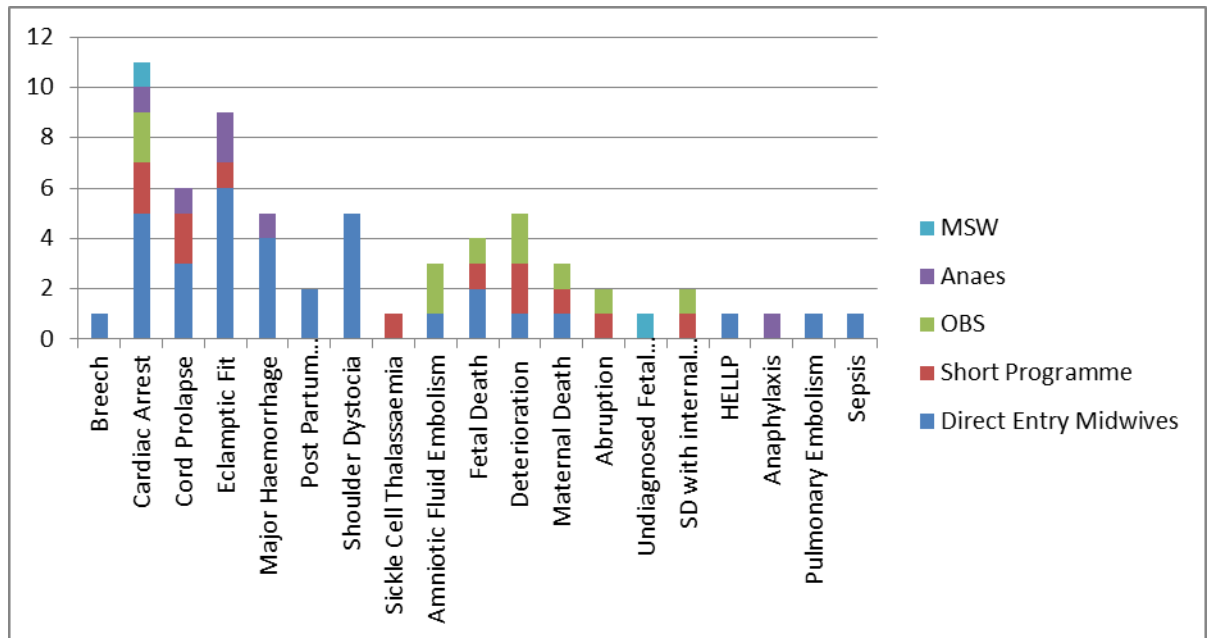
The findings are presented here in order to set the context of the ensuing qualitative comments only.

Table 7.2 presents the range of events which participants considered to be rare, critical and emergent during childbearing. It is noteworthy that only 11 participants considered cardiac arrest to be rare during childbearing when the most recent evidence from the Royal College of Anaesthetists (RCOA 2011) shows the rate of this event as rare at 0.02 per 1000 live births. When considering the number of maternal deaths attributed directly to cardiac disease MBACE (Knight et al, 2015) provides similar figures at 2.06 per 100,000 maternities.

**Table 7-2 Participant Perspectives of Rare Events**

	Experience	Breech	Cardiac Arrest	Cord Prolapse	Eclamptic Fit	Major Haemorrhage	Post Partum Haemorrhage	Shoulder Dystocia	Sickle Cell Thalassaemia	Fetal Death	Deterioration	Maternal Death	Abruptio	Undiagnosed Fetal Abnormality	SD with internal manoeuvres	HELLP	Anaphylaxis	Pulmonary Embolism	Sepsis
All Participants	1-5	1	2	2	3	1	2	4		1									
	5-10		2	1	1	1		1			1				1				
	10-15		4		2	1			1	1	1	1	1	1		1			
	15-20			2	2	2			2	1	1	2	1				1	1	1
	>20		3	1	1				1	1	2		1	1					
Totals	1	11	6	9	5	2	5	1	3	4	5	3	2	1	2	1	1	1	1
Total Participants = 25																			

Figure 7.1 shows the range of events considered to be rare by professionals groups. Cardiac arrest was identified by members of from each professional group and it can be noted that only anaesthetists included anaphylaxis in their responses. The RCOA (2011) suggests that anaphylactic shock accounts for 0.03 severe maternal morbidities per 1000 live births.



**Figure 7-1 Range of Rare Events by Professional Group**

Figure 7.2 shows the range of rare events by experience (in years). Here it can be noted that events such as maternal death, abruptio, should dystocia where internal maneuvers are required, pulmonary embolism and sepsis are considered as rare events by those with more than 10 years clinical experience. As seen (in Chapter 2) the rates of the majority of these events could be considered as occurring 'rarely' with the exception of embolism; which, whilst uncommon, remains a leading direct cause of maternal death with a rate of 1.01 per 100,000 maternities between 2009 and 2013 (Knight et al, 2015).

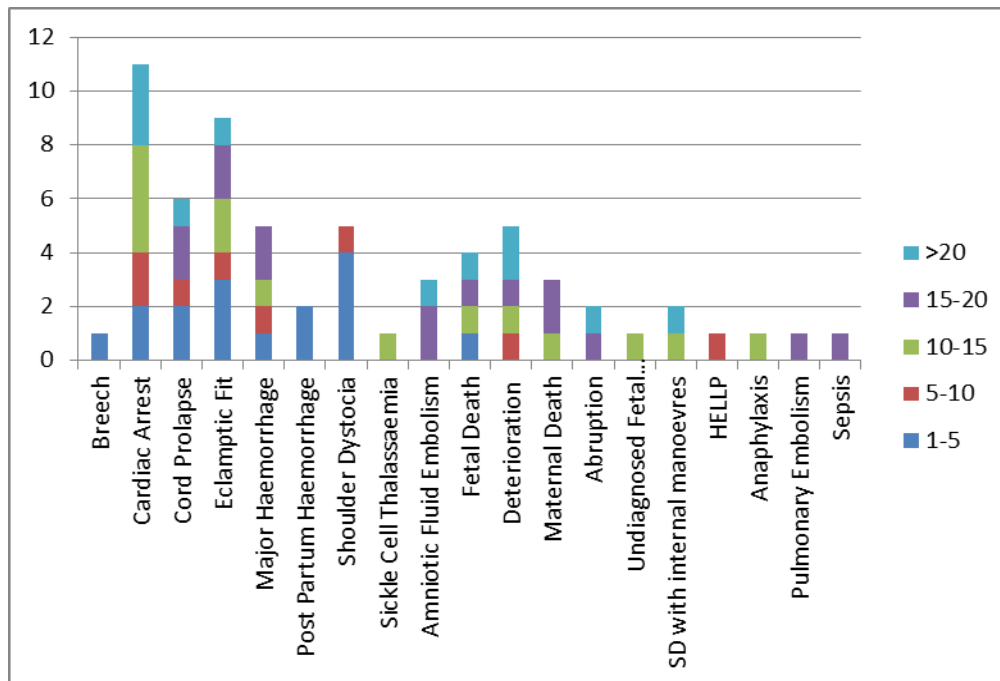


Figure 7-2 Rare Event by Experience (in years)

#### 7.4 Participant's Perspectives of Simulation

The analysis of participant views, described in chapter 6, illuminates the way in which attributional factors contributed towards and explained preparation for RCEE through simulated practise. Analysis suggests that there are elements of the design and delivery of simulated training which are deemed to be useful, such as feedback and responsive facilitation; and those which are less important, such as fidelity and realism. Individual motivations for engaging with simulated learning also demonstrates the importance of feedback, influence of personal learning style and the fear of causing harm to individuals as motivational forces. The most significant barrier to engaging with simulation is related to performance anxiety.

These interpretations are based on individual explanatory inferences which were deemed to be from an outside agent or force (external attribution) or related to self (internal attribution). Presented as either external or internal attributions analysis shows where some perspectives are given more emphasis than others and where alternative explanations compare and differ.

Study aims were achieved to the extent that findings enhance understanding and help to explain the ways in which simulated education and training helps or hinders preparation for RCEE.

## A Word on Attributions and Themes re Simulation

External attributions are those factors deemed to be from an outside force or agent in relation to simulated training/education. Overall, there were 4 emergent **themes** and 5 *sub-themes* within this domain: **Fidelity and Realism:** *fidelity of equipment* used in simulation, *realism of simulation* and *realism of task posed*: **Simulation Choreography:** *Intended outcomes of simulation* and *the facilitation of simulation*. **Multi-Professional Working: Repetition.**

Internal attributions relate to those factors which an individual perceives as relating to self. Overall, there were 5 emergent **themes** and 3 *sub-themes* within this domain: **Approach to Learning: Not causing Harm: Application to Practice;** *Feedback, Making Mistakes and Theory into Practice*: **Confidence Gained: Performance Anxiety.**

When discussing each theme the relative constancies (stability) or fluctuations (instability) will be identified.

### 7.4.1 Fidelity and Realism

This theme relates to fidelity (meaning the degree of exactness) of equipment used within simulation along with the realism (meaning true to life) of the simulation and the task they undertook. Fidelity and realism were considered to be external attributes. Overall, the theme gives a sense of the value placed on the ways in which simulation mimics reality and highlights both positive and negative attributes. Fidelity and realism were considered to be relatively stable; simulation scenarios developed over time and it could be argued that this is unstable; yet responses were deemed as identifying a relative consistency in approaches to simulation.

Participants were asked to think about the different types of products and equipment available to help with simulation and were prompted that some may appear very life like and others very basic. Questions asked them to consider their experiences and to identify the ways in which this mattered to them. Each participant's account of the **fidelity of equipment used in simulation** shifted the focus to mannequins.

Each arrived at a stable explanation of the way in which fidelity of the mannequin affected their experience. All participants identified similar perspectives on the feedback received from apparatus which allowed them to judge the impact of their actions '*For instance, stuff like doing the jaw thrusts, it just actually manipulating the jaws so*

*that you can see that the air's going into the chest, and the dolls that we've got are actually really good for that' (P1, Mw).*

When practitioners had seen the same responses as a result of their actions in the clinical setting, this enhanced the believability of the ways in which mannequins behaved. This was especially true for the cardiac (in adults) and respiratory (in babies) arrest scenarios where reassurance was gained from observing the chest rise, therefore indicating successful inflation of the lungs, along with successful chest compressions. *'the neonatal resuscitation it matters because, if when you are doing the sort of inflation breaths and things like that, the babies chest rises and it shows, and it helps you to know that actually, what you are doing is correct...and that's what happens with the dolls that we use''(P16, Mw).*

This is in contrast to the ways in which fidelity was perceived in relation to obstetric scenarios. Here, there was a shift in position to one in which fidelity was less important. These included scenarios related to breech, postpartum haemorrhage (PPH) and shoulder dystocia. This extensive quote gives the example of PPH and illustrates that high fidelity mannequins may not be the most appropriate choice for some scenarios. This appears to be dependent on what is trying to be achieved within the scenario i.e. estimating blood loss. *'We looked at some of the high fidelity ... at (name) they have got, I don't know what's she's called, the model that they've got, she doesn't look like a real woman any way, does she? She's very high tech and she speaks to you and you get feedback, but she still doesn't go pale when her blood pressure drops, and she doesn't look very real, she's a man really, isn't she? and there are some other complicated ones that produce, you know, has a reservoir where it can bleed better and, but it's very complicated to set up and what you need to do is get people looking at the blood loss and trying to estimate it, it doesn't really matter comes out of a cheaper version, you can see its coming out' (P9, Ob)*

There was a distinction made suggesting that, with increasing experience, practitioners would require equipment with greater fidelity. This was related to the need to understand basic principles (of anatomy and physiology) in the early stages of professional experience with applied scenarios with increasing experience: *' I suppose you know, for absolute beginners and if you want to buy a cheap mannequin or something on the labour ward, then it doesn't matter how realistic, it's just learning your land marks and going through the theory of it, but I think once people get more experience, then it is important to have much more realistic tools' (P17, Ob)*

What is particularly interesting is the way in which participants assigned terms such as 'doll' and 'dummy' to the mannequins. The majority of participants appear to trivialise the equipment in this way and this appeared to relate to the exactness with which the

products mirrored real life. Where these terms were assigned, by participants, this affected their ability to engage with the scenario *'I know this sounds silly, because you can't engage with a dummy' (P6, Mw)* *'your brain is telling you that this isn't real life you know, and actually it still doesn't help ... you know a rotten old dummy on the bed' (P11, Ob)*

Rather than engaging with the mannequin, due to the perceived realism, responses indicated a level of assurance that practitioners would react differently if confronted with the scenario in 'real life': *'when...you've got this dolly in front of you and you know it's not an emergency situation and you are having to think things through and I find that a struggle, where things I would do automatically on auto pilot I have to think about it more so, and I suppose it's that I don't like' (P12, Mw)*

Similarly, the perceived realism of the simulation scenario also affected how practitioners engaged and responded as they did not correlate the scenario with real life. The sub-theme of **realism of the simulation** relates to how participants reacted to simulation based on perceived reality. Note, where participants reflected on dynamic elements of the simulation e.g. difference in facilitators and how the scenarios were managed, responses were assigned to the theme of **simulation choreography**.

There were a number of different, yet related issues in terms of the believability and authenticity of the simulated environment. In the same way that unrealistic mannequins were deemed to influence the terminology of participants, the unrealistic nature of the simulation affected the responses of participants. When there was a sense that the scenario was unrelated to real life the most common response was to 'pretend' to carry out the task posed *'I must say on (name) I would sometimes pretend to cannulate, and the leader, and you know, whoever was leading the scenario would say No, you've actually got to put the cannula in and I'd say, something like, "Well obviously I would in real life you know". ...you know, you do things slightly differently don't you?(P24 Mw)*

Again, what is interesting is the perception that actions performed in the scenario would not occur in real life and the cognition that simulation is related to play. This appeared to diminish the value which practitioners placed on this training method: *'it's kidding, you know it's all its just, its playing here, you are playing a game and erm, and when it's real, its different, you know, you just you go automatically do what you are supposed to do' (P15, Msw)* In a minority of responses there were positive attributes assigned to simulation. These demonstrated the ability to relate what has been learned back to clinical practice: *'I think it's important to make it as true to the actual scenario as possible, obviously you can't practise it in the actual real field but erm, I think that's important because I think it just helps you to learn that way doesn't it... you can actually relate that back to your actual practise then' (P5, Mw)* and also the influence of stress within the simulation in preparing for RCEE: *"They do*



*kind of Sim-man® simulations there, and just kind of fire the vital signs at you and things like that. I think they're really useful because you do feel the panic that you would clinically' (P23, Mw)*

In contrast, there was perception that the simulated event was managed less well than the real-life emergency; where simulation was thought to be chaotic and disorganised: *'I feel that, from the incidents I've seen, I feel that we do pretty well with obstetric emergencies and critical events, and we are quite often succinct and do things in a fashion. Whereas on (name) sometimes it all gets a bit disarrayed and the thing that we do really well in real life is dealing with post-partum haemorrhages the things that are always do badly in (name) is a post-partum haemorrhage' (P10, Mw)*

Despite being identified as a positive element of simulation, what is unclear is how the realism of the environment influenced the overall experience or skill acquisition.

In addition to the realism of the simulation scenarios, the **realism of the task posed** appeared to contribute to engagement. Where the task was accepted by participants as being relevant to their role and sphere of practice, this was agreeable. When individuals were asked to perform in a role, or undertake a task, outside of their norm, this was unacceptable *'whereas sometimes, I am sort of referring to (name) now, that they withhold the Doctors so that the midwives have more to do, but that's not always reality they, in every case an anaesthetist would always appear to help you get that cannula in whereas in a simulation on (name) they are busy in theatre and they are expecting you, as a midwife, to do more than what you do in reality.'* (P2, Mw)

This theme shows that the fidelity of equipment used within simulation was found to be useful as a cue to successful actions. This was mainly in relation to cardiac/respiratory arrest; where there was an obstetric focus the simulation fidelity was less important. Participant accounts identified a notable limitation in ability to engage with mannequins due to the association with, what could be perceived as, play equipment. The relationship with play negatively influenced the value assigned to simulation; the task posed within simulation also needed to be authentic and relevant to individual roles. From the literature there appears to be no theory of fidelity in simulation. If higher fidelity equipment is not related to improved learning outcomes or viewed positively by those participating in simulation then questions arise about expensive investment in simulation modalities (discussed further in Chapter 9). The issues of realism of the simulation and of the scenario management, in particular the way in which simulation is designed and developed, are considered later in this chapter.

### 7.4.2 Simulation Choreography

The term 'simulation choreography' was assigned following peer review of the analysis where it was apparent that the way in which the simulation was designed and developed was seen to be multi-faceted. The original code 'scenario management' did not sufficiently capture elements relating to the scripting and staging of simulation as attributes appeared to relate to the intended outcomes of the simulation (the script) and to those tasked with facilitating the training (setting the stage). There were processes relating to the design, delivery and development of simulation which appeared to be under the radar and not obvious within the literature. This novel term was developed in order to encompass these processes and as a means of capturing the sequence of simulation.

Within this theme there are explanations for the ways in which the **intended outcomes of the simulation**, and its **facilitation**, impacted on experiences and these appeared to be changeable with each experience, therefore unstable; these two elements are considered sub-themes.

The way in which training is delivered is dependent on the **intended outcomes of simulation**. This is where a connection is made to the issue of realism of the scenario discussed earlier. If the intended outcomes related to clinical dexterity, then some degree of similitude is required; whereas, if teamwork, for example, is an intended focus then, arguably, elements of realism are less important "*my thing about simulation is that we don't have to strive, depending about what you are learning outcomes are, you don't have to strive for very similitude or similarity, it doesn't have to be just like real life*" (P11, Ob).

Furthermore, there were concerns about the amount of information delivered to participants over the course of the simulated training. This information was related to the number of outcomes required when a number of clinical scenarios were the focus of training. Information overload was recognised '*probably the amount of information that you need to take in and the amount of drills that we would do in one day, so we will cover shoulder dystocia, erm, we might do a fitting woman drill, a PPH drill, erm, and because you are trying to absorb all this information, and that sometimes difficult especially we only do it once a year... yeah it's a lot of information in one day*' (P4, mw)

What wasn't clear was how the intended outcomes for the practitioner (internal) differed from those of the programme (external) and the potential impact. This is an area for further exploration.

The attribution lens was useful in identifying where accounts showed the success, or failure, of simulation on externally driven forces which were beyond their influence. There were strong feelings that the success of simulation lay in the hands of a skilled facilitator. The **facilitation of simulation** was distinguished as important in terms of consistency in the scenario and in instructions given: *'they have been chosen because of what somebody else has seen in their ability but on how they have come across how they have explained things and more importantly, you know, the skills that they have ...I think the right trainer is important, the right people doing the training because often you know a scenario or situation is only as good as somebody has set it up and then you know, you respond to that'* (P8, Mw).

A key skill, demanded of the facilitator, was that of understanding the makeup of the group of participants; having an awareness of the individual needs of those attending and adapting accordingly. Where participants reflected on experiences of poor facilitation they were less confident and felt unsupported, the dangers of this having a negative and lasting impact were raised *'I think you need a very strong leader, or facilitator, for that session so that they can be aware of the slightly less confident person in that group. You know, be that the midwife, or the junior doctor or the health care who is doing it and actually make sure that people don't come out of it feeling even less confident than when they went in, because I think that can be dangerous'* (P17, Ob)

This was deemed important when those participating in the simulation may be unfamiliar with the environment: *'You know, if you've got say, a community midwife in the scenario, you kind of think, asking her to fetch something when she doesn't know delivery suite is probably really unhelpful because it would be much quicker for maybe to give her a job in a room and go and get it yourself, because you know exactly where'* (P23, Mw)

Arguably, this is a challenge for those leading the simulation as the facilitator may not have an awareness of the diverse experiences of those participating in the simulation: *'in the reality on labour ward if I was going to be directing a critical incident, I would delegate jobs to people who I knew had that capacity and that capability. Whereas on (name) because you're not with your colleagues that you work with all the time, you don't know their skills and capabilities, so I might say, "Oh (name) will you draw that up", and she'd go, "Oh I don't do that, I don't", you know so its'...you know I think that takes away from the learning sometimes, and you know when you do it as a mixed group with people that you are unfamiliar with, I think'* (P24, Mw) Here is a connection with the theme of 'preparation for training' to be discussed later in the chapter.

The way in which the facilitator responded to participants and gave feedback had the potential to influence participants experiences. A blame free approach was identified as necessary in engaging participants: *'As long as it's done in a very blame free culture environment, so that the risk is, in retrospect it's always very easy to say, to analyse things, as long as it's done on a very, which sometimes it can be very difficult to do, in a blame free environment, but that's the only way you can learn out of it. Otherwise people won't be, won't be as open as you want them to be (P25, Mw)*. There was a great deal of anxiety related to the way in which verbal feedback was given and received by participants and this appeared to have a lasting effect on how they perceived simulated training. Again, the appropriateness of feedback and anxiety related to simulation will be considered later in this chapter.

In summary, the main theme of simulation choreography captures the sequencing of simulation and showed that the skills and attributes of those leading simulation training were perceived as pivotal. An awareness of the needs of participants and an ability to adapt training accordingly is important; along with a blame free approach to feedback. This novel theme is not reported within the wider literature relating to simulation.

### **7.4.3 Performance Anxiety**

This theme relates to the overwhelming participant perception of simulation as being anxiety provoking. The term 'performance' was chosen to reflect the means by which people understand and interact during their experience of simulation. This was attributed to the perception of being watched (dependent on approach to feedback and largely associated with videoed approaches) and the fear of making mistakes which would result in judgments about personal expertise from colleagues. Overall, this theme gives a sense that anxiety must be relatively stable as all participants identified this attribute yet there is instability dependent on the level of participation required and the method of observation, recording and feedback.

A common approach to simulated training involved video recording the simulation in order to aid feedback; it was evident that practitioners do not enjoy being video recorded during their training. This interpretation was based on accounts of being 'put off' attending simulation due to the fact that their performance would be on display and subject to scrutiny. One participant echoed the sentiments of many in the language used to describe their dislike of simulation *'I find that simulations I'm sure I am not alone here, I find them almost as scary as the real thing .I hated I mean, it was just awful or it's just me seeing myself on video any more than anything I suppose, that what I hated about it' (P1, Mw)*

This apparent dislike of video recorded simulation was often attributed to the fact that others (colleagues) were watching *'I think everybody is the same, everybody is sort of like, you know, doing it, preparing for it before, you know but it's just your colleagues so it shouldn't really be embarrassing, but it's like, you feel like you are being tested in a way kinda of thing you are kinda being watched'* (P18, Mw). Along with anxiety relating to being watched there was a perception of being judged by those watching should a mistake be made. *'I think that maybe comes like a little bit of, you don't want to look stupid in front of your peers'* (P13, Mw)

Paradoxically, participant accounts suggested that they were more likely to make mistakes due to their increased anxiety at being observed and/or video recorded during the simulation *'you know it's not a real situation and you are like, under test conditions so it's just makes you, like you say, it just makes you feel that little bit anxious and you probably fumble a little bit more and you wouldn't probably behave if you were in a real time situation'* (P18, Mw). Thus simulation may hold greater risk than benefit for some.

The approach to simulation, in which participants are video recorded, was identified as being utilised for the purpose of feedback in relation to performance. This was a common experience and a minority of accounts identified positive attributions associated with the ability to identify areas for personal improvement *'you know you are being videoed and there is a video setup in the corner and you know that you won't be grilled after it, but you will be told what went well and what went wrong and even though you are told what went well, you focus on the negatives of it, but that's how I learn, because I know straight away when I see myself doing it, I shouldn't have done that'* (P4, Mw).

What is interesting is that, where negative associations with video recording simulations were raised, participants were all within the first 5 years of their clinical practice. Where participants had more than 5 years clinical experience, positive associations were made with the increased anxiety during simulations as beneficial. This was due to the perception that, in a similar way to simulation, real life critical situations are anxiety provoking also *'when you're getting videoed because you'd feel like you are being watched so, in that sense, you know even though it's a dummy you still want it do it right. So I do think it helps in real life, and you just got to think it's the same, you are being watched, you are sort of being tested'* (P2, Mw).

What wasn't clear was the way in which practise in an anxiety provoking simulation transferred into preparation for a real life critical event. Participants recognised the two situations (simulation and real life) as stressful and that practise created the urgency and adrenaline rush which mirrored reality; yet responses were limited in that they did not illuminate whether this practice helped to lessen their anxiety in real life situations. There were a number of different, yet related accounts of how elements of simulation

were applied to the practice setting.

#### 7.4.4 Application to Practice

Overall this theme relates to internal attributions which can be deemed as open to fluctuation and therefore, relatively unstable. Originally named 'theory practice gap' this theme identifies theoretical principles of simulation and how these transfer into the clinical setting. During analysis the original theme was delineated to include 3 sub-themes namely; feedback, making mistakes and theory into practice. The importance of *feedback* relates to a focus on what could be improved; *making mistakes* relates to being 'allowed' to make mistakes and developing training based on mistakes made in practice; *theory into practice* relates to learning the algorithms needed, recognising events in practice because of simulation and the intended learning outcomes of simulation.

Similarly to the way in which **feedback** from mannequins (during simulation) enhanced believability of the scenario, accounts show that verbal feedback during, and following, simulation was welcomed. This was unrelated as to whether the simulation was recorded or not. There was a shift in focus to the identification of good practice along with recommendations for improvement which participants viewed as the positive aspects of simulation *'I think it's quite good, because it's quite nice to do something and then get feedback from it, whether it be positive or negative because you can be aware of where you need to improve or what things you need to do different if it happened in a real life situation at work' (P7, Mw)*. How feedback was delivered also appeared to be an important factor in the experience of simulated learning. There was emphasis on the need for constructive feedback which identified areas for individual development and this, again, was deemed unstable as contingent on the skills of the facilitator. *'it was pivotal for me, that she gave me that feedback and I learnt from it because it affected me going forward, I think but then you have got to, you know, it was done in a very constructive way, Wow how did- you know, it was done in a very constructive way, it wasn't done in, in you know (...) what the hell were you doing? You know. You don't know what you are doing you are no good in that role, it was never done like that, so it's how it's done that's how feedback is given and then it all about you receive it' (P8, Mw)*

There was also reflection on training where feedback was omitted and this highlighted the potential consequence of practitioners being unaware of what was incorrect or how to correct it. *'it would have been more useful to go through them afterwards so I don't know which ones I got right or wrong... I don't know which ones were wrong and to this day I don't know which ones are wrong...some of them I sort of just had to guess' (P13, Mw)*

This highlights an epistemic injustice, where feedback is perceived as important for learning yet the feedback offered does not allow learning to happen.

Similarly to performance anxiety, when prompted to consider what was gained from simulated training, many participants identified **making mistakes** as enabling them to learn from the experience. Again, this allowed them to identify where improvements to their performance could be made *'because you learn from your mistakes and you can take a step back and see how you do work and maybe things that you can improve on... things that you have done well and things that you haven't maybe done so well ...I do find them beneficial'* (P5, Mw)

This is in contrast to the earlier theme of performance anxiety where there was an identified fear of making mistakes which may be judged by colleagues; simulation appears to offer the opportunity to practise in an environment where mistakes are a necessary evil. In a minority of accounts, it was identified that mistakes made during simulation meant that no actual harm could come to another individual *'I'm sort of better if I learn from my own mistakes I do make mistakes but.....that's it ...It just helps me re-cap over things in a controlled manner again. Where if I do make a serious mistake its not fatal to somebody else'* (P2, Mw)

The notion of 'not doing harm' will be addressed later in the chapter. Within this theme there were mistakes identified within the clinical setting which served as a catalyst for the development of training, tailored to a specific clinical need. One participant discussed poor outcomes which had been the result of misinterpreted CTG's within practice *'you know, these are people who have done their (name) and got their certificates to say that they had done it, but still managed to misinterpret CTG so we developed some sort of training package that would look, I suppose put CTG a bit more in context really'* (P9, Ob) This also shows that, despite undertaking the computer based simulated training package, there are deficiencies in application of theory into clinical practice.

The sub-theme, **theory into practice**, illustrates the ways in which simulated training appears to help individuals to think about their own practise and where this can be developed. Simulated training was thought to act as a reinforcement of knowledge already developed and served as a reminder, an aid memoir, for appropriate actions *'it's a re-enforcement of it...it is, you know , Oh yeah I remember that now and yeah, so to me it re-enforces what I know so it's just coming more up to date'* (P12, Mw). The ability to then transfer this learning back into clinical practice was also identified as a favourable element of simulated training. Responses highlighted a perception that simulation offers the opportunity to practise a skill which can then be transferred to a 'real life' situation *'it also is basic stuff that you do day after day but you don't realise you are doing it, keeping your baby warm, well we all strive to do that, but just being able to like continually assess and move on to the next bit. So you feel more quite confident when you come back that you can deal with a collapsed baby'* (P14, Mw).

The contrast between simulated practise and 'real life' was identified with 'real life' being perceived as offering greater learning opportunities. One participant reflected on being called into hospital to help manage a uterine inversion and highlights the rare nature of this event and the impact of learning through experience *'I knew what to do theoretically, but practically I had never done it, so I remember rushing into hospital and trying to bring together what I had learnt theoretically, and I sort of managed, and luckily it all went well, but if it were going to happen again, I thought, it might happen again in ten years' time, because it's so rare, I would be much more comfortable because I'd managed it already, so, learning through experience is obviously the best'* (P25, Ob).

In summary, there were positive associations with the ability to make mistakes during simulated training and these highlight a potential for personal development without harming others. Mistakes in clinical practice influence the development of training. How lessons learned from simulation transfers into clinical practice is unclear yet positive responses related to the opportunity to reflect on the training before a 'real life' situation occurs. Meanwhile, real life experiences were seen as being a catalyst for deeper learning and development.

#### **7.4.5 Repetition**

This theme relates to how individuals develop skills, how these may (or may not) diminish over time and what they attributed this to. Participants were prompted to consider how often, in an ideal situation, simulated training should be repeated. Whilst there was stability in responses that training should be repeated, there was no consensus on how regularly this should be; responses ranged from three months to three years.

An interesting point, yet not a particularly surprising one, is that those with less than 5 years' experience tended to opt for regular repetition (3 to 6 months) and those with more than 10 years' experience identified an acceptable range of 1 to 3 years. All obstetric (medical) participants identified that their mandatory updating was out of date and there appeared to be a laissez faire acceptance of this. Further exploration of this would be useful in order to identify the motivations for attending training and reasons for not doing so.

Nevertheless, practise in a simulated environment was deemed useful due to clinical exposure being limited: *'the number of hours I've spent as a trainee, so that's become engrained in me, so you kinda go into automatic mode and my concern now for young trainees coming through is that, they never get immersed or saturated to the extent that they can do it in their sleep'* (P17, Ob) The reasons for this limitation related to reductions in medical working hours and the rarity of some critical events. It was clear that, when participants felt that they had regular exposure to, and experience of, a critical event there was



greater confidence in their perceived ability to respond. Where critical events were considered to be less common, or even perceived as rare, there were questions around competency and ability to respond *'things like arterial lines you might go six months without using one, and if you are not used to them, you will have forgotten everything so I do think if you are not exposed to something regularly, there is a worry that you would lose your competency or you'll forget, or even worse, remember incorrectly... that is an issue if there is long periods between those kinds of events, (P23, Mw).*

Paradoxically, confidence appeared to be linked with exposure in the clinical setting and not to the simulated training: *'So during that stint when I was on the postnatal ward I would that I was very confident with resuscitation of a new-born. .because actually, physically having to, to do it ...but I think that sort of certainly CPR in an adult is something that I know that I can do because I have' (P13, Mw).* Simulation was not attributed to increased confidence in clinical practice; this was gained through clinical exposure.

#### **7.4.6 Confidence Gained**

This theme relates to the influence of simulated training on participant perceptions of confidence. Admittedly, responses in relation to confidence gained through simulation were minimal as the reasons for this will be borne out when considering the limitations of the study (chapter 9). Confidence in ability will also be discussed later in this chapter as a theme relating to participant perspectives of preparedness for RCEE.

It is important not to draw a veil over this finding as overall; the theme gives a sense of the initial impact of simulated training on participant confidence and the effect on this over time. Simulation appeared to increase confidence initially, due to the practical element. *'They definitely affect my confidence, because I always feel more confident leaving, I have never felt less confident or felt that I was undermined at all, I always feel like that I have been well supported and the criticism turned it round, say, why do you not try this and this next time,, so I've always felt more confident' (P13, Mw).* Arguably, there is a connection here with the facilitation of simulation and the appropriateness of feedback offered, as reported earlier in the chapter; thus serving to illuminate the multi-faceted nature of simulated learning and its effect on the participant experience.

Although confidence appeared to increase initially, following simulated training, participants recognised that this diminished over time and between training *'it's about decay, you start doubting yourself...and you think "Would I be okay in that situation, would I be competent in that situation, would I know what to do", and you probably do, its just a more of a confidence factor isn't it?' (P6, Mw).* There is a connection to the theme of repetition. There appears to be an increased confidence, initially, following simulated training with a potential for diminution over time. It is unclear as to the timeframe of perceived skill diminution. Surprisingly, responses relating to confidence were sparse with an overwhelming assertion of the anxiety provoking element of simulation.

### 7.4.7 Approach to Learning

Overall, this theme was identified as an internal attribution with stable elements focussing on differences in personal learning style. When prompted to consider what they (internal) thought about training for RCEE, responses showed how personal learning styles affected engagement. For some practitioners there was an appreciation of simulation as it allowed them to see actions. This was preferred to a 'traditional' classroom based, didactic approach *'classroom based' didactic teaching: 'I just think it just keeps you more interested and its more relevant than somebody standing in front of you or holding your hand and saying well this is what we do and this is what you do, you can actually see what happens'* (P12, Mw)

Conversely, classroom based learning was preferred by some and personal learning style was perceived as allowing the option not to engage with simulation *'depends on what type of learner you are as well. And I like to look at things and sort of think about it very anatomical in so different people would do it in different ways wouldn't they...I would sit in the room and I would take it in, because that's the way I would respond but I would imagine that some people wouldn't'* (P3, Mw). This confirms the argument for multiple teaching strategies which would enable the individual to access an approach more suited to their style of learning.

It is interesting that, where pre-training course materials were supplied this appeared to motivate participants as did the notion of being tested following simulation: *'I think it's a good thing to always be keeping your sort of knowledge up to date, and, I know when you do go on your (name) you probably read the course revision before you go to just to make sure that you know what you are doing on the day'* (P16, Mw)

The majority of responses identified an intriguing issue; despite there being pre-course preparatory materials there was no evidence of engagement being monitored. Participants identified that there was a necessity to prepare for training. Engagement with the preparatory material was again dependent on personal learning style. Where participants could identify that engagement, and subsequent knowledge development, would not be subject to testing, the necessity to prepare was diminished *'I don't think that most people do that... I mean, I don't know if the midwives, the doctors don't do that, you know. Because you know, you can't fail...so people don't feel that necessity to, to study for it'* (P25, Mw). The same was true for situations where testing occurred during simulation but it was identified that, due to the casual nature of testing, individuals could not fail.

For some practitioners, the advent of their mandatory training was the catalyst for reading relevant policies, guidelines and other forms of evidence: *'it's a good recap, it's quite, you know it's good just to go over it and make sure that you have got everything in your head about exactly about how everything should go, so a yearly basis to go back through all your notes and revise everything works really effectively before your (name) day ... you feel*

*more confident in what you are doing' (P13, Mw). This, as a means of ensuring that they are up to date with the training, appears contradictory to professional regulations relating to continuing professional development (CPD). It is noteworthy that being prepared for clinical practice was not identified as necessitating familiarisation with policies and guidelines nor was providing quality care to women: 'if I know it was coming up I would do more revision in that area or check, when we check the eclampsia bag every shift anyway, but it might not be used and you would go back and check that you know where everything is... you would go over the rates and everything, which you do just before your (name)day you should know this knowledge' (P4, Mw)*

In summary, engagement with simulation appears to be influenced by personal learning style. Where pre-training preparatory materials were provided this motivated some individuals; as did the prospect of being examined following simulation. Where pre-training materials were provided there was no evidence of compliance being monitored. It appears that it is the preparation for training, and not for professional practice, which engaged practitioners.

#### **7.4.8 Not causing harm**

Originally coded as 'desire for mastery' responses went beyond this and appeared to relate to a relative stability in the appreciation that RCEE will happen and in this eventuality there was a need to provide good care and not cause harm to women. This is in contrast to the positioning of simulation (from the literature) in the ability to practise in a safe environment without causing harm to others.

There was recognition and appreciation that RCEE will occur at some point in an individual's experience and this was motivation for training: *'because you don't know when it could happen, it could happen anytime and I suppose I want to be safe and I want to be good at my job and that's what motivates me to do it really' (P12, Mw)*

Simulation provided reassurance in relation to personal performance; engagement was motivated by the desire to provide safe and effective care or to not worsen the situation (not harming people): *'What motivates me to be able to provide good care and to know that if things did go wrong that its nothing that we'd done, or I personally had done that's, that's caused that basically, so that I could know if my own mind that what I did was done correctly, in a timely fashion and that I had not done anything that could delay or make an incident worse' (P10, Mw)*

In addition to not causing harm there was a shift in focus to practitioners providing the best care possible and to learn from poor outcomes in trying to improve care: *'we all strive to be better don't we. You know nobody is perfect. I think you've just got to accept that, you know most of the time you make good decisions and sometimes, you get it wrong, but*

*when you get it wrong, you have to look at why and try and make it better on another occasion, and try and share your experiences with other people as well' (P20, An)*

One participant reflected on a maternal death and was reassured by being equipped to deliver the best care possible where another identified the opportunity to learn from poor outcomes. *'We still didn't know why she had died which was very difficult obviously for her family but it was enough, it sort of brought home the limitations of what one can do but, at least we had been equipped and we had carried out care for her to the best of our abilities' (P11, Ob)*

In addition to the need to provide safe and effective care and avoid harm, responses indicated a motivation to engage with simulated training due to a desire not to let the team down and to promote the team and its efficacy: *'because we, just because we are popular, we are a very high risk unit... just means that you want to be able to do it, you don't want to let the patients down, or let the midwives down that sort of thing really' (P17, Ob).*

To summarise, the desire to not cause harm and to provide safe and effective care, motivated individuals to attend simulation based training. What remained unclear was whether practise in a simulated way did indeed reduce actual harm to patients. Learning from poor outcomes appeared to focus attention and provided a catalyst to attend training and improve the efficiency of the team.

#### **7.4.9 Multi-professional working**

The term multi-professional working was chosen over the commonly used 'multi-disciplinary team' (MDT) as the latter was interpreted as meaning the team which individuals worked with in the clinical setting. Many responses related to the need for teamwork (where the team may or may not consist of other professional groups) but not necessarily the team which participants were used to working with. Questions related to the importance of a multi-professional approach to education and training.

This theme relates to external attributes concerning the importance of multi-professional team involvement in simulation. What was clear was that team dynamics were required to mirror those of the clinical environment and highlights a connection with the realism of the scenario *'it is also as part of an MDT approach so you get midwives, health assistants, nurses, students everybody which is great, because mimics the real world, so I think that's really good' (P25, Mw).*

Team dynamics and the ability to work together were identified as important. There were accounts which focused on the development of communication skills which were attributed to multi-professional working. Participants accounts of how simulation had

changed over time highlighted a renewed emphasis on the importance of team communication and related this to increasing the likelihood of achieving positive outcomes *'the main focus of that is to get people to work together as a team, because if you can get people to work together as a team you are more likely to get the work done and get a better outcome'* (P10, Mw).

The need to train with those whom individuals were working with was identified as an important element of simulation. This was attributed to enhancing the realism of the training and being familiar with other professionals when working with them within clinical practice *"perfect learning would come from the people that you work with all the time, so our own Consultants, the Anaesthetist that you work with and obviously people like the Anaesthetist and the Registrar to an extent are rotational, so they came on our training as well as seeing them, you know, in a drill scenario when you were to be in that situation with them"* (P24, MW). This appeared in contrast to the majority of responses where the make-up of the multi-professional team was not deemed as important as the teamwork. Individual experiences of training where the team dynamics did not reflect reality highlighted the positive element of understanding other roles, promoting familiarity and increasing knowledge: *'you do get some familiarity with each other, and I think its professional everybody is there to do a job, they put us into the situation of who we are and what it's about, and I think that still works well once everybody knows what they need to be doing, I think it still works well, even being unfamiliar with each other. It shouldn't be about familiarity should it? It's about being professional and knowing what your role is, and the job that needs to be done, yeah.* (P22, Mw). In common with the anecdotal findings of the systematic review (chapter 4) the adoption of multi-professional working is seen as having high value within simulated learning.

Practitioners recognised a multi-professional approach to simulation as beneficial; however, this did not need to be those with whom individuals worked on a regular basis. To summarise, it is teamwork and not the make-up of the team, which appeared to enhance the experience of simulation.

## 7.5 Participant Perspectives on Preparedness for Rare Events

The analysis of participant's views, described in chapter 6, also illuminated the way in which attributional factors contributed towards, and explain how healthcare practitioners' develop skills in order to prepare for, and respond to RCEE. Analysis shows that recency of clinical exposure and training facilitated the feelings of preparedness. Clinical guidelines, debriefing and reflection were seen as useful, whereas competing priorities and lack of familiarity with the clinical environment hindered feelings of preparedness. Analysis also highlighted where practitioners rely on self and take anticipatory actions and, most surprising, where there is an overwhelming reliance on others. Again, these interpretations are based on individual explanatory inferences which were deemed to be from an outside agent or force (external attribution) or related to self (internal attribution).

Study aims were achieved to the extent that findings enhance understanding and help to explain skills development and outlines barriers and levers to preparedness.

### Attributions and Themes re Preparedness

External attributions are those factors deemed to be from an outside force or agent in relation to simulated training/education. Overall, there were 5 emergent **themes** and 2 *sub-themes* within this domain: **Experience and Expertise: Guidelines: Knowing the Team: The Environment;** *competing priorities* and *familiarity with environment:* and **Timing.**

Internal attributions are those factors which and individual perceives as relating to self. Overall, there were 6 emergent **themes: Debriefing and Reflection; Reliance on Self; Anticipatory Actions; Experience and Expertise; Knowledge;** and **Reliance on Others.**

Where there are similarities in themes i.e. identified as both internal and external attributions, these will be examined together; an example being 'Experience and Expertise'. As in the previous domain, when discussing each theme the relative constancies (stability) or fluctuations (instability) will be identified.

#### 7.5.1 Guidelines

Initially, this theme was assigned to the domain of 'participant perspectives on simulation' as it was identified that clinical guidelines resulting from governance procedures influence individual engagement with simulation and highlights training needs to mirror guidelines. The use of algorithms and checklists during training positively influenced perceptions of being up to date and there was a degree of stability to the availability of these.

This is an example of where analysis blurred between whether participants were focused on how guidelines influenced the simulation as opposed to being related to preparedness. Both were, however, considered external drivers with elements of stability in terms of on-going impact and it was found that the majority of responses related to how guidelines from governance procedures influenced preparation for RCEE *'the guidelines change. Like the new neonatal resuscitation guidelines changed a couple of years back now, but it seemed to be a while before I went on the training and realised that it had changed. So it's useful to keep up to date of what's thought best practise. Acronyms are really useful, so more like a formula'* (P8, Mw).

Along with lessons learned from risk management, externally driven guidelines were linked to professional preparation and were viewed positively and appeared to be an important aid memoir for responses to critical events *'there's definitely more pressure to go through algorithms...and I think you're more focussed on doing the right thing and following them more accurately'* (P6, Mw).

In summary, when reviewing findings relating to perspectives on simulation, clinical guidelines were identified as positively influencing perceptions of being up to date. When considering the impact on preparedness, clinical governance procedures were highlighted as an important approach to learning lessons from critical incidents. These procedures resulted in the formulation of clinical guidelines which were identified as positively influencing perception of preparedness; with particular focus on the importance of algorithms and checklists.

### **7.5.2 Knowing the team**

Similarly to the theme of multi-professional working, which was considered to be externally attributed and unstable, this theme relates to being in a working environment where the multi-disciplinary team are known to individuals and highlighted positive associations with the ability to respond to critical events.

What was interesting is the fact that knowing the team appeared to hold a relative stability as participants were reassured by knowing the team with whom they were working *'there is nothing worse than coming on duty to not knowing any of your medical staff, it's nice to have that working relationship, I know it shouldn't matter and you should all have the skills and the competence but it does help to be able to sort of, to know to know them and being able to work with them and know what makes them tick really and know how to get the best out of them'* (P14, Mw).

When participants considered how they recognise and respond to RCEE, teamwork was viewed as important due to the complementary skills available when multi-professional groups came together *'I think quite important really, because we are all sort of,*

*we are all working together as a team albeit doing different sort of jobs and professions, but like you say, caring for a critical woman, the obstetrician would have some input, the anaesthetist would have input, so I think it's all important that there are sort of seen together'* (P16, Mw)

One participant reflected on team dynamics when responding to RCEE and considered this to be related to the fact that the team trained together in the same way *'I think because we're all been trained in the same way, that we all follow that together so that you can see the team work happens'* (P22, Mw).

This is in contrast to earlier attributions relating to multi-professional working where it was not deemed important to train with a team one works with but to develop skills in team working. Overall, it appears that reassurance in responding to RCEE is gained through knowing the team with whom you are working and in how the team functions together.

### **7.5.3 The Environment**

Overall, this theme highlights external attributions relating to the physical (workplace) environment which participants identified when considering preparedness for RCEE. There were two sub themes identified and these were considered unstable as they related to the perception of **competing priorities** and a **familiarity with the environment**; both of which were open to fluctuation.

#### **Competing priorities**

This sub theme relates to how professional development, in terms of the need to find time to read, update and complete training, was in competition with workload demands. The need to update competed with working hours; pace of work and changing clinical roles and this was negatively associated with preparedness *'maybe we need to make more of an effort, but if you ever have down time it seems that you are catching up with the backlog of work as opposed to how actively doing things like that which is a shame really, but that's the NHS isn't it, you have got more and more work which is outside your clinical role to do'* (P14, Mw).

Others reflected on the usefulness of in-house training which, again, appears to be eroded due to workload demands and alterations in working hours *'whereas with the restrictions in terms of the working hours, the juniors are relatively finishing their training with much less experience than we had at the time'* (P20, An)



### **Familiarity with environment**

This sub theme highlights that a familiarity with the physical environment was an important aspect of their perceived preparedness for RCEE *'I think I would feel prepared purely because I feel comfortable in the area that I work and with those around me and the support, also just knowing where things are around the Delivery Suite and documentation'* (P2, Mw).

What is interesting is that this appeared true for all respondents yet those with less experience identified the fact that they regularly moved clinical area (on a rotation basis) as negatively affecting their perception of preparedness. This was attributed to the fact that they needed to re-familiarise themselves on a regular basis and this was disconcerting.

When participants had more clinical experience there was greater stability (due to reduced or no rotation) and a reassurance due to familiarity *'better understanding of your environment where you are working, where everything is equipment, who to call and who all your staff are, so I think now being here for sort of three years you very much know who your team is, who you want to call and what level these people, you know are at as well'* (P13, Mw).

In summary, the need to update appears to compete with working hours, pace of work and changing clinical roles; and a familiarity with the environment appears important in being able to respond to critical events appropriately.

### **7.5.4 Timing**

This theme relates to the perceived frequency of critical events and highlights that the amount of exposure was associated with preparedness along with recency of training and how regularly this is repeated.

Responses highlighted the perception that frequency of events within the clinical setting enabled practitioners to respond appropriately. Where events were less frequent this would challenge practitioner responses and act as a prompt for further training *'it made me then suddenly think, Oh my god you know, actually I haven't had a cardiac arrest in maternity for ages, which made me a bit complacent, then I had one a couple of months ago, and I thought I can't ignore that reminder to go to resus training, I've just got to do it'* (P17, Ob)

When asked about the ideal timeframe for frequency of training there was little consensus and responses highlighted perceived differences dependent on clinical experiences. Where participants were less experienced there was an identified need to train more frequently i.e. every 3 to 6 months.

There were responses which were in agreement with the status quo of the clinical site where yearly clinical skills training was the norm.

There was consensus in relation to the need to train more frequently when in the early stages of one's career and this was attributed to perceived confidence and the amount of clinical exposure *'I think yearly is fine...that's when I tend to feel a bit low in confidence...I would have enjoyed it more if you did it more, maybe six monthly when you are newly started, and I think even for some of the other girls who do it working in the trust just to know where everything is, just to make sure you know who to call and the sort of protocols, I don't think there would be any harm in doing it more regularly'* (P13, Mw).

Conversely, there were responses which highlighted frustration amongst those with more clinical experience. This lengthy quote serves to highlight such frustration raising the potential of tailoring training to differing levels of experience *'mid-career I think, I think I got more out of it then, and now I think maybe I sometimes find it a little bit frustrating the (name)because some of the girls on it will be those very junior girls that don't know much and I feel that they might, you know, if their scenario was to run perfectly, if you ran it with four Band 7's I would like to think it would run perfectly,(laughs), so I mean it's good that you've got all that, you know the shared learning in a group, but I think something like, once you get to a Band 7 and you've experienced all those drills and things, I think you'd probably want to go on something more advanced...the intensity level there, raises again and I definitely think you can learn from those every time you do that type of course'* (P24, Mw)

Overall, the frequency of clinical exposure and training was identified as positively influencing perceptions of preparedness. The same was also true for recency of exposure and training which positively influenced confidence. It appears that with increased experience there is a perceived decrease in the need for training yet with this experience individual's move towards a leadership/management roles with less clinical exposure. There is some suggestion that training should increase in frequency where clinical exposure is limited.

### **7.5.5 Debriefing and Reflection**

The theme highlights where participants identified their personal contribution to preparedness and/or relate to approaches to preparedness identified as useful on an individual level. This theme relates to how participants felt about debriefing and reflection following critical incidents as this was seen as a stable approach to learning valuable lessons from how the care was managed. The positive influence of debriefing was related to both real life critical incidents and those experienced through training

*'you learn so much don't you, from listening to cases being presented and then everyone discussing how it was managed' (P14, Mw).*

A number of responses related to the approach to debriefing and, similarly to feedback offered following simulation. It was perceived as important that a blame free and relatively informal approach was taken *'an opportunity to have a discussion afterwards around the opportunity for learning and again what could we do better you know, but not in a negative manner, you know that is more of an informal approach so it should be just a team discussion' (P22, Mw).*

In contrast, there were times when participants did not perceive team debriefing as useful to their development. Again, this appeared to be related to the way in which to debrief was approached raising important questions as to the requisite skills and experience of those who lead debriefing sessions.

This was reiterated by others and, alongside the most appropriate person leading the debrief, the approach to debrief was also viewed as important; where a non-judgemental approach was desirable *'I know that's something I've had to develop because it's all about people skills and you don't want anybody to ever feel threatened in a debrief or accusatory. It's about it's about giving them a voice' (P8, Mw)*

Participants also reflected on their personal performance following a critical incident and identified why this is perceived as important. A minority of participants referred to the process of reflection as requiring a sense of humility whilst others characterised reflection post incident as an opportunity to identify what went wrong. The following quotes serve to demonstrate an immersed focus on error (both internally and externally) rather than quality aspects of care *'I think, you just learn a lot, I think you learn a lot yourself just by your own self-criticism' (P13, Mw)* and *'I think as a midwife, constantly reflecting over things even now you know I have been doing it years and years but you still really never stop reflecting and thinking about your shifts and what you could have done better' (P14, Mw).*

Only one participant referred to reflection as an opportunity to reassure oneself of what went well and to identify positive areas of care. This was identified by the participant, as a trait of the medical profession *'I think because, as a medical profession, well as a profession generally in obstetrics generally ... if there's been a critical event, it helps you to deal with the aftermath to think, I did the best I could, and looked at that, I thought about it and I feel that I have done as much as I possibly could in that situation' (P9, Ob)*

It is noteworthy that reflection following a critical incident is common amongst practitioners as is a propensity to identify error rather than areas of good practise. Debriefing following critical incidents was appreciated by the majority of participants with attention being paid to the appropriate person, with the requisite skills, leading the review of care.

### **7.5.6 Reliance on Self**

This theme relates to participant understanding of their role in RCEE and highlights professional responsibility and perceived expectations of self, from others, as important catalysts to preparation. Although all participants recognised their need to be prepared for RCEE the rationale for this differed. For some there was recognition that, despite summoning assistance, they may be alone in a situation for some time *'even though you have hit that emergency buzzer you could still be in that room on your own for some considerable amount of time before any help comes'* (P1, Mw).

One participant emphasised the need to be prepared when working in an environment where help is not immediately available; recognising that those in community settings may require different approaches to training *'their trouble is that the resources that they have the problem the solution is different to them than it is on the labour ward so when they come into a sitting room and find somebody in a pool of blood well they can't pull the emergency buzzer, but of course, they can call for help but is not like the you know, the SHO is going to run in with a cannula and you know, they are on their own'* (P11, Ob)

This resonates with the issues identified in the theme 'familiarity with environment' and raises questions as to the most appropriate environment for training and preparation to take place. If a participant is not working in an acute environment and would, therefore, be required to respond to a critical event where help is not immediately available e.g. in the community setting, it could be argued that the approach to training should mirror this.

It is noteworthy that just two participants highlighted professional responsibility and accountability as their motivation to prepare for RCEE. A newly qualified practitioner recognised a change in responsibility and accountability with registration *'when I look back and thought, actually I need to step up a little bit now, I can't always rely on stepping back and being the scribe or allowing others to do things, it's my responsibility and I am very much accountable for what I need to do now'* (P13, Mw)

Whilst others reflected on the onus to be up to date and manage own training needs accordingly. Having a personal interest in critical events was identified as a motivation for preparation *'I know it sounds a bit macabre, but I do have a special interest in a critically ill child bearing woman myself, anyway I find things like pre-eclampsia and stuff very interesting so I suppose there's a personal interest that leads me to kind of go on courses and investigate down that way, because I am interested in that area of midwifery'* (P23, Mw).

In contrast, participants also perceived that with increasing experience there was a heightened requirement to be prepared. This was attributed to other people's expectation of knowledge and skills *'as a Band 7 often having to be either the first on scene or co-ordinate the oversee, you know, have that bird's eye view on it all, I think my skills need to be better, not just you know, basic life support intermediate, but advanced life support'* (P24, Mw).

In summary, the internal attribution of self-reliance was evident yet the individual motivation to prepare for RCEE differed. There were few who identified professional responsibility and accountability and responses largely related to a need for self-efficacy. This was dependent on the situation and other people's expectations based on professional experience.

### **7.5.7 Anticipatory Actions**

This theme relates to the steps practitioners take in anticipation of RCEE and highlights increasing confidence in predicting events with experience; along with anticipatory actions of risk assessment and reading as a method of updating.

Participants who identified their ability to pre-empt critical events all had more than 10 year's clinical experience. The power of prediction was attributed to a number of factors, one of which being depth of understanding of normality which, in turn, leads to increased suspicion of abnormality. This extensive quote serves to highlight where a developed index of suspicion leads one to take anticipatory steps *'I think you have to prepare for them by doing lots and lots of un-rare things because then you might get that rare situation, so you are prepared, mentally prepared, but also then prepared to get help in before you get to, so its anticipating that rare situation ...by having good clinical experience you know, it's the anticipation then of that rare situation'* (P17, Ob)

Similarly, another reflected on the degree of perception and identified an improved assessment of risk based on experience. This highlights the importance of observing cues to deterioration and understanding how to respond appropriately is not related to experience, but an understanding of normal processes *'I think I am better at predicting critical events than I use to be but that is just with experience and reflection on practice...in*

*terms of more acute events ...the ability to identify an acute event can be undertaken by anybody who has a degree of perception and is alive enough to the possibilities. I think people are responding to a line being crossed' (P11, Ob)*

A minority of participants reflected on a personal attribute as a risk assessor and identified a perception that not all practitioners hold this attribute which was thought to develop with increasing experience. Many identified an understanding of a woman's history was identified as a catalyst for anticipatory actions such as equipment checking. Along with preparatory actions relating to equipment a number of participants identified reading as an anticipatory action. This was an action when practitioners are faced with a specific risk factor or condition and also when there was a perceived limitation in knowledge *'I think it's easy enough to read how they should be managed, but until you know you are put in that situation to manage it yourself or with your team, it is quite difficult to know if you have got them skills or haven't ...if you are looking after somebody... that's got a certain condition, or is in a certain situation it's good to have them there just to give a read over or a text book or something like that just to remind yourself' (P7, Mw).*

The ability to predict when care needs may become critical or emergent was found to be associated with increased clinical experience. There were a number of responses which were considered as anticipatory actions and these include equipment checking, preventative measures e.g. cannulation and requests for additional assistance. Where participants were less experienced, reading (of clinical guidelines and relevant papers) was identified as a preparatory approach. It is also noteworthy that, all those who identified reading as a preparatory action, had less than 10 years clinical experience and here there is a move to consideration of confidence in ability. Initially identified as a theme, confidence was thought to blur in terms of individuals possessing the confidence to both recognise and respond to the need to take anticipatory actions.

Participants perceived confidence in their ability to respond to RCEE and highlights an associated with experience in clinical practice (in years and in exposure to critical events) and the ability to ask for help. Where expertise was attributed to confidence there was a perception that initial actions would be taken with an expectation that a practitioner with more expertise would arrive. *'I'm not sure if I would say expertise, I feel confident enough that I would be able to assist, or you know, know what to do in the first instance in an emergency and who to call and what to do in the first steps' (P16, Mw)*

Confidence was also cautioned by one participant who identified the need for practitioners to have an insight into their limitations based on experience *'I think its very individual depending on whether they understand what their limitation are, that some doctors are relatively junior and not so mature, and others have got really good insight into their level of expertise' (P9, Ob).* Limitations in experience appeared to negatively affect confidence and acted as a catalyst for further training and development.

With this in mind, participants were prompted to consider the development of expertise and the potential for diminution of skills over time. The ensuing responses, whilst providing obvious parallels with the theme of anticipatory actions and relating to perceived confidence in ability, are positioned within a distinct theme relating to experience and expertise.

### 7.5.8 Experience and Expertise

This theme relates to how participants perceived the development of their expertise. Responses highlighted that this is externally attributed to clinical exposure to emergency events. Whilst this could be perceived as unstable, as clinical events cannot always be predicted, a minority of responses highlighted a relative stability dependent on the clinical area in which one works. Again, there were recognised differences between those working in acute and community settings *'I'd upset some people with my answers, I know, but I honestly do believe, I, so, let's take for comparison. I did my (name) recently, me, somebody who had been qualified for the same amount of time as me that works on community, so in terms of level of education, we're both degree levels, we've got the same exposure to practice, somebody that works out on community that doesn't observe a haemorrhage as often as I would, my skills would, I know it sounds, my skills would definitely be better than theirs because I do see it in practice'* (P24, Mw). There was an expectation that those working in primary care settings, train in the same way, and for the same events, as those working in secondary care settings.

The recency of this clinical exposure was seen as influencing preparedness. Similarly, where experience and expertise was perceived to be limited, this was attributed to the working environment in terms of workload restrictions and the available opportunities to develop *'Well, I think our training was very different you know, we've come from a different, a completely different training point of view, so we don't have the working time directives for the reduction, you know the reduction in our hours that the trainees have now, and I think that's probably wise. It's more important for them, because you know, we just spend probably twice as many hours doing our job, and it's an apprenticeship after all, isn't it. So we spent a lot longer on the coal face learning the job'* (P20, An).

This also blurred with internal attributions which highlighted that it is the amount of experience and exposure to critical events, along with the recency of training, which influences professional preparation.

It was a common response that simulation cannot replace clinical experience and this appeared to be valued highly *'in terms of my competence, I don't think you really know until it hits you in reality and that actual, and you actually react there and then. I think it probably does,*

*but I think it's always going to take time and experience to become competent in it, it's not something, you can't just become competence by being good, in like simulation, I think it's just something that comes with experience more than anything' (P13, Mw).*

In the majority of responses it was evident that the amount of clinical experience was attributed to preparedness for RCEE and not simulated practise *'I think I probably have, yeah, just from the length of time that I have been on delivery suite and being call staff on there, so yeah, and I think it does actually develop with time and experience' (P10, Mw)*

The length of clinical experience was also attributed to an ability to recognise fault, or lack thereof, following a critical event *'it's funny because I sat down with somebody last week, but sometimes things will go wrong no matter what you put in place, but I am old enough in the tooth now to know that I didn't make that bad thing happen, so I can deal with things when they go wrong because I think, you know, it wasn't my actions that made that go wrong I went in to try and make things right' (P14, Mw)*

The amount of exposure to critical events i.e. being involved was associated with increased confidence in responding and was highly valued as a learning opportunity.

*I think its ongoing developments...certainly from when I started I can see the progression year by year...probably just having more exposure to it over time and seeing it more and more and thinking what did I do last time, let's try this, let's try this' (P13, Mw)*

There were critical events, identified as rare, for which participants did not feel able to respond and this was related to the fact that they were not part of simulated training and had not been experienced in practice. The amount of exposure and therefore, opportunity to learn, was identified as being linked to the type of unit one worked in.

When asked to reflect on skill development there were responses which related to perceived skill decay and the reasons for this were, again, related to clinical exposure where one participant identified the time-scale for the perceived decay. *'Every six months I think, really. I think once its more than six months, that you've done something, I think it's more your confidence that you haven't got as much...It diminishes if you don't actually, get the opportunity to practise what you have learnt in the simulation' (P1, Mw)*

The clinical environment was also attributed to skill decay where the ward area was seen as holding the potential to affect skill retention and confidence *'I always feel sort of deskilled in emergencies when I go off delivery suite. So every single time when I come back on, I think I'm always a little bit low in confidence so potentially when you are starting again it would be useful' (P13, Mw).*



One participant reflected on perception of diminished skill as a trigger for professional development. This perceived decay was at odds with previous responses as the participant identifies that regular practise and exposure still resulted in a need to re-visit learning *'There is the CTG master class that we have all gone on, I feel now it's a couple of years down the line that we're slipping back and that we probably all need to go do that again. So yeah, even though we are doing it day in day out, I think, that gave us a confidence to come back and challenge practise with all this new information then just gradually new people come in and the we slide back and I think, oh I need to go and do it again then'* (P14, Mw).

Conversely, despite a wealth of knowledge and perceived expertise, there was an awareness of the potential for a critical error and, therefore, a heightened sense of alert or anxiety *'Well I think you always feel, like you know, you always feel a little bit on edge if something is happening like a shoulder dystocia, and, I don't feel like well I'm really deskilled in shoulder dystocia, at the time I am on edge'* (P18, Mw).

In summary this theme illustrates a distortion when applying an attribution lens. There were causal attributions clearly identified as being internal to participants along with those which were external. Experience and expertise is an example being attributed to external factors such as exposure to emergency events (which are unstable and cannot be planned), the recency of this exposure and the restrictions on clinical working opportunities (for medical staff) which impact on exposure. Internal attributions related to the amount of clinical experience and this factored highly in perception of preparedness.

### **7.5.9 Knowledge**

This theme relates to the ways in which participants attributed their own knowledge (internal) to their perceived preparedness for RCEE. Initially coded as remembering, responses appeared to move beyond simply drawing on personal memories of critical events and training and highlighted depth of knowledge impacted on preparedness. Knowledge was deemed to be unstable as this is dependent on access to training, personal approach to learning and on experience. For some there were critical events where they were able to draw on personal experiences of previous events and this affected the way in which they responded to the event at hand *'It's experience. It's that long term experience and it's not one event, it might sometimes, it might be sometimes it might be one event where you think "Oh god that reminds me of ...times where you think, you know, if you just pull on it for things don't you, you just don't forget those really severe situations and I think, yeah, it's just bits from everything'* (P3, Mw)

It is interesting that, where participants held a dual registration (nurse and midwife) they were able to draw upon knowledge developed whilst in another professional role

and transfer this into responses to critical events *'I'm probably drawing on my knowledge that I already have deep down, and, sometimes I think, being a nurse, prior to being a midwife helps me draw on knowledge outside of midwifery and sometimes I can look at the bigger picture then what's going on, but I'm not saying that's good or that's bad because I think that there some really good midwives around that have never been nurses that could still see the wider picture, but I do think that helps, helps you a little bit , I don't know, I kinda just go onto auto pilot and just, just do what I have to do'* (P10, Mw).

As in other themes, participants identified reading as a means to develop knowledge in order to be prepared for critical events. Where there was an identified lack of knowledge or experience in relation to a specific event, participants identified that they applied basic principles, such as the standard response to cardiac arrest, to the situation being faced. Others identified the challenge in drawing upon the multiple attributes when faced with a RCEE and highlighted that recall can be testing *'I think the challenge is just remembering it all and just putting it into practise isn't it. But at the time, I think your just trying to process it all'* (P6, Mw).

To summarise, knowledge was identified as an internal attribution in recognising and responding to RCEE and responses highlighted that this is a multi-faceted issue. Knowledge is developed, and lost, for a variety of reasons. There are obvious approaches to increasing knowledge e.g. reading, training, reflection and experience, yet how this is applied in the advent of a RCEE is unstable and unclear.

#### **7.5.10 Reliance on others**

This theme relates to perceived skill deficiencies and highlights where responsibility for responding to RCEE is devolved to others. There appeared to be an overwhelming expectation that another individual will take over responsibility of responding to the event *'Oh God...I would feel confident so long as help came fairly quickly... I don't think I realised that I would have that sort of stress response. I just wanted someone else to help'* (P1, Mw).

Devolving the delivery of care to another person was attributed to the perception of whose responsibility it was. There was an expectation that, when help was summoned, this would always be available and that this would be an individual with more experience *'you know, in the grand scheme of things you can get hold of somebody, even if its running to a clinic to get somebody from clinic, but to tell you that every single like co-ordinator, SHO, Reg or Consultant are all unavailable just doesn't happen in a unit like this, you do have somebody there'* (P14, Mw). Passing the responsibility to another person was seen as a positive step as it was recognised that there may be a more appropriate practitioner for

delivering care. *'nine times out of ten when you go in, if somebody else has called the crash team, there is somebody else there managing the situation...so I feel prepared for going in and being able to respond to those things that need doing and assisting, I don't know how sure I would feel like going in and managing the situation myself... but there is always going to be somebody in that situation who is going to know how much you'* (P4, Mw)

Here there is a move to a sense of complacency that there would be an appropriate professional available should the need arise. The following quote serves to highlight a justification of diminished skills on the basis that a practitioner with the requisite skills will be available *'on labour ward, I rely on the fact that there will be an anaesthetist there and nine times out of ten, there is, but the thing that made, well part from the fact that my resus training was well out of date we actually had a cardiac arrest in theatre there were two anaesthetists so we still didn't do anything much, we were just instructed in what to do...I know, and partly you get a bit complacent because you think well there's always an anaesthetist around. So it's that complacency I think'* (P17, Ob).

Having an identified person to take charge of a critical event was highlighted as important. In all cases, respondents stated that there needed to be an identified lead in the room when a critical event was being managed. What remains unanswered is, who that lead individual should be!

The rationale for devolving responsibility was also attributed to a lack of confidence in own ability and a perception, from midwives, that those with dual registration (nurse/midwife) have developed additional skills and are the most appropriate person to care for those women deemed to be at high risk of complications as an anticipatory action *'I probably wouldn't feel that I was prepared at all...ladies who are critical...would be given to more 'nurse' Band 6's the ones that have done their nurse training, and their probably more sort of better prepared, because they've done the nurse training, whereas, because I'm direct entry I probably wouldn't feel as... comfortable ...you feel out of your depth you ask'*(P19, Mw)

Participants with many years' experience, and in roles which would be called upon as the perceived experts in managing an event, highlighted that they may not be the most appropriate person to respond. What is interesting is that experienced practitioners also held an expectation that additional help would arrive *'so when you have an unexplained collapse, Okay, I don't know what it is but I'll start with my basics, and working my way through the initial things and then hopefully somebody knows what is going on when help arrives'* (P9, Ob).

To summarise, this theme shows that there is an expectation that, once help is summoned, it will arrive and responsibility for managing a RCEE can be devolved to a practitioner who is perceived to have more experience and expertise. Conversely, those practitioners who identified gaps in their knowledge, regardless of experience, also identified that; they too, would be willing to pass the responsibility on. Having an identified lead in an emergency situation was identified as important and it remains unclear as to who the lead should be.

## 7.6 Summary of Findings

To summarise, the findings from qualitative interviews illuminate the way in which attributional factors help explain preparedness for RCEE. Explanatory inferences relating to participants perspectives of simulation identified the merits and challenges of internal and external forces.

The *fidelity* of equipment used during simulation, whilst offering useful cues to action, was not deemed to be important when applied to obstetric scenarios. The language used when considering the *realism* of equipment was interesting as mannequins were trivialised and scenarios were not associated with 'real life'. In connection with realism of the scenario the theme of *multi-professional working* also raised an important consideration in ensuring that team dynamics, within the simulation, mirror those in the clinical environment. A multi-professional approach to simulation was deemed beneficial but this did not need to be those with whom individuals worked on a regular basis.

The design, development and sequencing of simulation was assigned the novel term *simulation choreography* where the success of simulation lay in the hands of skilled facilitators and poor facilitation had a negative and lasting impact on the perception of simulation. A blame free approach was also identified as necessary in engaging participants.

It was clear that simulated training/education led to an overwhelming sense of *performance anxiety*; exacerbated by video recording of scenarios where the fear of making mistakes hindered performance. What wasn't clear was the way in which anxiety within a simulated scenario transferred (positively or negatively) to the clinical setting.

When considering **application to practice**, there were positive associations with the ability to make mistakes during simulated training and these highlight a potential for personal development without harming others. Mistakes in the clinical setting influence the development of training; how lessons learned from simulation transfers into clinical practice is unclear yet positive responses related to the opportunity to reflect on the training before a 'real life' situation occurs. Meanwhile, real life experiences were seen as being a catalyst for deeper learning and development.

When participants were prompted to consider **repetition** of training there was no consensus as to the ideal timeframe for revisiting clinical scenarios. It was clinical exposure and not simulation which participants attributed to their preparedness. When participants felt that they had regular exposure to, an experience of, a critical event there was greater **confidence gained** in perceived ability to respond. There appeared to be an increased confidence initially, following simulated training, with a potential for diminution over time. It is unclear as to the timeframe of perceived skill diminution. This will be discussed further in chapter 8. Surprisingly, responses relating to confidence were sparse with an overwhelming assertion of the anxiety provoking element of simulation.

Engagement with simulated training appeared to be influenced by a personal **approach to learning**; raising the argument for multiple teaching strategies in preparing for RCEE which would enable individuals to access training more suited to their approach. Where pre-training preparatory materials were provided this motivated individuals to engage, as did the prospect of formal assessment. It is interesting that preparation for training and not preparation for practice was a catalyst for engagement with learning. The desire to **not cause harm** and the provision of safe and effective care, motivated individuals to attend simulation based training. The study did not examine whether practise in a simulated way did indeed reduce actual harm to patients. Learning from poor outcomes appeared to focus attention and provided a catalyst to attend training and improve the efficiency of the team.

In addition to those findings relating to perceptions of simulation there were both internal and external attributions which help to explain how professionals prepare for and respond to RCEE. When reviewing findings relating to perspectives on simulation, clinical **guidelines** were identified as positively influencing perceptions of being up to date. When considering the impact on preparedness, clinical governance procedures were highlighted as an important approach to learning lessons from critical incidents. These procedures resulted in the formulation of clinical guidelines which were identified as positively influencing perception of preparedness; with particular focus on the important of algorithms and checklists. It also appeared that reassurance in

responding to RCEE is gained through **knowing the team** with whom one is working and in how the team functions.

The working **environment** was identified as helping and/or hindering perspectives of preparedness where the need to update appeared to compete with working hours, pace of work and changing clinical roles; and a familiarity with the environment appears important in being able to respond to critical events appropriately. **Timing** was considered in relation to frequency of clinical exposure and training, and this was identified as positively influencing perceptions of preparedness. The same was also true for recency of exposure and training which positively influenced confidence. It appears that with increased experience there is a perceived decrease in the need for training yet with this experience individual's move towards a leadership/management roles with less clinical exposure. There is some suggestion that training should increase in frequency where clinical exposure is limited.

Where participants identified their personal contribution to preparation for RCEE **debriefing and reflection** were identified as providing valuable insight into how care was managed. In connection with *simulation choreography*, debriefing and reflection following critical incidents was appreciated by the majority of participants; with attention being paid to the appropriate person, with the requisite skills, facilitating the review of care.

The internal attribution of **reliance on self** was evident yet the individual motivation to prepare for RCEE differed. There were few who identified professional responsibility and accountability and responses largely related to a need for self-efficacy. This was dependent on the situation and other people's expectations based on professional experience. Conversely, there was evidence of a **reliance on others**; where there was an expectation that, once help is summoned, it will arrive and responsibility for managing a RCEE can be devolved to a practitioner who is perceived to have more experience and expertise. On the other hand those practitioners who identified gaps in their knowledge, regardless of level of experience, also identified that they too would be willing to pass the responsibility on. Having an identified lead in an emergency situation was identified as important and it remained unclear as to who the lead should be.

The ability to recognise and respond to RCEE appeared to be related to increased clinical experience and this was attributed to the ability to undertake **anticipatory actions**. There were practitioners who demonstrated a higher self-efficacy in preparing for critical events as they were motivated to keep up to date with the evidence base (research, guidance etc.) and to attend training. There appeared to be an index of suspicion of deterioration based on a depth of understanding of normality. Limitations

in experience appeared to reduce confidence in preparedness and, in some cases, acted as a catalyst for further training and development.

The theme relating to ***experience and expertise*** illustrates a distortion when applying an attribution lens. There were causal attributions clearly identified as being internal to participants along with those which were external. Experience and expertise is an example being attributed to external factors such as exposure to emergency events (which are unstable and cannot be planned), the recency of this exposure and the restrictions on clinical working opportunities (for medical staff) which impact on exposure. Internal attributions related to the amount of clinical experience and this factored highly in perception of preparedness.

In connection with *experience and expertise*, ***knowledge*** was identified as an internal attribution in recognising and responding to RCEE and responses highlighted that this is a multi-faceted issue. Knowledge is developed, and lost, for a variety of reasons. There are obvious approaches to increasing knowledge e.g. reading, training, reflection and experience, yet how this is applied in the advent of a RCEE is unstable and unclear.

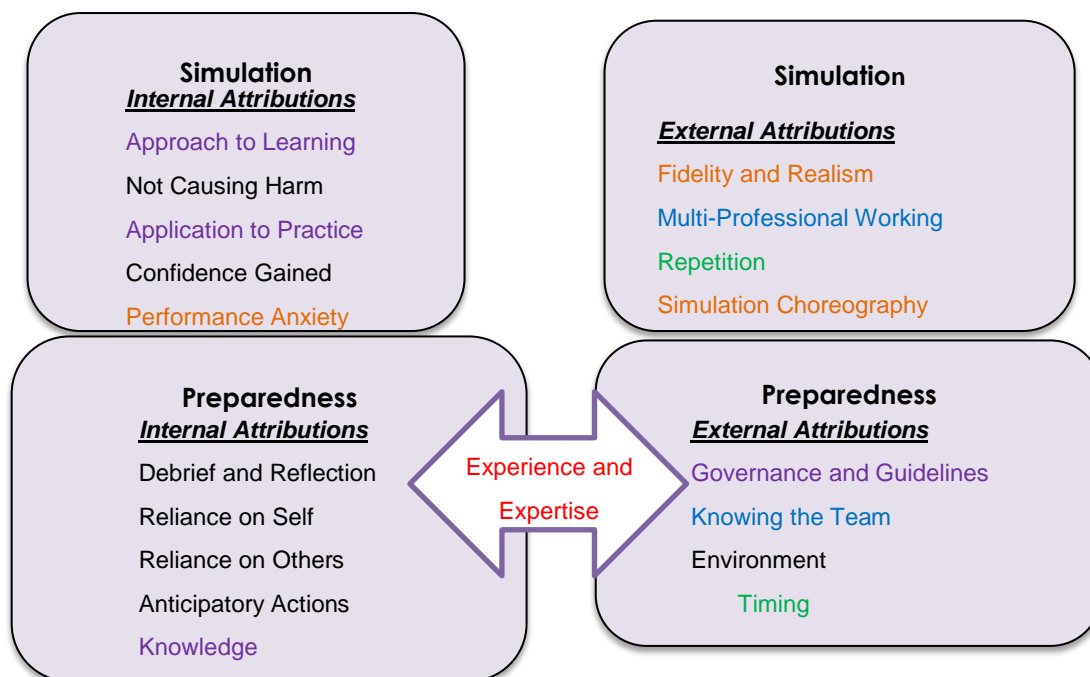
## **7.7 Summary of Chapter 7**

This chapter illuminated the findings from qualitative interviews using attribution theory as a framework for assigning internally or externally focused themes. From the summary of findings the aims for this phase are achieved in terms of enhancing understanding of the ways in which simulated education and training helps or hinders preparation for RCEE; and in explaining barriers and levers to perceptions of preparedness.

Overall, from the analysis of findings from this phase of the study, it becomes clear that the similarities in external attributions relating to perceptions of simulation are such that they can easily be grouped into one theme relating to the design, delivery and repetition of the simulated approach. Thus the term *simulation choreography* can be broadened to encompass multi-professional working, repetition and elements of realism. Figure 7.3 is a diagrammatic representation of the findings (where corresponding colours highlight similarities) which serves as a basic illustration of the key themes.

From this it can be seen that there are obvious connections; not only between internal and external attributes but also between the two domains of simulation and preparedness. The utility of applying the attribution, the ambiguity within the theory and

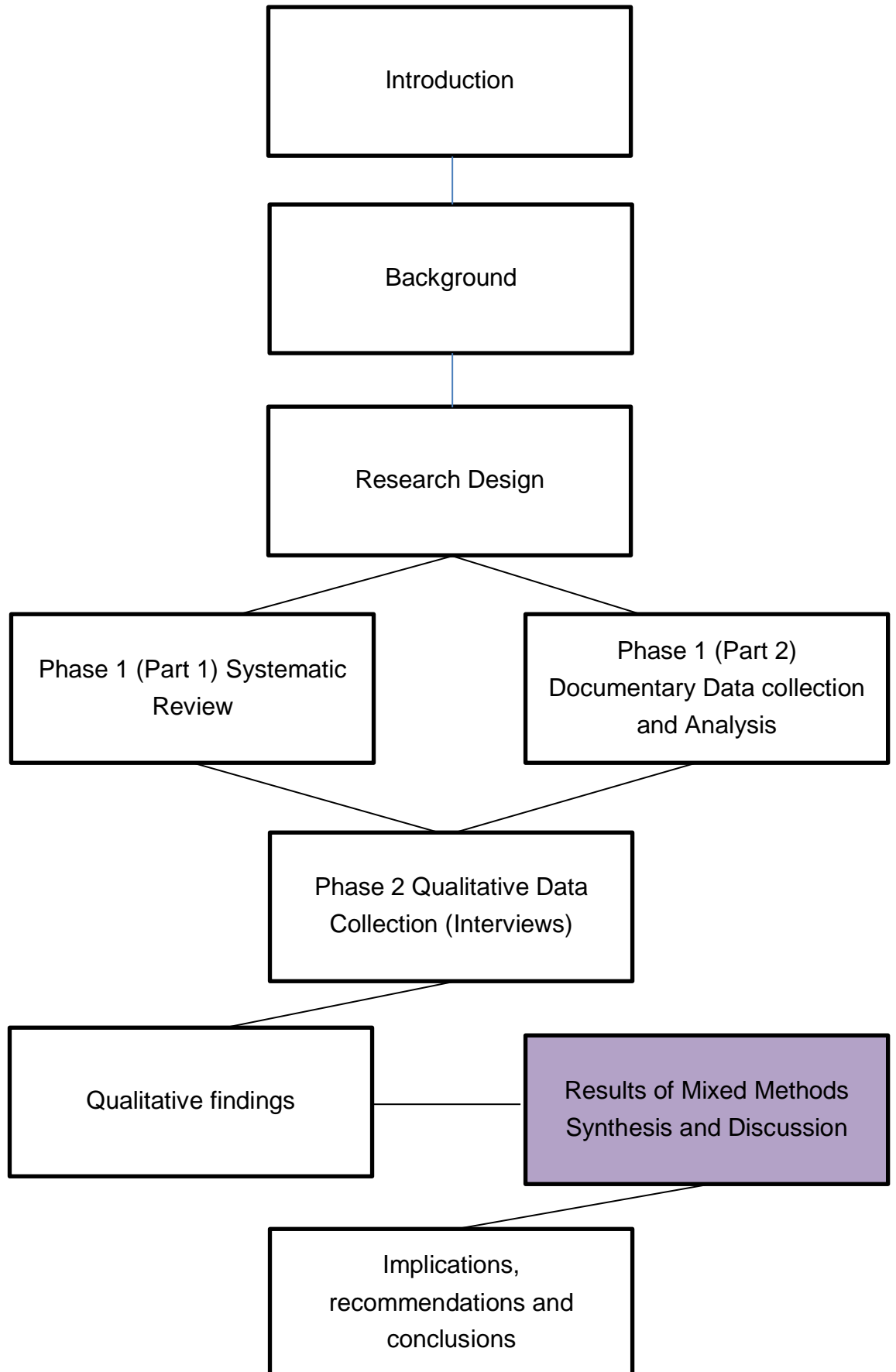
the multiplicity of attributions will be further evaluated when presenting the conclusion to the study in Chapter 9.



**Figure 7-3 Diagrammatic Summary of Findings from Phase 2**

The next chapter offers an integration of findings from phase 1 and 2 in this mixed methods study. This will show how the qualitative findings help to explain the quantitative findings with an overall synthesis in order to answer the research questions.





## Chapter 8 Mixed Methods Synthesis

*'Do what you can with what you have, where you are'*

*Theodore Roosevelt (1913)*

The preceding chapter (7) discussed the findings from qualitative interviews which helped to enhance understanding and explain the merits and challenges of training in a simulated way along with professional perspectives on their preparedness for RCEE.

This chapter presents a synthesis of findings across both phases of the study and, in order to address the aims of the thesis, includes an interpretation of these findings in relation to the literature and wider clinical context.

Following the tradition of explanatory, sequential mixed methods, evidence from quantitative (phase 1.1) and qualitative (phase 1.2) phases are integrated with qualitative findings (phase 2); the product being an iterative synthesis of overall results.

### **8.1 Achieving Integration within the Mixed Methods Study**

According to Denzin (2012) taking a pragmatic epistemological stance within the approach to research supports mixed methods inquiry. Indeed, many authors have offered pragmatism as an alternative epistemology as it lends itself to a practical and problem solving approach to methods or techniques in order to answer the research questions (Tashakkori & Teddlie 1998, Miller 2006, Creswell & Plano Clark 2007). Denzin (2012) goes on to suggest that meanings are not revealed through a specific methodology; here he suggests that a version of pragmatism is warranted which focusses on a practical approach to interpretative activity which focusses on the consequences of the inquiry. Howe (2012) conceives the integration of quantitative and qualitative data as bringing to bear different methods for different research questions; thus, pragmatically working towards a more comprehensive explanatory framework.

As discussed by Fetters et al (2013) mixed method designs provide tools for investigating complexity within healthcare and healthcare systems. As identified (in chapter 3) mixed methods studies draw upon both quantitative and qualitative designs in addressing research questions. Several authors suggest that it is the integration of design, data collection and interpretation that places value in mixed methods research (Bryman 2006, Creswell & Plano Clark 2011, Fetters et al 2013, and Creswell 2015).

In this explanatory sequential design, quantitative data, borne out of the systematic review, informed the qualitative data collection and analysis; thus, as described by Ivankova et al (2006), integration was achieved at the *design* level. Integration at the *methods* level is conceptualised by Creswell (2015) as involving either merging, building, explaining or embedding the approaches to data collection and analysis. These are captured in Table 8.1 and adapted from Creswell (2015).

Within this study the qualitative data collection was linked to the quantitative data at multiple points. Firstly the quantitative findings, from the systematic review, were *merged* with quantitative and qualitative findings from documentary analysis. Integration occurred within and between the two elements of phase 1 and this helped in *building* the data collection instrument for phase 2. This chapter shows how the qualitative findings help to *explain* findings from phase 1; therefore, integration is *embedded* at multiple points where each data set informs, questions and enhances the others.

**Table 8-1 Approaches to Integration in MMR.**

Approach	Description
Merging	Data links through analysis e.g. numerical data from questionnaires are integrated and contextualised with qualitative data from interviews.
Building	Data links through collection instruments e.g. data collection tools are designed based upon participant responses during interview
Explaining	Integration occurs when data borne out of a qualitative approach is used to explain that borne out of a quantitative approach.
Embedding	Data linked at multiple points in the study and may involve a combination of merging, building and explaining.

According to Fetters et al (2013) integration of quantitative and qualitative at the *interpretation* level occurs through either of the following approaches; *transformation* of the data from one form to another, *narrative* synthesis of the findings or through the visual medium of *joint display*. Creswell (2015) advocates joint displays as a means of pragmatically arranging results together in a visual format (table or graph) in order to allow the reader to compare and contrast results; thus enabling a determination of how data helps to explain the area of interest. At the first level of synthesis Table 8.2 offers a joint display of findings from both phases. This table demonstrates how qualitative findings help to explain the results from phase 1 and also identifies how these qualitative findings help to expand the explanation of preparation for RCEE and those issues highlighted (in red) provide the basis for ensuing discussion.

Table 8-2 Integration of Findings in a Joint Display

Phase 1 results (from systematic review and documentary analysis)	Qualitative Interviews Explaining Results from Phase 1 (relates to experiences of simulated practice)	Qualitative Interviews Expanding Explanation of Preparation for RCEE
<p>Simulation improves <b>performance</b> initially however, there is a trend towards <b>diminution</b> over time (systematic review)</p> <p>Theoretically participants could be unsuccessful in training, yet they were not tested in a way that could result in failure and repetition of learning (documentary analysis)</p>	<p>There was no consensus as to the ideal timeframe for <b>repetition</b>/revisiting clinical scenarios. It was <u>clinical exposure</u> and not simulation which participants attributed to their preparedness.</p> <p>With less than 5 years' experience practitioners wanted repetition of simulation every 3 to 6 months. With greater than 10 years' experience the required range was 1 to 3 years.</p> <p>Pre-training course materials appeared to motivate participants as did the prospect of assessment. Where there was no assessment of compliance with preparation the necessity to prepare was diminished and this affected engagement with simulation as a whole.</p>	<p><b>Timing</b> was considered in relation to frequency of clinical exposure and training and this was identified as positively influencing perceptions of preparedness. The same was also true for recency of exposure and training which positively influenced confidence. It appears that with increased experience there is a perceived decrease in the need for training yet with this experience individual's move towards a leadership/management roles with <u>less clinical exposure</u>. There is some suggestion that training should increase in frequency where clinical exposure is limited. <b>A dichotomy between level of clinical exposure and experience prevailed.</b></p> <p>The ability to recognise and respond to RCEE appeared to be related to increased clinical experience and this was attributed to the ability to undertake anticipatory actions. There were practitioners' who demonstrated a higher self-efficacy in preparing for critical events as they were motivated to keep up to date with the evidence base (e.g. research and guidance) and to attend training. There appeared to be an index of suspicion of deterioration based on a depth of understanding of normality. Limitations in experience appeared to reduce confidence in preparedness and, in some cases, acted as a catalyst for further training and development. There was greater sense of satisfaction with training where assessment of compliance with preparatory materials and performance was undertaken. <b>Motivation to prepare appears to be based on confidence in ability, clinical exposure and assessment of performance.</b></p>

Phase 1 results (from systematic review and documentary analysis)	Qualitative Interviews Explaining Results from Phase 1 (relates to experiences of simulated practice)	Qualitative Interviews Expanding Explanation of Preparation for RCEE
<p>The mechanism of simulation appears to be associated with <b>multiple learning strategies</b> (systematic review) with emphasis on working as a team (documentary analysis)</p>	<p>A <b>multi-professional approach</b> to <u>simulation</u> was deemed beneficial but this did not need to be those with whom individuals worked on a regular basis.</p>	<p>Reassurance in responding to RCEE <u>in the clinical setting</u> is gained through <b>knowing the team</b> with whom one is working and in how the team functions. <b>Team-working and communication appear to be enhanced within the clinical setting when there is a familiarity with the team and the environment.</b></p>
	<p>The design, development and sequencing of simulation was assigned the novel term <b>simulation choreography</b> where the success of simulation lay in the hands of skilled facilitators. Poor facilitation had a negative and lasting impact on the perception of simulation. A blame free approach was also identified as necessary in engaging participants.</p>	<p>In connection with <b>experience and expertise, knowledge</b> was identified as an internal attribution in recognising and responding to RCEE and responses highlighted that this is a multi-faceted issue. Knowledge is developed, and lost, for a variety of reasons. There was obvious approaches to increasing knowledge e.g. reading, training, reflection and experience, yet how this was applied in the advent of a RCEE is unstable and unclear. <b>A question which still needs to be addressed relates to how cues for pairing of training and practise can be optimised?</b></p>
	<p>Engagement with simulated training appeared to be influenced by a <b>personal approach to learning</b>; raising the argument for multiple teaching strategies in preparing for RCEE which would enable individuals to access training more suited to their approach. Where pre-training preparatory materials were provided this motivated individuals to engage, as did the prospect of formal assessment. It is interesting that preparation for training and not preparation for practice was a catalyst for engagement with learning.</p>	<p>The working <b>environment</b> was identified as helping and/or hindering perspectives of preparedness where the need to update appeared to compete with working hours, pace of work and changing clinical roles; and a familiarity with the environment appears important in being able to respond to critical events appropriately. <b>Potential epistemic injustice where the culture of the environment does not allow for learning to happen.</b></p>

Phase 1 results(from systematic review and documentary analysis)	Qualitative Interviews Explaining Results from Phase 1 (relates to experiences of simulated practice)	Qualitative Interviews Expanding Explanation of Preparation for RCEE
<p>Training through simulated means appears to lead to <b>increased confidence</b> in performance (systematic review) and participant evaluations suggest that simulated training is <b>enjoyable</b> (documentary analysis).</p>	<p>Simulated training/education led to an overwhelming sense of <b>performance anxiety</b>; exacerbated by video recording of scenarios where the fear of making mistakes hindered performance. <b>What wasn't clear was the way in which anxiety within a simulated scenario transferred (positively or negatively) to the clinical setting.</b></p> <p>There appeared to be an increased <b>confidence</b> initially, following simulated training, with a potential for diminution over time. <b>It is unclear as to the timeframe of perceived skill diminution.</b> Surprisingly, responses relating to confidence were sparse with an overwhelming assertion of the anxiety provoking element of simulation.</p>	<p>Where participants identified their personal contribution to preparation for RCEE <b>debriefing and reflection</b> were identified as providing valuable insight into how care was managed. In connection with simulation choreography, debriefing and reflection following critical incidents was appreciated by the majority of participants with attention being paid to the appropriate person, with the requisite skills, facilitating the review of care.</p> <p>The internal attribution of reliance on self was evident yet the individual motivation to prepare for RCEE differed. There were few who identified professional responsibility and accountability and responses largely related to a need for self-efficacy. This was dependent on the situation and other people's expectations based on professional experience. Conversely, there was evidence of a reliance on others; where there was an expectation that, once help is summoned, it will arrive and responsibility for managing a RCEE can be devolved to a practitioner who is perceived to have more experience and expertise. On the other hand, those practitioners who identified gaps in their knowledge, regardless of level of experience, also identified that, they too, would be willing to pass the responsibility on. Having an identified lead in an emergency situation was identified as important and it remained unclear as to who the lead should be. <b>Relates to lack of confidence!</b></p>

Phase 1 results (from systematic review and documentary analysis)	Qualitative Interviews Explaining Results from Phase 1 (relates to experiences of simulated practice)	Qualitative Interviews Expanding Explanation of Preparation for RCEE
<p>The value of simulation is situated in mirroring the <b>realism</b> of the clinical setting (and emergency scenario) and in allowing practise within a <b>safe environment</b> (systematic review and documentary analysis)</p>	<p><b>Fidelity of equipment used, whilst offering useful cues to action, was not deemed to be important</b> when applied to obstetric scenarios. The language used when considering the <b>realism</b> of equipment was interesting as mannequins were trivialised and scenarios were not associated with 'real life'. <b>Multi-professional working</b> also raised an important consideration in ensuring that team dynamics within the simulation mirror those in the clinical environment.</p>	<p><b>Clinical guidelines</b> were identified as positively influencing perceptions of being up to date. When considering the impact on preparedness, clinical governance procedures were highlighted as an important approach to learning lessons from critical incidents. Clinical guidelines were again identified as positively influencing perception of preparedness with particular focus on the important of algorithms and checklists.</p>
	<p>When considering <b>application to practice</b>, there were positive associations with the ability to <b>make mistakes</b> during simulated training and these highlight a potential for personal development without harming others. Mistakes in clinical practice influence the development of training. <b>No evidence for how lessons learned from simulation transfers into clinical practice is unclear</b> yet positive responses related to the opportunity to reflect on the training before a 'real life' situation occurs. Meanwhile, real life experiences were seen as being a catalyst for deeper learning and development.</p>	
	<p><b>Not causing harm</b> and the provision of safe and effective care, motivated individuals to attend simulation based training. <b>No evidence to support whether practise in a simulated way did indeed reduce actual harm to patients.</b> Learning from poor outcomes appeared to focus attention and provided a catalyst to attend training and improve the efficiency of the team.</p>	

Phase 1 results (from systematic review and documentary analysis)	Qualitative Interviews Explaining Results from Phase 1 (relates to experiences of simulated practice)	Qualitative Interviews Expanding Explanation of Preparation for RCEE
<p>Emphasis on <b>feedback</b> and not simulation as the key to learning through training (documentary analysis)</p>	<p>Accounts show that verbal feedback during and following simulation was welcomed with a shift in focus to the identification of good practise and areas for development.</p> <p>Here again, the emphasis was on the skills of the facilitator in providing constructive feedback.</p>	<p>Where feedback was omitted from the approach to training this highlighted the potential for practitioners to be unaware of how to correct their performance and, subsequently, be unprepared for responding to RCEE. <b>There is a potential for preparation to be co-constructed within and between the team through feedback.</b></p>



## 8.2 Discussion

Because of the explanatory, sequential nature of the study, findings from each phase have been discussed within chapters 4, 5 and 7. This final discussion draws together the subject, methods and findings; narratively weaving the results by placing them in dialogue with one another as suggested by Mertens & Hesse-Biber (2012). Mixed methods were adopted primarily to answer different research questions, the end product being greater than the constituent parts. The main aims of the thesis were to examine the concept of simulated learning and practise with the intent of understanding the role of simulation in real life management of rare, critical and emergency events (RCEE) during childbearing. This final discussion aims to draw together the results in answering the two research questions. It is clear that there are findings which help in answering both questions and any repetition is an intended consequence of answering the research questions.

### **Research Question 1; what are healthcare practitioners' experiences of simulated practise in order to respond to rare, critical and emergency events during childbearing?**

There are a plethora of studies (as discussed in chapter 2) which situate the value of simulation as allowing practise in a safe environment where skills developed will transfer into the clinical setting. Simulation appears to have been developed in order to reduce risk and improve patient safety with realism as an important facet of this approach. Indeed, the General Medical Council (GMC) in their blueprint for 'Tomorrow's Doctors' (GMC 2003) stated that skills laboratories provide an excellent setting for training. These assumptions are not verified within data borne out of this study. The evidence does not identify how often simulation should be repeated nor does it illuminate the effects on long term performance and retention of skills/knowledge.

The study identified many features of simulation which correspond to the review carried out by Issenberg et al (2005). These included the need for multiple learning strategies within training, the importance of feedback as an integral part of simulation and the opportunity to detect mistakes during training without consequence. As previously discussed (in Chapter 2) Issenberg's review was limited to high fidelity simulation within medical education and asserted that learners prefer realism within simulation as this

transfers to the 'real' patient (Issenberg et al, 2005). This study does not verify Issenberg's findings.

From the documentary analysis carried out in phase 1.2 of the study, the resulting typology situated simulation as being developed to mirror reality; with emphasis on practise within a safe environment and working as a team. This is in contrast to the findings from phase 2 where it was clear that fidelity of equipment provided useful cues to actions in some scenarios relating to basic skills e.g. basic life support, yet this was not deemed as important within obstetric focused scenarios.

Yuan et al (2011) offers a definition of low fidelity (less similar to reality e.g. training arms) intermediate fidelity (offering sounds without complexity and realism e.g. CPR mannequin) and high fidelity equipment which have actual physiological and pharmacological responses and recognises that the evidence to support transfer of the simulated experience into real life situations is limited. There are many studies which discuss the relative merits of high fidelity simulations such as increasing confidence and competence (Blum et al 2010, Yuan et al 2011) decreasing anxiety (Erickson et al, 2012) improving clinical judgement (Lasater, 2007) and detecting error whilst limiting negative consequences to patients (Nagle et al 2009).

Findings from this study also highlighted that simulated scenarios were related to play and the language used to describe mannequins e.g. doll and dummy, had a negative influence on the value placed on simulation. As far back as 350 (BCE) Aristotle offered the theory of associationism which asserted the law of similarity; essentially learning occurs when practise is hands on, of good quality, guided by instruction and, importantly, the learning situation is similar to the situation for which one is preparing (Olson & Hergenhahn, 1982). Later, Thorndike (1898 summarised by Bower & Higid, 1981) defined the learning process as the formation of associations where certain acts are connected with situations through an easily identifiable stimulus. Here there is an obvious connection to the findings from this study; where fidelity of equipment was not deemed as important yet the realism of the simulated scenario was considered to be requiring a degree of similitude when related to development of clinical dexterity. It is noteworthy that Mordi (2015), whilst mapping fidelity in simulation based medical education, found that there is no framework to guide optimal fidelity required during simulation and no theories of fidelity to aid individuals in achieving learning outcomes.

Where the development of teamwork was the intended outcome of simulation, elements of realism were less important. As teamwork is considered to be of recognised value in the delivery of safe and efficient health care (DH 2008a & 2008b) this has become an increasing focus within simulated training and education. Indeed Hoegl (2005) discussed the value of teamwork as engendering effective collaboration, communication, performance and effectiveness. Where team working is the intended goal of training, Edmondson (1999) refers to the need for 'collective efficacy' in improving motivation and effectiveness. Here 'collective efficacy' refers to the importance of participants feeling safe in giving constructive and critical feedback without fear of repercussion.

What is clear is the need for skilled facilitation of simulation and this related to consistency of the instructions, understanding of the background and learning needs of participants, and a blame free approach which allows participants to make mistakes without fear of consequence. Here there is a shift from the findings borne out of phase 1; which appeared to show a beneficial trend relating to increased confidence from and enjoyment of simulation (albeit with limited evidence to support this); to evidence from phase 2 which suggests that simulated education and training is overwhelmingly anxiety provoking. Anxiety was exacerbated by video recording of the scenario (for feedback purposes) where fear of making mistakes (in front of peers/colleagues) hindered performance. In a study of the effects of mannequin-based simulation on student comfort, Pugh et al (2009) asserted that, whilst anxiety can be beneficial by increasing motivation and adrenergic responses, it can also negatively affect information processing and the efficiency of learning. Finding that anxiety was associated with the potential of causing pain to patients, Pugh suggested that this was reduced when first year medical students received a simulated pelvic examination session. Whereas Blazeck (2011) offered the diagnosis of 'Simulation Anxiety Syndrome' suggesting that the most significant barrier to learning through simulation was related to fear of failure. Blazeck determined that, through skilled facilitation, where participants are fully briefed on the order of the day and what is expected of them, simulation anxiety can be reduced.

When synthesising the findings from this study there was lack of clarity regarding the ways in which anxiety within the simulated scenarios transferred (positively or negatively) into the 'real life' clinical setting. The majority of qualitative responses indicated that it was the video recording (being watched) for feedback purposes which increased anxiety as this was another means of identifying mistakes which, far from

being viewed as a learning opportunity, served to hinder development and, in some cases, led to participants shying away from being involved in the simulation altogether.

In the study of the effects of mannequin based simulation on student comfort levels, Pugh et al (2009) presented the frequency of 'fear of causing harm' to patients (151/304 participants = 49.7%) and found this to be the main cause of anxiety within practice and this acted as a stimulus for training. This corresponds to the theme of *not causing harm* where the need to provide safe and effective care was identified as a motivating force behind attendance at simulation based training. What remains unclear from this study, is whether practise in a simulated way did indeed reduce actual harm to patients. Meanwhile real life experiences were found to be a catalyst to attend training, improve the efficacy of the team and for deeper learning and development.

In a systematic review of the contribution of simulation to nursing student confidence Yuan et al (2011) reported that learning from simulation may not be realised until a real life situation is experienced. Likewise, this study found that simulation was useful to those where clinical exposure was lacking yet there was no consensus as to how regularly simulation should be repeated in relation to those events which were deemed a rarity. When asked about the ideal timeframe for frequency of training (within phase 2 of the study) there was little consensus and responses highlighted perceived differences dependent on clinical experiences. Where participants were less experienced there was an identified need to train more frequently i.e. every 3 to 6 months. There were responses which were in agreement with the status quo of the clinical site where yearly clinical skills training was the norm. During the analysis of findings from phase 2 it was noted that those with less than 5 years' experience tended to opt for regular repetition (3 to 6 months) and those with more than 10 years' experience identified an acceptable range of 1 to 3 years. All obstetric (medical) participants identified that their mandatory updating was out of date and there appeared to be a *laissez faire* acceptance of this. Further exploration of this would be useful in order to identify the motivations for attending training and reasons for not doing so and this is discussed further within the next chapter.

Another interesting finding relates to improvements in performance following simulation and the potential for diminution over time. From phase 1 the review data appeared to demonstrate improvement in performance initially following simulated practise yet none of the training programmes measured performance following simulation. Arthur et al (2007) define this loss or diminution of an acquired skill (or knowledge) as skill decay. Earlier, Arthur et al (1998) categorised the factors influencing retention of skills as task

related or methodological. Task related factors are those not easily able to be modified by trainers e.g. setting up of intra-venous infusions. Methodological factors can be modified e.g. method of assessment. Schmidt & Björk (1992) identified a limitation in the literature concerning skill decay in that acquisition of skill, subsequent decay and the potential for reacquisition are commonly studied as separate phenomenon. In a qualitative, cohort study of decay, transfer and reacquisition of complex skills amongst aviation professionals, Arthur et al (2007) found that the greater the period of non-use of an acquired skill, the greater the decay; recommending regular rehearsal of skills in a non-use period and suggesting a time frame of rehearsal every 8 weeks; a practice routinely applied to aviation training. Similarly to Arthur et al (2007) Veltman (2007) highlights approaches to training which can be adopted from aviation in improving and retaining skills acquisition for emergency events. These include improving the availability of simulations and simulators, for example in the clinical setting, and fostering a teamwork approach.

There is a dearth of literature relating to the most appropriate rehearsal period during non-use of skill within medical and healthcare literature. Clearly, there are cost and resource implications (in terms of release of time to train) inherent in adopting regular rehearsal of skills during non-use periods. Conversely, if there is perceived skill diminution, due to lack of clinical exposure or practise, it could be argued that there may be a greater cost implication if practitioners are unprepared to recognise and response to those events which are not commonplace.

Documentary evidence suggested that multi-professional team work during simulation enhances knowledge, confidence and performance but does not illuminate how or why this is the case. Despite many documents holding a theoretical stance that individuals could be unsuccessful during training this was not tested. Qualitative findings served to explain that pre-training course materials motivated participants to engage within simulation as did the prospect of assessment. Where participants reflected on training programmes which testing knowledge pre-training and then tested performance post-training there was compliance with the preparatory materials. Where there was a lack of assessment of compliance with pre-course preparation and/or performance testing (as was the case in the majority of participant experiences) this diminished engagement with simulation as a whole.

A key issue here appears to be related to the ways in which simulation is approached. Where pre-course preparation is required there needs to be testing of knowledge and/or performance to judge its value. This appears to be related to the overarching theme of *feedback* which informs participants of the extent to which learning objectives

of the simulation are met. Both Issenberg et al (2005) and Motola et al (2013) advocate feedback as a critical component of effective learning during simulation.

From this study, accounts show that verbal feedback during and following simulation was welcomed with a shift in focus to the identification of good practise and areas for development. Here again, the emphasis was on the skills of the facilitator in providing constructive feedback. Along with feedback relating to knowledge (pre and post simulation) Motola et al (2013) also emphasised debriefing as an important feedback mechanism following the simulated encounter.

In a study to determine where, in a simulated experience, knowledge gain occurred Shinnick et al (2011) found that the greater knowledge gains resulted from debriefing following simulation and not from the practical element. Whilst the work of Shinnick et al is limited by the range of previous simulated experiences of participants, they assert that it is the debriefing element of simulation which is the vital component. In relation to this thesis, there is an identified shift to this being related to the skilled facilitation of the feedback/debriefing. Where video recording was utilised for feedback this increased participant *performance anxiety*. Where feedback was facilitated in a blame free culture with identification of areas of good practise and those in need of development this was welcomed by participants. Poor facilitation of feedback/debrief had a negative and lasting impact on individuals perception of simulation and subsequent engagement. Where feedback was omitted from the approach to training this highlighted the potential for practitioners to be unaware of how to correct their performance and, subsequently, be unprepared for responding to RCEE.

Phase 1 of the study also identified the mechanism of simulation as being associated with multiple learning strategies and, importantly, the emphasis on working as a team. Motola et al (2013) identify teamwork as a key factor in patient safety and suggests that, as healthcare is delivered by teams, it is logical that those providing healthcare train as a team. Vincent et al (2010) suggests that, when working well together, teams are safer than individuals as they create the opportunity to check what is happening and pick up on where individual errors occur; allowing the opportunity for another member of the team to respond appropriately.

In a study of how distributed leadership improves decision making in an emergency Blenefeld & Gudela (2011) argued that, far from being hierarchical, leadership in an emergency is a team process where team decision making is vital. This resonates with the concept of 'human factors' in improving patient safety (see section 2.3.1) where importance is placed on the value of how teams function and communicate in patient safety related incidents. In a guide aimed at improving patient safety in healthcare Carthey and Clarke (2009) recommend that human factors be integrated into training

and education and, similarly to Veltman (2007) suggests that simulation provides an ideal opportunity for this. Whilst human factors was not the focus of the study, in a similar way team working was identified as an important mechanism of simulation and this is an area for potential development.

From phase 2 of the study it was found that a multi-professional approach to simulation was deemed beneficial to participants but this did not need to be those with whom individuals worked on a regular basis. The reason for this was the recognised need to understand the contribution of other member of the team and not necessarily to 'get to know' the team with whom they were training. This suggests that it is in the appreciation of individual roles and responsibilities during a RCEE that is an important learning point, promoting familiarity and increasing knowledge.

To summarise the findings in answering this research question, qualitative findings have been added to the typology of simulation (given in chapter 5) and Table 8.3 illustrates the final typology of simulation experiences.

**Table 8-3 Developed Typology of Simulation Experiences**

<b>Typology of Simulation Experiences</b>			
<b>Fidelity &amp; Realism</b>	<b>Safety</b>	<b>Feedback</b>	<b>Multi-Professional Working</b>
Simulation developed to mirror reality <i>where a degree of similitude is required but fidelity is not important</i>	Emphasis on practise within a safe environment <i>with emphasis on being safe to make mistakes without consequence</i>	Emphasis on feedback as the important factor <i>with skilled facilitation and a blame free approach</i>	Emphasis on working <i>and communicating</i> as a team <i>and not on the make-up of the team</i>

**Research Question 2: How do healthcare practitioners develop skills in order to prepare for and respond to rare, critical and emergency events during childbearing?**

Medical and healthcare education literature, relating to how clinicians move from novice to developing clinical judgements, focus on the importance of history taking and diagnostic thinking through dialogue with patients and colleagues (Gale & Marsden 1982, Bleakley et al 2003, Bowden 2006). Cope et al (2015a), in a study of how trainees interpret visual cues within the operating room, discuss a deductive processing by practitioners which depend upon a 'library' of exemplars held by a more experienced practitioner. Findings presented in this thesis identified that recognition of an emergent event, and subsequent response, is a multi-faceted issue where knowledge was developed, and lost, for a variety of reasons. Cope et al (2015b) identified a developed factual knowledge, honed motor skills, in terms of precision and accuracy of movements, and the ability to make meanings out of what is being seen as responsible for how surgeons learn in the operating room.

Drawing parallels with Cope et al (2015a) the ability to recognise and respond to RCEE appeared to be related to increased clinical experience and this was attributed to the ability to undertake anticipatory actions. This implies an acquisition of skill commensurate with experience, a notion for which there is a plethora of available literature (Schmidt et al 1990, Ericsson et al 1993, Ericsson & Lehmann 1996, Ericsson & Smith 1991, Ericsson 2003, Ericsson et al 2007, Feddock 2007, Edwards 2010 and Edwards & Nicoll 2011) Whilst there was an overall appreciation of the need to remain up-to-date with best practise and evidence, not all practitioners stated that they were able to achieve this. There were practitioners who demonstrated a higher self-efficacy in preparing for critical events as they were motivated to keep up to date with the evidence base (e.g. research and guidance) and to attend training. There was an increased index of suspicion of deterioration which appeared to be based on a depth of understanding of normality. When considering the motivating factors behind professional preparation for RCEE, limitations in experience appeared to reduce confidence in preparedness and, in some cases, acted as a catalyst for further training and development. These perceived limitations in experience appeared related to the timing and frequency of clinical exposure and training and this was identified as positively influencing perceptions of preparedness. The same was also true for recency of exposure and training which positively influenced confidence.



These findings echo the work of Ericsson et al (2003) who theorised that through repetition basic skills become honed over years and, coupled with increasing complexity, this results in developed expertise and, therefore, confidence in ability.

There was an obvious dichotomy emerging, as with increased experience there is a perceived decrease in the need for training yet with this experience individual's move towards a leadership/management roles with less clinical exposure. There is some suggestion here that training should increase in frequency where clinical exposure is limited and this could be true regardless of level of clinical experience. Here, experienced-based learning cannot be ignored. Historically, educational thinking around experiential learning has been influenced by the work of Dewey (1938) who argued that there is an 'organic connection' between education and the personal experiences (in practice) of the individual. Anderson et al (1995) amplifies the work of Dewey by suggesting that it is through active reflection and application of experience that learning occurs. Reflection and debriefing are re-visited later in the chapter.

Another interesting finding was the reassurance in responding to RCEE gained by practitioners through knowing the team with whom one is working and in how the team functions. This is in contrast to the findings relating to multi-professional working during simulation; where a familiarity with the training team was viewed as less important. Here the differences in levels of self-efficacy were evident and individual's motivations to prepare for RCEE differed. There were few who identified professional responsibility and accountability and responses largely related to what individuals perceived as being expected of them from others. This was dependent on the environment (acute care or community setting) and other people's expectations based on professional experience.

Where participants identified their personal contribution to preparation for RCEE, debriefing and reflection were identified as providing valuable insight into how care was managed. In connection with simulation choreography, debriefing and reflection following critical incidents was appreciated by the majority of participants, with attention being paid to the appropriate person, with the requisite skills, facilitating the review of care. In a concept analysis of debriefing as a learning process Dreifuerst (2009) argues that debrief promotes reflection, allows analysis of personal assumptions and thus enhances practise. Earlier work by Schon (1983) positioned debriefing in allowing thoughts in action and on action, in order to enhance clinical reasoning and judgements.

Here parallels can be drawn with earlier findings relating to appropriate facilitation of simulated training where the focus is on the most appropriate lead and a blame free culture. Vincent and Amalberti (2016) in an examination of critical incident analysis highlighted initial reactions to critical incidents and accidents as engendering a blame culture. Earlier work by Reason (1997) and Vincent et al (2000) revealed that, where

critical incidents arose, these could be attributed to environmental or organisational contexts. And so it appears that practitioners recognise the need to be prepared for RCEE and welcome critical analysis and debriefing in order to facilitate this. The prevailing culture of consequence and blame, within training and the clinical setting, appears to be stifling the analysis of personal and team performance and thus, the development of practice.

Conversely, there was evidence of a reliance on others where there was an expectation that, once help is summoned, it will arrive, and responsibility for managing a RCEE can be devolved to a practitioner who is perceived to have more experience and expertise. On the other hand, those practitioners who identified gaps in their knowledge, regardless of level of experience, also identified that; they too, would be willing to pass the responsibility on. This would appear to be a reasonable response were it not for the fact that this was the response of all participants regardless of role and level of experience. The common perception that 'someone will come' was perhaps mediated by the fact that all participants worked within a delivery suite environment where it would not be unreasonable to assume that, once summoned, help would arrive. There were no guarantees, however, that this help would be timely or a practitioner with greater experience/exposure to a particular event. Here, it was unclear as to whether this related to practitioner not developing the requisite skills in recognising and responding to RCEE; or if they had, but only to a point, thus necessitating the need for assistance from others.

The role of the clinical environment in skills acquisition proved interesting as the demands of the clinical environment were a powerful factor in the perception of preparedness; where service provision took precedence over the uptake of development opportunities and this appeared to be a worrying trend.

The working environment was identified as helping and/or hindering perspectives of preparedness where the need to update appeared to compete with working hours, pace of work and changing clinical roles. A familiarity with the environment appeared to be important in being able to respond to critical events appropriately. Here there appears to be an epistemic injustice where the culture of the working environment hinders learning and development. The challenge appears to lie in reconciling service provision with the need to provide appropriate and timely training and development opportunities for staff.

With a safety focus, clinical guidelines were also identified as positively influencing perceptions of being up to date. When considering the impact on preparedness, clinical governance procedures were again highlighted as an important approach to learning lessons from critical incidents. Clinical guidelines were again identified as positively influencing perception of preparedness with particular focus on the importance of algorithms and checklists. Gawande (2009) considered the usefulness of checklists in the business world and how this approach could be practically applied to healthcare. Gawande extols the virtue of checklists as a practical communication and confirmation amongst members of a team designed at reducing error and this approach has been successfully applied within the operating theatre setting over recent years with success. There is an opportunity to develop the approach to responding to RCEE. This could include greater emphasis on checklists, where the responsibility for reading each step in the process of responding, and checking off the requisite steps, need not lie in the hands of the most experienced practitioner. This is an area worthy of further exploration and adoption within training and education which will be discussed further within the next chapter.

Overall, the verbal accounts from practitioners during qualitative interviews revealed how skills acquisition for the recognition and response to RCEE are influenced by the pressures and challenges of contemporary working practices. It was clear that there are commonly held beliefs relating to experience and expertise where preparedness was attributed to clinical exposure. This 'exposure' was not measured in terms of years of experience but in exposure to a particular event and this could occur at any point in an individual's career.

The perceptions of what is considered to be a rare event (identified in Chapter 7.3) did not mirror those events for which practitioners trained for in a simulated way and on a yearly basis. It was clear that training needed to be relevant to those events not commonly experienced and, with increasing experience; practitioners appeared to develop an increasing ambivalence to the (yearly) mandatory training which focussed on the same critical events with little development over time.

### 8.3 Summary of Chapter 8

This chapter presented a synthesis of findings across both phases of the study and, in order to address the aims of the thesis, included an interpretation of these findings in relation to the literature and wider clinical context.

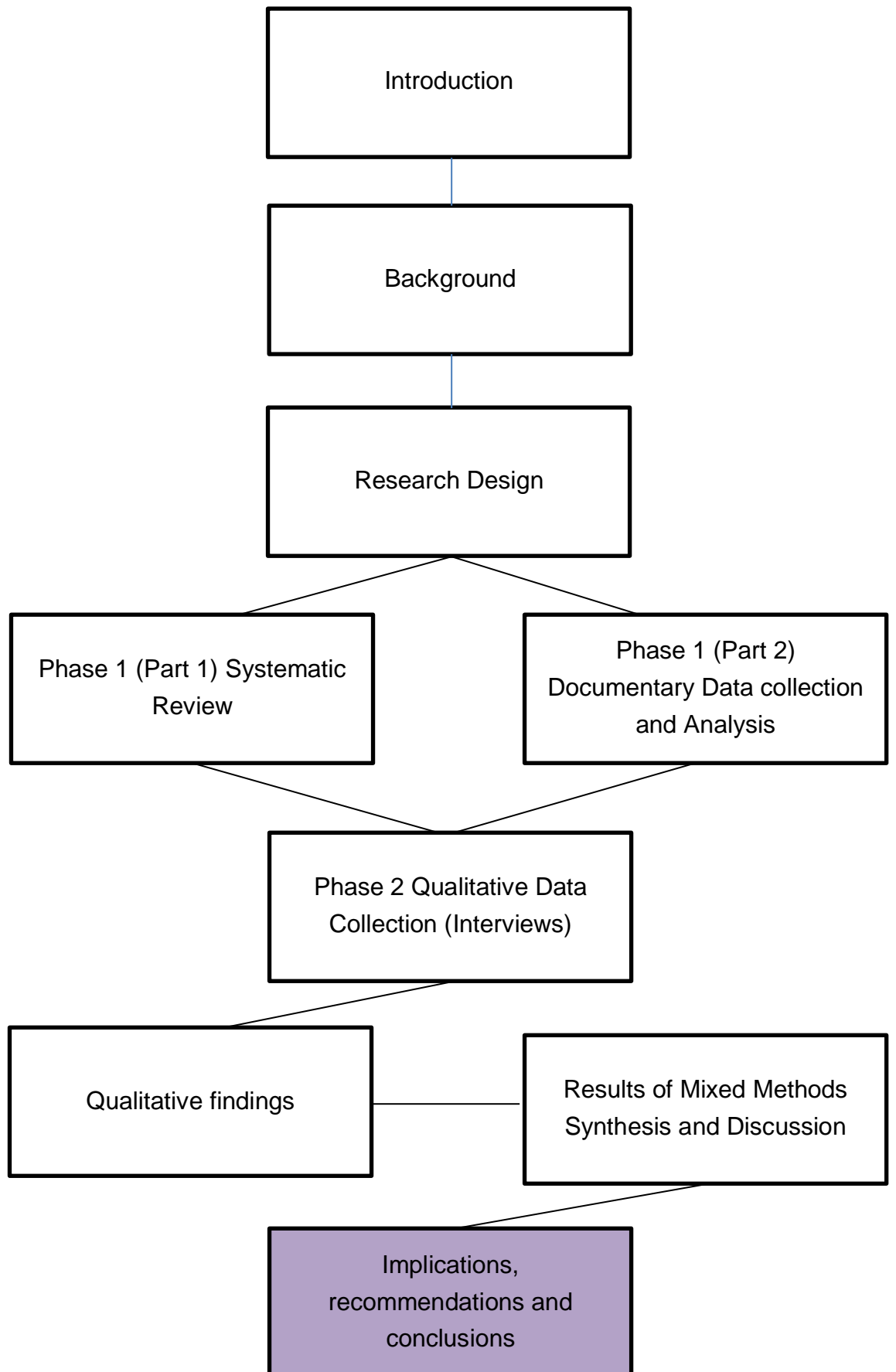
Following the tradition of explanatory, sequential mixed methods, evidence from quantitative (phase 1.1) and qualitative (phase 1.2) phases are integrated with qualitative findings (phase 2); the product being a joint display and iterative synthesis of overall results. Within the study there were multiple points where integration occurred; these included the design level, building of data collection instruments and in explanation of the findings.

Key issues emerging from the findings include the following;

- Within the literature, there is a lack of robust evidence relating to the effect of simulation on professional preparation for RCEE.
- The short term outcome of simulated training/education is an initial improvement in knowledge and performance yet questions remain as to how and when this diminishes.
- 'Real life' exposure offers the greatest learning opportunity. This may be clinical exposure and also debriefing and reflections following critical incidents.
- Algorithms and checklists which are developed through clinical governance processes are valued.
- There appears to be a devolved responsibility where, once summoned, responsibility for providing care would be assumed by those with more experience in attendance.
- Experienced practitioners tended to have greater managerial focus to their roles which limited their recency of clinical exposure and prioritisation of training updates.
- The 'busyness' of the clinical environment diminished the importance placed on attending training due to the challenges of competing demands.
- Knowing the team with whom one is working is reassuring and a multi-professional approach to training is valued yet, conversely, this does not necessarily need to be the team with whom one is working.
- A blame free approach to both debriefing (following clinical incidents) and during simulated training is a necessary step in developing collaborative team working.

- Within simulation there needs to be some degree of similitude with the clinical scenario yet higher fidelity equipment is not important for obstetric emergency scenarios. Practitioners indicated that simulated training/education was linked to play and this trivialised the scenarios.
- Where pre-training preparatory materials were provided there was limited assessment of compliance with this preparation. This was felt to be important in order to focus attention on its value. Where there was post-training assessment of knowledge and performance, this too heightened the value placed on simulation and increased engagement.
- The ability to recognise and respond to RCEE appeared to be related to increased clinical experience and this was attributed to the ability to undertake anticipatory actions. There were practitioners who demonstrated a higher self-efficacy in preparing for critical events as they were motivated to keep up to date with the evidence base (research, guidance etc.) and to attend training. There appeared to be an index of suspicion of deterioration based on a depth of understanding of normality. Limitations in experience appeared to reduce confidence in preparedness and in some cases, acted as a catalyst for further training and development.

The next chapter will bring together the integrated findings from this chapter in identifying the specific contribution of the study for clinical practice and training/education development. With this there will also be recommendations for further inquiry.



## Chapter 9 Implications, Recommendations and Conclusions

*‘Life gives us experiences for development. Appreciate the lessons and be a learner’*

*Lailah Gifty Akita (2015)*

The previous chapter (8) presented a synthesis of the findings across both phases of this explanatory, sequential mixed methods study and offered an interpretation of these findings in relation to the literature and wider context.

This chapter works through the implications of the findings in relation to professional preparation for rare/critical events. This does not claim to be the panacea but serves as a debate on how the findings can influence and have the potential to improve clinical practise and training/education. Recommendations for future research in this area are also proposed along with an identification of methodological issues in conducting this study.

### 9.1 Main aims of the thesis

The main aims of the thesis were to examine the concept of simulated learning and practise with the intent of understanding the role of simulation in real life management of rare, critical and emergency events (RCEE) during childbearing.

This study’s unique contribution to the existing body of evidence includes the following;

- Identification of the lack of robust evidence relating to the effect of simulation on professional preparation for events which occur rarely and where comparisons are made.
- The novel consideration of contextual conditions of training through framework analysis of curricula.
- The first study to explore practitioner experiences of preparation for RCEE through mixed methods inquiry.

Further explanation follows with identification of key findings along with the implications for clinical practice, training/education and further inquiry.

The study first explored the effects of simulation on the preparation for rare, critical and emergency events through a systematic review of the literature where comparisons with other forms of training/education were made (chapter 4). The findings of the review identified that there is a lack of robust evidence relating to the effect of simulation on professional preparation for events which occur rarely and may have catastrophic consequences for all involved.

Although a number of studies have considered the outcomes of simulated training/education this is the only study to date which considers the contextual conditions of training provision through the analysis of curricula documentation using a framework approach (chapter 5). From this data driven framework three typologies emerged. These related to the underlying pedagogy of simulated training programmes, a typology of simulation itself and also of the potential/demonstrable outcomes of training. The findings from this analysis were synthesised with those borne out of the quantitative systematic review. The evidence presented simulation as realistic and claimed that it afforded the opportunity to practise in a safe environment and translate this into improved patient care. Short-term outcomes also suggested an improvement in knowledge and performance initially and questions remained as to how and when this diminishes. Qualitative dimensions asserted that simulated training is enjoyable for participants and increases confidence although the evidence to support this was weak due to this being noted by researchers through observation and reported as a finding.

This study is also the first to explore the experiences of healthcare practitioners in the preparation for RCEE during childbearing through mixed methods inquiry. This was achieved through a sequential phase using semi-structured qualitative interviews (chapter 6). Using attribution theory as a tool for structuring the analysis of data, findings illuminated healthcare professionals' perspectives of simulation and their preparedness for RCEE which were considered to be both related to self (internal) and/or deemed to be from an outside force (external- chapter 7).

Following the tradition of explanatory, sequential mixed methods inquiry, evidence from both phases of the study was integrated at multiple points with the study (chapter 8) in answering the research questions. Essentially, the conclusions highlighted ambiguity between data borne out of phase 1 of the study (in terms of the features of simulated training/education programmes) and the perceptions of healthcare professionals (in terms of their perception in relating to the usefulness of simulation). When considering professional preparation for RCEE, verbal accounts from practitioners revealed the challenges and pressures faced in being prepared to recognise and respond to RCEE.

In offering a conclusion to the thesis; what follows are recommendations for how the findings might influence clinical practice and the development of training/education provision. Consideration is also given to those questions which remain unanswered or have evolved from the study findings and how further research might help to provide the answers.



## 9.2 Methodological Issues

In order to ensure transparency to the claims made there are methodological issues which may pose as limitations to the overall study as follows;

- The aim of the systematic review was to synthesise the evidence relating to preparation for RCEE from a range of professional disciplines which adopt simulation into their training and development. As the intention was to review literature which included a comparison of simulation with other forms of education and training this resulted in an unintended intrinsic limitation on the review. Within the aviation and engineering literature comparisons could not be found and it can be theorised that this is due to simulation being the habitual approach to disaster/emergency preparedness within these industries. The introduction of a comparator at the screening phase logically excluded the majority of this body of evidence. As a consequence, the systematic review did not capture the evidence relating to the effects of simulation on the preparation of individuals from a range of professions. Aviation and petroleum engineering (on oil rigs) adopt simulation strategies to prepare for critical events which, whilst rare, have the potential for catastrophic outcomes for all involved; much in the same way as healthcare. Exploration of the effects of these simulation strategies may have yielded useful insights which could be applied to healthcare professionals. Further consideration must be given to review of the evidence relating to factors and uses of simulation within aviation which lead to learning and this could be synthesised with what is known about medical simulation.
- The question remains as to whether newly acquired knowledge and skills are being utilised in everyday practise? Rare events are, by their very nature, difficult to engage in deliberately and repetitively within professional practice. The ideal time frame between simulations, therefore, should be questioned; especially during periods of non-use of specific clinical skills. As critical and emergency events are stressful the introduction of stress training within simulation (as adopted in the field of aviation) could be considered when preparing those professionals who may be called to deal with these events. Unfortunately, this was not given due consideration within the scope of the systematic review.
- Ethical approval was sought, within phase 1.2 of the study (documentary analysis) for the observation of simulated training programmes. The rationale

for this was to gather important items of interest which were missing from the data coverage within curricula documents. The ethical approval did not extend to a focus on the discourse within the simulated training nor on the participant performance. On reflection, this held the potential of yielding rich data as comments made by training facilitators and the reactions of trainees, which could not be included within the findings or in influencing the qualitative interview topic guide, were extremely thought provoking and served to enhance the justification of this study.

- A vignette was developed as a non-threatening tool to allow exploration of responses to critical events in context during the qualitative interviews. The questions were focused on allowing participants to discuss their thought processes in terms of what they were drawing upon in relation to the critical event (training, knowledge, experience etc.) it was not envisaged that this would feel like a test of the appropriateness of the actions of participants. Despite this being reiterated to participants it was obvious that the introduction of the vignette stifled the interview process; interviews appeared stilted following the introduction of the vignette and depth of responses were lacking. Following the first three interviews (where the vignette was used) each participant stated that they felt intimidated by the vignette and enquired as to whether they had responded correctly. Non-verbal cues also indicated a heightened anxiety amongst participants. Following discussion with supervisors, this was removed from the data collection process. A key learning point arises from the clinical focus of the vignette, where there was potential for practitioners to feel as though their knowledge was somehow being tested rather than the vignette acting as a prompt for practitioners to reflect in how they know the correct responses.
- The nature of taking quotations out of interview transcripts, whilst being useful for illumination of findings, holds the potential to draw a veil over the bigger picture or to lose the subtle nuances within what is being said. In part, lengthy quotes were included in order to mitigate this (chapter 7) but not always. The main point to note here is that decisions were made as to which quotes provided evidence for bigger picture findings whilst recognising that there many examples which were not included for pragmatic reasons.

- Attribution theory as a tool for structuring analysis was not without its limitations. The key issue being the variation between individuals as to whether an attribution could be considered as stable or unstable. Similarly, there was identified blurring between external and internal attributions; an example being the shift in preparedness for critical events dependent on clinical experience. There were multiple necessary and multiple sufficient causal attributions to be considered by individuals. Recognising that blurring existed, the multiplicities of attributions were evaluated when presenting the results.
  
- Reading around the integration of findings within mixed methods studies was disappointing as the guidance is, in part, somewhat superficial. Decision making around the approach to integration necessitated attendance at a research roundtable where, again, there appeared to be much ambiguity as to the most appropriate approach. Whereas integration can be clearly demonstrated within the study design, development of data collecting instruments and in embedding at multiple points, where each data set informs, questions and enhances the others, the overall synthesis of study findings appears limited by the theoretical case for and the approach to integration.
  
- The qualitative findings of the study are based on the responses of healthcare practitioners from one NHS Trust; therefore care must be taken in transferring the findings to all professionals tasked with recognising and responding to RCEE. There is a potential for participant subjectivity based on the culture of the clinical environment, potential conflicts and challenges in accessing training and in the approach to training and development within the clinical site. Findings from the semi-structured interviews are, therefore, situated in the context and situation of the clinical environment.

### **9.2.1 Reflexive thoughts**

Being a midwife, a supervisor of midwives, an academic and a mother will, undoubtedly, mean that there was a subjective viewpoint from the onset of the study. According to Flick (2009) demonstrating reflexivity of the researcher (through reflection on actions and observations) and of the research (through identifying how this informs the findings) is an explicit part of any inquiry. Through the immersion of myself in the research process and phenomena to be studied, caution was exercised regarding

personal theoretical positioning; where there was danger of missing out elements from findings, in order to convince others of presuppositions, and referencing some explanations over others as described by Taylor & White (2000). Throughout the study a reflective diary was kept; as advocated by Strauss (1987) as a means of capturing the experience of undertaking the study and identifying potential influences on interpretation. This helped in gaining a balanced perspective during each phase of the study and also in informing discussions with the supervisory team.

During data collection, through qualitative interviews, there was recognition of a vested interest in the clinical site due to a longstanding role as a supervisor of midwives. This held the potential of limiting the ability to develop diverse perspectives on coding data and developing themes. This was presented to the supervisory team during regular meetings and strategies were developed in order to negate this effect on the quality of the study. Reflexivity during the qualitative data collection process was discussed in chapter 6 (section 6.3). The coding of transcripts was also reviewed by an independent researcher where feedback confirmed a high level of agreement with the themes and sub themes.

There was recognition of the potential to hear or see something within clinical practice, which would be in conflict with my role as a midwife and supervisor of midwives. Clear boundaries were identified regarding actions should this have arisen and these were detailed within the ethical review form. Of greater concern was the potential for participants to feel stifled in their ability to speak openly during the interview process, or to feel coerced to participate, where the range of additional roles were known to them. There were attempts to mitigate this through the available participant information and initial invitation being sent by a third party. Perhaps this is an inherent limitation of the study where access to an alternative clinical site may have resulted in a broader range of perspectives.

The transparency in the way in which the interview was conducted and reviewed, hopefully goes some way to demonstrate quality assurance and methodological openness.

### **9.3 Implications for Clinical Practise**

A significant finding of the study, which arose from the qualitative interviews, related to the impact of learning through experience with 'real life' being perceived as offering greatest learning opportunity. The 'real life' in question was not only direct clinical exposure but also related to case based reflections and debriefing following critical incidents. Clinical governance procedures appear to work where there is a blame free approach and participants welcomed algorithms and checklists which were developed following these externally driven processes.

Here, the implication for clinical practise centres on the virtue of checklists as a practical communication and confirmation tool during a critical event. As checklists have been successfully adopted into operating department procedures there is an opportunity to develop a similar approach in areas where preparedness for critical events is warranted. As, by their very nature, some events are less common than others checklists could prove useful in focusing attention on key responses which may not necessarily be automatic to practitioners.

A checklist would require an individual being responsible for reading aloud clear commands for others to carry out. There needs to be consideration given to the most appropriate person to do this and it could be argued that this would not necessarily need to be the most experienced practitioner. Becoming familiar with checklists at an early stage in one's practise, through being responsible for reading aloud, could prove useful for knowledge development; this could also mean that those with more experience are free to take the appropriate actions during an event. This would be an example of a safety procedure transferring into clinical practise.

Currently there appears to be an over-reliance on the notion that, once summoned, help will arrive. This was true for all healthcare practitioners at all levels of professional experience; it must be recognised, however, that not all clinical areas have ready access to a multi-disciplinary team e.g. community, and not all areas have staff with experience of a wide range of critical events e.g. antenatal clinic. Again, the value of checklists can be applied here, as an aid to focused actions in the absence, in the short term, of additional assistance. There appear to be two implications here; firstly the question of whether the current approach to training and education is appropriate for all practitioners. A 'one size fits all' approach may well fall short of meeting needs dependent on the area of clinical practise. This will be discussed further when considering the implications for training and education. The second implication is much more concerning and relates to questions around whether practitioners are prepared to respond to RCEE. This apparent devolved responsibility leads to questions around who is ultimately responsible for care.

The NMC and GMC are very clear in their regulation relating to professional roles and responsibilities; the onus is on those attending childbearing women to be responsible for care (GMC 2014, NMC 2015) Here there is an obvious dichotomy between the statutory professional duties and the developed responsibility where those with more clinical experience are deemed to have greater responsibility. It is most noteworthy that those with more experience also recognised their limited recent exposure to clinical

practise (due to a greater managerial focus of their role) and, therefore, an internally perceived lack of up-to-date knowledge and skills.

The study also identified an apparent *laissez faire* approach to updating amongst medical practitioners which contrasts with the standards for knowledge skills and performance laid out by the GMC (2014) which stipulates (in much the same way as for midwives) that doctors must keep professional skills up to date (domain 1.8) and take regular part in activities designed to develop competence and performance (domain 1.9). In part, this could be a symptom of the value placed on simulated training and education by practitioners. It would not be unreasonable to conclude that, if the approach to simulated training remains largely unchanged or unmodified over the years, this may diminish the value placed on training in this way by those practitioners with more experience.

Here there is an implication for the development of training and education (and for safety within the clinical setting) if practitioners are not updated or exposed to learning opportunities due to their developed roles. The study also identified the clinical environment as impacting on an individual's ability to attend training and education where clinical demands lessened the importance placed on updating e.g. if the clinical areas were busy training was not prioritised. Obviously patient safety and care provision are of paramount importance yet this may well be compromised when clinical staff are not enabled to update/develop their skills through training. Vincent & Amalberti (2016) discuss the value of risk control in promoting safer healthcare using an illustrative example of the potential of emphasising safe standards while allowing the reduction of other (less important) work in order to protect both patients and staff. There may be times when such restrictions on the conditions of operation of a clinical area may well be necessary in order to facilitate staff development.

This would necessitate a movement in the notion of patient safety being linked to direct care provision and in risk management/reduction, where the focus appears to be on error and blame, to a more broadened focus on the multi-faceted nature of safety which is inextricably linked to professional knowledge and skills.

Finally, reassurance in responding to RCEE in practice was identified as being gained through knowing the team with whom one is working and in having confidence in how the team functions. Within the clinical setting there is the opportunity to focus on improving team working and communication with emphasis on the importance of the complimentary skills offered by members of the multi-disciplinary team. Throughout this

study the language of 'blame' appeared to have lasting negative effect on practitioner confidence in their performance, and the fear of making mistakes appeared to hinder their performance. A renewed emphasis on learning from experiences together as a 'team' and a movement away from individual blame holds the potential to develop collaborative team working.

#### **9.4 Implications for Training/Education**

A simulated approach to training and education is commonly situated in the value offered from scenarios which mirror reality and the increasing fidelity of equipment in supporting the simulation. Findings from this study showed that high fidelity equipment e.g. mannequins which offered actual physiological responses, are not deemed to be important for obstetric emergency scenarios. Practitioners indicated that simulated training/education was linked to 'play' which, in some way, trivialised the scenarios.

In light of limited evidence, from this study and wider literature, supporting the increasing use of high fidelity equipment, the justification of such an expense should be questioned in resource constrained clinical and/or higher education arenas.

This study adopted the novel term 'simulation choreography' to capture the scripting and staging of simulation as there were processes related to the design, delivery and development of simulation which appeared to be under the radar i.e. not obvious within the wider literature. Where the intended outcomes of simulation relate to clinical dexterity then some degree of similitude (in the scenarios and equipment) is required; whereas if teamwork, for example, is the intended focus then realism is less important. The scripting of simulation should, therefore, be outcomes focused.

The staging of simulation often includes some form of pre-training preparation; yet there appeared to be minimal confirmation of compliance with this or initial assessment of knowledge/skills. In the same way there was a theoretical positioning that an individual could be unsuccessful within the scenario. Where this was not tested engagement with the training was diminished. It is clear that assessment/testing increases engagement and, if the intended outcomes are to guide the development (or scripting) of simulated training then they should also provide focus for the assessment of knowledge/skills acquisition.

There is a propensity to focus professional development updates relating to childbearing emergencies on the same clinical scenarios year on year. These more commonly include postpartum haemorrhage, shoulder dystocia, breech presentation and eclamptic fit. These events are also those more commonly experienced in practise

and so, training for these events seems a reasonable approach. On the other hand, it could be argued that, if you are less likely to experience an event in the clinical setting, these are precisely the types of events which require preparation through training. Here examples could include thrombosis and thromboembolism, amniotic fluid embolism and sepsis; all of which remain leading causes of maternal death in the UK (Knight et al, 2015).

Of course, wherever there is an increase in training needs, there is an increase in funding need so there is opportunity to consider whether different roles may need different models of training. A 'one size fits all' approach does not meet the needs of practitioners from different clinical areas and the study highlighted examples of those working in primary care settings (community) having far less exposure to emergency events and being limited in who they can call upon to help should an emergency arise. There is an obvious need to tailor training to individual need. There are also those within secondary care settings who may not be delivering intrapartum care on a regular basis e.g. those working in day unit or clinic settings. The training needs of these individuals may differ based on the types of events they may encounter.

In the scenario of a RCEE it may be relevant to adapt the training of those with more clinical experience. Those practitioners who are called upon by those less experienced are seen as having the ability to recognise and respond to RCEE and this appeared to be related to the ability to undertake anticipatory actions and the possession of a developed index of suspicion of deterioration based on a depth of understanding of normality. The training for experienced practitioners could focus on those events which are less common yet more likely to result in catastrophic consequences.

Limitations in experience appeared to reduce confidence in preparedness and, in some cases, acted as a catalyst for further training and development. The training for those with less clinical experience could be adapted to focus on those events which are more common with a focus on developing the index of suspicion, recognition and responses. There is also opportunity for increased frequency of training for newly registered practitioners whilst their clinical exposure/experience is developing.



## 9.5 Implications for Further Research

The main question arising from the study relates to the cause and effect relationship between mistakes made during simulated training and practise. It would be beneficial to observe simulated training and to record the types/range of mistakes made; talk to trainees about their experiences and explore opportunities to ascertain whether practitioner make the same mistakes in simulated practise as they do in clinical practise. Understanding the ways in which simulated training and education transfers into safety within the clinical setting seems a worthwhile venture given that those extolling the virtue of skills laboratories and simulation centers situate it's efficacy in translating into patient safety.

The study did not delve into individual definitions of expertise. Questions remain as to whether expertise is self-awarded or whether it is dependent on how others view you. One could argue that expertise is both perceived by self and others and further exploration into this phenomenon may illuminate whether it can be both but not always congruent. The focus of the thesis was in the management of RCEE. An evaluation of which member of the multi-disciplinary team is best placed to manage rare events appears important as the findings of the study highlighted a potential devolving of responsibility to those perceived as either possessing greater clinical experience or developed expertise.

One could question if, given the nature of rare events, can anyone be 'expert' in managing them? As discussed, there is a potential for utilising a checklist approach during critical event management and the practitioner tasked with reading aloud the checklist would not necessarily be the most experienced practitioner. Investigation into the efficacy of a checklist approach to managing obstetric emergencies may improve patient safety and provide a useful tool for the development of education/training.

An interesting finding from the study was the suggestion of skill diminution over time following training. From the systematic review it was clear that the quality and quantity of evidence relating to this was sparse; yet many practitioners alluded to this during qualitative interview. There is a potential, therefore, to investigate the problem through longitudinal study following training, specifically for RCEE.

Finally, early in the process of developing the study, it was proposed that participant perspectives of their performance during critical events and preparedness would be

investigated utilising excerpts from an audio recording of real time responses to RCEE. There was a precedent, within the clinical site, of video recording childbearing events for the purpose of a television programme. The rationale for audio recording critical events was aligned with approaches to the review of emergency events, through review of 'black box' audio recordings, habitual within the aviation industry. There appeared to be a novel potential in audio recording critical events during childbearing emergencies for the purpose of review and development of training/education. Ethical approval was not granted, nevertheless, this is an area worthy of further consideration. The recommendation is to explore the lessons which can be learned from the recording of critical events and how this may impact of personal development, perceptions of preparedness and, ultimately, patient safety; the caveat being that thorough consideration of the ethical implications of consent and risk management.

## **9.6 Dissemination of findings**

According to O'Leary (2009) the ultimate goal of any research process is to add to a body of knowledge and it is important to plan how and to whom findings will be disseminated. Granger and White (2001) suggest that the process requires a careful match among (a) creation of knowledge, (b) target audiences and (c) the content, media and language used to reach those audiences. Harmsworth (2000) also asserts that key stakeholders will be groups or individuals who can affect or be affected by the achievement of the project objectives; dissemination plans will, therefore, target higher and further education communities, Professional networks and healthcare staff. The most effective way to disseminate to these groups is through a multi strand approach and this requires the development of a dissemination plan, as detailed in table 9.1, where key messages to be delivered to specific target audiences are outlined.

**Table 9-1 Dissemination Plan**

The Target Audience	The Message	The Method
Higher and Further Education communities. Professional networks. Healthcare staff	<ol style="list-style-type: none"> <li>Using Mixed Methods to investigate the research questions.</li> <li>Distillation of the characteristics of simulation and key findings from the study</li> </ol>	Submission for publication in relevant professional journals – examples are; <ol style="list-style-type: none"> <li>Journal of Mixed Methods Research (<b>paper in draft</b>)</li> <li>Medical Education, Health Education or British Journal of Midwifery.</li> </ol>
	<ol style="list-style-type: none"> <li>To what extent does simulation help healthcare professionals prepare for RCEE during childbearing?</li> <li>Using Mixed Methods to investigate the research questions.</li> <li>Simulation and preparation for RCEE, making a difference through professionalism.</li> </ol>	Abstract submission for presentation at relevant conferences. . <ol style="list-style-type: none"> <li>Association of Medication Education (AMEE) conference (<b>Accepted for Aug 2016</b>)</li> <li>MMIRA Conference (<b>Accepted for Aug 2016</b>)</li> <li>International Conference for Midwives (ICM) (<b>Abstract submitted, awaiting response</b>)</li> </ol> Paper – Target JMMR. Using Mixed Methods to Investigate how Healthcare Professionals Prepare for Rare/Critical Emergency Events during Childbearing (in writing process)
Peers in own institution	Shared experiences of undertaking SR., using mixed methods to answer research questions, MM integration, framework analysis and also dissemination of key findings from the study.	Internal workshops and teaching within undergraduate and postgraduate provision across the faculty.
Professional networks e.g. Nursing and Midwifery Council, General Medical Council	Key implications for clinical practise, training and education and future research as identified within 9.3, 9.4 and 9.5.	Discussion forums Mail based lists One to One

## 9.7 Conclusion of the thesis

To conclude, this thesis set out to examine the concept of simulated learning and practise with the intent of understanding the role of simulation in real life management of rare, critical and emergency events during the childbearing continuum.

Using an explanatory, sequential mixed methods design the study confirmed that professional preparation for RCEE during childbearing is a complex and multi-faceted issue. Despite the adoption of simulation strategies for training and education in recognising and responding to emergency events, evidence has shown that some professionals continue to have difficulty responding appropriately in clinical practice. There is a plethora of literature relating to simulation and its use in clinical skills acquisition however, evidence supporting the way in which, and to what extent, skills acquisition occurs remains unclear. Crucially, it is unclear as to how skills, developed through simulated means, transfer to other similar events occurring in practice.

Findings from the study reveal that simulation is useful when there is a reduction in clinical exposure, has the potential for practice in a safe environment and can result in increased confidence, initially. The value of simulation is commonly positioned in the ability to practise within a safe environment and here, there is a contradiction between the general consensus and the observed reality. The issue here is that simulation is perceived by healthcare practitioners as overwhelmingly anxiety provoking. The notion of feeling 'safe' to make mistakes was outweighed by concerns about being judged by colleagues and peers. Whilst simulating clinical skills means that patients are not harmed there is a need to explore whether practising skills in this way actually translates to confidence and competence in skills within the clinical setting.

Despite the literature extolling the virtues of increasing fidelity of simulation resources this was only deemed important when feedback was received during cardiac arrest scenarios. With a midwifery and obstetric focus fidelity was less important. Realism of scenarios affected engagement when not associated with 'real life' and practitioners related simulation to play; negatively influencing the value placed on simulation. This is at odds with the increasing expenditure (within clinical and higher education settings) on higher fidelity resources; the justification for which must be given attention in these financial constrained areas.

Teamwork, the development of expertise with experience, facilitated feedback and debriefing and governance procedures are all motivational factors in preparedness for

RCEE. Confidence in recognising and responding to RCEE is linked to clinical exposure and not, necessarily to simulation. Confidence was felt to decay over time, following simulation although the timeframe for diminution was unclear. As clinical experience increases over the years, it appears that so too does the index of suspicion as to worsening clinical conditions. However, this does not necessarily mean that ensuing responses are appropriate. As professional experience increases there is often a move away from the practice setting to greater focus on governance and/or managerial roles. There is a potential here, to develop training and education which is tailored to individual needs accordingly.

The findings of the study make it clear that there is ambiguity between the theoretical principles of simulation and the practical application. This thesis highlights an evolving conceptualisation of 'preparedness' which merges simulation (incorporating multiple-learning strategies) with deliberate practise. The focus should now be on simulation choreography to reduce anxiety and varied approaches to training dependent on differing roles.

The significance of simulation in reducing harm within the clinical setting, the optimum time for rehearsal of skill in non-use periods and the potential to develop training based on experienced-based needs are all areas which call for further exploration.

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## Appendices

### Appendix 1 Information Form for Documentary Data Collection

**A study of how simulation helps professionals prepare for rare, critical and emergency events during childbearing.**

#### **Information about the research (Documentary Analysis of Training and Education)**

I would like to invite you to participate in a research study and, before you decide, I would like you to understand why the research is being done and what it will involve for you. Please feel free to ask any questions if anything is unclear to you or you have any further questions.

#### ***What is the purpose of the study?***

The purpose is educational and part of my postgraduate research degree training and will inform larger studies in the future. The research aims to understand the role of simulated learning in the real life management of critical events during childbearing.

#### ***Why have I been chosen?***

I plan to undertake a documentary analysis of local training and education provision relating to critical events during childbearing.

You have been chosen to participate in the study because you are involved in the education and training of healthcare staff for emergency events using a simulated approach.

#### ***Do I have to take part?***

Your participation is entirely voluntary.

#### ***What will I have to do if I agree to take part?***

You will be asked to provide documentary information relating to your training and education programme. I will request your written consent for me to review and analyse the documents.

Where any elements of the documents are unclear clarification will be sought verbally.

I will also ask your permission to observe a simulated training programme. Participant performance will not be recorded or commented upon and the observation will be solely for the purpose of identifying common characteristics and approaches.

#### ***Are there any possible advantages of taking part?***

There are no advantages apart from the opportunity to contribute to a better understanding of factors which influence professional preparation for rare, critical and emergency events during childbearing.

#### ***Are there any possible disadvantages and risk of taking part?***

There are no risks perceived.

#### ***What happens to information about me and the documents I provide?***

With your permission I will analyse the documents which will be identified anonymously with the assigned participant ID. Direct quotations may be used in reports or publications anonymously. If you choose to withdraw from the study I also seek your consent to retain and use any identifiable data (using an ID number) which you have already given.

Your ID and contact details will be stored on a password-protected computer. During the study my supervisor, key investigators in the research team and I will have access to your anonymous data. Data will be stored on the University of Leeds firewall-protected secure server accessible via password for security and safety. This is in accordance with that Institutions data security policy. Data will be removed from the university server once I have completed my programme. After finishing this study the data will be stored on the password protected computer of my supervisor (Dr Janet Hirst) for 3 years.

***What will happen to the results of the research study?***

A written summary of the research and findings will be sent to all participants after the study has been completed. Any study results will be sent to participants.

***Who is funding the research?***

No application for external funding will be made.

***Who has reviewed the study?***

The scientific quality of the research has been assessed by my academic supervisors Dr Janet Hirst and Professor Trudie Roberts and two independent assessors at the University of Leeds. This study has also been reviewed by the School of Healthcare Research Ethics Committee (SHREC/RP/341).

***Who can I contact for further information?***

(details removed)

**You will be given a copy of this information sheet and a signed consent form to keep.**

## Appendix 2 Consent form for Documentary Data Collection

### CONSENT FORM

Researcher: Angela Hewett

Simulation and professional preparation for rare, critical and emergency events during childbearing – a mixed method study.

Name of Principal Investigator: Angela Hewett, University of Leeds

Contact 0113 3\*\*\*\*\*

SHREC approval number: SHREC/RP/341

Participant ID: .....

Thank you for your interest in this study. If you would like to take part, please read the associated information sheet, confirm the questions on this form with me and sign this form. You will be given a copy to keep. PLEASE INITIAL THE BOXES IF YOU AGREE WITH EACH SECTION:

1. I have read the information sheet (Version 1 Training and Education) for the above study and have been given a copy to keep. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my legal rights being affected and I give consent for any data already given to be retained and used.
3. I agree to provide documents relating to education and training provision which will be anonymised and analyzed and stored securely for 3 years following completion of the study.
4. I understand that I will not benefit financially if this research leads to the development of a new service.
5. I understand that the clarification may be sought by the researcher (verbally) relating to any unclear elements within the documents.
6. I understand that the researcher may ask to observe a simulated training programme and that participant performance **will not be recorded or commented upon** and the observation will be solely for the purpose of identifying common characteristics and approaches.
7. I know how to contact the research team if I need to.
8. I agree to participate in this study

---

Participant: name

Date

Signature

---

Researcher: name

Date

Signature

## **Appendix 3 Information Form for Interviews**

### **A study of how simulation helps professionals prepare for rare, critical and emergency events during childbearing.**

#### **Information about the research (Interview)**

I would like to invite you to participate in a research study and, before you decide, I would like you to understand why the research is being done and what it will involve for you. Please feel free to ask any questions if anything is unclear to you or you have any further questions.

#### ***What is the purpose of the study?***

The purpose is educational and part of my postgraduate research degree training and will inform larger studies in the future. The research aims to understand the role of simulated learning in the real life management of critical events during childbearing.

#### ***Why have I been chosen?***

I plan to undertake face to face interviews with healthcare professional who are, or have been, involved in critical and emergency care provision to women during childbearing.

You have been chosen to participate in the study because you are a healthcare professional identified as having been involved in the provision of critical and emergency care during childbearing.

#### ***Do I have to take part?***

Your participation is entirely voluntary. You will be given at least 24 hours to decide whether or not you wish to take part in the study after receiving the information sheet and invitation email. You will be informed you can withdraw from the research at any point during the interview.

#### ***What will I have to do if I agree to take part?***

You will be invited to an interview which will last about one hour. I will request your written consent when we meet and before the start of the interview.

#### ***Are there any possible advantages of taking part?***

There are no advantages apart from the opportunity to contribute to a better understanding of factors which influence professional preparation for rare, critical and emergency events during childbearing.

#### ***Are there any possible disadvantages and risk of taking part?***

There is the potential inconvenience in having to attend a research interview during working hours. The research will be organised to cause the least inconvenience possible, for example, meeting at your workplace. There are no risks perceived.

#### ***What happens to information about me and answers that I give?***

With your permission I will audiotape the interview. You will be assigned a participant identification number (ID) to identify the audio recording. Your name will not be recorded. I will transcribe the interviews verbatim and store them anonymously with the assigned participant ID. Direct quotations may be used in reports or publications anonymously. I will explicitly seek consent for the digital recording of the interviews and the use of direct quotations. If you choose to withdraw from the study I also seek your consent to retain and use any identifiable data (using an ID number) which you have already given.

Your ID and work contact details will be stored on a password-protected computer. The transcribed interview will not be held together with your details. During the study my supervisor, key investigators in the research team and I will have access to your anonymous personal data. Data will be stored on the University of Leeds firewall-protected secure server accessible via password for security and safety. This is in accordance with that Institutions data security policy. Data will be removed from the university server once I have completed my programme. After finishing this study the data will be stored on the password protected computer of my supervisor (Dr Janet Hirst) for 3 years.

During the interview if information is divulged which is considered to be illegal activity or in breach of the relevant code of professional conduct (NMC & GMC) this may be shared with and followed up by Head of Midwifery or Clinical Director (as appropriate to the professional group). Should this happen, you will be fully informed both verbally and in writing.

***What will happen to the results of the research study?***

A written summary of the research and findings will be sent to all participants after the study has been completed. Any study results will be sent to participants.

***Who is funding the research?***

No application for external funding will be made.

***Who has reviewed the study?***

The scientific quality of the research has been assessed by my academic supervisors Dr Janet Hirst and Professor Trudie Roberts and two independent assessors at the University of Leeds. This study has also been reviewed by the (name of ethics committee).

***Who can I contact for further information?***

(Details removed)

**You will be given a copy of this information sheet and a signed consent form to keep.**

## Appendix 4 Bibliographic Databases and Websites Chosen

- CINAHL for journal articles, books, dissertations and conference proceedings in nursing and allied health.
- EBM reviews
- Embase (via Ovid) for journal articles in biomedicine and pharmacy.
- PsychINFO (via Ovid) for journal articles, books and dissertations and theses in core psychology disciplines and behavioural sciences.
- Maternity and Infant Care (via Ovid) References relating to midwifery, pregnancy and childbirth
- Medline
- HMIC
- Cochrane Library (Including CDSR) high quality independent evidence to inform health care. <http://www.thecochranelibrary.com>
- DARE database of abstracts, reviews and events. <http://www.crd.york.ac.uk/crdweb/>
- Science Direct (website containing full text of journal from Elsevier scientific Publishing) <http://www.sciencedirect.com/>
- Web of Knowledge <http://wok.mimas.ac.uk/>
- Engineering Village (Via SPEME – largest engineering database – search for journal articles, technical reports and conference proceedings relating to all engineering disciplines and includes aviation and power)
- CSA Technology Research Database (Via SPEME) particularly useful for aerospace and aviation but also includes environmental engineering.
- OnePetro – includes key documents from the following organisations; American Petroleum Institute, Offshore Technology Conference, Petroleum Society, Society of Petroleum Engineers, World Petroleum Council and the Society for Underwater Technology.
- ESDU (via SPEME) allows searching for engineering design data and covers subject specific areas including Aerospace, Aerostructure, Marine, Transport and Power Generation
- Google Scholar
- Also hand searching of key journals e.g. international journal of obstetrics & gynaecology, The International Journal of Aviation Psychology, Oil and Gas Journal. Hand searching will also include electronic content lists.

Contact with experts/authors made and these were highlighted from key texts in the areas e.g. Kneebone

## Appendix 5 Search Activity

My research focus:	The effects of simulation for the preparation of professionals in rare events.			
Places to search for information:	Medline (via Ovid), CINAHL, Embase, PsychINFO, Maternity and Infant Care, EBM reviews. Cochrane Library, Google Scholar, DARE, Science Direct, Web of Knowledge, CSA Technology database (via SPEME) ESDU (via SPEME) Engineering Village, Global health. HMIC.			
List of sources searched:	Date of search	Search strategy used, including any limits	Total number of results found	Comments
Cochrane Database of Systematic Review (no date restrictions)	12/03/12	<p>Search 1 – Search for simulation in Title or Keywords or Abstract.</p> <p>Search 2 – (advanced search with use of * wildcard) simulat* AND rare* and emergenc* or novel.</p> <p>Search 3 – (advanced search) simulat* to cover all in title.</p> <p>Search 4 – Search simulation AND rare* or emergenc* or critical or novel. 39 results. 2 obtained for further review.</p>	<p>(5 results) non identified as potentially relevant</p> <p>0 results</p> <p>1 result (duplicate from search 1)</p> <p>39 results. 2 obtained for further review.</p>	<p>(total 45, when duplicates removed total 44)</p> <p>When screened all excluded.</p>

List of sources searched:	Date of search	Search strategy used, including any limits	Total number of results found	Comments
Google Scholar Searched in Biology, Life Sciences, Environment and Medicine. Science Direct, Web of Knowledge.	April 2013	Simulation or simulated with rare or emergency or critical or novel or rarely encountered.	Following all restrictions 10,700 results	Not sensitive enough to remove duplicates or limit search to a more advanced nature. Saved for back up.
Medline, MIC, Embase, HMIC, PsychInfo, Global Health. HMIC  Limit to English & Humans  Year 1995-2013	3 <sup>rd</sup> May 2013	rare event* OR ( pulmonary embolism or dystocia* or eclamp* or crash* or disaster* or emergenc* or accident* or trauma or major event or critical event or major incident or major event ) AND simulat* AND ( educa* or train* or prepar* or pre-reg* or post-reg* or learn* or qualif* or continu* n profession* n develop* ) AND ( medic* or doctor* or nurs* or midwi* or paramed* or health* n profess* or pilot* or police* or ambulance* or engineer* or flight crew or flight attendan* or cabin crew or cabin attend* or air traffic control )	317	Total <b>317</b> ( <b>219</b> identified as potentially relevant when duplicates removed)



List of sources searched:	Date of search	Search strategy used, including any limits	Total number of results found	Comments
<p>EBM Reviews – Cochrane Database of Systematic Reviews 2005 to March 2013, EBM Reviews – ACP Journal Club 1991 to April 2013, EBM Reviews – Database of Abstracts of Reviews of Effects 1<sup>st</sup> Quarter 2013, EBM Reviews – Cochrane Central Register of Controlled Trials March 2013, EBM Reviews – Cochrane Methodology Register 3<sup>rd</sup> Quarter 2012, EBM Reviews – Health Technology Assessment 2<sup>nd</sup> Quarter 2013, EBM Reviews – NHS Economic Evaluation Database 2<sup>nd</sup> Quarter 2013</p>	<p>7<sup>th</sup> May 2013</p> <p>Revised 6<sup>th</sup> June 2013</p>	<p>When revised the search included terms relating to education/training.</p> <p>(((((rare event* mp. OR pulmonary embolism* mp. OR dystocia* mp. OR ((breech adj3 (present* or birth* or deliver* or position*)) mp. OR eclamp* OR ((major or critical) adj2 (inciden* or event*)) mp. AND ((educ* or train* or prepar* or pre-reg* or prereg* or post-reg* or postreg* or learn* or qualif* or continu* profess* develop*) adj 2 (medic or medics or doctor* or nurs* or registrar* or house officer* or consultant* or surgeon* or obstetrician* or gynaecologist* or anaesthetist* or anesthetist* or paediatric* or pediatric* or neurosurgeon* or paramedic* or midwi*) mp. OR (health* adj (profession* or worker* or assistant*)))))) mp.</p>	<p>77 results</p> <p>102 identified – 40 duplicates, 6 SR, 3 same study (therefore 2 treated as duplicate) 2 same study (therefore 1 treated as duplicate) 15 not relevant</p>	<p>Total 77 of which 34 identified as potentially relevant . 2 identified as not duplicated from Medline, MIC, Embase, HMIC, PsychInfo, Global Health search. (need to refine search further – advice sought from subject librarian) .</p> <p><b>39</b> identified for pre-screen (this search included all of the databases searched to date.)</p>

List of sources searched:	Date of search	Search strategy used, including any limits	Total number of results found	Comments
CINAHL	15 <sup>th</sup> July, 2013	rare event* OR ( pulmonary embolism or dystocia* or eclamp* or crash* or disaster* or emergenc* or accident* or trauma or major event or critical event or major incident or major event ) AND simulat* AND ( educa* or train* or prepar* or pre-reg* or post-reg* or learn* or qualif* or continu* n profession* n develop* ) AND ( medic* or doctor* or nurs* or midwi* or paramed* or health* n profess* or pilot* or police* or ambulance* or engineer* or flight crew or flight attendan* or cabin crew or cabin attend* or air traffic control )	267 or which <b>32</b> identified after duplicates removed.	1 later identified as SR = <b>31</b>

List of sources searched:	Date of search	Search strategy used, including any limits	Total number of results found	Comments
DARE, CSA Technology database (via SPEME) ESDU (via SPEME) Engineering Village Compendex, Inspec & Referex within Engineering Village database.	15 <sup>th</sup> July, 2013	((((((((rare event or critical event or major event or emergenc* or accident* or trauma or critical event or critical incident) WN KY) AND ((simulat* ) WN KY)) AND ((educa* or train* or prepar* or learn* ) WN KY)) AND ((aviation or flight attendan& or pilot* or flight crew or cabin crew or cabin attend* or oil n rig or oil n engineer* ) WN KY))) AND (217nglish)))	357 (following de duplicate which search function allowed) of which <b>30</b> identified as potentially relevant for screening	Highlighted that lack of knowledge of subject speciality .....
Grey Literature	June 2013          July 2013	Hand searching/forward and backward citation tracking within all papers deemed potentially relevant  Hand searching & citation tracking within Engineering Village reference lists.  Unpublished studies searched through Proquest dissertations & Conference Proceedings of ASPIH (Association for Simulated Practice in Healthcare)	54 deemed potentially relevant on title alone. When abstracts retrieved 17 potentially relevant.  5 deemed potentially relevant.  No results	

## Appendix 6 Example Database Search

Medline (modified for industry and aviation databases)

1	pulmonary embolism*.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, nm, ui, tc, id]
2	dystocia*.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, nm, ui, tc, id]
3	(breech adj3 (present* or birth* or deliver* or position*)).mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, nm, ui, tc, id]
4	eclamp*.mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, nm, ui, tc, id]
5	(educ* or train* or prepar* or pre-reg* or prereg* or post-reg* or postreg* or learn* or qualif* or continu* profess* develop*).mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, nm, ui, tc, id]
6	((major or critical) adj2 (inciden* or event*)).mp. [mp=ti, ab, sh, hw, tn, ot, dm, mf, nm, ui, tc, id]
7	(medic or medics or doctor* or nurs* or registrar* or house officer* or consultant* or surgeon* or obstetrician* or gynaecologist* or anaesthetist* or anesthetist* or paediatrician* or 218nglish218ician* or neurosurgeon* or paramedic* or midwi*).mp. [mp=ti, ab, sh, de, hw, tn, ot, dm, mf, nm, an, ui, tc, id]
8	(health* adj (profession* or worker* or assistant*)).mp. [mp=ti, ab, sh, de, hw, tn, ot, dm, mf, nm, an, ui, tc, id]
9	7 or 8
10	((educ* or train* or prepar* or pre-reg* or prereg* or post-reg* or postreg* or learn* or qualif* or continu* profess* develop*) adj2 (medic or medics or doctor* or nurs* or registrar* or house officer* or consultant* or surgeon* or obstetrician* or gynaecologist* or anaesthetist* or anesthetist* or paediatrician* or 218nglish218ician* or neurosurgeon* or paramedic* or midwi* or (health* adj (profession* or worker* or assistant*))))).mp. [mp=ti, ab, sh, de, hw, tn, ot, dm, mf, nm, an, ui, tc, id]
11	1 or 2 or 3 or 4 or 5 or 6
12	9 and 10 and 11
13	limit 12 to 218nglish language
14	limit 13 to humans
15	limit 14 to yr="1995 –Current"

## Appendix 7 Pre-screen Tool

Reference			
Question	Element of Problem Statement	Yes/No/Unclear (Health = H, Aviation = A and Industry = I)	Comments
Is the paper concerned with the population?	Professionals who train/prepare for critical events – (to include Doctors, Midwives, Support Workers, Emergency Care Workers, obstetric nurses, obstetricians, nurses, pilots, petroleum engineers)		
Is the paper concerned with the intervention?	Simulation – may be individual or group focussed and include (but not restricted to) flight simulation, multi professional emergency training, major incident preparation or computer based models		
Does the paper include a comparison?	Other training and education within healthcare, aviation or engineering industries.		
Does the paper report findings specific to the following outcomes?	Post programme measure of perceived effectiveness including (a)confidence, (b) competence, (c) performance (d) self-esteem and (e) cost effectiveness	(a) (b) (c) (d) (e)	
Is the methodology appropriate?	Experiment and quasi experimental evaluations. It is not expected that many RCT's will be available (from scoping searches) therefore, case control studies or survey will be eligible provided that data from a comparison group are reported.		
overall decision	Review	Background	Reject
Check References:			

### Appendix 8 Example of Completed Data Extraction Table

Researcher Performing Extraction		A Hewett	Date of Extraction	20/08/13
<p><b>Identification features of the study:</b></p> <p>Record number (to uniquely identify study) (1)</p> <p>Author</p> <p>Article title</p> <p>Citation</p> <p>Type of publication (e.g. journal article, conference abstract)</p> <p>Country of origin</p> <p>Source of funding</p>	<p>Andrighetti, T., Knestrick, J., Marowitz, C &amp; Engstrom, J. (2011) Shoulder Dystocia and Postpartum Hemorrhage Simulations: Student Confidence in Managing These Complications. <i>Journal of Midwifery &amp; Women's Health</i>. Vol 57, No1p55-60.</p> <p>USA</p> <p>Funding not disclosed.</p>	<p><b>Outcome data/results</b></p> <p><b>How did studies assess how simulation worked?</b></p> <p>Unit of assessment/analysis</p> <p>Statistical techniques used</p> <p>Definition used in study</p> <p>Measurement tool or method used</p> <p>Length of follow-up, number and/or times of follow-up measurements</p> <p>Number of participants enrolled</p> <p>Number of participants included in analysis</p> <p>Number of withdrawals, exclusions, lost to follow-up</p> <p>Summary outcome data</p> <p>Dichotomous: number of events, number of participants</p> <p>Continuous: i.e. results from scale</p>	<p>Data analysed using SPSS 16.0</p> <p>Data described using mean and SD's for continuous data and frequencies for categorical.</p> <p>Comparison using Wilcoxon signed rank test for paired comparison of continuous data</p> <p>Frequencies compared using chi-square analysis</p> <p>Effect size (Cohen's d) calculated to compare change in confidence and categorized as small (0.2-0.49) moderate (0.5-0.79) or large &gt;0.8)</p> <p>All participants included (n28)</p> <p>Small increase in confidence score between pre test and post test of control group – not stat sig p=.08 Significant increase in intervention group p=&lt;0.1 Moderate effect size for intervention (PPH) 0.54 and large effect size for SD (1.68)</p>	

<p><b>Study characteristics</b></p> <p>Aim/objectives of the study</p> <p>Study design</p> <p>Study inclusion and exclusion criteria</p> <p>Recruitment procedures used (e.g. details of randomisation, blinding)</p>	<p>Quasi experimental design to evaluate student confidence in learning the management of shoulder dystocia and PPH.</p> <p>Graduate Mid Ed Programme – all students (n28) recruited control (n10) intervention (n18) <a href="#">(no detail re recruitment and randomisation)</a></p>	<p><b>Results of study analysis</b> e.g.</p> <p>Dichotomous: odds ratio, risk ratio and confidence intervals, p-value</p> <p>Continuous: mean difference, confidence intervals</p> <p>Narrative</p>	<p>Limited by small sample size</p> <p>Mean, SD and P values reported for continuous data and effect size only.</p> <p>Narrative results reported as demonstrated that student confidence increased significantly following high fidelity simulation.</p> <p><a href="#">High fidelity not used...</a></p>
<p><b>Participant characteristics</b></p> <p>Characteristics of participants at the beginning of the study e.g. Age, Gender</p> <p>Ethnicity, Professional group</p>	<p>Demographic data collection performed relating to age, experience and years since last education program. <a href="#">No significant difference in characteristics.</a></p>	<p><b>Additional outcomes</b></p> <p>Unintended or adverse</p>	
<p><b>Intervention and setting</b></p> <p>Setting in which the intervention is delivered</p> <p>Description of the intervention(s) and control(s) Description of co-interventions</p>	<p>All students completed student satisfaction and self-confidence assessment immediately before and after exposure. Control – PPH taught using a discussion format using question and answer approach. (n5)SD taught using video, discussion and demonstration by faculty. (n5)</p> <p>Intervention – high-fidelity simulations of both recreated in an environment closely resembling practice. Static mannequin (<a href="#">high fidelity mannequin not able to portray SD &amp; PPH</a>) used alongside role play between students and faculty. Scenarios built in complexity (<a href="#">no detail as to the number and nature of scenario</a>) 9 participants in SD and 9 in PPH.</p>		

## **Appendix 9 Quality Assurance of Data Extraction**

### The Effects Of Simulation For The Preparation Of Professionals In Rare, Critical & Emergency Events. Systematic Review

Angela Hewett

#### Data Extraction Tool Verification

- Data extraction of 3 studies (1, 2 and 5) reviewed with 100% agreement on study information gathered
- All 3 studies reviewed were quasi experimental allowing extraction of comparative study data for analysis
- The data extraction tool was detailed and consistent application to the studies was evident
- Quality appraisal scores were included but not verified at this stage
- The study aims i.e. outcome measures varied slightly e.g. performance; knowledge levels; student confidence therefore inclusion of the study aim in the data extraction may facilitate later analysis
- The level of study information provided on sample selection e.g. inclusion / exclusion and control or acknowledgement of confounding variables was not always explicit within the papers – this may be worth noting on the data extraction table, though it may alternatively be reflected in the quality appraisal

AC (signature removed) 25.3.2015



**Appendix 10 Example Data Summary Matrix**

INDEX	Programme = 1
2.2.1 Environment  2.3 Scenario Development	Run across 4 sites within Yorkshire and Humber. Delivered in simulation centres. In operation since 2011 4 bed ward environment with an obstetric theatre. Video recording controlled outside of room.
1.2Pre-training preparation  1.3Pre-test measure of performance  2.5 Realism	Course manual outlining the recognition and management of 7 scenarios. Based on clinical algorithms. No pre-course test. No information as to how participants will be assessed. No assessment of compliance with the pre-course reading. Attendees wear theatre scrubs in order to increase the 'realism'.
1.1 Professional Group	Obstetric anaesthetists. Not clear which level/experience? Trainees at the start of their obstetric rotation (n=5)
2.3Scenario development  3.3 Participant evaluation	Development of scenarios based on feedback from trainees, recognition of clinical needs and liaison with clinical skills network. Immediate post exposure evaluation of objectives, relevance, perceived ability, improving patient safety, organisation, confidence, environment.. 5 point scale (Unsatisfactory to excellent)). 5 completed with all in the Good to Excellent category.

## Appendix 11 Vignette for Semi Structured Interview

### **Initial information (further information relating to the progression of the scenario will follow during the discussion;**

Caroline Jones is a twenty-nine year old multi-gravida; her body mass index (BMI) at booking was 30kg/m<sup>2</sup>

Caroline is now 37 weeks pregnant. She has presented on delivery suite with a history of shortness of breath. She thought her symptoms were normal but her partner is concerned and has insisted that she sought advice.

Caroline also complains that over the past two weeks she has very oedematous legs and ankles. There has been no medical or family medical history of note. Caroline says that although she gave up smoking in pregnancy she has started again and smokes 10 cigarettes a day, she appears apprehensive. Caroline is also complaining of a severe headache and visual disturbances.

On clinical examination maternal baseline observations were:-

Temperature :- 36.5°C

Pulse 102 beats per minute

Respirations:- 26 breathes per minute

Blood Pressure:- 160/105

Urinalysis – proteinuria ++++

Clearly dyspnoeic.

Haemoglobin 9.6g/dl

On chest examination there is evidence of lung crackles, a rapid heart rate and wheezing.

Oxygen saturation:- 92% on 5L Oxygen

### **Further information to be given following initial discussion;**

Pre-eclampsia protocol was followed with no improvement.

Caroline's baby was delivered by emergency Caesarean Section under general anaesthesia

The estimated blood loss was 500mls following delivery.

Upon transfer to the delivery suite from recovery (30 minutes post-delivery) Caroline suffered a sudden cardiac arrest.

## Appendix 12 Interview Topic List

### Interview Topic List

**Bold type = question** Normal type = probe *Italics = prompt*

#### Introductory questions

**To start us off I am interested in some demographics.**

**When did you qualify and how long have you been working in this field?**

**If a midwife – was your pre-registration programme direct entry or shortened?**

**If the shortened programme – can you tell me about your experiences as a registered nurse.**

**I want to explore how we prepare for events that are rare during childbearing.  
*The range of what we would consider as rare could be very different.***

**What events would you consider as being rare?**

**I am interested in your experiences of simulated learning.**

***A few examples are multidisciplinary scenarios, basic life support, suturing, transfer of patients, role play, computer based work, venepuncture.***

**What types of simulated training have you experienced?**

**What were your experiences like?**

What do you think you gained? Did you enjoy it?

What are your impressions of simulated practice? Did you enjoy it?

Did anything challenge you?

What are your views on multi-professional simulated practice?

**I would like to know what you think about expertise and skill decay. *How we may lose skills over time.***

**Do you feel that you have developed expertise in recognising and responding to critical events?**

Have you ever questioned your own skills in responding to a critical event during childbearing?

How often do you feel that simulated practice should be repeated (ideal)?

Is there a point (between training) when you feel that you may be losing your skills?

**There are many different types and levels of products available to help with simulation.**

***Some seem very life like and others can appear very basic.***

**Have you experienced differences in the types of products?**

In what ways did this matter to you?

In what ways is the realism of the simulation important to you?

**Continuing the theme of how we prepare for rare events.**

**What motivates you to develop your skills in order to prepare for rare events?**

What elements of the simulation do you adopt in your day to day practice?

Can you tell me about your role during critical events during childbearing?

**How prepared do you feel for responding to and managing critical events based on your simulated education and training?**

**I am interested in what you think about training and preparation for rare events.**

Of all the different approaches to preparing for critical events can you tell me about your preferred option?

Do simulated emergency scenarios affect your confidence and competence in any way?

How important is a multi-professional approach to education/training?

**Is there anything else relating to your experiences of simulation that you wish to reflect upon/add?**

**Is there anything that we have not discussed which you thought we would discuss?**

## Appendix 13 Ethical Approval

Dear Angela

**Ref no: SHREC/RP/341 – Amendment\_1**

**Title: Expecting the unexpected: Simulation and professional preparation for rare, critical and emergency events during childbearing – a Mixed Methods Study.**

Thank you for submitting the amendment to the above named project.

This has been reviewed and I can confirm on behalf of the School of Healthcare Research Ethics Committee (SHREC) that ethical approval is granted and the amendment may be implemented based on the documentation received at date of this letter.

<i>Document</i>	<i>Version</i>	<i>Date submitted</i>
Amendment_form_A Hewett_Dec 2013	1	17.12.13
Consent_Form_Training and Education V2 Dec 2013	1	17.12.13
Participant Information Form_Training and Education V2 Dec 2013	1	17.12.13
Amended_Ethical_Review_Form_A Hewett_Dec 2013	1	06.01.14

Ethical approval does not infer you have the right of access to any member of staff or student or documents and the premises of the University of Leeds. Nor does it imply any right of access to the premises of any other organisation, including clinical areas. SHREC takes no responsibility for you gaining access to staff, students and/or premises prior to, during or following your research activities.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, and other documents relating to the study. This should be kept in your study file, and may be subject to an audit inspection. If your project is to be audited, you will be given at least 2 weeks notice.

It is our policy to remind everyone that it is your responsibility to comply with Health and Safety, Data Protection and any other legal and/or professional guidelines there may be.

The committee wishes you continued success with your project.

Yours sincerely

## **Appendix 14 Participant Information for Interview**

A study of how simulation helps professionals prepare for rare, critical and emergency events during childbearing.

### **Information about the research (Interview)**

I would like to invite you to participate in a research study and, before you decide, I would like you to understand why the research is being done and what it will involve for you. Please feel free to ask any questions if anything is unclear to you or you have any further questions.

#### ***What is the purpose of the study?***

The purpose is educational and part of my postgraduate research degree training and will inform larger studies in the future. The research aims to understand the role of simulated learning in the real life management of critical events during childbearing.

#### ***Why have I been chosen?***

I plan to undertake face to face interviews with healthcare professional who are, or have been, involved in critical and emergency care provision to women during childbearing.

You have been chosen to participate in the study because you are a healthcare professional identified as having been involved in the provision of critical and emergency care during childbearing.

#### ***Do I have to take part?***

Your participation is entirely voluntary. You will be given at least 24 hours to decide whether or not you wish to take part in the study after receiving the information sheet and invitation email. You will be informed you can withdraw from the research at any point during the interview.

#### ***What will I have to do if I agree to take part?***

You will be invited to an interview which will last about one hour. I will request your written consent when we meet and before the start of the interview.

#### ***Are there any possible advantages of taking part?***

There are no advantages apart from the opportunity to contribute to a better understanding of factors which influence professional preparation for rare, critical and emergency events during childbearing.

#### ***Are there any possible disadvantages and risk of taking part?***

There is the potential inconvenience in having to attend a research interview during working hours. The research will be organised to cause the least inconvenience possible, for example, meeting at your workplace. There are no risks perceived.

#### ***What happens to information about me and answers that I give?***

With your permission I will audiotape the interview. You will be assigned a participant identification number (ID) to identify the audio recording. Your name will not be recorded. I will transcribe the interviews verbatim and store them anonymously with the assigned participant ID. Direct quotations may be used in reports or publications

anonymously. I will explicitly seek consent for the digital recording of the interviews and the use of direct quotations. If you choose to withdraw from the study I also seek your consent to retain and use any identifiable data (using an ID number) which you have already given.

Your ID and work contact details will be stored on a password-protected computer. The transcribed interview will not be held together with your details. During the study my supervisor, key investigators in the research team and I will have access to your anonymous personal data. Data will be stored on the University of Leeds firewall-protected secure server accessible via password for security and safety. This is in accordance with that Institutions data security policy. Data will be removed from the university server once I have completed my programme. After finishing this study the data will be stored on the password protected computer of my supervisor (Dr Janet Hirst) for 3 years.

During the interview if information is divulged which is considered to be illegal activity or in breach of the relevant code of professional conduct (NMC & GMC) this may be shared with and followed up by Head of Midwifery or Clinical Director (as appropriate to the professional group). Should this happen, you will be fully informed both verbally and in writing.

***What will happen to the results of the research study?***

A written summary of the research and findings will be sent to all participants after the study has been completed. Any study results will be sent to participants.

***Who is funding the research?***

No application for external funding will be made.

***Who has reviewed the study?***

The scientific quality of the research has been assessed by my academic supervisors Dr Janet Hirst and Professor Trudie Roberts and two independent assessors at the University of Leeds. This study has also been reviewed by the (name of ethics committee).

***Who can I contact for further information?***

(Details removed)

**You will be given a copy of this information sheet and a signed consent form to keep.**

## Appendix 15 consent Form for Interview

### CONSENT FORM

Researcher: Angela Hewett

Simulation and professional preparation for rare, critical and emergency events during childbearing – a mixed method study.

Name of Principal Investigator: Angela Hewett, University of Leeds

Contact 0113 3\*\*\*\*\*

SREC approval number: SHREC/RP/341

Participant ID: .....

Thank you for your interest in this study. If you would like to take part, please read the associated information sheet, confirm the questions on this form with me and sign this form. You will be given a copy to keep. PLEASE INITIAL THE BOXES IF YOU AGREE WITH EACH SECTION:

1. I have read the information sheet (Version 1 HCP Interview) for the above study and have been given a copy to keep. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw during the interview without giving any reason, without my legal rights being affected and I will be asked if data already given can be retained and used.

3. I understand that, following the interview, I am free to withdraw within 7 days without my legal rights being affected. After this point any data recorded will be retained and used.

4. I agree to my interview being audio-recorded and I understand that a transcript of my interview will be anonymised and stored securely for 3 years following completion of the study.

5. I understand that I will not benefit financially if this research leads to the development of a new service.

6. I know how to contact the research team if I need to.

7. I agree to participate in this study



---

Participant: name

Date

Signature

---

Researcher: name

Date

Signature



## Appendix 16 Quality Assurance of Transcription

5. 3 transcriptions were assessed i.e. the transcript and audio-recording compared for accuracy and evidence of the transcription protocol.

As part of the quality assurance process an academic supervisor reviewed 3 transcripts to judge the dependability of the transcription process (interview numbers 4, 10 and 19).

Overall, the transcription protocol was used to good effect and improved in quality between early and later transcriptions as this skill developed.

There was a very high level of agreement between the transcription and the audio recording i.e. nearly all words spoken were transcribed verbatim. There were very occasional missing utterances i.e. "erm" from one of the participants (#19) and very occasional interruptions or para-verbal utterances missing from A (#4); neither made any apparent difference to the meaning of the sentence.

Para-verbal utterances were transcribed i.e. conversational gap fillers, expressions of feelings of doubt, confirmation. Pauses were indicated although these could have been noted more clearly for analysis e.g. (*duration*) or use of a dash-; --. Incomplete words were written verbatim. Emphasis e.g. when a participant became 'concerned' was evident in the text. Simultaneity for two speakers was handled effectively by inserting words in parenthesis.

The interviewer used the expression ..."that's interesting..." on more than one occasion for each interviewee. Its influence would be worth considering and if this was an intentional part of the interview style or a reflection of a 'light-bulb' moment.

Participants have provided rich data.

## Appendix 17 Peer Debriefing of Qualitative Data Analysis

I have looked through the NVivo file containing the data from 25 transcriptions and discussed the nodes with Angela. The parent nodes have been coded deductively and are based on attribution theory which gives four groupings based on combinations of external/internal and stable/unstable. These four are each approached in terms of preparedness and simulation, giving a total of eight groupings which may be considered 'themes'. Within each of the eight groupings there are several further nodes which may be considered 'sub-themes'. The sub-themes have been developed using a more inductive approach and use a combination of terms from the literature on attribution theory and terms developed by the researcher. It will be important to note the sources of each term.

I am not familiar with attribution theory however the majority of coding appeared credible and the themes and sub-themes largely hung together. We discussed some examples that had been coded as stable but could be considered unstable, and vice versa. We also discussed that there may be variation between individuals as to whether something is stable or unstable. Just as there is some blurring between stable and unstable, there is also blurring between internal and external. We discussed the need for Angela to address these complexities when writing the descriptions of the themes and sub-themes, and providing clear examples for each category in the narrative.

Specific comments and discussions are noted below.

### External, preparedness

1. Safety. Discussed what was meant by safety and that this could be understood as 'practising in a safe environment'. The reference that concerned the safety in practice that is gained through simulation was reassigned.
2. Teamwork (stable) and Familiarity with environment (unstable). Discussed why former was viewed as stable and latter as unstable and suggested: i) that both may be considered unstable, and ii) that, with experience, things may feel more stable to individuals.
3. Multi-faceted. This sub-theme had few coded examples; the examples all explicitly addressed the influence of multiple factors and all came from participants who were 'experienced'; quotations in other sub-themes also indicated such interactions, although more subtly. Discussed whether multi-faceted constituted a sub-theme or may be considered over-arching

and also that, with experience, individuals may be more likely to draw on a range of factors as they develop confidence and mastery, relying less on formal teaching and others.

4. Timing of training renamed to frequency of training, or possibly frequency and recency of training.
5. Workload. Discussed whether this may also reflect competing priorities and the value assigned (by individual or culture) to simulation.

#### External, simulation

1. Fidelity and realism. Discussed the significance of this sub-theme and that this could be categories further, e.g. appearance of doll, different roles, feeling watched/videoed/artificial/staged.
2. Discussed overlap between governance (in external, preparedness) vs. guidance (in external, simulation) – could they both be called governance and guidelines?
3. Task. This is linked to fidelity and realism (i.e. the tasks are 'real' and you can't just pretend to do them).
4. Discussed whether some of the examples in 'deliberate practice' could be considered 'task' and suggested considering the difference(s) between the two, alongside clarifying what makes something stable vs. unstable.
5. Multi-professional working. Quotations indicate that this sometimes links to fidelity and realism (e.g. not the people you would be working with / key role missing). Discussed the need to clarify why fidelity and realism are considered stable whereas multi-professional working is considered unstable. Discussed whether fidelity and realism is needed in both stable and unstable.
6. Outcomes. Discussed whether this may be coded differently due to including a blend of outcomes (effectiveness?) and drivers. Discussed removing this sub-theme and relocating the drivers into governance and guidelines.
7. Scenario management. Discussed that this includes a mixture of fidelity and realism, use of video feedback, people from different backgrounds (CMWs) and relevance to different workers. Perhaps some of this should instead go in fidelity and realism (e.g. scenario and way that information is provided). May rename scenario management, e.g. choreography. Codes to be re-read and see if some should be relocated elsewhere.

#### Internal, preparedness

1. Debriefing. Several examples include use of (video) feedback which could be incorporated with scenario management to avoid overlap. Debriefing also includes quotes indicative of reflection (i.e. person as active part of process) so discussed revisiting the examples and the possibility of grouping these sub-themes as debriefing and reflection or relocating some examples.
2. Anticipation. Discussed that this may be more accurately described as anticipation and preparation to reflect also taking action rather than purely cognitive process.
3. Experience and expertise. Discussed the need to clarify and justify why experience was classified as stable within external preparedness but unstable for internal preparedness. Also noted that some quotations about experience and expertise explicitly linked to confidence and that these links should be acknowledged in the narrative.
4. Making mistakes and reliance on other. Both included quotations indicating debriefing and reflection therefore need to consider relationships between these sub-themes and possible areas for further synthesis. Discussed that this may be partly a product of the interview being a reflective process.
5. Skill decay. Noted that this could be considered alongside experience and expertise, acknowledging that those with experience and expertise may face skill decay.

#### Internal, simulation

1. Being on display. Discussed that this links to confidence but the former has been coded as stable and the latter as unstable. Discussed that being on display appears to be more concerned with confidence in ability to respond appropriately and perform (akin to performance anxiety), whereas the node on 'confidence' is about confidence that is gained through simulation. Suggested that the names need to reflect these differences, e.g. renaming confidence as 'confidence gained through simulation'. Also discussed that within being on display, may be beneficial to tease out 'being videoed' from performance being public, and judged/evaluated, reviewed etc.
2. Desire for mastery. This appears to be more about the aspiration of giving really good care, rather than 'mastery' in relation to critical incidents.

3. Preparing for training. Discussed that this seems to be mostly about reading/revision i.e. pre-course requirements and a very particular type of learning, rather than psychological preparation/engaging in reflective processes in preparation for training.
4. Feedback. This has overlap with 'debriefing' and 'reflection' (which are in internal, preparedness). Discussed whether the same title (e.g. 'debriefing and reflection') could be used for both simulation and preparedness, and highlighting the commonalities and differences.
5. Making mistakes. This is in both preparedness and simulation. As for previous comment, it may be helpful – where applicable- to use the same titles across different categories.
6. Theory into practice. Discussed the need to clarify why this would be considered internal.

## Appendix 18 Illustrative Example of Analysis Development

Theme – Preparedness for rare, critical and emergency events (codes in <b>bold</b> , changes in <b>red</b> , alteration from peer review in <i>italics</i> ).						
Cause	Stability	Initial Coding	2 <sup>nd</sup> Iteration	3 <sup>rd</sup> Iteration	4 <sup>th</sup> Iteration (following peer review)	Final Coding
External Attribution	Unstable	<b>Outcomes of care</b>  <b>Familiarity with environment</b>	<b>Outcomes of care</b> – appeared to be related to clinical outcomes a–d - <b>Making Mistakes*</b>  <b>Familiarity with environment</b> – also related to other <b>environmental factors e.g.</b> <b>Timing of training</b> <b>Ability</b> <b>Workload</b>	<b>Outcomes of care and making mistakes</b> also contained elements of <b>frequency of events</b>  <b>Familiarity with environment</b> <b>Timing of training</b> <b>Ability</b> <b>Workload</b> <b>Multi-faceted code</b> used to identify elements such as learning style.	<i>Outcomes of care renamed as appeared to relate to <b>Frequency of events</b> e.g. how regular, rather than clinical outcomes</i>  <b>Familiarity with environment</b> <i>Timing of training renamed to <b>Training (frequency and recency)</b></i>  <i>Ability appeared associated with being able to anticipate events and therefore moved to Internal attribution.</i>  <i>Workload reflected <b>Competing priorities</b> in the workplace – value re-assigned</i>  <i>Multi-faceted discussed as being the overarching principle to be discussed along with developing expertise and experience. Value removed and data re-assigned within teamwork and reflection.</i>	<b>The Environment</b> (encompasses competing priorities and familiarity with environment).  <b>Timing</b> (encompasses frequency of events and training (frequency and recency))
	Stable	<b>Experience</b>	<b>Experience</b> – along with number of years this also related –o -  <b>Simulation</b> <b>Teamwork</b> <b>Governance</b>	<b>Experience</b> <b>Simulation</b> <b>Governance</b> further reviewed and associated with <b>safety</b>  <b>Teamwork</b> <sup>8</sup>	<b>Experience and Expertise</b> <b>Teamwork</b> <b>Governance and Guidelines</b> <sup>9</sup>  <i>Safety reviewed as meaning practise within a safe environment (gained through teamwork) and with the safety associated with simulation therefore value reassigned within simulation theme.</i>	<b>Experience and Expertise</b> <b>Governance and Guidelines</b> <b>Knowing the team</b>

<sup>8</sup> Blurring noted between teamwork as stable and familiarity with environment as unstable. Both may be considered unstable and, with experience become stable.

<sup>9</sup> This code also included within simulation theme (external) as found to be a key element/driver within both themes. To be discussed within the result chapter.

Internal Attribution (preparation)	Stable	Reliance on self Reflection	<b>Reliance on self</b> <b>Reflection – also related to reflections on the impact – f -</b> <b>Reading</b> <b>Debriefing</b>	<b>Reliance on self</b> <b>Reflection</b> <b>Reading</b> <b>Debriefing</b> <b>Age also identified within the data as relating to preparedness.</b>	<b>Reliance on self</b> <b>Reflection</b> <i>Debriefing (some quotes indicative of reflection and, therefore, reassigned).</i> <i>Reading appeared associated with anticipatory actions and, therefore, value reassigned.</i> <i>Age reviewed and re-assigned within experience and expertise (although it is noted that age is not unstable, the data appeared to relate to years of experience)</i>	<b>Debriefing</b> <b>Reflection</b> <b>Reliance on self</b>
	Unstable	<b>Skill decay</b> <b>Reliance on others</b> <b>Experience</b>	<b>Skill decay</b> <b>Reliance on others</b> <b>Experience also related to perceived Expertise</b> <b>Knowledge</b> <b>Confidence</b> <b>Habit</b> <b>Making mistakes<sup>10</sup></b>	<b>Skill Decay</b> <b>Reliance on others</b> <b>Experience and Expertise</b> <b>Knowledge</b> <b>Confidence</b> <b>Habit</b> <b>Making mistakes</b> Data identified as relating to recognition of critical nature of events and therefore assigned as <b>Anticipation</b>	<i>Skill decay noted as being related to experience and expertise as these individuals may face skill decay. Value re-assigned.</i> <b>Reliance on others</b> <b>Knowledge</b> <b>Confidence</b> <i>Habit reviewed and appeared to be associated with a desire for mastery borne out of education and training, therefore value re-assigned within simulation theme.</i> <i>Making mistakes included elements relating to debriefing and reflection and, therefore reassigned. Some quotes also identified as relating to governance – therefore re-assigned.</i>	<b>Anticipatory Action (encompasses reading)</b> <b>Confidence in Ability</b> <b>Experience and Expertise (encompasses skill decay)</b> <b>Knowledge</b> <b>Reliance on others</b>

<sup>10</sup> Blurring existed between mistakes being both external/unstable and internal/unstable. Unstable because this is not a regular or intentional action but both internal, as self-identified as having made the mistake but also external as other make mistakes.

Theme – Simulation (codes in <b>bold</b> , changes in <b>red</b> , alteration from peer review in <i>italics</i> ).						
Cause	Stability	Initial Coding	2 <sup>nd</sup> Iteration	3 <sup>rd</sup> Iteration	4 <sup>th</sup> Iteration (following peer review)	Final Coding
External Attribution	Unstable	<b>Deliberate practice</b> <b>Frequency of events</b> <b>Video and Feedback</b>	<b>Deliberate Practice</b> <b>Frequency of Events</b> Video and feedback appeared to be associated with <b>Reward &amp; Punishment</b> There also appeared to be data related to <b>Scenario Management</b> <b>Multi professional working</b> <b>Outcomes of simulation</b>	<b>Deliberate Practice</b> Frequency of events associated with the <b>scenario management</b> in terms of how often scenarios were practised. Quotes therefore reassigned. <b>Multi professional working</b> <b>Outcomes</b>	<i>Deliberate practice, some elements moved to 'task' as considered to be stable. Considered title of this code as elements which were unstable appear related to <b>repetition</b> of the simulation. There were also elements considered to be related to how the practice is facilitated within the simulation and, therefore, re-assigned to <b>simulation choreography</b>.</i> <i>Scenario management included a mixture of fidelity/realism, video feedback which were re-assigned to <b>simulation choreography</b> also. There were also elements relating to the inclusion of a range of members of a team and, therefore, value reassigned to <b>multi-professional working</b>.</i>	<b>Multi-professional working</b> <b>Repetition</b> <b>Simulation Choreography</b>
	Stable	<b>Clinical Guidelines</b> <b>Fidelity</b> <b>Mnemonics &amp; Acronyms</b> <b>Practised scenarios</b> <b>Realism of Simulation</b>	Clinical guidelines appeared to be associated with <b>guidance</b> driving simulation. Mnemonics & Acronyms also related to the guidance offered within the simulation. Some elements of this delineated to be related to <b>outcomes</b> . <b>Fidelity was linked with realism and, therefore, code merged</b> . Practised scenarios appeared to be related to the ease or difficulty of the task assigned, code changed to <b>Task</b> .	<b>Guidance</b> <b>Fidelity &amp; Realism</b> <b>Task</b> <b>Outcomes</b>	Discussed the overlap between governance (external/preparedness) and guidance here. Both could be considered to be in the correct place i.e. related to both simulation and preparedness but re named to <b>governance and guidelines</b> . There were elements within <b>fidelity and realism</b> which were re-assigned to simulation choreography (as related to different roles, video feedback etc.) Task was also linked to <b>fidelity and realism</b> as tasks were perceived to be 'real'. This node was removed. Outcomes was coded differently (within <b>governance and guidelines</b> ) and node removed. Appeared to be largely related to drivers.	<b>Fidelity and Realism</b> <b>Governance and Guidelines</b>

Internal Attribution (Simulation)	Stable	<p><b>Anxiety and Fear associated with Sim.</b></p> <p><b>Feeling associated with Sim.</b></p> <p>There were elements which I was <b>unsure</b> how to code at this point.</p>	<p>Anxiety and fear and feelings associated with simulation appeared largely related to <b>being on display</b> (also considered the term 'performance anxiety' and, therefore re-assigned.</p> <p>Data which I was unsure about was coded as <b>preparation for training, desire for mastery</b> and <b>memory &amp; learning style</b>.</p>	<p><b>Being on display</b></p> <p><b>Preparation for training</b></p> <p><b>Desire for mastery</b></p> <p>Memory and <b>learning style</b> – the elements relating to memory were re-assigned to knowledge (within preparedness) as this seemed a better fit for what was being said.</p>	<p>Being on display was related to confidence gained through simulation (therefore moved to unstable) and also akin to <b>performance anxiety</b>,<sup>11</sup> which, again, can be considered to be unstable as may change over time and, therefore, this code moved to unstable.</p> <p>Preparation for training identified as being about reading/revision and pre-course requirements and, therefore, re named <b>Approach to Learning</b>.</p> <p><b>Learning style</b></p> <p>Desire for mastery appeared to be related to the aspiration to <b>providing good care</b> and, therefore, re-named.</p>	<p><b>Approach to learning</b> (encompasses learning style and preparation for training)</p> <p><b>Providing quality care</b> (appeared a more appropriate term than providing 'good' care)</p>
	Unstable	<p><b>Theory and Practice Gap</b></p> <p><b>Luck</b></p> <p><b>Confidence</b></p> <p><b>Remembering</b></p> <p><b>Making Mistakes</b></p>	<p><b>Theory &amp; practice gap.</b></p> <p>Luck appeared to be related to both desire for mastery (within stable domain) and with outcomes (external) and therefore re-assigned and code remove.</p> <p><b>Confidence</b></p> <p><b>Making Mistakes</b></p> <p>Remembering was re-named <b>memory</b> as this seemed a better fit for what was being said.</p>	<p><b>Theory &amp; practice gap</b> quotes considered to be related to knowledge (within preparedness) and re-assigned.</p> <p><b>Confidence</b></p> <p><b>Making Mistakes</b></p> <p>Memory associated with desire for mastery, memories of being on display, anticipation of events and knowledge. Quotes re-assigned and code removed. Elements related to <b>Feedback</b> and, therefore re named.</p>	<p><i>Theory &amp; practice was discussed in terms of how fidelity and realism impacts on practice (therefore re-assigned) and what could be considered 'internal' and this appeared to be related to individual <b>application to practice</b>. This was also true for feedback and making mistakes. Quotes were, therefore re-assigned.</i></p> <p><i>Within feedback, some quotes were also related to debriefing and reflection (within preparedness theme) and, therefore re-assigned.</i></p> <p><b>Confidence gained</b> seemed a more appropriate term to encapsulate the effect of simulation on the individual. .</p>	<p><b>Application to practice</b> (encompasses feedback, making mistakes and theory into practice) Original code of theory-practice gap required delineating further.</p> <p><b>Confidence gained</b></p> <p><b>Performance Anxiety</b></p>

<sup>11</sup> Again, blurring exists as performance anxiety could feel relatively stable to the individual but could also change over time with experience and confidence.

## Appendix 19 Example from Field Notes re Analysis

17

Analysis cont. 30 May 2015.

~~Think~~ about engaging with the data ~~and~~  
and not the software (NVivo).

Printed first transcripts - Italy  
and analysed first before starting to  
code on NVivo.

Also reflected again on how the vignette  
distorted the flow of conversation and  
did not give me the depth of response  
I required for understanding what  
participants were drawing on in  
responding to events.

Transcribing the work meant that I  
began engaging with the data at  
an early stage.

June 2015 - 5th

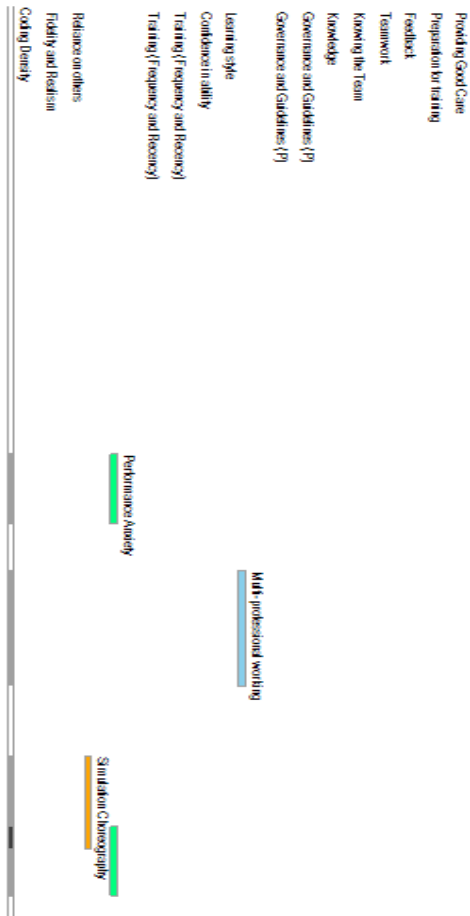
By 11 realised that the notion of  
"flow" required a separate analysis.



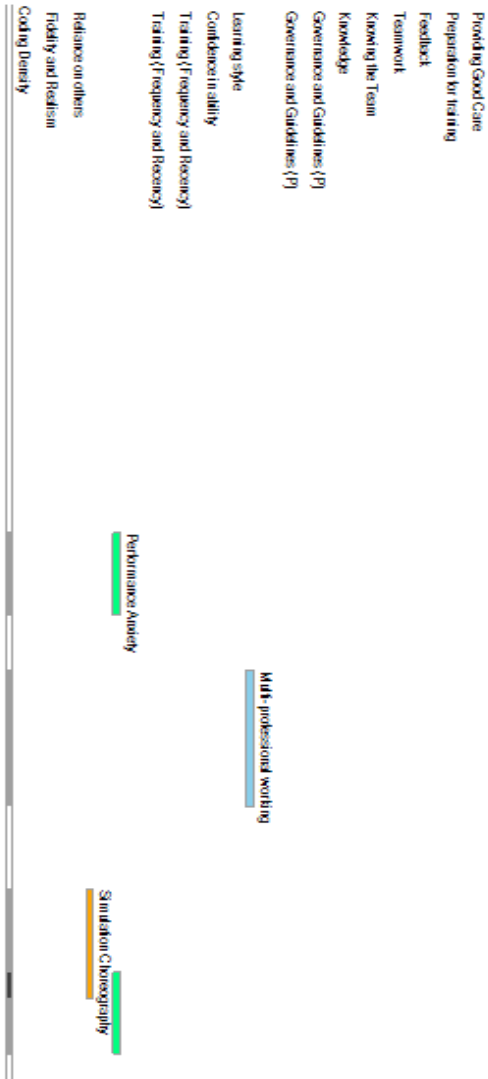
## Appendix 20 Example of Coded Transcript

First page of transcript includes details of professional experience and may identify the participant – therefore removed.

- 028: A. So you would consider those things to be rare.
- 029: B. Erm, (pause) I suppose rare-ish in comparison to all of the normality that happens. //yeah// but they still do happen so
- 030: A. Okay, and I'm also interested in simulated learning and how useful that is in preparing for these events and simulated learning can be a range of things from multi professional learning to role play to computer based those kind of things, so, what types of simulated training and experience have you had.
- 031: B. I suppose the main one is the YMET training which is the emergency training, for situation, for emergency situations such as shoulder dystocia or erm post partum haemorrhage and things like that, that's a simulated training, but also like a role play really as well.
- 032: A. Right, yeah, any other approaches?
- 033: B. Some of the electronic learning on computer now is sort of video's that you watch and answer questions following on.
- 034: A. Right.
- 035: B. Erm, there are also the CTG, K2, which is electronic as well, that's also sort of simulated learning
- 036: A. Right, and do you have a preferred approach that works for you
- 037: B. Erm, (pause) probably the computer based ones really.
- 038: A. Right.
- 039: B. Erm as I think the actual role plays are ever so good and I think they do work but, its not really my scene ( laughs) but I understand why you need to do them and I do think that they do work really well, but you are sort of being filmed and watched and it makes me feel nervous .
- 040: A. Right okay. So that's interesting, there are a couple of things there, so you think, you said that you feel its useful, in what way is it useful.
- 041: B. Because it just, it sort of raises your awareness and erm, because you have to do it mandatory every year, I suppose it, erm, highlights the need to be, sort of, on the ball and to know what would happen to do in an emergency and it sort of brings everybody together, erm, all this sort of multi disciplinary team that work on delivery suite, so midwives, health cares, obstetricians, anaesthetists, so you are all working together.
- 042: A. Right. But you said that the filming is stressful.
- 043: B. Yeah
- 044: A. Does that affect your experience of that simulation in any way.
- 045: B. Erm, not at the time, I don't think, because you are sort of, busy dealing with the emergency and although it is role play, it feels like it's a real scenario, so maybe not actually at the time but when you go back and look at it after ya, it makes you, and then you know next time you go, its going to be the same again where you are going to be filmed, so I think it's the anxiety as well before you go really that you know, that I think once you are actually in the scenario, you do tend to forget that actually you are being filmed
- 046: A. So how useful is the filming part of it to you.



- 328: A. So you would consider those things to be rare.
- 329: B. Erm, (pause) I suppose rare-ish in comparison to all of the normality that happens. //yeah// but they still do happen so
- 330: A. Okay, and I'm also interested in simulated learning and how useful that is in preparing for these events and simulated learning can be a range of things from multi professional learning to role play to computer based those kind of things, so, what types of simulated training and experience have you had.
- 331: B. I suppose the main one is the YMET training which is the emergency training, for situation, for emergency situations such as shoulder dystocia or erm post partum haemorrhage and things like that, that's a simulated training, but also like a role play really as well.
- 332: A. Right, yeah, any other approaches?
- 333: B. Some of the electronic learning on computer now is sort of video's that you watch and answer questions following on.
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- 335: B. Erm, there are also the CTG, K2, which is electronic as well, that 's also sort of simulated learning
- 336: A. Right, and do you have a preferred approach that works for you
- 337: B. Erm, (pause) probably the computer based ones really.
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- 342: A. Right. But you said that the filming is stressful.
- 343: B. Yeah
- 344: A. Does that affect your experience of that simulation in any way.
- 345: B. Erm, not at the time, I don't think, because you are sort of, busy dealing with the emergency and although it is role play, it feels like it's a real scenario, so maybe not actually at the time but when you go back and look at it a ter ya, it makes you, and then you know next time you go, its going to be the same again where you are going to be filmed, so I think it's the anxiety as well before you go really that you know, that I think once you are actually in the scenario, you do tend to forget that actually, you are being filmed
- 346: A. So how useful is the filming part of it to you.



547: B. Its, well its probably critical analysis isn't it really, going back and looking at, erm, and then sort of looking at the good things, things that people did well, things that people maybe didn't do so well, how you could improve, if there is any room for improvement, how you worked well as a team.

548: A. Yeah.

549: B. So, I think it is, it is probably quite vital really.

550: A. Yeah, Yeah. If there was a situation where a clinical scenario was filmed, but obviously you weren't involved in it but you still had that video and that stop start and that feedback and breaking it down, would that be just as useful less useful, how, would it make any difference do you think.

551: B. If I wasn't actually in the film but watching a film back.

552: A. Hmm.

553: B. Erm, I think so, yeah, but I think because you are not the participant you maybe, don't pay as much interest maybe, or just sort of, yeah but maybe not as much as if you were actually involved in the film, in the film at the time.

554: A. Right.

555: B. Yeah yeah.

556: A. Okay. So do you feel like that you have developed expertise over time in dealing with critical events.

557: B. Erm I wouldn't. I'm not sure if I would say expertise that I feel confident enough that I would be able to assist, or you know, know what to do in the first instance in an emergency and who to call and what so, and what to do and the first steps.

558: A. Right.

559: B. Yeah.

560: A. Okay. So have you ever questioned your skills in responding to a critical event.

561: B. Erm, Have I questioned my skills. Not sure that I have questioned my skills, but, and I do know that I am probably, less forward than some people as in the, in a situation, if other people came in to take over I would be happy for them to take over and I'd stand back a little bit, so I am probably not so full on as some people are really.

562: A. Right. And why do you think that is.

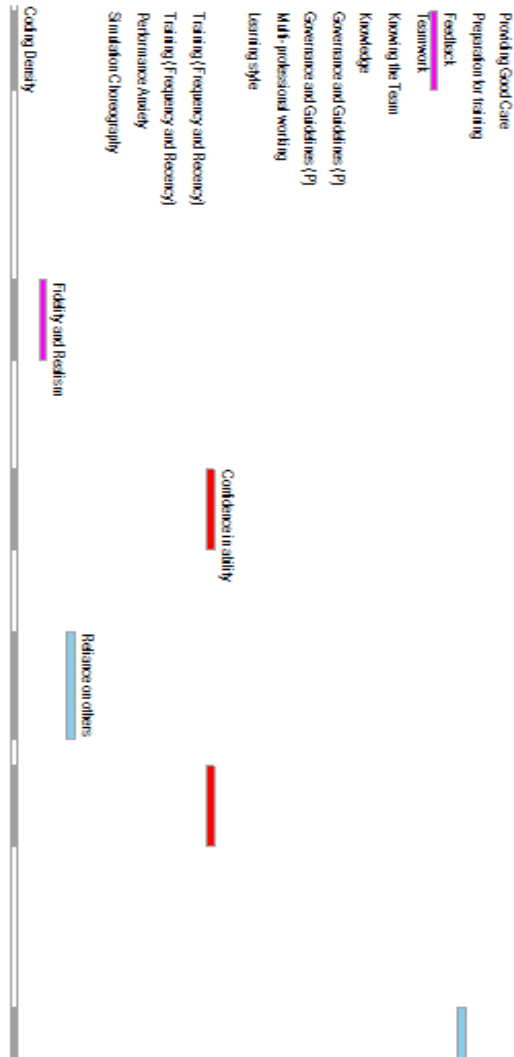
563: B. Maybe just a confidence thing, and lack of, lack of confidence and experience really, and if there is somebody else that comes in that's more experienced I'd feel yeah, just a confidence and experience thing.

564: A. Yeah, and is that because those events are rare, you haven't had that kind of, day to day experience on the ward environment.

565: B. Yeah Yeah.

566: A. Right. Okay. So, is there a point, you say that the YMET is annual and that is the one that you get the most out of //yeah// Is there a point in that year where you feel like, maybe you are losing your skills, who that you would prefer the simulation to be repeated.

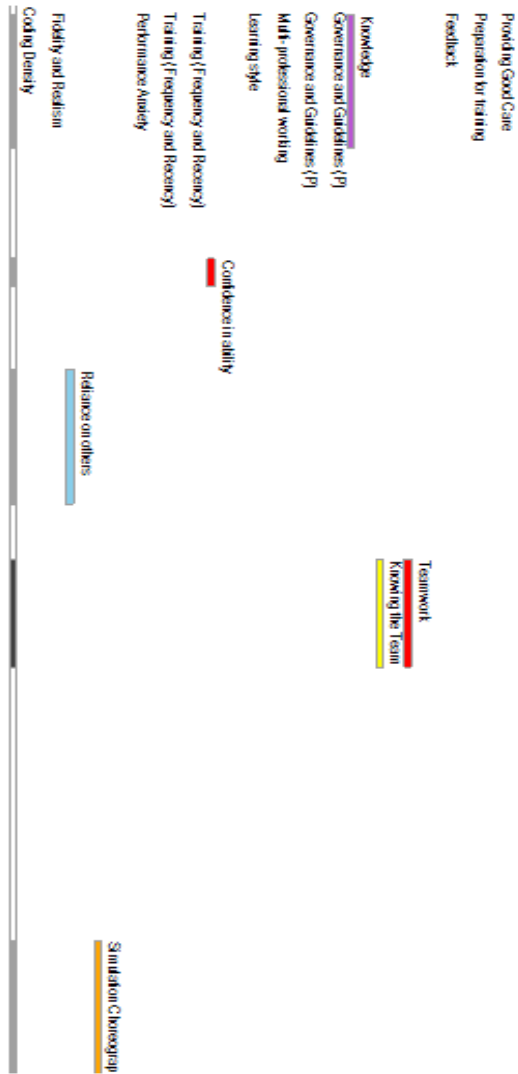
567: B. Yeah, yeah I think I think its a good thing to always be keeping your sort of knowledge up to date, and, I know when you do go on your YMET you probably read the course revision before



- you go to just to make sure that you know what you are doing on the day, so yeah, I do think that probably doing it more often would sort of, make you feel more confident and make sure that your skills are up to date.
- 568: A. Anyhow much more often would that be ideally then.
- 569: B. Maybe every six months, maybe.
- 570: A. Right, Right, and is that because, going to what when its nearing that year mark you, you feel that you are ready to be refreshed or, what is it, what would doing it more regularly would bring to you.
- 571: B. Erm, I just think it would concrete your knowledge a little bit more and build up your confidence and experience, and just make you feel a little bit more confident to deal with the situations, I'm not sure it would be for everybody but probably for me to do it more often just as a refresher, and I personally would probably benefit from that.
- 572: A. Yeah, okay. So I am also, there's different types of products and there are some that are very life like and some that are really quite basic, there's a whole range of things available. Have you experience in different types and levels of products over your experiences.
- 573: B. For learning skills, erm, you mean things like the dolls that we use
- 574: A. Yes, like the manikins.
- 575: B. The manikins and the dolls that you use for resuscitation and things like that. Yeah.
- 576: A. Yes, so how in, in what ways does it matter to you, how realistic or, or not.
- 577: B. Well I think, in, sort of the neonatal resuscitation that it matters because, erm, if when you are doing the sort of inflation breaths and things like that, the babies chest rises and it shows, and it helps you to know that actually, what you are doing is correct, because obviously, you need to have the babies head in the correct position with an oxygen mask in the correct position to enable you to get the sort of chest rises and that what happens with a, sort of the dolls that they use, so it makes you know, that actually, what you are doing is correct.
- 578: A. That you are doing it correctly
- 579: B. Yeah, yeah.
- 580: A. So in what ways is the realism of the whole simulation important to you, so thinking about your YMET or neonatal resus.
- 581: B. I think they are really important yeah.
- 582: A. Does it feel realistic to you when you are in those scenarios.
- 583: B. yeah it does yeah, very.
- 584: A. Right, okay. So what motivates you to develop your skills and prepare you for rare events, critical events.
- 585: B. Erm, I think its just sort of improving your knowledge, but its a continual learning in the job that we do so you are always sort of learning and reading and refreshing and topping up your knowledge.
- 586: A. Right.



- 087: B. Erm, I know there are like, HDU courses and different courses that you can go on to for you know, for critical skills in caring for women, sort of foreign ladies and things like that there's different courses that you can do //right// as opposed to sort of, just the basic HDU erm, but I suppose just to improve your skills as a practitioner really and just have an all round general knowledge.
- 088: A. Good. So, based on your simulated experiences, how prepared do you feel to go into a critical event, especially one that might be quite a rare critical event.
- 089: B. Erm, how was it
- 090: A. How prepared do you feel.
- 091: B. How prepared do I feel. (pause) Average
- 092: A. Average
- 093: B. Yeah
- 094: A. Okay and what can you just explain what that means then.
- 095: B. Yeah as I say I am happy to go in and assist, but I tend to be a person that steps back a little bit really and I know that I do that, so yeah I would be prepared to go in and obviously if I needed to take over or take the lead I would, but as I say, whether its just an experience or confidence thing that I'm you know, would be happy for somebody else to sort of, lead in situations.
- 096: A. Yeah. So that multi disciplinary teams seems important to you. How important is that multi professional approach to learning together important to you.
- 097: B. Erm. (pause) I think, yeah I think quite quite important really, because we are all sort of we are all working together as a team albeit doing different sort of jobs and professions, but like you say, caring for a critical woman, erm, the obstetrician would have some input, the anaesthetist would have input, erm, so I think its all important that there are sort of seen together yeah.
- 098: A. Yeah. So reflecting upon your experiences of simulated learning, where there has been multi-disciplinary team, have you ever had to take on a role that necessarily wouldn't be your day to day role.
- 099: B. No
- 100: A. You have always just been given the role that you would be expected to know.
- 101: B. Yeah
- 102: A. Okay and is that important.
- 103: B. Erm, yes I think it is, yeah
- 104: A. In what way.
- 105: B. Well because I am a midwife and that is my role, and that's the role that I am employed to do. Whereas, if in a simulation then somebody says will you be the obstetrician or you be the anaesthetist that's not my, that's not my role and that's probably totally out of my remit so, so no I wouldn't be happy to do somebody else's role.



¶106: A. Right okay. Is there anything else, thinking about all the things that we have talked about, is there anything else that you would like to say about simulation, how useful it is, or isn't in your learning.

¶107: B. I think its very useful I just as I say, it can be a bit nerve racking and its sort of true to life and it's a bit sort of role play enactment that I do think that it does help to prepare you for situations and at the time, when you are actually in the simulation or in the role play it does feel that it's a life like situation.

¶108: A. Right. So when you actually have to go into a critical event in real life, what are you drawing upon, are you actually thinking about those simulations, or

¶109: B. Erm, I suppose to a certain point you are going through the procedures of what would you do and sort of trying to remember the policy and the guidelines and you now, what would you do first and then second so, so going back to the simulations, yeah you would sort of take from that

¶110: A. Right. So it sounds like you are saying its those kinds of check lists or algorithms that you are learning in the simulation that you are thinking about.

¶111: B. Yeah like airway, breathing circulation things like that, or drugs, or what drugs you should give first and things like that.

¶112: A. Right. And could you think you could learn that in a different way.

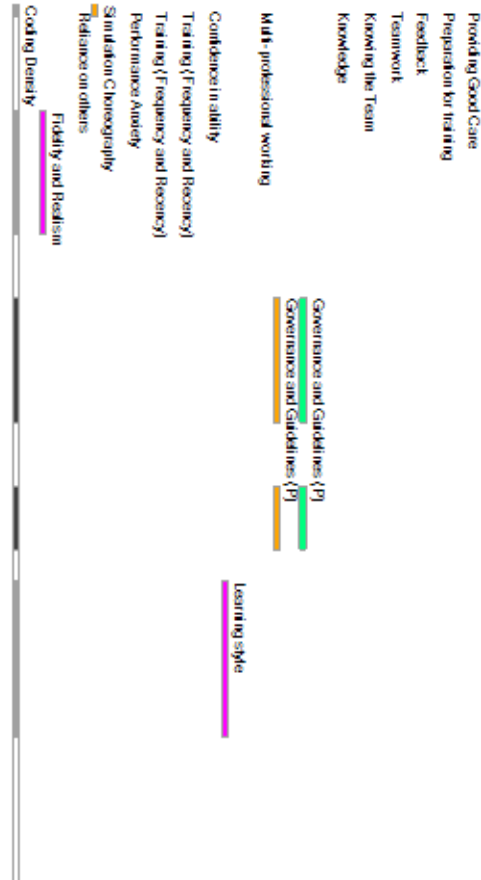
¶113: B. I think you could erm, yeah, by sort of reading policies and guidance but I think its different when it's a situation, a true life situation so to be able to sort of, act out those situations erm, helps you sort of. You think you know, you know you can read something and you think you will remember it, but actually then, when it came to real life event, would you sort of remember it back sort of, by enacting out the simulations, I think it does help you to cement things, //right// for me anyway

¶114: A. Is there anything else you would like to add about anything that we have talked about.

¶115: B. No I don't think no

¶116: A. You're happy

¶117: B. Yeah



**Appendix 21 Participant Quote Count**

Participant Number	Profession	Number of quotes used for demonstration of theme	Experience (range in years)
1	Midwife	Five	1 to 4
2	Midwife	Four	5 to 9
3	Midwife	Two	10 to 14
4	Midwife	Four	1 to 4
5	Midwife	Two	5 to 9
6	Midwife	Three	1 to 4
7	Midwife	Two	1 to 4
8	Midwife	Four	15 to 19
9	Obstetrician	Five	20 and over
10	Midwife	Five	5 to 9
11	Obstetrician	Five	20 and over
12	Midwife	Four	10 to 14
13	Midwife	Eleven	1 to 4
14	Midwife	Eight	20 and over
15	Maternity Support Worker	One	10 to 14
16	Midwife	Four	1 to 4
17	Obstetrician	Seven	10 to 14
18	Midwife	Three	15 to 19
19	Midwife	Two	5 to 9
20	Anaesthetist	Three	15 to 19
21	Anaesthetist	Three	10 to 14
22	Midwife	Three	20 and over
23	Midwife	Four	10 to 14
24	Midwife	Six	20 and over
25	Obstetrician	Four	15 to 19

Total for years' experience; 1to4 =29, 5to9 = 13, 10to14 = 21, 15to19 =14, 20+ =27