

**Nursing expertise and self-efficacy following high fidelity
simulation-based training**

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This work could not have been completed without the patience, support and guidance of my supervisors, to whom I am incredibly grateful.

Special thanks to my wife and son, for having to occupy themselves without me for so many hours. I look forward to spending more time with you.

Abstract

The use of simulation in healthcare education has dramatically increased in popularity over the last two decades. It is thought to provide a standardised way of exposing learners to clinical situations where they can safely learn from mistakes. However, there is a lack of evidence to suggest whether simulation-based training offers significant benefits for clinical care over more traditional educational techniques, especially when the objective is a clinical judgement or diagnosis rather than a practical skill.

This thesis explores whether the use of a high-fidelity patient simulator during training has an effect on the self-efficacy beliefs and clinical practice of learners, and whether this varies according to learners' prior experience with simulation training or the clinical topic.

Data were collected through semi-structured interviews with 16 qualified nurses, all of whom had attended a simulation-based training programme designed to improve clinical judgement skills. Analysis and data collection were iterative. Using a social constructionist epistemology, a thematic analysis approach was employed.

High-fidelity simulation was perceived to be valuable by participants, who reported that it helped them to contextualize their knowledge and feel more confident about relevant clinical judgements. The reported impact on self-efficacy varied according to how much personal experience learners had in either the relevant clinical domain or with simulation as a training technique. However, greater belief in personal clinical judgement skills did not necessarily change reported clinical behaviour. The need for psychological fidelity during training appeared to be inversely related to clinical experience, reflecting the importance of contextual sensitivity in the planning of simulation-assisted training. Future research should examine whether these findings are reproducible in other settings, and consider whether simulation fidelity should be tailored to specific learner profiles.

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Chapter 1. Introduction

The study presented within this thesis considers the self-efficacy beliefs of qualified nurses who have undertaken high-fidelity simulation-based training with the intention of improving their clinical decision-making skills. Although several influences upon self-efficacy will be explored, the main focus of the study is the interaction and experience occurring during high-fidelity clinical simulation. The way in which learners describe this may help us to understand more about the impact of this technological approach upon the organization of training and the development of clinical judgement skills.

This chapter will provide a description of the relevant context and background to the study, followed by an overview of the research project itself and a statement of the overall aims and objectives.

1.1 Overview of Thesis

This thesis contains a qualitative exploration of experiences and self-efficacy beliefs, described by qualified nurses of varying levels of experience following standardised high-fidelity simulation training. It begins with a literature review of the evolution of the role of simulation in healthcare education, and an outline of the educational theories that have been used to describe how simulation may help learners to acquire knowledge and skills in different situations. Some perceived advantages and disadvantages of simulation are discussed, including the role of modern high-fidelity simulators. The literature review summarises the concepts of clinical judgement skills, clinical expertise, and self-efficacy, as these feature heavily in the data analysis and subsequent discussion. The content of the literature review has been influenced retrospectively by the results of the study. As the data was analysed and themes emerged, it became clear that certain background topics required exploration in greater detail than originally planned.

The methodology and methods are described, with justification for why certain approaches were taken. The data are presented through a combined analysis and discussion, which allows for a more fluent description of the findings and interpretation.

1.2 Context & Background

The word “simulate” means “to imitate or reproduce the appearance, character or conditions of” (Oxford English Dictionary, 2008). “Simulation” can be defined as “a technique - not a technology - to replace (or amplify) real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner” (Gaba, 2007)

The use of simulation technology in clinical education has expanded dramatically in recent years, ranging from simple part-task trainers designed for practising technical skills to immersive virtual reality simulations that aim to recreate all aspects of the clinical world. The main accepted advantage of simulation technology is that it provides learners with the opportunity to hone their skills safely, knowing they are able to make mistakes without harming patients. Simulation technology is constantly advancing and the technology is usually associated with significant expense, requiring both equipment and the creation of a faculty of skilled trainers. So far, there is limited evidence to suggest how much, if any, added benefit can be gained by using simulation rather than more traditional educational methods. Simulation has been associated with improved levels of learner satisfaction (Smith and Roehrs, 2009), but it is not clear if this is universal for all forms of simulation (either individual technologies or scenario design), or whether improved satisfaction brings with it any other value in terms of clinical outcomes. This may therefore make the added expense, which can be considerable, difficult to justify in some circumstances.

The term “fidelity” describes the extent to which a simulation’s appearance and behaviour accurately reflect that of the real situation being simulated (Issenberg and Scalese, 2008). Over the years there have been several different attempts by various authors to define and explain what constitutes simulation fidelity. A commonly accepted view that is now generally accepted is based on work by Rehmann, Mitman and Reynolds (1995), who described a model that contained three overlapping dimensions of fidelity: equipment, environmental, and psychological:

- Equipment fidelity (sometimes called technological fidelity) refers to the degree of accuracy that a piece of equipment is able to achieve when attempting to physically represent something - for example, how well a full-size patient simulator mannequin manages to look and act like a real patient.

- Environmental fidelity refers to the additional stimuli in a simulated environment that a learner would usually encounter in real life - for example, looking at a bedside monitor to obtain additional information about a patient. It may overlap with, but is not exclusively related to, the accuracy of the physical representation of the clinical environment.
- Psychological fidelity refers to the perception that the student has of the simulation being an accurate representation of the reality that it is attempting to recreate, and their subsequent ability to treat the simulation as real and act just as they would in real life.

All these elements together are important in helping to create and maintain the illusion that the task or activity in which a learner is participating is an accurate representation of a task or activity that they may be required to undertake in the “real world”.

It is consensus opinion that psychological fidelity is the most important aspect in the transfer and application of skills from the training environment to the real world, as without it learners are unlikely to act in a training environment as they would in a clinical one (Beaubien and Baker, 2004).

These concepts were originally developed with reference to the aviation industry, where it is common to for a simulator to be a piece of equipment designed to mimic the interior of a cockpit, in which a trainee pilot sits and acts as they would when flying a real plane. In this case, the relationship between equipment and environmental fidelity is a close one. In high-fidelity simulation in healthcare, a simulator is often a patient mannequin rather than a training room. In this context, equipment fidelity usually refers specifically to a patient simulator. When environmental fidelity is considered, as well referring to visual cues and sensory information from the environment, it may also refer to the physical appearance of the environment if the environment itself is not considered part of “the simulator”. For the purposes of this study, all references to the physical training environment in which the simulated scenarios take place will be considered as environmental fidelity, although it is acknowledged there may be an overlap with equipment fidelity.

Northumbria Healthcare NHS Foundation Trust is a University-associated acute care trust that is spread over a large geographical area and includes three acute hospitals that accept emergency admissions. The provision of training opportunities in the management of unwell

patients plays an important role in helping to keep the knowledge and skills of clinical staff up-to-date. This helps to ensure that patients are managed appropriately and safely.

Within the Trust, two formal educational programmes have been developed that are aimed at helping qualified nurses to develop their clinical decision-making skills. Both these programmes employ a high-fidelity patient simulator. SMART (Scenario-Mediated Assessment, Response and Treatment) aims to train learners in the recognition and immediate management of acutely unwell patients in all clinical areas, whereas STAT (Stroke and TIA Assessment Training) focuses exclusively on the recognition and emergency management of stroke and TIA. Both these programmes use a combination of classroom-based teaching and simulated scenarios, in which the learners must interact with the patient simulator as if it were a real patient, determine what the main problem is, and decide on an appropriate course of action. There are no new technical skills taught, but learners practise applying patient assessment scales and making clinical decisions based upon guidelines. An outline of the two training programmes is provided in Appendix 2 and Appendix 3.

Although there are similarities between the two programmes, there are differences in the way they are implemented. STAT has a focus purely on stroke and TIA, and the emphasis during the simulated scenarios is on taking steps to diagnose or exclude that particular condition. SMART is intended to improve the early recognition of unwell patients, regardless of their specific clinical problem, and take more general supportive actions. As well as this, STAT uses integrated video material of real stroke patients alongside the patient simulator in order to overcome the technical limitations of the simulator in demonstrating certain neurological signs such as limb weakness. SMART does not use any genuine patient material to supplement the simulated scenarios, and relies solely on the mannequin to portray the simulated patient.

The STAT and SMART courses both use a Laerdal SimMan, the sophistication of which varies depending on the site of the training. There are core features of the simulator that are common to the training programmes regardless of the venue, so that the delivery of the training programmes does not need to be altered. The simulators are life-size human mannequins that incorporate hidden speakers that can be controlled by a facilitator to give appropriate responses to learners' questions to help provide a degree of interaction with the simulated patient. A monitor beside the simulator displays physiological observations such as heart rate, oxygen saturations and blood pressure, which vary depending on nursing

interventions within the simulated scenarios.

As simulation technology is constantly evolving, and aiming for ever-greater levels of equipment fidelity, one of the areas of interest for this study was to explore whether the ideas and attitudes of the learners towards simulated scenarios differed according to the sophistication of the simulator that they used (equipment fidelity).

The majority of research into the impact of simulation-based training has focused on the acquisition of practical skills, which are developed or rehearsed in the simulated environment. STAT and SMART are designed to give participants the chance to practise their clinical decision-making skills, about which there has been far less published with respect to high-fidelity simulation. This study was a qualitative exploration of the experiences of nurses who have attended either STAT and/or SMART, in order to try and gain an understanding of how this form of simulation-based training impacts on them, and what this might mean for their clinical practice. It was hoped that the similarities and differences between the two training programmes would help to provide insight into any aspects of simulation-based training which learners might or might not regard as particularly useful.

From the early interviews, it soon became apparent that a recurring core theme was the description of self-efficacy beliefs that were being given by the learners. In addition to describing their views on the value of training, they described how it influenced their confidence in their own ability to perform in their clinical role, and why that was valuable to them. Views varied according to the individual backgrounds and prior experiences of the learners. The study was then developed to explore the relationships between learner expertise, self-efficacy, and high-fidelity simulation.

It was felt that this approach may be used to draw conclusions and generate hypotheses about the circumstances in which high-fidelity simulation may be more or less valuable, and to what extent the time and expense of developing and running high-fidelity simulation-based programmes is justifiable for clinical assessment and decision making skills.

1.3 Research Questions

The main research questions considered by this study are:

With respect to high-fidelity simulation used in training to improve the clinical decision-making skills of qualified nurses:

- **How do nurses with different amounts of clinical experience and seniority describe the training?**
- **How, if at all, does the training affect self-efficacy beliefs, and what is the reported effect of any change?**

The study explores the impact of high-fidelity simulation within training that is based around the development of clinical decision-making skills. This includes participants' ideas and attitudes towards the use of a patient simulator, both as a general teaching aid and specifically in the context of stroke assessment (for those who have attended STAT) and illness severity assessment (for those who have attended SMART).

Before these questions can be addressed it is necessary to consider the origins of simulation in healthcare education, the relationship between self-efficacy and development of expertise in clinical judgement skills, and the previous research that has been done to explore these themes.

Chapter 2. Literature Review

This literature review provides an overview of the history and use of simulation in clinical education, and the evolution of high-fidelity simulation as a training tool. It includes a discussion of theoretical advantages and disadvantages, as well a discussion around how clinical judgements are made, and how expertise is developed. This is then related to the existing literature surrounding the use of high-fidelity simulation in nursing education.

These topics were initially chosen as the main focus of the literature review as they relate to the design of STAT and SMART. Once the study was underway, the concept of self-efficacy emerged as a prominent theme in the interviews. The literature review was then re-visited to focus specifically on the relationship between self-efficacy and high-fidelity simulation.

Each of these topics individually is potentially a huge area for discussion, and in order to define the boundaries of the thesis, the literature review will provide a brief summary of each area before focusing specifically on the relationships between self-efficacy and clinical-decision making, and relating it to the use of high-fidelity simulation where possible. This will provide a platform to support later data analysis and interpretation.

2.1 Simulation in Medical Education

2.1.1 Introduction

In the context of medical education and healthcare, a simulator is a device or tool that is employed to facilitate a simulation (Gaba, 2007). This can be as simple as an actor pretending to be a patient for students to practice history-taking, or an imitation limb to practice intra-venous cannulation. At the other end of the scale, computer equipment can be used to create virtual reality environments that aim to provide an immersive experience that mimics clinical environments and situations so closely as to be almost indistinguishable from real life.

Regardless of the form it takes, if simulation is used for training and evaluation it should be done in such a way that the student sees cues and consequences as they would in the real world, and therefore acts as they would in the real world (Issenberg et al., 2005). This part of the review will examine the origins of simulation in medical education, and discuss the current nature of its role.

2.1.2 History of Patient Simulators

Simulation as we know it today, with emphasis on accurate physical representation of tasks and situations to be imitated, initially grew out of the aviation industry's need for effective training that could be undertaken in a controlled environment to teach pilots how to respond to certain situations without putting real lives and equipment at risk. The first flight simulator was built in 1929 by a pilot called Edwin Link, who aspired to create a safer and less expensive means of learning to fly (Rosen, 2008). Initially more popular as an amusement park attraction, this early flight simulator was adopted by the military in the 1930s following a series of fatal aircraft accidents. The aim was to improve safety through the training of pilots. The complexity and realism of simulation technology grew following the incorporation of computer technology in the 1950s. Simulation as a technique has remained a gold-standard training tool for staff in the aviation industry ever since, teaching not only technical skills but also teamworking and communication skills, and aimed at improving behaviours and responses in emergency situations (Flin and Maran, 2004).

Compared to this, and other industries such as nuclear power and the military, simulation as an educational tool in healthcare was relatively late to develop, possibly due to a cultural resistance to change from the traditional “apprenticeship” model of clinical education (Bradley, 2006).

In the 1960s a group of anaesthetists approached Laerdal, originally a toy manufacturer, and encouraged them to produce and manufacture the first “Resusci-Annie” - a mannequin designed for the practice of cardio-pulmonary resuscitation. Around the same time, the University of South California was involved in the creation of the first high-fidelity simulator, known as “Sim-One”. It was designed to provide anaesthetists with training in airway management skills, but although it was technologically advanced it was also prohibitively expensive and therefore only one was ever built.

Later that decade, a cardiology simulator was developed by the Centre for Research in Medical Education in the USA. It was nicknamed “Harvey”, and comprised a torso and a head that represented a patient, with mechanical components inside that mimicked heart and lung sounds. It was used to teach medical students and trainee doctors cardiological examination skills and help them to identify abnormal findings. Unlike Sim-One, this

simulator was reproduced and installed in a number of teaching centres around the world over the next twenty years.

In the late 1980s, 2 high-fidelity simulators were developed simultaneously by competing groups: CASE (Comprehensive Anaesthesia Simulation Environment) and GAS (Gainesville Anaesthetic Simulator). The rights to these technologies were bought by commercial companies and although CASE was eventually abandoned, GAS was developed by METI (Medical Education Technologies Inc) into the HPS (Human Patient Simulator). A derivative of the HPS is still in use today, as is “SimMan”, the main product from Laerdal - the manufacturers of the original “Resusci-Annie”.

This historical focus on practical anaesthetic skills has been key to the development of clinical simulators (high-fidelity simulators in particular), with the ultimate aim of improving patient safety. Newer technologies, which are now cheaper and more readily available than ever before, are allowing increasingly intricate and complex features to be developed, opening up the arena to a vast new area of medicine that would previously have had no access to relevant simulators (Rosen, 2008).

2.1.3 Potential Benefits Ascribed to Simulation

Possibly the most obvious advantage to using simulation is the provision of a safe and structured learning environment where students can practise procedures and techniques for a wide variety of different situations without putting patients at risk. It is an environment where mistakes are acceptable, as they become learning opportunities for the student. The premise that these learning opportunities can lead to mistakes being eliminated from real clinical practice, although difficult to prove, led to an Academic Emergency Medicine Consensus Statement in 2004 that stated (Vozenilek, 2004):

“The impact of patient simulation on emergency medicine resident training is believed to be so significant that, were it not mindful of administrative and cost burdens for individual programs, the consensus panel would have advised that all emergency residency programs obtain access to a simulator.”

The emphasis in medical education is shifting from an apprenticeship model to one with a greater focus on meeting curriculum-based learning objectives, with a need to prove that knowledge and skills are maintained (Gorman et al., 2000). Simulation can provide a way to

facilitate this process and therefore aid clinical governance (Bradley, 2006).

Simulation has been used to address a range of different learning outcomes in different areas of medicine, being tailored to different areas of curricula, as it can provide a standardised demonstration and assessment experience to students as well as providing an opportunity for structured feedback to be given (Cooper and Taqueti, 2008). One of the recognised advantages is its ability to provide trainees with experience in managing uncommon or rare conditions and situations that they may never have previously experienced, but in which their actions could have a critical impact on a patient (Fritz et al., 2008).

2.1.4 Potential Disadvantages Ascribed to Simulation

Studies have demonstrated that simulation can be associated with increased interest and enthusiasm of learners and trainers (Gordon et al., 2001), high levels of realism (Bredmose et al., 2010), and construct and content validity (Kim et al., 2006a), but have so far failed to show how that translates into performance and behavioural change in clinical practice (Cooper and Taqueti, 2008). It is therefore difficult to prove that simulation, whilst respected and valued as a training tool by many teachers and learners alike, is truly cost-effective. Specifically with respect to high-fidelity simulation, it is difficult to draw conclusions about its efficacy compared to other interactive teaching modalities such as case-based, computer-based, or video-assisted learning. Studies have attempted to address this question by comparing the performance of learners trained via simulation to that of learners trained by other interactive methods, but they have shown mixed results, having been conducted with small numbers of participants and with the training outcomes representing a heterogeneous mix of clinical topics and skills (Barsuk et al., 2009; O'Toole et al., 1999; Seymour et al., 2002; Wenk et al., 2009).

One problem with attempting to make a generalised judgement with respect to the efficacy of high-fidelity simulation is that the context and content of its use within clinical training can be highly variable. However, although there is debate about whether simulation is any *better* than alternative educational methods, there is no suggestion from any published research that it is any *worse*.

From an educational point of view, a theoretical disadvantage of simulation is the inherent potential for negative transfer, whereby a flawed simulation (or instruction) leads to something being learned incorrectly (Fritz et al., 2008). This disadvantage appears to be

subjective and has not been demonstrated to be significant in a research setting.

When referring to simulation in the context of assessing individual performances to ensure competence, current lack of validated assessment tools may suggest that simulation is currently best limited to low-stakes, formative assessment only (Fritz et al., 2008). However, as pointed out by Gaba (1992): “*No industry in which human lives depend on the skilled performance of responsible operators has waited for unequivocal proof of the benefits of simulation before embracing it*”. This suggests that despite a lack of concrete evidence that simulation either improves performance or can usefully be used to assess competency, many people are willing to accept and adopt its use, particularly in high-stakes environments where the consequences of an inadequate performance may be serious, and where there is pressure on organisations to ensure that their employees are adequately trained to certain standards in order to minimise this risk. It seems logical that practising certain skills in a simulated environment should lead to improved performance when applying that skill for real. To an extent, this reasoning has been applied to medical training already, with respect to the Advanced Life Support programme, which uses patient simulators to teach resuscitation skills to staff. This training is mandatory for all medical staff working in secondary care in the UK.

A practical disadvantage to simulation is the cost of the equipment, which can be substantial, especially when talking about technology-laden high-fidelity simulators. As well as the initial purchase costs, there are often other resource considerations such as the training and subsequent availability of operators. As with every large investment the high cost needs to be justifiable, and a lack of conclusive evidence supporting the efficacy of simulation is perhaps preventing its uptake on a wider scale.

Whilst there are certainly good theoretical arguments for the use of simulation to augment clinical training, the lack of convincing evidence that it is universally and significantly superior to more traditional classroom-based teaching may make it difficult to justify the allocation of financial and time resources that it often demands. Particularly when healthcare and training costs are under constant review, careful thought needs to be given to how much investment is made in technology that may not necessarily bring any further benefit to patient safety. The emphasis of ongoing research into simulation in healthcare education should therefore be focused on whether there is any added value to be gained over existing technology and training methods.

2.2 Expertise & Clinical Judgements

Although originally developed for rehearsal of practical skills, simulation can be used to practise and assess clinical judgements for controlled scenarios. Before this can be discussed, we must first consider what constitutes a clinical judgement.

2.2.1 Defining Clinical Judgement

Several different terms have been used to describe the process of making clinical decisions, often with an overlap of definitions and ideas. These include “clinical decision-making”, “clinical judgement”, “clinical inference”, “clinical reasoning” and “diagnostic reasoning”. However, there are distinctions between some of the terms. Dowie (1993) refers to “judgement” as the process of assessing alternative choices, and “decision-making” as the process of actually choosing one of those alternatives based on the judgement. The medical model of distinguishing between judgements and decision-making would equate judgements to the process of making diagnoses, and decision-making to the process of selecting treatments. For nurses, the distinction is less clear. The diagnosis might not be as important as a general assessment of need when making a decision to take a certain action. The focus is usually on identifying deterioration, and is often made in a collaborative manner with the help of colleagues (Cioffi, 2000).

With respect to clinical judgements made by nurses, the following summary has been suggested: “*Clinical judgement refers to the ways in which nurses come to understand the problems, issues or concerns of clients/patients, to attend to salient information and to respond in concerned and involved ways; included in our understanding of the term is both the deliberate, conscious decision-making characteristic of competent performance and the holistic discrimination and intuitive response typical of proficient and expert performance*” (Benner et al., 1996 pp.2;). This statement reflects the fact that definitions of what actually constitutes a clinical judgement will vary depending on the level of experience and clinical role of an individual nurse.

With respect to the acquisition and development of clinical decision-making skills, regardless of the role or grade of the person making the decisions, it is helpful to consider the components that are required to inform decisions. These consist of an underlying knowledge base, an element of cognition or active thinking when applying knowledge, and a

metacognitive process that provides awareness and monitoring of the cognitive process and is necessary for the management of knowledge (McAllister et al., 1997).

Pattern-Recognition Theory suggests that in commonly seen or uncomplicated situations, diagnosis and management plans are made through recognition of common elements from other cases that an individual has seen in the past (Banning, 2008). There is less of a formal active cognitive process of “thinking” about what the diagnosis could be, but rather “knowing” what it is likely to be on the basis of matching it to a similar template from other cases. This is arguably a more likely strategy to be used or observed when an individual has a greater wealth of experience upon which to base decisions. As such, the underlying knowledge that informs these decisions is not necessarily anatomical or physiological theory, but can be based on the personal experiences of caring for similar patients. The ease by which sound clinical decisions are made is based on the acquisition of experience in a particular field. It is necessary to draw upon this experience in order to inform those decisions. This instinct or intuition therefore develops with expertise. There are various definitions of “intuition”, but a common theme is the idea that a rational and explicit reasoning process is bypassed by an individual who “just knows” what to do. It is the development of this intuition that defines the progression from novice to expert (Benner, 2000).

2.2.2 Novice-to-Expert

It is clear that exposure to situations that require a decision to be made is necessary for the development of situational specific judgement, and it is widely accepted that all brand new learners start without this expertise. The concept of different stages of expertise has been well described in the literature. Dreyfus and Dreyfus, originally writing regarding the advancements in artificial intelligence, refer to five steps or levels in the progression of expertise and skill acquisition (Dreyfus and Dreyfus, 1988). These are: Novice, Advanced Beginner, Competent, Proficient and Expert. In general, these stages reflect three general aspects of skilled performance:

1. The change from reliance on general principles to the use of past experiences as paradigms
2. The change in perception of the demands of a particular situation, and the ability to selectively identify and prioritise more relevant and significant parts of a task.

3. The change from a detached observer to an involved participant in a task

Benner, applying this concept to the development of nurses in training, suggests that the development of expertise is based on an ability to apply practical and theoretical knowledge, which overlaps with a particular individual's personal ideas and expectations that define how they will act in certain situations (Benner, 2000).

Discussion of “expertise” is often focused on technical skills or theoretical knowledge. However there is another important element that is also involved, which is the ability to analyse a situation or environment. This “situational awareness”, has been described as “*the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future*” (Endsley, 1988). This is difficult to observe, measure or even teach, but it is a critical factor in an expert’s performance when they are working in complex situations that have many factors for them to consider, or factors that are rapidly changing. The ability to consider these factors is what determines an expert’s ability to make effective judgements and decisions, and therefore to perform effectively.

One of the advantages of high-fidelity simulation that may not be achievable through classroom-based training is that, through the representation of clinical situations and scenarios, learners’ situational awareness can be improved and/or assessed at the same time as technical skills (Small et al., 1999; Kim et al., 2006a). External stimuli, which must be noticed and responded to appropriately by learners, can be incorporated into training scenarios. This could help not only to develop learners’ situational awareness on the path to an improved level of expertise, but also to achieve a greater degree of psychological fidelity by trying to represent various clinical factors that might be present in “real life”.

Because “expert” knowledge and decisions are often difficult to externalise and teach (as they happen in experts' subconscious) it is feasible that simulation-based training can provide a framework on which experience and expertise can be built. If learners participate in structured scenarios where they must assess a situation, respond to cues, make decisions and then reflect on their performance with the aid of feedback, it may help gain experience on which to base future clinical judgements and decisions. This could facilitate the transition from novice to expert.

2.3 Self-Efficacy

2.3.1 Introduction

Although teaching and training may provide a means by which to improve knowledge, skills or overall expertise of an individual in a particular field, it does not necessarily follow that the same individual will change their behaviour in the workplace and exercise that newfound ability. The factors that influence behaviour – specifically the ability and willingness to make judgements and decisions – are complex and multi-factorial (Ajzen, 2002), and include different concepts such as motivation, confidence and self-efficacy.

A particular area of interest in relation to simulation-based learning is the concept of self-efficacy, which describes the confidence that an individual has in their own ability to perform a specific task in practice. A number of studies have been done to describe the influences on “confidence” and “efficacy”, and the subsequent impact on decision-making (Banning, 2008) (Kendall-Gallagher and Blegen, 2009) (Rogers et al., 1991). However the boundaries between the two terms are ill-defined and unclear, and it is therefore useful to start by distinguishing between them.

"The construct of self-efficacy differs from the colloquial term 'confidence'. Confidence is a non-specific term that refers to strength of belief but does not necessarily specify what the certainty is about. I can be supremely confident that I will fail at an endeavour. Perceived self-efficacy refers to belief in one's agentic capabilities, that one can produce given levels of attainment. A self-efficacy belief, therefore, includes both an affirmation of a capability level and the strength of that belief. Confidence is a catchword rather than a construct embedded in a theoretical system." (Bandura, 1997 pp.382;)

This is an important point for this thesis. During the interviews, learners referred a lot to their feelings of “confidence”. This is not surprising as it is a commonly used term, unlike “self-efficacy”. However, as the above quote explains, to determine whether the colloquial phrase “confidence” is actually used to mean “self-efficacy”, the context of the expression of “confidence” needs to be specifically defined. This thesis does not consider confidence to be an entirely separate entity from self-efficacy. Instead, self-efficacy is considered as a specific form of confidence that relates to a defined context.

2.3.2 Definition

In his original paper describing self-efficacy, Bandura describes how the acquisition and regulation of certain behaviours is based upon specific cognitive processes (Bandura, 1977). The first of these processes relates to observation of actions and their consequences, which may be stored in conscious or subconscious memory. This can be observation of either other people or one's own self, and describes the reflective process that occurs following witnessed events. Based on that reflection, or alternatively on some other external feedback that has been given, self-corrective adjustments to behaviour or performance can be made.

Another important process is motivation, which is concerned with the activation and persistence of behaviours, through consideration of future consequences. Motivation operates through a continual cycle of goal-setting and self-evaluation, and is in turn determined by the outcome expectancy - an estimate that a certain behaviour will produce a given outcome.

Therefore the efficacy expectancy (which ultimately informs self-efficacy) is the strength of belief held by an individual in their ability to successfully execute a behaviour in order to produce an expected outcome (Bandura and Schunk, 1981).

Efficacy expectations are derived from 4 pieces of information:

1. Performance Accomplishments

Based on prior experiences and past performance, this causes an individual to estimate how likely they are to succeed at a particular task ("mastery expectations").

2. Vicarious Experience

This involves seeing the consequences of others performing the activities (i.e. "If they can do it, so can I"), with clearer outcomes conveying more efficacy information. However, its usefulness depends on social comparisons, so is less indicative of an individual's ability than using prior personal experience as an indicator of performance.

3. Verbal Persuasion

Suggestion to a learner that they are able to perform a task successfully is likely to have a positive effect on their self-efficacy, although again there is no authentic

experiential base. In order to be effective, the learner must actually believe what they are being told.

4. Emotional Arousal

Aversive arousal (fear/stress reactions) can reduce expectations of success, therefore negatively impacting on self-efficacy. Fear of performance ineptitude can raise anxiety levels beyond that of the actual activity itself, leading to a falsely low self-efficacy (and performance). Modelling can be used to overcome this by repeatedly exposing a learner to the same situation in the hope of producing a habituated response and reducing their anxiety levels. Although it has not been described in this way in the literature, it is conceivable that high-fidelity simulation could be used as a form of modelling in this context, particularly if it allows learners to gain controlled exposure to situations with which they are unfamiliar or uncomfortable.

An individual's self-efficacy describes their strength of belief that they are *capable* of successfully completing a task in order to achieve a goal. However, it does not necessarily follow that that individual *will* undertake that task, as other factors besides confidence in one's own ability are involved in determining how one behaves. Self-Efficacy Theory itself is part of a wider learning and behaviour model called Social Cognitive Theory. This theory, again originally described by Bandura, is based on the principle that through observation of others, and the cognitive processing of the consequences of those actions, an individual's behaviour can be modelled on others (Bandura, 1986). The main processes that are required for modelling to take place are attention and retention of knowledge, reproducibility of behaviour and motivation for reproducing behaviour. This theory has been applied to nursing education, particularly when complex skills are being learned in peer groups. For example, Bahn (2001) describes the intricate nature of the interactions between nursing students and their clinical environments, and how they inform the modelling of professional behaviours. Self-efficacy beliefs contribute to all these processes, and there is some considerable overlap between the information that informs self-efficacy and the information that informs behavioural modelling in Social Cognitive Theory. In particular, vicarious experience or observational learning is a key part of Social Cognitive Theory.

However, there are some critics of Self-Efficacy Theory. Eastman and Marzillier (1984), writing in regards to Bandura's initial research on self-efficacy, which was based around fear

and avoidant behaviours, stated that *“efficacy expectations were defined in such a way that included within them expectations of outcome, and thus could not be regarded as conceptually distinct”*. In other words, they disagreed with Bandura’s assertion that efficacy expectations and outcome expectations were distinct entities. Other authors have used this point to question the validity of Bandura’s work, arguing that outcome expectations naturally influence efficacy judgements (Kazdin, 1978) (Borkovec, 1978). Bandura has replied to this criticism by conceding that whilst it may be possible for outcome expectations to influence self-efficacy beliefs in some cases, this does not mean the efficacy beliefs are any less valid (Bandura, 1984).

2.3.3 Impact on Practice

Self-efficacy depends on the cognitive processing of certain information, and training may be designed to help facilitate this.

“When experience contradicts firmly-established expectations of self-efficacy, learners may undergo little change if ... they discount the importance of the experience” (Bandura, 1977).

Therefore, when training staff to act in a new way (e.g. to make diagnoses or perform new procedures) the training process should not just be looking to achieve objective competence, but to reinforce learners’ beliefs that they have that competence (i.e. self-efficacy). Further to this, the impact of performance achievements on self-efficacy depends on whether learners attribute those achievements to their own ability or effort.

Similarly, Bandura believes that the impact of learners’ accomplishments on self-efficacy may be dependent on the amount of effort expended. If an individual puts relatively little effort into achieving a goal, it may reinforce ease of task and therefore self-efficacy.

Similarly, having to exert a larger effort may cause a learner to question his or her own ability, therefore lessening the improvement in self-efficacy.

However, the reaction to the degree of effort expended may depend on the outlook of a particular individual. It could be argued that if a learner perceived a task as particularly difficult but still managed to successfully complete it, then their self-efficacy may be improved to a greater degree than it would do after an easy task, as the learner is likely to feel a greater sense of achievement.

Self-efficacy can influence choices of activities, along with coping efforts (Wood and Bandura, 1989). It is easy to imagine that if a person considers their chance of successfully completing a particular task to be low, they will either prepare themselves for failure, or may try to avoid undertaking the task at all.

However, self-efficacy alone is not necessarily enough to effect behavioural change (Bandura, 1977), as even if people believe they are capable of an action, they still need the skills and incentives to perform it. Studying this phenomenon in the context of observing phobics' responses to coping with aversive stimuli, he has shown that greater changes in self-efficacy translate into a greater likelihood of a change in behaviour. This is clearly a very different context to the training of clinical staff, therefore it cannot be assumed that this is also true with respect to nurse education. However, if it could be demonstrated to be true, then it may be possible to target clinical training to improve the self-efficacy of staff with the aim of increasing the chance that newly acquired skills and knowledge are used in clinical practice.

The transferability of self-efficacy beliefs between training and real-life environments may not be easy. Gist and Mitchell (1992) have, in discussing this subject, pointed out that there are a number of complex differences between the two environments that may constrain an individual's performance, and potentially counter any improvement in self-efficacy that has been gained from training. The differences they referred to included physical distractions, availability of resources, and the interdependence of tasks with other functions within that environment. With enough planning, some of these limitations could potentially be overcome through inclusion of obstacles and distractors in a simulated task. Although it would be impossible for every conceivable distractor to be simulated, it may be that generic skills of dealing with such distractions could be acquired, practised, and transferred to the "real-world".

Even if training situations can have a positive impact on "real-life" self-efficacy, there is no guarantee that this change will be permanent. In his original paper on self-efficacy (Bandura, 1977), Bandura writes that "*Generalised, lasting changes in self-efficacy and behaviour can best be achieved by participant methods using powerful induction procedures initially to develop capabilities, then removing external aids to verify personal efficacy, then finally*

using self-directed mastery to strengthen and generalise expectations of personal efficacy”. Although there is no empirical data to back up this assertion, if the theory is correct then the implication here with respect to clinical simulation is that a training event would equate to an *“induction procedure”*, with the subsequent mastery of behavior taking place after the training. The degree of mastery may well depend on the latency between training and utilisation of knowledge and skills, as well as the frequency of such utilization. This could be the key to changing an individuals’ practice in the long-term, and is an area that has been explored through this study.

2.3.4 Motivation

A lot has been written about the psychological basis of motivation in learning, the scope of which is too wide to be completely covered in this background. For the purposes of this research project, the specific relationship between motivation and self-efficacy needs to be explored, with particular focus on the impact on learners who are undergoing training. This chapter will use Self-Determination Theory (Ryan and Deci, 2000) to structure the discussion. In their paper, Ryan and Deci summarise the meaning of motivation as follows:

“Motivation concerns energy, direction, persistence and equifinality--all aspects of activation and intention. Motivation has been a central and perennial issue in the field of psychology, for it is at the core of biological, cognitive, and social regulation. Perhaps more important, in the real world, motivation is highly valued because of its consequences: Motivation produces. It is therefore of pre-eminent concern to those in roles such as manager, teacher, religious leader, coach, health care provider, and parent that involve mobilizing others to act.

Although motivation is often treated as a singular construct, even superficial reflection suggests that people are moved to act by very different types of factors, with highly varied experiences and consequences.”

A recent literature review of research into motivation in the context of medical education concluded that motivation can be seen as both a dependent and an independent variable (Kusurkar et al., 2011). It is independent in that it has been shown to influence learning and study behaviour, as well as academic outcomes. However, studies have shown that motivation can itself also be influenced by personal factors such as learner autonomy,

competence, and relevance of task. Therefore it can also be thought of as a dependent variable (Kusurkar et al., 2011).

Self-Determination Theory suggests that motivation is a continuum with innate “intrinsic” motivation at one end, a completely de-motivated state at the other, and with differing degrees of external “extrinsic” motivating factors in-between (see Figure 1).

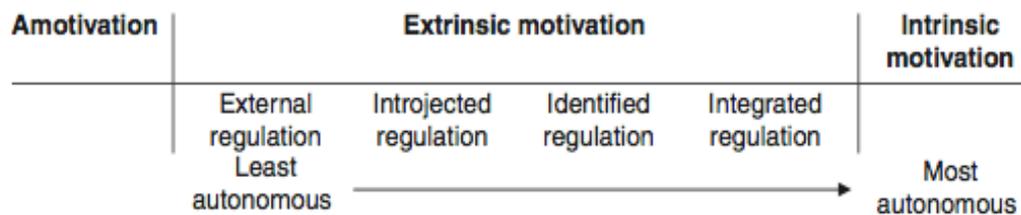


Figure 1. The Self-Determination Continuum (Ryan & Deci, 2000)

Intrinsic motivation is based on an inherent need for a particular degree of autonomy and competence (Kusurkar et al., 2011). In particular, the need for competence is determined by an individual’s belief in their own ability to achieve certain goals.

Building on the relationship between intrinsic motivation and self-efficacy, Keller (1987) described a model of incorporating this theory into the design of training programmes. It is based on the assumption that learners will be motivated to engage in educational activities if they believe that they are likely to be successful at the activity, and that the success will result in their needs being satisfied. This model was dubbed “ARCS” after the four categories of conditions for successful training that it describes: Attention, Relevance, Confidence and Satisfaction. According to the theory, each of these categories represents a set of conditions that must be met in order for a learner to be fully motivated. Although this may be an oversimplification of a complex issue, it does attempt to address each of the accepted influences on learner motivation. This would seem to be useful as a prompt for educators to use when designing training programmes, in order to help them consider as many potential influences on motivation as possible, but it does not account for the inequality of the different motivational issues that may differ not only between learner groups, but also between individual learners.

2.4 Simulation, Expertise and Self-Efficacy in Nursing Education

2.4.1 Relating Simulation to Educational Theory

Having discussed the history and role of high-fidelity simulation in clinical education, and the theory behind the development of expertise in clinical decision-making, the question now arises of how the two topics relate to each other. There is a limited amount of work in the published literature that has addressed this subject specifically.

Waldner & Olson (2007) published a literature review discussing some of the educational rationales and theoretical frameworks behind the use of high-fidelity simulation in the field of nursing education that might help to explain how simulation could contribute to the improvement of clinical competency. They make the point that in the current political and education climate where “practising” on real patients is seen as undesirable, and where opportunities for clinical experience are also reduced, the emphasis with respect to simulation should not be on proving its worth but rather on focusing on the best way to utilise it to maximum effect. This pragmatic approach overlooks the lack of evidence for simulation-based training over more traditional teaching methods. The willingness to embrace and refine simulation to maximise its potential should be tempered by the fact that the extra resources required to develop and deliver this training would be considerable, and may not even be justified in terms of overall clinical outcomes.

In their review, Waldner and Olsen make the following observation:

“Although one expects knowledge, critical thinking, and/or self-efficacy to increase with experience, the purpose of simulation education is really to improve performance or clinical competency. Performance or clinical competency is more difficult to measure than knowledge, critical thinking, or self-efficacy.”

This highlights an important reason why so many researchers have been unable to come up with “proof that simulation works”. Knowledge, critical thinking and self-efficacy (which will be discussed in the next chapter) are all factors that influence and inform performance and overall competency. Although competency is difficult to define and measure, it is possible to set performance standards that equate to a desired level of competency.

Simulation can then be used to train and examine to these standards. For example, Kim et al. (2006b) demonstrated that their high-fidelity simulated scenarios, based around resuscitation

of critically unwell patients, had construct validity when used with external scales that quantify performance in a system called “Crisis Resource Management”. They recreated emergencies seen in acute care settings, and rated learner performance using edited video recordings that were viewed independently by three assessors, with intra-class correlation coefficient scores being used to measure inter-rater reliability. Because students at different stages of training were invited to participate, the study demonstrated that differences in expertise could be recorded through simulated assessments. The real uncertainty seems to lie with whether performance in a simulated environment reliably and consistently corresponds to real-world performance.

Both Benner’s Novice-to-Expert model (Benner, 2000) and Kolb’s Experiential Learning Theory (Kolb, 1984) are relevant here. Benner’s definition of “experience” in the context of developing expertise applies to situations where pre-existing theoretical knowledge is reinforced, refined or challenged. This could be used to determine some boundaries of what can be taught through simulation - i.e. there would have to be some theoretical material included that learners could engage with by mapping it against what they already know. The main drawback of using simulation to give learners these experiences is that they are not, by definition, “real” clinical experiences. The learner will always be aware that they are in a simulated situation. The question then arises as to whether those simulated experiences aid the progression from novice to expert in a clinical setting, or whether learners are merely becoming experienced in performing simulated tasks. Waldner & Olsen (2007) argue that for at least the first two steps of Benner’s model (“novice” and “advanced beginner”) simulation should be able to provide enough opportunity for the “refinement” of knowledge to enable the experience to be relevant to the learners’ clinical practice. Seeing the consequences of their actions in a simulated scenario, particularly if those consequences are unexpected, may also help learners to progress from the “advanced beginner” to “competent” stage of the model. Using simulation in this way would also allow learners to have experiences that would either not be possible (or ethical) to plan or standardise with real patients.

Kolb’s Experiential Learning Theory, which describes how learners reflect on meaningful experiences in order to incorporate them into existing cognitive frameworks, can be applied to simulation training and augments Benner’s Novice-to-Expert model (Waldner & Olsen, 2007). This draws upon some of the educational paradigms discussed earlier - in particular, constructivism and reflective theory. The common theme is the incorporation of experiences

into a pre-existing belief system after reflection. However, it is unclear what is required for this process to take place and how much of it has to do with the different elements of the simulation itself.

Larew et al. (2006) have also discussed the application of Benner's model to interactive high-fidelity clinical simulations. Through experiences with training student nurses at different stages of their educational process, they noted "*challenging novice students with complex patient care simulations resulted in their feeling overwhelmed and anxious*". Novice students would have little or no experience of managing complex cases and would therefore be likely not only to struggle in completing the simulated scenario but also to have low self-efficacy in this regard. Larew and his colleagues developed a new simulation protocol, which used Benner's framework to create scenarios that can be adapted for different abilities and performance characteristics of students at different stages. Although the overall clinical problem would remain the same, extra cues and prompts would be included for learners at an earlier stage, who would be less likely to know what to do intuitively. The less experienced the student, the less subtle and more specific the prompts would be in order to help them recognise what the problem was. Benner's definition of "expertise" includes an ability to communicate well with multidisciplinary team members, and this skill was incorporated into the scenarios to deliberately expose students to this role.

The different levels of expertise described by Benner may be useful in helping to understand the decision-making process of individuals and potentially to tailor training programmes accordingly. However, a complex simulated clinical scenario can comprise of many different clinical elements, some will be more familiar to some learners than others based on the different personal and professional experiences of each individual. Experience, and the application of experiential knowledge, is likely to be a more indistinct and continuous phenomenon than described in Benner's model, with learners potentially able to be at different "levels" for different parts of a clinical problem. This risk of over-simplification has been recognised by Gobet & Chassey (2008), who believe that novices and experts use the same problem-solving methods, but with different degrees of perceptual situational awareness and holistic understanding of situations; these are acquired through experience and can be regarded as "expertise".

Overall, Benner's model provides a convenient way of quantifying different amounts of clinical expertise, but the question of whether it can be usefully applied to the context of

simulated clinical scenarios during training is yet to be satisfactorily answered.

Lasater (2007) suggested that four dimensions of clinical judgement can be influenced and studied by simulation: self-confidence, aptitude for critical thinking, objective (qualitative) measures of clinical judgement skills, and students' experiences. Together, these dimensions overlap to form Lasater's "Interactive Model of Clinical Judgement Development". Lasater explored students' experiences through a focus group of volunteers who had participated in high-fidelity simulated scenarios that had been integrated into a pre-existing clinical training programme. The main themes that arose from the focus groups included practical strengths and limitations of the simulations, students' personal feelings and reflections about participating, and the value of learning and working in a team. Self-confidence was not mentioned as a major theme in Lasater's results. However, it is worth noting that the topic guide for the focus groups was written to elicit opinions about the process itself, rather than the outcomes, and the subject of self-confidence, despite being one of the four dimensions of Lasater's model, was not specifically raised. The importance of this issue in terms of the impact on learners' practice may therefore have been underestimated.

2.4.2 Simulation & Clinical Judgement Expertise in Nursing Education

There have been numerous studies conducted to explore the potential uses and benefits of simulation in nursing education. Many of these have concerned the acquisition and development of psychomotor skills or clinical procedures, which is outside the scope of this thesis. With respect to the role of high-fidelity simulation-based training with a specific focus on the development of clinical judgement skills, there is less literature available. Studies that have been done on this subject have shown mixed results in terms of whether simulation provides additional benefits when compared to other training methods. These are summarised in Table 1.

Shepherd et al. (2007), in a controlled trial of 74 graduate nurses, compared medium-fidelity simulation-based training to self-directed learning packages (supplemented with Powerpoint presentations for some of the learners). They then asked each participant to undertake a standardised structured clinical assessment on the simulator, and scored their actions and responses. The assessment scores were significantly higher for the group that had undergone simulation training beforehand, and the authors concluded that simulation training had the potential to reduce the time required for nurses to become clinically proficient. However, it is

possible that the results merely reflect familiarity with using the simulator in the group that had been exposed to it in training. Prior experience of participants is unknown as the baseline group characteristics were not provided.

More recently, a paper by Wolfgram & Quinn (2012) claims to demonstrate that simulation improves performance in clinical assessments compared to standard training. The authors integrated an optional programme of high-fidelity simulated scenarios, covering a variety of different clinical topics, into an undergraduate nursing curriculum in 2007. They report that nursing students who attended the simulation-based training over the following two years recorded higher test scores in assessment of both theory and practical examination skills. As this was not a randomised controlled trial, these results may merely reflect the fact that learners who elected to participate in the simulations were either more motivated individuals who were likely to perform well anyway, or those who had more time available to study. Qualitatively, they report that the teaching faculty observed “more accuracy and confidence being demonstrated by the students who had attended the physical assessment simulation lab”, but no further exploration of this is offered.

Alinier et al. (2006) studied the clinical performance of 99 nursing students, who either undertook standard clinical teaching in peri-operative care, or underwent a simulated training experience. Objective Structured Clinical Examinations (OSCEs) done pre- and post-training showed that whilst both groups’ performance improved, the degree of improvement was significantly greater in the simulator group. However the assessments in this study seemed to have more of a focus on objective knowledge and technical skills rather than problem-solving or clinical judgement ability.

Author(s)	Study Design	Clinical Topic	Study Population	Methodology	Outcomes
Alinier et al. (2004)	Quantitative	Peri-operative care	99 student nurses	RCT: simulation vs standard training	Greater improvements in OSCE scores after simulation compared with standard training
Brannan et al. (2008)	Quantitative	Acute myocardial infarction	107 student nurses	Quasi-experimental: simulation vs lectures	Higher scores in questionnaire on MI management in simulation group
Brown & Chronister (2009)	Quantitative	ECG rhythm recognition	140 student nurses	Quasi-experimental: simulation vs didactic instruction	No significant differences in critical thinking scores between groups
Jeffries & Rizzolo (2006)	Quantitative	Post-operative care	798 student nurses	RCT: case studies vs medium-fidelity mannequin vs high-fidelity simulator	No difference in objective knowledge assessments between the groups; higher self-confidence in the 2 simulation groups; higher levels of learner satisfaction in high-fidelity simulation group
Kaddoura (2010)	Qualitative	Critical care assessment	10 newly-qualified nurses	Semi-structured interviews	Learners perceived that their critical thinking skills had improved through simulation training.
Lasater (2007)	Qualitative	Acute illness assessment	15 student nurses	Focus groups	Main themes surrounded value of simulator to integrate theory into practice, and the ability to deliver a breadth of experience
Radhakrishnan et al. (2007)	Quantitative	General and focused patient assessment	12 student nurses	Quasi-experimental: simulation vs standard training	In assessed simulated scenario, learners from the simulation training group were more proficient at recognising and responding to a deteriorating patient
Ravert (2008)	Quantitative	General patient assessment	40 student nurses	RCT: simulation + small group teaching vs small group teaching alone vs standard training	All groups showed improvement when assessed with validated critical thinking scales, but there was no significant difference between the groups
Shepherd et al. (2007)	Quantitative	General clinical assessment	74 graduate nurses	Self-directed learning vs e-learning vs low-fidelity simulation	Simulation group had significantly higher performance scores (on customized performance scale) than those in the other two groups

Table 1. Previous Published Studies of the Effects of Simulation on Clinical Judgement Skills

Jeffries and Rizzolo (2006) did the largest-scale study on simulation that has been published to date. It was conducted on a national scale over three years, involving 798 nursing students who were randomised to undergo training in postoperative patient care that involved a video lecture plus participation in one of three intervention groups: a written case study, a simulation using a static mannequin (medium fidelity), or a simulation using a high-fidelity mannequin. Questionnaires on self-confidence after the intervention showed statistically significant improvements in the two simulation groups compared to the case study group, but no difference between the medium and high-fidelity groups. Learners in the high-fidelity group did report greater satisfaction with the training, but importantly no overall difference was observed between any of the groups when objective knowledge assessment was undertaken using a questionnaire on postoperative care. Although this study was well designed and adequately powered, no details about the baseline characteristics of the study population were given, so it is difficult to know whether the age and experience of the study groups participants might have affected the results. One other potential source of bias for this study is that it was sponsored by Laerdal, the manufacturers of high-fidelity simulation equipment.

Brown & Chronister (2009) studied the impact of simulation-based training on clinical judgement skills in the interpretation of ECG rhythms. They used a randomised controlled trial design to allocate 140 nurses to either didactic teaching or simulation-based training over a 4 week period, but did not find any difference in performance between the two groups at the end of the training period. The authors clearly believe that simulation is the superior training modality, as they report “the time spent in simulation activities was too brief to have a significant effect on the outcomes measured cite”. They also cite variability in day-to-day training experiences of the students, as well as different background experiences, as potential confounding variables. Realistically, this would be true of all studies of this nature.

A further RCT has also failed to show a difference between simulation and other teaching methods. In this randomised controlled trial, nursing students were allocated to one of three groups: standard clinical training only, standard training plus “enrichment sessions” (small group teaching and case discussions), or standard training plus “enrichment sessions” that included high-fidelity simulation training. The outcome measures for this trial were two validated scales for the assessment of critical thinking. All three groups demonstrated improvement on these scales after training, but there was no significant difference between

the groups themselves. The numbers in this study were small (only 40 students participated, with 3 of those withdrawing), but it may suggest that the method of educational intervention is less important than the actual intervention itself when considering these objective measurements of performance. Of course, actual clinical performance after training is harder to capture, and there are likely to be more elements that inform the impact of training on an individual learner than are represented here.

Lapkin et al. (2010) published a systematic review of studies that had used patient simulator mannequins specifically to teach clinical judgement skills to undergraduate nursing students, and concluded that the disparity in sampling, methods, reporting, outcome measures and results of different studies makes it very difficult to draw any definite conclusions about the merits of simulation. This is partly due to the versatility of simulation as a training tool, in that it can be applied to many different clinical areas and skills that are difficult to compare directly. It is also unlikely that, in any study, the inclusion of a simulator, or simulated scenarios, will be the only variable that changes. Where and when the training is delivered, who it is facilitated by, and the quality of the feedback are all likely to play a part in influencing learners' outcomes. A positive finding of the review was that most of the studies, regardless of whether or not they had demonstrated any objective change in clinical performance, retained knowledge, or self-confidence, reported a high degree of learner satisfaction with the simulation training. If this is the most consistent outcome to arise from studies of the use of simulators in clinical training, it raises the questions of why simulation is so highly valued, and whether that alone is enough to justify its use without any proof of other benefits.

All of the studies referred to above have examined the *effect* of high-fidelity simulation, rather than the process. Furthermore, the quantification of clinical judgement through the use of question-based assessments would not necessarily reflect the development of clinical expertise. Aside from the work done by Lasater (2010), which concentrated mainly on the learner preferences rather than investigating how the process influenced the acquisition of clinical judgement skills, there has only been one other study that has taken a purely qualitative approach to explore this area. Kaddoura (2010) conducted semi-structured interviews with 10 newly-qualified nurses who had participated in high-fidelity simulation-based training as part of a critical care training program that was completed over a six month period. One of the themes to be reported from the data analysis was the participants' feeling

that their own critical thinking skills had been enhanced through use of the simulator. This was one of a number of themes to be reported, and limited detail was elicited regarding why the participants had these perceptions. It is hoped that this thesis will address some of these gaps in the literature.

2.4.3 Simulation & Self-Efficacy in Nursing Education

As previously discussed, experience of actions and consequences (either personal or vicarious) plays an important role in learning new skills and the development of self-efficacy. Simulation would therefore seem to be an ideal conduit for the facilitation of these experiences, being a safe and controlled method of allowing learners to practice and, if necessary, make and learn from any mistakes. There are several examples in the literature of simulation being examined specifically in relation to self-efficacy. Chlan et al. (2005) used an experiential learning programme to teach practical skills for complementary therapies and showed that it led to an improved self-efficacy when learners were surveyed. Similarly, Bambini et al. (2009) used medium and high fidelity simulators to train undergraduate nursing students to manage common obstetric complications. Pre- and post-training, they surveyed 112 students using numeric self-confidence scales and demonstrated subjectively improved levels of communication skills, self-confidence (with respect to psychomotor skills), and clinical judgement abilities. Unfortunately, there was no evidence that this apparent improvement in self-efficacy had led to any objective change in practice (although this would likely have been difficult to demonstrate). Neither of these studies made a comparison with “standard” training, so it is unclear whether or not it was the nature of the simulations that led to this result, or merely the fact that there had been some training of any sort. A study by Sinclair & Ferguson (2009) attempted to address this, by using Likert-scale questionnaires to assess self-efficacy and comparing a lectures & simulation combination to lectures-only for 175 nursing students. They found that, although both interventions were effective in improving learners’ confidence, self-confidence scores in the simulation group were higher than scores in the lecture-only group. Significantly however, the allocation to groups was not randomised, and the groups themselves were not well matched in terms of prior clinical experience, with the learners in the intervention (simulation) arm having a lower average number of years of experience. This raises the question as to whether *any* form of educational intervention may have had a greater impact on self-efficacy beliefs in novice learners than in more experienced learners. Furthermore, as there was no randomisation,

learners may have chosen which intervention arm to enter based on pre-conceptions that may also have influenced the responses they gave in the questionnaires. Similarly, although there was a small amount of qualitative data to expand on these results, in the form of written reflections from twelve of the learners, the study as a whole was limited by the fact that participation was voluntary, leading to a low questionnaire response rate. The results are therefore possibly biased by the likelihood that only those learners with particularly strong feelings about their experiences may have chosen to participate.

The positive effect of simulation on self-confidence in nursing students has also been explored qualitatively. Reilly and Spratt (2007) showed, through interviews with student nurses in New Zealand, that participating in simulation-based learning led to a reported increased in self-confidence, which the students' felt stayed with them during their clinical placements. However, there was no follow-up period to suggest the duration of this effect. Pike and O'Donnell (2009) interviewed a focus group of 9 student nurses to explore the effects of simulation-based training on self-efficacy. They concluded that the self-efficacy with respect to (technical) clinical skills had improved, but it had not affected self-efficacy in the (non-technical) area of communication skills, which they identified as a specific target to incorporate into future training (although it is possible that this issue arose due to the overall lack of clinical experience in this population, and may be reflective of the small sample size). They also highlighted the students' desire for more authentic simulated experiences that would make them feel more like they were working in clinical practice rather than in a training environment. The authors speculated that improved psychological fidelity in simulations would enhance self-efficacy and therefore skills transfer.

In a different study, Smith and Roehrs (2009) conducted a survey of 68 nursing students who had participated in a simulated scenario (using a high-fidelity patient simulator) in which they were required to manage a patient in respiratory distress as part of their clinical training. The learners' level of self-confidence and their degree of satisfaction with the learning experience was measured on a 5 point scale, along with a list of the different components of the simulation (objectives, support, problem-solving, guided reflection and fidelity). The students were asked to rate how strongly they felt each of these aspects had been reflected in the scenario. A mean confidence score of 4.2 out of 5 was achieved after the experience, although this was not measured prior to taking part so an improvement in confidence cannot be inferred. The mean overall satisfaction score was 4.5 out of 5. All aspects of the

simulation design scored highly (mean scores 4.4 – 4.8 out of 5) - meaning that learners felt that they were all incorporated into the scenario well - with “guided reflection” scoring slightly higher than the other components. Interestingly, in this study, some of the participants did have some prior clinical experience of looking after patients with this condition. The authors accounted for this in the analysis of their results and found that it had no significant impact on either the reported self-confidence of the learners, or the satisfaction with the experience. Correlational analysis and linear regression analysis both showed that, even accounting for the variability in learner demographics, the simulation characteristics of “objectives” and “problem solving” were the only aspects of the learning experience that correlated with, and could be used to predict, better satisfaction and self-confidence scores. In other words, learners who felt as though the objectives of the experience were clearer, and who felt as though they had been challenged to solve a clear problem, were more likely to have higher self-confidence and satisfaction ratings, regardless of prior experience.

On this basis it is possible that high-fidelity simulated scenarios, if designed with the appropriate focus and with clear enough learning outcomes, could be useful educational tools for improving self-efficacy regardless of whether or not that clinical situation has been encountered previously by learners. However, the extent to which this could be true for learners with greater accumulated clinical experience is uncertain. The research that has so far been conducted on the effect of simulation on self-efficacy has largely concentrated on student nurses, who will inevitably have limited experience and who are likely to be at the “novice” end of the novice-expert spectrum, and therefore acquiring new skills during training. What has not so far been described is the impact of high-fidelity simulation-based training on qualified nurses who may have a great deal more experience to model their learning on. This is a relevant issue, as it is likely that only through the accumulation of clinical experience will nurses be able to identify their learning needs when participating in simulated training, where they are required to compare the simulated experience to real clinical practice and consider the practicalities of any changes that need to be made. Does a greater wealth of experience make it easier for simulation to facilitate the acquisition and application of new skills, and improve the ability to make sound clinical judgements, or does simulation challenge systems and beliefs that might be held so deeply that it becomes even harder to develop brand new skills? Furthermore, is it easier for experienced staff to use simulation as an opportunity for deliberate practice, and be able to hone and refine existing skills and decision-making strategies rather than developing entirely new ones? These

questions are yet to be satisfactorily answered, and will be addressed in this thesis.

One of the criticisms of many studies that have advocated the use of simulation is that any observed effect in improved self-confidence or clinical performance may result from *any* form of clinical training and might not be specific to simulation. Scherer et al. (2007), when teaching experienced graduate nurses to manage cardiac events as part of their nurse practitioner training, used a quasi-experimental design to compare the effects of a simulation-only teaching method with a case-study discussion, with each group being given a lecture on cardiac arrhythmias beforehand. They showed that there was no significant difference in the improvement in objective knowledge assessment between the two teaching modalities and that, in fact, the case-study discussion group reported significantly higher post-test confidence levels than the simulation group one week after the training (although when reassessed after one month, there was no significant difference between the groups). Unfortunately, the individual aspects of self-confidence that changed are not described, and only average results are given.

This raises the possibility that simulation as a tool purely for acquisition and retention of knowledge to inform clinical decisions may be no better than a more traditional teaching modality. However, there are many more aspects that inform self-efficacy and clinical performance than knowledge alone, and simulation can provide a means of applying what has been learnt. It is interesting to note in the above study that self-confidence ratings were initially higher in the case-study group than the simulation group. This does not necessarily mean that simulation was viewed as an inferior training tool, as the reasons for learners' responses were not explored in detail. One explanation may be that the simulation training gave the learners better insight into their knowledge and skill gaps, and perhaps the higher self-confidence ratings in the classroom group were due to an over-estimate of competence. It is interesting that the difference in confidence levels disappeared a month later. For the purpose of teaching skills in clinical decision-making, it may well be that the most effective way of utilising simulation is to integrate it with other modalities such as traditional classroom teaching or study-group discussion that encourage learners to participate and receive feedback. Furthermore, as previously discussed, improving situational awareness by providing additional stimuli during a simulated scenario may also contribute to enhanced self-efficacy beliefs beyond the effect of knowledge and technical skills training.

A small-scale study done by Wolf (2008) integrated a high-fidelity patient simulator into an

educational programme for emergency department triage nurses, and exposed them to a variety of common emergency presentations in order to improve the rates of so-called “under-triage” (inappropriate prioritisation or initial management). Thirteen nurses participated in the study, and although rates of under-triage reportedly improved subsequently, it was not documented how this was measured or over what time scale. Similarly, it was reported that the nurses reported feeling more confident in their triage role, and that they found the simulator helpful, but no detail was given as to how this was measured or described. It concluded (without convincing statistical evidence) that the use of the simulator could improve both nursing self-confidence and patient outcomes (through improved triage accuracy), but did not go into any depth regarding the role of the simulator in causing these changes, nor the nature of the change in confidence and what it specifically related to.

Gordon & Buckley (2009), looked at the effect of using high-fidelity simulation in training qualified medical and surgical nurses to recognise and respond to acutely unwell and deteriorating patients. They suggest that nurses on medical and surgical wards, as they are the most likely staff to recognise and need to act on signs of patient deterioration, may be a particular group to benefit from the advantages of high-fidelity simulated training. They describe a training course that involves classroom-based theoretical teaching about common clinical emergencies followed by a combination of medium and high-fidelity simulated tasks. In the medium-fidelity tasks, they practised resuscitation techniques and associated practical skills on part-task trainers, and following that, in the high-fidelity tasks, they were required, in teams, to manage a deteriorating patient. Scenarios were recorded on video to aid with debriefing, and were preceded by specific team-building exercises to develop clinical leadership and problem-solving strategies. There was also a cardiac arrest/resuscitation workshop included. 50 study participants completed questionnaires before and after taking part in this training course, and were asked to rate their perceived ability in relation to a mix of technical and non-technical skills that relate to the emergency management of unwell patients. The mean length of time since qualification was 9 years and interestingly, none of the participants had any prior experience with high-fidelity simulation. The pre-training level of confidence for recognising and unstable patients, identifying priorities and calling for help was high, but despite this there was a significant improvement in self-confidence with respect to identifying clinical priorities after having the training. There was significantly improved confidence in the technical aspects of advanced life support such as airway management and

defibrillation, which might be expected after being given an opportunity to practice these psychomotor skills.

The authors conclude that high-fidelity simulation, combined with more traditional teaching methods, is effective at improving self-confidence of qualified nurses with respect to the recognition and management of clinically unwell and deteriorating patients. Importantly, this is still demonstrable in learners who already had a high level of confidence prior to the training. However, from the methods described it is difficult to conclude that it was the “high fidelity” component of this educational intervention that produced these results. There were, in fact, differing levels of fidelity (certainly environmental and technical, and probably also psychological) that were created during different tasks, which are all likely to have contributed to the learners’ overall improvement in confidence. With no further detail about the changes in self-confidence, it is unclear how much importance was attached to the fidelity of each task by the learners.

Although the study makes reference to self-confidence, what is actually described is the self-efficacy of the learners as they were being asked to rate their perceived ability to perform specific tasks in real situations in order to improve the patient outcome. The improvements in reported self-confidence/efficacy that were observed were not as large as other studies that involved (less experienced) student nurses, and this should be expected. Unless being asked to learn about and deal with situations that are completely new and unfamiliar, most of the nurses would have a degree of post-qualification experience, during which their confidence of being able to perform as expected in certain situations would develop. In this context, simulation provides an opportunity to practice, hone or refine skills rather than learn anything entirely new. It is likely that those staff who were already confident prior to the training will remain so afterwards, but the longevity of any added benefit (especially in the technical skills that are not practised often) is unknown. Unfortunately the intricacies of this were not explored in the study population, as the questionnaire that was used for data collection did not allow for sufficient detail for individuals to explain their responses or the reasons for any change (or lack thereof).

In a recent paper by Luctkar-Flude et al. (2012), use of a high-fidelity simulator was compared with the use of real people (either a healthy volunteer or an actor to be a “standardised patient”) in a clinical scenario designed to teach assessment of the respiratory system to nursing students. The authors found that there were no significant differences in

self-efficacy beliefs between the three groups. The highest learner satisfaction was reported in the group that used a healthy volunteer, with the simulator receiving the lowest scores - a finding which might seem to contradict some of the interview data from STAT learners. However, the group who had trained with the simulator had the highest scores when their competence in assessment was formally examined. The authors speculate in their discussion that despite lower satisfaction scores and a perceived relative lack of realism, using a simulator mannequin may be resulting in improved performances by providing learners (novice learners in particular) with a low-stress learning environment in which they can concentrate on the task without having a “real” patient to worry about. However, there was no further qualitative examination of learners’ experiences to corroborate this.

2.5 Summary

When previous studies are considered, it is plausible that simulation could be an effective tool in facilitating the development of judgement and decision-making skills through the provision of a means of experiential learning upon which future decisions can be based. Simulations can be a controlled / guided way of students obtaining “paradigm cases” which, according to Benner’s model, are index cases that become reference points upon which future knowledge acquisition and clinical judgements can be based. They can reinforce learning through experience, or can provide an opportunity for deliberate practice of existing skills. Within simulated scenarios, actions and decisions are required from the learner, increasing the potential for reinforcement. Background knowledge and preconceptions may determine how effective this is.

However, it is not solely the development of knowledge and skills-based “expertise” that determines whether a learner will apply their new attributes in practice. They also need to have adequate self-efficacy - the belief that not only that they are able to successfully complete the particular task they have been trained to do, but also that their actions will lead to the task being completed successfully.

In most previous studies on high fidelity simulation, the focus has been on the acquisition and application of knowledge rather than the impact on self-efficacy. According to educational theory, the latter may be a more valuable outcome when considering changes in learners’ clinical practice, but to consider this aspect would require exploration of individual learners’ experiences.

Although some studies have investigated the impact of high-fidelity simulation on learner self-efficacy, this has not been explored in detail on an individual basis with nurses of differing levels of clinical experience. In the context of two local simulation-based training events, this thesis will examine the views and ideas of learners to specifically consider the impact of high-fidelity simulation on self-efficacy beliefs with respect to development of clinical judgement skills. This includes exploration of whether and how prior clinical experience alters the experience of the training for the learner.

Chapter 3. Methodology & Methods

3.1 Introduction / Overview

This study aimed to explore participants' ideas and attitudes towards the use of a high-fidelity patient simulator, both as a general teaching aid for illness severity assessment and specifically in the context of stroke assessment. In particular, it focused on participants' reported self-efficacy with respect to the transfer of new knowledge and decision-making skills into clinical practice, how the training might have influenced this, and specifically what impact high-fidelity simulation had on training experiences. Responses were compared and contrasted between learners with different background levels of experience of both clinical nursing and simulation training, to consider the whether the relationship between high-fidelity simulation training and self-efficacy changes depending on seniority and/or prior clinical experience.

As described earlier, the STAT and SMART training programmes in Northumbria Healthcare NHS Foundation Trust both integrate high-fidelity simulated scenarios with classroom-based teaching. A summary of the main features of the training is outlined in Table 2 (below).

The study was initially designed to look for common themes regarding the relationship between high-fidelity simulation and the Novice-to-Expert model of nursing skill acquisition. It was later refined to specifically consider the development of self-efficacy in learners with differing levels of prior experience.

	STAT	SMART
Duration	1 day	4 days
Facilitators	Mainly medical	Mainly nursing (lecturer practitioners)
Clinical Focus	Subject specific - Stroke recognition and management	General principles - Illness severity and recognition
Lectures	Yes	Yes
Simulated scenarios	Yes	Yes
Assessment	Individual simulated scenarios and MCQs	Group scenarios and MCQs

Table 2. Comparison of STAT and SMART

3.2 Epistemology

This design of this study took a qualitative approach, as it was the nature of individuals' subjective thoughts and feelings towards the role of simulations in clinical training that were being sought. There was no hypothesis to be tested, but the aim was for the analysis of this content to highlight patterns and themes that could be conceptualised.

To understand the rationale behind the design and analysis of this research, it is necessary to first consider the epistemological origins of the approach, which is summarised in Figure 2.

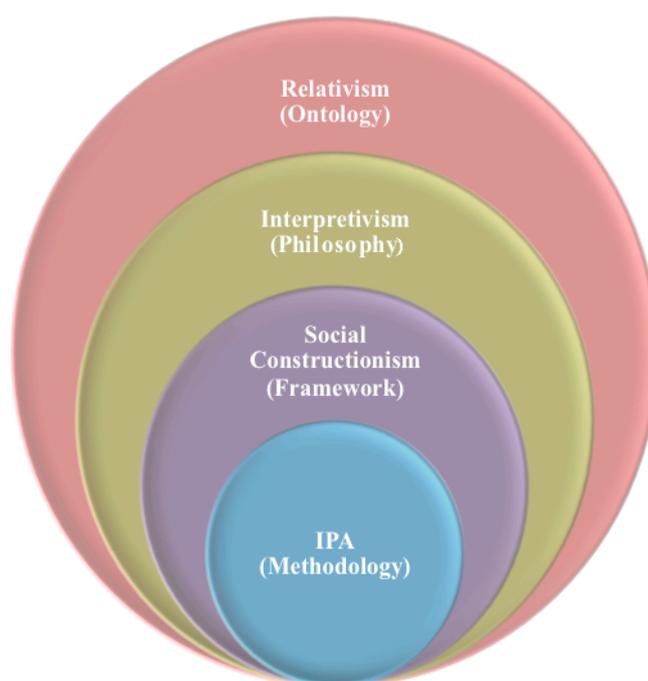


Figure 2. Epistemological Structure of Study

This work has been based on a social constructionism framework. Social constructionism has been defined as *“the view that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context”* (Crotty, 1998). This means that there is no absolute truth to uncover, but the aim is rather to

explore the views of reality that people hold for themselves as a result of the social world in which they live and interact with. Although there is recognition that some objective facts do exist, the “truth” that is sought is the result of perspective, and is created by individuals based on their own beliefs, personalities and experiences (Guba and Lincoln, 1994). This study will describe, where appropriate, how individual realities are constructed, as well as acknowledging the common sociological underpinnings that shape their beliefs and views. The study participants will each have their own thoughts and opinions about how they respond to the use of simulation in training and the effect they perceive it to have on their clinical decision-making skills, but there may be common themes or social constructs that lead them to form these opinions. There is no objective phenomenon to be described, but rather the focus will be on how the individuals’ experiences of simulation have shaped their perceptions of reality. The “knowledge” that was sought through this research was therefore a description of how the participants have constructed these realities.

The ontology behind this study is relativism. Whilst it is acknowledged that there are certain physical facts that are beyond doubt, the definition of “reality” will vary from person-to-person based on their own specific knowledge, belief and interpretation of those facts, combined with other subjective “facts” that they have gained from their own experiences.

The philosophical stance underpinning the methodology of this study is interpretivism. This is an exploration and explanation of human and social reality through the “*culturally derived and historically situated interpretations of the social life world*” (Crotty, 1998). This applies to both the researcher and the participants, as the interpretations of reality may differ between individuals. This was reflected upon in the writing of this study, and the acknowledgement of such will help to maximise credibility.

The methodology itself is interpretive phenomenological analysis (IPA). The main aim of IPA is “*to explore in detail how participants are making sense of their personal and social world*” (Smith and Osborn, 2008) and, in doing so, gain an understanding of the meanings that experiences have for the participants. It has an idiographic focus, and examines how an individual makes sense of a particular phenomenon, rather than looking objectively at the phenomenon itself. IPA is rooted in phenomenology, which is a well-established psychological qualitative research approach that focuses on how an individual’s personal experience has been interpreted to influence their knowledge and views of the world (Giorgi, 1997). IPA invites individuals to reflect upon and describe experiences and phenomena in

order to focus on how meaning is constructed. They are encouraged to take an unbiased exploration of their own conceptions of phenomena, and hopefully gain a “re-interpretation” of the subjective experience. Where IPA differs from the principles of phenomenology is in the role of the researcher / interviewer and the degree to which that person’s own interpretation of the data is relevant. In contrast to traditional phenomenology, which tends to identify, bracket and exclude the researcher’s own values and beliefs, IPA not only embraces them, but considers them necessary to makes sense of the participants’ experiences (Clarke, 2009). Indeed, it could be argued that it is impossible for a researcher to code themes entirely without any epistemological prejudice.

Therefore, in taking this approach it must be acknowledged that I, as the researcher (and, in some cases, the educator) cannot be merely an objective observer, and that my involvement is an integral part of the reality that is constructed by not only the participants but also myself. This is not a barrier to the research being worthwhile, as long as it is considered during interpretation of results. As well as my role as a researcher in this study, I was also heavily involved in the design and delivery of STAT, as well as occasionally facilitating some sessions on SMART courses. Whilst this did provide me with insight as to how the training works on a technical level, it inevitably introduced a personal perspective to the data interpretation – this was particularly felt with STAT. It is also worth noting that I taught many of the interviewees during their training, and this may have affected their willingness to speak openly and honestly about their experiences in the subsequent interviews, which were also conducted by me. Steps were taken to minimise this effect by assuring potential volunteers of neutrality and anonymity, but it would be practically impossible to eliminate it altogether. As long as these factors are considered in the interpretation of the data, then rather than being detrimental to the quality of the study they should become important to the overall epistemology.

3.3 Methods / Design

Nurses who had attended STAT or SMART were invited to participate in individual semi-structure interviews to attempt to build up a picture of how simulation is perceived and valued in the context of training designed to improve clinical decision-making. Interviews provide a personal in-depth exploration of not only what ideas and beliefs are held, but also how they came about. This method is likely to provide richer, more detailed data, which would be more likely to address the main research question than other forms of data collection such as questionnaires or focus groups (Silverman, 2009). A topic guide was created based upon previous studies, which reflected the main themes of this research whilst allowing flexibility to explore issues and ideas held by the interviewees that might not have been anticipated.

The area of interest that was generated from the background reading and literature review was the focus on self-efficacy beliefs of qualified nurses attending STAT and/or SMART - specifically, the described experiences of qualified nurses undergoing scenario-based high-fidelity simulation training in relation to how it influenced their self-efficacy beliefs with respect to clinical decision-making. This informed the development of the topic guide that was used to conduct the interviews (Appendix 4).

3.4 Sampling

Purposive sampling was used to select staff who had attended STAT and/or SMART courses, and invite them to be interviewed for the project.

It was originally intended that, for each of the two teaching programmes, there would be 2 cohorts of people: those who had attended training recently (within 3 months of interview) and those who had attended training over 6 months previously. This was intended to identify any different themes that may emerge as a result of time that had lapsed since attending training. In particular, any staff who had attended both training events were sought, as it was felt that their insights into the differences between the two programmes would be especially useful. For STAT, which requires learners to complete online MCQs before and after the training, comparison of pre- and post-course assessment marks was to be used to plan purposive sampling, as it would have provided data from people who both passed and failed the knowledge assessments, who may therefore have different perspectives about the value and efficacy of the training. This is an example of “theoretical sampling”, which involves selectively targeting the most likely “data-rich” sources in order to achieve data saturation (i.e. the point at which no new findings are emerging from the data) more quickly (Silverman, 2009). The number of learners who “failed” their first attempt at the assessment (scoring less than 65%) was small, and all of those people declined to be interviewed.

Contact email addresses of learners were taken from databases of training records, which also included the date that each learner had attended the training event and, where applicable, the assessment scores. Learners who matched the above mentioned profiles were sent (via email) letters containing details of the study and its aims, and an invitation for them to attend for interview. These stressed the voluntary and confidential nature of the interviews, along with the emphasis on exploring attitudes to simulation and self-confidence rather than merely being an evaluation of the specific training programme they had attended. Copies of these letters have been included in Appendix 9 and 10. If there was no reply to the initial invitation, one further email was sent offering an opportunity to address any concerns that potential interviewees might have. None of these additional emails resulted in people volunteering to be interviewed. In addition, a brief verbal appeal was also made at the end of each training session that I attended, and information letters were available for learners to collect at the end of the day.

There were no pre-defined targets for the number of interviews to be conducted (this would be a meaningless objective, as the quality and nature of the data were not known in advance). Instead, the process of interview and analysis was planned to continue for as long as possible within the time constraints of the project, or until data saturation appeared to have been reached with no new themes emerging from the analysis.

3.5 Data collection and analysis

Those staff who accepted the invitation to participate in the study were individually interviewed in private. The interviews were semi-structured, and focused on the core theme of the impact of simulation on self-confidence with respect to the development of clinical decision-making skills. The interviews were recorded using a digital audio recorder. The digital audio files were then downloaded onto a computer and stored on an encrypted drive. I transcribed the recordings myself, as I anticipated that it would be a useful way of becoming familiar with the data. As the transcription was being typed, I was able to pause the playback of the recording in order to make notes about the content and themes of the interviews as the thoughts occurred to me. I cross-referenced these notes with the time-code of the relevant part of the audio file to allow me to refer back to that part of the interview. An example transcript is included in Appendix 6, and an example of the corresponding notes took is included in Appendix 7. After each interview had been transcribed, I began coding the data with respect to emerging themes. In the particular note-taking software I used, this was done by using “tags” to mark certain paragraphs of interest. These tags could then be collated, arranged and viewed independently across different interviews, facilitating the organisation of the data and the identification of common themes.

In keeping with the epistemological stance described earlier, an approach to analysis was taken which permitted themes within the data to be identified without making pre-determined judgements about their value. This was done through thematic analysis, which identified core ideas and themes that were then developed and explored further in future interviews.

Thematic analysis is often described as a method that is part of grounded theory methodology. Grounded theory, however, is “post-positivist” in its approach, and aims to prove and uncover absolute truths and concrete knowledge (Glaser et al., 1968; Crabtree and Miller, 1999). The analysis of this research has been from a social constructionism viewpoint, which believes that there is no ultimate truth or objective knowledge to be found. Therefore, a grounded theory approach to data analysis would not be appropriate. However, it can be argued that thematic analysis, as well as being a common foundation for multiple methodologies in qualitative research, can be viewed as a methodology in its own right and is consistent with constructionist as well as positivist paradigms. Braun and Clarke (2006) suggest that as long as the epistemological and ontological principles of the methodology and the author are explicit, the use of thematic analysis as a method can be justified as it can be a

way of producing rich and meaningful data. They define thematic analysis as a way of *“identifying, analysing and reporting patterns (themes) within data”* to provide a minimal level of organisation, but a detailed description of data. From a social constructionism viewpoint, interpretation and description of experiences are not individually generated, but instead are influenced by the social frameworks in which they exist and operate. Therefore, thematic analysis in this context *“does not seek to focus on ... individual psychologies, but instead seeks to theorise the sociocultural contexts, and structural conditions, that enable the individual accounts that are provided”* (Braun and Clarke, 2006).

This approach to data analysis was taken with the intention of producing meaningful data around the subject in order to describe and better understand different individuals' responses to simulation-based training.

In line with the epistemological approach of the study, the emergence and conceptualisation of themes within the data arose from my own interpretation of the content of the interviews. This involved a method that was somewhere between “editing organization” (whereby the content of the interviews is cut and rearranged into meaningful segments that can be categorised and connected together) and “immersion/crystallization” (whereby prolonged and repeated exposure to the data aims to elicit as many different interpretations as possible) (Silverman, 2009). By transcribing the interview recordings personally, and making notes along the way, I was able to familiarise myself with the data to the point at which themes started to become clear. Transcripts were then re-read, and recordings were re-listened to, to allow further opportunity for inspiration. If new themes or ideas presented themselves, older data was revisited to determine whether the new themes had any relevance to what had been said in previous interviews. The development of themes was also prospective as the study progressed, and the interview topic guide therefore developed iteratively according to constant comparison between the participants' responses. The initial and final topic guides are included in Appendices 4 and 5, respectively.

The approach to interpreting the data took a mixed inductive and deductive approach. An inductive (“bottom-up”) approach involves linking the themes strongly to the data, rather than a deductive (“top-down”) approach that starts from a particular theoretical stance and uses that as a basis to determine themes (Pope et al., 2000). There was a large inductive component to my approach, as I let the conversation within the interviews flow naturally (around a semi-structured topic guide) and also attempted to take an open-minded stance

when identifying themes from the interview data. However, the interview topic guide did evolve to specifically focus on descriptions and experiences of self-efficacy changes, and this was a particular theme that I sought to elaborate upon in my analysis, which could be perceived as a deductive approach. However, there was room for the research question and main focus of the topic guide to change as the data was obtained. From my background reading, I believe I had some analytical preconceptions regarding the themes that I was interested in – for example, the idea that learners may value more realistic and interactive simulations more highly. However, there was no pre-determined coding framework, and I attempted to develop this on the basis of the content of the interviews.

3.6 Methodological Quality & Rigour

Because this research was qualitative in nature, and was being conducted from a social constructionism viewpoint, the usual assessments of rigour (i.e. validity, reliability, objectivity) that are applied to positivist or quantitative research do not apply. Instead, it has been suggested that the methodological and analytical quality of constructivist qualitative work should be judged by “Criteria of trustworthiness” (Guba, 1992).

These are: credibility, transferability, dependability and confirmability.

- Credibility refers to the need to verify the plausibility of findings and interpretations of the data by discussing and checking it with the research participants. Their agreement with the interpretations made and conclusions drawn improves the credibility of the findings, although the researcher’s own opinions should not be ignored. In this particular study, although the thoughts and ideas of participants are checked with them through discourse at the time of the interviews, it would not be practical to individually discuss the interpretation of each interview with the individuals concerned. Although this may impact on the credibility of the work, my understanding of the data has been clarified through regular discussion with my research supervisors at meetings that were scheduled during the course of the research project.
- Transferability is important as, due to the specific context within which realities are constructed and described in qualitative research, it is often difficult to make generalisations based on the results. However, good quality research should produce

data that is sufficiently detailed to justify assumptions about transferability of observed phenomena between different situations based on specific similarities. In the case of this study, the transferability was heavily dependent on the detail of the interview data that is obtained. A detailed description of the relevant simulation-based training programmes and participants has been provided in order to help readers understand the context of the research, which will aid transferability. Maintaining an awareness of the need for transferability throughout the course of the research helped achieve this when planning and revising the interview schedules/topic guides and also when conducting the interviews themselves.

- Dependability is measured by an audit-process of research activities. A dependable study will be able to provide documentation of the processes of the research to allow an external researcher to view, corroborate and assess the process that has been followed. For this study, a research log was kept of all activities, along with thought processes and emerging themes, both of which evolved as the study developed iteratively.
- Confirmability describes the attempt to limit bias, whilst at the same time accepting the subjective nature of the involvement of the researcher and their impact on the data. As discussed earlier, the very nature of constructionist epistemology contradicts a notion of true objectivity, as there is no truth beyond individuals' social constructs and cognitive frameworks. This is equally true for the researcher as well as the participants, but although it is important for the researcher to acknowledge that reported results are a product of subjectivity, it is also important for those results to relate directly to the data obtained so it is clear where and how particular descriptions or conclusions have been obtained. To maximise confirmability in this study, a research log was kept, and the final discussion of the data includes descriptions of the data on which certain statements are based. To demonstrate this process, an example interview transcript is included in Appendix 6. The initial research notes associated with this interview are included in Appendix 7.

3.7 Ethical Considerations

Informed consent was gained from all participants following invitation to take part in the research after attendance at STAT or SMART (Appendix 11). When initial contact was made with potential participants, an invitation letter and information sheet was given to them. This outlined the basic background behind the study, and an overview of what to expect if they chose to take part. Importantly, it stressed that their decision about whether or not to participate, and any views expressed at interview, would be confidential and would have no bearing on any aspect of their employment. This was particularly important, as many of the participants had been taught by me in the training events, and may also have had ongoing professional relationship with me.

Interview transcriptions were anonymised, and the identities of the participants are known only to myself as the primary investigator. Collected data was scored electronically on an encrypted hard-drive partition. Participants had the right to request that their data be withdrawn from the study at any time.

Participants were also asked whether they would like to receive a summary of the main findings of the research once the project was completed.

Ethical approval for this study was granted by the local Regional Ethics Committee (Appendix 8).

Chapter 4. Results & Analysis

4.1 Overview

The results of the study, and the subsequent discussion, will be presented as a combined section in order to improve the flow of the analysis.

This chapter has been divided into four sections, which reflect the main topics within the data. Although there is a natural overlap, it is advantageous to separate them out for discussion. The main topics are:

- **‘Simulation’ and ‘Clinical Practice’ as Novice-to-Expert Domains**

This section outlines the different contexts in which learners referred to their own levels of experience and expertise, with comparison to the frameworks by Benner and Dreyfus & Dreyfus. It lays the foundation for later sections in the chapter, which compare self-efficacy, learner preferences and motivational influences between the two domains

- **Self-Efficacy**

The concept of self-efficacy (frequently referred to generically as “confidence” in the data, but with respect to specific tasks) was discussed with all the interviewees. This section describes how the data illustrates perceived change in self-efficacy beliefs, and separately considers the specific impact of using a high-fidelity simulator.

- **Influences on Motivation**

The impact of various factors on the motivation of learners, both to attend the training and to change their clinical practice, is considered. Again, comparisons are made between learners with different amounts of experience, but significantly this section separates the influences on learners’ intrinsic and extrinsic motivation, as well as describing the relationship between these factors and reported self-efficacy.

- **Learning Process Preferences**

The preferences of the learners for certain teaching methods, styles and tools are considered in this section. The data is examined for any patterns that might indicate how different levels of experience might affect these preferences. The main design points of the simulation-based training programmes that are considered are the fidelity of the simulator, the use of real people in addition to, or instead of, a simulator mannequin, and the realism of the training environment.

Between May 2010 and April 2011, sixteen participants were interviewed. Although it appeared that data saturation had not been reached by the end of the study, the data obtained was rich enough to provide patterns of themes and topics that could be compared and contrasted between participants in order to generate discussion.

The purposive sampling strategy was hindered when people who were invited to participate either declined or did not reply to the invitation. The final selection of participants reflected those who had attended STAT: 13 of the interviewees had been on STAT only, 2 had been on SMART only, and 1 had been on both. It was easier to recruit people who had attended STAT as I was a facilitator at many of the training days and was able to advertise my research project to potential participants. SMART was run less frequently, delivered by other teachers, and the number of potential participants was smaller. Reasons for difficulties in recruitment, and the possible impact of this, will be discussed later.

In order to understand the perspective of each volunteer, they were asked to describe their clinical experience relevant to the training. As the data was analysed and coded iteratively, one of the themes that began to emerge was the idea that learners were describing their experiences based on their prior level of personal experience of both simulation and clinical situations. There was a suggestion from senior nurses that their perceptions of simulation training had changed as they had become more experienced themselves. It is important to remember that simulation technology and implementation is not a static technique and has itself evolved over time, so any change in learners' perceptions is not necessarily solely due to changes within themselves. However, the theme of changing perceptions of simulation over time kept recurring in the interview data to such an extent that I re-evaluated my approach to the data analysis. Instead of using the self-efficacy model as the central theme, it became clear that the most interesting area for discussion would be the participants'

descriptions of their own expertise, and how that related to their experience of the training. Benner's Novice-to-Expert model of the acquisition of expertise with respect to clinical judgement (Benner, 2000) provided a well-recognised and accepted framework to compare with the interview data to look for similarities in the way in which experience and expertise is described. This helped to explore how high-fidelity simulation influences people with different levels of expertise, and how successful it is at helping learners achieve a level of competency that they feel could translate to clinical practice.

To look for comparisons and contrasts in the data, the learners were clustered into groups depending on whether they had "some" or "no" prior experience with high-fidelity simulation (part-task trainers and other non-interactive simulators were not included as they are not the focus of this study, although they were discussed in the interviews on occasion) and whether they had "little" or "much" experience with the clinical context of the training (e.g. assessing and managing acute stroke patient in the case of STAT). In some cases this was difficult to quantify, and a subjective decision about how to categorise individuals was made by myself as the investigator based on the interviewees' descriptions of their own levels of experience and competence. This was used as a starting point to compare and contrast interview data, with the expectation that some data may not fit neatly into one of these categories. In the discussion of the data and the themes there is further elaboration of the background experience of individual learners.

A summary of the characteristics of each participant is included in Table 3.

Participant	Gender	Clinical Background	Prior Clinical Experience	Prior HF Simulation Experience	Time Since Attended Training	Key Themes from Interview
Nurse 0 (pilot)	Female	Stroke research nurse	Much prior clinical (stroke) experience – 4 years in current post	Some prior HF simulation experience	Attended STAT 1 year prior to interview	<ul style="list-style-type: none"> Improved self-confidence Validation of knowledge Relationship between knowledge and self-confidence
Nurse 1	Female	Stroke research nurse (previously a staff nurse on ITU, then on acute stroke unit)	Much prior clinical (stroke) experience – 2½ years on stroke unit, 6 months in current post	Some prior HF simulation experience	Attended STAT 7 months prior to interview	<ul style="list-style-type: none"> Self-efficacy of patient management Relationship between seniority and adaptation to change Realism vs comfort
Nurse 2	Female	Staff nurse on stroke unit	Much prior clinical (stroke) experience – 2 years in current post	Some prior HF simulation experience	Attended STAT 7 months prior to interview, and SMART 1 year prior to interview	<ul style="list-style-type: none"> Relationship between comfort and confidence Transference of self-efficacy beliefs from training to practice
Nurse 3	Female	Junior sister on Medical Admissions Unit	Little prior clinical (stroke) experience	No prior HF simulation experience	Attended STAT 2 weeks prior to interview	<ul style="list-style-type: none"> Ceiling effect of realism/fidelity for usefulness of experience Reality gap between training and practice Professional credibility & appearance of competence
Nurse 4	Female	Stroke specialist nurse (in post for 7 weeks at time of interview)	Much prior clinical (stroke) experience - worked on stroke ward before moving to current post	Some prior HF simulation experience	Attended STAT 2 weeks prior to interview	<ul style="list-style-type: none"> Intrinsic & extrinsic motivating factors Importance of realism
Nurse 5	Female	A&E sister	Little prior clinical (stroke) experience	No prior HF simulation experience	Attended STAT 5 months prior to interview	
Nurse 6	Female	A&E sister	Little prior clinical (stroke) experience	No prior HF simulation experience	Attended STAT 6 weeks prior to interview	

Table 3. Summary of Participants

Participant	Gender	Clinical Background	Prior Clinical Experience	Prior HF Simulation Experience	Time Since Attended Training	Key Themes from Interview
Nurse 7	Female	Medical nurse practitioner	Little prior clinical (stroke) experience - background in surgical assessment	No prior HF simulation experience	Attended STAT 4 months prior to interview	<ul style="list-style-type: none"> • Simulation as paradigm case for expertise development
Nurse 8	Female	Staff nurse on Medical Admissions Unit	Little prior clinical (acute illness recognition) experience	No prior HF simulation experience	Attended SMART 2 weeks prior to interview	<ul style="list-style-type: none"> • Perceptions of role and seniority • Importance of environmental fidelity
Nurse 9	Female	A&E staff nurse	Little prior clinical (stroke) experience	Some prior HF simulation experience	Attended STAT 6 weeks prior to interview	<ul style="list-style-type: none"> • Barriers to psychological fidelity discussed • Retrospective appreciation of benefit
Nurse 10	Female	A&E staff nurse	Little prior clinical (stroke) experience	Some prior HF simulation experience	Attended STAT 2 months prior to interview	<ul style="list-style-type: none"> • Feelings of “safety” in simulations and impact on psychological fidelity • Factors influencing transferability
Nurse 11	Female	Sister on Medical Admissions Unit	Much prior clinical (acute illness recognition) experience	Some prior HF simulation experience	Attended SMART 2 weeks prior to interview	<ul style="list-style-type: none"> • Useful comparison with previous unsatisfactory simulation experience
Nurse 12	Female	A&E staff nurse	Little prior clinical (stroke) experience	No prior HF simulation experience	Attended STAT 12 months prior to interview	<ul style="list-style-type: none"> • Benefits of unexpected elements of scenarios – environmental fidelity • Discussion of learning vs reinforcement

Table 3. Summary of Participants (continued)

Participant	Gender	Clinical Background	Prior Clinical Experience	Prior HF Simulation Experience	Time Since Attended Training	Key Themes from Interview
Nurse 13	Male	A&E staff nurse	Little prior clinical (stroke) experience	Some prior HF simulation experience Some prior HF simulation experience	Attended STAT 18 months prior to interview	<ul style="list-style-type: none"> • Good discussion of novice-to-expert progression • Deliberate practice in simulated environment
Nurse 14	Male	A&E staff nurse	Little prior clinical (stroke) experience	No prior HF simulation experience	Attended STAT 6 months prior to interview	<ul style="list-style-type: none"> • Useful discussion of how to hone skills in simulated training • Balancing fidelity needs
Nurse 15	Female	Stroke specialist nurse	Much prior clinical (stroke) experience – in post for 3 years	No prior HF simulation experience	Attended STAT 3 months prior to interview	<ul style="list-style-type: none"> • Subject expertise aids acclimatisation to simulated environment • Describes relationship between self-efficacy and expertise development

Table 3. Summary of Participants (continued)

With the Novice-to-Expert model identified as a core theme around which to structure the data analysis, other codes and themes were used to discuss how self-efficacy beliefs, learning process preferences, and motivating factors were described by learners with different amounts of clinical and simulation experience.

The iterative development of the topics and themes for this analysis has been illustrated through the use of “topic maps”, which were drawn and amended throughout the process as I looked for patterns within the data (Appendix 1). As can be seen in these maps, the initial approach to the data was split into 3 domains: novice-to-expert references, the views of the learners specifically with respect to simulation, and descriptions of what learners felt were effective learning techniques or styles. These domains reflected the main themes of interest that had been generated by the initial literature review, around which the initial topic guide had been structured. As the interviews were carried out and analysed, it became clear that self-efficacy was a common theme to each of these domains, and should be addressed independently, rather than as a sub-domain of the Novice-to-Expert theory. The topic map was then restructured, with the Novice-to-Expert framework providing the basis for discussion around self-efficacy changes and motivating factors. The interview topic guide was amended to reflect this. The initial topic guide and the final topic guide are included in Appendix 4 and 5 respectively, to demonstrate how the focus of the interview questions changed to explore these ideas in more detail. For example, the idea that there may be a “ceiling effect” with respect to simulation fidelity and its impact on self-efficacy (which will be expanded on later in this chapter), first occurred during the interview with Nurse 04 – see Appendices 6 and 7. The topic guide was then altered slightly to explore whether this was a common concept amongst other interviewees and whether there was any correlation with levels of expertise.

In the interview data, I also noted that descriptions of learners’ expertise referred independently to clinical practice and also simulation-based training. These prior experiences in each domain seemed to influence the learners’ experiences. The idea of differing levels of experience within the clinical area compared with experience using high fidelity simulation was then developed as a theme, and used to draw comparisons and contrasts within the data.

The descriptions of the factors that seemed to be influencing learners’ views and opinions regarding the simulations were initially categorised as either extrinsic or intrinsic. After further reflection and iterative analysis, this evolved into two slightly different categories:

1. Influences on learner motivation (to participate in, and engage with, training)
2. The exploration of expressed preferences regarding physical aspects and implementation of the simulation training.

To begin with, the central theme was intended to be the novice-to-expert *transition*, but this was changed to novice-to-expert *status*, as it was felt that the concept of exactly how a change from one “stage” of expertise to another occurs was difficult to support from the data. Instead, the focus was kept on descriptions of learners’ expertise at different points, whether they felt their expertise had changed, and how this affected their experiences (including learning preferences), self-efficacy and reported behaviour (including motivation).

Learning theories were originally included as a distinct discussion point, but were later removed from the topic map as I felt this was too large a subject to discuss separately, and would distract from the core subject of the research. Where appropriate, references to applicable learning theories have been mentioned in other parts of the discussion.

A final summary diagram of the main concepts and relationships described in the data is shown below (Figure 3) and provides a structure for the discussion that follows.

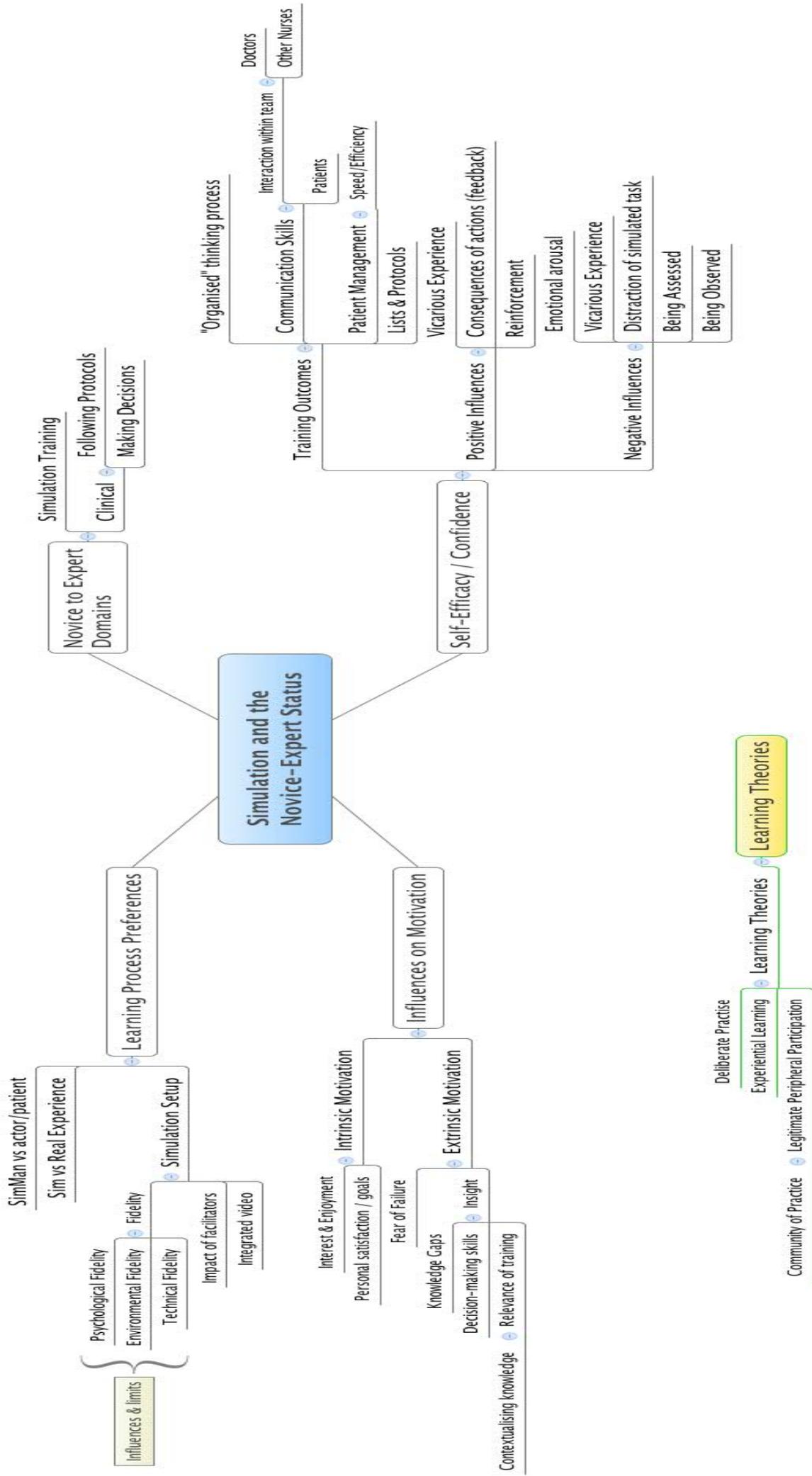


Figure 3. Final thematic framework

4.2 'Simulation' and 'Clinical Practice' as Novice-to-Expert Domains

4.2.1 Introduction

Throughout the interviews there were descriptions of experience and expertise from all the participants. From the provider perspective in the context of STAT and SMART, the purpose of simulation-based training is to provide a means of experiential learning that can improve an individual's performance in the "real world" (Gaba, 2007). The factors that can influence the transfer of knowledge and skills from the simulated environment to the clinical one are numerous and complex, and it is not the intention of this study to focus on all facilitating factors and barriers to transfer (Kneebone et al., 2004).

It has already been discussed how some of the educational literature has used Benner's adaptation of the Novice-to-Expert model to describe the role of high-fidelity simulation in the development of clinical expertise (Larew et al., 2006; Waldner and Olson, 2007). However, through exploring this idea in this study, it was clear that there was a different context in which different learners used the term "experience". As will be shown in this chapter, some learners referred to their prior clinical experiences and how these were recalled during the simulated scenarios, which would be consistent with Benner's model in the context of clinical decision-making. However, some learners also described the simulated scenarios as tasks to be mastered in their own right, regardless of clinical context, and related their prior experiences of generic simulation to their performance in the most recent training. This moves away from the specific domain of clinical expertise and towards a more general model of experience and skill acquisition as originally described by Dreyfus & Dreyfus (Dreyfus and Dreyfus, 1988). This difference may reflect varying ability of individuals to relate their training experiences to clinical practice, which may in turn have implications for the ease of which knowledge and skills are transferred between the training environment and the real world. It may also mean that a standardised simulation training programme which is outcomes-based may be experienced differently by learners with different prior amounts of clinical and simulation experience, despite the content of the training being the same.

In Benner's model, it is recognised that expertise is not generic and transferable, and applies to domain specific experience (Benner, 2000). A nurse might be an expert in one clinical situation in which they are very familiar, but a novice in another situation that has no clinical overlap with their usual responsibilities. It follows that this could also apply to familiarity

with training methods and equipment such as high-fidelity simulation. With reference to STAT and SMART, what is detailed in this chapter are the different ways in which learners describe their levels of experience and expertise in relation to the domains of relevant clinical practice and high-fidelity simulation, and how Benner's model can be applied to some of these descriptions to illustrate changes in expertise that may result from the training.

4.2.2 Descriptions of Clinical Expertise

With respect to the development of clinical expertise, Benner's model is well referenced in the literature (Banning, 2008). Simulation-based training programmes such as STAT and SMART are outcomes-based rather than learner-based, meaning that in general the content and learning outcomes are the same for all learners rather than being tailored to the needs of particular individuals. Depending on the exact format of the programme, and the ability of the facilitators, there is scope for flexibility through introducing extra challenges for learners who are doing well, or spending more time on certain topics if learners are struggling. However, by the end of the training every learner should be able to meet the minimum required standards, which fits with Benner's description of the Advanced Beginner stage:

“Advanced Beginners are ones who can demonstrate marginally acceptable performance, ones who have coped with enough real situations to note the recurring meaningful situational components ... [that] include overall, global characteristics that can be identified only through prior experience” (Benner, 2000)

Of particular interest in this definition is the use of the word “real”, which Benner uses to distinguish between classroom-based discussion and genuine clinical experiences. Simulated scenarios are not the same as the real experiences which they are trying to recreate, and one of the avenues that was explored in this study is the ease with which real experiences can be substituted with simulated ones in training designed to develop expertise in making clinical judgements. The following quote is from Nurse 7, who has been qualified for 27 years and has a lot of general nursing experience, but had no prior experience of caring for stroke patients before attending STAT:

“I think it's a start. I think it's just a start. I mean, I really enjoyed it and I think it's really useful and I think that it does give you a lot of insight and helps an awful lot, but it's just the beginning of your experience.” (Nurse 7; 16:36)

With these two training programmes in particular, one of the challenges in facilitating them is that the learners have a wide range of skills and experiences. Unlike training aimed purely at student nurses, who will all be expected to be at the same point in their training and with similar levels of clinical experience, learners attending STAT and SMART have a variety of different clinical backgrounds and are at different stages in their careers. Some will therefore be able to meet the learning outcomes of the training programmes more easily than others, as the clinical material may be very familiar to them. Learners who are already at or beyond the Advanced Beginner stage in clinical practice may still value the training for its role in reinforcing their existing knowledge and behaviour. This is highlighted by the comments of Nurse 3 who is an A&E sister who had prior experience of managing acute stroke patients before attending STAT:

“I didn't realise before I went on the training I knew as much as I had picked up from work, but it was more to answer the questions that I guess are there that you wonder ‘am I doing this right; is this the correct practice?’” (Nurse 3; 01:23)

In this case, the nurse was already beyond the level of Advanced Beginner by the time she attended the training. However, as discussed earlier, this may be an artificial and static label for what is actually a complex clinical skill-set that develops and evolves as a continuum. As such, some of the individual elements of the clinical problem may be more familiar than others. She had encountered relevant patients and cases in clinical practice, and therefore already had some knowledge and ideas of what to do. However, without any formal training or reinforcement that she was doing the right thing, she had reached a plateau where she wasn't able to advance her own expertise because she had insight into the limitations of her knowledge. Therefore, even though she was technically already performing at the standard of the learning outcomes of the training programme, she was nevertheless able to improve her self-efficacy and expertise by having it reinforced to her that she was doing the right things. She did not have to have the salient features of the simulated scenarios pointed out to her, and was able to demonstrate that she could recognise them independently. These descriptions of her perceived abilities after undergoing the training are consistent with the Competent stage of Benner's model:

“I think I would be able to pre-empt things, to pre-empt what was going to happen thus, I guess, cutting down any waiting time. I would feel a bit more comfortable and confident in my actions.” (Nurse 3; 03:02)

The desire for a feeling of comfort and confidence in their clinical roles was a recurring theme throughout all the interviews, and is integral to the notion of self-efficacy development that will be discussed further later.

The data illustrate how simulation might facilitate change between different Novice-to-Expert levels. One of the key differences between a Novice and an Advanced Beginner in Benner's theory is the ability to recognise certain clinical situations. In progressing from one to the other, there is a change from reliance on abstract protocols to being able to recognise clinical situations and respond appropriately. This is the crux of the training in STAT and SMART, where the students are being trained to recognise acute stroke patients and acutely generally unwell patients respectively. Movement further up the scale to 'Competent' depends on developing the ability to analyse, contemplate and plan how to manage clinical situations: The following quote, again from Nurse 3, describes how she felt the training had changed her ability to manage acute stroke patients:

"[Before the training] I guess I didn't really know how the flow would work, if that makes sense. If somebody said we were going to thrombolyse a patient I couldn't tell you that they need to be in CT at this point, I need to weigh them and pre-empt that we're going to be getting the drugs out... I guess, previous to that, I'd just be waiting for somebody to feed back guidance about where we were going, whereas now I can kinda pre-empt clinical decisions." (Nurse 3; 19:51)

Some of what she is saying here relates to the practicalities of the clinical management of patients, and in what order things should be done. This practical knowledge ("knowing how" rather than "knowing that") is an important part of experiential learning (Kolb, 1984). However, what is also inferred in the quote is she is also now able to make a clinical judgement about which patients are likely to get certain treatments, and then act accordingly through conscious and deliberate planning. In fact, she later goes on to describe an example of a case where she identified aspects of the presentation that *didn't* make sense in a patient who had been brought in with a possible stroke:

"After I finished STAT, I hadn't been back for many shifts, and I had this guy where I was worried about the blood pressure and they'd dropped their GCS, but when I was doing his neuro assessment I was thinking 'he hasn't really got any deficit, and his arm's moving' and I was not convinced there was any difference in his pupils, and it sounded more like he'd had a seizure ... I remember thinking 'it doesn't feel right but I'll just go with it' and then when the stroke consultant came down he said 'he hasn't had a stroke, he's just had a seizure'. It was

in the back of my mind that I was thinking about it, and I would never have normally questioned it.” (Nurse 3; 20:47)

Being able to recognise deviations from the normal presentation is one of the features of the Proficiency level of Benner’s model, and this nurse has used experience and knowledge from the training to make an appropriate clinical judgement in her real-life practice. Interestingly, she didn’t act on that judgement, and continued to treat the patient as though he/she had had a stroke. This anecdote might suggest that acting on those judgements requires a particular amount of self-efficacy, which she did not possess at that point.

Another key feature of the progression from Novice-to-Expert in developing clinical judgement skills is understanding the underlying clinical theory which, according to Benner, *“is crucial to forming the right questions to ask in a clinical situation; theory tells the practitioner where to look for problems and how to anticipate care needs.”* (Benner, 2000)

This is described in the interview data:

“I just think now I have the confidence to make more decisions myself and to take more control of the care of the patient. I probably wouldn't have been quite so confident [before] - I still knew what I was doing before the STAT course, but maybe not the reasons behind that.” (Nurse 9; 08:00)

Understanding the theory behind the protocols that are already being used can serve to improve self-efficacy and expertise, as described above. In the case of Nurse 9 who, like Nurse 3, also had prior experience of caring for stroke patients, it was the grasp of this underlying theory that makes her feel as though her expertise of the subject has improved. The combination of simulation with classroom-based teaching could serve to reinforce the taught theory through experience. Although not necessarily exposing learners to the nuances and intricacies of applying the theory in all cases, it does provide the opportunity for all learners to experience a relevant case and consolidate their theoretical knowledge, which they may not get in real-life.

These examples illustrate how the learners on STAT and SMART had various different levels of perceived clinical expertise prior to attending training. Regardless of the amount of prior experience, they all perceived their clinical expertise to be improved after the training, despite the fact that it was a simulated experience rather than a genuine clinical one. The Novice-to-Expert model can be applied to the nurses’ reported experiences to interpret the

changes in expertise that they perceive to be occurring. This will form the basis for describing some of the results in the following chapters. Similarities and contrasts will be sought between the data from learners with and without prior experience of simulation and/or relevant clinical situations.

4.2.3 Descriptions of Simulation Expertise

This section deals with the description of the experience of learning through simulation according to previous exposure. For the learners who reflected on their prior experiences with simulation, it is interesting that some of them viewed simulation as a discrete entity, with the clinical context seemingly having less of an influence on their perceptions than the simulations themselves:

“As simulations go, I’m not a big fan of them from past experience” (Nurse 11; 12:46)

Here, based on previous negative experiences which she later goes on to describe, this nurse has separated simulation from the context of what it was being used for, and has made a statement that generalises her experience with all simulation-based training. She does not comment on the efficacy of these experiences with respect to the acquisition of clinical knowledge and skills, but rather focuses on the experience of participation in the simulated scenarios themselves and how this has affected her opinion of simulation as an educational tool. This seems to reflect an emotional response, rather than a logical one that is based on reflection about the efficacy of the training model.

Other participants suggested similar ideas. In some cases, the focus was particularly on the simulator mannequin itself rather than the environmental and technical aspects of fidelity:

“Once you get used to a simulation dummy I think they're just about all the same. Obviously they all do different things, but once you get used to doing scenarios with a simulation dummy the training's good.” (Nurse 4; 26:06)

The idea that interacting with a simulator mannequin is a skill in itself that has to be acquired is a concept that has not been described previously. This comment from Nurse 4 suggests that it is the situational aspect of interacting with a simulator that’s important to adapt to, rather than the specific technical aspects of what an individual simulator can and can’t do. Using an actor rather than a mannequin may make the adaptation to simulated training easier, as communicating with a real person is likely to be more familiar to learners than talking to an

inanimate object, no matter how realistic it looks. However, this may counteract the “safe” feeling of an artificial training environment. This will be explored further in later discussions regarding the advantages and disadvantages of using a real person in the simulations rather than a mannequin.

The above comments imply that familiarity with the format of high-fidelity simulated scenarios is important in order to get the most out of the training. It would seem obvious that a period of adaptation is needed for any new training process before a learner can adjust and realise what is expected of them. This is consistent with Cognitive Load Theory, which was initially described 20 years ago and has only recently been applied to medical education (Van Merriënboer and Sweller, 2010). This theory assumes that a learner has a limited working memory capacity, which interacts with elements of long-term memory in order to achieve goals. It is particularly relevant to complex tasks, which require a relatively high cognitive workload. Novice learners have less relevant information in their long-term memories, and their working memory struggles to manage the many different elements of complex tasks such as are required in a high-fidelity simulation. Van Merriënboer explains this as follows:

“Element interactivity is the degree to which the elements of something to be learned can, or cannot, be understood in isolation... Tasks with high element interactivity are difficult to understand and yield a high cognitive load because learners must deal with several elements simultaneously. The only way to foster understanding and to reduce intrinsic cognitive load is to develop schemas that incorporate the interacting elements. It follows that a large number of interacting elements for one person might be included within a single element for another more experienced person who already has a schema that incorporates the elements.”

According to this theory, novice learners find worked examples of tasks more useful than autonomous problem-solving tasks as it reduces the cognitive load and keeps the task more manageable. It could be argued that simulation experience may be as important as clinical experience in this context, as the data in this study shows that learners who have never used a high-fidelity simulator before tend to focus themselves on adapting to the mode of training, possibly at expense of some of the clinical content. The simulated scenarios are designed to replicate real-life environments, situations and tasks. It might therefore follow that, if the degree of fidelity is high enough, minimal adaptation should be needed by the learners as they should feel free to act as they would normally do.

It seems that in order to maximise the educational gains of high-fidelity simulation learners must be experienced enough with the techniques to be able to focus on the learning outcomes of the task rather than the physical process of participating in and “completing” the simulated scenario:

“I think it would be easier in terms of you'd know what to expect from the mannequin and what sort of response, and what it can do, so in that way I think you'd just be more comfortable with what it does and be able to concentrate on the learning as opposed to what the mannequin does.” (Nurse 4; 30:49)

This suggests that prior experience with respect to participation in simulated scenarios may be an important contributor in how easily a learner is able to relate the clinical context of the training environment back to the real world.

If a learner has no prior experience of simulation-based training, they might be more focused on the “skill” of participating in the simulation and interacting with the simulator. Their inexperience may cause them to feel particularly self-conscious in this situation if they feel that talking to a mannequin is an artificial, and in some people’s eyes “ridiculous”, thing to do:

“It’s like pretending, like playing, like being a child again, and everyone’s watching you, and you’re using the phone but nobody’s on the other end of the phone - it just feels ridiculous! And you can see everyone’s giggling and everyone’s nervous and then I think once you get into the swing of it and have a bit of fun with it it’s ok, but the first time you use it you just feel ridiculous.” (Nurse 3; 23:53)

As this nurse puts it, the key when participating in a simulated scenario seems to be the ability to “get into the swing of it”, at which point a learner can focus less consciously on the simulation as a process, as they become accustomed to format of the training and the capabilities of the simulator, and the act of participating in the scenario becomes more instinctive.

If this happens, it may not necessarily be because there is improved psychological fidelity, but rather because the familiarity with the training modality means that they can participate and interact with the simulator instinctively without consciously having to think “I must treat this mannequin as a patient”:

“You don't ever really think it's a person, but if you get over the initial ‘oh this is just a dummy, and I'm just in a room’ you actually think ‘I've got to get something out of this’, so I'm trying to learn something and I want to be assessed doing this so the best way to do it is play along” (Nurse 0; 16:47)

This nurse is describing her insight into this process. She realises that in order to achieve her objectives from the training she needs to look beyond the physical confines of the training environment and appreciate the context of the clinical message. This insight may itself be a metacognitive process that develops with experience of simulation.

There are likely to be different levels of familiarity and therefore comfort that learners have with the process. Nurse 7 gives a good description of this transition, and how it could even happen within the space of a single training day:

“I think when you first go into the room it's not realistic at all because, you know, it's a plastic dummy lying there and you're really self-conscious anyhow, but I think as the day goes on - a little bit like with your tape recorder [in the interview] - you just forget about that, so I think eventually you just forget that it's a plastic dummy, and I think as you get more involved in the roleplay it's just a person. So I think initially you're conscious that it's a plastic person, but you just forget about that eventually.” (Nurse 7; 28:53)

The adaptation to a new approach to learning happened quickly, and the interaction with the simulator became more instinctive as a result. This comment also suggests that it's not just experience alone that helps learners to adapt to using the simulator, but also a feeling of comfort, which is acquired at the same time. The parallel with the tape recorder in the interview is a good one - she seemed to be acutely aware of it at the beginning of the interview and was therefore guarded and considered in her responses. As the interview progressed, she became more comfortable with the format and less focused on the tape recorder. The same thing happened within the simulation. However, this refers to a learner being able to adapt to a specific simulation setup over the course of a single training day. Of course, each simulation-based training programme will have a different design. Simulation technology is also constantly evolving and there are a large number of different pieces of equipment that could potentially be used. So is there a feeling of generic simulation competencies that are transferrable across different training programmes? The data suggests this might be the case:

“When I go on [simulation-based training] now I think less about the dummy and more about the course, and when I did it the first time ... I thought more about the dummy and less about the course. Do you know what I mean, like almost the dummy was an offputting factor, whereas now I know that there's going to be a dummy lying on a table at some point on this course, and it's just become ... not second nature, but I think if you've been on a few of them then the dummy does become less of a part.” (Nurse 13; 32:58)

This comment from Nurse 13 suggests he feels experienced enough with this mode of training to be able to adapt to any format that a high-fidelity simulation might take. This viewpoint is of course limited by his experiences, which might not be extensive enough to prepare him for *all* possible forms which simulation could take. However, with respect to the use of patient mannequins he is describing how familiarity with that training method helps to shift the focus from the technology itself to the clinical context. The combination of personal and vicarious experience of simulation may improve learners' self-efficacy with respect to performance in the simulated tasks, and lead to a greater feeling of comfort.

Interestingly, having made comments that would support the notion of needing to be proficient at simulation before being able to make useful clinical gains from it, Nurse 4 also suggested that the novelty value of using a simulator for the first time would stimulate interest in the activity and make the process of “learning” more effective:

“I think if you've not used a simulating mannequin before then that does help the learning process cos it makes you a bit more interested as to what the mannequin can do and things like that.” (Nurse 4; 30:18)

This was not elaborated on during the interview, and she is speculating rather than drawing on her own experiences, but it is likely that there is an overlap between the different domains of learning - learning new skills and knowledge, and learning to use a simulator. However, she still implies that the focus would be on the simulator itself rather than the clinical context. However, in contrast to the earlier discussion about the focus on the simulator being detrimental to the achievement of the learning outcomes, it may be that the extra motivation provided by using interesting and stimulating equipment (such as a technologically advanced high-fidelity simulator) may overcome this disadvantage.

It should also be remembered that “simulation”, even using “high-fidelity” equipment, can take many different forms and is unlikely to be something that can standardised in order for people to become experts in. As technology advances, and simulated training is designed to

meet a growing variety of clinical training needs, it is highly likely that each training programme will be different from the previous one and there will be different technical or environmental features that the learner has to adapt to. However, there are also likely to be many common components, such as interacting with a patient simulator in some form, in which learners can become experienced.

4.3 The Impact of Simulation on Self-Efficacy Beliefs

4.3.1 Introduction

In this chapter the self-efficacy beliefs of the learners, both prior to and as a result of the training, will be described in relation to their experiences with the simulated scenarios. The first sub-chapter will discuss the data relating to perceived changes in self-efficacy in the learners' clinical roles as a result of training in general, as well as how and why that change is important to them. The second sub-chapter will deal specifically with the influence of the simulated scenarios and their impact on self-efficacy beliefs when used as an integral part of clinical training, with reference to each of the domains of self-efficacy influence: performance accomplishments, vicarious experience, verbal persuasion and emotional arousal.

The previous chapter discussed some perceived differences between the domains of simulation and clinical practice in terms of expertise. These have also been highlighted here to see whether learners with different amounts of expertise, either clinically or with simulation, report different things with regards to self-efficacy. Positive and negative influences on self-efficacy, some explicitly stated by the learners and some interpreted from the data, are described and compared with Bandura's theory (Bandura, 1977).

Much of the data gathered from the interviews centred on the concept of self-efficacy. Where "confidence" was mentioned by the learner (either spontaneously or through a direct question) the meaning and context of the reference was explored to determine what they felt more or less confident about, why that may have changed, and whether they were unknowingly or indirectly referring to and describing self-efficacy beliefs.

4.3.2 The Clinical Context of Self-Efficacy Changes

The commonest descriptions of changes in self-efficacy beliefs were in respect to improved clinical performance in a "real-world" setting.

"I had a gentleman the other weekend who came in as "query stroke" but it turned out he was a seizure and was post-ictal. But at the time he had a deteriorating GCS and he was becoming hypertensive. Now I knew there was a problem there so I had to alert the doctors, but in the back of my mind I was also thinking: "it's probably happened because of this, this

and this, and this is what I need to be doing" - pre-empting what they were thinking, and it just made more sense and it made me feel more comfortable in my actions, more comfortable looking after the patient, and more confident. When I presented the case to the doctor, I felt more confident that I was doing the right thing and I knew that although I'd identified there was a problem, I understood the severity of the problem more than if I hadn't had that underlying knowledge." (Nurse 3; 11:36)

As a result of training, this nurse had a greater understanding of what might have been causing the patient to become unwell and knew what needed to happen next, and what her actions needed to be in order to provide the best and most appropriate care. As she was able to correctly anticipate what was going to happen, she was better able to imagine her role in looking after her patient and felt more self-assured as events unfolded. She describes this as a feeling of “*comfort*” but this itself appears to actually have been derived from an increased self-efficacy, as she was more confident in her own ability to successfully assess the patient in order to choose the correct course of action. This has reduced the amount of anxiety that she would otherwise have expected to feel.

All of the interviewees reported that one of the biggest benefits of the training was the effect on their own confidence. When asked whether they felt there were any benefits for the patients, the answers were a little less clear:

“Building confidence in people's abilities clinically has got to have a positive effect on the way that they care for the patients.” (Nurse 0; 08:59)

“It's being able to provide good care for the patients, isn't it? If you're confident in yourself then you're being competent at your job.” (Nurse 2; 10:01)

These quotes suggest an assumption that improved confidence equates to a higher standard of competence. The nurses in question recognise an association between their own improved self-confidence and their perception of themselves as being more competent. This was a recurring theme when talking about the impact of training on patient care. Interestingly, all of the nurses’ responses concentrated on changes that are internal to the learners - mainly an improved feeling of confidence. There were no immediate references to implementing newly acquired skills that would have a practical impact upon patient care. Instead, what was widely reported was a feeling that the patients were assessed, triaged and managed more efficiently, with an emphasis on speed:

“Interviewer: Do you think you being more confident would change anything [for the patient]?”

Nurse: Not necessarily cos I tend to be quite careful anyway. Y'know, in doing the observations I had them all on time. I suppose I would be a little bit quicker in practice cos I wouldn't have to sift through all the protocols. I'd be a little bit quicker.” (Nurse 2; 14:06)

Nurse 2 reports doing the same tasks and procedures as she was before the training, but through being more familiar and confident about what she was meant to be doing, the time it takes her to complete these tasks has been reduced. This was commonly cited as the main tangible benefit that the nurses felt as a result of the training. They did not perceive themselves to be taking any more responsibility for patient care through the making of additional (conscious) clinical judgements and decisions, but rather improving their performance with respect to roles and tasks which they are already expected to perform. For many of the nurses interviewed, who already had some (if limited) relevant clinical experience, the change in self-efficacy was not related to the acquisition of new skills but rather to the utilisation of existing ones. To an extent, this is to be expected from outcomes-based training if the learners have different backgrounds and experience at the start. For most nurses on STAT and SMART, the end-point of their patient assessments is getting medical attention for the patients:

“You're going to recognise the signs quicker or you know what you should be looking out for so you can get on to the doctor sooner if you need to.” (Nurse 11; 05:04)

This is not unexpected, as all the nurses attending the training programmes are already qualified, and have come on the training as it is relevant to their clinical roles and is designed to help them improve their performances at work. However, in the case of STAT and SMART, the belief amongst the novice learners was that the overall outcomes for the patients would not be any different:

“Interviewer: So what did that translate into in terms of a practical difference? What physically happened that was different?”

Nurse: There was nothing physical. Well, I recognised the signs more than what I probably thought I would have in the past, and I think it just built my confidence really and helped me approach the doctors and get the treatment the patient needed.” (Nurse 8; 03:27)

This was mirrored in responses from other novice learners - they believe that the patients would get reviewed and treated appropriately regardless of their level of training, but an

improved confidence has helped them expedite this process. They value the training for making them better at their existing role within the clinical team rather than making them more willing or able to take a greater degree of individual responsibility for a patient's care. This leads to a question about why the training is valued so highly by learners if they believe it makes no difference to patient outcomes. The answer might relate to the degree of insight they have regarding their own performance when measured against an expected standard:

“In A&E what you're doing might be different to what somebody else thinks is right, and it's the same thing when current practice changes. It's changing all the time ... so you just think 'am I doing this right'? You want to do your best for the patient and if you feel like you're doing a crap job then it just doesn't make you feel good and then you feel terrible.” (Nurse 12; 13:32)

Nurse 12 has enough experience to give her insight into what the standard of care should be and whether or not she is able to meet that, but not enough experience to be able to perform to those standards. As a result her self-efficacy beliefs prior to the training are limited, and she becomes demoralised as she feels as though she is failing to provide adequate care to the patient, and is unable to rectify this. After training, with an insight into how she needs to act and improved self-efficacy with respect to the same tasks and outcomes, she feels happier in herself with what she is doing. Improved job satisfaction may therefore be a positive outcome of the training, and could also be a factor in the application of knowledge related to an improved self-efficacy. Not only that, but she also feels as though her own sense of confidence transmits to the patients under her care which she believes gives them more faith in her:

“Interviewer: Obviously it would be nice not just for you, but for everybody, to feel more confident. I think everybody would like that, but do you think it's important in terms of the job that you do? Does it help you do your job better?”

Nurse: I think it does. When I'm confident in something it does help me do my job better, of course. I think it's important for the patient to feel that whoever's looking after them is confident, and therefore competent, at what they're doing.” (Nurse 12; 17:03)

A slightly different perspective was given by Nurse 7, who was a very experienced surgical nurse but a relatively new nurse practitioner with no practical experience of stroke management. She felt that the main benefit of STAT was to familiarise herself with the guidelines for managing stroke patients:

“ I feel more confident in what I'm doing because I've got the guidelines to look at, and I know that what I'm doing is what people want me to do, if you see what I mean. So I feel more confident about the whole outcome because I'm following the guidelines.” (Nurse 7; 09:31)

In this case, the improvement in her self-efficacy relates to looking at and following written guidelines about what to do. The phrase “what people want me to do” is an interesting choice of words that implies she is distancing herself from the active decision-making process and the responsibilities that are associated with it. This would fit with her being towards the Novice end of the Novice-to-Expert spectrum with respect to the clinical context of the training. She has to rely on fixed rules rather than experience and intuition. However, the training has given her an introduction to the guidelines in question, and a chance to practise implementing them, which in turn has given her confidence to apply them in clinical practice.

So it seems as though novice learners, with less relevant clinical experience, do experience improvements in self-efficacy beliefs related to their role in patient assessment and management which they perceive to be part of their existing clinical duties. The fact that they do not believe that patient outcomes are changed (except for happening more efficiently) may be because they haven't been put in situations where they have been required to make significant decisions regarding patient management. In contrast, there may be a slightly different impact on self-efficacy in learners with a greater degree of expertise that may lead them to actually act differently. Nurse 6 describes an event she witnessed where a senior colleague, who had also been on the training, intervened in the management of a particular patient:

“It was one of the sisters. She'd been on the training, and the doctor was going to discharge this patient. If I remember rightly the patient was still having symptoms, and there was a bit of controversy, but the nurse in question went over what she'd picked up on the course and said "this patient is still having symptoms, so I think you should consider...". I think the doctor was a little bit funny about being questioned, but it ended up that the patient was thrombolysed.” (Nurse 6; 07:54)

It's not known whether this sister would have had the knowledge, experience and confidence to intervene anyway, regardless of whether she had been on training, but the inference from the nurse being interviewed was that the training had given her colleague the confidence to challenge the doctor's decision to discharge the patient. Although she would need to have a degree of certainty in the specific clinical judgement in order to voice her concerns, there will

also have been a generic confidence and experience that has made that individual nurse feel able to challenge a medical decision.

It seems as though having attended a formal training course, rather than acquiring knowledge through informal teaching, can lead to an individual feeling more authoritative:

“There’s people who have taught me things over the years and they’ve taught me things and you take it, like, ‘that’s brilliant, that’s the best information I’ve ever been told’, then you go round the corner and somebody says ‘oh that’s not how it’s done’. And you don’t know where to go. So when you’re given a formal learning event you walk away feeling reassured that what you’ve been taught is the correct thing.” (Nurse 3; 35:28)

It follows that if people have a greater degree of faith that what they are being taught is unquestionably the truth, or the right way to do things, that will have a positive influence on their self-efficacy beliefs. Therefore, in effect, attending these training days may become a professional status symbol of sorts, in that the nurses are not only more likely to act on their improved self-efficacy, but they also feel that colleagues are more likely to respect their views:

“Interviewer: Do you feel as though your colleagues who know you’ve done the training look at you any differently? Do they have higher expectations of you?”

Nurse: Well, in a way yeah I suppose they will because they’ll expect my knowledge to be a bit better than what it was before and if I’m saying ‘we need to be looking for this’ or ‘if this is happening I want to know about it’ then I would like to think that they would think ‘well we have to do that cos she knows what she’s talking about’.” (Nurse 11; 30:03)

Outside of the context of a disagreement with a colleague about the correct management plan, the data from the nurses with the greatest amounts of relevant experience suggests that they, like their novice colleagues, experience an increase in their self-efficacy without being aware of any changes in patient outcomes:

“I think just to be more aware of the things to recognise, which I think we do anyway, but like I say I think that just reinforced it and gives you a bit more confidence to say ‘yes, this is definitely what we’re looking for, this is what we need to flag up’.” (Nurse 5; 04:25)

IN contrast to Nurse 7, who placed a great deal of importance on being able to follow guidelines, Nurse 5, who had a great deal of relevant clinical experience before attending the training, goes on to describe how she attaches value to understanding the theory of why those

guidelines are there as opposed to following them unquestioningly:

“You need to know why you're doing something. If you're just doing something because somebody's told you that you need to do this, this and this, and you don't really know why you're doing it, then anybody could do it. I think you need that knowledge to make you a better nurse.” (Nurse 5; 06:09)

The use of the phrase *“anybody could do it”* highlights the distinction between herself as an experienced nurse who knows a lot about the management of stroke patients, and a less experienced nurse who doesn't. Of course, it shouldn't matter whether or not “anybody can do it”, as long as “it” is an acceptable standard of care. The importance attached to this understanding in order to become a *“better nurse”* hints at the expertise and intuition needed to cope with patients and situations that don't conform to standard guidelines. In other words, the clinical decisions don't merely relate to following guidelines, but the ability to know when the use of such guidelines is and isn't appropriate.

The quotes described above all indicate that the nurses feel that their experiences in the simulated scenarios have improved their efficacy beliefs with respect to their clinical roles. This is consistent with Self-Efficacy Theory:

“Self-efficacy is commonly misconstrued as being concerned solely with specific behaviours in specific situations. This is an erroneous characterization [sic]. Domain particularity does not necessarily mean behavioural specificity.” (Bandura, 1997)

Even though there is a perceptible difference between the training and clinical environments, any self-efficacy changes within the simulated scenarios are not necessarily confined to the training environments, and may be transferrable to a learner's clinical role.

The specific impact of the simulation on the individual domains that inform self-efficacy will now be considered.

4.3.3 The Effect of Simulation on Performance Accomplishments

Performance accomplishments are based on individuals' own prior experiences of the same or similar events upon which they can draw to form an opinion of how likely it is that they will succeed at a particular task. High-fidelity simulation-based training is intended to create an accurate representation of a situation a learner may face in clinical practice, so that they can gain relevant experience from the training that they should be able to apply in the real

world when they encounter a similar situation. Therefore, for a learner on STAT or SMART to be able to use the training experience to inform their performance accomplishments, they must be able to readily relate the training experience to the clinical world. This is nicely described by Nurse 14, an A&E charge nurse with some prior experience of both simulation and the relevant clinical topic:

“There’s nothing better than experience. I mean, life’s all about experiences ... If you’ve never swam before and you fall into water, it takes ages and you drag yourself out; now the next time you fall in water, you might not be the best swimmer but you know what to expect - you think ‘hang on, I’ve done this before and this is what I did then’. So that’s my comparable. You go on a course and you think ‘oh, what am I going to expect here?’ - you do the course, you go back to your own environment and it happens ... it happened within 2 days for me ... and suddenly you think ‘hey, I know this, this is going well, this is what we’re doing’.” (Nurse 14; 31:53)

Here, the swimming metaphor highlights the importance of physical experience. Rather than solely knowing the theory of what to do, the training has provided an opportunity to physically go through the motions of the required tasks, which then has a positive impact on his self-efficacy in practice as it reinforces the belief that he could successfully complete a similar task if required to in the future. Nurse 10, who also had some prior experience of stroke patients before attending STAT, puts it rather more succinctly:

“Interviewer: Are you ever in the A&E department looking after a patient, and you think back to how you acted in the scenarios?”

Nurse 10: Sometimes. I did at first, when I first went back to work - I thought ‘right, this is what we did’, and sort of pictured it.” (Nurse 10; 18:07)

Ideally, this is the effect that simulation-based training would have on all learners, giving them experiences to reflect on that would help them feel better equipped to deal with the same situation in real life. However, not all learners are able to draw the comparisons between the two environments so readily. Nurse 8, who was newly qualified when she went on the SMART training, felt that although the training was a useful experience, it wasn’t a substitute for the same relevant clinical experience:

“I just think clinical experience is far better than simulation in any case. You learn from your experiences, and you need the clinical [experiences] ... You’re not going to come across everything in simulation. I mean, you’ve got different relatives, different patients, loads of different things to deal with on a daily basis in real clinical practice, and not everything runs

as smoothly as when you've got one patient to deal with in a simulated room. You've got to have 7 poorly patients to look after on MAU, and they're all dehydrated, septic and breathless, and you need to be able to deal with all of the patients in a real clinical environment with all of the pressures and things.” (Nurse 8; 33:13)

She refers to the variability and unpredictability of the clinical workplace, implying that higher-level prioritisation skills and adaptability are needed to perform a clinical role, and that these cannot be developed through simulation. She later goes on to say:

“I think it's like learning to drive. You don't really learn properly until you've passed your test!” (Nurse 8; 36:05)

This analogy reinforces the idea that simulation doesn't teach you how to cope with all the subtle nuances of clinical situations that you would be expected to deal with in real life. It could be that Nurse 8, in contrast to her more experienced colleagues, is not easily able to separate these “higher level” aspects of the task from the core skills that are the focus of the training.

For those nurses with a lot of prior clinical experience of the subject matter, they already have performance accomplishments to take into the training with them, and require less “convincing” through simulation that they are capable of performing certain tasks or using certain skills in their clinical practice. The emphasis of the training becomes more about consolidating existing skills and giving those nurses the reassurance that the performance accomplishments they already have are valid:

“I already had a general idea [about thrombolysis], but definitely doing that in the way that it's structured so having to apply the assessment tools and then physically stand up and do it and assess somebody is a good way to do it to consolidate that knowledge.” (Nurse 0; 07:20)

The comparison between people with different levels of clinical experience is illustrated by Nurse 13, another experienced A&E charge nurse, who attended STAT alongside one of his student nurses and an A&E sister of the same level of seniority and experience as himself. He draws attention to the ease at which his pre-existing experience allows him to incorporate the learning objectives of the training day into his existing practice, compared with a less experienced colleague:

“Interviewer: Do you think that all three of you, if you'd all gone back into a shift in A&E [after the training], would all have equally been able to do those initial assessments and work-up a stroke patient and so on?”

Nurse 13: I think we'd have all probably went about it a little differently. I certainly think I would have taken it into my practice and put it in to the way I work, rather than sort of just put it to one side and go 'right there'. So I think I put it into my practice ... I think we probably would have done the same things, but whether we would have got to them the same way I don't know. And I don't think we'd have probably done it with as much confidence as each other - possibly with less experience you'd still be 'am I alright to do this, can I do that?', whereas myself or the sister who was there probably would have went 'I've learnt this yesterday - right!' and then gone and implemented it.” (Nurse 13; 20:41)

Perhaps then, for training course such as STAT and SMART, their ability to be regarded as performance accomplishments is diminished for learners with less clinical experience - either of the subject matter being taught, or of how to cope with other practicalities of clinical work that are not usually explicitly taught but are acquired over time. Maybe nurses with limited experience of *both* clinical practice *and* subject-specific patients feel as though they cannot relate as readily with the simulated experience at the time of training. Cognitive Load Theory could again be applied here, as these learners are being asked to assimilate a large amount of new information, both with respect to the clinical material and the concept of participating in the simulated scenarios. This information overload may undermine their ability to successfully grasp the key learning points of the training, and therefore make it less likely that self-efficacy beliefs (and subsequent clinical performance) will improve. Although none of the interviewees, even the novices, described a *decrease* in their self-efficacy beliefs, it is theoretically possible that this could happen for learners who did not manage to cope with a new cognitive burden. It would have been interesting to see whether this was reported by learners who did not perform well in the STAT summative assessments, and would be an area for future research.

The data did not appear to suggest that prior experience of high-fidelity simulation training made a difference to the ability of the nurses to reflect on the training experience once they were back in their real workplace. There were different views on the required level of simulation fidelity, which will be discussed in more detail in a later chapter, but the extent to which the training was regarded as a “performance accomplishment” depended mainly on the level of prior experience of the learner.

4.3.4 The Effect of Simulation on Vicarious Experience

Vicarious experience depends on seeing the consequences of others performing the required actions. The clearer the outcomes to the observer, the greater the impact on their self-efficacy. This depends on social comparisons rather than personal experience. Seeing a colleague act a certain way is no guarantee that a learner will be able to attain the same level of performance, but if they see themselves as having equivalent roles or abilities, then it may reinforce their belief that it is within their capabilities to do so.

“I actually learn best by watching somebody else do it, standing back getting all the information and evidence and then doing it myself. In doing the act, or whatever it is, that is my way of learning - it's like watch one, see one, do one ... or whatever you call it.” (Nurse 12; 19:04)

Vicarious experience is more than just a source of mimicry for physical tasks. The learners must believe that they are equally as capable of completing a task as the individual being observed, and that by doing so they will achieve the desired outcome. It may be possible to translate this into simulated-based training, which provides tailor-made opportunities to observe the performances of others and see the results of their actions as the scenarios unfold. Group work forms an important part of the STAT and SMART training programmes, as most of the simulated scenarios involve one or two people participating and the rest of the learners observing. This was described by some of the learners:

“Being in the audience and watching though, you learn. So you find, y'know, the first person that goes up tends to make the most mistakes, and if you wait and go at the end you know what you're doing because you've watched everybody else's mistakes and you've figured out by the end how it's meant to be done.” (Nurse 3; 32:50)

“I think it helps to watch other people do it as well, cos then they might miss out something that you would remember or you'd miss out something that they'd remember so I think it's good to watch everybody doing it cos then I think then you learn from other people's mistakes.” (Nurse 4; 15:02)

According to Self-Efficacy Theory, the efficacy beliefs of the observers should be enhanced as they see their peers successfully completing the simulated tasks. In the above quotes, these two nurses both focus on mistakes made in the simulated scenarios, and how the members of the group learn from each other's mistakes. Seeing the consequences of actions taken (or not taken) is necessary for observational learning, which influences how likely a learner is to act

a certain way. The intended learning outcomes for STAT and SMART are fixed. All the learners are expected to have the same understanding of specific scenarios by the end, and it is expected that the knowledge and skills taught could be used in their daily clinical practice. In theory, there should be no reason why any of the learners could not relate, through observation, to any of their colleagues who are participating in the simulated scenarios and learn vicariously from the process. However, the different mix of grades and experience within the learner groups may mean that, despite the commonality of the tasks being performed, learners who are more junior and less experienced may see themselves as unable to perform to the same level as their senior colleagues. Nurse 11 describes how this affected her during a prior simulation-based training day, when she witnessed the facilitators demonstrating how to correctly perform a task using the simulator:

“They ran through a simulation and said ‘well, we’ll show you what we’re going to do’ and one of them did the talking and the firing questions and ‘this is happening, that is happening’ and the other one was doing what they wanted us to do, but obviously they do it day in, day out, and they made it look really simple and really easy, but when we came to do it you just felt that you were under so much pressure, thinking ‘God, mine’s nowhere near what they were coming up with’, so you do feel like you’re really under pressure.” (Nurse 11; 13:58)

Although in this case it was vicarious experience through watching trainers rather than other learners, the demonstration should have had the effect of making her believe that she could successfully complete the task. Instead, she felt as though there was a significant experience gap between the people doing the demonstration, who “do it day in, day out” and herself, which she believed made the task look deceptively simple. Rather than convincing herself that she could competently perform the task, the disparity in expertise between herself and the trainers had a negative effect on her efficacy beliefs, regardless of her actual ability. In situations like this, the onus should be on the educators to help the learners feel as though successful completion of the task is within their capabilities.

In all these descriptions, it appears that vicarious experience in a controlled learning environment is having an effect on the learners’ self-efficacy. What is less clear is whether the self-efficacy is changing with respect to real-world clinical performance or completing simulated tasks. Certainly Nurse 11, for whom the experience described earlier was her first encounter with high-fidelity simulation, seemed to feel that the pressure she felt at being asked to complete the task was more related to the challenge of completing a simulated scenario rather than the practicalities of the task itself:

“Interviewer: Is it the same sort of pressure as you feel in a real-life emergency situation?”

Nurse 11: No, not at all, cos I've been in situations where people have arrested and I haven't felt anything like that!” (Nurse 11; 14:30)

In contrast, when she came to SMART, her fear and self-doubt about her ability to participate in simulated scenarios was eased through vicarious experience, when she saw a colleague complete a task that she was able to relate to her own ability:

“On the first day when we did the simulation on the SMART course ... I was really, really nervous because of what had happened on the last one and when we came in I thought ‘Oh God, here we go again’. But it wasn't until one of the other girls went first and I kinda thought ‘oh, this is a bit different, this isn't going to be horrible like the last one’, so it kinda relaxed us a bit more, so when I came to do mine I was alright about doing it.” (Nurse 11; 19:10)

Again, the focus here is on the participation in a simulated scenario rather than the clinical task which is the focus of the scenario. Perhaps a degree of experience with high-fidelity simulation is needed to focus the learners' concentration on the clinical message of the teaching rather than how to “pass” the simulated scenario. Although superficially there may not be much distinction between the two (i.e. the clinical skill or task must usually be completed in order to successfully complete the scenario), if a learners' focus is more on the latter objective then it may affect the likelihood of successful transfer of knowledge and skills from the simulated environment to the real world.

Nurse 2, who had some prior clinical experience of the taught subject, as well as with high-fidelity simulation before attending the training, hints at a link to clinical practice:

“I suppose you learn from others because every scenario is slightly different. And also you knew your turn was coming up so you wanted to take in what you were looking for so you didn't make a fool of yourself when you got up. It did make you think and take it in, and then you've learnt again from everybody else.” (Nurse 2; 32:33)

Although the statement that she was wary of embarrassing herself might suggest that she was more concerned about her performance in the simulated task, she draws attention to the fact that she recognises the (clinical) variability between the different scenarios, and that she was able to “take in” that information.

Although the data illustrates how vicarious experiences in the simulated scenarios have

influenced efficacy beliefs in the learners, it is less clear whether these efficacy beliefs are related solely to performance in a simulated scenario, or whether this also transfers to clinical practice. As cited previously, Self-Efficacy Theory does allow for transferability of efficacy beliefs to other tasks with similar components, and are therefore not necessarily specific to simulated tasks in this context. With respect to the development and transfer of skills into practice, most of the comments made by the interviewees centred around their prior personal experiences (performance accomplishments) rather than relating explicitly to vicarious simulated experiences. Witnessing a colleague performing a simulated task may indeed influence the efficacy beliefs of an individual with respect to their clinical role, but there was limited data to support this.

Through these references to vicarious experience, the relationship between Self-Efficacy Theory and Social Cognitive Theory becomes particularly evident. Social Cognitive Theory is a model for describing observational learning of behavioural and social skills (Bandura, 1986). The sub-processes that govern observational learning in this model are attention & retention of knowledge, reproduction of behaviour and motivation for behaviour. Motivation will be discussed in more detail in the next chapter, but it is clear from the quotes above that there is a perceived benefit of nurses observing their colleagues during the training. The self-efficacy changes that are occurring seem to be part of a wider behavioural modelling process that is taking place. How much of this modelled behaviour is transferrable to the workplace and how much is specific to the simulated scenarios remains unclear.

4.3.5 The Effect of Simulation on Verbal Persuasion & Emotional Arousal

Verbal persuasion is the suggestion to an individual that they are able to perform a task successfully, which in turn, if they believe the suggestions, has a positive effect on their self-efficacy. Again, as with vicarious experience, there is no personal experiential basis for a change in self-efficacy.

“It's really good to have to look at why you're doing something, and the process of doing it, and then actually be encouraged to do that practically, albeit with a simulator and not with a real patient ” (Nurse 0; 05:41)

There was little reference in the data to specific verbal encouragement from either facilitators or other learners. The encouragement described by the above quote refers to the style of facilitation in the STAT and SMART programmes. There are no references in the data to any

of the learners being explicitly “persuaded” by anyone that the completion of the task and the performance of the clinical skill was achievable. Instead, some of the interviewees referred to a style of facilitation that put them at ease with the situation, which in turn improved their efficacy beliefs. This is illustrated well by Nurse 11, who compares her positive experience on SMART with the previous negative experience she had on a different training course:

“They put us at ease straight away when they explained what they were going to do. But they made it fun as well. I mean it was still an emergency situation - you had a patient there who was deteriorating and you had to act on it, but the way they did it, they made you feel more confident to actually go in and do what you would do, whereas in the other one they were kinda like really quite intimidating.” (Nurse 11; 15:29)

“I think it's down to the way that the people who are [facilitating] the course actually do the simulation.” (Nurse 11; 17:55)

Once again, it is difficult to discern whether the confidence that is mentioned refers to the simulated task, the clinical skill or both. In reality, there is likely to be some overlap. In the previous chapter, it was described how this same nurse experienced the feeling of pressure that had been created, intentionally or otherwise, by the instructors had undermined her confidence in her ability to succeed at the simulated task. In SMART, the way the programme was facilitated had a positive effect on her confidence. She did not mention specifics of what was said to make it fun, but the effect was the same as providing verbal persuasion as she felt better able to participate in the simulation and complete the task compared with the other course. It is unclear how much of a contribution this would make towards confidence in clinical practice.

This overlaps with the final component of self-efficacy - emotional arousal. According to Bandura, aversive arousal (fear/stress reactions) can reduce expectations of success, therefore negatively impacting on self-efficacy. Conversely, putting the learners at ease and reducing the level of stress that they feel should be associated with improved self-efficacy.

“I don't like standing up in front of a group - I don't like doing roleplay. But if everybody's relaxed and you can have a laugh that makes it easier, and then you can think about things better rather than just worrying about having to get up next.” (Nurse 5; 16:06)

This quote is a typical example of how the learners described finding it easier to participate in the simulated scenarios if they felt more relaxed. As well as the approach and style of the facilitators, this can also be achieved through the design of the scenarios. In STAT and

SMART, humorous elements are included in the scenarios to try and put the learners at ease. When the interviewees mentioned this, it was described as a helpful strategy in improving their experience.

“A little bit of comedy was brought into it, which does help with the learning as well I think. Appropriate comedy at appropriate times.” (Nurse 1; 28:32)

“There was an element of humour in it, which was good 'cos it's a bit like 'right, let's laugh about the fact that this isn't obviously a real person to start off with' and then move onto the fact that the reason you're using it is because you need to be able to do these things, so that was fine. I didn't feel intimidated doing the assessments either.” (Nurse 0; 14:51)

This is more than just a way of giving learners a more pleasant experience. By helping them to feel comfortable with the situations that they are in then they feel as though they are better able to participate more actively, and may even make aid learning through vicarious experience. This is described well by Nurse 7:

“It breaks the ice, and I think when people are very nervous to start with and very shy about it I think personally everybody gets more out of it. When there's an atmosphere, everybody's frightened to speak. You know if you're in a group of people in a lecture or something, and nobody speaks and you're asked a question and nobody answers then you don't really learn very much, but actually if you're in an environment where there's one or two daft people and they ask stupid questions and people have a bit of a laugh, it breaks the ice and then people are more happy to ask other questions and things. And I think you learn more from other people if there's a lot more interaction. So I think if you can make the learning session fun, and break down the barriers of people not asking questions and that sort of thing, then you actually learn a lot more. (Nurse 7; 20:26)

This shows that learners can be apprehensive and anxious about participating, usually because they are worried about making mistakes in front of their colleagues or the facilitators. Fear of performing poorly can raise anxiety levels beyond that of the actual activity itself, leading to a falsely low self-efficacy. Biological and clinical studies have shown not only that increased stress and anxiety during simulated training isn't detrimental to learning, but that it can actually improve knowledge retention and subsequent successful performance of tasks (Demaria et al., 2010). Despite this, it is seen as an undesirable consequence of the training format by learners, and was commonly reported by many of the interviewees as a concern prior to participation in the simulated scenarios. Nurse 9 described what she was thinking when waiting to take part in one of the scenarios on STAT:

“Oh my god, don't make a fool of yourself!” [laughs] ‘Don’t get it wrong, don't miss something!’” (Nurse 9; 18:43)

There is a contradiction here between the negative impact of stress and anxiety on self-efficacy, and the improved performance which is thought to be associated with increased stress whilst undertaking a simulated scenario. An improved ability to carry out a task is likely to be of little use if a learner lacks the required self-efficacy beliefs required to motivate them into autonomously performing that same task in real life. Therefore, a balance needs to be found in order to provide the optimal level of emotional arousal for learners during training. Although work has been done to attempt to quantify levels of physiological stress during simulation-based training through the measurement of biomarkers (Bong et al., 2010), the levels of stress and anxiety that produce the most favourable results are still unknown. The data in this study did not suggest any variation in responses to emotional arousal that was associated with the level of experience of the learners. All of the nurses who raised the subject of feeling stressed and anxious indicated that those emotions had a negative impact on the usefulness of the training. What did vary however, was the extent to which those emotions were felt by learners with different levels of experience. Nurse 7 was able to explain how her experience helps her overcome the performance anxieties in training situations:

“You’re always frightened that you're going to make a fool of yourself or do something absolutely stupid. But I have learnt over the years that, on the whole, almost everybody makes a fool of themselves sometime, and actually nobody really bothers, and if you make a mistake and somebody else learns from what you did wrong, then I think ‘well what was the harm in that’.” (Nurse 7; 18:14)

This relates to her experience with training in general, and not specifically to simulation. It may be that this performance anxiety limits the usefulness of the training if it inhibits learners’ willingness to participate. Perhaps then the chance of changing their efficacy beliefs will improve if they are comfortable with the idea of having to perform in front of others.

Interestingly, the data suggest that this may also be true if the domains of expertise are reversed. Nurse 15, a stroke nurse practitioner, describes how her familiarity with the subject area gave her the self-efficacy to participate in the simulated training - the format of which was a new experience for her:

“If it had been somebody in a different condition, like somebody who'd collapsed, and it was something out of my own comfort area, then I might not have liked it at all ... I didn't mind cos like I said before if there was something that you were expecting and it was changed, it's something that I was familiar with anyway.” (Nurse 15; 14:50)

Her expertise in the clinical field meant that she was able to predict the simulated clinical situations and respond to the challenges of the content of the scenarios. She confirmed that the situation would have been different if she had not been so confident with the clinical context. In this instance, her clinical expertise has reduced the emotional arousal that she might otherwise have felt, and had a positive effect on her efficacy beliefs with respect to interacting in the simulated scenario.

4.3.6 Sustained Self-Efficacy Changes

Self-efficacy depends on the cognitive processing of all this information. Merely completing a simulated task may not be enough to change a learner's efficacy beliefs. The importance of the experience to the learner must not be discounted, and therefore to be effective the training process should not just be looking to achieve objective competence, but to reinforce learners' beliefs that they have that competence (i.e. self-efficacy). This is probably easier to achieve on a single training day with people who already have some clinical experience to use as a base on which to build the extra experience gained through simulated scenarios:

“I think consolidating is definitely the word for me - it consolidated what I already knew about thrombolysis and assessing stroke patients early on and ... y'know ... signs and symptoms. I would say after that day I definitely felt more confident with that knowledge.” (Nurse 0; 12:18)

“It reinforced it. Like when you were doing your neuro assessment, and thinking ‘oh, ok, I'm doing that right’. Cos you've only ever been taught in a nursing capacity from somebody else. So to be on a course and for somebody to formally reassure that yes, you are doing the GCS correct - it was nice to see it done in that capacity, and be reassured that we're doing it the right way.” (Nurse 3; 07:09)

These two nurses, talking about STAT and SMART respectively, already had significant pre-existing knowledge. The training not only updated their skills, but also provided them with the positive reinforcement to make them believe that they were capable of performing to a certain level. This description is similar to Deliberate Practice Theory, which is characterised by conscious efforts to improve the performance of tasks that are already within an

individual's capabilities (Ericsson, 2008). It requires lots of task repetition, intrinsic motivation from the learner (which will be discussed in more detail in a later chapter) and detailed feedback to improve performance.

For the novice learners, who have less experience to reinforce their efficacy beliefs, simulation can provide initial exposure to clinical problems to be considered as performance accomplishments. However, unless that behaviour is reinforced in the clinical environment, the development of self-efficacy may not occur.

“This sounds awful, but I felt more confident just straight after the training than I do now because you forget some of the bits, don't you?” (Nurse 7; 24:06)

Nurse 7 had not had any opportunity to put her skills into practice in the four months between attending STAT and being interviewed for this study. In this time her confidence had diminished. Compare this with Nurse 8, who was able to use her exercise her newly improved skills and self-efficacy soon after returning to work, and has continued to use them since, leading to a sustained improvement in self-efficacy:

“When I went back into practice there was a particular patient who was dry who'd come from A&E and was really dehydrated and needed fluids, and I felt more confident approaching the doctors and getting some fluids for the patient. So it helped straight away ... I was back in work the next day, so it was the next day that it helped me, and it's still helping me now - I feel more confident. ” (Nurse 8; 02:08)

In Bandura's original paper on self-efficacy, he comments that *“generalised, lasting changes in self-efficacy and behaviour can best be achieved by participant methods using powerful induction procedures initially to develop capabilities, then removing external aids to verify personal efficacy, then finally using self-directed mastery to strengthen and generalise expectations of personal efficacy”* (Bandura, 1977). The evidence from this data suggests that high fidelity simulation can, depending on the level of experience of the learner, either act as the initial induction procedure or as a tool for mastery learning. It cannot, however, do both at the same time and the skills and knowledge must be regularly used in clinical practice if positive changes in individuals' self-efficacy are to be maintained. The data demonstrates that if the learner groups comprise individuals with a variety of backgrounds and expertise, learners with different amounts of expertise are gaining different benefits, despite the process and content of the training programmes being the same for all the participants. This has potential implications for the planning of such training. Even if the planned learning

outcomes of a programme are intended to be universal for all learners, consideration of the prior clinical and simulation experience of the learners may be needed to optimise the benefits for each individual.

4.4 Influences on Motivation

4.4.1 Introduction

The topic of learner motivation now needs to be considered, as it has an overlap with the influences on learners' self-efficacy. Specifically of interest is learner motivation with respect to both participation in the training and, perhaps more importantly, a subsequent change in clinical behaviour when they return to their clinical roles.

With respect to motivation, the following summary from Karen Mann provides a suitable introduction to this part of the study:

“Motivation and learning are integrally related. Motivating learners is clearly a complex endeavor[sic], and we can influence motivation in many ways and at various levels, including the learner, the education program[sic], and the learning environment. Being mindful of these many influences offers us many excellent opportunities to motivate students to achieve excellence in their professional lives.” (Mann, 1999)

All the learners interviewed expressed satisfaction with the training that they underwent, and claimed that they were motivated to participate. This chapter will discuss the different aspects of the training programmes, and specifically the simulation-based aspects where relevant, that influenced the learners' motivation not only to participate in the training itself, but also to utilise the knowledge and skills when back in their usual clinical roles.

As referred to in the literature review, the discussion of learner motivation in the context of this study is framed by Deci and Ryan's Self-Determination Theory (Ryan and Deci, 2000), which involves separating the motivational influences into intrinsic and extrinsic components. Intrinsic motivation is focused on the immediate activity in hand, and the influences on it are internal to the learner - usually being driven by a sense of enjoyment or purpose. Extrinsic motivation can be colloquially thought of as “a means to an end”; that is, factors external to the learner are providing the impetus to undertake the activity.

The decision to take this approach was based on the way in which the interviewees described different influences on their own perceived likelihood of acting in a certain way. Several different emotional states, such as interest, excitement, satisfaction and fear were described during the interviews, and these were related to the learners' own descriptions of how such emotions were likely to alter their future behaviour. This was how ‘motivation’ was defined

and considered, and what follows is a separation of those influences into distinct categories.

The main influences on intrinsic and extrinsic motivation that were expressed by the learners will be described, with comparison and contrast between learners of difference experience, and with respect to the development of self-efficacy.

4.4.2 Intrinsic Motivation

Intrinsic motivation refers to the desire to do something for the sake of personal satisfaction from that particular task, rather than doing something as a result of external pressure. Once again, in the interview data, comments regarding the intrinsic motivators seemed to be split between references specifically to the simulated tasks and references to the clinical outcome. However, the two are not necessarily mutually exclusive:

“It obviously can't be really fun, but I think it does help if you're enjoying what you're learning and enjoying the process of doing that then your learning stays with you - what you've learnt on the day.” (Nurse 4; 29:42)

This nurse is implying that the immediate enjoyment of the training and the simulated tasks themselves helps her to remember what she is learning after she leaves the training environment. However, it's interesting that she says at the start of the quote that “*it can't be really fun*”, suggesting that too much frivolity would distract from the serious nature of the learning outcomes. Perhaps this is due to her expectations that enjoyment or fun is not a typical component of the learning process during a training day. Alternatively, perhaps the workplace and clinical tasks that are being simulated are not associated with being “fun”, and so too much fun in the simulated scenario would detract from the psychological fidelity of the simulation. Nurse 12 offers a different explanation:

“I think it was a bit more relaxed and it didn't seem so much as a test. Therefore I probably took more in because it was a bit more relaxed” (Nurse 12; 25:47)

Perhaps the enjoyment of the process doesn't necessarily come from the simulated scenarios themselves being inherently “fun”, but rather because they are not perceived as being assessments as a result of which a learner might “fail”. This allows the learners to focus less on worries about their own performance, and more on the tasks themselves. Regardless, it does seem that these nurses are saying that they were more engaged with the process as a result of finding it enjoyable, and that makes it more likely that they will remember the

material in the future. Whether or not that makes them more likely to use that knowledge in the workplace is another matter, and will be discussed further later on.

The physical process of participating in the simulated scenarios doesn't itself have to be an enjoyable process in order to affect intrinsic motivation. If learners are focused on the end result of the training and what it might mean to them, this can give them the motivation not only to complete the training program but also to use those skills in real life. One aspect of this is the drive of personal ambition, regardless of the specific topic:

"It's just I think as well for me it's satisfying learning something new. It's nice just to have that little bit more knowledge I think." (Nurse 10; 11:11)

"I think unless you push yourself with knowledge you're not going to strive for better are you? And I think with practice always changing it's good to get a current update for starters. It differs for different people. I would prefer to be constantly learning, even if it is stuff that you may not use everyday, cos you'll always pick up something new when you do study days." (Nurse 12; 27:45)

These quotes show that these nurses are being driven by personal desire to improve their knowledge and skills, which they find satisfying. In particular, Nurse 12 states that she is not just focused on things that she "may not use everyday", but has a desire to be "constantly learning". There is likely to be an overlap here with extrinsic motivating factors such as the fear of being reprimanded or appearing foolish in front of colleagues for not knowing certain things, but this is not explicitly stated. Instead, she talks about how she strives to better herself through the acquisition and maintenance of knowledge and skills. The satisfaction she derives from this is her intrinsic motivation.

In addition to personal ambition regarding the acquisition and accumulation of knowledge, intrinsic motivation can also develop from insight into how it might make that individual feel if they are able to implement a change in their practice. A common focus that was reported in the interviews was the role of the learners within their clinical teams:

"I think there's nothing nicer for doctors when everything's going crazy and they're under a lot of pressure cos there's a big decision to make, if there's a nurse around to anticipate your every move and everything's there and there's that reassurance as well for the doctor. It can't be very nice for them making that decision, but if the nurse is in the same boat going "oh no, I agree with you" it's gotta be nice." (Nurse 3; 04:35)

Here, the motivator is the personal satisfaction derived from the perception that she is a more valued member of the clinical team. She is able to imagine herself playing a more useful within the team by supporting the medical staff in their decision-making and patient management. By feeling as though she would be able to anticipate medical decisions and provide a source of reassurance for a doctor, she imagines that she will make life easier for that doctor (as she is empathising with the difficulties of their particular role). This makes her feel more valued as a member of the team. The desire to achieve this feeling contributes to her intrinsic motivation. Similarly, she later gives an example of how an improved ability to communicate with patients contributes to her sense of self-worth:

“If a patient asks ‘what is happening to me, what does that mean, why is this?’ ... then you want to be able to answer those questions and look like you know what you're talking about. Yes, anyone can spiel off some protocol, but to understand the bigger picture and be able to explain it to people when they're scared and they want more information, without looking, like, ‘I dunno, I'll go and get the doctor’, ... it would be helpful for us to answer those types of questions.” (Nurse 3; 10:40)

By completing the training and taking away an improved understanding not only of the medical condition, but also the management pathway that the patient can expect to go through, she feels better able to answer the patient's questions. The implication in this is that it might make her feel more confident in her role as nurse. If she were not equipped to answer the patient's questions, and had to go and ask someone else for help, this may make her feel inadequate if she feels that the patient expects her to know the answers to those questions. Even her comment about wanting to *“look like you know what you're talking about”* might suggest that how she appears to the patient could be even more important than whether or not she actually *does* know what she is talking about. Clearly the two are not mutually exclusive, but this may give a clue as to what influences her motivation the most.

Putting knowledge and skills into practice can further increase the satisfaction derived from the feeling of being more knowledgeable:

“A lot of courses, you come back with a bit of a buzz that you've been on it and you've done something and for want of sounding a little bit macabre, you kind of wish that the next patient to come in is something to do with the last course you're on so you can get in there. You feel as though you want that - you go on ATLS then you're desperate for somebody to come in as a trauma just so you can put all of this into practice ... not that you'd wish it upon anybody, you don't wish a cardiac arrest on people, but if you've just been on ACLS there's nothing

nicer than one coming through the door and you going 'right, I'm right up on top of this', 'cos it's a good feeling to be on your game about what you're doing and it's quite nice.' (Nurse 13; 10:41)

This nurse is being motivated by the feeling of satisfaction and achievement that he derives from successfully applying the skills he was taught in his training. This is in contrast to how he earlier describes what would have happened without any training:

"I couldn't have pre-empted anything, I would have just had to wait for [the medical staff] to tell me what to do" (Nurse 13; 05:21)

In this case, his intrinsic motivation appears to come from the satisfaction derived from the feeling of autonomy and improved self-efficacy that has resulted from the training. He now knows how to act in that situation, and is able to do so without any instruction from his medical colleagues.

As previously discussed, the interactive element of the training was felt to be valuable by all the learners, and there was agreement from everyone that the simulator was an important part of that feeling of interactivity. This is consistent with a constructivist approach to teaching and learning, as the participants are able to form their own belief constructs on the basis of their interaction with the environment (Parker and Myrick, 2009). The experiential, dynamic, and inquiry-based nature of high-fidelity simulated scenarios is allied very closely with the constructivist principles that enable learners to acquire and develop their own knowledge and skills (Dabbagh and Bannan-Ritland, 2005).

In all likelihood, with respect to intrinsic motivation that the learners derive from being able to contextualise the training situation and realise how and why it would be meaningful for them to participate due to the real life application, this may well be achievable with a lower fidelity simulator. The benefit of the high-fidelity mannequin, aside from providing a more realistic representation of a patient, may improve the learners' motivation for participating in the training through a more direct route - by making them more interesting in the training process itself:

"It was something new... Cos we've all seen resusci-Annie dolls, and there's only so much you can look at them. And this, with its interaction, just invoked the mind a bit more and made you think. I think the key to learning is that you've got to be interested. If you're not interested, you're not going to learn." (Nurse 14; 22:00)

The assertion that an individual needs to be interested in what they are doing in order to help them learn is not surprising. Much has been written about the psychological impact and influences of interest in educational theory; most of which is outside the scope of this work. However, the idea that the simulator can be an object of interest for a learner in order to motivate their learning strategy is consistent with reported theoretical approaches, and it is therefore plausible that it could help to improve situational interest (of the clinical topic) at the same time (Krapp, 1999). If the simulator itself is more advanced than learners would have expected from prior experience with other less-advanced simulators, this alone seems to generate interest:

“Interviewer: How important do you think it is that it's high-tech?”

Nurse: I don't think it's particularly important, but I do think it is sort of quite good fun in a way, and it sort of gives a different element to it. I mean, it is quite nice learning all the different things that [the simulator] can do.” (Nurse 7; 19:22)

Here, Nurse 7 initially claims that she doesn't feel that the technological ability of the simulator is very important to her, but she then goes on to describe how being interested and impressed by the simulator itself, was a pleasing feeling. This sense of being impressed or excited was also voiced by learners who had not encountered this technology before:

“There was a wow factor that it responded and I know you were using a computer to make it react to what we were doing.” (Nurse 8; 24:32)

This “wow factor” is probably significant in helping the learners engage with the process. Even though Nurse 7 and Nurse 8 had different levels of experience with high-fidelity simulation, they both felt the same feelings of interest that motivated them to engage with the process. However, this is not conclusive:

“Interviewer: If you'd seen that simulator 10 times before would going to do that training be equally as effective?”

Nurse: Probably not. I probably would have lacked enthusiasm. If you kind of get excited about something you get into it a little bit more and you're involved in the training and you don't take off and get bored and you keep stimulated all the way through.” (Nurse 8; 25:01)

Nurse 8 speculates that familiarity with the simulator technology might cause the initial interest and excitement to wane, possibly adversely affecting her motivation. This again is consistent with the educational theory of interest, as object-specific interest is not necessarily

constant. However, although the “novelty factor” of a simulator may wear off with familiarity, the comments of other interviewees who did have prior experience of high-fidelity simulation suggest that they still found the training stimulating.

As well as stimulating learners’ interest in the simulations, the data also suggests a further benefit to the use of high-fidelity simulation, in that it can help individuals feel valued as learners as they perceive that a lot of time, effort and expense have been spent on their training experience:

“Obviously there was a lot of effort put into it. Sometimes you turn up to a teaching session, somebody's trying to teach you something and they've put in less effort that you have to get there, and you think ‘hang on...’. But when you go to something and you suddenly think ‘hey, they want us to learn this, they've provided this to teach with’ ... and it does draw you in a bit.” (Nurse 14; 26:24)

This perception has come from a nurse who has a lot of experience of different training programs, and therefore plenty of references for comparison. He feels that the simulator is sufficiently impressive that it equates with effort and expense. This not only flatters him as a learner, increasing his sense of self-importance, but also serves to underline the importance of the clinical topic. Both of these factors influence his intrinsic motivation, and helps to “draw him in” to the process.

4.4.3 Extrinsic Motivation

Factors and pressures that are external to the learner influence extrinsic motivation. In other words, it does not come from an individual’s innate interest in a subject or their drive for personal satisfaction, but rather the influence or expectations of others. It can come from the desire to be rewarded, or the fear of failure and punishment. One example of this in relation to STAT and SMART is the peer pressure that influences learners’ motivation to attend the training in the first place:

“When people are coming back and are telling you how much they've enjoyed [the training] and the things that they've learnt, it kind of strikes a little pang where you don't want to be the one that's not doing that. Do you know what I mean? You don't want everybody else going ‘oh yeah I'm doing this, and you're not up to speed with it’.” (Nurse 13; 03:16)

Rather than being driven primarily by a personal interest in the subject or the desire to improve her knowledge, this nurse talks about the fear of being disadvantaged by being the

only one of her colleagues not to be trained to a certain standard. Intertwined with this is the pressure that nurses may feel due to the consequences of under-performing and clinical mistakes that they make:

“Unfortunately I think, as a nurse, a lot of stuff comes into play ... new policies, new procedures etc ... and it perhaps comes into play before all the training is through, and I think you have that worry where if I do something wrong or I'm not 100% confident that I'm doing it right I've got my registration to look after ... I think it's the reassurance that you're doing a good job, and that you're doing it well, and that as long as you've got the training, and you do everything that you're told, you can't really be brought up for it.” (Nurse 3; 07:47)

This is not specific to simulation-based training, and could be applied to any form of educational intervention. The data did not suggest that the inclusion of a simulator would have any extra influence on extrinsic motivation over other forms of training. However, it may be that if the learners perceived the simulation-based training as a whole to be more effective than other forms of training, then the extrinsic motivation could be felt more strongly.

There are also extrinsic motivators with respect to the simulated scenarios themselves. The feeling of being under pressure to perform in front of facilitators and colleagues can cause a learner to become focused on their performance:

“With the simulation you know you're being assessed and watched, so you do think twice and you are more thorough. But I think that's a bad thing because you put too much pressure on yourself and you're frightened that you miss something.” (Nurse 9; 24:34)

The motivator here is associated with negative feelings, in that it's fear of missing something whilst being assessed that is driving her. It is causing her to be considered and thorough in her approach. The question then arises about how much of that considered approach is taken back to the clinical environment, and how much was due to her motivation specifically to complete a simulated task. All the nurses reported a feeling of being under pressure to perform, and there was no clear link between prior experience and the learners' response to this pressure. It was clear that some of the nurses concentrated more on the assessment aspect of the task, which they felt made it harder to relate it to real life:

“You’re trying to think what [the facilitators] are thinking or what they're trying to get you to say, rather than just thinking off your own bat. It's like ‘what’s he suggesting?’ or ‘what should I be saying now?’” (Nurse 9; 30:45)

However, some of the nurses did describe how the feelings of pressure in the simulated scenarios made them explicitly think of how their actions related to their relevant clinical roles in the real world:

“It basically creates an environment where you're not only questioning the system, you're questioning yourself and your ability to manage. You're in it and you're thinking ‘well if that happened in my department, who am I going to contact and what am I going to do’. It does throw questions up, but answerable questions about how you would manage.” (Nurse 14; 14:01)

Here, the realisation of how his actions would relate to the clinical role arose as a result of the pressure of having to perform in front of an audience during a simulated scenario. Again, there is a lack of further data to confirm or contradict this situation for other learners.

However, comments made by some of the interviewees hint at how the generic advantages of a high-fidelity simulator could mean that it is better able than lower-fidelity simulators to contribute towards the issues discussed above:

“I think the learning is possibly better when you've got an interactive mannequin. I think it just makes it feel more like practice if you're doing it with an interactive simulation dummy as opposed to just a dummy that doesn't do anything. I think I take it in more if it's interactive.” (Nurse 4; 26:55)

If the quality of the learning experience is felt to be superior due to the interactive features of a high-fidelity simulator, this in itself would be enough to make it more effective in influencing extrinsic motivation of the learners.

4.4.4 The Relationship Between Motivation & Self-Efficacy

Having explored the influences on learners’ intrinsic and extrinsic motivation, it is now important to consider the specific interactions they have with self-efficacy. Social Cognitive Theory states that self-efficacy is a key component of motivational beliefs that inform an individual’s efforts to regulate their behaviour (Bandura, 1997). This concept can be applied to the interview data:

“I'm never happy doing anything unless I'm confident in doing it” (Nurse 2; 12:23)

This quote from Nurse 2 highlights how the need to feel happy about doing certain tasks may be an intrinsic motivator for her to seek to become more confident. It is representative of the feelings expressed by all the nurses interviewed, and reflects the importance attached to their self-efficacy beliefs. Not only is it desirable for personal comfort, but some of the interviewees also suggested that it is a pre-requisite in order to be able to perform a clinical role to an acceptable standard:

“Interviewer: Do you think it's important to be more confident at those things?”

Nurse: Yeah! [laughs] Otherwise you wouldn't be able to do your job!” (Nurse 4; 12:25)

If an individual does not believe that they are capable of successfully completing a task, they are less likely to attempt it. This involves both intrinsic and extrinsic motivation (Bandura, 1977). Not only is no intrinsic pleasure or satisfaction likely to be gained from struggling unsuccessfully with a task, but there may also be extrinsic consequences, such as adverse outcomes for patients and therefore punishments for the individual, if an error is made. Therefore, if self-efficacy is improved following the training, this may positively affect a learner's motivation to apply the relevant skills in practice. If the learner has insight into this, it may itself give him or her the motivation to attend the training in the first place.

There are also other ways in which self-efficacy can influence motivation. Bandura believes that intrinsic interest, and therefore motivation, in any subject can be developed through self-efficacy beliefs:

“Most of the things people enjoy doing for their own sake originally held little or no interest for them. Children are not born innately interested in singing operatic arias, playing contrabassoons, solving mathematical equations, or propelling shot-put balls through the air. But with appropriate learning experiences, almost any activity, however trifling it may appear to others, can be imbued with consuming personal significance.” (Bandura, 1997)

In other words, through the development of individuals' self-efficacy beliefs, an enthusiasm for the subject can be developed which is likely to have a positive influence on their intrinsic motivation to seek out opportunities to reinforce these beliefs. This was shown in the interview data.

“I found it really boosted my confidence, because it's much more in depth to a particular aspect of patients. So I found it interesting from that respect.” (Nurse 9; 28:45)

“I did [enjoy it] very much. It made me a bit more interested in the subject as well now. I think because I enjoyed that training I would go for something again - I would put myself forward for a stroke course.” (Nurse 10; 40:47)

Having earlier described improvements in their self-efficacy, these nurses are now expressing more of an interest in the clinical topic, which may influence their motivation to manage those patients in the real world. They both also talked about how much they enjoyed the training, which is also a factor that can influence both self-efficacy beliefs and intrinsic motivation. All the nurses who were interviewed claimed to have found the simulation-based training enjoyable, and comments like this one were typical:

“I think of all the courses I've been on, this definitely has been the most beneficial and the most enjoyable.” (Nurse 14: 26:24)

Whilst, as a trainer, it is pleasing to hear positive comments from the people who have been trained, there are wider aims to the process than merely ensuring that people have a good time. Enjoying the training itself is likely to give them the intrinsic motivation to participate on the day, but what needs to be explored is whether the enjoyment of the training was due to the interest in the simulator, or whether it was because the learners could see its relevance and felt that it was going to be something which would benefit them, thereby increasing their self-efficacy. It might be that the training process itself is indeed fun and enjoyable, but this is likely to have less effect on a learner's intrinsic motivation to use those skills in the real world than a sense of satisfaction that they are able to competently complete a particular clinical task.

“It's got to be relevant. If things aren't relevant then it might be my way of learning but I find things more difficult to concentrate on and take in. If I can see relevance in it, if I can see how that is so close to what I'm doing at work then it sinks in a lot quicker and certainly a lot deeper, and it makes it all seem a lot more focused.” (Nurse 13; 24:51)

“I did enjoy the fact that there was more of an interaction than just a one-way thing.” (Nurse 13; 29:30)

Nurse 13, who in his previous quotes has described the personal satisfaction he derives from being able to use new skills, seems to find the training process interesting and enjoyable because of the relevance of the content to his clinical role, and the improved self-efficacy within that role that results from the training. More than one constructivist learning theory could be used to explain this - Discovery Learning Theory, which involves interactive

problem-solving based on prior experiences (Kolb, 1984), would seem to apply as the quote refers to Nurse 13 finding the relevance of the training to his job. Similarly, it could be argued that this is a form of Situated Learning, as it is occurring within the context in which those same knowledge and skills will be applied (Lave and Wenger, 1991) - this raises the question as to whether a simulated environment can justifiably be considered “the same” as the clinical environment that it is trying to recreate in order for the learning to truly be considered situated, but the data has already shown that this is true for some of the learners. The application of situated learning to simulation-based training has already been described (Bradley and Postlethwaite, 2003), but perhaps the successful achievement of this learning depends on how well the ‘reality gap’ is bridged, and how easily the learners themselves regard the training as situated.

Improved self-efficacy can positively influence an individual’s motivation to perform clinical tasks, which in turn can further improve self-efficacy if done successfully. Simulation appears to have the potential to have a positive effect on both. Not only can it have a direct impact on efficacy beliefs through the reinforcement of correct practice, but it can also improve both intrinsic and extrinsic motivation in the training environment with similar implications for real world practice.

Of course, it may be that the learners who declined to be interviewed may have held different views, and may not have been motivated to either attend the training or change their clinical practice. However, the data does seem to support Keller’s ARCS model (Keller, 1987), where the learners who did have a positive motivational response to the training found it to be attention-grabbing, relevant to their work, confidence-boosting, and satisfying training needs.

4.5 Learning Process Preferences

4.5.1 Introduction

This section of the analysis deals with different physical aspects of the training programmes themselves and how learners described them. In particular, it explores how preferences between learners with different amounts of expertise. As simulation-based training was the main focus of the interviews, the use of patient simulators was a core theme that was referenced by all the interviewees. As well as recounting their experiences, many speculated as to what the ideal format of simulation should be, how it compares to real-life “on the job” training, and how training should be structured in order to provide the most useful experiences to learners. These details will be described in the following chapter, which deals primarily with the concept of simulation fidelity.

As the focus of discussion in most of the interviews was the simulator mannequin itself, the issue of simulator (equipment) fidelity will be addressed first, including discussion of the role of real people rather than mannequins into the simulated scenarios. Environmental fidelity will be discussed later.

As described by the interviewees, both the simulator (equipment) fidelity and the environmental fidelity play an important part in the overall psychological fidelity that is experienced by the learners. Psychological fidelity will therefore not be considered separately, but instead will be referred to during the discussions about the physical aspects of the simulated scenarios, which is reflective of the nature of the discourse in the interviews.

4.5.2 Simulator Fidelity

In the interviews, the most frequently discussed topic with respect to the simulated scenarios was the simulator mannequin itself. All of the learners felt that using a simulator was an acceptable substitute for a real patient when practising clinical skills.

“I personally think it's the nearest you're going to get to a patient, so without actually doing it in real time with a person, then that's the next best thing you can get.” (Nurse 0; 14:21)

The above quote is illustrative of the feeling expressed by the rest of the interviewees. However, the use of the phrase “*the next best thing*” implies that, despite the simulation

process being valued by the nurse, there is a conscious disparity between the usefulness of participating in a simulated scenario and practising skills in a real clinical environment. She later elaborates on the aspect of the simulation that distinguishes it from real life experience:

“Sometimes it's hard to suspend the knowledge that it's a dummy but if you really want to get something out of the day you have to get beyond [that]” (Nurse 0; 14:51)

Here she is saying that in order for her to be able to relate her actions in the simulated scenarios to real life clinical practice, she has to be able to treat the simulator mannequin in the same way in which she would a real patient. This is not easy for her as she is very conscious of the fact that it is a simulator in front of her at the time. Her unfamiliarity with the format of the training meant that she found it difficult to put aside the artificial nature of the simulated task. This would seem to underline the argument for using more realistic simulators, which may help to bridge the gap between the simulated and the clinical environments for learners who would otherwise struggle to associate a simulator with a real patient.

“Interviewer: So then do you think that if we hadn't had the talking mannequin which you can measure it's obs on - if we just had, say, Resusci-Annie, just a mannequin, do you think that would have made a difference?”

Nurse: I don't think it would grab people's attention and interest in the same way because you're suspending your belief even more if there's nothing for you to do. If it literally is like a Resusci-Annie where you're not getting anything back from doing anything with it then it is different. At least you can take blood pressure, look at heart rhythms, you're a bit more involved with SimMan.” (Nurse 0; 18:52)

A “Resusci-Annie” is a low-fidelity simulator mannequin that was designed for learners to practise the technical skill of CPR on. It has the shape and form of a human, but does not have any of the technical features of more advanced mannequins such as SimMan. If one of these mannequins had been used in the training instead of SimMan, this nurse feels as though the gap between the training and clinical environments would have been even larger. She stops short of saying that the training experience would have been less useful in this case, although that can be inferred from her earlier comments regarding how difficult she found it to overcome the difficulty of talking to an inanimate object. This opinion is shared with other learners with little experience of simulation-based training:

“The simulator was very good, but it wasn't a real person. But the simulator was better than just having a dummy lying on the bed that didn't speak.” (Nurse 1; 27:50)

Again, the feelings expressed by this nurse suggest that a higher-fidelity mannequin is preferable to a lower-fidelity one, but both are inferior to real-life experience. It might follow, therefore, that efforts to make the mannequin as realistic as possible might assist the learners in their efforts to relate it to real life. This idea was expressed by some of the interviewees:

“It was very lifelike ... that definitely is important to me, if you can get it close to be like that - that's quite good training.” (Nurse 2; 26:21)

The importance attached to how lifelike a simulator is may correspond with how easy the learners find it to relate the mannequin to a real patient. Nurse 2 had limited clinical experience prior to the training, and perhaps expressed her preference for a very lifelike simulator as she had few real clinical encounters to base her understanding of a situation on. She then associated the realistic appearance of the simulator with an impression of “*good training*”.

The value attached to the realism of the patient simulator seems to be in helping the learner link the training environment with their clinical role. This was stated by several of the interviewees:

“I just think you can interact better when you see something that's portraying what it's supposed to be rather than this lump of plastic that you can't even imagine being a person. I think that distracts you away from what you're really supposed to be doing. Rather than when I see this simulator that looks more like a patient, I can get into the role that I'm trying to do and pretend that this is a patient.” (Nurse 15; 18:52)

However, it is likely that learners with more clinical experience will be better able to imagine what a real patient with a particular clinical presentation would look like, and how they themselves would act in a given situation. Their experiences may play a larger part in bridging the two environments than their less experienced clinical colleagues, and may therefore not require the physical appearance of the simulator to provide this information for them:

“I would say that if you're not very experienced ... the dummies that are in place tend to put you on edge anyway because it tends to give you a bit of a disjointed feel cos you see it as a dummy but you have to talk to it like a person so it kind of puts you a little bit ... it makes you feel unnatural... I think that if you're more confident in what you're doing before you go to do

it with the dummy ... you're probably a little bit more happier to do it. So I think people with very little skill or knowledge in the topic are probably more likely to feel more intimidated by it.” (Nurse 13; 16:08)

The benefit of Nurse 13’s experience allowed him to reflect on how his feelings towards using a simulator have changed with time. He mentions the “unnatural” feeling of treating the simulator as a patient, which he attributes to inexperience. He feels as though his existing skills and knowledge around the subject areas prior to training have not only made him feel more comfortable with exercising those skills in a training environment, but also find it easier to treat the simulator as a real patient. This idea was also suggested by Nurse 8:

“I think it is important [for the simulator to be realistic], but obviously you come across patients in a real environment anyway, so you can kind of imagine the patient in a way.” (Nurse 8; 19:54)

Although she had no experience of the specific clinical context of the training, she is a very experienced nurse practitioner and was able to use her experiences of seeing real patients to imagine what the simulated scenarios would look like in clinical practice. Some of the other experienced nurses expand on this idea, expressing the opinion that there would be a limit to the usefulness of more realistic simulators:

“Interviewer: What about the physical appearance of the dummy itself? Do you think you need it to look particularly realistic?”

Nurse: To be honest, probably no, not to me. I think there's enough there to be able to engage the mind and definitely get you to think and to react. I think ... something like a virtual reality wouldn't benefit that much more to be honest.” (Nurse 14; 20:57)

Here, the learner suggests that there is a point beyond which a greater degree of technical fidelity becomes irrelevant, as he is already able to make the link between the training and his clinical environment. This idea was also echoed by Nurse 13:

“I think unless it was actually a real person who was there I think a doll's always going to look like a doll.” (Nurse 13; 13:53)

Both these nurses highlight their feelings that, no matter how convincing the simulator is as a representation of a patient, the fact that they, as learners, will always be aware that it is a simulator rather than a real patient. For them, there is no extra benefit to be had from striving to improve the levels of realism after they reach a point at which they can successfully

associate the two environments and act in one as they would do in another. What is being described here is an ability to acknowledge but ignore the artificial aspects of the task and act as one would in real life.

“Interviewer: Is it really important for the simulator to look as close to a real person as possible?”

Nurse: Possibly not. I think it does help though, but I think the way that it was on the day was enough to be able to treat it as a real person.” (Nurse 10; 26:13)

This quote emphasises the point that the other nurses were making - the simulator needs to be realistic enough “*to be able to treat it as a real person*”. The idea that there might be a ‘ceiling effect’ to the levels of realism of high-fidelity simulators, beyond which there would be no extra advantage for the learner in terms of how well they relate the training to real life, has not previously been discussed in the literature in relation to the impact of learning. Other authors have commented that development of simulation training should be based on the needs of the learners rather than the technological ability of the simulator manufacturers (Maran and Glavin, 2003), but there has been no specific assertion that there might be a limit to the usefulness of increasing realism. In a paper where they discussed the evidence for the use of high-fidelity compared to lower-fidelity simulation techniques, Beaubien & Baker gave the following summary:

“Although there is a tendency to believe that more fidelity is always better, the published research does not support this conclusion. Specifically, we were unable to identify any studies that found a direct correlation between the level of simulation fidelity and training related outcomes, such as learning, transfer, and safety. Like any other tool, the effectiveness of simulation technology depends on how it is used.” (Beaubien and Baker, 2004)

One particular study attempted to measure performance outcomes after ACLS training when a group using low-fidelity simulation was compared to a group using high-fidelity simulation, but no significant differences were shown (Hoadley, 2009). In that study, the participants were from a variety of backgrounds, but were all qualified and experienced healthcare professionals. Perhaps a similar ‘ceiling effect’ of simulation fidelity was being observed with these learners. It would have been interesting to see whether the results would have been any different if less experienced staff had been trained. Interestingly, despite no objective difference in objective performance assessments, the learners in the high-fidelity simulation group did state a strong preference for high-fidelity simulation as the mode of training,

although the reasons for this were not explored.

It might be that learners with less experience of both simulation and the clinical field are more likely to feel that they need a greater degree of simulator fidelity in order to relate the process to a real environment.

The difference in attitude toward the simulation at a novice level was acknowledged by Nurse 13, who reflected on his early experience with simulation as a junior nurse:

“I think when I first started [working as a nurse], when I first went [on simulation-based training], I think the more real it was the more comfortable I would have been with it because it was all alien and it was all different for me” (Nurse 13; 34:15)

At that point in his career, not only was the format of training a new experience but he also had little clinical experience to relate it to. Increased realism of the simulator was therefore valuable to him, to make him feel more comfortable with the process.

There seems to be an ‘experience-simulation tipping point’ at which a learner has enough prompts from the simulated scenario to bridge the gap between simulation and reality. Once this ‘reality gap’ is bridged, they are able to mentally engage with the simulated task in order to relate it to clinical practice and act accordingly:

“I think it's really physically impossible to recreate an exact replica of what you'd actually do, but I think simulation comes as close to it as you're going to get, really. And yes, you do look at it and I'm introducing myself to the patient, and I'm doing everything that I would normally do - for example, when I receive a patient into resus I'm already thinking of before they get there what am I going to need, how am I going to manage this, what am I looking for. So the simulation replicates that.” (Nurse 14; 15:27)

This effect is consistent with Cognitive Load Theory (Van Merriënboer and Sweller, 2010), which was described earlier. In the context of the quote above, it could be argued that the realism of the simulator could be acting to reduce the cognitive load, especially for novice learners, as it reduces the number of new elements that have to be processed by the learners. As earlier quotes have shown, better technological fidelity of simulators appears to be preferred by clinical novices as it helps them to imagine themselves interacting with a real patient which, without prior clinical experience of similar situations, they might not otherwise be easily able to do. This is seemingly also helpful to simulation novices, who find the interaction with the simulator easier as a result of its realistic physical appearance and

physiological responses. This may also be aided by the inclusion of video material of real patients in STAT - this will be discussed further in the next chapter.

The appearance of the simulator mannequin may play some part in how quickly or easily learners engage with the simulation, but what appears to be more important to the learners is the degree to which they are able to interact with it as they would do with their patients. By being, as Nurse 0 says, “*a bit more involved*”, a learner can start to occupy themselves with individual component tasks, such as monitoring physiological observations, which they would do in the real world. They are also able to identify and respond to prompts from the simulator and the equipment on their own rather than having to be fed that information by a facilitator:

“It's just a bit different [from low-fidelity simulation]. You didn't have to tell us something was the matter with the dummy - we could physically see it and act upon it at the same time, as we would at work. We would just see blue lips and, right - doctor, oxygen - sort of thing. We don't have the [facilitator] to tell us that the patient has blue lips and what are we going to do about it. Do you know what I mean? It's easier to associate it with work, whereas with a dummy that doesn't really do a lot...” (Nurse 10; 22:45)

These elements of interactivity, whilst not themselves wholly realistic, seem to provide other means of bridging the ‘reality gap’ for the learners by giving them tasks and situations that they can identify with. The quotes suggest that whilst for some learners the physical appearance of the simulator is less important, they all placed a lot of value on the degree of interactivity and participation within the simulated scenarios.

“It's more realistic and more easier to learn from if you've got an actual scenario and you say 'I've got to do the obs', and put them on, and do the actual task of doing it, and then the monitor shows you what the results are, and I think that way you can change the scenario as you're going through to make the patient better or worse, whereas I think relying on a lesser mannequin that doesn't necessarily do all that makes a lot more work for the person teaching on STAT, or whichever course you're doing, and it's not as realistic if it's not coming from the dummy.” (Nurse 4; 23:06)

This nurse is suggesting that the advantage of a high-fidelity mannequin comes more from the fact that it responds to her voice and actions, rather than the way it physically appears.

Interestingly, even the learners who felt as though they didn't *need* a high-fidelity simulator expressed a preference for one, and there did seem to be other advantages to a high fidelity

mannequin beyond its physical appearance and its degree of interaction. The experience of using new technology piqued their interests, and helped to motivate them to participate in the process. In her earlier quote, Nurse 0 mentioned that a more realistic mannequin would have a better chance of “*grabbing people’s attention and interest*”. She does not comment on specifically what aspects of the simulator make it more interesting than a lower fidelity mannequin, but seems to suggest that the interactivity provides most of the stimulation for her as a learner. Conversely, this may prove to be disadvantageous for some learners. Nurse 14 raises the suggestion that if an individual was too focused on the technology they might lose sight of the clinical messages:

“I think for somebody with less experience it would probably be too much to take in to suddenly put them into an environment that was ... let's just say we had a doll that could get off the table and walk round - that type of realism. I think they would be so amazed that they wouldn't be learning.” (Nurse 14: 24:23)

This idea has been described in the literature as “seductive details”, which refers to increased focus on learning materials that are not important to understanding the information that needs to be learnt (Sanchez and Wiley, 2006). The concept was initially described in relation to pictures in textbooks, and has since been applied to interactive computer simulations. Although the principle should be the same for high-fidelity simulation, it could be argued that increased technical fidelity of these simulators *would* be relevant to the learning points as the aim of the simulation is to mimic real patients and clinical situations. However, it is plausible that learners could be distracted by the technology at the expense of the clinical topic if the technological capabilities were not related to the topic being taught:

“If you wanted to teach us about the points of the STAT training, and not everything else going on around, and you took all that business away - the ‘outside noise’, for want of a better phrase - and you just kept the essential information and that's all we focused on, and we ignored the rest of it, it then highlighted what you needed to be taking away from it rather than distracting with other bits that perhaps aren't even necessarily information people need to know” (Nurse 03; 27:59)

So not only might there be a ‘ceiling effect’ to the usefulness of the realism of a high-fidelity simulator in terms of helping learners relate it to real life, but there may also be a point at which the technological advancement distracts from the clinical topic. However, there is also likely to be a minimum acceptable level of fidelity needed not only to persuade learners to treat the simulator as a patient, but also to interest them and motivate them to participate.

Ultimately, the interviewees were all in agreement that it was important there should at least be some attempt to make the simulator and scenario realistic and involving to help them identify with real life. However, they all believed that no amount of technology could overcome their awareness that they are in an artificial training environment:

“You know when you look at flight simulators - they've got to cost multi-millions, but you still look out of the window and it doesn't look like the real thing. I'm not saying you could learn to fly a plane on a BBC computer, but you've got to get the balance right.” (Nurse 14; 25:49)

As this nurse is pointing out, even if simulation technology reached such a point as to appear indistinguishable from real life, he would retain the conscious knowledge that he was in a training environment rather than a genuine clinical one. Not only is this probably unavoidable, as it would be unethical (as well as technically difficult) to train someone in a simulated environment without their knowledge, but it is also necessary for the learners to feel “safe” to act freely and even make mistakes from which they can learn, and which will help them to reflect on the process. If the distinction between training and real life is always going to be made, regardless of the simulation fidelity, then there has to be another justification for the time and expense spent on improving simulator fidelity.

If learners do not have their own experiences to draw on to help them relate a training environment to their clinical practice then it is reasonable to suggest that they might need a higher degree of equipment fidelity in order to compensate for that. However, it is also possible that an unexpectedly high-tech simulator mannequin might prove to be a distraction if learners are also new to simulation-based training as a whole. So perhaps there is a limit to the usefulness of equipment fidelity, beyond which efforts and expense should not be spent on making it more realistic, but rather focused on helping learners maintain and develop these skills in the real world. This may require closer attention to be paid to the design of simulated scenarios, and more consideration given to the selection of simulation equipment, when designing training for particular groups of learners. This is not always possible if, as is the case with STAT and SMART, the training is aimed at a large number of learners with a variety of simulation and clinical experience. In these situations, a case can be made for using high-fidelity simulator as it may be more useful than a lower fidelity model for inexperienced learners without any detriment to the more experienced learners who, whilst they may be able to interact with a lower fidelity mannequin equally as well, may prefer using a high-fidelity model if they perceive it to be more interesting.

4.5.3 Use of Real People

Following on from the discussions regarding the realism of the simulator mannequin, some of the interviewees commented on the role of a real person, either a patient or an actor, within a similar scenario-based training format. In reality, there are often logistical reasons for choosing to run a formal training programme using a simulator rather than a real person, such as availability and reproducibility of resources. What was of interest to this study was whether those logistical reasons carried any educational disadvantage and whether the learners felt that, in an ideal situation, a human being should be used in preference to a simulator mannequin wherever possible.

Interestingly, out of all the nurses interviewed, only one expressed a preference for using a real patient in the simulated scenarios:

“I think whatever it is, you want it to be as real as possible because at the end of the day that's what you're going to be faced with and so as real as possible would be great.” (Nurse 12; 30:17)

The reason for this hinges on the importance of a realistic portrayal of a clinical situation, and this nurse believes that using a human simulated patient would be a better way of representing this than a mannequin. In expressing this preference, what she is describing is a requirement for as realistic a representation of a real patient as possible in order to maximise the psychological fidelity of the simulation and help her relate the training to a real life scenario. However, this was not a consistent finding amongst the interviewees, as others who were also simulation novices expressed opposite views.

“Nurse: With it not being a real patient as such you don't feel as anxious. It sort of gives you a bit of practise, if you see what I mean? Obviously you don't feel as intimidated because it's not a real patient, so I felt a bit more relaxed. I think I would have felt worse if it was a real patient

Interviewer: What if we'd have used an actor instead of a simulator?

Nurse: I'm not sure. No, I think I was more comfortable with the simulator. I think you just worry in case you're going to make a mistake or make a fool of yourself. Do you know what I mean? I think I personally felt better with the simulator.” (Nurse 6; 21:46)

Perhaps the reason for the difference in opinion regarding the preference for using an actor rather than a simulator is to do with the focus of their attention. Whereas Nurse 12 talked

about the *format* of the simulation needing to be as realistic as possible in order to achieve maximum gains, Nurse 6 focused on the *content* of the training, with which she was relatively inexperienced. Feeling less comfortable with the clinical content caused her to worry that her own performance may be inadequate and made her self-conscious. She speculates that this feeling would have been amplified if she was being asked to interact with a real person - perhaps because the extra degree of reality would come at the expense of some of the security of a “safe” training environment, and it would therefore feel less acceptable to make mistakes.

“Interviewer: Would you feel able to act as freely with a patient volunteer as you would with a mannequin?”

Nurse: No, because at the back of my mind I'd be thinking that the patient was judging me and thinking ‘What the hell are you doing?’ You know? So at least if you make a mistake and it's a mannequin you're gonna feel a bit better about it and think ‘Oh well, it's just a dummy, it's not going to judge me’.” (Nurse 11; 24:13)

This was an opinion expressed by the majority of the interviewees, who felt that interacting with a real patient rather than a mannequin would make them more nervous about participating in the scenarios, which in turn would have a detrimental effect on their learning:

“Nurse: It would have made me more nervous, and I perhaps wouldn't have taken as much information in.”

Interviewer: Why do you imagine you might have taken less information in because you were nervous?”

Nurse: When you said about having real people, all I could think about was the OSCEs from [a previous training course], and I can't remember anything that happened during those! It's like a lot of blackness in my memory. I know I went in and spoke to people but I couldn't tell you what I asked them or what I did! I think I was that nervous at the time.” (Nurse 3; 26:59)

When asked to elaborate on what would be different about using a simulator rather than a real patient, Nurse 3 goes on to describe why she feels the experience is different.

“Less pressure. I think it just keeps coming back to that. And if you're not pressured then maybe ... I feel I remember more.” (Nurse 3; 30:32)

The heightened emotional arousal associated with using real patients in the scenarios, and the negative connotations that this carries for the learner ties in with Self-Efficacy Theory. If the

learners are less experienced in the clinical assessments that they are being taught, their efficacy beliefs whilst they are on the training day are likely to be poor until they have reached a level of performance which they feel could realistically be transferred to the real world and used satisfactorily. Those efficacy beliefs appear to be needed by the learners in order for them to feel comfortable using their skills on real patients, regardless of whether those patients were in a training environment or a “real world” clinical environment.

“I think people would find it more nervewracking on the STAT day if they were told they had to go and assess a real patient. Especially for people who hadn't ever done assessment of stroke or TIA before, although they may pick it up from a stroke background, as in the ward, I think they would still find it very nervewracking to then go and assess a patient using what you're learning on STAT, if it was a real patient as opposed to a simulation. I think they find it nervewracking enough with the simulation. ” (Nurse 4; 20:03)

As well as feeling more nervous, the idea of that they might be “practising” on real patients was uncomfortable for some of the nurses. This was because they didn’t want to portray themselves as novices to people who had an authentic link to the clinical environment that was being simulated:

“If we miss something or don't do something right, I'd hate to put that thought into the patient's mind ... You'd lose your safe environment. If I'd made a mistake I would feel ... not guilty, but uncomfortable. If it was a [real] patient I'd feel uncomfortable.” (Nurse 10; 27:32)

The knowledge that a real patient was being using in the simulation could nullify the feeling of a “safe” learning environment where it is acceptable to make mistakes. Similarly, in the presence of a real patient, some nurses might feel inhibited in their ability to freely ask questions:

“I think it's better sometimes when you're in a classroom and you can talk about things without having a real person there. At least with the simulator you've got a bit of both going on. I think sometimes when you are training there are things that you want to speak about that you wouldn't speak about if there was a patient there.” (Nurse 15; 19:37)

These nurses seem to be describing a professional barrier that they perceive in the real world between themselves and the patients, behind which they appear to be calm and confident. Incorporating real patients into a training environment, in which they feel they should be allowed to appear uncertain and make mistakes, would be a breach of this professional barrier, and would then lead to the learners feeling self-conscious and uncomfortable. Other

studies of nurses' perceptions of high-fidelity simulation have shown a consensus amongst learners that simulation training should be done in a safe, non-threatening environment (Leigh, 2008). It is possible that this feeling would be undermined by the inclusion of "real" patients although, as described in the literature review, a previous study showed no difference in self-efficacy changes when a simulator mannequin has been compared with real people in simulated scenarios (Luctkar-Flude et al., 2012).

In STAT, although a simulator mannequin is used rather than a real person, video clips of real patients are integrated into the simulated scenarios to demonstrate genuine clinical signs to the learners as they interacted with the simulated patient. This is to compensate for the fact that the mannequin is not designed primarily to assist with neurological examination and is limited in this regard. The theoretical advantage of including the video material alongside the mannequin is to integrate real clinical information into the simulations and give learners the opportunity to describe and interpret their findings, and incorporate them into the scenario that they are participating in.

The data from the interviews provided some insight as to how this combination was viewed by the learners:

"I thought [the video] was very good because, like I say, I haven't seen many people who have had a stroke, and at least then you can actually identify ... you can see the face drooping and that sort of thing. Because obviously SimMan can't do everything, it just helps you visualise much more the symptoms and the signs. " (Nurse 7; 22:16)

For learners such as Nurse 7 who have little or no prior clinical experience of the subject being taught, the video material was well-received as a good way of demonstrating the relevant clinical signs. Within the context of STAT, it was able to fulfil its main purpose, which was to compensate for the limitations of the simulator in being assessed for a possible stroke.

"I think it's good to do the whole interactive scenario. Y'know, be able to use the dummy to test its arms and legs and, although it can't actually respond and you've got to watch the video, I think that's still part of it, unless you get a walking, talking dummy - and I don't think you're ever going to get that!" (Nurse 4; 23:58)

It was clear from comments such as this one that the learners did feel that use of the video material helped to overcome the technical limitations of the simulator with respect to

neurological assessment. She refers to the video as “*still part of it*”, meaning the interactive scenario. She was able to combine and process the information from her interaction with the mannequin and the information from the video to help her complete the simulated scenario.

“I think the fact that they're real people helps most people, so it injects that bit of reality. [It was] easy to view good examples of what it was we were looking for.” (Nurse 0; 15:42)

In this quote, the nurse is describing how the inclusion of the video, as well as providing a demonstration of authentic clinical signs, has helped her to bridge the gap between an artificial training environment and real clinical practice. This could be a valuable additional benefit to the inclusion of video material in addition to the demonstration of specific clinical features, which was the initial reason for using it.

Although the use of patient video material has previously been described and reported in the medical literature, this is most often in regards to classroom-based teaching or computer-based training (Kamin et al., 2003). There is no mention of it being integrated into simulated scenarios alongside a high-fidelity simulator. However, work has been done that has integrated standardised patients with part-task trainers to recreate the need to communicate with a patient at the same time as performing a psychomotor task, which was perceived to be valuable by learners (Kneebone et al., 2002). The principle here is very similar, as it is designed to contextualise the simulated patient in order to help learners relate to it, as well as demonstrating clinical examination findings. It has been suggested that a focus on tighter integration between clinical skills training and actual clinical practice is likely to be more beneficial in terms of sustained improvement in clinical practice than a focus purely on technological capabilities of a particular simulator or training environment (Kneebone et al., 2004).

Kneebone has also argued that using actors within simulated scenarios provides a degree of realistic interaction between “patient” and healthcare professional which would be difficult to achieve using a mannequin (Kneebone et al., 2006).

“The presence of a real person within a simulated scenario adds enormously to the perceived authenticity of the experience. Involving a human ‘patient’ creates an anchor to each clinician’s actual practice, which in turn taps into a complex web of conscious and unconscious professional responses. These include empathy, communication, clinical judgement, and decision making. Accessing such responses through mannequins and computer simulators alone is not feasible, given the current state of technology. Indeed, there

seems a danger that practitioners may learn to 'play the simulator'. Yet the ultimate focus of any health care training must be the patient." (Kneebone et al., 2006)

Kneebone's reference to people learning to "*play the simulator*" is particularly interesting given that some of the data already described in this study has suggested the existence of simulation-based training as an independent domain in which people can develop their expertise. However, the concept of a human standardised patient acting as an "*anchor*" to clinical practice might be dependent on whether an individual has enough relevant experience to act as an anchor point, and it might therefore be an over-simplification to claim that *all* scenario-based simulation training should employ human standardised patients. As already demonstrated by interview data from some of the experienced nurses who have attended STAT, it is possible in some learners for the professional domains of empathy, communication skills, judgement and decision-making to be engaged through a high-fidelity simulator without requiring a real person.

The data demonstrates that, for some learners at least, the inclusion of video material helps to form tighter links between the clinical and training environments. If video material can be used as another building block to help bridge the 'reality gap', it may be able to do so without some of the disadvantages of using a real person as the simulated patient. With video, the learner has one-way access to the "real world", whilst still maintaining the feeling that they are in a safe training environment and are free to make mistakes, or stop what they are doing to ask questions, without the same pressure that they feel dealing with a real person.

"If it was realistic and you had a person there, I would be distracted thinking about what the person would think. If you've got a resusci-Annie, it just doesn't remotely feel real and you can't really, I guess, connect it with memories of real life. With SimMan, it's like a half-way stage. You've got your videos and you've got this mannequin, so it's as true to life as you can get without worrying about the person sat in front of you. If it's a real person it's scary and they're judging you, and looking at you, and are you doing it right? You can make mistakes on SimMan and that's ok, but if you make mistakes on a human you're worried that it might not be ok." (Nurse 3; 30:54)

As Nurse 3 describes, the combination of the high-fidelity simulator and the patient video material provided enough stimuli to enable her to relate the training materials to real life without subjecting her to the perceived pressure of dealing with a real person in a clinical field with which she is unfamiliar. It may be, therefore, that including video material of real patients may be a way to compromise between the two ideals.

However, there may be disadvantages to this method of training, in that the mannequin and the video are both separately being used to represent a single patient.

“I think it's hard when you're talking to the mannequin and asking that question, then you've got to look at something else to get a response. That's maybe a bit strange.” (Nurse 5; 20:03)

Nurse 5 is describing how this separation reinforced the artificial nature of the situation. As interacting with a simulated patient and a video monitor is not a natural way in which she is used to acting in the real world, it affected her ability to fully engage with the simulation as if it were a real life situation. However, despite this, she also commented that she found the content of the videos useful in portraying clinical signs, and echoed comments of other interviewees that she preferred a combination of mannequin and video to using either an actor or a real patient, which she claimed would make her feel uncomfortable.

Overall, the integration of video into the simulated scenarios was universally well received, with even the potential drawback of different modes of information delivery being deemed acceptable. There was no difference of opinion from nurses of differing backgrounds and experience regarding its usefulness as a learning tool. For most, it provided an extra dimension of reality within the simulation, helping them to visualise the simulated patient as a real person but without actually having a real person as the subject of the simulation. Most of the learners, again regardless of personal experience, agreed that the use of a real person rather than a simulator mannequin may actually impede the attainment of the learning outcomes due to the associated distracting feelings of stress and pressure that they expected to experience. However, in view of what was discussed in an earlier chapter about the potential benefits of emotional arousal in aiding knowledge retention and performance, it may well be that heightened anxiety caused by the integration of a real person into the simulated scenarios could have a positive effect on self-efficacy.

Emotional arousal is not the only factor to consider and, as already highlighted, the maintenance of a “safe” training environment is also important. A balance between these factors needs to be found, and this would be an interesting area for future studies to explore.

4.5.4 Environmental Fidelity

The next subtype of fidelity to consider in relation to the impact on learner self-efficacy is environmental fidelity. As described earlier, there are different ways of defining this, but the

focus for this work will be on the physical representation of the training environment, as this is what was discussed by some of the interviewees. The following discussion will summarise the attitudes that learners had towards environmental fidelity and its importance.

Although the simulator itself is termed “high fidelity” for its ability to interact with the learners and respond to their actions, the environments in which STAT and SMART are conducted are not intended to be accurate representations of clinical areas. This is partly because of the different clinical backgrounds of the learners - it would be impossible to create a simulated clinical area that reflected the working environment of all the participants. The learning environment is also set-up to include all the learners who are observing the simulated task, not just the learner who is participating in a particular scenario. This has advantages from a training point of view, as all the learners can be involved and ask questions. However, it could be argued that this detracts from the immersive realism of the situation:

“I think you possibly take it more seriously if it's not in front of a big group of people. I know that sounds a bit daft - you still take it seriously when you are being watched, but you don't have those people in your sight; you can just sort of look at it and you put yourself as if it's real. You can pretend it's real and just go with it, whereas when you're being watched it's a little but different.” (Nurse 10; 20:36)

Nurse 10 describes how the presence of her fellow learners in the same room when she is participating in a simulated scenario serves to remind her of the artificial nature of what she is doing and makes it harder for her to temporarily suspend disbelief and to pretend that she is in a clinical role. The incorporation of peer observation and feedback is recognised as being helpful in the acquisition and development of new knowledge and skills (Lincoln and McAllister, 1993), although in the case of high-fidelity simulation it has the potential to distract from the simulated task, thereby potentially negatively impacting on the psychological fidelity. This phenomenon has been reported previously, although qualitative studies of learners’ perceptions of peer observation suggest that even if a learner is being observed remotely rather than having their peers watching on in the same room, the knowledge that they are being watched by their peers creates a feeling of anxiety which may affect their performance (Melluish et al., 2007). There may be no way around this without observing a learner without their consent, which would certainly be unethical. It is possible that individual personalities and characteristics of learners may make them more or less likely to be able to ignore or overcome the awareness of being watched, but there was not enough

relevant data in this study to comment on this. However, it seems as though the awareness of being observed (which, in the case of STAT and SMART, is contributed to by the presence of other learners in the room) is not the only factor that separates simulation from reality. One of the other nurses expressed the opinion that the physical appearance of the room is unlikely to make her forget she is in an artificial environment, and whilst this is in the forefront of her mind, she instinctively focuses her thoughts on what she needs to do to “pass” or succeed in the scenario.

“It’s nothing like real life. For all that it’s set up like a hospital bay, the difference is you have to think about things thoroughly, whereas on the ward or in A&E you just do things, and you just know to do things. You’ve got your routine of how to assess a patient, and with the simulation you’re constantly re-thinking and re-checking: have I done everything, have I missed something? Because you know you’re being assessed on it, whereas in practice you just do it and you know that you’ve done everything. You don’t question yourself at all.” (Nurse 9; 20:29)

Despite the effort to improve environmental fidelity by trying to accurately re-create a hospital environment, it does not disguise the fact that she is being trained and assessed. To an extent, overcoming this is never going to be possible, as learners will always be aware that they are being trained, even if that training were to take place in their own clinical environment. Although being in a more familiar environment may make the accomplishment of certain tasks easier due to the practicalities of knowing what equipment was available and where it is stored etc., the suggestion is that the degree of environmental fidelity will never mask the fact that the scenario isn’t real. This mirrors the comments made about the fidelity of the simulator itself, suggesting a ‘reality barrier’ that is created through the conscious awareness that the training environment, no matter how realistic the appearance, is not a real-life environment.

“Obviously in the simulator room you don’t do things you would in practice, you do things kind of in practice by instinct really and kind of get on and do it, and in the Sim room you’re aware that people are watching you and that it was a simulated scenario so it was just different to practice.” (Nurse 8; 14:57)

The responsibility therefore appears to lie with the learner to shift their focus from “passing the test” to trying to act as they would in real life. This seems to rely on a degree of metacognition, with the learners having to try and look beyond the immediate situation and try to consciously relate their actions to their clinical roles. Note that Nurse 8 had never

participated in high-fidelity simulation previously, and it is unsurprising that she was preoccupied with the immediate simulated task as learning how to engage with that was the immediate priority for her. However, Nurse 5, another simulation novice, felt that there would be little extra advantage in a more realistic setting:

“Interviewer: If we'd have mocked up an entire A&E department and put the simulator in there, just to increase the sense of a realistic environment, would it have made a difference?”

Nurse: Not hugely, I don't think. It would have maybe made it a bit more realistic, but I don't think that would have made a huge impact.” (Nurse 5; 18:12)

Earlier comments from Nurse 5 had suggested that she felt there would be an advantage to having a real person as the simulated patient due to the added realism. However, she does not attach the same importance to the visual representation of the clinical environment. Other learners who did have prior experience of simulation-based training also felt that the simulated patient, as the main focus of the scenario, was more important than the appearance of the room in which the simulation took place:

“It doesn't really matter. You're focused on what you're doing with the patient, so it doesn't really matter that they've got the curtains up or a pretend defib in the background or whathaveyou. It doesn't really matter - for me, anyway.” (Nurse 9; 24:05)

All the other nurses who were used to simulation-based training echoed this feeling. In terms of trying to create a realistic and immersive simulated environment, the overriding opinion was that, as with the simulator itself, there is probably a minimum standard that needs to be reached to give the learners enough of a link to the clinical world, but beyond that there seemed to be little extra benefit:

“I don't think it's as important as the mannequin itself, and the scenario that you're given. I think it would be a lot of work to do all that - to make it. I think it's quite realistic what you've got at the minute - the trolley and the monitor and all the props like the oxygen and things like that to actually run through the scenario and actually do things as you go, and have an assistant to help you if you need. I don't think it needs to be any more in depth for the scenario for the training.” (Nurse 4; 22:10)

The use of props that come into play during the scenarios, such as the patient monitor and oxygen mask, are equally as important, if not more so, than the appearance of the room according to this nurse. These are all physical objects which learners can use to interact with the simulated patient (and the scenario), and which they are used to using in real life. They

help to form associations between the two environments, which in turn can make learners perceive the learning process to be more effective.

Chapter 5. Conclusions

5.1 Summary

The aim of this research was to describe and explore the experiences of qualified nurses who had participated in high-fidelity simulation-based training intended to improve their clinical decision-making skills. It was an attempt to understand how the learners perceived these experiences and inform the healthcare education community about the efficacy of high-fidelity simulation as a training modality.

The training programmes were both outcomes-based and designed for nurses of various levels of clinical experience and from different clinical backgrounds, which provided a rich source of data in terms of the different perspectives that were obtained through the interviews. Benner's Novice-to-Expert model was used to illustrate the different levels of experience of the learners, as well as explore how the training had potentially changed their perceived degree of expertise.

Interviewees clearly found the training enjoyable, and were all in agreement that the use of interactive simulated scenarios was worthwhile. This is unsurprising given that it is generally considered to be more stimulating and engaging than classroom-based teaching, and this view is well documented in the literature. However, what was of greater interest to this study was the perceived effect of the training on the learners in their usual clinical roles, and the extent to which different aspects of the training design influenced this effect.

5.1.1 The Impact of Expertise on Self-Efficacy Changes

The most widely-reported impact on the learners was the positive effect on the self-efficacy of all the learners, which was experienced regardless of their prior clinical experience or background. This resulted in the nurses all feeling more confident about their ability to perform the specific tasks in which they had been trained. This improved feeling of self-efficacy was highly valued, which itself was shown to be an important motivator for implementing new skills in real clinical practice. There were two domains of self-efficacy described by the learners: performance in clinical practice and performance in simulation-based training in general. It seemed that novice learners, particularly those with little experience of high-fidelity simulation, had a greater focus on their performance within the

simulated scenarios, and the skills required for this. Learners with more experience of both simulation and relevant clinical situations found it easier to adapt to the simulated environment and concentrate on the clinical topic of the training. This seemed to suggest a pattern in the data, with more experienced learners better able to form a link between the simulated training environment and clinical practice.

5.1.2 The Impact of Expertise on Simulation Experience

The level of realism of the simulator was shown to be important particularly in helping novice learners relate the training to real life. With less authentic experience of their own, they are perhaps less well equipped to use their own imaginations to bridge the ‘reality gap’ between the simulated environment and real life and achieve a minimum level of psychological fidelity. As such, a greater equipment fidelity was valued by this group, although the inclusion of patient video material was also useful adjunct. For more experienced learners, it is likely that an adequate degree of psychological fidelity could have been achieved with less realistic simulation. This appears to oppose a widely-held view that greater realism is needed as learners become more experienced. However, the technological abilities of the simulator were thought to be impressive and interesting, as well as conveying the welcome impression that a lot of time, money and effort had been invested in the learners’ education.

A question still hangs over the benefits and harms of creating a stressful learning environment. Data analysis from this study showed that, understandably, the learners did not enjoy feeling stressed and anxious during the training. However, there seemed to be a balance between a tolerable amount of emotional arousal and a heightened level of anxiety that had the potential to negatively impact on self-efficacy beliefs. Several of the learners speculated that anxiety would be further heightened if a real person was used in the simulated scenarios rather than a patient mannequin, which they felt would detract from the effectiveness of the training, perhaps compromising the feeling of a “safe” training environment. Without a real frame of reference for comparison it is difficult to know whether this is true, as other literature has suggested that a state of emotional arousal can actually be beneficial for learning (Matthews et al., 1990). There may be an optimum balance to be struck, and the point at which this is found may vary depending upon the experience of individual learners and the relevance of the training topic to core professional roles.

5.1.3 The Impact of Simulation on Motivation and Self-Efficacy

A combination of intrinsic and extrinsic motivational factors were found to be influential in determining why the interviewed learners attended non-mandatory training, and how likely they felt changes would occur in their clinical practice as a result. This is to be expected, as the complexities of different aspects of motivation are well documented. However, the most prominent theme that stood out from the data was the learners' desire to improve their confidence in their own clinical performance (ie. achieve a higher level of self-efficacy). Of course, efficacy beliefs do not necessarily equate to competence, and training needs to be about more than just making the learners feel more confident in their ability to assess patients. A balance is needed between ensuring minimum standards of competency in the interests of patient safety, and promoting self-efficacy beliefs to maximise the chances of a learner acting on those beliefs in clinical practice. The data in this study would seem to suggest that, by combining pre-determined essential content with improvements in self-efficacy, simulation-based training has the potential to address these issues. This lends weight to the argument for the use of high-fidelity simulation in preference to more traditional teaching methods.

5.2 Strengths & Limitations

One of the strengths of this study was the richness of the data obtained from the interviews, which described interesting and novel viewpoints about the role of high-fidelity simulation in clinical education. The pool of volunteers provided good opportunities for opinions to be compared and contrasted between learners of varying degrees of experience and all of the themes that were developed and described in the analysis were consistent within the data.

Although the research was centred on two very specific training programmes within a single NHS trust, this study is more than an evaluation of those programmes. The findings have been related to existing educational theories, which should make them relevant to a wider range of simulation-based training activities.

However, although the interview data contain many references to the generic application of high-fidelity simulation in nursing education, it should be noted that the interviewees had attended either one or both of two specific post-registration training programmes within Northumbria Healthcare NHS Foundation Trust. This limits the transferability of the results, although it is possible that some of the findings would be relevant under different circumstances.

Due to time constraints, it is not certain that theoretical data saturation was reached. Ideally, a greater sample of nurses should be interviewed, with an emphasis on individuals at different ends of the Novice-to-Expert spectrum (for both simulation and clinical practice) to further compare and contrast the various themes mentioned in this work.

However, the main limitation of this study was the small scale on which it was conducted and the number of participants that were interviewed, and the failure to achieve the intended purposive sample.

Difficulties with recruitment may have been partly due to the nurses being unwilling to give up their free time to take part in the research. However, informal feedback I received outside of the study suggested that despite reassurances to the contrary, invitees may have felt that their clinical knowledge would have been re-tested in some way and a judgement made about ability, which could have deterred them from participating - especially if a significant amount of time had passed since they had been on the training. This concern about teacher or organisational surveillance deterring engagement with research would be an interesting topic

for study, but would require a different approach such as participant observation.

It is therefore not surprising that attempts to selectively target people who performed poorly on the post-course STAT MCQ were also unsuccessful. It would have been interesting to explore the reasons for the poor performance in the assessment and see whether there was a difference in the reported experience of the training from those individuals. This may have led to an over-representation of positive experiences – it was noticeable that all the participants in this study reported high degrees of satisfaction after attending training. The opportunity to give extra “feedback” about their experiences may in itself have been a motivating factor for them taking part in the research. It may be that some of the people who were reluctant to take part in the study felt had negative experiences and did not wish to re-live it or discuss their feelings. Without a larger sample group of interviewees with a wider range of reported reactions it is impossible to know.

It is also possible that nurses who declined to be interviewed but *did* pass the assessment may have expressed differing views about training. For a more complete and balanced picture, it would have been necessary to identify and interview those nurses who didn't enjoy or value their training experience. Performance in the MCQs may be a purposive sampling mechanism for this. It may have been beneficial, when writing to the learners to invite them to participate in the study, to explicitly seek the opinions of people who had not enjoyed the training or had not found it to be helpful.

Due to the nature of the qualitative paradigm used, it should be noted that the analysis of the data was inevitably subject to my own interpretation as a researcher. This is not necessarily a disadvantage, due to my knowledge of the training and the clinical topics, but it needs to be acknowledged that in any piece of constructionist qualitative research not everybody will interpret the data in exactly the same way. However, the credibility of the analysis was maintained through regular discussions about the data and its interpretation with my research supervisors. For future research, the quality and reliability of the data interpretation could be improved by providing each interviewee a summary of topics discussed and an overview of the themes elicited from their own interview, allowing them to comment and feedback on their own interpretation. This was not done in my study, and could be a potential limitation.

As I conducted the interviews myself, there was potential for unintended pressure on the interviewees to make positive comments about the training programmes as, for those nurses

who had attended STAT, I had been a facilitator on the course during their training. I attempted to address this by promising confidentiality, asking for their honest opinions, and emphasising that the research was an exploration of their attitudes and ideas about the role of simulation in nurse education rather than an evaluation of the training programmes themselves.

5.3 Recommendations

As previously stated, it would not be appropriate to make broad recommendations about the use of high-fidelity simulation on the basis of this study, as it was designed for a very specific training context. Further research would help to determine whether these results are consistent across different user groups and different training programmes. In particular, learners who have had negative experiences should be sought in order to incorporate their views and provide a more balanced perspective. However, from the data obtained and the resulting iterative analysis, the following recommendations can be made about STAT and SMART:

- High-fidelity patient simulation should continue to help postgraduate nurses develop clinical decision-making skills. Training groups can be of mixed ability and experience, as long as the intended learning outcomes are clearly defined and are appropriate to all the learners. Learning outcomes should be concentrated on improving knowledge and confidence within a pre-existing sphere of clinical responsibility.
- Rather than seeking to improve the degree of equipment fidelity, or realism, of the simulated scenarios any further, efforts should be focused on helping learners relate the training experience to their real clinical roles. This could be done by collecting learner profiles before the training programme, so that the facilitators are better equipped to tailor the simulation experience to the small group. A group with less clinical experience may require more efforts to provide a “real” experience, whereas a more experienced group can deal more easily with the abstract scenarios being simulated due to their pre-existing knowledge.
- The most valuable outcome of training from the learners’ perspectives was the resulting improvement in self-efficacy that resulted, which appeared to strongly influence motivation to change clinical behaviour. A post-training estimation of their self-efficacy could be used as a surrogate measure of how likely an individual is to put the relevant training into action. It would therefore be useful to include questions pertaining to self-efficacy in the assessment or feedback at the end of the training. A future study would be needed to determine whether this was acceptable, and whether it would reflect subsequent changes in clinical practice.

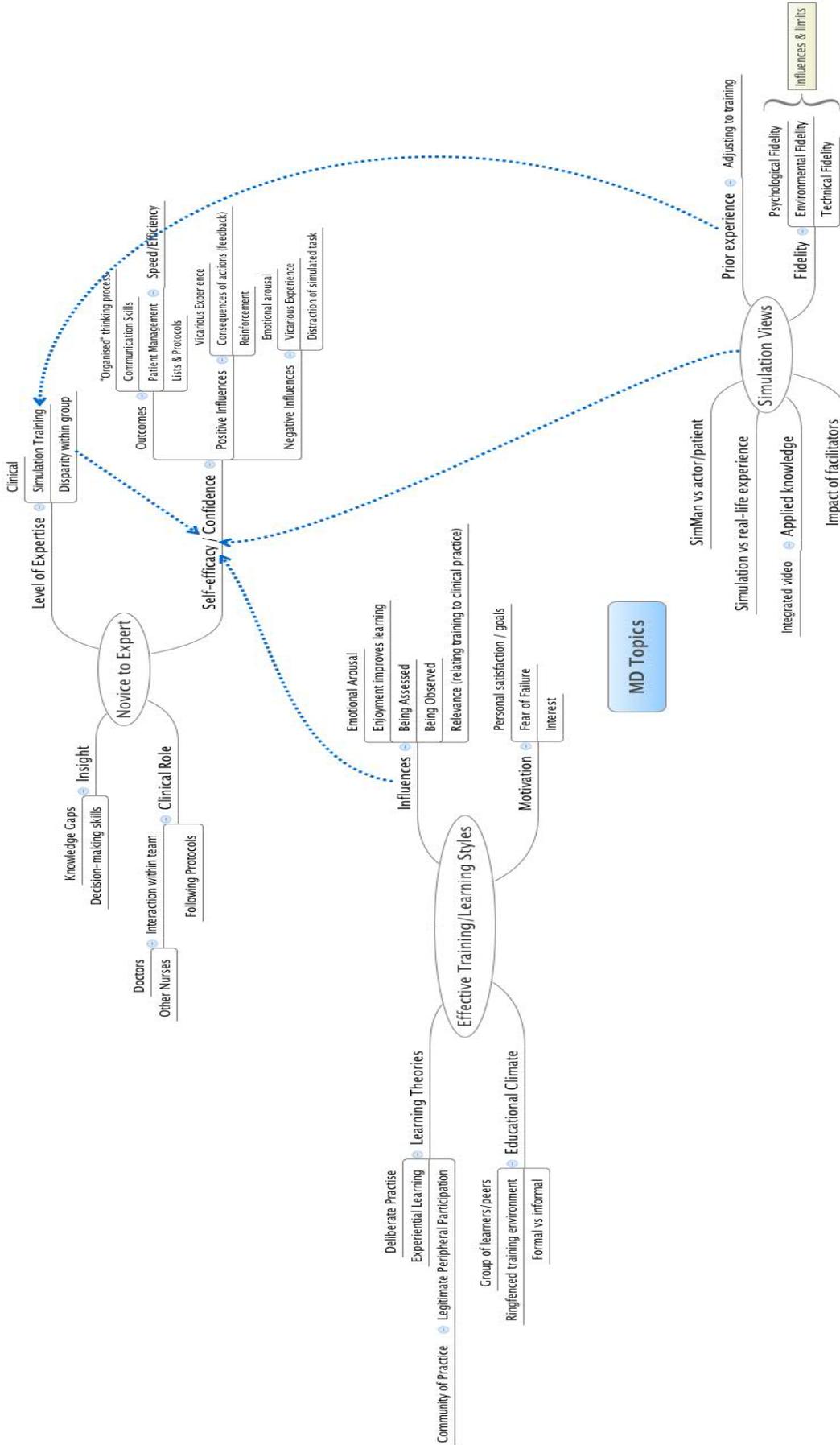
If a future study was to be done around this subject, it should look to expand on the themes identified in this thesis and, in particular, examine whether they appear in other high-fidelity simulation training programmes. A further series of interviews would provide the most in-depth exploration of these themes. Specifically, it would be necessary to explore in more detail the concept of a “ceiling effect” with respect to equipment fidelity, and whether there are any patterns to suggest that attitudes surrounding this concept might vary depending on level of clinical expertise. This could be done by designing simulated scenarios of differing levels of fidelity, but representing the same clinical situation. Participants (of differing levels of seniority) could then be asked to complete a scenario using each of the different levels of simulation fidelity, before then discussing their experiences, preferences and thoughts about which form of simulation they felt to be most effective. Although more resource-intensive, this method could help to overcome the problem of learners speculating about how they *might* feel in different simulated environments.

It would also be useful to explore whether self-efficacy beliefs are more or less likely to change if training is undertaken with a group of peers of similar expertise compared to groups with mixed levels of seniority. A study design that compared attitudes to training in these different groups, across different subject areas and using different levels of simulation fidelity, may help to determine whether it is helpful to tailor the fidelity levels of simulation-based training to specific learner groups or individual learners.

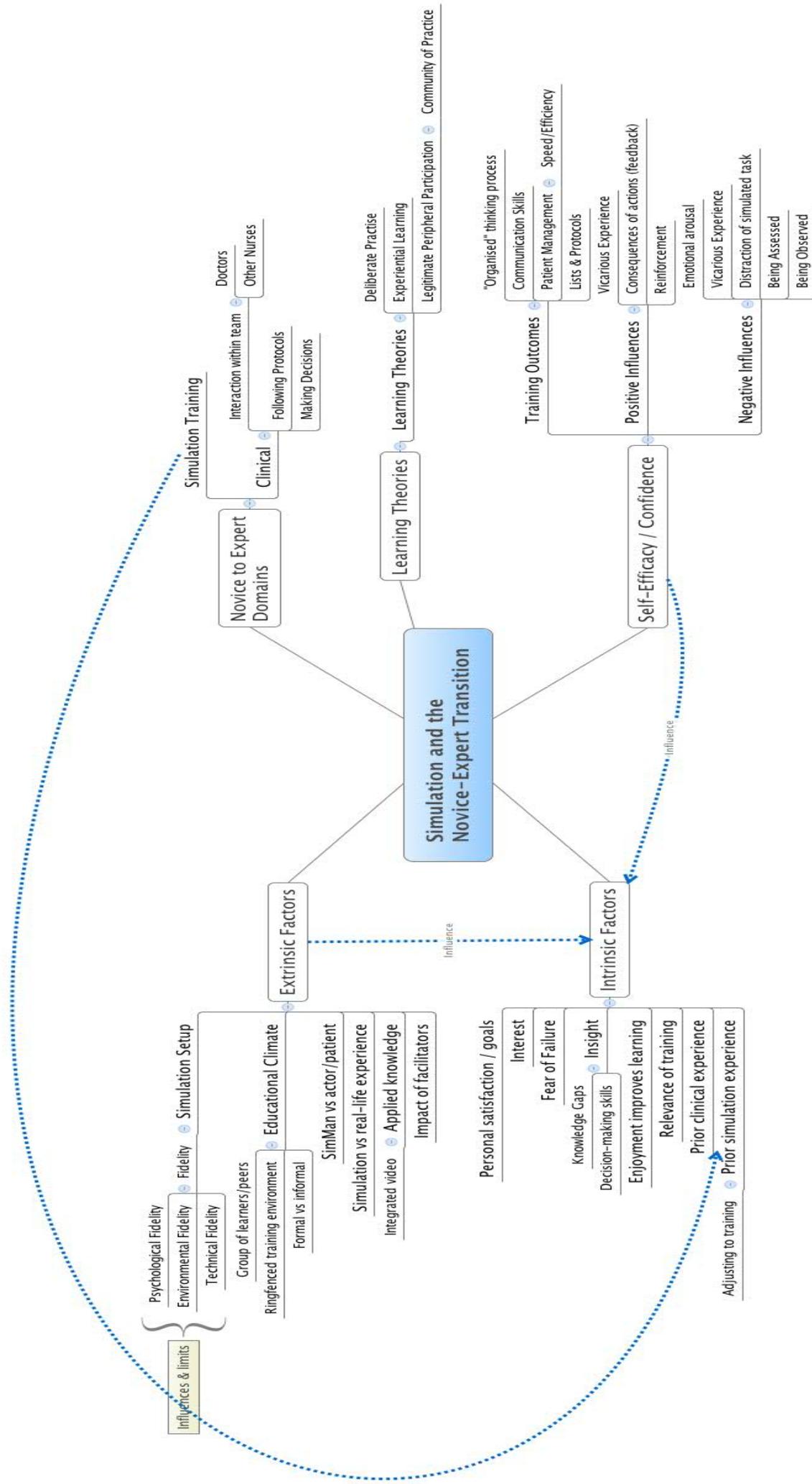
Finally, it would be important to study the long-term impact of simulation-based training on self-efficacy changes. This could be done by interviewing learners repeatedly, at set time scales after being exposed to training, to explore the longevity of any effect of training, and whether repeated simulation training experiences may be helpful in sustaining this.

Appendices

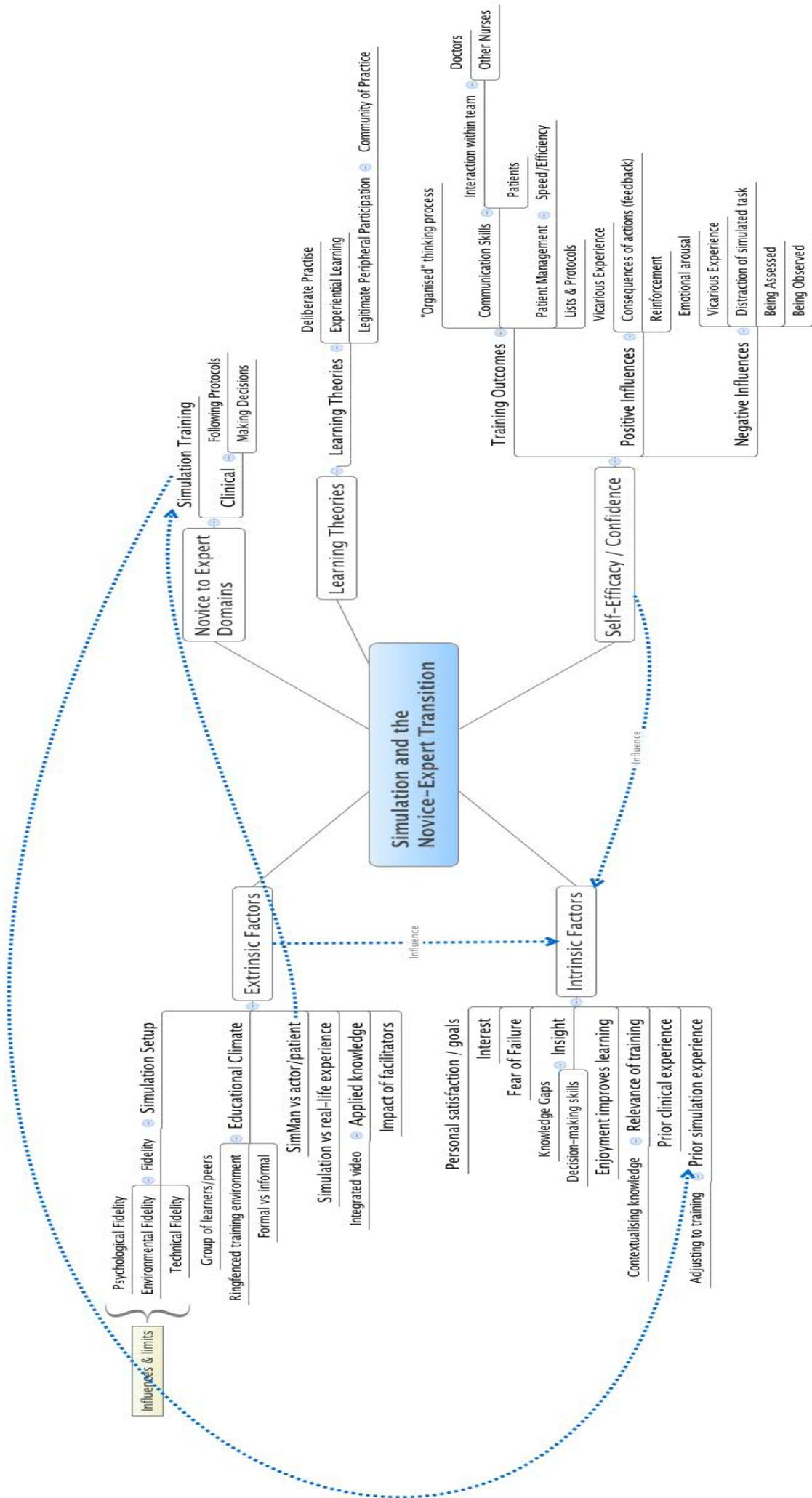
Appendix 1. Evolution of thematic frameworks



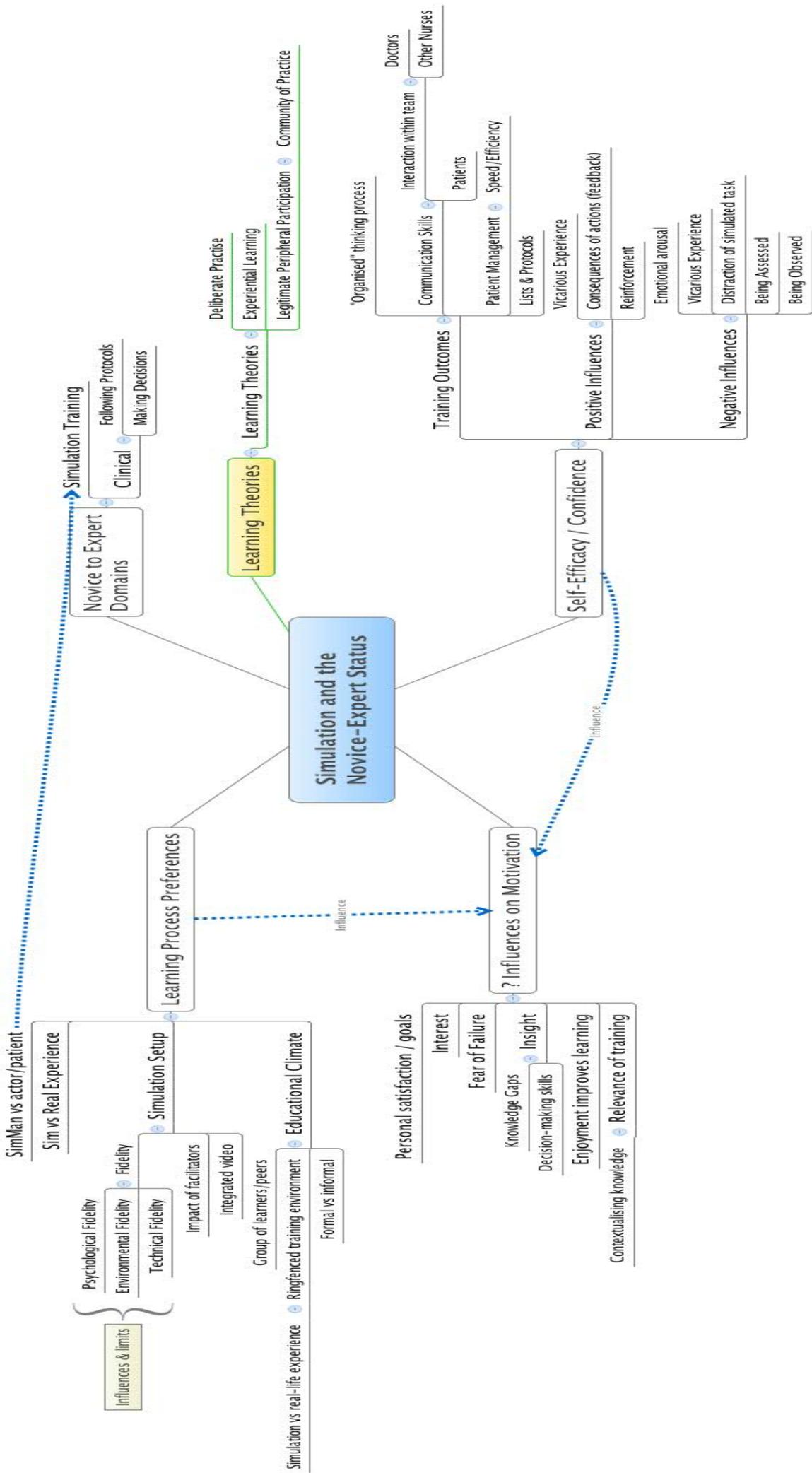
1st Thematic Framework



2nd Thematic Framework



3rd Thematic Framework



4th Thematic Framework

Appendix 2. STAT Programme

9:30 – 9:40	Introductions and orientation
9:40– 10:30	Identification of stroke patients Clinical presentations of stroke and immediate care Stroke mimics ROSIER “SWObs” assessment
10:30 – 11:10	Scenarios: Stroke recognition and SWObs
11:10 – 11:40	Thrombolysis and criteria explained “SWIM” management
11:40 – 12:30	Scenarios: SWIM and administration of thrombolysis
12:30 – 13:30	Lunch (5 minute individual learner assessments)
13:30– 14:00	Recognition of clinical changes post-thrombolysis and appropriate intervention
14:00-14:30	Scenarios: Thrombolysis monitoring
14:30-15:30	TIA risk stratification (ABCD2) introduction TIA risk stratification exercises
15:30 – 16:00	Discussion and summary

Appendix 3. SMART Programme

<u>Day 1: Breathlessness</u>		<u>Day 2 Fluid: Balance</u>	
9:00 – 9:15	Introduction to course	9:15 – 9:30	Overview of day
9:15 – 10:00	Clinical Introduction	9:30 – 10:00	What is dehydration?
10:00 – 10:30	What is breathlessness?	10:00 – 10:30	Group Simulator Scenario
10:30 – 10:40	Introduction to simulator	10:30 – 10:50	Coffee
10:40 – 11:00	Coffee	10:50 – 11:30	Scenarios and Discussion
11:00 – 11:30	Scenarios and Discussion	11:30 – 12:15	What causes dehydration? How do we treat it? Pitfalls
11:30 – 12:15	What causes breathlessness? How do we treat it? Pitfalls	12:15 – 13:00	Lunch
12:15 – 13:00	Lunch	13:00 – 14:00 14:00 – 15:00	Group work Paper case scenarios Simulator scenarios
13:00 – 13:45 13:45 – 14:30	Group work paper case history Simulator scenarios	15:00 – 15:20	Break
14:30 – 14:40	Break	15:20 – 15:40	Discussion of group work and scenarios
14:40 – 15:10	Group work / simulator scenarios	15:40 – 16:20	Questions & Summary
15:10 – 15:40	Discussion of scenarios		
15:40 – 16:20	Questions & Summary		

<u>Day 3: Sepsis</u>		<u>Day 4: Clinical Skills</u>	
9:15 – 9:30	Overview of day	09:00 – 09:30	Feedback from clinical practice
9:30 – 10:00	What is sepsis?	09:30 – 10:45	Case discussion summary points of days 1, 2 &3
10:00 – 10:30	Group Simulator Scenario	10:45 – 11:00	Coffee
10:30 – 10:50	Coffee	11:00 – 11:30	ABG Basics
10:50 – 11:30	Scenarios and Discussion	11:30 – 12:30	ECG Basics
11:30 – 12:15	What causes sepsis? How do we treat it? Pitfalls	12:30 – 13:30	Lunch
12:15 – 13:00	Lunch	13:30 – 16.00	Simulator assessment Venepuncture & cannulation training
13:00 – 14.00 14.00 – 15.00	Group work Poster presentation Simulator scenarios	16.00 – 16:30	Summary and Feedback
15.00 – 15.20	Break		
15:20 – 15:40	Discussion of group work and scenarios		
15:40 – 16:20	Questions & Summary		

Appendix 4. Initial Interview Topic Guide

Introduction

- Thank you for coming.
- Purpose of interview is to explore value of simulation in clinical training.
- It is NOT an evaluation of the course itself.
- The research will be written up as a dissertation for my Medical Doctorate degree. The results may be presented locally and nationally.
- I will be using a digital audio recorder
- You will not be identified by name in any written report. Your identity will only be known to me.
- Regional ethics committee has granted ethical approval for project.
- Check consent form.
- Could you please speak clearly. I am looking for your views on the subject - there are no right or wrong answers. I have a topic guide for the interview with some set questions to ask.

Background

- Could you tell me your current role at work?
 - Position at work.
 - Years experience
- Prior experience related to training

Relation to training

- Did you attend STAT or SMART?
- How long ago?
- What was your motivation for attending?
- What were you expecting?
- What do you think the purpose of the training was?
- How did the training fit with your clinical role?

- What do you think you learnt from the training?
 - Expand
- Do you think there are any other benefits of the training?
 - Expand
- Did you find the training easy?

Application at work

- How did you manage these patients before going on the training?
- Did you know what to do? If so, how?
- Have you changed your clinical practice in since attending the training?
 - In what way?
- Have you been able to put the training into practice at work?
 - Examples?
 - If not, why?
- Do you feel patient care is any different?
- Do you think your decision-making is any different?
 - Expand – what is perceived as “decision-making”
 - Examples?
- Has there been anything you would like to have used at work but haven’t?
- Is there anything you feel has inhibited this at work?
- Do you feel more confident after doing the training?
 - Why? Expand.
 - Is this important?
- Have your expectations about yourself changed?
- Have others’ expectations of you changed?

Simulation

- What do you think simulation-based training is?
- Is it important? Why?
- What do you remember about using the simulator?
- How did you feel about taking part in the simulations?
- Which parts of the simulations do you think were most/least effective?
 - Why?
- Did you have any prior experience of the clinical situations prior to attending training?
 - If so, how did the simulation compare to these?
 - If not, did simulation provide a realistic experience?
- What were the main differences between how you acted in the simulations and how you would act in clinical practice?
- How would you act now if you came across a real situation that you had done in the simulations?
- Can simulation be a substitute for clinical experience?

Training efficacy

- What aspects of the training were most effective in helping you learn?
 - How / why?
- What would have made it more effective?
 - How / why?
- Is a focus on diagnosis important?
 - Why?

Conclusion

- Is there anything else you would like to add to what we have talked about?
- Any questions?

Appendix 5. Final Interview Topic Guide

Introduction

- Thank you for coming.
- Purpose of interview is to explore value of simulation in clinical training.
- It is NOT an evaluation of the course itself.
- The research will be written up as a dissertation for my Medical Doctorate degree. The results may be presented locally and nationally.
- I will be using a digital audio recorder
- You will not be identified by name in any written report. Your identity will only be known to me.
- Ethical approval has been granted for project by regional ethics committee.
- Check consent form.
- If you could please speak clearly. I am looking for your views on the subject - there are no right or wrong answers. I have a topic guide for the interview with some set questions to ask.

Background

- Could you tell me your current role at work?
 - Position at work.
 - Years experience
 - Prior experience related to training

Relation to training

- Did you attend STAT or SMART?
 - How long ago?

- What was your motivation for attending?
 - What were you expecting?
 - What do you think the purpose of the training was?
 - How did the training fit with your clinical role?
- What was the main benefit of doing the training?
 - Expand
- How did you manage these patients before going on the training?
 - Did you know what to do? If so, how?
- Have you changed your clinical practice in since attending the training?
 - In what way?
 - Have you been able to put the training into practice at work?
 - Examples?
 - If not, why?
- Do you feel patient care is any different?
- Do you feel more confident after doing the training?
 - Why? Expand.
 - Is this important?
 - How do you gain confidence?
- Do you feel you have more expertise?
 - Expand
- What would happen if you disagreed with a colleague about what was wrong with a patient, or how to manage them?

Simulation

- What are your views on the use of simulation in training?
- What do you remember about using the simulator?
- How did you feel about taking part in the simulations?
- Which parts of the simulations do you think were most/least effective?
 - Why?
- How important is it to have a realistic experience in the simulation?
 - Why?
 - Are there any limits to how realistic a simulation has to be before it starts/stops becoming useful?
 - Is there a difference between the simulator and the environment?
- What do you think about when you're doing a simulated scenario?
 - Do you need to "believe" that you're in a real-life situation?
- Did you have any prior experience of the clinical situations prior to attending training?
 - If so, how did the simulation compare to these?
 - If not, did simulation provide a realistic experience?
- What were the main differences between how you acted in the simulations and how you would act in clinical practice?
- How would you act now if you came across a real situation that you had done in the simulations?
- Can simulation be a substitute for clinical experience?

Training Groups

- Who else was in your group when you attended training?
- Did it matter that people had different backgrounds/experience?
- Can a single standardised training day be useful to people with different levels of experience/expertise?
 - How/why?
- If you had more/less clinical experience, how might that change the training experience?

Conclusion

- Is there anything else you would like to add to what we have talked about?
- Any questions?

Appendix 6. Sample Interview Transcription – Nurse 04

Nurse_04 (03/08/10)

Interviewer 00:00:02.09

Can you tell me about your background - the job you do at the minute, your level of experience, that sort of thing...

Nurse 04 00:00:19.84

I've just commenced as a stroke specialist nurse. I'm 7 weeks into post now and I've just finished some training and am officially back on the ward now to start my new post. Before that I was a staff nurse on the stroke rehab and acute ward and 2 years post-qualification.

Interviewer 00:00:45.35

It was the STAT course that you've been on. Prior to that, how much experience did you have in that field?

Nurse 04 00:00:59.03

2 years

Interviewer 00:01:01.18

Would you say you have a lot of experience in the acute assessment?

Nurse 04 00:01:04.25

No

Interviewer 00:01:07.34

Any at all?

Nurse 04 00:01:09.49

Yes, but not loads.

Interviewer 00:01:12.93

It was only a couple of weeks ago that you came on STAT. What was your motivation for attending?

Nurse 04 00:01:23.49

Role development, really. Learning the role of acute assessment in strokes and awareness of stroke and TIA assessment basically.

Interviewer 00:01:33.23

Do you think it managed to achieve that?

Nurse 04 00:01:36.23

Yes, definitely. Lots of information gained.

Interviewer 00:01:42.23

What do you think the purpose of the training was?

Nurse 04 00:01:47.52

To increase your knowledge regarding strokes and TIA assessment and help you use a format to assessment in your practice, like SWOBS and SWIM.

Interviewer 00:02:02.78

Did it manage to do that for you?

Nurse 04 00:02:03.83

Yeah, definitely.

Interviewer 00:02:08.67

How do you think it managed to improve your knowledge?

Nurse 04 00:02:14.55

It gave you a basic information session, and then how you would use the assessment process, and then you got to go to the simulation room and practise using it, so that helped you get it into your brain - how you're going to use it in a real life situation by using the simulator.

Interviewer 00:02:36.31

How valuable did you find the classroom-based sessions where we talked about the background theory?

Nurse 04 00:02:45.35

It think they're useful, 'cos obviously you've got to have a background to base everything on, so I think they're useful, but I think the actual simulation's more useful than the classroom-based stuff because it helps you learn it solidly as opposed to just hearing about it. I don't think you learn as much if you're just listening to somebody talking as to doing it yourself.

Interviewer 00:03:07.70

Do you think that's true for most people, or just something that's personal to you?

Nurse 04

00:03:11.62

It's definitely personal to me, but I think it's probably true for a lot of people. I think everybody needs to practise what they're going to do in practice, but I think it depends on your learning style.

Interviewer 00:03:21.99

Do you have any ideas about what it is about doing the simulations that makes it more useful than sitting in a classroom being taught?

Nurse 04 00:03:31.76

You pay more attention! [laughs] I dunno, I think it just, for me, it's the hands-on experience, to practise the actual scenarios so that you learn rather than making notes and listening to somebody when it goes in one ear and out the other sometimes when you do it that way.

Interviewer 00:03:53.58

When you were doing the training, were you able to tie it in to any experience that you'd had previously?

Nurse 04 00:04:03.83

Yeah

Interviewer 00:04:05.05

What sort of things?

Nurse 04 00:04:10.07

I suppose, like, ward patients that have deteriorated, so, y'know, you could use the assessment process that you're taught on STAT of "do you think it's a stroke", the FAST test and things like that, and be able to use them to make the process easier to get a doctor to come and see them.

Interviewer 00:04:31.16

So looking back on the situations that you've been involved in before the training, what would you have liked to have done differently?

Nurse 04 00:04:44.67

I suppose we weren't really taught, before the training, anything formal on assessment of strokes, so you could use the training from STAT to help you do like a formal FAST test assessment of your patient, rather than just being able to know there was something wrong, you could do an assessment before the doctor got there to speed up the process.

Interviewer 00:05:05.74

Do you think that patient care will improve as a result of the training?

Nurse 04 00:05:11.11

Yeah, definitely...

Interviewer 00:05:12.91

In what way?

Nurse 04 00:05:15.39

Well, I think it speeds up the process. I think if you have done an assessment, even how minor it is, even if it's just a FAST test for ward nurses, and then to ring the doctor and say "this is definitely different, this is something new, this is what we've found so far - will you come and see them", I think they'll come a lot quicker than if you were just to say "they're not quite right, I don't know what it is, but they're different to what they normally are", so then I think it will speed up patient care cos the doctors will come, and be able to prioritise their workload to come and see your patient if it's a new stroke - things like that.

Interviewer 00:05:48.68

Do you think that hangs on improved clinical skills, or just a different way of communicating with the medical staff?

Nurse 04 00:05:55.42

I think it's both. I think you have improved your clinical skills and you've learnt a different way to communicate as well.

Interviewer 00:06:04.01

Have you been able use these new skills or knowledge that you've picked up on the training yet?

Nurse 04 00:06:12.50

Yes. Obviously my new job role is assessing stroke and TIA patients in the A&E, so I've been working alongside somebody else and using the techniques taught on STAT, such as the SWOBS and SWIM, to decide whether patients are suitable for thrombolysis and things like that.

Interviewer 00:06:31.09

Is it something that you do consciously, like think back to the course, when you're doing this? What do you remember about the training that ties into what you do now?

Nurse 04 00:06:44.97

Well, obviously you remember the FAST test, 'cos that's the basic part of STAT, and I think it's just the order that you're taught on STAT - like SWIM: is it a stroke, have you got their weight, more information and monitoring them - I think the way you're taught SWIM and SWOBS helps you and I think you do think back to that to go through when you're doing it in practice, like "have I done this? I haven't missed out this..." kind of thing, the process of doing it.

Interviewer 00:07:16.29

Is there anything that you would have like to have taken away from the training and used in clinical practice, but for whatever reason you haven't been able to?

Nurse 04 00:07:25.14

Not that I can think of!

Interviewer 00:07:29.32

Have you been working with other members of staff, when you've seen these stroke patients, in A&E for example, that have been on the training, or that haven't been on the training?

Nurse 04 00:07:42.19

I've been working with people that haven't been on the training, so I suppose they wouldn't know necessarily what your hierarchy or what your SWIM and SWOBS would be.

Interviewer 00:07:55.12

And how do you interact with them in the team dynamic? Do you think it makes a difference that they haven't been on the training?

Nurse 04 00:08:06.38

Well, I suppose I've been working with specialist people in the area so obviously they know their job role whether they've done STAT or not. I think it probably would help if everybody has done it, cos then everybody's on the same page. But I don't think it's a disadvantage that they haven't done it necessarily 'cos obviously they've got their own experience, but I think it would help for everybody to be on the same level if everybody does it.

Interviewer 00:08:29.75

Do you feel like they look to you as the stroke specialist nurse and expect you to take over?

Nurse 04 00:08:36.63

Yeah, in my new job.

Interviewer 00:08:40.78

Do you think the job that you've got now, because it's stroke specific, did that make it any easier or more difficult to go through the training?

Nurse 04 00:08:56.82

I think STAT is more relevant to my new job role than it was to my old job role as a staff nurse, although I think the basic FAST test and things like that are relevant to a staff nurse job on the ward, whereas the other things like the thrombolysis protocols and all the sort of ways you go through that part are more relevant to my new job role, so I think some of it is more relevant to certain job roles than others.

Interviewer 00:09:22.92

Do you think that, having been on the training, your process of decision-making is any different?

Nurse 04 00:09:33.86

Yeah, more than likely. I think because of the way you're taught on STAT I think you can make a decision, like, you can remember the process that you've got to go through first so you don't forget anything before you make the decision. It probably has helped.

Interviewer 00:09:51.21

Can you give me any example then, either real-life or hypothetical, of how you would make a decision differently now?

Nurse 04 00:10:01.92

Let me think on that one ... I suppose with a thrombolysis patient, it would be to remember to make sure you had all the information, and I think the way you're taught on STAT reminds you to make sure you've done the weight and everything before you communicate and that you're continuously monitoring, and then to make a decision about whether you're going to thrombolysed the patient you need all that information. So I suppose it highlights all the key stuff you need for thrombolysis so that it'll speed up your decision-making process cos I suppose if you take all the information to the consultant and you've missed out a key part of it then you're going to have to go back again, so it probably does speed up the decision process if you've got everything.

Interviewer 00:10:50.05

That's collecting information for the consultants to make a treatment decision. Are there any decisions you make about the patient yourself?

Nurse 04 00:11:02.80

I suppose making a decision as to whether they're a stroke or a TIA in the first place, and for CT scans and things like that. So yeah, learning obviously FAST assessment and ROSIER definitely helped with decision-making in terms of CT scans.

Interviewer 00:11:24.82

Is that something that is new to you as a nurse? Did you ever make decisions like that before?

Nurse 04 00:11:29.54

No. It's definitely new.

Interviewer 00:11:33.30

Do you think it's more to do with the training that you make those decisions, or your new role?

Nurse 04 00:11:40.71

Both, I think, 'cos obviously the training is very relevant to my new job role, so learning how to do the ROSIER scale on STAT, that helped with my new job role.

Interviewer 00:11:52.64

Do you think you feel more confident after doing the training?

Nurse 04 00:11:56.85

Yeah

Interviewer 00:12:00.43

Do you think there's anything specifically that you feel more confident at or about?

Nurse 04 00:12:07.77

Stroke assessment in general, I think. Doing the FAST test, working out the ROSIER scale, and obviously I learnt how to do the NIH scale as well, so more confident to do all those things.

Interviewer 00:12:22.50

Do you think it's important to be more confident at those things?

Nurse 04 00:12:25.31

Yeah! [laughs] Otherwise you wouldn't be able to do your job!

Interviewer 00:12:35.17

Do you think that being confident at those things means that the patients are going to get better care?

Nurse 04 00:12:48.07

Yeah, I think because if you've got a certain knowledge base and you are confident in how to use your knowledge base then yeah, it will improve patient care.

Interviewer 00:12:57.61

Have you ever worked with anybody who didn't seem confident about acting a certain way, making decisions or looking after patients, but you knew that they were safe and competent?

Nurse 04 00:13:16.21

Not that I can think of.

Interviewer 00:13:20.03

That's fine! Let's talk about the simulation then. To you, what does simulation-based training mean?

Nurse 04 00:13:33.48

Interactive teaching with a simulation dummy to act out scenarios to be able to learn the process of doing an assessment or other things.

Interviewer 00:13:48.31

Do you think it's a good way of teaching or learning?

Nurse 04 00:13:50.57

Yeah, I enjoy doing hands-on learning.

Interviewer 00:13:56.16

Which particular parts of simulation do you think are the most helpful?

Nurse 04 00:14:02.22

I think it's a good way of taking the information you've learnt and being able to understand it more by running it through in real time - a real scenario, how it would be in practice.

Interviewer 00:14:19.64

You said "real time". Do you think timing is an important part of it?

Nurse 04 00:14:24.39

I think simulation wouldn't be as good if you only got one chance to do it or one chance to watch it, whereas I think if you've got more than one scenario that's good so you can see it from multiple different ... or y'know for this sort of patient, y'know this is what you would do but then what if this happened, so I think that helps you learn.

Interviewer 00:14:50.06

In STAT you've got all these scenarios. You're not doing them all yourself - you'd maybe do one or two yourself and you watch other people do the others. Does that change the experience at all - watching rather than doing it?

Nurse 04 00:15:02.92

I think it does, and I think it helps to watch other people do it as well, 'cos then they might miss out something that you would remember or you'd miss out something that they'd remember so I think it's good to watch everybody doing it 'cos then I think then you learn from other people's mistakes, or what they've done and you haven't done, kind of thing.

Interviewer 00:15:21.14

How important do you think it is to go through the whole process of assessment rather than just breaking it down into its component part and, say, just do a simulation, for example a FAST test, on a mannequin, as opposed to setting a scene, giving you a presenting complaint and making you do all of the assessment?

Nurse 04 00:15:42.68

I think if you just do one specific test, I think you'll learn it but I don't think you'll learn it as much as if you put it into a scenario with all the background information because you can only go so far with learning an assessment without other information like background because then you're not really going to think about how you would put it into practice without the scenario background. I think that makes it feel more realistic, having a background: "this patient came in with such and such, you've got to do this assessment on them" - I think that helps you learn more than just "go and do that test on that dummy, and just do that bit only".

Interviewer 00:16:23.90

Are you saying it's more realistic to have lots of different information sources and pull them all together...?

Nurse 04 00:16:31.15

Yeah, like you would do in practice.

Interviewer 00:16:36.26

You said that you would regard simulation as using a mannequin, a dummy, a patient simulator, but realism is also important - is that right?

Nurse 04 00:16:51.01

Yeah.

Interviewer 00:16:54.25

Is there a limit on how realistic it could be before it stops being more useful?

Nurse 04 00:17:05.02

I think the dummy that we've got here is very realistic, although it can't move its arms and legs, but at least then you've got the videos to watch, sort of thing.

Interviewer 00:17:16.22

Let's talk about the videos for a second. Do you think they were good?

Nurse 04 00:17:24.44

Yeah, I think they were good. If you're going to do simulation and you've got to do the FAST test on the dummy, for example, and you say "can you smile", well obviously the dummy can't do it, so I think it's good to watch the videos so then at least you've got something in your head to say "ok, well look, that patient smiled, so they've got this, or not that".

Interviewer 00:17:44.62

So by the same token, would it be even better to dispense with the dummy and the video, and use a real patient in the simulations?

Nurse 04 00:17:58.76

Hmmm. I think it makes it more awkward for training if you've got real patients, having just done my OSCEs! It's very nervewracking! I think the dummy and the videos allow realism to a certain level, without being a real patient. Even, I suppose, I don't know, unless there's a stroke [patient] that's got a residual weakness, it's not going to necessarily be an acute stroke, so you might not get the same as they had on admission. You'd struggle to find patients with strokes.

Interviewer 00:18:34.73

Sure. But practicalities aside, let's say we could pick stroke patients and use them for training, why would it be more nervewracking?

Nurse 04 00:18:50.31

I suppose it makes it more realistic, and I think people that are learning something would prefer to use a simulation dummy than learn on a real patient.

Interviewer 00:19:03.69

Why is that, if realism is valued? If using the video and seeing real signs is good, when does that tip the scales and become a bad thing if you were to use a real patient?

Nurse 04 00:19:23.12

I think when people are initially learning something. I think torturing patients .. [laughs] putting them through loads of people assessing the same thing time in, time out ... it's more beneficial to use the simulation dummy as opposed to a real patient. I think it's just people's perspectives of training ... most nurses don't do things on real patients initially. I think you learn through simulations and then progress onto doing real patients and assessments.

Interviewer 00:20:00.42

Is that a cultural thing - how you're used to learning things?

Nurse 04 00:20:03.39

I think so, yeah. I think people would find it more nervewracking on the STAT day if they were told they had to go and assess a real patient. Especially for people who hadn't ever done assessment of stroke or TIA before, although they may pick it up from a stroke background, as in the ward, I think they would still find it very nervewracking to then go and assess a patient using what you're learning on STAT, if it was a real patient as opposed to a simulation. I think they find it nervewracking enough with the simulation.

Interviewer 00:20:38.00

I suppose you're talking about the element of practise - being able to practise without harming patients.

Nurse 04 00:20:44.50

Yes

Interviewer 00:20:50.15

What if we didn't have an actual patient but we had an actor?

Nurse 04 00:20:58.15

It would be different to having a real patient, but I still think that people would still find it ... I don't know ... I suppose if it was just somebody in your group that was doing the acting or somebody like yourself doing the acting I don't think it would be as bad as a real patient, but I think perspectives again from different people.

Interviewer 00:21:18.56

Does that hinge on you knowing that it's an actor?

Nurse 04 00:21:21.28

Yeah probably! [laughs] I think if you knew you you're going to do a simulation, there's a real person that's doing it but they're an actor, I think people would be alright with it - it's no different to using a simulation dummy.

Interviewer 00:21:35.71

Would you have a preference in those scenarios between a mannequin or an actor, or does it make no difference?

Nurse 04 00:21:42.83

I don't think it makes much difference.

Interviewer 00:21:47.42

What about the environment that you train in. I suppose you could argue that to make the simulation as realistic as possible we could mock up an A&E department, with other people milling around in the background, and we could make you feel as though you were really there working in real life. Do you think that's important?

Nurse 04 00:22:10.80

I don't think it's as important as the mannequin itself, and the scenario that you're given. I think it would be a lot of work to do all that - to make it. I think it's quite realistic what you've got at the minute - the trolley and the monitor and all the props like the oxygen and things like that to actually run through the scenario and actually do things as you go, and have an assistant to help you if you need. I don't think it needs to be any more in depth for the scenario for the training.

Interviewer 00:22:42.83

How important do you think it is that we use a technologically more fancy simulator - like one that can be cyanosed, and can talk, and you can measure its obs - as opposed to a more basic simulator, which maybe couldn't talk, and we just told you what its responses would be, and just gave you an obs chart rather than using the monitor?

Nurse 04 00:23:06.07

I don't think it's then as realistic. It's more realistic and more easier to learn from if you've got an actual scenario and you say 'I've got to do the obs', and put them on, and do the actual task of doing it, and then the monitor shows you what the results are, and I think that way you can change the scenario as you're going through to make the patient better or worse, whereas I think relying on a lesser mannequin that doesn't necessarily do all that makes a lot more work for the person teaching on STAT, or whichever course you're doing, and it's not as realistic if it's not coming from the dummy.

Interviewer 00:23:48.35

Did you enjoy using the mannequin?

Nurse 04 00:23:51.03

Yeah.

Interviewer 00:23:53.97

Anything in particular?

Nurse 04 00:23:58.22

I think it's good to do the whole interactive scenario. Y'know, be able to use the dummy to test its arms and legs and, although it can't actually respond and you've got to watch the video, I think that's still part of it, unless you get a walking, talking dummy - and I don't think you're ever going to get that! I think it is useful to be able to learn and do tasks with the dummy as opposed to just having one that doesn't do anything.

Interviewer 00:24:25.51

Did you find it easy?

Nurse 04 00:24:29.83

I think you've got to learn the process, so once you get used to actually dealing with the simulation mannequin I think then it's fine, but I think initially it's challenging when the dummy talks to you. Or blinks! [laughs]

Interviewer 00:24:49.64

Is that because it's an unfamiliar piece of technology?

Nurse 04 00:24:54.78

Yeah, I think that's probably it. Once you're used to it I think it makes the learning process easier.

Interviewer 00:25:03.26

OK, but in terms of the content, and what we were asking you to do?

Nurse 04 00:25:07.57

I think it's challenging enough but not too hard!

Interviewer 00:25:11.10

So just right! Great! Had you used any sort of simulation-based training before?

Nurse 04 00:25:22.55

Yes, at University.

Interviewer 00:25:24.59

Can you tell me about that?

Nurse 04 00:25:29.04

CPR is obviously one of the main ones, but it's not as mechanical dummy or simulator that you're using. And then I think we did other training regarding the unwell patient where you could hear it breathing and things like that and the patient deteriorates and things like that, and then obviously having done NACAN training we've used the simulator for that as well, for listening to breath sounds and heart sounds and things like that.

Interviewer 00:25:59.26

How did those experience compare to your experience of simulation on STAT?

Nurse 04 00:26:06.00

Just the same. Once you get used to a simulation dummy I think they're just about all the same. Obviously they all do different things, but once you get used to doing scenarios with a simulation dummy the training's good.

Interviewer 00:26:20.80

What about the CPR one? Are you talking about ALS or BLS?

Nurse 04 00:26:29.24

ILS. The intermediate one, I think I did. But that's obviously just a plastic mannequin, it's not interactive, so I suppose that's similar kind of training but not as interactive so you can't change the scenarios - you're going along, you're told all the information and then you do the scenario with the mannequin.

Interviewer 00:26:52.11

So did that make it less effective?

Nurse 04 00:26:55.88

I think you still learn, but I think the learning is possibly better when you've got an interactive mannequin. I think it just makes it feel more like practice if you're doing it with an interactive simulation dummy as opposed to just a dummy that doesn't do anything. I think I take it in more if it's interactive. If you get a response from what you're doing, y'know, you've done this treatment and the patient gets better you're just told that, but at least if you can see it with your simulating dummy it's a bit more realistic.

Interviewer 00:27:31.01

So you're talking about seeing a response to your actions, which you wouldn't necessarily get with a more basic simulator?

Nurse 04 00:27:42.34

Yes

Interviewer 00:27:44.57

So to see the consequences of your actions reinforces it as a learning point?

Nurse 04 00:27:48.54

Yeah

Interviewer 00:27:53.06

OK. How did you feel taking part in the simulations? When you had to get up and do it?

Nurse 04 00:28:09.40

I think initially it's nervewracking. "My God, I've got to do a scenario in front of all these people", but I think it's a good learning curve. I think you've got to do it if you're going to do it your own practice it's good to do it in a classroom-based simulation situation before you do it out in practice.

Interviewer 00:28:28.49

What was it about doing it in front of all those people that you found most difficult?

Nurse 04 00:28:36.10

I suppose if you don't know the people you're doing it in front of, that doesn't help, or fear of getting anything wrong, even though we're all learning!

Interviewer 00:28:48.15

Do you think it's more difficult in front of strangers?

Nurse 04 00:28:51.21

Yeah probably, but at the same time it's sometimes hard doing it in front of people that you do know as well 'cos then they expect you to do well or things like that.

Interviewer 00:29:02.51

One of the features of the scenarios that we did in STAT is that we made parts of it quite tongue-in-cheek and put some humour into it using voice files and everything. Is that something that you were conscious of at the time, or was it just all part of the same experience?

Nurse 04 00:29:25.47

I think it enhances it. It makes it a bit more fun to learn from as well, but I don't think it makes it any worse by adding that in.

Interviewer 00:29:36.38

Do you think it's important to make it fun?

Nurse 04 00:29:42.85

It obviously can't be REALLY fun, but I think it does help if you're enjoying what you're learning and enjoying the process of doing that then your learning stays with you - what you've learnt on the day.

Interviewer 00:29:55.81

How much of enjoying the experience was due to the interest factor of the simulator, because some other people have said that they thought that because they hadn't seen a mannequin like that before then they were a bit more engaged with it because they were curious about it? Do you think that makes a big difference?

Nurse 04 00:30:18.07

Yeah I suppose it does. I think if you've not used a simulating mannequin before then that does help the learning process 'cos it makes you a bit more interested as to what the mannequin can do and things like that. But obviously all part of the learning.

Interviewer 00:30:35.64

By the same token, if you'd done a lot of training on these sorts of simulators, would it make it less effective if you'd come into STAT and thought "oh, no, here we go again, another one of these simulators"?

Nurse 04 00:30:49.85

No, I think it would be easier in term of you'd know what to expect from the mannequin and what sort of response, and what it can do, so in that way I think you'd just be more comfortable with what it does and be able to concentrate on the learning as opposed to what the mannequin does.

Interviewer 00:31:06.94

If we just get away from the mannequin for a minute and think about the scenarios, how realistic do you think the scenarios were compared with what we were trying to get across in the teaching?

Nurse 04 00:31:18.19

I think they are realistic. I think the scenario information that you're given helps you to be able to put into practice the information that you've just learnt in the classroom. By providing you with the background you can then think "right, well, in practice this is what I'd do" and then put into practice what you've learnt as well.

Interviewer 00:31:41.69

Which bits of the training did you think were the most effective in helping you learn?

Nurse 04 00:31:52.75

I think the balance is the key on the course. I think the fact that you learn several ways by listening to somebody talking through Powerpoint presentations but also being able to see it, and then taking that and using it in the simulation environment and getting a scenario and learning that way. I think the whole thing makes it easy to learn. I think if you did one or the other you'd be missing out on key information. You've obviously got to have the knowledge to underpin your practice, so learning the knowledge first - listening to somebody talking and looking at the Powerpoints - and then being able to go through and utilise what you've just learnt in the scenario ... I think the whole thing works well.

Interviewer 00:32:35.55

How important is it to have a training day, like we did, as opposed to say some more informal teaching where I just came and got you off the ward and took you to do some simulation training?

Nurse 04 00:32:56.58

I don't think people would be able to concentrate as much 'cos obviously you've just come out of your work environment, you've got other things in your head. I think if you're coming in to a day that you know you're going to be training and learning you've got that in your mentality and you learn better than if you were just going to come in for an hour and just do one scenario and then have to go back to work, you wouldn't then think it through.

Interviewer 00:33:17.75

So you've got your learning hat on when you come to training, but not when you're at work!

Nurse 04 00:33:21.04

Yes. I think obviously you learn at work, but I think there's so many other things to think about other than what you've just learnt in a classroom which you only did an hour of, then you go back to work and possibly it all goes out of your head and you don't think about it. I suppose if you've had a full day of learning and you go home then you tend to think about it and then be able to put it into practice when you're back at work.

Interviewer 00:33:47.22

So you can reflect on your day's activities?

Nurse 04 00:33:48.32

Yes

Interviewer 00:33:50.53

In STAT, we concentrate a lot on making a diagnosis of stroke, or to think about other diagnoses. That's something that traditionally probably hasn't been done a lot in nurse education courses. Do you think it's important?

Nurse 04 00:34:13.50

I think it is, because in practice you're always going to find out what your patient's diagnosis is, so I think to do it in a scenario it helps you to kind of put everything together and think "oh yeah, that was what happened, that was the diagnosis" so that you can think the process that you've got to get to there has been done, whereas maybe if you just do the process and then nobody actually says "well this is what they had" then I think you've learnt but you haven't maybe thought the whole process through to be able to think of it from start to finish.

Interviewer 00:34:54.03

Is that just something that's nice to do from an academic point of view, or is it important clinically?

Nurse 04 00:35:04.39

I think it's probably important clinically because then obviously you're not just going to do an assessment on a patient and not look at what the actual diagnosis is going to be, so it's just as useful to do it in scenarios as it is in practice.

Interviewer 00:35:18.59

Do you think that, having been on the training, you would be confident enough to make a diagnosis or perhaps even contradict a different diagnosis that somebody else has made?

Nurse 04 00:35:31.27

I think that comes with time! I think the information you learn is always going to help you with diagnoses and differential diagnosis, but I think to put it into practice is going to take you time to get used to utilising what you've learned.

Interviewer 00:35:55.47

Can you expand on that? What sort of things do you have to practise?

Nurse 04 00:36:00.71

Just getting used to different types of presentations with stroke and TIAs and the diagnosis you get from the symptoms that present to you.

Interviewer 00:36:13.66

Is that something that could feasibly be done in simulated training?

Nurse 04 00:36:18.51

No I think it's something you've got to take back to practise. I think knowledge over several weeks, months, years, is how you're going to develop your skills in that area.

Interviewer 00:36:32.60

Do you think you could ever replace that with a hypothetical programme where, once a week, you went and did an hour of simulator-based training that was a little bit different every week?

Nurse 04 00:36:40.85

Yeah, I think it would probably help. I think in terms of clinical decision-making and things like that, that's possibly something you have to learn on the job.

Interviewer 00:36:56.38

Can you put your finger on what you think it is in the job that makes it specific to needing clinical experience?

Nurse 04 00:37:04.57

Time, probably. I think that's probably the factor. Clinical experience helps you in your decision-making and I think obviously the more time you've got to practise the skills you've got and then see different cases and scenarios and then you learn that way as well.

Interviewer 00:37:23.45

Do they have to be seen in real life?

Nurse 04 00:37:26.24

Not necessarily I suppose. If you kept going through scenarios and simulations and things like that over a period of time I think you'd probably still learn.

Interviewer 00:37:36.98

Could you do them online?

Nurse 04 00:37:39.17

Yeah, I think that would be useful. Scotland's got something like that, haven't they - scenarios online?

Interviewer 00:37:46.38

Yes

Nurse 04 00:37:47.44

I think it's useful, but then again you still have to take that into practice to learn it completely. I think it's useful to learn stuff online and through simulation and things like that but then you've got to be able to put it into practice to make it more "solid" in your brain!

Appendix 7. Sample Interview Notes – Nurse 04

General Notes

Relatively junior nurse for current post - only 2 years post-qualification!

Worked in a stroke-specific field before current post

More references to "increasing knowledge"

Several mentions of "getting the doctor" as the ultimate objective, and implies at times that this is the main thing that the training can help achieve

Time Referenced

0410 - Is "getting the doctor" the ultimate objective? Interesting to compare this with SMART

0515 - Again, there is emphasis on communicating with medical staff to get a patient seen faster

0644 - Focus here is on remembering a checklist. It's important, but it's different from relating understanding of why things are done to actually doing them.

0933 - Focus is on not forgetting to do things, rather than remembering how to do things properly (is this assumed?)

1001 - This isn't her making the decisions, but rather aiding the consultant's decision-making process

1225 - It's important to be confident "otherwise you wouldn't be able to do your job" - equates confidence with competence?

1248 - She's equating confidence with competence

1402 - Is "real-time" an important factor in simulation?

1424 - Vicarious experience is valuable

1542 - Different levels of "learning". You can learn a skill (e.g. assessment tool) and how to

apply it, but this learning is enhanced when it is contextualised / given a frame of reference. Interesting, as surely the application of this skill will be the same in both cases, so she is probably referring to understanding of how to interpret findings (judgement rather than decision-making)

1758 - There might be a ceiling of realism that is useful for learning, above which it becomes "too real" and takes the trainee out of the comforting environment of a "pretend" situation. Refers to it being "awkward for training", but means she herself would feel awkward!

1923 - Disadvantage of using a real patient isn't the lack of realistic learning opportunity, but a consideration of the patients' feelings and comfort - these can be disregarded to a large extent with a simulator.

1923 - "Most nurses don't do things on real patient initially" - interesting, as this is different from others' views of "traditional" nurse training. Is this a shift in culture and attitude?

2003 - Equates "simulation" with the use of a mannequin. Implies that use of a real patient, even in a training context, would not be regarded as "simulation".

2210 - Mannequin seems more important than environmental fidelity - patient-centred training (but without an actual patient)?

2655 - What is it that you have to "see" in order to learn from the consequences of your actions?

2942 - Being fun/enjoyable helps, but interesting that she says it can't be too enjoyable! If you're enjoying it too much, does that mean you're not taking it seriously?

3049 - Being too interested in the mannequin could be a distraction from the content of the training!

3413 - There is an idea that getting a diagnosis provides concrete feedback, but this is not necessarily right. An incorrect diagnosis would not necessarily mean that anything has been done badly or incorrectly! Is she suggesting that the diagnosis is the end point of the process, or that it is needed in order to reflect and modify practice?

3704 - Hints at, but unable to fully articulate, the gap between simulation-based training and "real-world" experience. Even full-time simulation based training could not replace clinical

experience - is this because it is not realistic enough, or would even the highest level of fidelity not manage to facilitate learning as much as on-the-job experience?

3747 - You haven't learnt something until you've done it in "real life" - applying the knowledge/skills reinforces self-efficacy

Appendix 8. LREC Approval Letter


National Research Ethics Service

Northern & Yorkshire REC
Room 002, TEDCO Business Centre
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NE32 3DT

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15 June 2010

Dr Mark Garside
Teaching and Research Fellow
Northumbria Healthcare NHS Foundation Trust
Wansbeck General Hospital
Ashington
Northumberland
NE63 9JJ

Dear Dr Garside

Study Title: The role of patient simulation in the development of clinical judgement skills amongst qualified nurses
REC reference number: 10/H0903/25
Protocol number: V3

Thank you for your email of 25 May 2010, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by myself under Chair's Action.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a **favourable ethical opinion** for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

For NHS research sites only, management permission for research ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission for research is

This Research Ethics Committee is an advisory committee to the North East Strategic Health Authority
The National Research Ethics Service (NRES) represents the NRES Directorate within
the National Patient Safety Agency and Research Ethics Committees in England

available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>. Where the only involvement of the NHS organisation is as a Participant Identification Centre, management permission for research is not required but the R&D office should be notified of the study. Guidance should be sought from the R&D office where necessary.

Sponsors are not required to notify the Committee of approvals from host organisations.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
REC application	IRAS V 2.5	19 February 2010
Covering Letter	From Dr Mark Garside	21 April 2010
Protocol	V3	28 April 2010
Investigator CV	Mark Garside	26 April 2010
Investigator CV	V2	01 September 2007
Letter of invitation to participant	V1	01 April 2010
Topic Guide Nursing Interviews	V1.1	01 April 2010
Participant Information Sheet	V1.1	01 May 2010
Participant Consent Form	V1.1	01 May 2010
Response to Request for Further Information	By email from Mark Garside	25 May 2010

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Service website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document "*After ethical review – guidance for researchers*" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

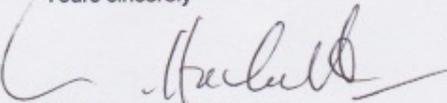
We would also like to inform you that we consult regularly with stakeholders to improve our

service. If you would like to join our Reference Group please email
referencegroup@nres.npsa.nhs.uk.

10/H0903/25

Please quote this number on all correspondence

Yours sincerely



(PP) Professor Peter Heasman
Chair

Email: bill.hackett@suntpct.nhs.uk

Enclosures: "After ethical review – guidance for researchers"

Copy to: *Dr Christopher Price*
Wansbeck General Hospital
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Ms Caroline Potts
R&D manager
Education Department
North Tyneside General Hospital
Rake Lane
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Appendix 9. Participant Information Letter

Dear Colleague,

I would like to invite you, as former attendee of either the STAT (Stroke and TIA Assessment Training) and/or the SMART (Scenario Mediated Acute Response and Treatment) programme, to participate in a study about changes in attitudes, beliefs and behaviour after a simulation-based training programme.

The use of simulation in clinical training is becoming increasingly widespread, and your opinion would be valuable in exploring the merit of this and developing its future role.

The enclosed information sheet tells you more about the study. If you would like to participate then please contact me and I will arrange a convenient time and place for an interview, which should take no more than 1 hour. As stated in the information sheet, participation is entirely voluntary and has no bearing on your current or future employment. Total anonymity is guaranteed, and the trust will not know who has participated or what the opinions were from any one individual.

The study has been planned as part of my Doctor of Medicine Degree at Newcastle University, and is being supervised by Dr Christopher Price and Dr Gabrielle Greveson. As supervisors to the study, they will ensure that the methodology and analysis are rigorous, but individual participants will not be identified in any project discussions.

If you would like further information about this study then please contact me:

Telephone number 01670 521212 extension 3578.

Email mark.garside@northumbria-healthcare.nhs.uk.

Best wishes

Dr Mark Garside

MBBS BMedSci MRCP

Teaching and Research Fellow in Medicine

Appendix 10. Participant Information Sheet

INFORMATION FOR PARTICIPANTS

As a learner on either the STAT (Stroke and TIA Assessment Training) and/or the SMART (Scenario Mediated Acute Response and Treatment) programme in Northumbria, we would like to invite you to participate in a study about the education of nurses during a simulation-based clinical education programme. Before you decide to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything unclear or if you would like more information.

Thank you for reading this.

Why are we doing this study?

There is an increasing trend towards the use of simulation in clinical education on the basis that it provides a safe environment in which to train staff. However, beyond the development of practical clinical skills, there is little evidence to suggest how, why, or if it affects learners' behaviour when they return to their real-life clinical roles. We hope that this study will provide some insight into the influence that simulation-based training has on learners when it is used to aid clinical decision-making.

Why have I been invited?

We would like to involve a total of 12 nurses who have undertaken either one or both of the STAT and SMART programmes during the past 12 months.

Do I have to agree to take part?

We hope you will want to help, but if you choose not to take part then it will have no effect on your training or employment. Your participation is voluntary and you are free to withdraw at any time without giving a reason. If you withdraw from the study then your data will also be withdrawn if you wish. If you decide to take part you will be asked to sign a consent form.

What is involved?

We would like to examine how simulation-based training affects self-confidence and perceived ability to make clinical decisions in real life. *If you agree to take part in the study we would invite you to be interviewed at least once (and in some cases twice) within six months after the completion of the training. This private interview will be semi-structured and will seek your views about the structure of the training and the value of the simulator. We expect interviews to last from 30 minutes to an hour. Interviews will be recorded and then transcribed.* Only Mark Garside and Chris Price will have access to this database. All information displayed from this database and the interviews will be anonymous and it will not be possible to trace it back to any individual.

What are the possible benefits of taking part?

This study will involve 12 nurses and will gather important information about the use of simulation in clinical training. We expect to gain a better understanding of the value and role of simulation, not just in this setting but possibly applicable to the wider world. You will also have the opportunity to voice your opinion about the training programme(s) and what you consider works well in training.

Will the information obtained from this study be confidential?

All information obtained will be entirely confidential. The recordings will be destroyed after they have been transcribed and the transcriptions kept in a secure place. We will, when appropriate, use direct quotes in our final report. You will have the chance to review any direct quotes that may be used from your interview, prior to the report being published. If you are concerned that you may be identified from a particular response then you will have the opportunity to remove this. The data from this study may be published and will be submitted as part of a research thesis. The information however will be anonymous and it will not be possible to identify any individuals from the data. A summary of the findings of the study can be sent to you once the study is complete.

Who will be told about my participation and what if there is a problem?

Northumbria Healthcare NHS Trust supports this study but no-one will be told that you are taking part unless you wish us to do so. We are aware that as a research group we are also heavily involved in the teaching of the programme(s) that you are have undertaken, and we are concerned that you don't feel pressurised into taking part. If you have any problems or anxieties related to the study that you would like to discuss with someone outside of the research group, then you can contact Sharon Hartley, Nurse Lecturer Practitioner, WGH (Tel. 01670 529689). Regardless of this, if you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, the normal trust complaints procedure is available to you through the Northumbria Healthcare R&D Department (contact caroline.potts@northumbria-healthcare.nhs.uk).

Who is funding this study?

This study is funded jointly by the academic department and the nursing directorate of Northumbria Healthcare NHS Trust. There is no external funding or any financial incentives for the researchers or volunteers. We have planned the study in conjunction with educational researchers at Newcastle University (Gabrielle Greveson).

What if I have further questions?

If you would like further information about this study please contact Dr. Mark Garside, East Wing, Wansbeck General Hospital, Woodhorn Lane, Ashington, NE63 9JJ. Telephone number 01670 521212 extension 3578. Email mark.garside@northumbria-healthcare.nhs.uk or the course director christopher.price@northumbria-healthcare.nhs.uk.

Appendix 11. Participant Consent Form

What is the impact of simulation-based training on self-efficacy and clinical decision-making?

Consent Form

I have read the information given to me and have had the chance to think about participation.

I understand the purpose of the study and have been given the opportunity to talk to Mark Garside about any further questions I may have.

I understand that if I choose not to take part, that neither my training nor my employment will be affected. If I choose to take part then I am aware that I can withdraw at any stage with no penalty.

- I agree / do not agree (please delete as appropriate) to participate in the above study

Initial:.....

- I agree / do not agree (please delete as appropriate) to an audio recording of my interview being made (all recordings will be erased at the end of the study)

Initial:.....

- I would like/would not like to receive a summary of the study results on completion

Initial:.....

Name:

Address:

Contact telephone:

Email:

Signed:

Date:

Signed by researcher:

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