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The Benefits and Barriers towards the Implementation of an Electronic Nursing Record and the Potential to use Speech-to-text Technology to Support Point of Care Documentation in the Irish Context

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in partial fulfilment of the requirements for the degree
of Master of Science in Health Informatics

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university.

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Abstract

Introduction

Nurses in Ireland have traditionally documented in a paper-based patient record. The National Electronic Health Record (EHR) is currently being developed and the strategy was launched in Ireland in 2013. The introduction of a National EHR will require all health care institutions to implement an interoperable Electronic Patient Record (EPR) to allow for the flow of patient data between systems. The transition to an electronic record will be a paradigm shift for nurses in Ireland. Retrospective documentation has been associated with the traditional approach to documentation. However, point-of-care documentation will be essential to the successful integration of an electronic record. Technological advancements in society provide supports and enhance our daily lives. Speech-to-text technology is continually evolving and could act as a solution to point-of-care documentation.

Aims

The objective of the research is to question nurses on the perceived benefits and barriers towards the implementation of an electronic nursing record and to consider the potential to use Speech-to-text technology to enable point-of-care electronic documentation.

Methodology

The literature review was conducted prior to the study and was an essential prerequisite for two reasons. An explainer video was devised as a method for communicating challenging yet key concepts. The literature was reviewed to ensure it supported the use of this medium in the chosen context. Furthermore, a review of the literature provided the rationale for the study and identified previous studies to inform the methodology of this research. A quantitative research method was utilised. A questionnaire was developed for this purpose. Data was gathered using an online and paper based questionnaire. Data was analysed using Qualtrics and Microsoft Excel.

Conclusion:

Successful implementation and adaptation to a new technology system can be dependent upon a number of factors as highlighted in the literature. Education, continuous support, and

Involvement at an early stage of development has been directly associated with nurses accepting and adapting to a new system. It would appear that there are more perceived barriers than benefits to the implementation of an electronic nursing record and STT technology. However, recognition of the barriers and early intervention with possible solutions can ensure that nurses remain engaged with the technology. Adaptation to a new technology system is extremely challenging. However, it is achievable if nurses are continuously informed and supported by the vendor, nurse leaders and 'super-users'.

Table of Contents

Declaration I

Permission to Lend and/or Copy II

Acknowledgements III

Abstract IV

Table of Contents VI

List of Figures and Tables IX

Abbreviations IX

1.0 Chapter 1: Introduction 1

1.1 Background and Rationale 1

1.2 The Aims and Objectives of the Research 2

1.3 Overview of Dissertation 3

2.0 Chapter 2: Literature Review 4

2.1 Introduction 4

2.2 Video as a method for explaining challenging concepts 4

2.2.1 Rationale to support the use of video as a method for explaining challenging concepts 4

2.2.2 Benefits of using video versus other forms of media 5

2.2.3 The Explainer video and Transportation theory 5

2.3 Nursing documentation and current practice 7

2.3.1 Definition and statistics 7

2.3.2 The handwritten nursing record 7

2.3.3 Accurate records enabled by point-of-care documentation 8

2.4 Electronic records and nurse documentation 9

2.4.1 The Electronic Health Record 9

2.4.2 Challenges to the adoption of an electronic record 10

2.4.3 Point of care documentation in an electronic record – benefits and barriers 11

2.5 Point of care documentation with STT technology 12

2.5.1 Definition and background 12

2.5.2 Rationale for using Speech-to-text technology for nursing documentation 14

2.5.3 Previous studies to support the use of Speech-to-text technology 14

2.5.4 The benefits of utilising Speech-to-text technology to support point of care documentation 16

2.5.5 Barriers and potential solutions to utilising speech-to-text technology 17

2.5.5.1 Environmental noise 18

2.5.5.2 Patient confidentiality 18

2.5.5.3 Accuracy of STT technology 19
2.5.5.4 Lack of involvement of nurses at an early stage of development 20
2.5.5.5 Lack of education or training 20
2.5.5.6 A preference for manually typing in the electronic record 21
2.5.5.7 Encouraging solutions to existing barriers 22
2.6 Conclusion 22
3.0 Chapter 3: Research Design and Methodology 24
3.1 Introduction 24
3.3 Research Aims and Objectives 26
3.4 Research setting and participant recruitment 28
3.5 Literature Review 28
3.6 Ethics Approval 29
3.7 Questionnaire 30
3.7.1 Questionnaire development 30
3.7.2 Questionnaire content 31
3.7.3 Questionnaire pilot 31
3.7.4 Distribution of Questionnaire 32
3.8 Data Collection Method 32
3.9 Data Management 33
3.10 Data Analysis 33
3.11 Conclusion 33
4.0 Chapter 4: Results 34
4.1 Introduction 34
4.2 The main objectives of the methodology 34
4.3 Response rate 35
4.4 Participant demographics 35
4.5 The Explainer video – were key concepts addressed? 36
4.6 Nurse documentation and current practice 37
4.7 Technology and nursing 40
4.8 Recently Implemented technology and adoption 41
4.9 Speech-to-Text (STT) technology 43
4.10 Conclusion 46
5.0 Chapter 5: Discussion 48
5.1 Introduction 48
5.2 Establishing a Frame of reference 48
5.3 The paper-based nursing record and identified issues 49

5.4 Adapting to an Electronic Nursing Record 51
5.5 STT technology to support point-of-care documentation 52
5.5.1 Implementing new technology and associated challenges 54
5.5.2 Acknowledging existing barriers 54
5.5.2.1 Noisy environments 55
5.5.2.2 Interruptions 55
5.5.2.3 Confidentiality 56
5.5.2.4 Accuracy of STT technology 56
5.5.3 The importance of training and support 57
5.5.4 Involving nurses in the early stages of development 58
5.5.5 Documenting at the point-of-care 58
5.6 Conclusion 60
6.0 Chapter 6: Conclusion 61
6.1 Introduction 61
6.2 The key findings 61
6.3 Limitations 64
6.4 Recommendations 66
References 67
Appendix A: Patient Persona and Staff Nurse Persona 76
Appendix B: Link to online film and screen shots 78
Appendix C: Information Leaflet and Consent Form 83
Appendix D: The Questionnaire 88

List of Figures and Tables

Figure 2.1: The functionality of Speech-to-text technology..... Page 13

Figure 3.1: Workflow diagram of proposed research plan ..... Page 27

Figure 4.1: The number of years the participant is qualified as a registered nurse..... Page 35

Figure 4.2: The use of the Explainer video to communicate key concepts..... Page 37

Figure 4.3: Point of Care – Reality versus the Ideal..... Page 39

Figure 4.4: Identified issues when documenting in a paper-based record..... Page 39

Figure 4.5: Participants experience using different technological devices..... Page 41

Figure 4.6: Point of Care documentation and the benefits of STT technology..... Page 44

Figure 4.7: Potential barriers that exist with the use of Speech-to-Text technology in the clinical environment..... Page 45

Table 3.1: Primary and Secondary search terms..... Page 29

Table 6.1: Barriers to the use of Speech-to-Text technology and potential solutions.... Page 64

Abbreviations

DoH	Department of Health
EHR	Electronic Health Record
EPR	Electronic Patient Record
EWS	Early Warning Score
HSE	The Health Service Executive
Generation C	Generation Connected
IPPOSI	The Irish Platform for Patient Organisation Science and Industry
MDT	Multi-Disciplinary Team
NMBI	The Nursing and Midwifery Board of Ireland
NMC	The Nursing and Midwifery Council
STT	Speech to Text

1. Chapter 1: Introduction

1.1 Background and Rationale

As nursing documentation makes a transition from paper-based to electronic records, nurses must be ready to engage with these new systems to ensure optimum patient safety. The following research question will be answered in the course of this thesis:

'What are the perceived benefits and barriers toward the implementation of an electronic nursing record and the potential to use speech-to-text technology to support point of care documentation in the Irish context?'

Nurses spend a significant amount of their time (25-50%) away from the patients' bedside documenting retrospectively in the nursing notes (Blair and Smith, 2012). Very often nurses experience poor time management as a result of retrospective documentation and view paper-based documentation as a burden (Prideaux, 2011). The implementation of a National Electronic Health Record (EHR) in the near future will place an additional burden on the nurse as they struggle to document into an electronic nursing record. Documenting in an electronic record, as opposed to the traditional paper-based record, will be a paradigm shift for nurses in Ireland. Point-of-care documentation is essential to the delivery of safe patient care and should be applied to all documentation regardless of whether it is paper-based or electronic. The challenge is to facilitate point-of-care documentation without negatively impacting the patient.

The suggested benefits of e-health include the transformation of care delivery, improvements to safety and patient centred care (Yee et al, 2012). Speech-to-text (STT) technology translates the spoken word into text and is commonplace on many smart devices in society. However, the idea of utilising STT technology in the healthcare setting could be an abstract idea for many nurses. Furthermore, traditional embedded approaches in nursing care can make it difficult to introduce new ideas. Technical solutions can engender a sceptical response in nurses whose primary objective is to ensure the safety of the patient. However, embracing new and innovative approaches can have a significant positive impact on patient care.

Informal feedback suggested that nurses were not satisfied with the current nursing documentation process and resulted in the approach to this research. Frustration with current practice can encourage nurses to be open to seeking alternative solutions. Suggesting an alternative solution to a perceived inefficient process can produce an initial optimistic attitude. However, it is imperative that the introduction of a new technological system aligns with the workflow of the clinical environment. Adaptation to new technology is a challenging objective. This research considers the process of planning, implementing and adapting to new technology and how this may be achieved.

1.2 The Aims and Objectives of the Research

The majority of hospitals in Ireland currently use the traditional paper-based record (The Department of Health (DoH), 2015). This research proposes to explore the perceptions of the nurses towards the implementation of an electronic record and the potential to use STT technology to support point-of-care documentation. The lack of a reference point currently for nurses in Ireland has resulted in an alternative approach to introducing the concepts. The production of an explainer video portraying the fundamental concepts regarding the use of STT technology in conjunction with an electronic nursing documentation will provide a frame of reference for the nurse prior to receiving feedback. Perceived benefits and barriers will be captured in the questionnaire. The chosen methodology will provide a logical sequence of questions as the participants are asked to reflect on their current nursing documentation and consider the future implementation of the electronic record, potentially supported by STT technology. A comprehensive review of the literature will inform the questionnaire ensuring the provision of relevant questions. It is envisioned that the findings of this research will inform future studies and provide an insight into the implications of introducing new technology in the clinical environment.

The National EHR will be briefly discussed for clarification purposes. This will not be an examination of the National EHR but, in part, will explore the impact that the introduction of an electronic nursing record will have on the nurse and patient.

1.3 Overview of Dissertation

- Literature Review – A comprehensive review of the existing literature on relevant subjects including nursing documentation, electronic nursing records, and STT technology in healthcare.
- Research Design and Methodology – The research aims and objectives will be discussed whilst outlining the chosen methodology and rationale for same. The ethical implications will be addressed in this section.
- Results – The results of the questionnaire will be presented in this section, focusing on the key elements of the research question.
- Discussion – The findings and results of the questionnaire will be explored in combination with the evidence in the literature review.
- Conclusion – the final section will discuss the key findings and the implications for future research and practice. The limitations of the study will be addressed in the final chapter.

2. Chapter 2: Literature Review

2.1 Introduction

"The quality of records maintained by nurses and midwives is a reflection of the quality of care provided by them to patients." (The Nursing and Midwifery Board of Ireland, 2015)

As patient documentation makes a transition from paper to electronic records and information management systems, staff nurses must be ready to engage with these new systems to ensure optimum patient safety. The following chapter explores the existing literature on the current nursing documentation, the impending electronic nursing record, and the potential to use STT technology to support point-of-care documentation. The chapter begins with a brief section on the rationale for using the explainer video to communicate the key concepts.

2.2 Video as a method for explaining challenging concepts

2.2.1 Rationale to support the use of video as a method for explaining challenging concepts

The significant rise in the use of video as a learning tool can be attributed in part to its inclusion in e-learning online courses and the widespread use of online viewing platforms such as YouTube, Vimeo, Facebook and other social media (Kramer and Bohrs, 2017). Rissmendel (2016) describes an online media research survey of more than 700 participants purporting that 62% of videos accessed online were for educational purposes. Conventional teaching methods have evolved to incorporate multimedia technology and online platforms that support learning. Generation 'C' (Connected) or 'YouTube' generation is defined by attitude as opposed to age (Barry et al, 2016). Generation C are more likely to achieve numerous social activities on the internet, a characteristic defined as 'digital native'. Active online communities and social media sites are not age-related. This type of social activity is dependent upon being technologically savvy and being comfortable with online media (Think with Google, 2018).

Video tutorials have become more commonplace with widespread access to the internet and improved internet services (Sitthidah and St-Maurice, 2016). Zhong (2017) maintain that the 'Millennial Generation' or 'Generation C' has adapted to the use of personal technologies and social media than previous generations. Higher education institutions have started to use video content via social media platforms to facilitate learning. Online video is the most commonly used source of social media for teaching (Moran et al, 2011). 70% of students preferred web-based content for learning anatomy compared to textbooks or content with an instructor. 78% of this group selected YouTube to source video clips for learning about anatomy. 78% of the student group who accessed video content for learning rated its usefulness from useful to extremely useful (Barry et al, 2016). 93% of 1200 communication professionals believe that video has become a vital part of communication (MELCRUM STUDY, 2011). Kramer and Bohrs (2017) suggest that the learning success of videos can be attributed to the way it captures and conveys the intended message.

2.2.2 Benefits of using video versus other forms of media

Video is an abundant and powerful medium frequently utilised in educational platforms such as e-learning courses, considering information can be presented cohesively and consistently. Comparison to traditional classroom teaching suggests that utilising video in this manner can potentially increase learner engagement and attention. The study conducted by Zhang et al (2006) tested the influence of interactive video on learning outcome with positive results demonstrated. Participants in the study felt that video was a valuable medium for learning as long as the content was coherent and easy to understand. Moreover, Wyzowl (2017) maintain that 79% of people surveyed would rather watch a video to learn about something new compared to reading text from a page. Kaltura (2015) suggest that video enables contemporary types of learning and will replace most textbooks in the future.

2.2.3 The Explainer video and Transportation theory

Explainer videos are generally short videos of 3-4 minutes in duration implemented with large groups to communicate challenging concepts. Concise and clearly communicated content is an absolute requirement of the explainer video. The explainer video should have a well written script that clearly communicates the conveyed message. It should be easy to follow and have a clear structure (Kramer & Bohrs, 2017). The video length is reduced to allow for

the easy recall of information following its viewing. The challenge is to include the most pertinent information in the short viewing time. Bond (2008) suggests that a maximum video length of 3-4 minutes allows the producer of the film to communicate the message without sacrificing the amount of time necessary. The content of the video should be easy to follow and simple as possible. Utilising the viewers' previous knowledge of the subject matter can set up a framework to facilitate the explanation. Knowing your audience is essential to this prerequisite (Sitthidah & St-Maurice, 2016).

Kramer and Bohrs (2016) suggest that a fundamental and compelling element of these short films is the ability to tell a good story. Story telling is most useful for engaging an audience and maintains focus and attention on the content of the video. Challenging concepts can be difficult to communicate in a short time frame. Transportation theory in film is particularly suitable for these requirements. Transportation theory suggests that narratives presented in video and film is highly effective and has the ability to capture the attention of people as they become immersed in the story (Dosani & Neuberger, 2015). Video is being utilised more readily in education as it allows broad concepts to be portrayed and grasped more immediately than could be achieved by other means. Good visuals are essential for capturing the audiences' imagination as they play an essential role in conveying the message and providing context (Zhang et al, 2006).

Short explainer videos can suit busy lifestyles, brief attention spans and the need to consume content easily and quickly (Barry et al, 2015). This can be advantageous when utilising an Explainer video as part of a research. The explainer video can be viewed at a time that suits the participant. This is beneficial to both the researcher and participants. It would be time-consuming and a potentially complicated process to present the key concepts in a presentation (PowerPoint, handouts, textual format). Videos presented in this way can have positive knowledge effects on the viewer who may have a low level of prior knowledge of the subject matter (Kramer and Bohrs, 2016).

2.3 Nursing documentation and current practice

2.3.1 Definition and statistics

Nurses can spend up to 50% of their time away from the patient's bedside documenting in nursing notes, and often recording retrospectively. Nurses can experience poor time management, inaccuracies and errors as a result of retrospective documentation (Blaire & Smith, 2012). Hakes and Whittington(2008) suggest that 30% of a nurses time is spent on documentation, essentially 3 hours of a 12-hour shift. Nursing notes are used to capture interactions and discussions with patients about their care plan. Accurate, precise and current nursing notes must be maintained by nurses utilising the professional and ethical frameworks provided by the nursing and midwifery regulatory body of Ireland (NMBI, 2015). The terms nursing documentation, nursing records, and nursing notes are often used interchangeably to describe the recording of patient interactions, patient progress, telephone conversations, consultations, results of tests and reports (Prideaux, 2011). The NMBI assert that nursing documentation is a representation of the care given. Lack of documented evidence, therefore, indicates that no care was delivered (O'Brien and Cowman, 2011). Moreover, The Nursing and Midwifery Council (NMC) in the UK clearly state that the provision of safe and competent care is highly dependent upon accurate documentation (The NMC, 2010). High-quality nursing notes can be a powerful communication tool for all members of the MDT (Multi Disciplinary Team) for decision making. Prideaux (2011) maintain that there are constant issues with the quality of nursing documentation. Quality records ensure quality of care.

2.3.2 The handwritten nursing record

The majority of nurses in Irish hospitals document in a paper-based record (Twomey and Cummins, 2010, DoH, 2015). The literature confirms that the burden associated with hand-written documentation has a greater negative impact on job satisfaction compared to other reasons such as income or hours of work (Ajami, 2016). Banner-Olney (2009) asserts that paper records are a hindrance to efficient documentation primarily due to the inability to access the right data at the right time. This is further compounded by the increase in regulatory requirements for documentation adding to the burden. Nurses frequently remain

on duty after their shift has ended to complete their documentation (Carter-Wesley 2009). Nurses often feel that paperwork can be burdensome and get in the way of caring for the patient (Prideaux, 2011). Furthermore, Kohle-Ersher et al (2012) revealed in their study that documentation is not a high priority for nurses when compared with patient care tasks.

Documentation is often conducted away from the patients' bedside because of environmental constraints such as interruptions, noise, and confidentiality. Research suggests that documentation is viewed as a burdensome task as it reduces the amount of time nurses spend with the patient at the bedside (Blair and Smith, 2012). Moreover, documentation is often left until the end of the working shift. This can result in rushed entries that lack accuracy and detail. These retrospective entries can potentially be missing critical data and have consequential adverse effects on patient outcomes. O'Brien and Cowman(2011) maintain that nurses do not have adequate time to document in the nursing notes due to increased patient morbidity and poor staffing levels. The findings in this Irish study on nursing documentation revealed that nurses reported that a lack of time and poor staffing levels were barriers to documenting in a paper-based record.

2.3.3 Accurate records enabled by point-of-care documentation

Legibility is often cited as an issue with handwritten documentation which can lead to inaccuracies or mistakes in care. A number of authors cited in the literature maintain that the fundamental requisite of good record keeping is ensuring accuracy with documentation (Prideaux, 2011). The lack of an accurate and comprehensive record in the nursing notes can increase the risk of litigation. O'Brien and Cowman (2011) assert that nurses lack awareness about the legal ramifications of poor documentation. Accuracy in nursing care involves a chronological recording of information to reflect a sequence of events or stages of care provided which will require 'point-of-care' recording of documentation (Wheatley, 2017).

The NMBI state that nursing notes should frequently be documented to provide a narrative that clearly communicates the patients' condition and care plan. In an acute setting, the records should be accessed frequently to reflect accurate and timely documentation. Furthermore, the NMBI clearly state that documentation in the nursing notes should be carried out as soon as possible after the care has been provided (NMBI, 2015). Point-of-care documentation provides all members of the MDT with timely communication, increased accuracy and results in a positive effect on patient safety (Kohle-Ersher et al, 2012). Point-of-

care documentation facilitates narrative charting which has been identified as an essential framework for maintaining proper records. Narrative charting involves chronological documenting of nursing interventions and their outcomes (Blair and Smith, 2012). According to the literature, point-of-care documentation is vital for the successful implementation of an electronic record (Stokowski, 2013 and Kohle-Ersher et al, 2012). Documenting in an electronic record and the transition from a paper-based records, will be a paradigm shift for nurses in Ireland. The ability to document throughout the day and at the point-of-care will provide nurses with the opportunity to gather an accurate narrative and provide safer nursing care (Duffy et al, 2010). However, there are barriers and benefits associated with the introduction of an electronic record.

2.4 Electronic records and nurse documentation

2.4.1 The Electronic Health Record

Information systems need to promote safety, continually improve efficiency, reinforce quality and act as a cornerstone in the sharing of knowledge (Wheatley, 2017). According to eHealth Ireland, a national Electronic Health Record (EHR) is an essential requirement for the future of healthcare delivery. An EHR represents a record system at the top level of hierarchical structures and works across the entire health system network. The EHR will replace the need for paper-based records to a greater extent (DoH, 2015).

An ageing population and strain on the health service as it struggles to meet demands has resulted in examining the current system. The national EHR represents a key component of transformation to allow for more efficient and safer delivery of care. The EHR will allow for the recording and management of information utilising information technology. The EHR is central to eHealth Ireland's strategy to reform the healthcare service, and it will be implemented as part of that strategy in the near future. The rationale for introducing an electronic health record is to improve patient safety, efficiency and quality of care (Hakes and Whittington, 2008). The Electronic Patient Records (EPR) refers to standalone hospital patient records that should integrate with the broader EHR for information sharing. The EPR is maintained at a local level and interoperability with the EHR is an imperative part of the

eHealth strategy (DoH, 2015). The electronic nursing record is a fundamental component of the EPR (Yee et al, 2012). The term 'Electronic record' is used throughout the remainder of this document in reference to the use of an EPR and more specifically the electronic nursing records, unless stated otherwise.

2.4.2 Challenges to the adoption of an electronic record

Maillet et al(2015) maintain that successful implementation of an electronic record involves a complex change that occurs over time. Frustrations can set in prior to adoption, and this can lead to reluctance to accept the new system. Acceptance models have been developed specifically to identify the variables affecting the acceptance of technology in healthcare. These models focus on healthcare professionals' perceptions on the usefulness of the technology and how quickly they can learn to use the system. The implementation of an electronic record can be challenging, and it can often be negatively viewed as nurses struggle to adapt it to their workflow (Duffy et al, 2010). Kohle-Ersher et al(2012) maintain that barriers to the implementation of an electronic record include adoption and difficulties applying it to the nurses' workflow. Furthermore, nurses are often concerned by the amount of time allocated to documentation and that this would increase due to technological constraints. Further identified barriers to the implementation of an electronic record include lack of experience with technology, inefficient equipment, lack of education, lack of support, and issues with the time taken to log in or log out of a system (Blair and Smith, 2012).

Colligan et al (2015) maintain that the effects of implementing an electronic record on patient safety and outcomes are more or less unknown. However, the physical and mental impact of massive change cannot be ignored. This overwhelming change to practice can have negative consequences for adoption. The most impact is often felt at the 'sharp end' or the frontline of practice. Studies reveal that nurses attitudes towards a new system, is significantly affected by the emotional impact of the implementation of same. Documentation time can increase following the implementation of an electronic record. Factors influencing this can vary; however, the literature suggests that point-of-care data entry into a computer can have a negative impact on efficiencies. This can be attributed to distractions, interruptions, and typing speeds (Banner-Olney, 2009). Studies reveal that implementation of an electronic record demonstrated minimal improvement in documentation time, however, the quality and completeness of the record had improved (Kohle-Ersher et al, 2012). The design of a new

system should align with staff expectations, and it should be compatible with the workflow. Nurses are key players in the care team. A system that supports decision making, collaborative work and enhance patient care will encourage the integration of new technology (Maillet et al, 2015). Furthermore, the use of iterative design when integrating an electronic record can promote adoption. Iterative design tests and refines the systems to ensure it coincides with established workflow practice (Colligan et al, 2015).

2.4.3 Point of care documentation in an electronic record – benefits and barriers

Point-of-care documentation is an essential requisite of the implementation and evolution of electronic records (Kohle-Ersher et al, 2012). Current and relevant patient information ensures timely interventions by all members of the MDT, especially the medical team. Blaire and Smith (2012) maintain that a well-designed system that allows point-of-care documentation could be transformative. It could improve the efficiency and quality of nursing records, resulting in more time spent on direct patient care. Accuracy and real-time data access are the main benefits derived from point-of-care documentation. The Health Service Executive (HSE) issued a digital maturity online assessment across the acute hospital sector in January 2018. The digital maturity assessment is a self-assessment tool to measure how prepared hospitals are to deliver care digitally and to ascertain how well the services are supported by digital technology. The three main areas being assessed are readiness, capabilities, and infrastructure. The hospitals' capabilities and readiness to deliver care digitally at the point-of-care is paramount to this assessment. eHealth Ireland maintains that technical supports must be in place to deliver healthcare services paper free at the point-of-care (DoH, 2015).

Vollmer et al(2014) identify three main barriers for implementation of computer-based nursing documentation including insufficient technology for collecting data at the point-of-care. Technological barriers identified by nurses are associated with anxieties regarding the lack of knowledge about the technology. Lack of education and support was identified as a barrier to point-of-care documentation. Training needs should be based on individual workers aptitude and previous experience with technology. Structuring training needs based on the profession of the user may not target appropriate individuals and thus lead to non-

acceptance (Colligan et al, 2015). Identifying nurses who require extra support at an early stage in the implementation phase will significantly increase the chances of adoption.

In one study nurses were asked if their documentation practice had changed in respects to point-of-care recording of information following the introduction of electronic records. Minimal change was noted as nurses continued to document away from the point-of-care. 45% of the participants felt that the presence of a computer in the patients' room for documenting was a barrier. Furthermore, the patients' perception of the technology can act as a barrier (Kohle-Ersher et al, 2012). Point-of-care documentation raises the issue of confidentiality. The NMBI (2015) clearly state that confidentiality is vitally important and builds trust between the nurse and the patient. Point-of-care documentation can result in incidental disclosure where elements of the patient interaction can be revealed due to a discussion. This is a common phenomenon in nursing, and very often the interaction between the nurse and the patient results in the communication of sensitive information. However, incidental disclosure is acceptable as long as the nurse takes reasonable measures to reduce the breach in confidentiality such as talking quietly and ensuring sensitive information is not displayed on a computer when not in use (White and Scott, 2015). The provision of technology that supports the fast pace of nursing in an acute setting is essential to avoid critical barriers. The decision to implement a point-of-care documentation system must involve nurses to ensure that the workflow and practices are incorporated into functionality (Kohle-Ersher et al, 2012).

2.5 Point of care documentation with STT technology

2.5.1 Definition and background

Speech-to-text systems utilise speech or voice recognition software to translate the spoken word into text. The hardware and software that supports the use of Speech-to-text (STT) technology include wireless microphones, soundcards, and speech engine software. The microphone can convert sound into electrical signals whilst the sound card captures the electric signal and changes it to a digital format. The speech engine software interprets the digital signal converting it into text (Johnson et al, 2014). In the healthcare setting, the

speech is captured on the wireless microphone and is transferred to the EPR where it is edited and accepted by the user (McCartney, 2013) (Figure 2.1)

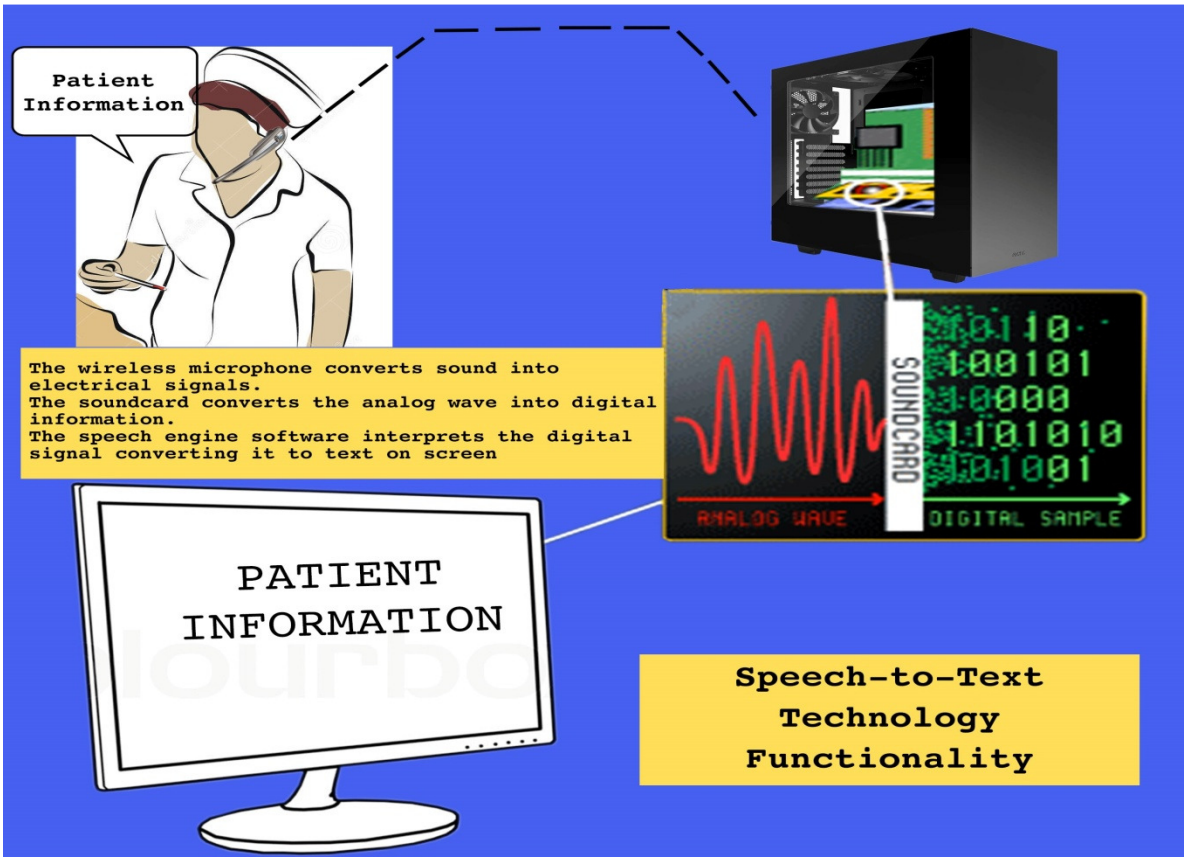

Figure 2.1 – The functionality of STT technology

STT technology was initially developed in the 1970's, and at that time it had a high error rate as it could only recognise a limited number of words. It continued to evolve throughout the 1980's and 1990's producing more robust systems capable of understanding continuous speech patterns and producing more accurate results. However, it is only in the last decade that STT technology has improved with a higher degree of accuracy and a more extensive vocabulary (Ajami, 2016). STT technology when optimised for nursing can be programmed to recognise common nursing and medical terminology. It can replace accepted abbreviations with full-text versions. Templates are often included to provide large amount of standard language used by nurses (White and Scott, 2015). Dragon software proved to be the most accurate when translating nursing vocabulary compared with general medical vocabulary (Johnson et al, 2014). Dragon dictate was introduced in the early 1990's, and it was initially intended for use with legal and medical practitioners. Dragon Naturally Speaking software

has evolved since its inception to become one of the most efficient and accurate STT systems globally (Carter-Wesley, 2009).

2.5.2 Rationale for using Speech-to-text technology for nursing documentation

Nurse expectations are initially very positive when STT technology is suggested as an alternative to manually recording in the nursing notes (Dawson et al, 2014). Fratzke et al (2014) assert that timely, accurate and contemporaneous nursing documentation is a challenge for nurses in an overburdened healthcare environment. The preservation of time for direct patient care is essential and perceived as a fundamental aspect of care by nurses. Furthermore, innovative strategies such as STT could support this endeavour. White and Scott (2015) discuss the implementation of STT technology at Alderhey hospital, Liverpool. The rationale for the implementation of same was recognition of the increasing burden of complex documentation. Wheatley (2017) is quick to point out that documentation requirements have increased over the last decade. The reason for the increase in demands for documentation includes nurses uptake of new roles requiring specific documentation and concerns regarding litigation, prompting more in-depth entries into the notes. Furthermore, patient care has become more complex and involves a more holistic integrated approach including all members of the MDT. Nurses often act as the coordinators of information and this requires rigorous communication to support this activity within the documentation. Dawson et al (2014) reveal that 22% of clinical incidents involving nursing care could be attributed to poor communication within the nursing notes resulting in delays in diagnosis and treatment. Communication barriers have been identified as a central contributing factor to inaccuracies and errors in healthcare (Fratzke et al, 2014).

2.5.3 Previous studies to support the use of Speech-to-text technology

The utilisation of STT technology for nurse documentation is in its infancy, and therefore there are a limited number of studies conducted on the subject (Wheatley, 2017). Fratzke et al (2014) maintain that there is a lack of evidence to support the utilisation of STT technology in acute healthcare settings. The principal outcome measure for STT technology involves productivity and accuracy (Johnson et al, 2014). Previous studies have focused on the usability, technical feasibility and acceptance of the technology. The introduction of STT

technology for documentation should consider how nurses have adopted new systems in the past. Nurses' beliefs and culture can have a strong influence on the process of implementing new technology (White and Scott, 2015). Nurses value the impact new technology will have on patient care, and it is imperative to question the validity of same when conducting research. Furthermore, the quality of training and the reliability of the technology are often raised as areas of concern (Wheatley, 2017). Previous studies are essential reflective material when planning further research. The lack of prior research in this area in the Irish context can provide a strong rationale for conducting research. However, the lack of a reference point in Ireland requires a tentative approach when suggesting potentially new concepts to participants of a study. The eHealth Ireland strategy provides a valuable insight into the necessity to *lay the foundations* prior to implementing new technology, such as the EHR.

Patient and healthcare worker Personas have been developed as part of the eHealth Strategy. According to eHealth Ireland, Personas and Scenarios 'help make the National EHR real, by outlining how interactions will look and feel in the future' (DoH, 2015). Personas can give a personal frame of reference to a particular scenario. The lack of a reference point for the application of STT technology in healthcare in Ireland provides a strong rationale for including personas in this study. In this context, the patient persona and the staff nurse persona provide a background to support the scenario and therefore provide insight. Moreover, utilising the Persona and Scenario aligns with the eHealth Ireland strategy. This is essential considering that the proposed STT technical solution should conform to the ultimate goal of providing safe and efficient care at the point-of-care. Personas have been developed as a precursor to the introduction of the EHR to inform and guide the engagement between the healthcare professional and the patient. Therefore, the development of personas in this context acts to inform the study as a precursor to the introduction of an electronic nursing record and the potential to use STT technology to support the point of care documentation. The patient persona and the staff nurse persona coalesce to illustrate the scenario. Both documents are presented in Appendix A.

2.5.4 The benefits of utilising Speech-to-text technology to support point of care documentation

White and Scott (2015) suggest that the accuracy and quality of nursing records can be negatively affected by the introduction of an electronic record. As previously discussed, point-of-care documentation is imperative to the implementation and evolution of electronic records. Al Masslawi et al (2016) maintain that the delay between the point-of-care and point of documentation can result in loss of information and a breakdown in communication. This can have devastating effects on patient safety and the quality of care. Retrospective documentation often occurs at the end of the working shift, resulting in avoidable expense and frustration as the nurse often works overtime. Moreover, time spent documenting is time away from the patients' bedside. Engaging with the patient is central to the provision of safe care (Wheatley, 2017). Chavis (2012) argue that the amount of time spent at the patients' bedside increases the probability that the patient outcomes are met. Unfortunately, nursing documentation very often occurs away from the patients' bedside. Nurses write their notes temporarily on pieces of paper or report sheets and transcribe it later into the nursing notes. This form of duplication is unsafe practice, and there is the potential for a breach in confidentiality if the paper is misplaced (Dawson et al, 2014).

STT technology can provide potential solutions to the issues raised above. Al Masslawi et al (2016) identify specific benefits from utilising STT for nursing documentation including the timely capture of patient data, ease of access to that data, and protecting patient information from misinterpretation or loss. Ajami (2016) identifies speed and accuracy of data input as a barrier to acceptance of an electronic record. STT technology has been proposed as a solution to improve these inefficiencies potentially. Time is often wasted retyping hand written notes into a computer at the end of a shift. STT automatically populates the nursing documentation thus providing the nurse with more time at the patients' bedside (Carter-Wesley, 2009). Furthermore, previous studies on the use of STT technology in long-term healthcare environments have demonstrated a decreased documentation burden and a reduction in nursing overtime (Fratzke et al, 2014). White and Scott (2015) have identified significant improvements in the quality of the nursing documentation. Previous manually typed record entries were limited and lacked detail. An audit on the implementation of STT technology demonstrated that the nursing notes were more detailed when compared to the

typed record. Accuracy had improved with fewer typing and spelling errors. More importantly, it was noted that the nursing notes captured a more contemporaneous narrative of patient care. Wheatley (2017) suggests that the literature supporting STT for documentation demonstrates the potential for a more accurate recording of notes due to the timeliness of entry and the continuum of the narrative. Direct patient care can be enhanced as the nurse spends more time engaging with the patient and documenting at the point-of-care.

2.5.5 Barriers and potential solutions to utilising Speech-to-text technology

Although the research is limited, the literature reveals that barriers do exist for the use of STT technology for nursing documentation. Technology can be problematic with software and hardware inefficiencies. Poorly structured education can have negative effects on implementation and adoption of the technology (Al Masslawi et al, 2016). Technical issues and problems with hardware or software can result in frustrations as nurses experience delays to the workflow. Over the course of four experiments, 80% of nurses felt that the technological aspect of STT hindered patient care (Fratzke et al, 2014). The experience of nurses use of similar technology cannot be ignored. A study in the US revealed that the majority of nurses had never been exposed to electronic records despite the widespread use of electronic records in the country (Banner-Olney, 2009). Age-related barriers to technology are often cited in the literature. Dawson et al (2014) revealed that the nurse participants in their study believed that older nurses struggle with technology. However, Gagnon et al (2012) maintain that socio-demographic factors such as gender, age and experience are infrequently considered as barriers to adoption to technology in healthcare. STT has great potential if the technology is consistent in its operation. Issues with software and hardware are significant in exacerbating the difficulties with adoption. None the less, Fratzke et al (2014) argue that these innovations should be encouraged by nurse leaders if the right system is implemented to complement the workflow and enhance patient safety.

Johnson et al (2014) reviewed the literature on the use of STT technology amongst healthcare professionals including nurses, pathologists, physicians, radiologists, administration and dental. Nurses had the lowest expectations with respects to the accuracy of the STT systems. The accuracy of STT technology is dependent upon dictation, accent and speed of delivery (Wheatley, 2017). It has been raised as a potential barrier to adoption of STT. However,

accuracy can be significantly improved through continued use and perseverance (White and Scott, 2015). Klie (2016) asserts that modern STT technology has evolved to be more accurate and sophisticated than its predecessors. This can be attributed to improvements in hardware, faster transfer of digital data, and the development of medical specific vocabularies. Nuance Technology, responsible for the design and manufacture of Dragon Medical STT technology, claim that it is 99% accurate 'out of the box' (Leventhal, 2014). Chavis (2012) argue that the technology will never be 100% accurate despite continuous improvements being made.

2.5.5.1 Environmental noise

Environmental issues such as ambient noise level could affect the performance of voice capture and hinder the transfer of information. Patient-nurse interaction is fundamental to the nurse and repeated entries into the nursing notes due to a noisy environment create an unwanted barrier (Fratzke et al, 2014). Moreover, Chavis (2012) argue that the use of the spoken word for documentation in the clinical environment acts as a barrier in itself. The spoken word adds to the noise in the environment and disrupts workflow. Disruptions lead to errors. Noise cancelling capabilities are evolving and constantly improving (Johnson et al, 2014). White and Scott (2015) have tested noise-cancelling capabilities of the wireless microphone an intensive care unit where elevated noise levels are commonplace. The efficacy of the device was unaffected. Furthermore, Wheatley (2017) maintains that advancements in technology allow for cancelling of background noise which in turn reduces the need for speaking loudly for voice capture. This is an important factor to facilitate discreet capture of the patient record.

2.5.5.2 Patient confidentiality

The majority of nurses utilising STT technology have expressed concern about dictating at the point-of-care for fear that other patients or visitors will overhear sensitive information (White and Scott, 2015). Dawson et al (2014) support the findings that nurses were anxious about a breach of patient confidentiality. Audible documentation poses a potential risk to data protection and confidentiality. However, there are accepted norms, and incidental disclosure allows for environmental factors such as proximity to other patients. The capture of patient information with STT technology should be treated with the same consideration as communicating sensitive information to another member of the team (White and Scott,

2015). Moreover, there are opportunities to be gained from point-of-care documentation. Nurses often fear that this form of audible documentation can result in the patient asking probing questions about their care. Fratzke et al (2014) maintain that this should be viewed as a positive consequence of STT documentation. The integrated care model is considered a key element of reform to the healthcare system in Ireland (DoH, 2015). Empowering the patient is a central tenet of this model. Transparency and open communication are essential to involve the patient in their care. Dictating into the patient notes at the point-of-care can engender a more careful approach to documentation. This form of documentation can provide opportunities to inform the patient and clarify any confusion surrounding their care. Furthermore, patients become more involved with their care when they are made aware of their progress and hear what is being dictated (Nuance, 2016). The Irish Platform for Patient Organisation Science and Industry (IPPOSI) are a patient-led organisation who is focused on patient-centeredness. Their principal objective is to ensure that the patient is central to the development of health policy and innovation (Phelan et al, 2016). This person-centred approach ensures that the implementation of new technology in healthcare enhances the patient services whilst involving the patient in their care. Therefore, nurses should embrace the potential to engage with the patient when using STT technology to satisfy this progressive approach to healthcare.

2.5.5.3 Accuracy of STT technology

Adoption of technology has been highlighted as a potential barrier throughout the literature. Wheatley (2017) suggests that usability, reliability and feasibility are factors affecting adoption. McCartney (2013) maintains that Smartphone users have experience interacting with their device using voice commands. Therefore, the prospect of interacting with STT technology is less daunting. Fratzke et al (2014) firmly believe that previous experience with Smartphone technology dramatically increases the ease of use of technology. The accuracy of STT is dependent upon the enunciation and speaking style of the user. A less confident user will lead to inaccuracies and inevitable frustration. Derman et al (2010) maintain that adoption of STT technology requires at least six to eight weeks of continued use. Regular use is crucial, and research demonstrates that nurses disengage too soon with the STT technology due to frustration and issues with technology (Johnson et al, 2014). Adequate training builds confidence; however, regular use and experience encourage competence. The Scope of

practice for nurses and midwives (NMBI, 2015) asserts that competence can only be achieved when the nurse has acquired the appropriate knowledge, skill and attitude. The appropriate attitude is only attained through experience and time.

2.5.5.4 Lack of involvement of nurses at an early stage of development

Nielsen(1992) asserts that there is a need to engage with the user to know their requirements in the pre-design stage. 'Knowing the user' should include engaging with individuals to appreciate their characteristics and develop an understanding of workflow and current practices. Organisations should consider how nurses have adopted new systems in the past. Waneka and Spetz (2010) believe that it is important to involve nurses in the development and implementation of new technology to allow for successful adoption. Moreover, the benefit for the patient must be apparent, the emphasis being on patient safety. Nurse leaders are key figures in promoting and driving the use of new technology. The nurse leader must advocate for nurses in the development of new technology and represent the best interest of the patient. Nurses beliefs and culture can have a strong influence on the process of successfully implementing new technology (White and Scott, 2015). Fratzke et al (2014) maintain that healthcare professionals should be directly involved in the development of new innovations. This will ensure that the introduction of new technology supports the current workflow and enhances patient safety. Nurses are more willing to accept the use of technology if their opinions are respected and the benefits for the patient are clearly outlined (Ajami, 2016).

2.5.5.5 Lack of education or training

The use of STT technology is in its infancy, and it has been suggested that the implementation of the EHR will allow for better integration of other supportive systems (Chavis, 2012). Dawson et al (2014) maintain that the successful implementation of technology is dependent upon training, support and champions or 'super-users'. Furthermore, any difficulty with learning or using the system will create a barrier. STT systems are not designed to work in isolation and rely on the interaction between system, staff, environment and process to work efficiently. Therefore, it is critical to the successful implementation of a STT system that nurses have been adequately trained and feel confident with the use of the technology (Johnson et al, 2014). Training nurses in the use of STT technology can be time consuming.

White and Scott (2015) discuss the training implemented in their study. Ten super-users were selected to facilitate training with other nurses. Training sessions lasted 15 – 30 minutes and were conducted at the bedside. This type of training proved challenging and required the full attention of the trainee in their work environment. Dawson et al (2014) revealed that nurses were very anxious that they receive adequate training prior to the implementation of new technology. In another study participants were frustrated with the lack of accuracy and consistency with voice recognition. However, this lack of consistency and accuracy with voice recognition was attributed to the lack of training. Participants were not confident in the use of STT technology as they had limited or no experience with the practice of dictation (Fratzke et al, 2014). Training has been rated very highly in the literature, and it is seen as an absolute requisite to enabling efficient use of technology in the clinical environment (Wheatley, 2017). The delivery of training in the use of STT technology varies from 5 minutes to 6 hours. However, research suggests that prolonged exposure of one to two months prior to implementation improves the chances of adoption (Johnson et al, 2014).

2.5.5.6 A preference for manually typing in the electronic record

Nurses are traditionally accustomed to accessing a paper record and documenting a hand written record. Accessing an electronic record requires logging into the system, selecting the patient and typing into the nursing notes using keyboard entry. Documenting in this manner can be a challenge for nurses who are not touch typists and struggle with technology (White and Scott, 2015). Moreover, the quality of documentation could be improved with STT technology as the nursing notes are captured at the point-of-care and not typed into the electronic record from handwritten notes later in the shift (McCartney, 2013). In one study STT technology for documenting was preferable when compared with manually typing the notes. Staff felt that the STT technology was more user-friendly and less time consuming (Carter-Wesley, 2009). Data entry into a computer can be up to five times quicker using STT when compared with manually typing. However, this is dependent upon the users' experience with using a computer (Marukami et al, 2012). Experienced typists can have difficulty accepting a STT system as they see no benefits in dictating. It would appear that slower typists derive the most benefit (Johnson et al, 2014). Fratzke et al (2014) revealed that nurses favoured keyboard input into the electronic record as opposed to STT technology.

Prior experience of keyboard entry, technical challenges, and a culture shift with using STT was associated with reluctance to embrace the new technology.

2.5.5.7 Encouraging solutions to existing barriers

The need to improve or change the design process requires inherent flexibility often associated with new technological solutions in healthcare. Unstable requirements, ill-defined environmental constraints, and a critical dependence upon human cognitive or social abilities are collectively defined as 'wicked problems' in healthcare informatics (Hevner et al, 2004). The need to continually review and revise the system is essential to successful implementation and adoption. However, nurses will be more willing to engage with technological solutions in the future if the perceived benefits for the patient are transparent from the beginning. It is apparent from the literature on the use of STT technology to support point-of-care documentation that more barriers than benefits exist. However, the literature suggests that careful planning and including the nursing staff at an early stage will encourage solutions to issues as they arise. Education needs to be timely and adequate to meet the needs of the team. Cognisance must be given to the current workflow prior to the implementation of a new system to ensure smooth implementation with the ultimate goal of adoption. The barriers to using the technology must be minimised as much as possible to facilitate this outcome. Ajami (2016) assert that there will always be problems with successful integration of STT technology should issue remain with time consumption and system usability. Moreover, Wheatley (2017) argues that frontline adoption is unlikely until device functionality is no longer disruptive to nurses' workflow. None the less, an inherent flexibility and a need to revise the system will be tolerated by nurses if the communication and support are established at an early stage and throughout the implementation process.

2.6 Conclusion

The literature review supports the necessity for the proposed research by providing insight into previously published work. A comprehensive review of the literature demonstrates that there is a broad range of information on the implementation of electronic health records. However, the literature to support the use of STT technology is limited. Moreover, the current situation regarding nursing documentation in Ireland demonstrates a gap in the literature. The evidence in the literature suggests the need to explore the perceptions of the

nurse regarding the impending electronic record and the potential to use STT technology to support point-of-care documentation in Ireland.

3. Chapter 3: Research Design and Methodology

3.1 Introduction

The following chapter discusses the methodology and the rationale for selecting the research method. There will be a brief description of the three major research methods to highlight the different approaches available. The research aims and objectives will be outlined. The research setting and participant selection will be discussed in conjunction with the literature review to reveal the influence the literature has had on the research method. The ethical considerations are synonymous with the methodology, and therefore the process involved in the study will be described. The final components of the chapter will discuss in detail the development, content, pilot, and distribution of the questionnaire. Data collection, management and analysis, will chronologically conclude the chapter.

3.2 Research Methods

Bryman and Bell (2011) maintain that a comprehensive understanding of the different research methods is essential before choosing a method, to ensure the most appropriate approach is taken. There are many research methods available for conducting research; however, the three major research paradigms are Quantitative research, Qualitative research and Mixed methods research (Doorenbos, 2014).

Quantitative research methods are useful for studying a sample of the population and obtaining numeric data reflective of attitudes or opinions (Creswell, 2014). Quantitative research is often defined as an objective process where large amounts of data can be captured, culminating in the production of numerical and statistical information (Barnham, 2015). Quantitative research utilises a systematic approach to data collection to enable the production of accurate and objective information (Pannuci and Wilkins, 2010). This systematic approach is grounded in the Positivist ideology which asserts that the researcher must concentrate on gathering the facts, whereas the Phenomenological approach relies on the researcher to ask 'why?' in order to seek a deeper meaning (Doorenbos, 2014).

In direct contrast to quantitative research, qualitative research seeks to elicit a more in-depth understanding from participants of a study. Consequently, qualitative research often involves

a smaller study population (Barnham, 2015). Grove et al (2015) maintain that qualitative research methods can capture the thoughts and feelings of the participant often conveying the values and beliefs of the individual. Qualitative data collection includes interviews usually involving one to one interaction with the participant, focus groups, observation, and action research. Ethnography, Grounded theory, and Phenomenology are the commonly used methodologies in a qualitative study. Qualitative research necessitates a reflective approach from the researcher. Perspectives and biases are often unavoidable in qualitative research but should not be ignored. Qualitative researchers will often keep a reflective journal to make sense of their perspectives as the study progresses (Sutton and Austin, 2015).

Mixed methods research involves a combination of quantitative and qualitative methods in order to avail of the benefits of both approaches. Mixed methods researchers believe that this combination of methodologies decreases the risk of bias associated with using only one particular method (Doorenbos, 2014).

Prior to selecting a methodology, the researcher considered approaching the research question utilising quantitative, qualitative and mixed methods approach. It is imperative that the researcher chooses the most appropriate data collection method to apply to the chosen research setting to ensure accurate results (Creswell, 2014). The researcher opted to use a quantitative research method. Qualitative and mixed method data collection, such as face to face interviews or observation, requires interaction between the researcher and participants in order to gain a more in-depth comprehension of human behaviour (Barnham, 2015). The majority of the participants were known to the researcher and selecting a data collection method that would facilitate an unbiased response from the participant was imperative. According to Pannuci and Wilkins (2010) bias can occur at any stage of the research process. Bias hinders the study design by encouraging the participant to select one outcome or answer over another. There is a number of quantitative data collection techniques used to gather data such as questionnaires, observation, structured interviews, experiments and clinical trials (Creswell, 2014). The researcher opted to utilise a self-administered questionnaire in order to avoid bias and collect the necessary data.

Questionnaires are useful for obtaining a quantitative description of attitudes or opinions of a sample of the population. This sample is representative of the population as a whole. Questionnaires include checklists and Likert scales or rating scales. The questionnaire

contains closed questions and can be completed by the participant in the absence of the researcher. All data gathered from the participants would be anonymous, and the questionnaire was designed to allow for comments at the end of some of the questions so that the participant could include an alternative response or elaborate on their answer. This allowance was an essential addition to the questionnaire to further support an unbiased response from the participant.

Questionnaires can measure and collect objective data to produce quantified descriptive findings. None the less, it is imperative to have a more in-depth knowledge of the research setting to ensure the most appropriate questions are selected to avoid confusion or misunderstanding (Depoy and Gitlin, 2015). Online questionnaires can facilitate a faster response time when compared to a paper-based questionnaire. However, opting to utilise an online questionnaire only, can risk excluding potential participants who may not have access to the internet or emails. Therefore, producing an online questionnaire and a paper-based questionnaire will ensure accurate data collection as it seeks to capture all eligible participants.

3.3 Research Aims and Objectives

Creswell (2014) asserts that the researcher must question the validity of the study by questioning how the project can contribute to the current literature. Although this is not a new topic, the researcher believed that new elements would transpire from the study. The overall aim of the research is to provide relevant and potentially valuable results to add to existing knowledge with the aspiration that it will inform similar studies in the future or provide insight for organisations as nurses make a challenging transition. It is not meant to be an exhaustive account or definitive approach to the subject matter. The aim of the research study is to gather a new perspective from nurses in an Irish hospital about the perceived benefits and barriers towards the implementation of an electronic nursing record and the potential to use STT technology to support point of care documentation. The lack of a reference point for nurses in Ireland who traditionally document in a paper-based record potentially requires the facilitation of some insight into the world of electronic nursing documentation and STT technology prior to the completion of the questionnaire. Developing a short explainer video was deemed the best approach to portraying these challenging concepts. Story boards were designed to ensure the Explainer video could communicate the

relevant content succinctly. Subsequently, the lead researcher produced, directed and acted in the Explainer video. Links to the Story boards, the Explainer video and screen shots are located in Appendix B. The main objective of the film is to inform without biasing the participant. Following the viewing of the film, the aim of the questionnaire is to provide statements related to the subject matter to inform the participants and allow them to make decisions. A comprehensive review of the literature was conducted to inform the contents of the questionnaire and confirm the rationale for proceeding with the study. A proposed workflow was developed prior to proceeding with the research. The workflow diagram ensured the research plan coincided with the Aims and Objectives of the study. The workflow diagram is outlined in Figure 3.1.

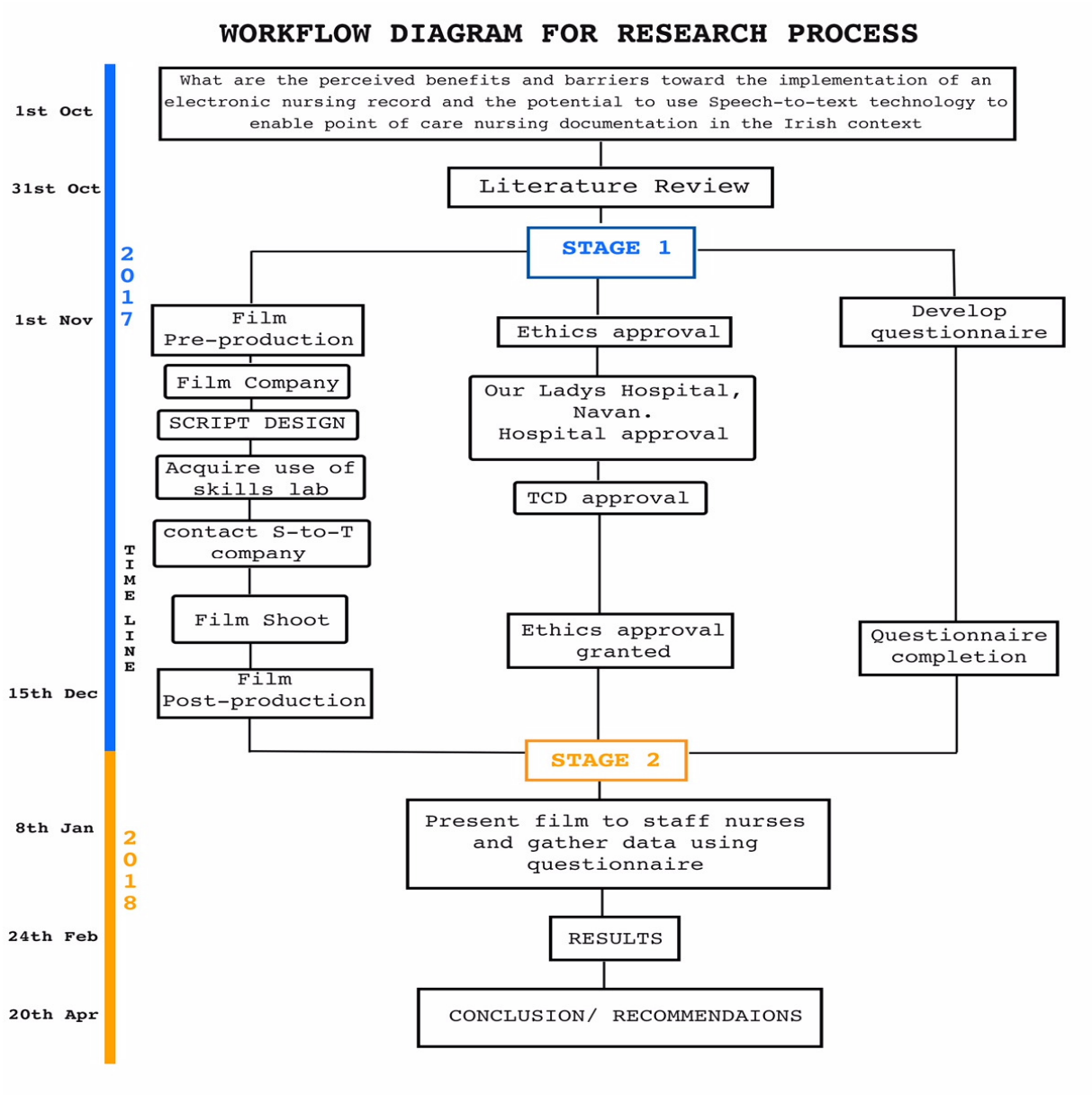

Figure 3.1 – Workflow diagram of proposed research plan

3.4 Research setting and participant recruitment

The research was gathered in a general acute hospital setting. Our Ladys Hospital, Navan, County Meath is part of the Ireland East Hospitals Group. The hospital cares for medical, surgical and orthopaedic patients. There are approximately 180 whole time equivalent nurses employed in the hospital. Nurses in the hospital predominantly use a paper-based record which reflects the traditional approach to nursing documentation in Ireland and, at the time of the study, was representative of the majority of hospitals in the country. It was felt that this was a good baseline for the study. Participants were formally informed of the imminent study via the ward managers. Each ward manager was emailed to notify them of the proposed start date for the study. The nursing staff were informed that all qualified nurses over the age of 18 were eligible to participate in the study. To satisfy the random sampling and selection of individuals, the researcher utilised a number of methods to distribute the questionnaires. This will be discussed further in section 3.7.4.

3.5 Literature Review

A rigorous review of the literature was conducted to explore the chosen topic and to inform the most appropriate content for the questionnaire. It was essential in the initial stages to examine the literature pertaining to the use of video as a medium for communication. The researcher felt it was prudent to confirm that the literature supported the use of video as part of this research. The literature review provided valuable insight to guide the direction of the study and structure the questionnaire to include the most prevalent aspects of the literature.

Keyword search terms amalgamated the phrases ‘Speech-to-Text technology’ and ‘Healthcare’ to obtain the current literature in order to investigate the State of the Art. This was an essential first step to provide a justification and rationale for the study. Relevant primary and secondary search terms were used to elicit a broader understanding of the chosen topic (Table 3.1)

PRIMARY SEARCH TERMS	SECONDARY SEARCH TERMS
STT - speech-to-text, voice-to-text, voice recognition, (Automatic), Wireless microphone, hands-free, interactive, technology, wearables	Nursing informatics, prototype, nursing, handover, time-in-motion, accountability
Nursing Documentation - nursing documentation, paper-based, electronic nursing documentation, nursing records, point-of-care documentation, workflow, electronic health records	Standardised nursing language, communication
Video - Explainer video, educational video, educational media, online learning, e-learning, social media, web-based learning, online videos, media effects, interactive video, multimedia	Film, video, documentary

Table 3.1: Primary and Secondary Search Terms

3.6 Ethics Approval

There are a number of ethical concerns to be aware of when conducting research. These included the aim of the research, the motives of the researcher, and the rights of the participant (Depoy and Gitlin, 2015). The participant information leaflet and participant consent form were produced prior to seeking ethics approval. Prior to submission for ethics approval to Trinity College, ethics approval was sought from the hospital involved in the study. However, the study involved staff nurses only and did not include patients or patient

data. Therefore, the General Manager and the Director of Nursing confirmed in writing that formal ethical approval was not necessary. Both parties provided a waiver granting permission to proceed with the study following a complete description of the proposed research. Ethics application was subsequently submitted to Trinity College Research Ethics committee, and approval was granted to proceed with the study.

3.7 Questionnaire

3.7.1 Questionnaire development

The questionnaire was developed to include questions that would provide the relevant content in conjunction with the research question. The review of the literature did not reveal an appropriate existing methodology that could be applied to this study for further investigation. However, previous studies gave some indication as to what would be the most appropriate questions to include as part of the questionnaire. Consideration was given to the need to engage with staff nurses who would rather complete a paper-based questionnaire. Some staff nurses may not have access to or be familiar with the relevant technology to access the online version. Exclusively providing an online version would only exclude some potentially valuable participants. This could negatively affect the results considering that many questions included in the questionnaire were related to the use of technology. All eligible participants were given the same opportunity to avail of the questionnaire.

The online survey was developed in Qualtrics, which is a web-based survey tool for developing, distributing and analysing surveys. Trinity College research ethics application proposed design principles to be applied to the questionnaire. The questionnaire adhered to these principles to ensure that it met the necessary criteria for ethical approval. The online version was tested utilising the Qualtrics test and preview tools to ensure functionality and usability. The paper-based questionnaire was developed in conjunction with the online questionnaire to ensure compatibility. A participant information leaflet and consent form was developed. Staff nurses received the information leaflet and consent form for signing prior to completing the questionnaire. Informed consent had to be completed prior to being able to access the online questionnaire. Therefore, the information sheet and consent form were presented initially on accessing the online link for the questionnaire. The nurses could only proceed to access the questionnaire if they consented to the information presented in

the information leaflet. The information leaflet and consent form are presented in Appendix C.

3.7.2 Questionnaire content

The questionnaire contains 37 questions reflective of the quantitative approach. The questionnaire contains closed questions yielding a yes or no response. Furthermore, additional questions are structured as a statement and require the completion of a Likert scale in response to the statement. The literature was used to inform the questionnaire to ensure the questions yielded the most relevant response to gain an insight into the perceived benefits and barriers towards the implementation of electronic nursing records and STT technology. Open free text was utilised on some questions to allow for comments from the participant. This feature was implemented to allow for a more open-ended approach to capturing more in-depth information while seeking to reduce the bias often associated with quantitative research (Doorenbos 2014, Creswell 2014).

The workflow of the questionnaire was crucial to the design and outcome. Initially, the questionnaire captures the participants' profile whilst ensuring anonymity. There follows a brief section on the participants experience of viewing the Explainer video to ensure it conveyed the key concepts. The remainder of the questionnaire was designed to capture a systematic response as the participant considers current documentation practice, the potential for using electronic nursing records, and finally exploring the potential to use STT technology to support point-of-care documentation. Moreover, the review of the literature revealed that there are some barriers associated with the implementation of new technology in nursing. Therefore, the questionnaire included a section exploring the participants' views on pre and post implementation of new technology in their clinical setting. It was envisioned that this would provide a fascinating insight into how nurses adapt to new technology. The questionnaire and the full list of questions are provided in Appendix D.

3.7.3 Questionnaire pilot

The questionnaire was reviewed and revised following feedback from research supervisor and colleagues. Two nurses piloted the questionnaire from another similar site at Our Lady of Lourdes Hospital, Drogheda. The online questionnaire and the paper-based questionnaire were tested individually by the nurses. Following the pilot of the questionnaire, further

amendments were made and it was subsequently submitted for ethical approval to Trinity College Research Ethics Committee.

3.7.4 Distribution of Questionnaire

It was essential to this study that all eligible staff nurses had the chance to participate. Random sampling was utilised as the most appropriate method to achieve this objective when distributing the questionnaires. Creswell (2014) suggests that random sampling is the purest form of probability sampling as each eligible participant has an equal chance of being selected. However, it is imperative that the participants are a representative of the population as a whole. The literature reveals that some staff nurses struggle with accessing computers and online content. Producing two ways to access the questionnaire was crucial to its success. Therefore, to satisfy the requirements of random sampling and to reduce the chances of bias, the researcher produced two documents. The first document contained the participant information leaflet and an online link to the consent form and subsequent questionnaire. The second document contained the participant information leaflet, participant consent form and the paper-based questionnaire. These documents were placed in a designated area on each ward. All staff nurses were informed about the study at handover, ward meetings, information posters and via the ward managers. The managers on the wards continually prompted the staff nurses to participate in the study as directed by the researcher.

3.8 Data Collection Method

Data collection was achieved using two methods. Online data was automatically captured in Qualtrics as participants submitted their completed questionnaires. The paper-based questionnaire was submitted to a secure central location in the hospital. A collection box was kept at the main reception and continually monitored by the staff member working in that area. Furthermore, participants were given the option to submit their completed questionnaires to a collection box on each ward area. It was envisioned that these numerous options would yield a greater response by making the procedure more accessible and ensuring anonymity. Furthermore, the methods employed reduced the chances of bias by excluding the researcher from the data collection process.

3.9 Data Management

Data from the paper-based questionnaire was amalgamated with the data derived from the online questionnaire in Qualtrics. The collective data was exported to Microsoft Excel for analysis and to illustrate the findings. The amalgamated data was stored on an encrypted personal computer in a locked office. The researcher was the only person with access to the office and the computer. No personal information was collected from participants, and therefore all participant data was anonymous. Raw data and Consent forms are stored in the office, and this information will be destroyed following the completion of the study. Creswell (2014) maintains that research data should be stored for a minimum of five years after the publication of the research.

3.10 Data Analysis

The data from the online questionnaire was captured in Qualtrics. There were seven paper-based questionnaires submitted and this data was entered into Qualtrics for amalgamation with the online data. The rationale for collating this information was to utilise the Data and Analysis functionality in Qualtrics to produce the necessary statistics and reports. The Qualtrics report was exported with the raw data numerically coded for analysis in Excel. Data cleaning was performed by comparing the raw data with the numerical data in Excel. Charts, tables, and descriptive statistics were produced to demonstrate the findings.

3.11 Conclusion

This chapter discussed the chosen methodology and the motivation for selecting the quantitative research method. The research aims and objectives were outlined to clarify the intended approach and rationale for same.

4. Chapter 4: Results

4.1 Introduction

The following chapter will discuss the findings and results of the methodology utilised to gather the data. The questionnaire results will be discussed in respects to the relevant central themes and objectives while focusing on the key elements of the research question. The chapter will begin by briefly discussing the main objectives of the methodology, the response rate and the participant demographics.

4.2 The main objectives of the methodology

The main objective of the methodology was to present to the participant a broad framework of themes and ideas obtained from the literature to support the research question. The explainer video was an essential element to the study, and it was initially presented to the participant for viewing before completing the questionnaire to provide a specific solution to point-of-care documentation. The explainer video presented the application of STT technology in a typical ward based scenario. It did not, however, suggest benefits or barriers to the use of STT technology in the healthcare environment. The thematic structure of the questionnaire was presented in a particular format as supported by the literature review and it was therefore designed to elicit an informed response. The questionnaire was distributed to nurses working in an acute hospital in Ireland, as discussed in detail in chapter 3. This form of probability sampling proved advantageous to this study as it was representative of the population as a whole. The main themes presented in the questionnaire will be discussed in relation to the findings. The main themes were as follows:

- The Explainer Video – Were key concepts addressed?
- Nurse documentation and current practice.
- Technology and nursing.
- Recently implemented technology and adoption.
- STT technology.

4.3 Response rate

There are approximately 180 whole time equivalent nurses working in the hospital. 79 nurses accessed the questionnaire resulting in a 44% response rate from the staff. However, one participant declined to consent, and three questionnaires were left incomplete. Therefore, the data analysis was derived from the remaining 75 respondents. The response rate for individual questions, related to the main themes, ranged from 95% to 100% where participants opted not to provide an answer to certain questions. The lowest response rate was to question 32 regarding the impact of STT technology on patient care, with 5% declining to provide an answer.

4.4 Participant demographics

The response rate to the demographic questions regarding the number of years the participant is qualified as a nurse was particularly poor with only 70% divulging this information. Of the 70%, the number of years qualified ranged from one year or less to forty-four years. The majority of respondents to this question (43%) were qualified for more than twenty years. Moreover, 85% of the respondents were qualified for eleven years or more. Although this is not an accurate representation of the entire sample, it does provide relevant insight into the profile of the participants (Figure 4.1).

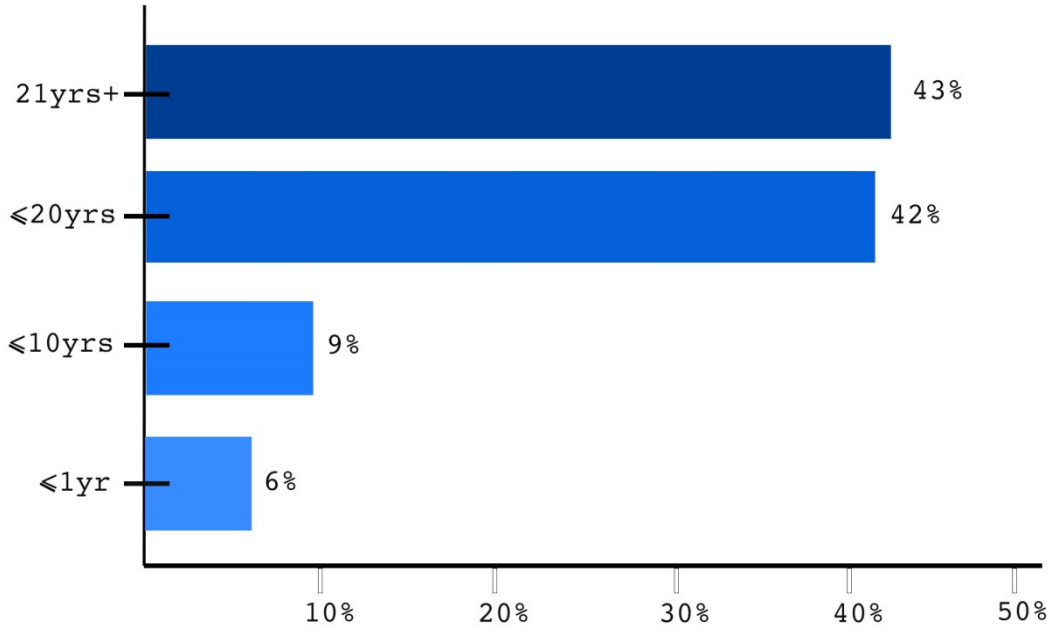

Figure 4.1: The number of years the participant is qualified as a registered nurse

The number of years qualified appears to correlate with the age profile of the participants considering that the majority of the participants have been qualified for more than eleven years. 92% of the participants are 30 years of age or more. The highest response rate of 48% is associated with the 40-49 year olds. The lowest response rate was 8% for the 18-29 year olds. This result could be reflective of the age profile of the nurses in the hospital as opposed to the overall response rate to the questionnaire. Furthermore, it is not surprising that the response rate from female nurses is exceptionally higher (93%) considering the majority of nurses in the hospital, and in nursing, are women.

4.5 The Explainer video – were key concepts addressed?

It was deemed appropriate to include a section in the questionnaire regarding the participant experience of interacting with the explainer video. The objective was to ensure that the participant understood the fundamental concepts outlined in the video. It was imperative that the application of STT technology to a familiar nursing intervention was communicated sufficiently as this was potentially the only frame of reference in respects to the technology for the participant as they proceeded to answer the questionnaire. A lack of understanding could lead to a lack of insight as they progress through the questionnaire thus affecting the outcome.

The response rate to the three questions regarding the explainer video was absolute with all 75 participants responding to each question. 64% strongly agreed, and 33% agreed that the video presented as per the explainer video was an excellent method for explaining new concepts. The remaining 3% of participants were undecided. These results were further supported by the findings in the remaining two questions.

The first question ensured that the ward based scenario was accurately portrayed. 88% felt that the video gave an accurate representation of a typical scenario, while 4% disagreed and 8% were undecided. Only 45% strongly agreed that the video presented an accurate portrayal of a ward-based scenario. Considering that nurses work in different wards and specialities this potentially could result in the participants being more critical when the presented scenario does not fit in with their experience. However, an overwhelming number of participants (96%) agreed that the STT technology was sufficiently explained in the video.

62% strongly agreed that the key concept was communicated. This encouraging result ensured that the majority of participants were well informed before completing the questionnaire (Figure 4.2)

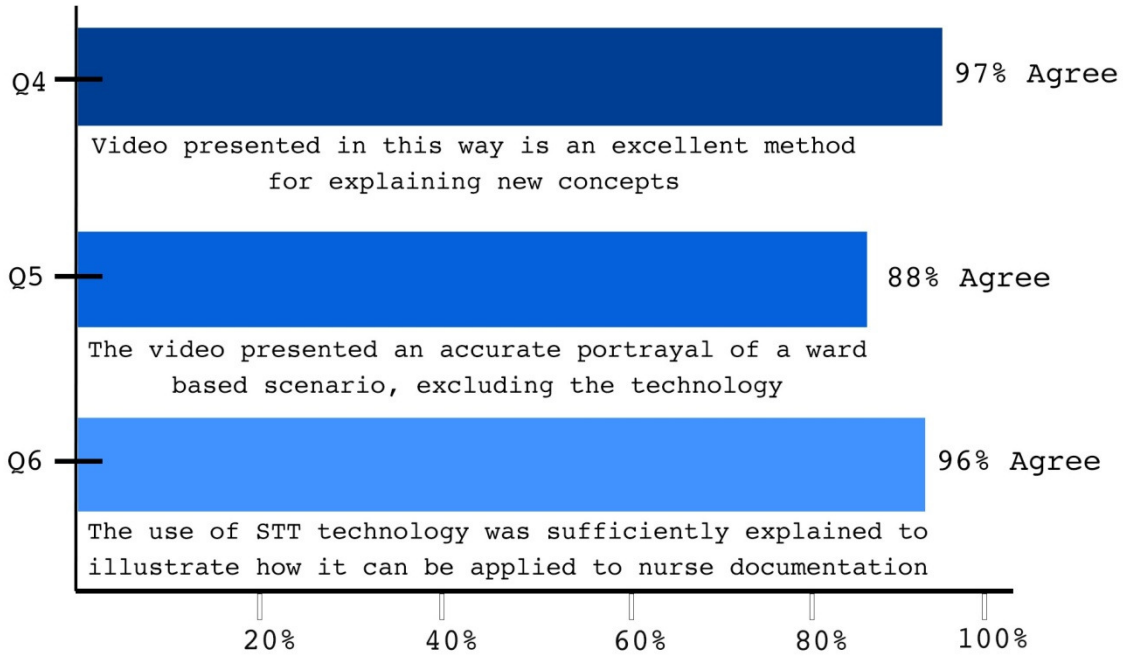

Figure 4.2: The use of the Explainer video to communicate key concepts

4.6 Nurse documentation and current practice

The following section discusses the current practice in respects to nursing documentation. The literature suggests that the transition from a paper-based document will be a significant challenge for nurses. Furthermore, point-of-care documentation is an essential aspect of nursing care as highlighted in the literature. The rationale for including this approach in the questionnaire was to provide a baseline for what is currently happening in the hospital regarding nursing documentation. Moreover, it was deemed appropriate to gauge the subject of point-of-care documentation to assess where and when documentation occurs and the reasons for same.

The response rate to the nine questions in this section was favourable with only two questions missing responses. Question 12 regarding the time that documentation occurs was missing two responses. Question 15 regarding the participants' feelings on the current method of documenting was also missing two responses.

The initial question in this section established if the current format for documenting was predominantly a paper-based record. 89% of participants' document in a paper-based record with only 3% of participants documenting in an electronic record. The remaining participants document into both a paper-based record and an electronic record. These findings provided an appropriate and necessary baseline as the participant progresses through the questionnaire. The questionnaire was devised on the presupposition that the majority of nurses in the hospital still document in a paper-based record. The video demonstrates how the electronic record could be used in a typical ward based scenario and a potential solution to enable point-of-care documentation. This established baseline and the remaining questionnaire provides the participant with an appropriate workflow as they progress through the questionnaire and consider the potential technological solution.

Participants were asked to identify any issues when documenting in a paper-based record. The literature suggested that there were a number of barriers such as illegibility, time consumption, locating the document and locating information within the document. These issues were presented as suggestions in multiple choice format. 72% of the participants felt that all of the suggested issues were applicable as barriers to documenting efficiently in a paper-based record. The remaining participants felt that some of the suggested issues were not relevant and opted to be more selective. However, 20% of the entire sample believed that time consumption was the most significant issue when documenting in a paper-based record, followed closely by illegibility (19%). Other separate issues identified included duplication of information, interruptions when completing documentation and too much paperwork. 99% of the nurses agreed that time spent at the patients' bedside is invaluable and extremely important. 88% strongly agreed with this statement. In direct contrast to these findings, nearly three-quarters of the participants document away from the patients' bedside (Figure 4.3).

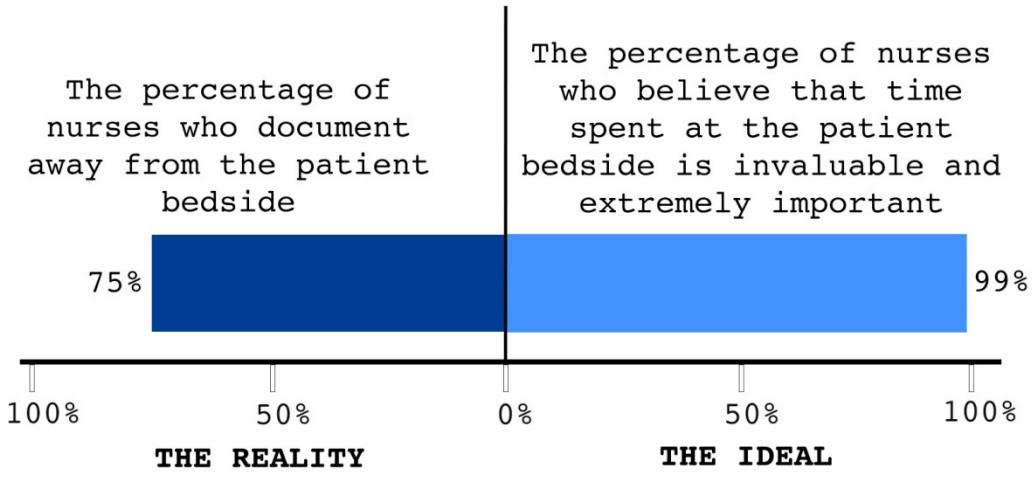

Figure 4.3: Point of Care – Reality versus the Ideal

The suggested rationale for documenting away from the patients' bedside includes interruptions, confidentiality issues, and too much noise. The literature provided the insight into forming this question and yielded the suggested answers. 66% of the respondents believed that all of the suggested answers were significant reasons for documenting away from the bedside. A further 21% opted to select individual answers (Figure 4.4). 13% of the participants decided to provide their own rationale including lack of space or lack of a designated area to document at the bedside. Other reasons included an inability to concentrate, the location of the notes in the office, and one staff member commented that it is the culture on the ward. The culture in a hospital or individual department can have a strong influence on adapting to change as evident in the literature.

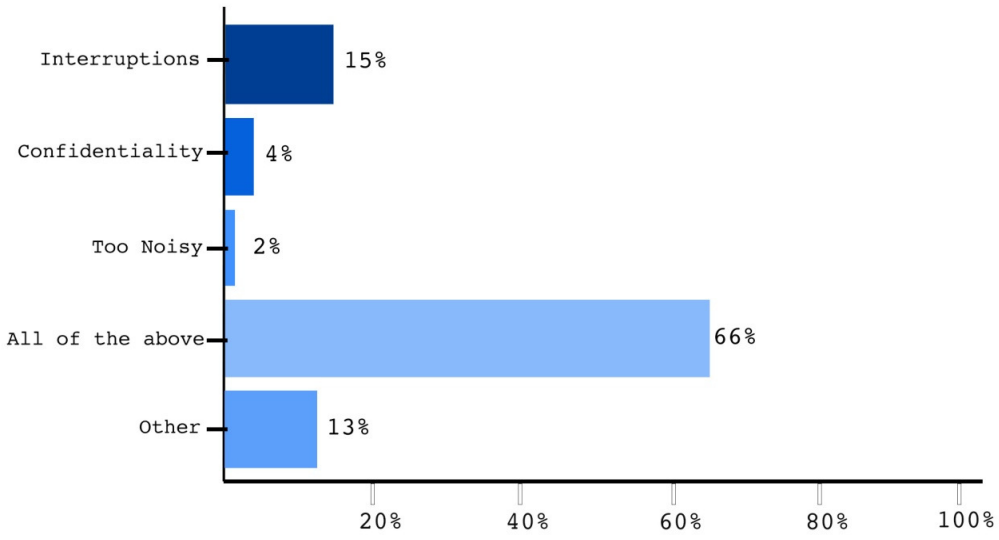

Figure 4.4: Identified issues when documenting in a paper-based record

The paper-based nursing record is often associated with retrospective documentation. The literature suggests that nurses will prioritise nursing care in favour of the need to complete documentation, often placing it low on the list of priorities. 70% of the participants completed their documentation retrospectively, with the same percentage of staff nurses feeling that they did not have enough time to document. When asked to prioritise nursing documentation in relation to other nursing duties, 51% of the nurse participants designated it from medium to low. However, nearly half of the respondents believed that documentation warranted a high to very high priority. The importance of nursing documentation as a duty of care potentially adds to the frustrations of nurses who evidently believe that barriers exist to point-of-care documentation and therefore inevitable retrospective documentation is not effective. Moreover, 75% of the participants asserted that the current method of documenting in the nursing notes was inefficient.

4.7 Technology and nursing

The literature would suggest that previous experience with technology can influence the adaptability of healthcare professionals to a new technology system. The nurses' experience with similar technology and their level of comfort when using it could potentially influence their opinion to the application of technology in the healthcare environment. The development of the National EHR and the technological supports required to allow for its implementation could prove more challenging if the nurse has limited experience with technology. It was therefore deemed prudent to gather this information to gain an insight into the previous technology experience of the participant and their beliefs in relation to its potential use in healthcare.

This brief assessment initially considered the participants' awareness of the development of the National EHR. A little more than half of the participants (54%) were aware of the impending National EHR. The literature would suggest that nurses are more willing to adapt to a new system if they have an awareness of its planned implementation and if they have been involved at an early stage. The lack of awareness among 46% of the participants could be an indication of the need to be more inclusive and informative as the eHealth Ireland strategy progresses.

The majority of the participants were comfortable with using technology such as computers, smartphones and tablets. 81% agreed that they have sufficient experience with this type of

technology. 7% of the participants were undecided, and 12% maintained that they had insufficient experience with this technology. 71% of the participants had experience of using all three devices. The remaining participants had experience with some of the devices. Smartphone use was rated the highest (20%). One participant declined to answer this question (Figure 4.5). Participants were asked if they believed that technology, in general, can add value to nursing care. All participants responded to this question with 96% of the nurses in favour of the application of technology in healthcare.

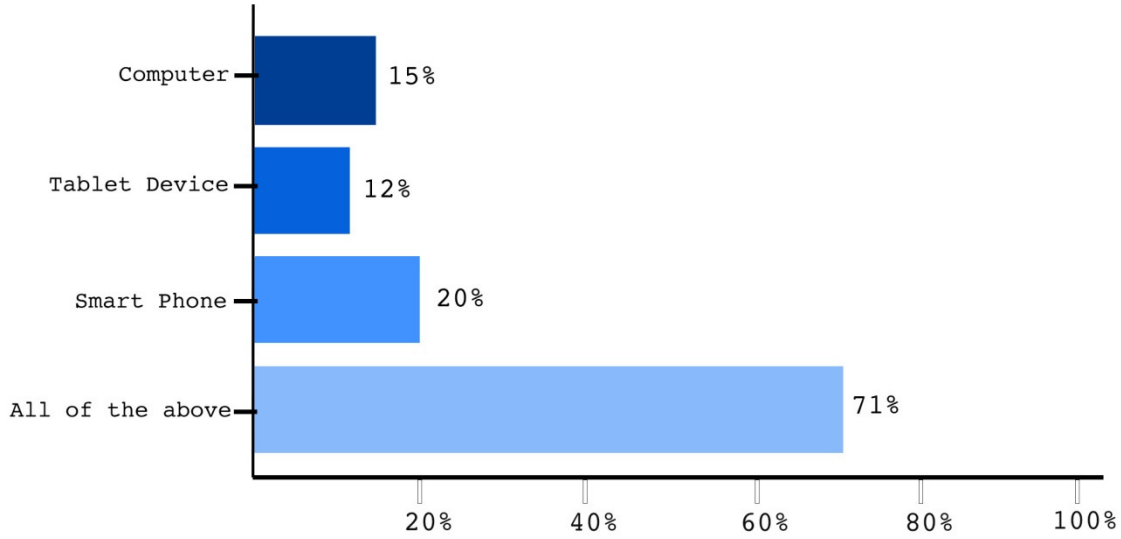

Figure 4.5: Participants experience using different technological devices

4.8 Recently implemented technology and adoption

The implementation and adaptation to a new technology system have been widely discussed in the literature. Adaptation can often be negatively affected by 'wicked problems' such as culture in a hospital, scepticism, lack of involvement, inadequate or ineffective training and lack of ongoing support. The following section was strategically introduced to illustrate the process, or potential lack, of adaptation to a recently implemented new technology system to replace an outdated system. Nurses were given the example of the introduction of the Blood Tracker system. This new system allows a nurse to track and trace a blood product before administering to a patient. It uses a handheld device that electronically captures the patient information and requires only one nurse to implement the procedure. The previous paper-based system required two nurses to capture all of the details in a paper record and manually

track and trace from the lab to administering the blood product. The adaptation issues identified above could reveal the participants previous experience with the implementation of the new technology and potential barriers that may have prevented or delayed the implementation of the new system. Furthermore, this previous experience could inform the remaining section of the questionnaire as the participant considers the potential use of a STT technology system to support documentation.

The culture in a hospital can have an influential effect on beliefs and the willingness to embrace change. However, more than half of the participants (55%) were initially sceptical about the new technology, and only 35% were reluctant to change and make a transition from the current system. A well-informed nurse is more open to change if they have been involved or informed at an early stage of development. 77% of the participants were made aware of the new technology and the impending change before notification about training. Furthermore, 92% of the respondents maintained that they received adequate training in the use of the new technology. The importance of training has been well documented in the literature and identified as a significant factor to implementation and adaptation. In fact, 100% of the participants agreed that training was essential when introducing a new technological initiative.

The effectiveness of the training is an essential prerequisite to early adaptation. The literature suggests that poor training and lack of support can result in regression and failure to adapt to a new system. 65% of the participants felt confident to use the new technology following the training. A smaller yet significant group (14%) remained anxious about using the new technology following the training. The successful implementation of a new system could be affected by a reluctant yet influential group of nurses. Hospital wide adaptation could be difficult if confidence in the new system is not absolute. However, 96% gained confidence in their abilities as time progressed. The NMBI (2015) assert that nurses need time to adjust to achieve competence. Adequate and effective training can provide essential tools to progress. Nonetheless, individual nurses can require more time to achieve competency and confidence in their abilities. It is evident from these findings that the nurses adapted to the new system. The level of involvement, training and support they received resulted in 91% of the participants agreeing that the new system was better than its predecessor.

4.9 Speech-to-Text (STT) technology

The format of the questionnaire up to this point was designed to provide a workflow for the participant as they consider the following section. Furthermore, the previous data should provide valuable insight to support the participants' opinion of STT technology to enable point-of-care nursing documentation.

There were ten questions related to STT technology making it the largest section in the questionnaire. The response rate to this section was favourable. However, the question with the lowest response rate was associated with STT technology. 5% of the participants declined to answer question 32 regarding the application of STT technology and its affect on patient care.

The initial question revealed a surprising finding with only 29% of the participants being aware STT technology before viewing the video. However, nearly three-quarters of the respondents (72%) believed that patient/ nurse interactions could be improved with STT technology. 27% were undecided, and only 1% of the participants disagreed. The following two questions were designed to prompt a response in association with previous sections of the questionnaire. 96% of the nurses could see the value of being able to document at the point-of-care. A similar percentage of respondents (93%) maintained that the use of STT technology in the healthcare environment would afford them more time at the patients' bedside. Moreover, 100% of the participants who responded to the question felt that patient care could be enhanced with the use of this technology. These findings appear to demonstrate a high level of support amongst nurses for the use of STT technology in the healthcare environment (Figure 4.6).

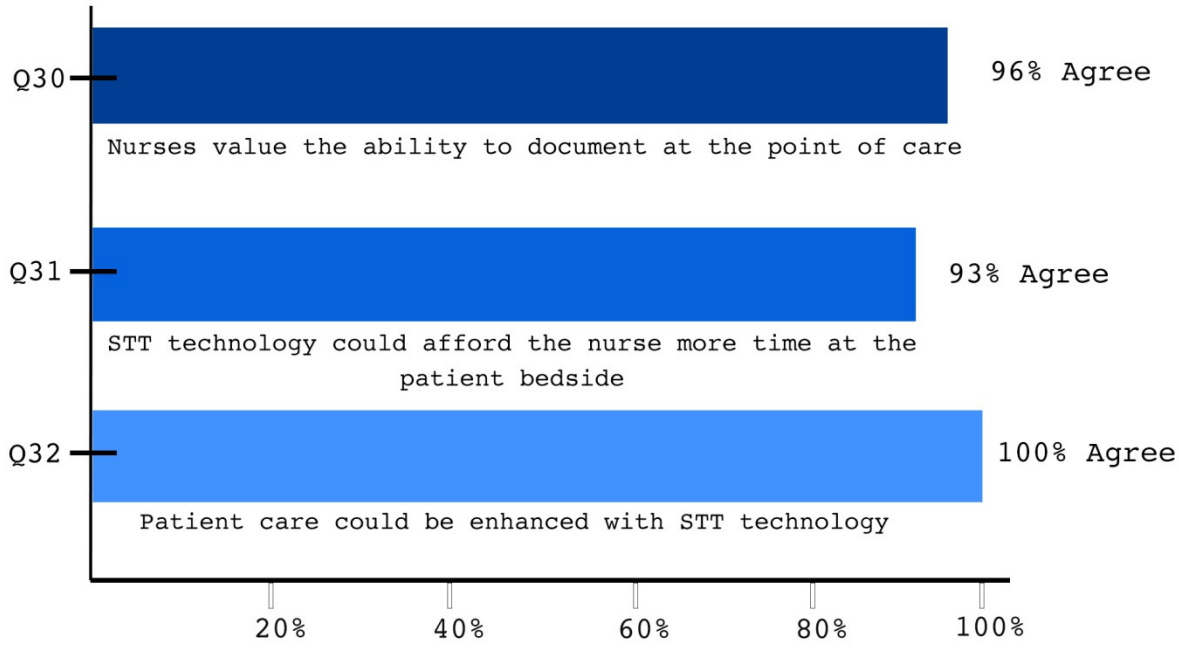

Figure 4.6: Point-of-care documentation and the benefits of STT technology

The literature provided the potential barriers that exist with the use of STT technology. These suggestions were included in the following question to provide the participant with relevant insight into existing barriers. Following the viewing of the video, it was imperative to offer these prompts considering their exclusion from the video. 47% of the participants who responded to this question believed that all of the suggested barriers could affect the use of STT technology in the clinical area. The remaining participants selected individual barriers. Noisy environments, interruptions, and confidentiality issues received similar recognition as potential barriers. The lack of confidence in the accuracy of the technology was perceived to be the least likely to act as a barrier with only 3% of the respondents identifying it as an issue (Figure 4.7).

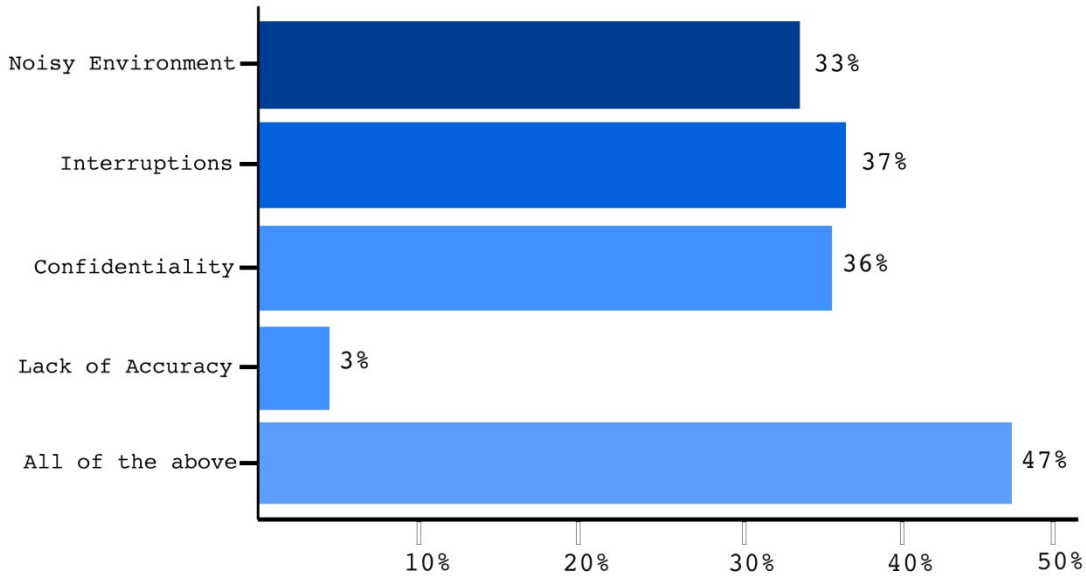

Figure 4.7: Potential barriers that exist with the use of STT technology in the clinical environment

A number of alternative suggestions were proposed as barriers to the use of STT technology in the clinical area. The lack of confidence in the accuracy of STT technology was suggested as a barrier in the questionnaire. The inability of the STT technology to capture enunciation could contribute to a lack of accuracy. The lack of accuracy was insignificantly identified as a barrier to the use of STT technology. However, a number of participants suggested a number of key contributory factors to a lack of accuracy including accent, pronunciation and the speed at which the speech is dictated. Respondents chose to elaborate on the third suggestion regarding confidentiality. One participant was fearful of other people overhearing what was being recorded, especially during the visiting hours. The lack of infrastructure to support this type of communication was identified as a barrier. The proximity of patients to one another resulted in a number of participants struggling with confidentiality. However, it was suggested by another participant that a single room environment would reduce the risk of a breach of confidentiality. Furthermore, infection control issues were raised as a concern. The respondent did not elaborate on this proposed barrier. However, the video portrayed the need to manually initiate the wireless microphone by pressing a button on the headset. The use of a non-touch technique is well recognised as the highest standard of care in infection control (Clare and Rowley, 2018).

Participants were informed that the introduction of an electronic record would require the need for typing using a keyboard. 19% of the participants maintained that they would prefer

typing into the electronic record as opposed to using STT technology. Nearly half of the respondents (47%) would prefer to use the STT technology and thus avoid having to type the nursing notes manually. Approximately one-third of the participants (34%) were undecided. The lack of experience using STT technology could be responsible for this indecision.

The literature would suggest that the introduction of STT technology for nursing documentation at the point-of-care would be a challenge for some nurses. Previous experience with technology and the nurses level of understanding regarding the application of STT technology in the clinical environment can directly affect their opinion of the technology before implementation. More than half of the participants (54%) believe that the transition to using STT technology would be a challenge as they do not frequently interact with technology. However, they feel it would be achievable with the right support and time. 43% of the participants maintain that STT technology would be easy to use as they are generally okay with the use of similar technologies. A smaller percentage of nurses (3%) would be concerned about the difficulty in using this technology. Nonetheless, they acknowledge the potential benefit to the patient. It was suggested in the questionnaire that STT technology has no place in the care of the patient and it would not benefit the nurse. Encouragingly, no participant agreed with this statement.

Successful implementation and adaptation to a new technology system can be dependent upon a number of factors as discussed in the literature. Involvement at an early stage of development has been directly associated with nurses accepting and adapting to a new system. The majority of the participants (82%) supported the findings in the literature by suggesting that they would like to be involved with the design and development of STT technology or similar technology. Moreover, 92% of the participants assert that their involvement at an early stage of development could ensure that nurses would accept the new technology.

4.10 Conclusion

The results of the questionnaire were discussed in this chapter with five main themes being presented. The explainer video was designed to communicate how STT technology could be applied in the clinical environment and it was imperative that the fundamental concepts were established. However, it did not provide instruction or consider the attributes of the system. The sequence of the questionnaire was essential to the outcome. This approach ensured that

the participant reflected on the current documentation process and subsequently considered future practice. The robust content could have dissuaded potential participants from completing the questionnaire. However, the logical sequence was designed to generate an engaged and enthusiastic response. The following chapter will discuss the results in combination with the findings in the literature review.

5. Chapter 5: Discussion

5.1 Introduction

The lack of research on the use of STT technology to enable point-of-care nursing documentation in Ireland illustrates the potential of implementing this technology to support the transition to an electronic record. However, nurses currently document in a paper-based record in the majority of hospitals in Ireland. The following chapter will explore the results of the questionnaire in conjunction with the literature review. The lack of a frame of reference as the participants consider the use of an electronic record and STT technology resulted in the sequence of events as the participant reviews their current practice and perceives the potential of interacting with the technology in the future.

5.2 Establishing a Frame of reference

The benefits and barriers towards the implementation of an electronic nursing record and the potential of STT technology to support point-of-care documentation could not be fully realised without establishing how this technology could be applied. The lack of a reference point for nurses is directly attributed to the current practice in Ireland. Twomey and Cummins (2010) maintain that the majority of nurses document in a paper-based record. This continues to be the current practice as the eHealth Ireland strategy progresses towards the implementation of a National EHR. Furthermore, 89% of the participants' document in a paper-based record, and this is reflective of the current practice in Ireland. The absence of an electronic nursing document or associated technical supports resulted in the production of an explainer video to provide a frame of reference for participants of the study.

Barry et al (2016) maintain that the Generation 'C' is defined by attitude as opposed to age. The propensity towards social media and learning online is dependent upon how *tech-savvy* the person is and their level of comfort with online media (Zhong, 2017). 92% of the participants were 30 years of age or older. In fact, the highest response rate was from nurses between forty and forty-nine years of age. Moreover, 81% of the participants are comfortable with using modern forms of technology such as computers, smartphones and tablet devices. 91% of the participants accessed the online video and questionnaire without apparent issue thus supporting the findings in the literature.

The lack of a reference point for nurses and the inability to visualise the fundamental concepts could have been devastating to the outcome of the questionnaire. The production of the Explainer video provided the necessary insight. The rationale for accessing an online video tutorial for learning, as opposed to other forms of media, is the videos ability to convey the intended message succinctly without the need for the presence of a facilitator (Kramer and Bohrs, 2017). 96% of the participants maintained that the STT technology was sufficiently explained in the video. This was a significant finding considering that 71% of the respondents were unaware of STT technology prior to viewing the video.

The Explainer video can clearly communicate key concepts in a short time frame (Barry et al, 2015). Moreover, online access to the video provided the participant with the ability to view the content at a convenient time. This approach expedited this initial process to progress with the remainder of the study. Bond (2008) suggested that the Explainer videos length should be no longer than 4 minutes to allow for the message to be communicated efficiently and to retain the concentration of the viewer. 97% of the participants agreed that the video was an excellent method for explaining new concepts and thus providing the essential frame of reference as they progress through the questionnaire.

5.3 The paper-based nursing record and identified issues

Documentation is an essential aspect of patient care and must be maintained to provide an accurate representation of the care that was given (NMBI, 2015). The implementation of an electronic record could exacerbate the existing frustrations associated with the paper-based record if they are not addressed. The transition could be extremely challenging for nurses and could result in poor adaptation (Dawson et al, 2014). The current issues with the paper-based record could provide valuable insight to inform the development and implementation of a new electronic system in Ireland. A review of the current documentation process and associated barriers will establish a baseline allowing for comparisons when considering the benefits and barriers of an electronic system.

Ajami (2016) asserts that nurses often view documentation as a burdensome task. Furthermore, Banner-Olney (2009) argues that the inability to access the right data at the right time adds to the burden. It has been suggested in previous studies that documentation is not a high priority for nurses when compared with patient care tasks (Kohle-Ersher, 2012). However, 91% of the participants believe that nursing documentation is seen as a medium to

high priority. Moreover, only 9% of the participants felt that documentation is a low priority. Therefore, barriers to efficient documentation can only add to nurses frustrations.

The literature suggests that illegibility, time consumption, locating the record and locating information in the record are issues associated with paper-based documentation. Illegibility can lead to errors in communication and inaccuracies with documentation. This can lead to delays in treatment for the patient (Prideaux, 2011). 72% of the participants believed that all of the suggested issues, including illegibility, were relevant. A further 19% of the respondents individually selected illegibility as an issue. Illegibility is clearly identified as a barrier to documenting in a paper-based record. However, Illegibility is not an issue when documenting in an electronic record, and this is viewed as a benefit of this system. Moreover, duplication was raised as a separate issue by a number of participants. A fundamental aspect of the eHealth strategy is to ensure the right person receives the right information at the right time, avoiding the need for unnecessary duplication (Department of Health, 2015)

The documentation burden associated with time consumption is often compounded by the inability of the nurse to document continuously and at the point-of-care. An accurate record could be maintained if a contemporaneous narrative could be recorded in the nursing notes. Moreover, the inability of the nurse to document at the point-of-care can result in retrospective documentation and poor time management. Many nurses experience frustration at having to document later in the day resulting in rushed entries that lack essential detail (O'Brien and Cowman, 2011). Nurses often have to remain on duty after their shift is finished to complete their nursing notes (Carter-Wesley, 2009). Time consumption was the most significant issue identified by the participants of the study. 99% of the participants believed that the time spent with the patient is invaluable and extremely important. Considering the level of priority associated with documentation, it is understandable that nurses are concerned with the issue of time management. 69% of the participants document away from the point-of-care, with an equivalent percentage of nurses documenting retrospectively. Moreover, 70% of the participants do not feel they have enough time to document in the nursing notes.

Interruptions, noisy environments and issues with confidentiality have been identified as barriers to point-of-care documentation (Blair and Smith, 2012, O'Brien and Cowman, 2011). 66% of the participants asserted that all of the identified barriers prevent the nurse from

documenting at the bedside. Interruptions were perceived as the most significant barrier to point-of-care documentation. 13% of the respondents provided other reasons for documenting way from the point-of-care. It was suggested by some of the participants that the culture on the ward can have an influential effect on the nursing process. Culture in a hospital can have a significant role in facilitating change. White and Scott (2015) maintain that nurses are more willing to change if it aligns with their values and beliefs.

Ajami (2016) asserts that the burden associated with the handwritten record can have the greatest negative impact on the nurse when compared with other issues. The findings above support the need to identify an alternative approach to facilitate point-of-care documentation. Blaire and Smith (2012) argue that the nurse will continue to view documentation as a burdensome task if it remains inefficient and reduces the amount of time at the patients' bedside. Moreover, 75% of the participants maintain that the current paper-based record is inefficient.

5.4 Adapting to an Electronic Nursing Record

The implementation and adoption of an electronic health record have been achieved successfully in other countries (Clarke et al, 2016). The continual progression of the eHealth Ireland strategy and the gradual introduction of the national EHR allows for an informed approach as a consequence of other countries progressing at a faster rate. It has been well documented in the literature that a transition to an electronic health record can be extremely challenging and unpredictable (Maillet et al, 2015, Duffy et al, 2010). However, acceptance models focus on the nurses' perceptions on the usefulness of technology and the implications for the patient (Duffy et al, 2010). Previous studies have demonstrated that certain barriers can hinder the adoption of an electronic record. These barriers include a lack of experience with technology, a lack of education, inadequate support, and insufficient involvement in the early stages of development (Blair and Smith, 2012).

Volmer et al (2014) argue that anxieties regarding technology can have a negative impact on adaptation. Moreover, the lack of education and support with using the technology creates a barrier to point-of-care documentation. Nurses with previous experience of using similar technology are less reluctant to interact with new technology, and therefore they are more willing to adapt to the new system (Fratke et al, 2014). 100% of the participants have interacted with mainstream technology such as computers, smartphones or tablet devices.

Moreover, 81% of the participants maintain that they are generally comfortable with using these devices. Considering the age profile of the participants this result may be indicative of the attitude associated with the Generation 'C'. Furthermore, this is an encouraging finding as it may reflect the attitude of nurses and their willingness to adapt to new technology. Colligan et al (2015) believe that it is crucial to identify nurses who may require extra support with the use of technology at an early stage to facilitate adaptation. Training and support should be determined by the experience of the user and not by other factors such as age. Establishing the previous experience with technology could be a key indicator in assessing a nurses adaptability to a new system.

eHealth Ireland are concerned with the digital maturity of the organisation and their readiness to deliver care digitally as the eHealth strategy progresses. Assessing the infrastructure and capabilities of the institutions is paramount to this process. Moreover, it is essential that healthcare professionals be informed and made aware of the impending transition at an early stage. Involving the healthcare professionals at an early stage of development will help foster an attitude of adaptation. Nielsen (1992) argues that the pre-design stage could be well informed by engaging with the user of the technology. Developing an understanding of the workflow and processes can facilitate the integration of a new system. Furthermore, nurses are more willing to accept the new system if it benefits the patient (Wheatley, 2017). This approach is only possible if healthcare professionals are well informed. However, half of the participants were unaware of the development of a National EHR. The eHealth strategy was published in 2013 and continues to progress towards the implementation of the national EHR. The digital maturity assessment tool is representative of the interaction that must happen to inform the healthcare institutions of the requirements in preparation for the transition to electronic records. Nonetheless, this could potentially act as a barrier to adaptation if the nurses working at the front-line are unaware of the impending changes.

5.5 STT technology to support point-of-care documentation

Colligan et al (2015) maintain that a nurses perception of a technological system can change over time as it progresses from the development to the implementation of the system. Moreover, the nurses' attitude towards the system can be significantly affected by the emotional impact. Dawson et al (2014) reveal that nurses had positive expectations with the

use of STT technology when it was initially suggested as a method to facilitate point-of-care documentation. Indeed 72% of the participants of this study believe that the interaction between the patient and the nurse could be improved with the use of STT technology. Furthermore, the majority of the respondents (92%) perceive that the application of this technology to support point-of-care documentation could afford them more time at the patient bedside. These findings are supported by Fratzke et al (2014) who assert that the preservation of time for direct patient care is of paramount importance to the nurse.

However, nurses views and opinions can change following the implementation of STT technology. Johnson et al (2014) maintain that nurses had the lowest expectations of the accuracy of STT technology following its implementation. The findings in this study are significant and represent the perceptions of nurses to the potential use of STT technology. Nonetheless, experiential learning and the application of STT technology to current practice could produce an informed alternative response. The introduction of a new system should align with existing practice. If nurses struggle to adopt the new system to their workflow, this will result in frustration and poor adaptation (Duffy et al, 2010).

The current method of documenting in a paper-based record (89% of participants) and the frustrations with existing practice can encourage nurses to welcome alternative solutions. Retrospective documentation and associated issues can reflect poorly on existing practice. Considering that 75% of the respondents believe that the current method of documenting is inefficient. Moreover, 70% of the participants document retrospectively and a further 70% document away from the patient bedside. 99% of the nurses value the time spent at the patients' bedside with a further 96% supporting point-of-care documentation. These collective findings can lead to frustrations associated with existing practice, and this can engender an enthusiastic attitude towards change. However, the successful planning, development and implementation of STT technology in the healthcare setting are dependent upon a number of influential factors. These include the challenges associated with introducing new technology and acknowledging existing barriers to the implementation of STT technology. The importance of training and the need to involve the nurses in the early stages of development are essential prerequisites to adaptation. Moreover, the transition from a paper-based record to an electronic record will be a challenge further compounded by the need to document at the point-of-care. This could be particularly demanding considering that point-of-care documentation is not part of the current workflow.

5.5.1 Implementing new technology and associated challenges

Wheatley (2017) argues that the focus of the nurse is on the impact new technology will have on patient care and whether it will add value to nursing care. 96% of the participants believe that technology can add value to nursing. Moreover, 100% of the nurses maintain that patient care could be enhanced with the use of STT technology. These encouraging results are reflective of a perceived benefit derived from viewing the Explainer video as opposed to practical experience. However, 91% of the participants champion the use of recently implemented technology, claiming that it is better than the previous system. Moreover, 55% of the respondents were initially sceptical about the implementation of the new technology. The provision of adequate support and appropriate education were pivotal to the successful implementation of this new technology. The participants strongly advocated the support and training they received. 77% of the participants were informed about the impending changes prior to the commencement of training. Involving nurses in the early stages of development prior to the implementation of new technology is a key factor in adaptation (Waneka and Spetz, 2010). Furthermore, 92% of respondents indicated that they received adequate training in the use of the new technology. These findings illustrate the importance of training and support when implementing a new technological system. 81% of the participants were comfortable with using modern technology. Nonetheless, 55% were sceptical about the use of technology in the healthcare environment. Several studies agree that the challenge for nurses for adapting to new technology is dependent upon the impact it has on the patient. Moreover, previous experience with technology can have a positive influence on the attitude towards the potential use of technology in the healthcare environment, but not at the expense of patient care (Fratzke et al, 2014).

5.5.2 Acknowledging existing barriers

Several studies agree that barriers exist with the implementation of STT technology in the healthcare environment. STT technology can be perceived as a solution to point-of-care documentation prior to its implementation. However, barriers to adaptation will become detrimental to progress if solutions are not provided. Collaborative communication between the healthcare professional and the vendor will facilitate adaptation and help prevent premature disengagement (Johnson et al, 2014). Moreover, the learning gained from

previous studies can inform the planned implementation by addressing the barriers before they become an issue. Noisy environments, interruptions, confidentiality, and accuracy are suggested barriers to the use of STT technology in the clinical setting (Wheatley, 2017).

5.5.2.1 Noisy environments

100% of the participants agree that the suggested barriers could prevent successful implementation with 47% of the participants suggesting that all of the barriers could be apparent following implementation. Noisy environments are associated with a lack of accuracy when using STT technology. Fratzke et al (2014) argue that repeated entries into the nursing notes or the need to alter the captured record can lead to frustration. 80% of the respondents identified noisy environments as a barrier to using STT technology. However, technology continues to improve voice capture and noise cancellation capabilities resulting in a more accurate data collection (Klie, 2016). Improved accuracy can only be experienced through continued use of the device (Derman et al, 2010). Participants of this study would gain a better insight into the accuracy of the technology if they were able to use it in their clinical environments. Perceptions of the use of STT technology as opposed to experiential learning is a limitation of this study.

5.5.2.2 Interruptions

Interruptions to the workflow can have a serious negative impact on patient care (Chavis, 2012). 84% of the participants acknowledge that interruptions could act as a barrier to the use of STT technology. However, 70% of the respondents do not currently document at the point-of-care in a paper-based record because of interruptions. Moreover, interruptions act as a significant barrier to point-of-care documentation in an electronic record. The need to document at the point-of-care in an electronic record will often involve the need for a computer at the bedside. Kohle-Ersher (2012) discovered that half of the participants in their study recognised that the presence of a computer at the patient bedside was also a barrier. Patient perceptions of technology can accentuate the existing barriers. The presence of a computer at the bedside could be intimidating to a patient. The discreet nature of STT technology could help alleviate this barrier. However, this does not prevent the issue associated with interruptions. The human element associated with this unavoidable barrier is referred to as a wicked problem. Wicked problems are not easily described and are even more difficult, if not impossible, to solve due to the unpredictable nature of human

intervention (Hevner et al, 2004). It is apparent that issue of interruptions transcends paper-based documentation and is reflective of all point-of-care documentation. Therefore, interruptions by the patient specifically should be seen as an opportunity to engage with the patient about their care. Patient cantered care is strongly advocated as part of the transition to an electronic record. IPPOSI recommend that the patient should be given the opportunity to engage with the healthcare professional to acknowledge the importance of involving them in their care and decision making (IPPOSI, 2017).

5.5.2.3 Confidentiality

Confidentiality is clearly addressed in the literature and raised as a concern when using STT technology to facilitate documentation at the patient bedside. The majority of participants (92%) agree that the use of STT technology would afford them with more time at the patient bedside. However, 83% of the respondents expressed a fear that confidentiality could be at risk when using this technology. Johnson et al (2014) challenge the issue of confidentiality asserting that the technology is constantly evolving. Wheatley (2017) maintains that voice capture technology is continuously improving and reducing the need for speaking loudly into the STT microphone. Additional supportive technologies are being produced to facilitate confidentiality. Hushme is a personal acoustic device that can suppress or mask the human voice in open environments and is specifically designed to facilitate confidentiality (Gethushme.com, 2018). Moreover, incidental disclosure is an acceptable norm in nursing, whilst ensuring that discretion is maintained when dictating the nursing record to facilitate confidential capture of information (White and Scott, 2015). 96% of the participants acknowledge the value of being able to document at the point-of-care thus encouraging nurses to identify a solution to this barrier.

5.5.2.4 Accuracy of STT technology

Prideaux (2011) assert that the provision of an accurate record is fundamental to ensure high standards of documentation. Nurses are often concerned with the accuracy of STT technology and its ability to capture the right information. The accuracy of STT is dependent upon human interaction and the level of experience of the user (Wheatley, 2017). It is recommended that continual use of the technology will produce more accurate results. The provision of training and support will encourage initial use. However, competency can only be achieved through continued use (NMBI, 2015). 63% of the participants were confident on

the initial use of recently implemented technology in the clinical environment following training. However, 96% gained competence with the new technology following continued use and time to adjust. Derman et al (2010) asserts that six to eight weeks of continued use of STT technology will facilitate adaptation. Nurses need to be continually supported throughout this process and encouraged to persevere with the difficulties encountered with the technology. Nurse leaders must support nurses when making a significant change to practice. The introduction of Super-users or Champions to the clinical area is recommended to facilitate the implementation of STT technology and offer support when encountering barriers.

5.5.3 The importance of training and support

Education and ongoing support are central to the successful implementation and adoption of STT technology in healthcare (Al Masslawi et al, 2016). The NMBI (2015) assert that competency can only be achieved through experience and time. However, education is essential and establishes confidence in the ability of the nurse. Therefore, the successful implementation of STT technology would be dependent upon appropriate training, adequate support and the introduction of 'Super-users' in the clinical setting (Dawson et al, 2014). Furthermore, it is imperative that nurses receive adequate training prior to the introduction of the technology to the clinical environment. 92% of the participants affirm that they received adequate training prior to the implementation of a new technological initiative. Moreover, only a limited number (14%) remained anxious on initial use of the technology in the clinical area following the training. This significant result reflects the impact technology can have on the nurse and the positive outcome achieved from providing adequate training. Anxiety and frustrations with technology as a result of poor education can result in poor adaptation and premature disengagement (Johnson et al, 2014). 100% of participants expressed the importance of training when introducing a new technological initiative.

The benefits of using a STT technology system can only be fully realised if the user has received appropriate training. Barriers to the use of technology, in part, can be avoided if the nurses feel adequately prepared to use the system in the clinical environment. Furthermore, ongoing support will generate confidence in the technology and ensure it aligns with the workflow. More than half of the respondents (54%) acknowledge that the transition to using STT technology would be a challenge, but they feel it would be achievable with the right

support and time. 42% of the participants maintain that the previous use of similar modern technology will facilitate the use of STT technology in the healthcare setting. The literature suggests that nurses are initially enthusiastic about the potential use of a new system. However, anxieties and frustration can manifest in response to the existing barriers if they are not addressed. Education and support are pivotal in retaining the enthusiasm and involvement of the user as they make the challenging transition to using the STT technology.

5.5.4 Involving nurses in the early stages of development

Nurses are more willing to engage with new technology if their opinions are respected (Ajami, 2016). Moreover, Fratzke et al (2014) maintain that nurses should be involved in the early stages of development of a new system to ensure adaptation. Prior knowledge of the impending changes to practice was instrumental in the successful implementation of new technology. 77% of the participants reveal that they received information about a new system prior to notification about the training. Advanced notification combined with adequate training resulted in 96% of the participants gaining competence in a new technology system. It is the responsibility of the vendor to ensure that the design of a new system is compatible with the workflow in the clinical area (Maillet et al, 2015). Iterative design is a cyclical process of continually refining a system based on the users' experience. Nielsen (1992) argues that involving the healthcare professional in the early stages of development is critical to adaptation. The unpredictable and stressful nature of the clinical environment justifies early collaboration with healthcare professionals to ensure the technology aligns with expectations. Nurses are continually concerned with the impact practice will have on the patient. Involving the nurse at an early stage of development provides the professional insight to ensure the new system will enhance patient care. 100% of the participants perceive that STT technology could enhance patient care. However, 82% of the respondents would like to be more involved in the development of similar technology, and 92% of the nurses assert that the involvement in the early stages of development will facilitate the acceptance of new technology. The professional knowledge and experience of the nurse can have a significant role in providing safe and effective patient-centred solutions (Waneka and Spetz, 2010).

5.5.5 Documenting at the point-of-care

Point-of-care documentation is an idealistic endeavour seldom realised in practice (Blair and Smith, 2012). Barriers exist to hinder point-of-care documentation when using a paper-based

record, an electronic record, or supportive technology such as STT. However, the ability to capture a contemporaneous account of patient care is invaluable to a nurse. 96% of the participants support the value associated with point-of-care documentation. The nursing and midwifery boards of Ireland and the UK assert that documenting at the time the care is provided ensures a true and accurate narrative of events (The NMBI, 2015, The NMC, 2010). Point-of-care documentation can facilitate an accurate approach to recording the patient care. Furthermore, point-of-care documentation is a fundamental aspect in the implementation of an electronic record (Stokowski, 2013, Kohle-Ersher, 2012). Retrospective documentation is identified as a burden, and 99% of the participants value the time spent at the patient bedside. Moreover, the respondents argue that there is too much time spent on documenting retrospectively away from the patient bedside. Considering that the majority of nurses (70%) document retrospectively in a paper-based record, the transition to an electronic record and point-of-care documentation will be a significant challenge. STT technology could provide a solution but it could also hinder the delivery of care. The frustration associated with retrospective documentation is accentuated by the need for the nurse to remain on duty to complete the patient notes (Carter-Wesley, 2009). STT technology can facilitate point-of-care documentation allowing for continuous capture of the nursing narrative. Barriers can be diminished with adequate training and support. The outcome should result in the continuous use of the device and increase the probability of adaptation. The benefit derived from point-of-care documentation utilising STT technology can be fully realised if the barriers are addressed before nurses become frustrated.

The value of point-of-care documentation must be acknowledged. The delay that occurs with retrospective documentation can result in communication errors and loss of information. This can have devastating consequences for patient safety (Al Masslawi, 2016). Chavis (2012) maintain that the time spent at the patient bedside is fundamental to nursing care and the achievement of patient objectives. 98% of the participants support the importance of time spent at the patient bedside. Nurses are willing to engage with alternative approaches to providing patient care as they currently struggle to document efficiently with a paper-based record. Previous experience with modern technology and recently implemented technology in the healthcare environment has encouraged nurses to be more receptive to technical solutions. 96% of the respondents believe that technology can add value to nursing care. Moreover, 100% of the respondents support the potential use of STT technology to enhance

patient care. Barriers to point-of-care documentation will always exist. However, continuous support and pre-emptive solutions could facilitate the use of STT technology to enable point-of-care documentation.

5.6 Conclusion

The discussion chapter reviewed the findings in the survey in the context of the existing literature. The limited research on the use of STT technology in the healthcare environment has resulted in a lack of evidence to support the use of STT technology to support point-of-care documentation. However, the findings in this study encourage the use of STT technology provided that appropriate measures are in place prior to the implementation of the technology. The concluding chapter will discuss the key findings as consideration is given to the implications for future research. Furthermore, the limitations of the study will be discussed in the final chapter.

6. Chapter 6: Conclusion

6.1 Introduction

The exploration for an alternative solution to documentation originated from informal feedback from nurses expressing their frustrations with the current nursing record. The research aimed to explore the potential to use STT technology to support point-of-care documentation. Moreover, the transition from a paper-based record to an electronic record could be extremely challenging for nurses in Ireland. Irish nurses were asked to consider the benefits and barriers towards the implementation of an electronic nursing record and the potential to use STT technology to support point-of-care documentation. It was envisioned that the key findings could provide an insight to inform the process of implementing a new technology system in the healthcare environment. The key findings will be discussed below as consideration is given to the implications for future research. Furthermore, the limitations of the study will be discussed.

6.2 The key findings

The increased burden of complex documentation and associated professional responsibilities has the potential to be escalated by the introduction of an intimidating change such as the implementation of an electronic nursing record. The transition from a paper-based record could make this particularly challenging. Point-of-care documentation represents the highest standard of patient care. Nurses acknowledge the value of point-of-care documentation and recognise the positive impact for the patient. However, existing barriers and frustrations with the current nursing record contribute to the practice of retrospective documentation and completing documentation away from the point-of-care. In contrast to the literature, the majority of respondents in this study assert that documentation is a high priority. These findings further compound the frustrations experienced with documentation. The challenges associated with maintaining point-of-care documentation in a busy healthcare environment result in the nurse being open to suggestions about alternative approaches to documentation. Moreover, the transition to the use of an electronic record will necessitate point-of-care documentation. The literature review identified the challenges associated with the implementation of an electronic record and new technology. However, a key finding of this research was the willingness of nurses to embrace change associated with the

implementation of new technology. Previous experience with modern technology appears to have a positive influence on the perceptions towards the implementation of technology to support patient care. The literature would suggest that nurses' focus on the impact new technology will have on patient safety and if it will add value to patient care. Both the literature and the findings of this research demonstrate the positive perceptions nurses have on the potential use of STT technology in healthcare. Nonetheless, the reality in practice can quickly lead to frustration as the nurse experiences associated barriers to the use of the technology.

Limited previous research reveals that there are existing barriers to the use of STT technology. Moreover, the findings in this study support the literature. The perceptions of the participants confirm that the barriers identified in the literature could have implications for the adoption of STT technology. Barriers are unavoidable and a consequence of implementing new technology for the purpose of documentation. However, addressing the issues and providing solutions before the barriers result in disengagement from using the technology, could produce a favourable outcome. Furthermore, the benefits of the technology could be fully realised.

Although barriers exist to the use of STT technology, similar barriers exist with current paper-based documentation and electronic records. The initial enthusiastic approach that nurses demonstrate towards the new technology must be encouraged by nurse leaders and supported appropriately as they make the difficult transition. The positive attitude demonstrated by the participants of this study towards the use of STT technology is reflective of the potential benefits of its application in the healthcare environment. The participants strongly acknowledge the potential of STT technology to enable point-of-care documentation and to enhance patient care. Moreover, the benefit associated with the potential for STT technology to increase the time spent at the patients' bedside is invaluable. Therefore, if point-of-care documentation is best practice and STT technology could facilitate this process, then adequate supports should be implemented to avoid or lessen the negative impact of associated barriers. The literature demonstrates that continued unhindered use will result in adaptation. However, frustrations associated with barriers will result in premature disengagement.

Education, continuous support, and involving nurses in the early stages of development are fundamental to ensuring adaptation to new technology. Moreover, the findings in this research support these fundamental requirements considering the participants acknowledge the benefits of STT technology and the potential barriers to its implementation. Education was instrumental to the implementation and resultant adoption of a new technology system. 100% of the participants advocated the importance of training when implementing new technology in the healthcare environment. Knowledge and skills are central tenets in the achievement of competency in nursing and cannot be facilitated without education. The importance of involving nurses in the early stages of planning and development must not go unrecognised as a significant contribution to adaptation. The findings in this research illustrate the importance of informing the nurses prior to the implementation of a new system. Scepticism was transformed to acceptance of a new technology system with prior information, support and education. Approximately half of the respondents in this study are unaware of the impending National EHR. This is a significant finding considering the support demonstrated for the involvement in the early stages of similar projects. The transition to an electronic record could be facilitated to a greater or lesser extent by the level of involvement of nurses at the front line.

The overwhelming support for the potential use of STT technology in the clinical environment to enable point-of-care electronic documentation should encourage the possibility of implementing similar technologies. However, existing barriers must be acknowledged and highlighted with users of the technology. Adoption is only possible if the users are informed, supported, and fully prepared to engage with the technology and the potential pitfalls. The barriers to the use of STT technology in the clinical environment and potential solutions are outlined in table 6.1.

Barriers to facilitating point-of-care documentation with STT Technology	
STT Technology - Barriers	**Solutions**
Noisy Environments	- Noise cancelling technology continually improving. - Improved accuracy of capture. - Continual use of the device.
Interruptions	- Reframe and consider as an opportunity to engage with the patient and team members
Confidentiality	- Technology is constantly evolving reducing the need to speak loudly for voice capture. - Additional supports can facilitate confidentiality – Hushme Tech. - Discretion should be maintained when capturing the voice, similar to speaking with a patient at the bedside (incidental disclosure).
Accuracy – Voice capture, Accent, Speed of dictation	- Adequate training - Continuous support from vendor, nurse managers and super-users. - Continuous use and time to adjust.
Inadequate Support	- Continuous support from vendor, nurse managers and super-users
Lack of Education	- Adequate education prior to implementation. - Feedback to ensure training was appropriate. - Continuous support.
Not being involved at an early stage	- Involve all relevant stakeholders at an early stage – inform, address concerns and consider changes to adapt to workflow.
Lack of experience with technology	- Support individual staff members. - Address anxieties/ concerns regarding the use of technology. - Provide training/ support necessary to individual needs.
Infection prevention and control	- Hands free technology - Education regarding infection prevention when using the device.

Table 6.1 Barriers to the use of STT technology and potential solutions

6.3 Limitations

It is essential to acknowledge the limitations of the research and reflect on the nature of such limitations. Researcher bias, selection bias and the chosen methodology could potentially

impact the quality of the data. Researcher bias could have an impact on the outcome of the study considering the lead researcher is known to the participants of the study. Every effort was made to ensure an unbiased response by providing a self-administered questionnaire and an anonymous collection of data. However, the Hawthorne effect is a common phenomenon in research bias where the participants are influenced by the connection with the researcher and therefore provide a modified, as opposed to an honest, response (Campbell et al, 1995). The information and consent sheet was explicit regarding the anonymous gathering of data and consequently should encourage a critical reflection on the subject matter prior to submitting a response.

Selection bias can occur when the intended randomisation is not achieved and therefore the sample is not representative of the population (Smith and Noble, 2014). All eligible nurses were invited to participate in the study; however, some of the prospective participants may have been intimidated by the technical aspect of the subject matter and opted out of the study. Moreover, the predominant response to the online questionnaire potentially could have attracted participants who are in favour of technology and therefore subjected the research to Volunteer bias, a pervasive form of selection bias. Nonetheless, the provision of a paper-based questionnaire and the potential to include all eligible participants should have restricted this form of bias.

Limitations potentially existed with the chosen methodology. There are many benefits of using self-administered questionnaires. However, some of the questions may have been ambiguous and required further clarification before providing an answer. The absence of the researcher may have left the questions open to interpretation. Questions regarding perceptions towards the use of STT technology may have required further clarification due to a lack of practical experience. Multiple choice questions can prevent ambiguity by providing suggested responses. However, providing the barriers to STT technology may have limited the participants' perception and encouraged a forced response. The provision of an explainer video that intentionally lacked details regarding the potential barriers resulted in the inclusion of the existing barriers in the questionnaire. Moreover, the explainer video can only elicit a perceived response as opposed to the potential to gather data based on experiential learning from interacting with the technology.

6.4 Recommendations

The key concepts were communicated sufficiently using the explainer video, thus providing a strong rationale for utilising this approach. The use of video as a method for explaining challenging concepts could be used appropriately prior to implementing new technology. Video could be instrumental for educating healthcare staff about new technology or informing participants prior to a study. However, the limitations with using an explainer video can become apparent in practice as healthcare professionals struggle to adapt the technology to their workflow.

It is imperative that education and continuous support will encourage adaptation. Healthcare professionals must be supported and encouraged to apply themselves to a new technology system for a significant duration prior to providing critical feedback. This will be an intense adjustment period for staff and they must be supported by vendors, nurse leaders and super-users. Previous studies have reviewed the potential to use STT technology in the healthcare setting, often demonstrating the frustration associated with the early adjustment to the technology. However, sufficient time must be given to allow for adaptation. Nurses need time to adjust to change and gain competence in a new system. This research demonstrated that the process of adaptation should be established prior to reviewing a newly implemented system in order to gain a comprehensive review of the system. Therefore, conducting research prior to the implementation to ascertain a baseline, reviewing the progress during the adjustment phase, and following up with a review after adaptation will elicit more robust data. The sample size may not be reflective of the wider nursing population in Ireland. A more robust longitudinal national study could reveal alternative results.

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Appendix A: Patient Persona and Staff Nurse Persona

#hello my name is… John Marry

Bio:
John is a senior surgical staff nurse who is passionate about his nursing career. He believes that time spent at the patient's bedside is the most beneficial to both patient and nurse. The constant need to document can be frustrating.

Role:
John has been working in the surgical ward for 15 years since commencing work with the hospital.

Location:
Surgical 1 – acute surgical intervention

Goals:
John has 2 children and he manages to balance his home life and work life. He is very driven and makes continuous efforts to develop and progress professionally.

Frustrations/Fears:
Activity on the ward has increased in the last 5 years. John feels that the current system does not support the efficient delivery of care. The constant threat of litigation is a fear.

at a glance

Age: 42

Family Status: Married

Education: *Nursing Degree*

Role: Senior surgical nurse

Personality

Extrovert – Introvert

Organised – Disorganised

Emotional – Rational

Technology:

Broadband Access

Smartphone/Tablet

Internet Usage (Low – High)

Tech Comfort (Low – High)

Scenario: Post operative care and documentation

Actors: Patient, surgical staff nurse, theatre nurse.

John prepares to receive patient from theatre following surgical procedure at 11.00. Patient returns post operatively to ward at 11.10. Handover is received from the theatre staff. Patients orientation and consciousness level checked on initial return to ward.

Oxygen administered via nasal prongs at 2litres. Observations recorded as per Early Warning Score (EWS) chart and hospital post operative policy. Pain Score assessed using pain scale. Oral hygiene attended to. Intravenous fluids administered as per drug kardex. Wound assessed and remains dry & intact. Urinary catheter out put recorded. Patients family contacted as per the patient request, to inform of return to ward.

Nursing documentation is written into the nursing notes at 19.00. This is the normal routine regarding time of documentation. The retrospective documentation often is recorded away from the patient in the nursing office. All of the postoperative details above are recorded in the nursing notes. John is continuously frustrated by the need to document retrospectively. He feels timely documentation at the point of care would be best practice.

Appendix B: Link to online film and screen shots

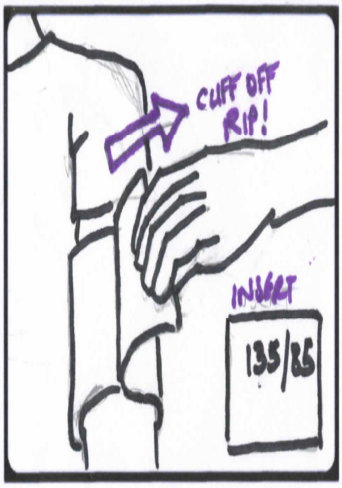
Video Title 'Nursing the Patient, Not the Notes' -
https://www.youtube.com/watch?v=MwwRXx4dSsI

The Story Boards -

Name of Project: NURSING THE PATIENT , NOT THE NOTES Group Members: DIKSON ISEHAN

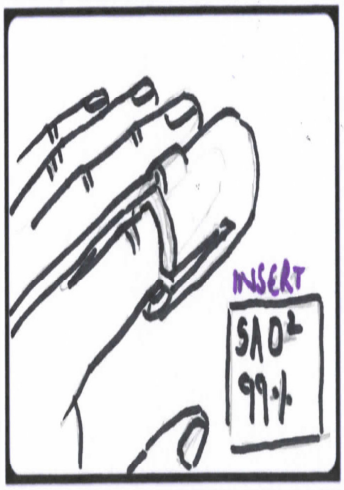
7 E.C.U of Nurse speaking into microphone

8 C.U. pulse being taken - insert of monitor reading (pulse)



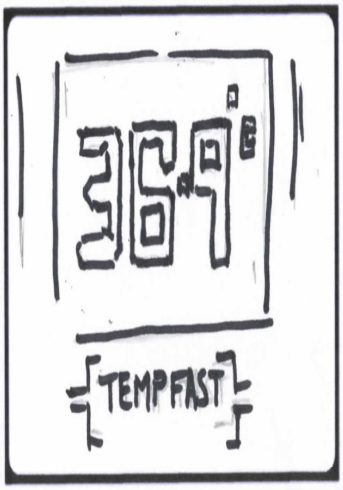
9 C.U of blood pressure cuff being removed.

Insert - Blood pressure monitor reading



10 C.U. Oxygen saturation probe on finger.

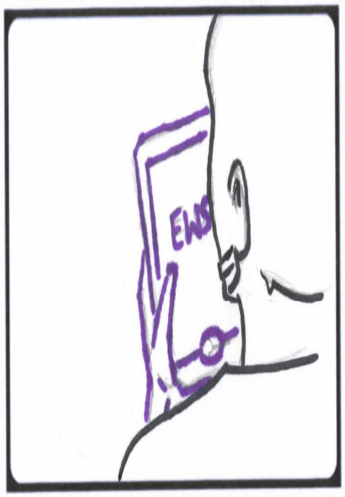
Insert - Oxygen saturation reading



11 C.U of temperature machine reading

12 C.U of patient chest clearly see rise and fall of chest (always exagerated)

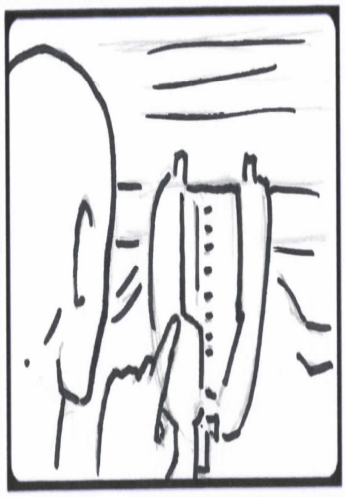
Name of Project: Nursing The Patient, Not The Notes **Group Members:** Darren Behan



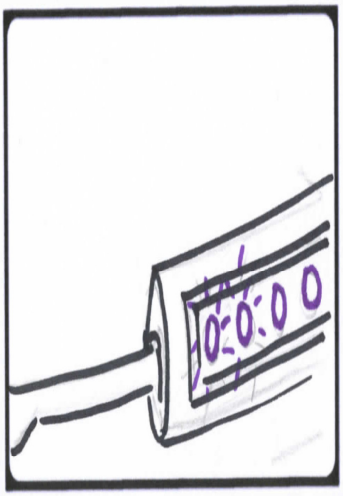
13 Over shoulder shot of nurse looking at ipad and early warning score

14 locked down POV Extreme C.U. of ipad with EWS details/recording

15 C.U of nurse speaking into microphone



16 Overshoulder shot(nurse) of urine collection Volumeter being examined

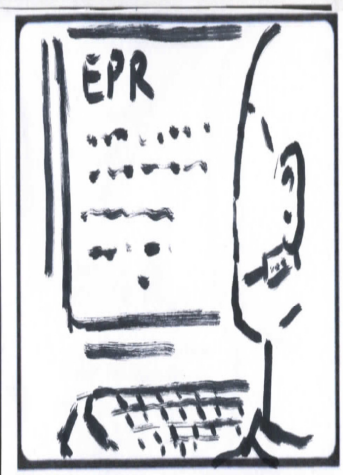


17 Extrem C.U of Microphone. Dot LED lights illuminate as nurse speaks into microphone

18 Wide shot Nursing office nurse on phone

Name of Project: NURSING THE PATIENT, NOT THE NOTES Group Members: DARREN BEHAN

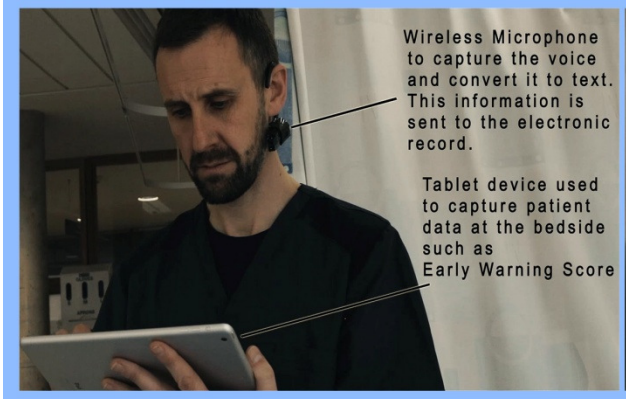
19 ? Overshoulder or lateral shot showing phone being placed back on receiver and nurse immediately accesses microphone



20 Overshoulder shot (nurse) at computer terminal scrutinising the dictated record.

21 P.O.V (nurse) of Electronic Patient Record. Nurse clicks to confirm record.

Explainer Video -
"Nursing the Patient, Not the Notes"
Screen Shots

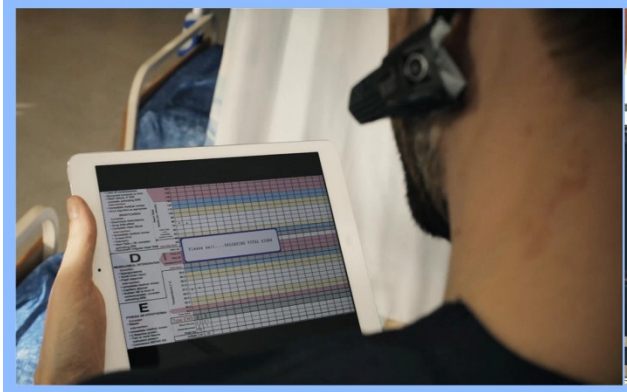


1) Explaining the Technology

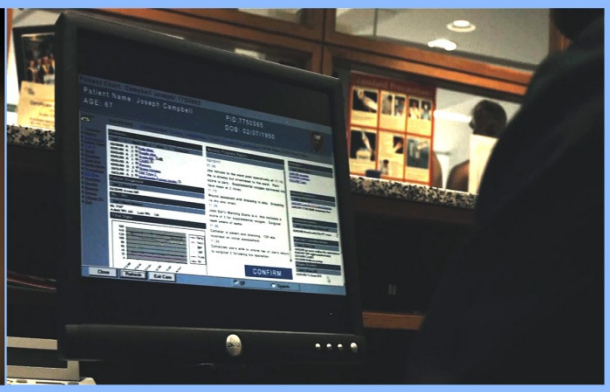
2) Checking the patients' wound

3) Checking the vital signs

4) Point-of-care documentation



5) Checking the Early Warning Score on tablet device



6) Confirming the data entry in the Electronic Patient Record

Appendix C: Information Leaflet and Consent Form

PARTICIPANT INFORMATION SHEET

Dear Participant ,

I am currently completing my final year of an MSc in Healthcare Informatics at Trinity College, Dublin. I am planning to conduct research to inform my thesis and to answer the following research question:

"What are the perceived benefits and barriers towards the implementation of an Electronic Nursing Record and the potential to use Speech-to-Text technology to support point of care nursing documentation in the Irish context."

In order to effectively answer this question I have decided to produce a short explainer video (3 minutes and 55 seconds in duration) to depict a potential futuristic ward environment where the nurse can record point of care documentation using speech-to-text technology. This record is transferred into the Electronic Health Record (EHR) for review and sign off by the nurse at an appropriate time during their shift. This video was filmed in a simulated environment (skills lab in a college) and not in a real ward or on the grounds of any hospital. It involves one actor only, in this case the lead researcher.

I have decided to conduct my research in Our Lady's hospital, Navan as it is my current place of employment. You have been selected as a participant because you are a registered nurse (aged 18 years or older) working in Our Lady's Hospital, Navan. I appreciate there may be a potential conflict of interest as I am employed at the site where the research will be conducted. However, I believe this will be offset by the fact that the returned questionnaires will be anonymous.

You will be asked to view the short explainer video and following this your feedback will be gathered utilising a questionnaire comprised of both open and closed questions. The questionnaire will take approximately 5 minutes to complete.

Please read the following carefully before proceeding to sign the attached consent form:

- Participation in the study will be voluntary.
- All participants will be 18 years or older.
- Participants may withdraw from the study at any time and for any reason without penalty.
- The video does not contain flashing imagery; however, it is important to notify you of the following. If you or anyone in your family has a history of epilepsy then you are

proceeding with viewing the video at your own risk.

- Participants can decide to omit any question they do not wish to answer.
- Participants will not benefit directly from participating in this research.
- The participant's data will be treated with full confidentiality and all data will be anonymous.
- The participant will be informed that I will act in accordance with the information provided.
- Participants will be informed that their contribution to the research will be included in the lead researchers MSc dissertation. Their data will be used for scientific purposes and it will be published in scientific publications in a way that does not reveal their identity.
- Participants will be informed that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.
- Participants will be informed that signed consent forms and research data will be stored in the CPC office at Our Lady's Hospital, Navan, until the completion of the course. All data will be stored on a password protected computer and in a locked office to which the lead researcher has sole access.
- It is important to acknowledge a potential conflict of interest arising from the fact that the intended site of study is the lead researchers' place of work. However, all returned questionnaires will be anonymised and it will therefore be impossible for the researcher to identify any participant.
- The participant will be informed that the results of the research will be discussed at the monthly ward managers meeting and nurse practice development meeting. The ward managers from each area will be in attendance and they will communicate the findings from the study to the staff nurses in each ward area to debrief them on the outcome of the research. Furthermore, a summary report will be sent to each ward area.
- The purpose and nature of the study has been explained to the participant and they have the opportunity to ask questions or clarify details about the study by contacting the people involved with the study (details below)

Darren Behan (Lead researcher), **behand@tcd.ie**
Gaye Stephens (Supervisor), **gaye.stephens@tcd.ie**
MSC in Health Informatics, Trinity College, Dublin.

Thank you in advance for your participation in this valuable research. I look forward to receiving your feedback.

Yours Sincerely,

Darren Behan

PARTICIPANT CONSENT FORM

Consent to take part in research titled – "What are the perceived benefits and barriers towards the implementation of an Electronic Nursing Record and the potential to use Speech-to-Text technology to support point of care nursing documentation in the Irish context."

LEAD RESEARCHER: Darren Behan

BACKGROUND OF RESEARCH: As patient documentation makes a transition from paper to electronic records and information management systems, staff nurses must be ready to engage with these new systems to ensure optimum patient safety. This transition to using an electronic record could be challenging for many nurses. Point-of-care is an important aspect of introducing an electronic record. The lead researcher has opted to explore the use of Speech-to-text technology as potential solution to support point-of-care documentation.

PROCEDURES OF THE STUDY: In order to effectively answer this question I have decided to produce a short explainer video (3 minutes and 55 seconds in duration) to depict a potential futuristic ward environment where the nurse can record point of care documentation using speech-to-text technology. This video was filmed in a simulated environment (skills lab in a college) and not in a real ward or on the grounds of any hospital. It involves one actor only, in this case the lead researcher. I have decided to conduct my research in Our Lady's hospital, Navan as it is my current place of employment. You have been selected as a participant because you are a registered nurse (aged 18 years or older) working in Our Lady's Hospital, Navan. Participants will be asked to view the short explainer video and following this their feedback will be gathered utilising a questionnaire comprised of both open and closed questions. The questionnaire will take approximately 5 minutes to complete.

- I have read the attached information sheet, I freely and voluntarily agree to participate in this research study, though without prejudice to my legal and ethical rights.
- I am 18 years of age or older at the time of consent.
- I understand that even if I agree to participate now, I can withdraw at any time or for any reason without penalty.
- I understand that the video does not contain flashing imagery and that I am proceeding with the viewing of the video at my own risk.
- I understand that I can omit any question I do not wish to answer.
- I understand that I will not benefit directly from participating in this research.

- I understand that all information I provide for this study will be treated confidentially and all data will be anonymous.

- I understand that the lead researcher will act in accordance with the information provided.

- I understand that my contribution to the research will be included in the lead researchers MSc dissertation. Furthermore, I understand that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.

- I understand that in the extremely unlikely event that illicit activity is reported to the lead researcher during the study they will be obliged to report it to appropriate authorities.

- I understand that signed consent forms and research data will be stored in the CPC office at Our Lady's Hospital, Navan, until the completion of the course. All data will be stored on a password protected computer and in a locked office to which the lead researcher has sole access.

- I understand that there is the potential for a conflict of interest arising from the fact that the intended site of study is the lead researchers' place of work. However, I acknowledge that the returned questionnaires will be anonymised and it will therefore be impossible for the researcher to identify any participant.

- I understand that the results of the research will be discussed at the monthly ward managers meeting and nurse practice development meeting. The ward managers from each area will be in attendance and they will communicate the findings from the study to the staff nurses in each ward area to debrief them on the outcome of the research. Furthermore, a summary report will be sent to each ward area.

- Following this information the participant will be given the opportunity to ask questions about the study. The lead researcher and supervisors details will be provided below to allow for same.

- The purpose and nature of the study has been explained to me and I have been given the opportunity to ask questions and all my questions have been answered. I understand that I can clarify any further queries regarding the study by contacting the people involved with the study.

Darren Behan (Lead researcher), **behand@tcd.ie**
Gaye Stephens (Supervisor), **gaye.stephens@tcd.ie**
MSC in Health Informatics, Trinity College, Dublin.

Signature of research participant

---------- ----------

Date:_____

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

Signature of researcher

---------- ----------

Date:_____

Appendix D: The Questionnaire

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

Survey of Staff Nurses at Our Ladys Hospital, Navan – Questionnaire

1. How many years are you qualified as a registered nurse?

   _____ years

2. What age are you?

   18 – 29 ☐
   30 – 39 ☐
   40 – 49 ☐
   50 – 59 ☐
   60+ ☐

3. What gender are you?

   Female ☐ Male ☐

4. Video presented in this way is an excellent method for explaining new concepts.

   Strongly agree ☐
   Agree ☐
   Undecided ☐
   Disagree ☐
   Strongly Disagree ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

5. The video presented an accurate portrayal of a ward based scenario, excluding the technology.

   Strongly agree ☐
   Agree ☐
   Undecided ☐
   Disagree ☐
   Strongly Disagree ☐

6. The use of Speech-to-text technology was sufficiently explained to illustrate how it could be applied to nurse documentation

   Strongly agree ☐
   Agree ☐
   Undecided ☐
   Disagree ☐
   Strongly Disagree ☐

7. Do you document your nursing notes in a paper record or on computer in an electronic record?

   a) paper record ☐
   b) on computer in an electronic record ☐
   c) both on paper and computer ☐

   If you answered (a) or (c) please proceed to question 8
   If you answered (b) please skip to question 9

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

8. When documenting in a paper record are any of the following items an issue?

Illegibility ☐
Time consuming ☐
locating the document ☐
locating information within the document ☐
all of the above ☐
other (please specify) _____

9. Time spent at the patients bedside is invaluable and extremely important to me as a nurse?

Strongly agree ☐
Agree ☐
Undecided ☐
Disagree ☐
Strongly Disagree ☐

10. When you document in the nursing notes does it mostly occur:

a) At the patients bedside ☐
b) Away from the patients bedside (for example; in the nursing office) ☐

If you ticked answer b) please answer question 11
if you ticked answer a) skip to question 12

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

11. The reason for documenting away from the patients bedside;

Interruptions ☐
Confidentiality ☐
Too noisy ☐
All of the above ☐
Other (please specify)_____

12. When you document in the nursing notes, does it mostly occur:

a) at the time the care is given? ☐
b) Later in the shift leaving a time gap between point of care and documentation? ☐

13. Do you feel you have enough time to document in the nursing notes?

Yes ☐
No ☐

14. How do you prioritize nursing documentation when compared with other duties?

Very Low ☐
Low ☐
Medium ☐
High ☐
Very High ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

15. Do you feel the current method of documenting in the nursing progress notes is efficient?

    Yes ☐
    No ☐

16. Are you aware that there is a National Electronic Health Record being currently developed?

    Yes ☐
    No ☐

17. Do you believe that technology in general can add value to nursing care?

    Yes ☐
    No ☐

18. I am normally comfortable with using technology? (computers, tablet device, smart phone, etc)

    Strongly agree ☐
    Agree ☐
    Undecided ☐
    Disagree ☐
    Strongly Disagree ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

19. Which of the following devices have you had some experience with using?

- Computer ☐
- Tablet device (ipad, etc.) ☐
- Smart phone ☐
- All of the above ☐
- None of the above ☐

Consider the recent implementation and adoption of new technology to the clinical environment (e.g. blood tracker) and answer the following questions

20. Were you initially sceptical about the new technology?

- Yes ☐
- No ☐

21. Were you reluctant to change and move away from the system as it was?

- Yes ☐
- No ☐

22. Were you made aware of the new technology and the impending change prior to notification about training?

- Yes ☐
- No ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

23. Did you receive adequate training in the use of the new technology?

    Yes ☐
    No ☐

24. On initial use of the new technology in the clinical environment, following the training, I was:

    Very confident ☐
    Confident ☐
    Neutral ☐
    Anxious ☐
    Very Anxious ☐

25. Training is very important to me when introducing a new technological initiative

    Strongly agree ☐
    Agree ☐
    Undecided ☐
    Disagree ☐
    Strongly Disagree ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

26. Following the implementation of the new technology system, and time to adjust to same, I now feel competent in using the technology?

Strongly agree ☐
Agree ☐
Undecided ☐
Disagree ☐
Strongly Disagree ☐

27. The new technology system is better than the previous system?

Strongly agree ☐
Agree ☐
Undecided ☐
Disagree ☐
Strongly Disagree ☐

Consider the use of Speech-to-text technology in the healthcare environment and answer the following questions

28. Were you aware of Speech-to-text technology prior to viewing the video?

Yes ☐
No ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

29. Patient/ nurse interaction could be improved with this technology.

Strongly agree ☐
Agree ☐
Undecided ☐
Disagree ☐
Strongly Disagree ☐

30. The ability to document at the point of care would be extremely valuable for nurses.

Strongly agree ☐
Agree ☐
Undecided ☐
Disagree ☐
Strongly Disagree ☐

31. This system would afford me more time at the patients bedside?

Strongly agree ☐
Agree ☐
Undecided ☐
Disagree ☐
Strongly Disagree ☐

32. Do you feel patient care could be enhanced or hindered with the use of this technology?

a) Enhanced ☐
b) Hindered ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

33. Which of the following do you perceive as being a barrier to the use of Speech-to-text technology in the clinical area?

    -A noisy environment could prevent me from recording at the bedside.

    -Interruptions could prevent me from documenting at the bedside. ☐

    -A fear that someone might overhear what I am dictating into the patient record. ☐

    -Lack of confidence in accuracy of technology could prevent me from using same. ☐

    -All of the above. ☐

    -Other(please specify): ☐

    _____

34. Documenting in an electronic record would require the need for typing using a keyboard. I would prefer to type the nursing notes using a keyboard as opposed to using the Speech-to-text technology?

    Strongly agree ☐

    Agree ☐

    Undecided ☐

    Disagree ☐

    Strongly Disagree ☐

35. Which of the following statements apply to you?

    a) Speech-to-text technology would be easy to use as I am currently okay with the use of similar technology.
    b) The transition to this Speech-to-text technology would be a challenge as I don't frequently use technology but I feel it will be achievable with the right support and time.
    c) Personally I would not want this technology to be implemented as it would be too difficult to use but I do see how it could benefit the patient.
    d) This technology has no place in the care of the patient and it would not benefit the nurse.

    (a) ☐ **(b)** ☐ **(c)** ☐ **(d)** ☐

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

36. Would you like to be involved with the design and development of similar technologies designed for nurses?

    Yes ☐
    No ☐

37. Do you feel that being involved at an early stage of development ensures that the new technology will be better accepted by nurses?

    Yes ☐
    No ☐