Towards a Framework for Telenurses' Decision Making: The Decision Ladder

by

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Supervisory Committee

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Abstract

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Telenursing is a highly specialized area of nursing practice that has evolved in response to the advent of new technologies within the delivery of health care. Telenursing has been defined as "the use of communications and information technology [ICT's] to deliver health and health care services and information over large and small distances (CRNBC, 2016). Telenurses use health information systems (HIS) in the form of a Clinical Decision Support System (CDSS) to assist callers with their health related concerns on a 24/7 basis. As decision making is an integral part of telenurse practice, particularly because they are using a CDSS while assessing the caller over the phone, it was important to understand the factors that influence the decision making process so as to better support telenurse practice in terms of education as well as other supports. This thesis identified those factors and used Rasmussen's Decision Ladder as a model in order to provide a framework for telenursing. It was found that there were several factors identified that influenced how telenurses made decisions while using a CDSS. Additionally, the decision ladder was validated as a framework to describe telenurse practice.

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Acknowledgments

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Dedication

I would like to thank my wonderful husband, Vincent Johnstone, for supporting me throughout this educational journey. Also, my mother, who shares my name, Danica Tuden, has always been an inspiration to me. She encouraged me to continue pursuing my education when she was terminally ill with leukemia. This degree will be named in her memory as she passed away December 3, 2010.

CHAPTER 1: INTRODUCTION

Registered nurses (RN's) have provided advice over the telephone informally for many years in areas including emergency rooms and public health units (Goodwin, 2007). There were no standardized protocols available to these nurses as there are today in the form of computerized decision support systems (CDSS). Consequently, a nurse relied solely on his or her experience and clinical judgment to offer health advice. As health care has become more costly and increasingly difficult to access, telehealth nursing was identified as a strategy in an attempt to alleviate these problems. In fact, the World Health Organization (WHO) considered telehealth so effective in managing these issues that they published a brief to recommend that policy makers need to invest in telehealth as a solution to integrate health care (Stroetmann et al, 2010). Therefore, an investment in implementing telehealth in terms of cost effectiveness would assist in ensuring that consumers use health care resources appropriately. It is clear that an emergency room (ER) visit is several times more costly than a trip to a general practitioner (GP); however, it is also evident that GP's are becoming increasingly more difficult to access. A simple telephone call to a nurse in a telehealth call centre can help in supporting a patient so they may get to the right place safely at the right time. In fact, a systematic review of Canadian telephone triage services indicated that 50 % of calls were manageable with home treatment alone (Stacey et al, 2003). The investment of telenurse call centres by government is clearly an economically sound decision.

1.1 Telehealth Nursing

According to the College of Registered Nurses of British Columbia (CRNBC), telehealth is defined as "the use of communications and information technology [ICT's] to deliver health and health care services and information over large and small distances" (CRNBC, 2016). In particular, *telenursing* is specific to registered nurses using ICT's in order to provide health care. Telenursing is a highly specialized area of nursing practice that has evolved in response to the advent of new technologies within the delivery of health care. This unique field of nursing has been utilized as such an option to many countries world-wide such as the United Kingdom (U.K.), the United States (U.S.) and Canada. The concept of telenursing has been employed in areas such as chronic disease management, call centres and palliative care. General symptom triage and health education advice is often provided in a telenurse call centre, which is typically operational on a 24/7 basis. Within this setting, telenurses assess a caller's symptoms and use a CDSS in order to determine a recommendation on how and when to seek care. Telehealth call centres typically employ telenurses to provide symptom triage and health education to callers. It is important to note that telenurses come from diverse backgrounds such as various units within acute care hospitals as well as community settings. As most telenurse call centres provide generalized health care, telenurses use a CDSS in order to support and complement their workflow. For example, a telenurse with a background in pediatric oncology would not be as familiar with a caller who presented with symptoms that were mental health related, and thus, the use of this kind of health

information system (HIS) is very important in the goal towards managing a larger population of callers.

Further to the discussion related to cost effectiveness, there have been some arguments on the rationale as to why to employ a RN as a call taker in this type of setting in light of the fact that would certainly be more costly than a non-clinical individual. The fact that CDSS are utilized to support staff in managing calls might lead one to believe that asking some simple questions word for word would be well suited to non-clinical individual. In reality, any lay person can ask "yes" and "no" questions prescriptively within an algorithmic protocol, but it is the RN who has the knowledge and expertise in providing *individualized and holistic* care who would be most appropriate in this role. The telenurse uses the CDSS to accompany his or her knowledge and experience and consequently, would not be bound to use it prescriptively. In fact, the literature shows that a typical telenurse has an average of 28.7 years of nursing experience (Greenberg, 2009). A CDSS is only a tool; and nurses have the tacit knowledge that no software can capture every situation; in essence, no two patients are alike. This knowledge, coupled with the fact that there is no face to face physical assessment to rely on, requires a telenurse to possess excellent communication skills as well as expertise in decision making.

1.2 Decision Making

Decision making is a complex cognitive process whereby individuals use their knowledge and experience to form actions. Kushniruk (2001) identified that telephone triage is a domain where high-performance decision making is closely associated to the overarching methods in interpreting the urgency of each unique situation. In fact,

situations that present with a high degree of task intricacy, heuristic approaches, or, ‘rules of thumb’ may be employed (Kushniruk & Patel, 2004). Kushniruk (2001) further reported that the actual ‘decision event’ is preceded by a complex process where the individual weighs various alternatives in how to proceed. As health care is concerned with ensuring patients receive safe and high quality care, it is evident that decision making needs to be thoughtful and meaningful. HIS can certainly facilitate the goal of appropriate decision making in terms of the utility of CDSS, but the user ultimately has the power and professional responsibility in making the final decision. For example, RN’s use particular software as their main CDSS to assist callers in how, when and where they need to access health care; however, there is some uncertainty as to the degree of rigidity telenurses employ in using these systems. Also important to note is that the patients calling for assistance may experience symptoms ranging from that of a simple hangnail to something more urgent and life threatening, such as heart attack. In the latter circumstance, it is clearly necessary to ensure that a patient is attended to as quickly as possible to preserve life and minimize morbidity; therefore, the telenurse may need to revise his or her decision making in using the CDSS. A model that is flexible to this kind of health care delivery is absolutely essential in order to provide some guidance and structure to telenurses.

As telehealth is a relatively new means to providing health care, it is important to understand, and thus, support the role that critical thinking plays in how telenurses make decisions while using HIS. Unlike traditional nursing care, telenurses are limited in terms of the accuracy and quality of information they receive from callers as they cannot perform a physical assessment. In addition, the information that a caller reports must be

analyzed and interpreted while simultaneously researching and documenting the appropriate health information. Schleyer and Beaudry (2009) explained this as a process of transforming data into wisdom whereby the interpretation and integration of the data results in individualized patient outcomes. Essentially, nurses are able to fine tune their use of the nursing process with the application of critical thinking skills they have acquired and developed from their years of experience. This experience provides a telenurse with a general foundation of knowledge that is essential in decision making towards the management of these patient encounters.

1.3 Clinical Decision Support Systems (CDSS)

Musen, Shahar and Shortliffe (2006) defined a CDSS as "any computer program designed to help healthcare professionals to make clinical decisions" (p. 700). They further identified three categories in the requirements for excellent decision making, which include data accuracy, appropriate knowledge, as well as appropriate application of problem solving skills (Musen et al, 2006). Essentially, the information in the CDSS needs to be evidence-based, which means in order to maintain accuracy and currency, regular reviews and updates need to occur. In addition, the information needs to be comprehensive enough to be able to address a situation or scenario yet balanced with an understanding that the end user should not be overwhelmed with an abundance of information. Finally, the end user needs to have working knowledge of the information within the CDSS to be able to make sound decisions. In terms of telenurses making decisions using the CDSS, this would involve the use of problem-solving skills, or as it is more often termed under the domain of the nursing profession, critical thinking. All of

these components collaboratively aim to streamline health care delivery with the overarching objective of patient safety (Morris, 2002).

CDSS are employed for various purposes related to health care ranging from alert reminders, such as in allergy alerts, to algorithmic protocols which are used to provide recommendations for health care. One particular application uses algorithmic protocols as its main focus in decision support. Its vendor is a non-for profit organization that develops health content and health education solutions including CDSS's to such telehealth call centres. In addition, it provides health content applications for consumer health portals, hospitals and health care management companies. This vendor is specifically used in one major Canadian telenurse call centre. In this organization, telehealth nurses use this application as their CDSS in order to provide symptom triage and health education to callers. A similar application, the Knowledge Base (KB), is used as the web-based information application for the public consumer. Depending on the organizational policy, research shows that CDSS's can be utilized in various ways especially when RN's or telenurses, are employed (i.e. more prescriptively or with more flexibility). Furthermore, individual telenurses may use these tools quite differently depending on their education and years of nursing practice. This research will serve to explore the various ways in which telenurses use CDSS as well as provide some groundwork in understanding critical thinking within decision making.

1.4 Decision Ladder

Several decision making models are available that range on a continuum from methods which are purely analytical to those that are more naturalistic. One tool in

particular that has some interesting naturalistic aspects of decision making is based on Rasmussen's work in terms of the 'decision ladder' (1993). This model is concerned with the control task phase of cognitive work analysis in health care proposed by Rasmussen and Peterson (1994). Cognitive work analysis is a method which considers the entire work system, including the individual, organizational, task-related, environmental and technological factors (Rogers, Patterson & Render, 2011). The decision ladder was developed by Jens Rasmussen and Annelise Mark Petersen, and later advanced by Vicente (Rogers et al, 2011). The goal of performing a cognitive work analysis is to offer some awareness into those work tasks that pose challenges and barriers in cognitive processes and therefore, has the potential to propose some insight into systems, such as in the case of CDSS (Rogers et al, 2011). Cognitive work analysis is concerned with five phases, the second of which includes a control task analysis. As telenursing is concerned with decision making, the focus will lie within this phase and as such, will consider the decision ladder as a potential framework. Furthermore, the fact that this model has the capability to provide the opportunity for heuristic shortcuts may have some interesting implications for telenursing in terms of the degree of a caller's symptom urgency and/or complexities.

1.5 Statement of the Problem

It is clear that the movement toward telenursing as a health care platform for service delivery is becoming more accepted and evident throughout many locations. Furthermore, there are more opportunities for business cases within telehealth organizations whereby nurses will begin to support clientele with more complex and

sensitive health care needs. The anticipated expansion of telenurses supporting health care in new and unprecedented methods requires a model or framework to assist decision making, especially while using HIS. Because there is little research on models or frameworks to guide and support this skill within the nursing profession, let alone within telenursing, may pose some challenges in further in supporting and enhancing telenurse practice. Certainly, in B.C., the CRNBC provides a practice standard for RN's in telehealth (CRNBC, 2016).

Loiselle and Profett-McGrath (2007) addressed the point that nursing theories borrow models from other disciplines such as psychology and in fact, this has even been considered controversial because there is advocacy in developing unique nursing theories. It is not clear as to why this is the case, essentially because of the reality that all humans make decisions – nurses are no different. Therefore, testing a model, such as that of Rasmussen's in a telehealth setting is not an unrealistic task to embark upon. In reality, there are other models that have been borrowed and tested from other disciplines in terms of decision making. To illustrate this, an example of this was evident in terms of Bond and Cooper's (2006) research on Klein's work in regards to the Recognition Primed Model for Decision Making (RPD). Klein, who is a psychologist, developed this model when studying decision making in real world settings such as in the work of urban fireground commanders. This example will be discussed further as it is clear that models can be successfully applied to other disciplines.

As previously mentioned, there are few studies that have discussed decision making models within telenursing. One model in particular proposed by Greenberg (2009) illustrated a process of telephone nursing. This model addressed Schleyer and Beaudry's

concept of the translation of data into a context that is individualized to a caller (2009). This model certainly provides a platform for nursing in terms of the various phases of decision making. Also, Greenberg (2009) does clarify that these phases are iterative and cyclical and may in fact move more quickly in situations where a caller may have more urgent symptoms. It may not; however be as explicit in delineating the data processing and the resultant states of knowledge as are clearly demonstrated in Rasmussen's decision ladder. Furthermore, the phases in Greenberg's (2009) model may not be as obvious in demonstrating the short-cuts supplied in Rasmussen's decision ladder. Again, we have many models, theories and frameworks for nursing in general, so testing another model, especially from a different domain would not be an unordinary practice.

1.6 Significance and Purpose of the Study

As telenursing is a relatively new process of health care delivery, it is important to ensure that it is provided to patients in a manner that is consistent with best practice in mind. There are several models and frameworks that provide a foundational support to nursing practice in a broad sense, but little research speaks to telenursing specifically in terms of critical thinking within decision making – especially as telenurses use HIS to assist patient callers. Understanding and thus, enhancing decision making skills through organizational supports and educational opportunities are vital to ensuring a future towards a high quality of telehealth nursing. Therefore, research in this area, including an assessment of other existing models or frameworks, such as that of Rasmussen's decision ladder will serve to facilitate this journey.

1.7 Research Objectives

The objectives of this research are to:

- Understand the cognitive processes of telenurses' decision making with the use of HIS; specifically CDSS
- Identify the factors that influence how telenurses use CDSS
- Explore the use of heuristics or "short-cuts" by telenurses while using CDSS

1.8 Research Questions

1. How do telenurses make decisions while using CDSS?
2. What factors influence how telenurses make decisions while using CDSS?
3. What aspects dictate how and when nurses employ shortcuts/heuristics while using a CDSS?
4. How well does the data map to Rasmussen's decision ladder and cognitive levels of decision making?
5. Do telenurses perceive the CDSS as supporting their decision making?

1.9 Summary

Telehealth nursing is an emerging platform to health care service delivery and as such, it requires the attention of stakeholders and policy makers to ensure that it is involved in a process of quality improvement. This includes continual organizational support and the provision of ongoing education. Before this can come to fruition; however, we need to understand the basic, yet complex nature of decision making. Models and frameworks

have the potential to provide us with this understanding and thus, adding an existing model into a new domain may be of significance to the contribution of the ultimate goal: safe and quality patient outcomes in telenurse practice.

CHAPTER 2: LITERATATURE REVIEW

2.1 Introduction

Telehealth nursing or, 'telenursing' is an evolving area of health care service delivery. As critical thinking is an essential element in formulating decisions, it is important to understand, and thus, support the role that critical thinking plays especially when HIS such as CDSS are utilized. In conducting a review of the literature, it was noted there was an abundance of information available about critical thinking and decision making in general nursing practice. In terms of telehealth, however, there were only a limited number of studies available. The publications that were found focused on a telenurse's experience of using a CDSS as well as some usability issues. The information gleaned from these studies identified some common themes within the context of decision making which will be explored. Based on the fact, however, that the research is somewhat thin in these important telenurse skills, the results of the review of this literature suggests the need for more research to be pursued in order to support and enhance quality patient outcomes as well as the appropriate use of health care resources. In addition, the research will require some focused attention on models and frameworks for guiding telenurse practice.

2.2 Telehealth Nursing (Telenursing)

As previously mentioned, telehealth nursing is a very specialized form of health care service delivery. The Canadian Nurses Association (CNA, 2007) developed and issued a position statement on the role of the nurse in telehealth in order to highlight some of the

professional and practice standards in a telehealth context. For example, this document explains nurse-client relationships, privacy and confidentiality as well as the practice environment in terms of telehealth practice. Essentially, the CNA (2007) defines nursing practice in telehealth (i.e. telenursing) as "all client-centered forms of nursing practice and the provision of information and education for health care professionals occurring through, or facilitated by, the use of telecommunications or electronic means" (p. 1). There are many avenues for telenurse positions, such as in telemonitoring of patients in chronic disease management. For the purposes of this work, the author will focus on a more generalized approach to providing telephone symptom triage and health education such as in a telenurse call centre setting. Arnaert and MacFarlane (2011) defined tele-triage as the "process of assessing the priority of urgency of patient's symptoms by telephone" (p. 35). Telenurse call centres are typically a 24 hour per day, 7 days a week operation (in order to meet the needs of patients seeking health advice). The Emergency Room (ER) is generally the only option during the night so it would be prudent to have service available when resources are minimal, as well as more costly.

2.3 Telenursing and the Cognitive Process of Decision Making

Kushniruk (2001) reported that psychological research within decision making primarily concentrated on a term called the "decision event" in which the decision maker considers the options and selects a plan of action. Additionally, he reported that health care professionals make decisions under unique conditions where there is often uncertainty as well as a variety of potential interpretations on how patients present (2001). In terms of telenursing, these descriptions of the complexities in health care are

evident. Telenurses care for callers over the phone while ubiquitously using a CDSS and because there is no way to know what a caller is presenting with on the other end of the line, the complexities surrounding this type of health care delivery has its own decision making challenges. For example, the data that a telenurse collects from a caller must be carefully analyzed as there is no face to face physical assessment. Kushniruk (2001) also identified telephone triage as an area whereby high-performance decision making is associated with ruling out emergent symptoms, such as in the case of a caller with a potential heart attack. Certainly a telenurse is able to rely on the use of a CDSS, but because callers are not always able to clearly articulate their situation because of factors such as language barriers or health literacy issues, the telenurse must rely upon knowledge, expertise and critical thinking in making sound clinical decisions. The process of decision making can be varied within the domain of telenursing depending on factors that are discussed in the next sections. Kushniruk (2001) described Hammond's work within decision making as identified along a cognitive continuum, which ranges between intuition and analysis. As one of the goals is in ensuring that callers receive the appropriate level of care, it is important to understand and acknowledge the factors that influence where telenurses make decisions along this continuum. This understanding will serve to provide a potential basis in supporting and further educating telenurses in offering an optimal degree of care. Furthermore, it may offer some insight into the system development life cycle (SDLC) of CDSS (Kushniruk, 2001).

2.4 Telenursing and Decision Making: Influences of Stress and Fatigue

Berkow, Virkstis and Stewart (2011) mentioned three factors which have contributed to a shift in patient population in an acute care hospital: (1) a decrease in patient's length of stay, (2) an increased patient acuity and complexity, and (3) a growing number of protocols. These issues can influence a call centre in terms of the types and numbers of calls telenurses receive. For example, patients are being discharged more quickly than ever and have the potential to develop complications at home where they would have been previously monitored by nurses. Furthermore, patients do not always fully absorb the limited discharge teaching they were offered in hospital because of factors such as pain and anxiety and as such, may also contribute to incoming calls. Employed recently as a telenurse, the researcher has experienced these calls, which do come in at any hour of the day. An example of this is where a patient calls at night for advice on potential signs of a postoperative wound infection. It is for these reasons that a 24/7 operation is appropriate as it contributes to cost effectiveness.

As previously noted, a telenurse call centre is available for patients to obtain health care advice around the clock. It is evident as to the reasons such a setting is useful in terms of cost effectiveness and efficiency. However, it is important to keep in mind that telenurses work all shifts and therefore it is expected that there they will experience a degree of stress and fatigue. In addition, stress and fatigue can increase for a telenurse when there are many patients waiting to receive care. Although a telenurse cares for one caller at a time, he or she is cognizant of other patients waiting on the line for assistance. A qualitative study in a call centre in Sweden used semi-structured interviews to see how

telenurses made decisions while using the CDSS under various conditions (Ernesater, Holmstrom & Engstrom, 2009). Interestingly, telenurses reported that when they were tired and under stress (i.e. high call volumes) they relied more heavily on the CDSS (Ernesater et al, 2009). A similar finding was noted in a meta-ethnography by Purc-Stephenson and Thrasher (2010) where situations of long call queues proved to be stressful to telenurses and subsequently, they felt pressured to get through the calls faster and potentially offer a lower standard of care. In this case, it is clear that the telenurse used the CDSS more prescriptively, but the CDSS may also introduce a new dimension to the concept of patient-centered care. As staff cannot keep up with the volumes of individuals who are calling, there may be a potential for a patient-centered approach to be at risk because of the organizational structure. Nauright, Moneyham and Williamson (1999) used a focus group to identify that telenurses were frustrated when they did not feel support to assist callers in a holistic manner. For example, a telenurse assisting caller who clearly demonstrated a need for some health education may not feel supported by management to provide this when there were many other callers waiting in the queue for telenurse advice. In this case, telenurses felt they needed to rush through the call in order to assist the other callers. Telenurses were worried that a caller in the queue could be very ill and thus felt they needed to work more quickly (Nauright et al, 1999). The focus group method used in this study may have been beneficial as it offered a more interactive group approach. Telenurses work in isolation and are only connected to the caller by a telephone headset and computer; therefore, using focus groups as a methodology may have served as a supportive venue for this information to be shared. In addition, Kitzinger (1995) stated that the use of focus groups was a helpful way of allowing for the

exploration of knowledge and its underpinnings. In terms of critical thinking and decision making, these three studies provided some context about the CDSS utility under stressful situations. Although only one study was explicit as to how the telenurse used the CDSS (i.e., followed without any deviation), the other two were more focused on managing callers more quickly depending on call volumes (Ernesater et al; Purc-Stephenson and Thrasher; Kitzinger) Perhaps further probing may have elicited some more detail on the use of the CDSS itself. If we were to compare these situations to those in an acute care hospital, one could analogize that in hospital, a nurse is often busy with his or her patient assignment, especially in light of the aforementioned factors regarding the shift in hospital patient population. Although a telenurse is only concerned with one caller at a time, the callers in the queue may be construed as those awaiting transfer to the ward from the ER with the exception that the telenurse still has control over when to end the call, albeit he or she may have an internal or organizational pressure to end the call more quickly. A ward nurse usually does not have the option to divert a transfer until he or she is ready as the ER needs to keep up with waiting room demands. As mentioned earlier, there are measurements in place to monitor call length as well as the time it takes to respond to a call. Goodwin (2007) explained that despite the reality that these perceived quality indicators are used to measure telenursing practice, she stated there is no evidence to substantiate this in her literature search. Furthermore, Rutenberg and Oberle (2008) identified that an organization which emphasizes call length as an indicator can cause a form of moral distress when faced with a caller who needs some more support in terms of health education. Reinhardt (2010) echoed this fact in that a supervisor's oversight of a telenurse's calls in terms of timing call length was known to increase stress levels to the

telenurse. She further reported that "setting expectations on call quotas, wait-times and abandonment rates were mentioned as additional stressors" (p. 301). The author's own telenurse experience suggests that call length is not an appropriate indicator of call quality as this can undermine telenurse practice, and potentially, the judicious use of clinical judgment in making decisions. A telenurse may spend more time with a caller contemplating suicide, and obviously, shortening the call is not safe or ethical practice. Call assessment tools need to measure indicators of patient safety and specific competencies around the use of making sound clinical nursing decisions.

2.6 Telenurses and Decision Making: Novice to Expert

When a telenurse begins dialogue with a caller, the nursing process begins, just as it does in any other health care setting. In order to ensure a caller is safe, emergency symptoms are ruled out and subsequently, the telenurse continues with an assessment. The telenurse begins building a mental visual picture of the caller as there is no face to face encounter (Edwards, 1994). Edwards defined picture-building as, "…the process by which nurses attempt to substitute for the physical absence of the client by constructing a mental image of the caller and the situation which she/he is dealing with, p.53). At this point, the telenurse uses standardized protocols within the CDSS to determine a recommendation. As previously mentioned, it is impossible for the CDSS to provide dispositions to meet each individual caller's needs; and this is again, why registered nurses (RN's) provide this service. A telenurse has some degree of latitude and flexibility in using the CDSS. For example, he or she may not agree with a resultant disposition based on some previous knowledge or experience and may choose to 'upgrade', or,

recommend for the caller to seek care sooner. For example, a telenurse may triage a caller using the CDSS with symptoms of an early wound infection, but if the caller suffers from a chronic health condition such as diabetes, there is a higher risk of complications and therefore, the telenurse may choose to recommend a more urgent disposition of care. This practice is more commonly seen in expert telenurses as opposed to novices. This observation is in alignment with Benner's research findings in that "the ability of a nurse to focus and act upon contextually bound nuances automatically is a characteristic of expertise" (as cited in Edwards, 1994, p. 718). Dowding et al (2009) performed a qualitative study of the experience of telenurses' use of a CDSS and found that telenurses new to the job were more likely to use the system more prescriptively. Through the use of non-participant observation of telenurses as well as interviews, it was noted that increasing experience and familiarity with the CDSS resulted in a greater likelihood of the application of clinical judgment in decision making (Dowding et al, 2009). Furthermore, as nursing is such a diverse profession, no telenurse can be knowledgeable about every caller scenario. This study highlighted the fact that the telenurses would use the CDSS like a 'safety net' for situations they were not as familiar with (Dowding et al, 2009). Another U.K. qualitative study described the concept of 'dual triage' whereby the telenurse independently assessed the caller and then used the CDSS as a complement to the decision-making process (O'Cathain et al, 2003). Interestingly, the telenurses in this study reported that anyone using the CDSS without clinical judgment or critical thinking could be viewed as a 'monkey' or a 'robot' (O'Cathain et al, 2003). These powerful statements were elicited from interviews performed by the researchers so they were obviously passionate about this. Perhaps some further probing could have offered some

contextual knowledge or background to this. For example, the author's own experience as a telenurse illustrated that there have been instances of other telenurses being fearful of losing their job as they could be replaced by non-clinical staff. Perhaps asking some questions to understand the reasons for their statements could have provided some more context.

In using the CDSS, the discussion of upgrading a disposition has been highlighted in terms of how a telenurse uses his or her judgment in making decisions. Interestingly, in a later study from the U.K., there appeared to be a shift in the use of the CDSS because of senior management's position (Greatbatch et al, 2005). The management maintained that the prescriptive use of the CDSS would limit a telenurse's independent abilities to use judgment in decision making so as to ensure information is provided in a safe and consistent manner (Greatbatch et al, 2005). It is not explicit in this study as to if the management team had any nursing background which could provide some insight. This use of the CDSS is contrary to the culture of the nursing profession as it does not allow for individualized and patient-centric care. Despite the management's position, this study revealed that telenurses not only deviated from the use of protocols in terms of upgrading dispositions, but they also found they were downgrading (Greatbatch et al, 2005). So, for example, if a patient was assessed and the recommendation was to seek care within 4 hours, a telenurse might adjust this to a 'next day' disposition. According to Koehne (2009), downgrading a disposition is not a recommended practice in telehealth nursing. The standardized protocols in CDSS are written by a variety of health care professionals including nurses and physicians in both general and specialized disciplines. They are also evidence-based and reviewed on a regular basis to ensure accuracy and currency. One

would hope to assume that the knowledge of these review processes would offer some confidence in that downgrading would not be necessary. Although this practice did occur in this particular study, management made allowances for it by requiring telenurses to document their rationale; however, telenurses did not always comply (Greatbatch et al, 2005). This qualitative study used a wide variety of data collection including audio and video recording, semi structured interviews and non-participant observation (Greatbatch et al, 2005). The use of video recording strengthened this study because they were able to document non-verbal actions such as facial expressions which may be important in understanding how the telenurse used the system (Greatbatch et al, 2005). To provide more data and insight, another valuable methodology might be the use of cued recall, especially in light of the fact that telenurses did not always conform to organizational policies (Greatbatch et al). Using cued recall can offer an immediate method of feedback in reviewing how and why a telenurse used clinical judgment in decision making. This methodology will be discussed in greater detail in chapter three. Also worthy to note is the study provided excerpts of transcriptions for the telenurse-patient interaction, but because there was no legend to address the symbols used to represent verbal intonations, the author had some difficulty in fully understanding the call flow as described within this study. Furthermore, this is a U.K. study whereby the dialect in the English language is different; therefore, the researcher had some challenges in its interpretation.

2.7 Rasmussen's Decision Ladder

The decision ladder is a framework that was developed by Rasmussen following several studies whereby he used verbal protocols to understand decision making actions

of experienced workers in thermal power stations (Naikar, 2010). He found that the workers' use of verbal protocols was associated with a series of reports about their "states of knowledge" in relationship to the power plant that involved their tasks and activities (Naikar, 2010). Rasmussen also noted that there was little or no discussion of any planning or deliberation of options by the workers and thus, it became evident that they had some inherent knowledge of what was occurring because of their experience (Naikar, 2010). If those workers were faced with tasks that were less familiar to them, the verbal protocols demonstrated that they were more analytical in nature and provided more detailed data (Naikar, 2010). It is clear that the decision ladder may serve as a useful framework in novices and experts within a specific work domain. In fact, Rasmussen's work on human error elicited some interesting adaptation processes in terms of humans interacting with information systems; and this aligns with the concept of novice and expert (Lipshitz, 1992). He found that there were three distinct kinds of behaviour: knowledge-based, rule-based and skill-based (Lipshitz, 1992). These will be discussed further in the use of the decision ladder so as to illustrate how this framework may be useful in many work domains, including telenursing.

Rasmussen (1993) explained that the decision ladder is structured in a linear fashion which includes a situational assessment, planning, development of goals and their priorities. However, as we will see later, this framework is actually designed with heuristic "short-cuts", whereby the user may be able to move from the left side of the ladder to the right as opposed to following it more prescriptively. The decision ladder is structured so that the left side of the ladder is associated with information processing activities; the top includes evaluation of options; and the right side relates to planning,

scheduling and implementing (Burns & Vicente, 2001). The ladder includes linkages between the cognitive state, or position of being (i.e. a state of awareness), and the cognitive process (i.e. assessment or planning) (Lintern, 2011). Figure 1 illustrates the ladder as it may apply to telenursing. The rectangles represent information processing activities and the circles illustrate states of knowledge. Jenkins et al (2009) distinguished 'shunts', which link an information processing activity to a state of knowledge (rectangle to circle), from 'leaps' which may link two states of knowledge without any processing of information (2009). It is not possible; however, to connect two information processes to another as there must be always be a resultant state of knowledge (Jenkins et al, 2009).

Rasmussen, Pejtersen and Goodstein (1994) discussed three modes of cognitive control of activities characteristic of novices as opposed to experts. First, knowledge-based control is concerned with a model-based approach whereby the individual requires an explicitly formulated goal. This type of information processing is usually concerned with new and unfamiliar situations. In these cases, the use of shortcuts alongside the decision ladder may have very limited utility.

In terms of rule-based control, Lipshitz (1993) described this as behaviour controlled by rules as well as knowledge that can easily be articulated by the decision maker. There may be some level of recognition which may in effect elicit a rule (Lipshitz, 1993). This kind of control might be exemplified when faced with a situation that is familiar, but may not be inherently clear as to how to proceed. Some clarification or further questioning may be required to facilitate decision making and the evidence of heuristics may be present but perhaps not to the same extent. In contrast, the skills-based behaviour is confirmed by the sheer automation of tasks or decision making (Lipshitz, 1993).

Naikar (2010) proposed that the decision tree framework used in cognitive work analysis may accommodate all three types of behaviour. Knowledge-based behaviour was more evident in workers who are faced with unfamiliar tasks or in novices (Naikar, 2010). In comparison, rule based behaviour demonstrates more utility of heuristic shortcuts, but there will be shifts in the types of behaviour within decision making depending on situational urgency as well as the cohort's familiarity with a particular scenario, regardless of the profession or domain (Naikar, 2010). There may be some similarities in terms of decision making between areas such as the military and tank warfare applied by Jenkins et al (2009) and health care evidenced by the fact that both domains require a high degree of decision making skills, especially in urgent situations.

2.8 Conclusion

This review of the literature has highlighted some themes pertinent to critical thinking in relationship to how telenurses make decisions using decision support tools. There is a degree of variance in how organizations structure their systems; therefore, there are some challenges in identifying these commonalities. The vast majority of these studies performed within the context of this subject were carried out in the U.S. and Europe. A particular theme of interest discussed regarding patient outcomes would be extremely useful to study further as the goal of patient safety and satisfaction would be of interest to government, especially if there were any other cost-effective strategies. Furthermore, supporting telenurses with educational opportunities within the realm of critical thinking and decision making may foster a patient centred focus. As there are limited studies done

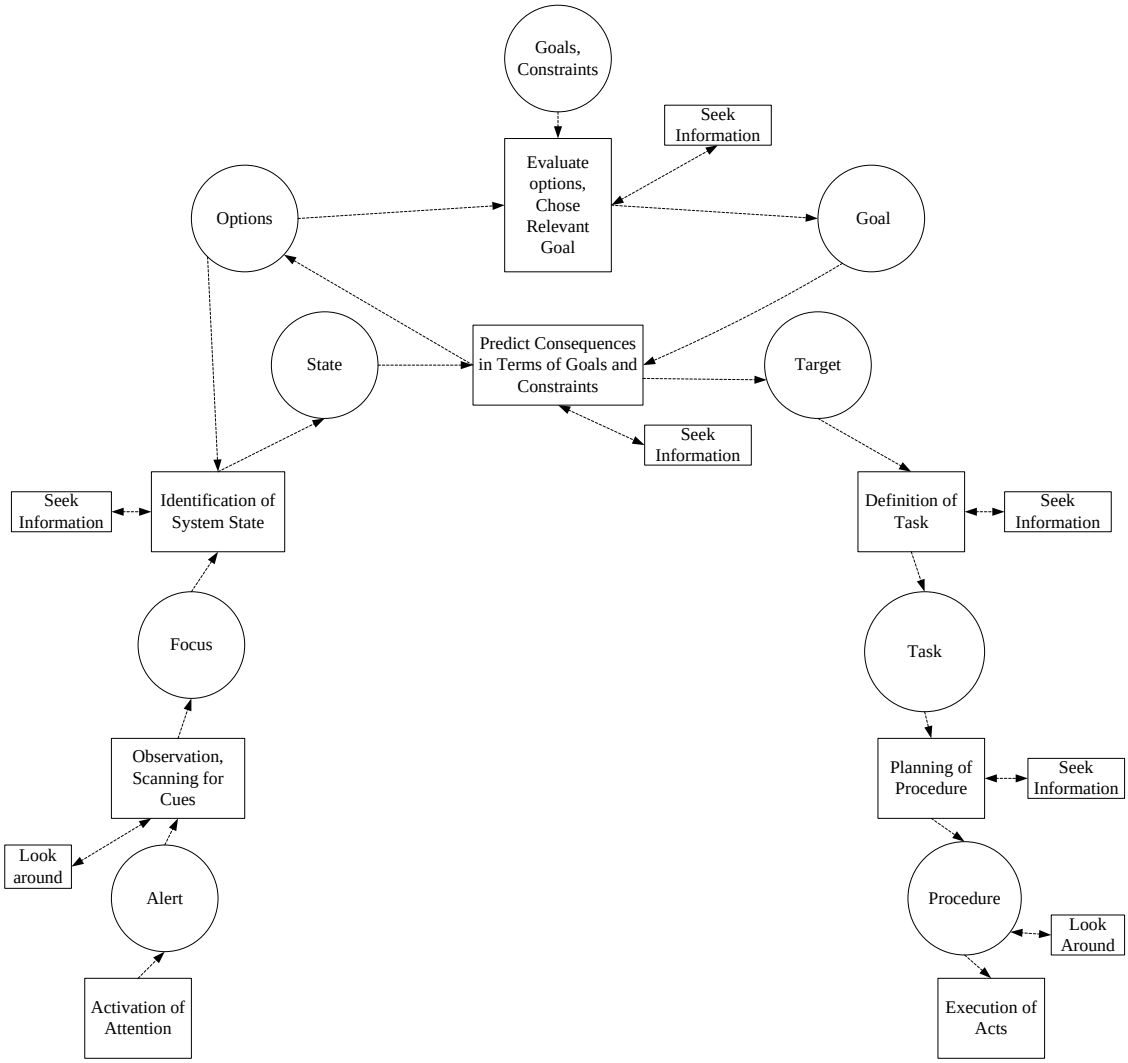

Figure 1: Rasmussen's Decision Ladder in its Original Form (Rasmussen, 1994).

in Canada, it would be prudent to perform research of this nature in this country to determine any cultural differences in practice.

In terms of frameworks and models, the literature revealed a lack of research studies guiding telenursing practice. As mentioned earlier, there are countless models that were developed by nursing theorists which guide and support nursing practice from a general perspective. The Self-Care model developed by Orem is one that whose theory is based on the premise that nursing is concerned with assisting and facilitating patients to meet their own self-care needs (Loiselle & Profett-McGrath, 2007). This model can certainly

offer some provisions for an overarching foundation for empowering callers. It is not as explicit in understanding the cognitive processes within decision making, especially in the presence of HIS. Greenberg (2009) proposed a model for telenursing that identified information gathering, cognitive processing and outputs. Although she did propose it do be an iterative process, moving back and forth between these stages, it did not specifically address heuristic shortcuts that telenurses use when faced with situations which may warrant urgent symptoms. Leprohon and Patel's (1994) study on decision making strategies actually identified that nurses used heuristic shortcuts in patients with serious and life-threatening symptoms when using a CDSS. Furthermore, the nurses' use of these shortcuts proved to provide highly accurate recommendations (Leprohon & Patel, 1994). The potential for a model to address a collaboration of these elements of telenursing may have some exciting implications for supporting, enhancing and appreciating this extraordinary area of nursing practice. It is clear that researching telenurse's experience of using CDSS in terms of decision making and the application of Rasmussen's decision ladder as a framework can offer some valuable insights for the future of telenursing.

CHAPTER 3: RESEARCH APPROACH

3.1 Research Methodologies

A qualitative approach was chosen to perform this research as the researcher was concerned with exploring the experience of decision making in when a telenurse used a CDSS. Furthermore, as the researcher was exploring the underlying cognitive processes of decision making, it was important that the various concepts that underpin these processes emerged as well as their linkages. As the researcher was concerned with validating Rasmussen's Decision Ladder as a framework to support telenursing, it was important to use a methodology in which the concepts were aligned. The decision ladder included some generic coding within the stages of information processing and resultant states of knowledge; therefore, a model based approach to coding the data was used. Table 1 illustrates the potential variations on the original terminology used within Rasmussen's Decision Ladder as it might apply to telenursing. These terms were based upon the experience of a telenurse's workflow in how calls were managed from the time that a caller was assisted with their health issue. Borycki, Lemieux-Charles, Nagle and Eysenbach (2009) used this approach in evaluating how novice nurses seek information when working in environments that use hybrid systems (i.e. paper and electronic based environments). This approach was useful in demonstrating information seeking activities in hybrid environments with the use of an existing model (Borycki et al 2009). The definitions as related to the decision ladder were in alignment with the information seeking tactics described in this particular paper (Borycki et al, 2009). As decision

making is clearly associated with information processing, testing Rasmussen's Decision Ladder using this approach was an appropriate choice.

3.2 Participants

In the attempt to understanding the experience of a telenurse's use of the CDSS a sample of telenurses was clearly the most appropriate choice. As participants, telenurses were able to provide an insider perspective of the true realities in how they reach decisions. In terms of sampling, the focus in this qualitative research was on description and exploration; therefore, large numbers were not required for generalization across the population as is in the case of quantitative methods. Eight telenurses participated in the study and in fact, this is the typical number noted in research in order to reach saturation. Similar telenurse related studies using a qualitative approach used samples of anywhere between five to ten telenurses resulting in rich data and saturation (Edwards, 1998; Greenberg, 2009). Furthermore, a convenience method of recruiting telenurses was used for selection as the operational requirements in terms of service levels and callers waiting would affect the availability of telenurses.

3.3 Inclusion Criteria

One of the first criteria in participant selection was the length of employment at the telenurse call centre chosen for this study (Centre A), as this helped to distinguish the novice nurse from the expert. Dowding et al (2009) performed a qualitative study of the experience of nurses' use of a CDSS and found that telenurses new to the job were more likely to use the tool more prescriptively. As they became more familiar with the tool,

they were more likely to deviate by 'upgrading'. Call Centre A's last session of recruitment was very recent; therefore, there might have been some variety in the levels of competency along the novice to expert continuum. This might have been helpful in identifying some key factors that distinguish the novice from the expert telenurse. However, there were no novice telenurses that decided to participate. Additionally, the actual criteria for employment as a telenurse at Call Centre A requires that the nurse have at least three to five years of experience in an acute care, public health or emergency room setting. In terms of computer and keyboarding skills, a telenurse needs to type at least 30 words per minute as well as some basic windows knowledge. In fact, the average telenurse at Centre A has an average of approximately sixteen years of experience.

3.4 Recruitment

As most of the telenursing staff met the inclusion criteria, the researcher chose participants based on operational requirements and scheduling as well as their willingness to participate. The author sent an email notification outlining the study. In addition, the email included a section on a request for telenurses who would be interested to reply. As emailed responses came in, their years/months of telenurse experience were reviewed (this was asked in the email) and a purposive sample of novice to expert telenurses (approximately 6-8) was selected. The purpose of this was to be able to understand the factors involved in decision making between novice and expert telenurses as this has been highlighted as a major influence in the literature review. In this study, none of the novice telenurses responded and so this was not tested. At the time of the study, the telenurses who were selected were asked to sign a consent form. They were then

debriefed on the data collection process as well as provided with a questionnaire (Appendix A) to collect demographic information on the telenurse's experience.

3.5 Research Setting

It was most logical as well as practical to perform this research in the most naturalistic setting possible, which was the telehealth nursing call centre (Centre A). The researcher was aware of the fact that research studies in health informatics have previously been conducted at the Centre A; therefore, this precedence provided some influence on permission to move forward with this research. Permission was granted by the organizational executive director to perform this research. Hall, Kushniruk and Borycki (2011) performed a study that utilized usability engineering methodologies to evaluate the HIS at Centre A. This study was based more upon user interface design and features. In fact, one of its recommendations was to perform further research in determining the potential to which software usability may influence telenurse job satisfaction (Hall et al, 2011). This particular study used a usability methodology entitled cognitive task screen turn analysis (CTSTA) within the clinical simulations. Hall et al (2011) explained this as "a method we have developed where a screen-turn is defined as a user initiated request of the system to perform an action resulting in the display of a new screen of information", (p. 4). This research did not formally address job satisfaction explicitly, but certainly there were some areas in which telenurses expressed emotions during the interview.

A telenurse workstation within the call centre was used for this study in order to maintain a naturalistic setting. Figure 2 illustrates the workstation design in terms of how a telenurse interacts with the telephony and the HIS. The location of the workstation in

relationship to the call centre was arranged so that there were no disruptions or distractions to other telenurses on live calls.

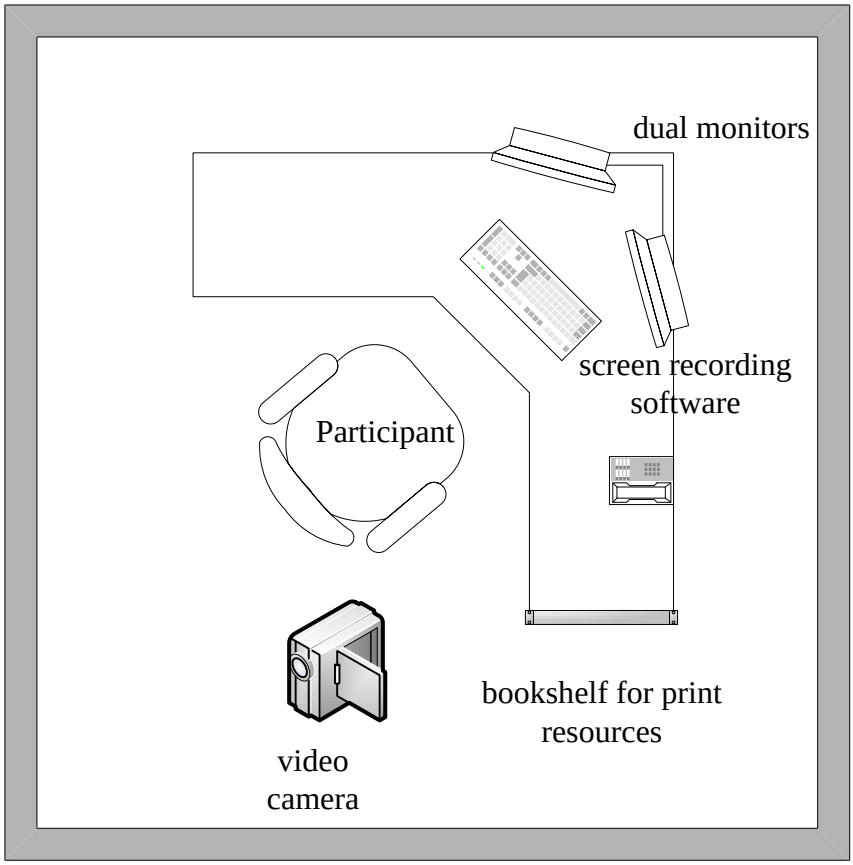

Figure 2: Telenurse Workstation Design for Clinical Simulation.

3.6 Procedure

Borycki, Kushniruk, Anderson, J. and Anderson M. (2010) discussed the use of clinical simulation as a methodology used by health professionals to enhance and improve clinical knowledge as well as evaluating the use of HIS. As previously mentioned, Hall et al's (2011) research was performed using a simulated call very effectively in evaluating the usability of the EMR and the CDSS. The use of clinical

simulation, therefore, was an excellent approach to capturing the true essence of critical thinking and decision making in order to test Rasmussen's Decision Ladder as a framework in telenursing. Furthermore, the literature review only identified two studies where clinical simulation was used in some capacity (Edwards, 1994; Hall, Kushniruk & Borycki, 2011). The remaining methodologies used included surveys and focus groups and thus, utilizing clinical simulation, particularly where a telenurse used a CDSS, had some new and exciting implications. Two simulated call scenarios were tested. One involved a caller with urgent symptoms of a heart attack, and the other consisted of a new postpartum mom with symptoms of a potential mastitis and her newborn baby. These were chosen with the premise that they would both follow a different pathway along the decision ladder (i.e., one demonstrated urgency along with the use of heuristic shortcuts while the other was more complex and used in a more linear fashion). In essence, these two scenarios would follow a different pathway in terms of workflow. These two scenarios were validated as examples of common calls at Centre A by the Quality Management nurses and the Clinical Educators. As these calls were simulated within the telenurse call centre, there was no impact to patient privacy and therefore, no special permissions were required. These calls were also audio recorded by specialized telephony. The computer screens were recorded by Camtasia© software so as to offer further data in how the telenurse used the CDSS (Hall et al, 2011). Upon completion of the call, the researcher played back the audio and computer screen recordings for the telenurse and she was asked to comment on her decision making experiences. These verbalizations were also audio recorded for further analysis. After the call was played back, the researcher asked open ended questions in the form of semi-structured

interviews to clarify these verbalizations (see Appendix A). This cued recall approach served to extract data in truly understanding a telenurse's cognitive processes. Cued recall was particularly useful in terms of reviewing playback and identifying a telenurse's thoughts while using the CDSS.

3.7 Data Analysis

Transcription and analysis took place as soon as the collected data was reviewed in order to ensure that accuracy was preserved. In addition, constant comparison of the data occurred so as to identify any similarities or differences (Jackson & Verberg, 2007). This iterative process ensured that every piece of data was examined and re-examined for any potential emerging themes as well as some validation that saturation has been reached. As the goal of this cyclical process was to makes some sense of the data, the researcher was fully immersed in the analysis.

Content analysis was used as a method of systematically deconstructing the data. Priest, Roberts and Woods (2003) described this particular method as being specifically reliable in coding decisions as there was an opportunity for assessing data integrity and stability. As the researcher used a model-based coding approach, the analyzed data was compared to the terminology within Table 1. New descriptors of the coding emerged; and these were added to the list of terminology. In addition, the behaviours that were influenced by factors previously mentioned (i.e. novice to expert, stress and fatigue) were analyzed in how these fit in with telenursing. Table 2 provides an overview of how these behaviours may be construed based on the literature.

Once all of the data was analyzed, the researcher mapped out the various trajectories of call-taking by telenurses using Rasmussen's Decision Ladder in order to understand its utility as a framework in telenursing. In doing so, detail was provided with respect to the

Decision Ladder: Coding Terms				
Nursing Process Phase	Rasmussen's Decision Ladder (Naikar, 2010)	Definition of decision ladder terms	*Mapped to Telehealth: States of Knowledge (Circles)*	*Mapped to Telehealth Information Processing (rectangular)*
Assessment	Activation	Detect need for action		Anticipating a new patient encounter
	Alert	What needs attention?	Alert Data Actual State New Caller on the line	
	Observe information and data, scanning for cues	Active and Passive information seeking techniques (Borycki et al, 2009)		Observe data Listen to caller Anticipate Identify options Perception Rule out 911 symptoms to ensure caller safety
	Information	What is the current state	Knowledge of caller's health status	
	Diagnose State	Active and Passive information seeking techniques (Borycki et al, 2009)		Review potential nursing diagnoses
	System State		Triage options	
	Predict Consequences			Predict consequences Plan comprehension Formulate plan
	Options		Information	
	Evaluate Performance			Evaluate triage options
	Overarching goal		Goal of a safe caller outcome	
	Chosen Goal			

Planning	Predict Consequences		Target state	Predict consequences Plan comprehension Formulate plan
	Target State		Safe care for caller	
Implement ation	Definition of task			Triage with CDSS
Decision Ladder: Coding Terms				
Nursing Process Phase	Rasmussen's Decision Ladder (Naikar, 2010)	Definition of decision ladder terms	*Mapped to Telehealth: States of Knowledge (Circles)*	*Mapped to Telehealth Information Processing (rectangular)*
	Task		Recommended disposition obtained	
	Planning of Procedure			Planning of caller care Execute Implement
Evaluation	Procedure	Active and Passive information seeking techniques (Borycki et al, 2009)	Caller verified understanding Understand consequences if recommendations not followed Tasks Resources	
	Execute			End Call and document in client record

Table 1 Mapping of Decision Ladder Concepts to Codes for Analyzing Telenursing Decision Processes.

varying behaviours in how heuristic shortcuts were (or were not) used in telenursing. There were many different scenarios based on the demographic of the telenurse and experiential background; and these were outlined and mapped in detail in order to fully substantiate this potential framework for telenursing.

Behaviours	Novice Telenurse	Expert Telenurse	Unfamiliar Scenario	Stress/ Fatigue
Knowledge Based Behaviour	x		x	x

Rule Based Behaviour (shortcuts)		x		
Skills Based Behaviour (automatic)		x		

Table 2 Potential Manifestations of the Various Behaviours as Related to Telenursing.

3.8 Ethics Approval

In August 2013, an ethics review application was submitted to the University of Victoria Human Research Ethics Board. Ethics approval was provided on October 2013. Data collection activities started following this approval. See Appendix 4 for documentation.

3.9 Conclusion

Telehealth nursing has been recognized as an economically effective platform for the delivery of health care. Research has been done in countries such as the U.K. and Sweden in order to identify how telenurses make decisions using HIS. This research provided some understanding regarding a telenurse's level of critical thinking. This knowledge is important to supporting telenurses with educational opportunities within the realm of critical thinking and decision making. In addition, this knowledge has the potential to foster a patient centred focus as well as facilitating safe and quality patient outcomes. Because there are limited studies conducted in Canada, it was important for this research to be implemented as it would contribute to ongoing quality improvement to nursing practice as well as HIS including CDSS. Furthermore, no such study has been performed

at Call Centre A (or any other call centre known to the researcher); therefore, the results may have some interesting implications.

Models and frameworks are fundamental in providing guidance as well as support in the ongoing quality of professions, and telenursing is no different. There are many possible propositions that could ensue from the development of this framework. First, is the creation of partnerships between other telenurse call centres. In fact, there is no established collaborative network that the researcher is aware of across Canada. Next, there is potential for this research to spark interest in this topic in other Canadian telenurse settings whereby practices could be shared such as understanding some of the lessons learned in telenurse related projects. Certainly, this is dependent on the level of proprietary knowledge a particular organization maintains. Finally, this work could serve to offer some foundational knowledge in forthcoming business opportunities, such as in chronic disease management and other specialized telenurse related services. This research has outlined a number of potential impacts that may bridge some of the gaps to telehealth care delivery provincially, if not nationally or globally.

CHAPTER 4: STUDY FINDINGS

4.1 Introduction

Based on the data collection and analysis, this section provides an overview of the observations and study findings from the clinical simulations performed at Call Center A as well as the post cued call interview questions. These include findings about the characteristics of the participants and observations made about decision making processes as mapped to Rasmussen's Decision Ladder. Furthermore, the factors that influenced how participants made decisions as well as the use of short cuts within the decision ladder were identified. For the purposes of this section, the terms "telenurse" and "participant" were used interchangeably.

4.2 Demographic Characteristic of Participants

It is important to gather information about the demographic characteristics of the telenurse to understand how knowledge and experience as well as other potential factors influence decision making. Nurses come from various fields of work (i.e. acute care, community care, and geriatrics, to name a small number of specialty areas in nursing). Furthermore, the full time equivalent (FTE) of a telenurse's amount of time worked may also play a role in understanding decision making in terms of the relationship between how many hours the telenurse works (i.e. full time versus part time) simply because he or she has logged more hours and thus has more experience. In addition to this, working in other organizations as well as in a telenursing organization concurrently can impact decision making. For example, if a RN works as a telenurse in Call Centre A and part

time in another facility, such as a pediatric unit in a hospital, she would have more specialized experience in that area and would potentially manage these types of callers differently than a telenurse without pediatric experience (i.e. he or she may provide more specific detail on recommendations to care, or may actually decide not to use the CDSS because she is more knowledgeable in that area). Furthermore, she would be exposed to pediatric specific practice changes on the unit and could offer feedback on that particular content in the CDSS.

4.2.1 Basic Demographic Characteristics of the Participants

Eight telenurses participated in the study; 100% of which were female. Seventy- five percent (n=6) of the participants worked full time hours whereas only 25 % (n=2) only worked part time. Twenty- five percent (n=2) of the participants worked as a telenurse between 6-10 years while 75% (n=6) worked between 11-20 years. In terms of years of experience working as an RN, 50% (n=4) of the participants had more than 21 years of work experience, 37.5% (n=3) had between 11-20 years of experience, while only 12.5% had at least between 6-10 years. Telenurses had an average of 20.6 years of experience working as an RN.

4.2.2 Computer Competency Questionnaire Results

With respect to the participants' actual use of computers prior to working at Center A, 87.5 % (n=2) had used computers in some capacity and 12.5 % (n=1) had no experience at all in using computers. Table 3 summarizes the demographic characteristics of the participants.

Characteristic	Frequency (%)
Sex *(n)*	
Female	100 (8)
FTE	
Full Time	75 (6)
Part Time	25 (2)
Years of experience as a telenurse	
≤5	0 (0)
6-10	75 (6)
11-20	25 (2)
≥21	0 (0)
Years of experience as a registered telenurse	
≤5	0 (0)
6-10	12.5 (1)
11-20	37.5 (3)
≥21	50 (4)
Working in Other Areas?	
No	100 (8)
Competency level in computers	
Poor	0 (0)
Fair	37.5 (3)
Good	25 (2)
Very Good	37.5 (3)
Computer Use prior to working at Centre A	
Yes	87.5 (7)
No	12.5 (1)

Table 3 Demographic Characteristic of Telenurse Participants.

** n – Number of subjects*

4.3 Post Simulation Interview Observations

The observations noted in table 4 were based on the post cued recall simulation interview questions for the two scenarios. The cued recall approach warrants questioning immediately following the video and audio playback of the call so that the participants had the information fresh in their minds and were able to offer detailed responses. There were many commonalities among the interview responses which have been detailed in

the sections below. In addition, it is important to note that participants often provided a variety of responses per question and only the most common responses (at least 50%) were noted.

4.3.1 Explanation of Simulations

Two call simulations were performed per telenurse participant in order to illustrate the potential different uses of the decision ladder. The first, a potential heart attack victim, is an example of a situation whereby the telenurse notes a life threatening urgency in her assessment. Classic symptoms of a heart attack were exhibited by the caller and as such, the telenurse would be expected to get the caller to medical assistance quickly and safely. The second scenario actually involved two patients – a mom who delivered her baby six days prior and has chosen to breast feed. The mother described symptoms that were indicative of a potential breast infection (mastitis) including redness, warmth, pain and swelling of her breast. As the mother may have a diagnosis of mastitis, her newborn baby would be at risk for dehydration because the mother's symptom of pain may dissuade her from feeding her baby as often. This particular scenario would illustrate an alternative use of the decision ladder as there were two patients to manage. Selecting two very different types of scenarios was important to this study in order to identify as much diversity within the use of the decision ladder as possible. For the purposes of this section, any text in italics represents nurse-caller encounter data; regular text indicates the researcher-nurse interview data.

4.3.2 Decision Making Processes and Strategies

As previously mentioned, decision making is a complex cognitive process whereby individuals use their knowledge and experience to form actions. The resultant actions inform the strategies necessary to manage situations. Within this study, strategies were specifically geared toward telenurse practice. Rasmussen (1993) described practical decision making as:

> …not the resolution of separate conflicts, but a continuous control of the state of affairs in a dynamic environment. It is dependent on the tacit knowledge of context and cannot be separated from action planning, (p. 159).

In both of the scenarios, participants used their clinical knowledge and experience differently, but they differed significantly based on the type of caller scenario. In the heart attack scenario, 87.5 % (n=7) of the participants stated that they were knowledgeable about the presenting symptoms of the caller. They noted that the caller's symptoms were urgent and characteristic of a heart attack as illustrated in the following quote:

> R: okay, so, what kind of went through your mind here when this patient was talking about these symptoms?
>
> N: I knew that was going to be a 911 call
>
> R: you did?
>
> N: ya automatically
>
> R: and what made you think that

N: well as soon as somebody says chest pain, it's usually, but then when she said shortness of breath, like problems breathing, then those are very classical symptoms (Telenurse 1, post call cued recall interview)

Interestingly, the breast feeding mom and baby scenario revealed that only 37.5% (n=3) of participants mentioned clinical knowledge and experience:

R: Obviously I could tell you were concerned there

N: what I wanna do is assess him but I know she was having a problem too

R: Yes

N: so um I knew he was gonna have to go in so that's why I said I would assess her later on and then I would go back to him

R: right, right, right, ok. Um, so here were you thinking of anything back in your experience

N: oh for sure

R: Ya?

N: and that tells me that probably wouldn't have been an emergency call. Three diapers in 24 hours

R: oh okay (Telenurse 1, post cued recall interview)

So, this particular telenurse knew that this call would not be an emergency based on her experience, but of course, this was not the majority.

In terms of other responses to this question, 50% (n=4) of the participants in the heart attack scenario reported that their callers mentioned several risk factors as influencing aspects in how they arrived at a decision for a recommendation; and that resulted in the final 911 disposition. The excerpt below describes this:

R: so, just wondering your thought process here then, you have got these symptoms

N: um, well, you know there's really, you could ask a few more questions about chest pressure, but that's pretty straightforward, any kind of funny feeling, I'm looking at her age, she's got two other symptoms that could be related to a heart attack, it's not even at that point even particularly necessary to get the health history and again unless the person is hesitant to go in, um, because you know that that's in some instances that might increase the urgency but there is nothing more urgent than calling 911, so, again it sometimes it just comes down to how much effort you need to put into actually convince the person so if they're insistent she mentioned I'm nauseated I thought it was something I ate, so some people will really hang on to that and then you might, um, well okay let's talk, well no no no, it's just whatever, okay, then what's your health history, ok so you tell me you have some cardiac history, so then you try and put it altogether, for them, I was willing to go there if that's where she was going to go but this was straight forward (Telenurse 3, post cued recall interview)

Another 50% (n=4) of the participants stated that they were knowledgeable about the CDSS and in this case, knew exactly where they needed to go if it were necessary as illustrated in the following excerpt:

N: and we'll take a look here at the symptoms you're experiencing okay, specifically I'm looking at chest problems, okay, with that chest pain….okay, so, um chest pain or pressure or a strange feeling in the chest, you're having, right?

R: So you seemed to know exactly where to go, what topic

N: ya it's obvious, ABC's (Telenurse 7, call encounter and post cued recall interview)

In contrast, 37.5% (n=3) of the participants stated that the breast feeding mom and baby scenario involved a higher level of complexity in terms of navigating within the CDSS, as evidenced by the following quote:

N: so here I'm going into here but it has nothing to do with a rectal problems, but I thought, where is that where it tells me how many wet diapers a 6 day old should have [participant was looking at the newborn bowel movements alert when actually was searching for the urinary norms for newborns inline note]. So of course I go in here and this is just the bowel movements, I thought it also had, I couldn't remember if it had the urine in it that's why I went into this [rectal problems topic]

R: so you were actually looking for the alert and in your mind this is the place that you remembered you could find it

N: yes, I was thinking, how many, for 6 days, how many wet diapers should I see and of course, this is the first thing I thought of that it might be included in this but this is only stool

R: so this was unfortunately the wrong place to go

N: yes, but that's why you are hearing a lot of pauses cuz I'm going, where is it, it doesn't include this

N: so, let's just see here, bear with me as I try and find the right topic, [a period of silence] sometimes if you have a fever and sore nipples, usually it comes because of a plugged duct, you may have an infection called mastitis, um, usually

it doesn't involve a sore nipple as much (Telenurse 5, call encounter and post cued recall interview)

This telenurse experienced some difficulty in locating the information she wanted, and thus was more focused on the HIS than the caller as evidenced by the period of silence. Patient focus will be discussed in more detail in a later section.

Generally speaking, the majority of telenurses were more comfortable with the heart attack scenario in terms of knowledge, experience and ease of using the system. The breast feeding mom and baby scenario was more complex because there were two patients and multiple body systems were affected that required assessment, which would naturally lead to a greater degree of navigating within the system.

4.3.3 Level of Ease/Difficulty with Case

In this question, 100% (n=8) reported that the heart attack scenario was easy to manage because it was straightforward (50%, n=4) in terms of the fact that the symptoms were very classic of a possible heart attack. The following quote illustrates this:

C: um, I'm having difficulty breathing and I feel like something's sitting on my chest

N: okay

R: any thoughts so far?

N: well, so with the difficulty breathing, I wasn't too concerned, because I could hear that she's talking just fine, but when she said something was sitting on her chest, that was like, you know, red alert, 3 alarm fire (Telenurse 2, call encounter and post cued recall interview)

In addition, 50% (n=4) of the participants stated that the ease of use of the CDSS was attributed to their experiences with the classic signs of a heart attack as described in the quote below:

> *C: um, well, I'm home alone right now, and my husband's out and I feel um chest pain, and having some problems breathing*
>
> *N: okay, now do you have any cardiac problems in the past?*
>
> *C: um, my doctor um ordered some blood work and um and an ECG just a while ago as I was having some ankle swelling*
>
> R: okay, so, what kind of went through your mind here when this patient was talking about these symptoms?
>
> N: I knew that was going to be a 911 call
>
> R: you did?
>
> N: ya automatically
>
> R: and what made you think that
>
> N: well as soon as somebody says chest pain, it's usually, but then when she said shortness of breath, like problems breathing, then those are very classical symptoms (Telenurse 1, call encounter and post cued recall interview)

On the other hand, 87.5% (n=7) of the participants stated that the breast feeding mom and baby scenario was hard because they now had two patients to manage:

> *N: okay, um alright, oh, and hang on a sec here, a lot fussier than usual, okay, ya, according to the information I have here, he should be, at six days, gradually increasing to at least six or more wet, or urine diapers a day [reading inline note], and um, so he's not having that so, my concern is more, and I know you*

certainly have a valid concern about your nipples, I also, though think there is a concern for your baby and that he might be getting a bit dehydrated because he's not having as many, interesting, he's feeding every two or three hours, but, just a second, just bear with me for a sec, just trying to go over this protocol and talk to you at the same time (Telenurse 5, call encounter)

Again, many of the participants felt the heart attack scenario was easier to manage the caller because of their prior experience with urgent symptoms of a heart attack as well as the fact that it is such fundamental knowledge to nurses in general. The breast feeding mom and baby scenario was more complex because the telenurse had to manage two patients at a time with competing priorities.

4.3.4 Utility of Past Experience and CDSS

In terms of past experience, 62.5% (n=5) of the participants indicated that they utilized their past clinical experience in the heart attack scenario as described in the excerpt below:

C: well I'm not feeling well and I'm not sure if I need to see the doctor, I'm home alone and my husband's out babysitting the grandchildren and it feels like it's hard to breathe and that I'm feeling some pressure on my chest as well

N: when did this start?

C: about a half hour ago and I feel a bit nauseous and sweaty too I thought maybe it was something I ate, like maybe some indigestion or something, and I'm sitting down now.

R: so, in hearing some of these symptoms, what kinds of things are going through your head?

N: she needs an ambulance

R: can you explain what is influencing this thought process?

N: um, past experience obviously, and I was a cardiac nurse as well as a telenurse (Telenurse 7, call encounter and post cued recall interview)

Clinical knowledge also played a part in the heart attack scenario with the participants [62.5% (n=5)]. The following excerpt describes this:

N: Really about making sure the patient is safe, my knowledge as I understand the protocols and know what the information will say. Also, really understand if and when the caller is hesitant, especially in such situations to make sure they are safe (Telenurse 3, post cued call interview)

Interestingly, the breast feeding mother and baby scenario demonstrated that 100% (n=8) of the participants answered yes to using their past experience in conjunction with the use of the CDSS to manage the caller as illustrated in the below excerpt:

N: okay, alright, so I'm going to go through the questions with you about the postpartum problems, just an awareness that most of the time when a baby is about 6 days of age, you would like to see him have about 6 wet diapers like he was doing before, the 5-6 would be what we would kind of be expecting, but 3 in the last 24 hours we would be getting concerned that he might be getting dehydrated… I'm just going to ask a couple of more questions, how is he behaving to you, is he very very sleepy, do you have a hard time waking him?(Telenurse 6, call encounter)

A further breakdown of that cohort revealed that 87.5 % of the 100% (i.e., 7 out of 8) of those previously mentioned participants relied on their personal experience of either having experienced symptoms of mastitis themselves as a mother or knowing a friend with that experience as shown in the quote below:

> N: I mean I knew what the symptoms [of mastitis] were, just from my own knowledge, and from our CDSS, and I've had a couple of kids myself, as well as mastitis, so I knew what that was like, so I knew that the symptoms could possibly be that, so little bit of everything I guess, I worked in pediatric ICU – I remember saying if it was only one diaper, let's stop now, and that would be more based on CDSS that it was severe dehydration – it was me knowing that it was there with that scenario, not my background… we try not to let them get that dehydrated in ICU [laughing] (Telenurse 6, post cued call interview)

In this particular case, the telenurse did not even use the CDSS to manage the caller – in fact, she actually used a reference book from the shelf where she knew the exact information that she wanted to discuss with the caller regarding how to unplug a duct. The following quote describes how this process occurred:

> *N: so, I'm just gonna kind of read through this, and please stop me if you have any questions*
>
> *C: okay*
>
> *N: I'm getting this from the La Leche International breast feeding and answer book and there should be a support group in your area if you have ongoing questions or issues, it's really great with your local La Leche League group*
>
> *C: okay*

> R: so you were reading this information, I don't think you had pulled the book down yet (breast feeding answer book – print resource), and so is just something you know?
>
> N: I know this from having looked at that topic many times before, I know exactly where I'm going in the La Leche answer book and that's where again my processes just normally, I would be grabbing that as soon as she said sore breasts, and it just feels a little awkward, so, but knowing specifically that I want to go to the topic of mastitis where I know I will find the description where they differentiate between what a blocked duct looks like and what mastitis looks like and I find that the most helpful just to sort of work through with the caller initially which situation you're dealing with, because and then because ultimately the information is the same in terms of how you treat it so I know that I want to get to that (Telenurse 3, call encounter and post cued call interview)

This telenurse used her past experience to assist the caller by providing information from this particular book of which she has used many times. In essence, she has decided to forgo using the CDSS altogether.

Professional experience was reported by 100% (n=8) of participants as being an integral component to use of the CDSS. This experience ranged from working as a postpartum nurse on a hospital unit, or in on a pediatric hospital unit as described below:

> N: yes I used my experience in postpartum, about the lack of wet diapers baby's had, and also about the redness I knew she needed [the mother] to get in because she may have mastitis and the tenderness, and also my personal experience cuz I have had that [mastitis] (Telenurse 1, post cued call interview)

In this particular case, professional experience and clinical knowledge was evident in both scenarios.

In the heart attack scenario, a telenurse's general knowledge as a nurse and specialized experience as a cardiac nurse influenced how she assisted the caller. In the case of the breast feeding mom and baby, the telenurse mentioned that she had experienced mastitis herself in addition to her work as a nurse in the pediatric ICU, and that this affected how she managed the patient.

4.3.5 Incidence of Problems and Utility of CDSS

Participant responses with respect to HIS problems were very different between the two scenarios. In the heart attack scenario, 75% (n=6) of the participants stated they had no problems with the system as shown in the excerpt below:

> N: no problems with the system, just it was a little bit slow, the pages to load up (Telenurse 1, post cued call interview)

Fifty percent (n=4) of the participants stated that using the system was straight forward as illustrated below:

> R: Did you have any problems using the system?
>
> N: No, it was easy in this case because very straight forward – ABC's [Airway, Breathing, Circulation] (Telenurse 3, post cued call interview)

In the breast feeding mom and baby scenario, the participants elicited responses that were quite different than how they found the system within the heart attack scenario. Eighty seven and a half percent (n=7) of the participants mentioned they did have various problems with the CDSS. Interestingly enough, 62.5 % (n=6) of the participants

described several problems with system components, such as hyperlinks that did not work, poor search engine functionality and slow page loading times. In the excerpt below, the telenurse explained a feature in the system whereby she was positioning the mouse so that the cursor was on a hyperlinked area that displays information:

> N: Again, trying to find the information about the urinary norms, and that hover thing being so hyposensitive (Telenurse 5, post cued call interview)

In another example, the telenurse used the search engine within the CDSS to look for a topic that was appropriate to the issue at hand (in this case, breast feeding):

> N: when I put in breastfeeding in the search, it came up with 8-10 things that said breast feeding, but I found that I was quickly trying to scan to something that applied in this situation – it was quite a long return on the search
>
> R: so the search engine was an issue
>
> N: yes (Telenurse 5, post cued call interview)

Another problem identified by 37.5% (n=3) of the participants was specific to system customizations that were developed in order to incorporate British Columbian and Canadian health care guidelines such as alerts that open in a new window as well as inline notes (i.e. additional customized text within the CDSS content that is embedded within the respectful page). For example, the CDSS contains information about how to manage symptoms of mastitis. As mentioned earlier, the CDSS is an American based application, and as such, contains American health information that is not always in alignment with Canadian health standards. In the case of mastitis, the information is slightly different in terms of how quickly a patient should access care. Therefore, a customization was added to the content in order to alert the telenurse to provide the

Canadian information in place of the American recommendation. An alert pops up in a new window when the topic is accessed. An inline note is different, in that text is added directly within the sentence or paragraph of the topic page where the associated mastitis recommendations are located. The telenurse clicks on the icon of the inline note to open it and read the information. The example below describes the participant's difficulty:

> R: Did you have any issue with the inline note
>
> N: ya, I couldn't remember how to close it
>
> R: oh, I see, I remember later that you had gotten a little fussed about you know, having something open and opening the disposition by accident or something?
>
> N: ya I was going to try and change a disposition but that's not going to work
>
> R: again it looked like you had to manoeuvre the system to try and get to what you wanted [Telenurse had to close disposition in order to open the "latching problems" inline note, which is about the baby latching onto nipple of the breast)
>
> N: ya
>
> R: that's where you accidentally hit one as opposed to the other, does that happen a lot
>
> N: sometimes (Telenurse 2, post cued call interview)

The telenurse explained that there was more than one active component here (the inline note and the disposition window). This provided some confusion to the telenurse and thus negatively changed the workflow because she did not know which one to click on.

In the heart attack scenario, the telenurse did not report any system problems. This call lasted 2:12 minutes and the telenurse visited 3 pages of the CDSS (screen turns). Essentially, clicking on a particular component to move to a different page within the

application would be termed a “screen turn”. In contrast, participants identified system issues in the breast feeding mom and baby scenario. The call length was 14:24 minutes and there were 12 screen turns. They noted system customizations were problematic because there were several components open (i.e. the disposition window and two other inline notes). As such, the telenurse was confused about what to open or close. Essentially, these problems contributed to the complexity of the situation in terms of causing the telenurse to become distracted in trying to manage the system while trying to stay focused with the caller:

> N: … I felt it was unnecessary to go have to go through all these questions, did it anyway, and then when I did come to the questions well, then we have this inline note that gives us a different disposition, so at this point, I don’t know if I was just stunned with fear but it would have been nice at that point to be able to have something there that says, go there, and maybe it did and I didn’t see it properly, but I know that breast feeding education topic has a lot of education, so it would have just been nice to have just have something, well, go there and do this, just because this is not my clinical field, and ya, these are not my favourite calls (Telenurse 2, post cued call interview)

The telenurse described a point where she found the inline note and reacted with fear because she could not find the appropriate information. The breast feeding topic she referred to contains several pages of information. The telenurse had to sift through the information by scanning and navigating between pages, and this meant that the patient had to wait while the telenurse interacted with the HIS. In this case, the telenurse was not

familiar with postpartum nursing protocols and as such, she was overwhelmed (i.e. the comment regarding fear).

System problems were identified in the breast feeding mom and baby scenario in terms of the number of customizations and number of pages that the telenurse had to navigate through. There were two patients instead of one; therefore, each patient had to be assessed in separate topics of the CDSS. The mom and baby experienced different symptoms (i.e. breast problems for mom and potential dehydration for baby) which in turn increased the amount of content to be covered and therefore increased the chances of system problems to be encountered. Telenurses did not identify specific system problems within the heart attack scenario, but the telenurses did not always use the CDSS because the symptoms were so classic of a serious heart problem. Symptoms of a heart attack are basic in terms of nursing knowledge where it is necessary to assess the urgency of the patient's condition. The fact that she did not even use the CDSS would not even give her the opportunity to detect a system problem. To summarize, the incidence of system problems may be dependent on the extent of use of the CDSS.

4.3.6 Level of Ease/Difficulty with System:

One hundred percent (n=8) of the participants who managed the heart attack scenario stated the system was easy to use. The participants provided various reasons for their ability to easily use the CDSS; for example, two participants (n=25%) stated they did not even use the CDSS, as the callers experienced urgent symptoms. The telenurses were very comfortable and confident in asking the caller to hang up and dial 911. This practice would be an example of the use of a shortcut with respect to the decision ladder model:

N: yes, it was just straightforward, did not use CDSS only briefly in record because of presentation of symptoms (Telenurse 4, post cued call interview)

In the breast feeding mom and baby scenario, 62.5% (n=5) found it difficult. The following excerpt describes some of the factors that made this call challenging:

N: hard, harder!!

R: Why do you say that?

N: because of my clinical background, I tend to form a picture when I talk to people and I don't have much of a reference for these calls (Telenurse 2, post cued call interview)

The telenurse talked about a process called "picture building" where she used the data from her assessment and envisioned what the situation might look like. This concept was defined earlier in the study by Edwards (1994) as "the process by which nurses attempt to substitute for the physical absence of the client by constructing a mental image of the caller and the situation which she/he is dealing with", (p. 53). The telenurse also stated she had little reference for these calls in terms of amount of experience, which may have been a reason for the difficulty she experienced with the call.

Another participant explained the challenges she had with the breast feeding scenario as described in the quote below:

N: little more challenging, so somewhere in a little higher than that continuum, just because there were two patients, you had to check multisystem, multi patients, which I missed, I am just giving credit I would have it done it right away afterwards as I was hanging up, I thought shoot…I try not to do that cuz you never know for sure if you're going to get them back and you know the

> probability is good that the baby is going to go in the mom, and she identified some concerns, like the baby was fussy, so I don't think it would have been a concern, but still. Straightforward but more challenging (Telenurse 4, post cued recall interview)

This telenurse stated that the managing two patients and multiple systems contributed to the difficulty of the call. Immediately following the end of the call, the telenurse stated:

> N: oh shoot, I just realized I didn't assess the baby, so in a real situation, I would be phoning the patient back (Telenurse 4, post cued recall interview)

So, the telenurse actually forgot to formally triage the baby as she found the scenario quite complex. Fortunately she did remember after the call was over, but this recall may have been missed and thus may have undermined the goal of patient safety.

The reasons given by the telenurse regarding the level of ease and/or difficulty experienced by the telenurses were well communicated. The heart attack scenario was definitely easier because the call was straightforward to her. Both of the excerpts within the breast feeding mom and baby scenario posed some challenges as well as the potential for a patient safety issue.

4.3.7 Suggestions for System Improvement

In the heart attack scenario, seventy-five percent (n=6) of the participants stated that they did not have suggestions for improvement because they really did not use the CDSS. The participants said it was a clinically straight forward scenario as described in the quote below:

> N: No, that one was straightforward I think it just flowed well with that scenario (Telenurse 7, post call interview)

When the CDSS was used in the patient context of the breast feeding mom and baby scenario, 100% (n=8) of the participants indicated that the system's usability could be improved. Four suggestions were made by two of the participants. Twenty-five percent (n=2) of the participants suggested there was a need for a more flexible (and less prescriptive) system. For example, the algorithmic questioning of the CDSS required the telenurse to respond (click yes or no) to each question to trigger the next question. They do not have the ability to skip questions that they deem irrelevant. In the case of the pregnancy related topic, the telenurse must ask several questions about other body systems including, but not limited to headaches, leg swelling and visual disturbances before getting to the breast related questioning, which is very time consuming and cumbersome. This may be viewed as very rigid and prescriptive. Certainly the system is designed for safety to ensure that all body systems affected by a postpartum mother are assessed. A telenurse that has worked in a postpartum nursing unit may have more expertise to make a judgment about the line of questioning and thus, could use a shortcut by skipping questions that were not relevant. This is where a more flexible system would be more beneficial so as to allow the telenurse to tailor the questioning for the caller and thus offer shortcuts. The following quote explains this suggestion:

> N: well, for the pregnancy related problems, it probably would be better to have a more focused decision trees, because um, I think we have to give the caller some credit for when they are calling in for a problem that they tell us what their concern is, and um, you know, I think it would be better to have a maybe an

> overall pregnancy problem, well, um postpartum, or break it up into several ones (Telenurse 2, post cued call interview)

Twenty-five percent (n=2) of the participants recommended embedding the customizations into the content directly, such as in the case of inline notes, where the text is in a component within the content and includes an icon that opens when it is clicked. In the following quote, the telenurse described the difference between alerts, which are customizations that pop up in a new window to provide information about a particular subject within the CDSS, and inline notes which do not pop up, but are placed within the text of the topic content:

> N: um oh yeah, so I would probably, oh well, that's the thing that when you have new staff, they really benefit from the alerts but when you have staff that have been here awhile, so maybe, I really like them when they're in the topic
>
> R: so you mean like inline notes?
>
> N: yes that's right
>
> R: you like those better
>
> N: much better because I scroll over all the highlighted blue wording so I find them when they are in, there is one topic they actually have it in, I can't remember which topic it is, I think fever maybe, but they actually have one topic where it's in there, so it's easy to see and I can do it as I'm going through the call so it flows (Telenurse 1, post cued call interview)

Here, rather than the telenurse having to recall in which topic the alert was, she was able to access the information right within the content where it is relevant. Alerts are attached

to topics and rely on recall as opposed to recognition, which is a very important heuristic, or rule of thumb in the design of HIS's (Nielsen, 1993).

Twenty-five percent (n=2) of participants proposed some improvement to the search engine; for example, in the excerpt below, the participant suggests the following improvements are needed to make the system more usable:

> N: um, well, this is completely separate, the way the topics are labelled, I would never have come up with "Problems after delivery of your baby", so the title, so somebody who wasn't as experienced might have a hard time finding that topic because it's not intuitive. The fact that postpartum can be spelled 3 different ways in the search engine. It can make a difference in how high the item comes up (Telenurse 4, post call interview)

The term that the telenurse referred to can be spelled, "Postpartum", "Post-Partum", or "Post Partum" – and depending on how it is entered in the search engine, the results will be different each time. The search engine should be more forgiving to the user and allow for some of these nuances so that the results come up more consistently.

Finally, 25% (n=2) of the participants strongly suggested fixing the hyperlinks which were extremely hyposensitive and would not work unless the telenurse point the mouse right in the middle of the text as opposed to anywhere within the hyperlink:

> N: Again, trying to find the information about the urinary norms, and that hover thing being so hyposensitive (Telenurse 5, post call interview)

The telenurses provided suggestions on particular customizations, such as alerts and inline note customizations as well as hyperlinks and the search engine. In addition, the line of questioning in the CDSS was identified to be very rigid and prescriptive, and

suggestions were offered in how to make the system more flexible to the telenurse based on professional and personal experience. These suggestions were more evident in the breast feeding mom and baby scenario, as mentioned previously in the section regarding level of difficulty of use. Telenurses reported the heart attack scenario to have been straightforward and that they did not get into the system very far (i.e. only 3 screen turns). Again, there were more suggestions offered with the breast feeding mom and baby scenario because the telenurses were exposed to more screens and customizations.

4.3.8 How the System Affected Decision Making Skills

There were some mixed results with respect to how the CDSS affected decision making. In the heart attack scenario, 62.5% (n=5) of the participants reported that their decision making skills were not really affected by the system because they used the CDSS only minimally as evidenced by the example below:

> N: Knowing that the information was there to support my decision making (i.e. the chest problems topic), although I mostly went to the topic protocols for my documentation rather than use it to manage the call (Telenurse 3, post call interview)

The telenurse acknowledged that the information was available to her in order to support her decision making. The other thing to note is that when telenurses access topics within the CDSS, the information is actually auto-charted into the Electronic Medical Record (EMR). The system keeps a record of every topic page that the telenurse has visited within the CDSS. This particular telenurse relied on this as part of her documentation

strategy, and acted as a short cut as she did not have to manually document the topics that she navigated to.

The remaining 37.5% (n=3) of participants felt that the CDSS enhanced their decision making because it provided appropriate information and acted as a safety net, i.e. if the telenurse did not have knowledge or experience in a particular area, the system was there with the information available at her fingertips with (Dowding et al, 2009):

> N: it [the CDSS] enhances [decision making] because it gives uh, me the information I need to make the recommendation, the appropriate recommendation (Telenurse 1, post cued call interview)

In the breast feeding mom and baby scenario, 62.5% (n=5) of participants reported that the CDSS supported their decision making as it validated the decision that the telenurse had already made:

> N: I don't think it really affected it one way or the other, I think that she needed to get looked at by the doctor today anyway so when it came up as a yellow see doctor today, then that validated it, I think if it came up as something different, I still would have gone with see a doctor today because she had those symptoms and it kind of worked out both for mom and baby anyway (Telenurse 6, post cued call interview)

The system verified the telenurse's anticipated decision for a recommendation, although it appears that she would have gone ahead and went with her own recommendation regardless, in other words, overriding what the CDSS disposition was.

Essentially, telenurses stated that they felt the CDSS supported their decision making, whether it was simply because the information existed, or that it served as a validation to

what their anticipated recommendation was. This was evident in both scenarios in some capacity, i.e. less so in the heart attack scenario than in the breast feeding mom and baby.

4.3.9 System Effects on Level of Ease/Difficulty in Terms of Decision Making

Similar to the question regarding the level of ease/difficulty with the system in section 4.3.5, 62.5 % (n=5) of participants who managed the heart attack scenario stated the CDSS did not affect their decision making as described in the excerpt below:

> N: My decision was already made up on how to manage the call so it didn't affect it, it was automatic… as soon as you hear the chest pain, it's almost automatic as to what it's going to be... it almost wakes you up and makes you more alert, because it could be a 911 (Telenurse 7, post cued call interview)

This telenurse did not have a comment on the system itself; rather, she described her reaction to the caller. She further stated that the urgency caused her to react in such a way that she was prepared to provide a recommendation that was urgent.

The remaining 37.5% (n=3) of participants perceived that the CDSS made decision making easier because the information was there and provided some details about heart attack related symptoms thereby allowing her to be engage the caller, as shown in the excerpt below:

> N: easier because then, when you um gloss over the blue links, then it gives you some suggestions on what would be considered heart attack related symptoms so it's then it's easy to read those off, and rather than having to remember them (Telenurse 1, post cued call interview)

The participants' responses to the breast feeding mom and baby scenario were different in that 50% (n=4) of those who participated felt the CDSS made it easier, acting as somewhat of a safety net to ensure that nothing had been missed:

> N: Easier, cuz I know that it's covering all the bases, because it asks everything, it's a mental reminder of all the different things that need to be looked at and those things higher up are potentially more life threatening, more important to rule out. Because I didn't have as much OB [obstetrical] experience, it acted like that helps as well, for sure (Telenurse 4, post cued call interview)

To summarize, it was noted that telenurses did not use the system to a great extent in the heart attack scenario, but when they did, it was helpful. Telenurses were very focused on the caller as their symptoms appeared to be very urgent in nature. In the breast feeding mom and baby scenario, participants stated that the CDSS was there as a 'safety net' so as to ensure that nothing was missed. In some cases, participants lacked obstetrical experience, and that the system was helpful in these cases.

4.3.10 Factors Influencing Decision Making Skills

As previously mentioned, decision making is a complex process; however, it is also very unique to the individual. There are many factors that can influence telenurse decision making including, but are not limited to, nursing knowledge and education, professional experience, personal experience and the knowledge of the CDSS itself. These factors are very important to telenurse practice as there is certainly a level of

consistency that needs to be maintained when telenurses manage patients on the telephone. The goal of telenurse care is to provide safe, appropriate and patient focused care to patients, but there is also an important component that contributes to the quality of care: the consistency of the information provided by telenurses. This highly specialized cohort of nurses has various areas of expertise, such as obstetrics, pediatrics, or emergency room experience as evidenced by the participant responses. They acquire more specialized knowledge and skills and thus, decision making processes can be affected in terms of using a HIS.

The nursing professional experience was similar in both scenarios. In the heart attack case, 75% (n=6) of participants, identified that nursing experience influenced their decision making as evidenced in the excerpt below:

> N: yes, my nursing experience, the symptoms, the training that I have had
>
> (Telenurse 1, post cued call interview)

This telenurse explains that her nursing experience in terms of the situation presented (in this case, the heart attack caller) influenced her decision making. She further discussed that symptoms were an important factor in how she would proceed with her decision as to how to manage the caller. The training she refers to is telenurse related and includes how to use the HIS and in particular, the CDSS.

In addition, 87.5% (n=7) of the participants reported that nursing knowledge and education were factors that influenced their telenurse decision making. The excerpt below describes these factors:

> N: my nursing experience, education and judgment, really basic nursing knowledge… any telenurse who's graduated should be probably saying the same

> thing, as well as previous calls from others that have had chest pain. And I think if the person didn't have as many symptoms, sometimes you get someone calling and they have shortness of breath, but when you talk to them a little more, oh I have a stuffed nose with a cold, so sometimes if someone calls with just one symptom, I'll ask more questions and tweak it a bit more, but she said other things like sweating and nausea without me even asking, in this case I didn't (Telenurse 6, post cued call interview)

Clearly, nursing knowledge and education are significant factors in how telenurses make decisions. This telenurse even made a statement that all nurses should manage a caller the same way because the symptoms were so characteristic of a heart problem. In addition, listening to the caller's voice in terms of volume and tone were factors in deciding if this caller had a simple respiratory infection or a serious heart condition. For example, the heart attack scenario demonstrated a sense of urgency whereby the discussion of calling 911 actually caused the caller to sound anxious and worried.

In the breast feeding mom and baby scenario, 50% (n=4) of participants stated that personal experience was vital in how they came to a decision. Here, telenurses who were mothers used their past experiences with breastfeeding children to inform their decisions as described by one participant in the following quote:

> N: Personal experience and I think that it has to do with the level of confidence, some people could get really twitchy, I think there is a big decision making event on where to go for this 3 diaper issue and so it depends on how twitchy you are

R: you mean your level of comfort or confidence [clarified twitchy as being nervous]. Also, you are very well versed in this problem; did you ever have this issue [breast problem]?

N: yes, I had a major mastitis, like shivering, fever, and I unplugged it myself (Telenurse 3, post cued call interview)

This particular participant did not even use the CDSS to manage the caller. She actually referred to a text book off the shelf that had the information in terms of how to unplug the breast duct in order for milk to freely flow and release the inflammation that was potentially leading up to a breast infection. This will be discussed later as a short cut to decision making.

In addition, 62.5% (n=5) of participants stated their past professional experience as a nurse influenced their decision making. Participants identified that their past nursing experiences in the areas of obstetrics, pediatrics, telenursing and ER influenced their decisions. In terms of the heart attack scenario, this participant discussed her experience as demonstrated in this quote:

N: I know what the typical symptoms from there of a heart issue and if it's pretty well all of them. My past experience as a telenurse and working in emerg (Telenurse 4, post cued recall interview)

This telenurse has had professional experience in working within the ER and was clear in stating her knowledge of the symptoms of a heart attack.

Within the breast feeding mom and baby scenario, 62.5% (n=5) of the participants also reported that professional experience was a factor. This was noted within the quote below:

> N: ya I think if you were less confident you might send the baby in because they are mildly dehydrated, and because I worked in pediatrics and this particular caller sounded confident and understood the information and parameters, I would say try it for this length of time, but if things don't seem to be improving then to go in as opposed to just go in right now.
>
> R: yes right. I'm glad you also mentioned you worked in pediatrics (Telenurse 3, post cued recall interview)

Also worthy to note, the participants reported that the CDSS influenced how they came to a decision as described in this excerpt:

> N: what the CDSS says, partly she was a first time mom, even though vague, it's important if it's not treated. And the baby was fussy and irritable maybe the volume of what's going out [breast milk] has dropped down and maybe baby is not getting as much milk she's six days and may not be full flow, she may not be able to feed enough out of one breast. Maybe the milk out of the bad breast tastes bad (Telenurse 4, post cued call interview)

In summary, there were several factors influencing decision making identified by participants. In the heart attack scenario, nursing experience, knowledge, education and nursing judgment were utilized. The breast feeding mom and baby scenario also revealed that personal experience was drawn upon, potentially because the majority of the participants were women with children. Personal experience as a breast feeding mother with a new baby appeared to have been a contributing factor in the development of experience in the area of breast feeding. In addition to the above, professional experience with respect to working in related areas such as obstetrics or pediatrics was found to be

useful. Finally, the knowledge and familiarity of the CDSS influenced telecare nurse decision making in terms of the information that it provides.

4.3.11 Factors Influencing the Utility of Shortcuts

Shortcuts in the context of decision making within the decision ladder are described as the act of an experienced worker performing familiar tasks and moving from one part of a ladder to another as opposed to in a fixed, linear fashion (Naikar, 2010). In the context of telenurse practice, shortcuts are used similarly in that they use the CDSS differently (or not at all) in order to reach a goal. Here, the researcher explored how participants changed their use of a CDSS in order to attain a telenurse goal. In the heart attack scenario, 50% (n=4) of the participants reported that the urgency of a patient's situation was driven by the use of shortcuts as demonstrated in the quote below:

> N: um, I'm just trying to put this into context… just cuz I knew where I was going that it needed to be a 911, so I did the shortcut, because I didn't want to delay care. I could have gone to the CDSS and I knew it was going to tell me the same thing, and I thought why delay care when I was fairly certain they were pretty significant symptoms so that would be a factor that influenced the whole use of shortcuts in that case (Telenurse 6, post cued call interview)

Here, the telenurse was very mindful of ensuring that she did not delay care and thus had no problem in either minimizing her use of the CDSS or avoiding it altogether by employing a short cut. In fact, 25 % (n=2) of participants actually mentioned that there was a policy in place whereby they were given permission to forego the use of the CDSS

altogether in situations where a 911 disposition was potentially imminent as illustrated in the excerpt below:

> N: ya, so, it was like, the policy that we have that we can do that, so that we can make a 911 recommendation based on the initial nursing assessment without using the CDSS (Telenurse 2, post cued call interview)

The breast feeding mom and baby scenario provided some different results. Seventy-five percent (n=6) of participants identified that their knowledge of the system helped them to employ short cuts when making a decision; for example, some participants knew where to find information in the system as well as what the CDSS content entailed:

> N: answering some of the questions, clicking off on them because I already knew the answer to them, I was clicking on the answer even before I got an answer from the caller… the one shortcut I think I followed is with the baby, I didn't open another chart – there was that topic that talked about urinary norms and it tells us how many wet diapers you should be having, so I know that that's there, and I've done enough calls to know what the guidelines are, by the time they're at one week of age, they should be having at least 6 good wet diapers, for 24 hours, so I guess the shortcut is that I remembered that, told that to her, and that's when I suggested that the baby should be seen as well, whereas otherwise I would have opened up a whole other topic and then read it from there (Telenurse 5, post cued call interview)

Shortcuts were frequently used in urgent situations such as in the heart attack scenario. Telenurses did not want to delay care by wasting precious minutes to use the CDSS and ask redundant questions. In the breast feeding mom and baby scenario, shortcuts were

employed for different reasons. There were two patients on this call instead of one, which would, by policy require a second EMR to be created. It is worthy to note, that none of the participants actually followed this policy (i.e. opening a second chart) and used shortcuts instead because of system problems as discussed in the quote below:

> N:…I didn't see it, and then of course when I went to the baby, I guess I could have manipulated the system in a different way, I could have opened a new service [new EMR], and then I would have had the baby's demographics, but I know from experience with FC [First Contact, EMR] that that causes different problems so I wasn't gonna go there.
>
> R: okay that's good to know, cuz I don't know if that's what is in practice
>
> N: well I think people do, but then they end up, ya, in this case they may not open a new service, but in other cases but if in other cases depending on the nurse they may open a new service and that's fine it's just it can give you problems saving, like you know how we have to fill out the mandatory fields, well the last time I did that, I think it was in test, I filled out the mandatory fields on both charts, I closed the call, it remained inactive, I opened it again, and they had lost the mandatory fields on one of the charts, so that's why I'm saying it can be a problem of the system
>
> R: wow that is really good to know
>
> N: yes so I wasn't gonna go there, of course, so as a result of that I had to edit the demographics in the dehydration topic and ya, so, I don't know if you notice it, when I looked at it, I was sort of scratching my head and then I realized, oh, yes, I have to edit (Telenurse 2, post cued call interview)

This telenurse described the difficulty she had in the past when following the policy. She followed a shortcut instead that required some edits to the demographics field, which also was a challenge.

Both of the scenarios demonstrated the utility of shortcuts. The heart attack scenario was interesting in that the telenurse did not even use the CDSS because of the urgency of the symptoms presented. In the breast feeding mom and baby situation, the fact that none of the telenurses opened a second EMR for the baby could be classified as a shortcut, as they were bypassing the system. It was interesting that the telenurse quoted that there were problems with the system crashing when a second EMR is opened, and this was reported to management.

Table 4 below summarizes the post call interview questions and the telenurses' responses for both scenarios (section 4.3). In addition, the frequency of these responses is listed.

	Call Scenario and Data Revealed			
Questions	**1. Potential Heart Attack**	**Frequency (%)**	**2. Breast Feeding Mom and Baby**	**Frequency (%)**
Can you describe the process of how you came to a decision about what to do for the case? What strategy did you use?	• Knowledge of urgent classic symptoms from clinical experience and nursing judgment • Knowledge of CDSS (and where to go if needed) • Cues for risk factors/age/auditory cues (SOB) /home alone/cardiac history	82.5 (7) 50 (4) 50 (4)	• Clinical knowledge and experience • More complex with 2 clients	37.5 (3) 37.5 (3)

Call Scenario and Data Revealed				
Questions	**1. Potential Heart Attack**	**Frequency (%)**	**2. Breast Feeding Mom and Baby**	**Frequency (%)**
Was the case easy or hard? Why?	• Easy • Straight forward • Classic signs of heart attack/clinical experience	100 (8) 50 (4) 50 (4)	• Hard • Two callers to manage	87.5 (7) 50 (4)
Did you use your past experience while using the CDSS?	• Yes – , ER, Cardiac experience • Past clinical knowledge	62.5 (5) 62.5 (5)	• Yes • Personal • Professional	100 (8) 87.5 (7) 100 (8)
Did you have any problems using the system? Please explain.	• No problems • Straight forward	75 (6) 50 (4)	• Yes • System component problem • System inflexibility and customization	87.5 (7) 62.5 (5) 37.5 (3)
Did you find using the system easy or not?	• Easy • Did not use system	100 (8) 25 (2)	• Easy • Not • System problem	62.5 (5) 37.5 (3) 50 (4)
Do you have any suggestions on how to improve the system	• No	75 (6)	• Yes • More flexibility in CDSS questioning – streamline workflow • Embed customizations directly into content • Improve the search engine • Fix the “hover” feature on hyperlinks	100 (8) 25 (2) 25 (2) 25 (2) 25 (2)
How did you feel the system affected your decision making skills?	• Wasn’t really applicable (did not use CDSS) • Enhances by providing information/ back up	62.5 (5) 37.5 (3)	• Helpful as a back up	62.5 (5)

Call Scenario and Data Revealed				
Questions	**1. Potential Heart Attack**	**Frequency (%)**	**2. Breast Feeding Mom and Baby**	**Frequency (%)**
Did system make your decision making easier or hard? Explain	• Neither – didn't need to use • Easier	62.5 (5) 37.5 (3)	• Easy • Hard • Not applicable	50 (4) 37.5 (3)
What factors influenced your decision making?	• Experience • Knowledge and Education	75 (6) 87.5 (7)	• Personal experience • Professional experience (Obstetrics/Pediatrics/Telenursing) • CDSS	50 (4) 62.5 (5) 50 (4)
What were the factors that influenced your use of shortcuts?	• Urgency of situation • Policy (911 Nursing Judgment) • Knowledge of CDSS	50 (4) 2 (25)	• Degree of knowledge of the system	75 (6)

Table 4 Post Call Simulation Interview Responses.

4.4 Data Elements Potentially Relevant to Shortcuts

There were a number of data elements which could have significance in terms of how and why participants utilized shortcuts. These were extracted and posted into table (5) below. Call handle times for both scenarios are presented as well as the mean and median times. Furthermore, the table describes how the two scenarios were different with respect to how telenurses accessed various elements of the CDSS. As noted within the post call interview questions, both scenarios employed the use of shortcuts in some fashion. This section discusses the related data elements.

	Call Scenario	
Data Element	**Potential Heart Attack**	**Breast Feeding Mom and Baby**
Call Handle Time (minutes) Mean Median	 2:16 2:14	 10:10 11:08
n = # of participants		
CDSS accessed during call? Yes No	 37.5 (n=3) 62.5(n=5)	 87.5 (n=7) 12.5 (n=1)
Health History/Risks Updated? Yes No	 87.5 (n=1) 12.5 (n=7)	 62.5 (n=5) 37.5 (n=3)

Table 5 Data Elements with Potential Relevance to Shortcuts.

4.4.1 Call Handle Time

Call handle time (CHT) is defined as the length of time it takes for the telenurse to begin an encounter with a caller by answering the call, and ending it by hanging up. Table 5 summarizes the information regarding CHT. The mean CHT is dependent on a number of factors, such as the type of caller, as we have seen in this study. For example, the heart attack and the breast feeding mother and baby scenarios differ in the length of the CHT. In the heart attack scenario, the mean CHT is 2:16 minutes whereas in the breast feeding mother and baby scenario, the mean CHT is 10:10 minutes. The median CHT for the heart attack scenario is 2:14 minutes and 11:08 minutes for the mother and baby breast feeding scenario. As mentioned earlier, this can be attributed to the number of pages navigated within the system (for instance, screen turns) as well as the number of

patients managed (one in heart attack scenario as opposed to two within the breast feeding mom and baby). Urgency of the scenario as well as complexity were also factors contributing to length of the call. As identified earlier, the urgency of a situation requires a quick turnaround in order for the patient to get to care quickly as in the case of the heart attack scenario. The following excerpt illustrates urgency of the heart attack scenario:

C: um, I'm home alone, and I don't feel very well, and I'm not sure if I need to see a doctor or not so that's why I'm calling

N: Can you tell me a little bit more about not feeling very well

C: um, I'm having difficulty breathing and I feel like something's sitting on my chest

N:

R: any thoughts so far?

N: well, so with the difficulty breathing, I wasn't too concerned, because I could hear that she's talking just fine, but when she said something was sitting on her chest, that was like, you know, red alert, 3 alarm fire (Telenurse 1, call encounter and post cued call interview)

The telenurse refers to this situation as being a "3 alarm fire" which implies a sense of urgency in helping the caller seek care as quickly as possible. This was also evident at the end of the call as demonstrated by the following quote:

N: okay, so Margaret my recommendation is that you hang up and call 911, the symptoms could indicate that there is something seriously wrong with your heart and the best and safest way to get seen is by calling an ambulance because they can look after you on the way to the hospital like you need to be seen by a doctor right away

C: okay

N: are you able to do that or would you like me to put you through to BC ambulance

C: no, I'll be able to do that, thank you (Telenurse 2, Call encounter)

The telenurse recommended an ambulance based on her assessment of the caller's heart health.

The breast feeding mom and baby scenario necessitated the utility of several areas within the CDSS to manage multiple body systems for both patients. This was evident from the data from the Camtasia screen recordings in terms of how many screens the telenurse navigated to.

4.4.2 Accessing the CDSS During Call Encounter

As previously identified, shortcuts are utilized by telenurses for various reasons. One such reason is when symptoms are urgent and straight forward, such as in the case of the heart attack scenario. The telenurse stated she did not want the caller to delay care. In the heart attack scenario, only 37.5% (n=3) of participants used the CDSS. The remaining 62.5% (n=5) of participants did not use the CDSS. The following excerpt describes the telenurse's use of a shortcut:

> N: um, I'm just trying to put this into context… just cuz I knew where I was going that it needed to be a 911, so I did the shortcut, because I didn't want to delay care. I could have gone to the CDSS and I knew it was going to tell me the same thing, and I thought why delay care when I was fairly certain they were pretty significant symptoms so that would be a factor that influenced the whole use of shortcuts in that case (Telenurse 6, post cued call interview)

These results were remarkably different when compared to the breast feeding mom and baby scenario where 87.5% (n=7) of participants used the CDSS and only 12.5% (n=1) did not. The following quote discusses the participant's experience of using the CDSS:

> N: well for the questions, making sure that I didn't miss anything made it [using the CDSS] easier, but just the questions I that felt were irrelevant I had to answer them all I felt that was hard. But for making the decision, I would say it helped (Telenurse 2, post call interview)

To summarize, there was a significant difference in the use of the CDSS between the two scenarios. The telenurse in the heart attack scenario was very clear about her confidence in her decision not to use the CDSS and furthermore, she articulated that she knew what the information within the CDSS was going to recommend (i.e., a 911 disposition). In contrast, the telenurse in the breast feeding mom and baby scenario used the CDSS although she did feel that it was cumbersome in terms of the lack of recognition in searching for the appropriate information within the CDSS as well as some of the system problems earlier identified, such as the search engine and hyposensitivity of the hyperlinks.

4.4.3 Completion of Health History Section

The Health History (HH) is a template that is found in the EMR used at Call Centre A. The telenurse reviews and completes the HH during an encounter with a client. The HH is used to help telenurses make a decision about how to best manage a patient. For example, if a patient has diabetes, is on particular medication or has had a recent surgery,

the telenurse may choose to adjust the disposition of the caller. This qualitative data offers insights into understanding the use (or disuse) of shortcuts.

In the heart attack scenario, only 12.5% (n=1) participants opened the HH section of the EMR with the remaining 87.5% (n=7) ignoring it as illustrated by the following quote:

> N: I don't think I used a shortcut, I could have though, especially if I had heard in the caller's voice that they were having difficulty breathing, I wouldn't have even done the health history, just the 3 symptoms and would have called an ambulance (Telenurse 7, post cued call interview)

In this case, the telenurse was being mindful of listening to the level of difficulty in the caller's breathing. She indicated that the caller's breathing sounded normal despite the caller's reported difficulty. This will be reviewed later as a limitation to the study with respect to how real the mock caller sounds to the telenurse on the phone. The choice to avoid updating the HH can be considered here as a shortcut in this scenario because this information would not make the patient's urgency any higher.

The breast feeding mom and baby scenario was quite different from the heart attack scenario. Here, 62.5% (n=5) of participants opened and reviewed the HH section. One participant actually completed the HH incorrectly. This participant entered the baby's data instead of the mother's data into the HH as shown in the excerpt below:

> *N: okay, great, and just to update his health history, we do this every time you call, was he a term baby?*
>
> *C: yes*
>
> *N: and healthy?*

C: yes

N: and did he have to still in the hospital because of the jaundice?

C: no

N: okay, is he on any medications at all?

C: no

N: has he been back in the hospital for any reason?

C: no

N: You see I made a mistake here the call wasn't about him [telenurse is referring to the health history field] it was about her, so I should have got her health history, but I got his

R: ahhh

N: so I made a mistake

R: I didn't even catch

N: ya

R: I didn't even catch that um

N: not thinking because usually they call about somebody else (Telenurse 1, call encounter, post cued call interview)

In terms of the heart attack scenario, the telenurse disregarded the HH section as part of her goal to get the caller to care as quickly and safely as possibly, and thus, her actions could be considered a shortcut, similar to how she did not use the CDSS. In the case of the breast feeding mom and baby, the HH was accessed more often, although there was an inaccuracy detected as there may have been some confusion in managing two callers at the same time.

4.5 The Relevance of the Decision Ladder as a Framework to Telenurse Practice

The decision ladder framework was used to understand decision making in telenursing Figure 3 illustrates the decision ladder with a focus of telenurse practice. In the next section, the researcher will describe how the various steps within the decision ladder were relevant (or not relevant) to telenurse practice based on the data collected in the simulations.

4.5.1 Defining the Decision Making Processes in the Decision Ladder as Mapped to Telenurse Practice

Although the State of Knowledge (SK) "Goal" is part of Rasmussen's Decision ladder at the top, the goal of safe, appropriate and patient focused care outcomes are more of an overarching guide and objective for nurses working in telehealth. Rasmussen (1993) describes the goal intermingled within the other areas of the original ladder (figure 1), "…the interaction of situation analysis, goal evaluation, planning and action, and indication of "recognition-primed" shortcuts (p. 162)".

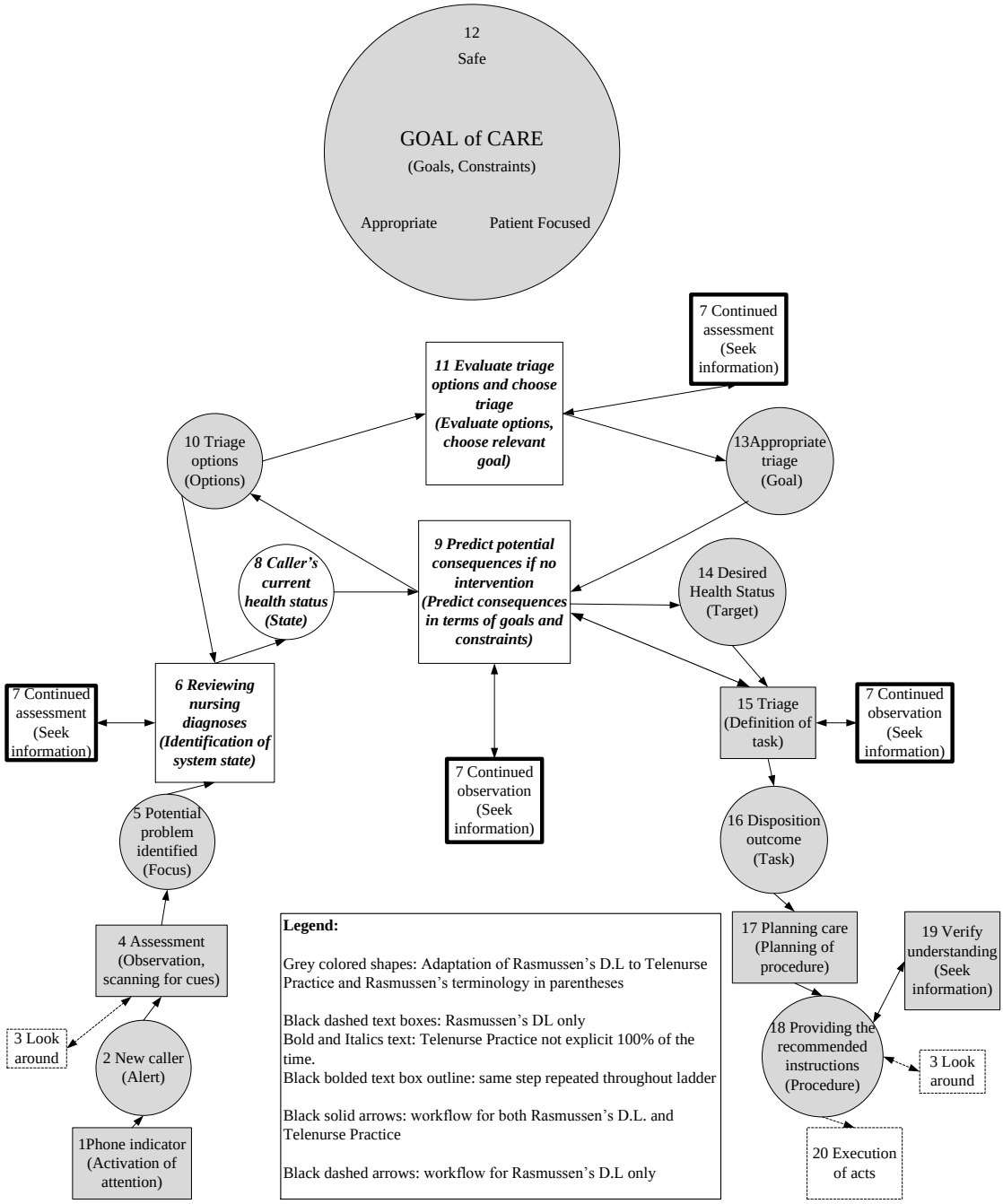

Figure 3: Rasmussen's Decision Ladder as Compared to an Adaptation within Telenurse Practice.

The "Goal of Care" in Figure 3 mapped to telenursing is listed here as #12 to provide a step wise legend for the purposes of this study. The overarching goal of safe, appropriate

and patient focused care was evident in 100% (n=8) of participants. The excerpt below illustrates how safety is an important aspect to the overarching goal:

> N: so right there – she's home alone, she's worried, about something, she's worried that she has an imminent concern she's got grandchildren, so she's older, anywhere in the 40 - 80 eighty range and from her voice, I would get some sense of the age and how she sounds distressed or not distressed. I would be listening for breathing fast or anything like that (Telenurse 4, post call cued recall interview)

The second element of the goal is the appropriateness to accessing care. The following quote describes how the telenurse discussed the recommendation to care and how to access suitable resources:

> N: okay, so Margaret my recommendation is that you hang up and call 911, the symptoms could indicate that there is something seriously wrong with your heart and the best and safest way to get seen is by calling an ambulance because they can look after you on the way to the hospital like you need to be seen by a doctor right away (Telenurse 1, post cued recall interview)

The final element in the goal relates to telenurse care that is patient focused. The caller should feel they are treated and managed without the feeling that a telenurse is reading/navigating through a HIS. This may require strategies on the part of the telenurse For example, filling in time by talking to the caller when there are slow screen loading times, reading and navigating through information, whether it is familiar or new, or dealing with a prescriptive line of triage questioning (may be several questions that are

not applicable to caller scenario but needs to be asked/manipulated to move on). The next excerpt describes some of these strategies:

> R: okay, it's just that I noticed it sounded like you were filling in the time it took to load with some of those pre-emptive things, like disclaimers
>
> N: ya, and the other thing is that I don't ask, 'do you have chest pain' and 'shortness of breath' or 'do you feel like you're going to pass out' because I find by the time I sort out what their response to that is, I actually could have figured it out just by the basic dialogue so I don't typically do that (Telenurse 4, post cued recall interview)

The telenurse had just opened the patient's chart and it was taking some time for the page to load. While the system was opening, the telenurse discussed some of the disclaimers to the caller (i.e., the information that we provide is current and general, but not meant to replace the advice of your doctor). This is a helpful way to fill in the time it takes for system problems, but there are certainly other instances where the telenurse would want to maintain a patient focus, such as alleviating a caller's anxiety but developing a rapport with them. This is described in the following quote:

> *C: I'm finding it really difficult cuz it's really painful and I'm not really sure what's going on there*
>
> *N: okay, so first of all, let me assure you that it's not as natural as you think it should be, most people do have some problems with this, so let me see what we can do to help you, okay?*
>
> *C: Okay sure*
>
> *N: Okay, so can you tell me a little bit about the baby first of all congratulations*

C: oh thank you

N: and is it a little boy or a little girl (Telenurse 2, call encounter)

In this situation, the telenurse has offered some insight into childbirth to the mother, as well as congratulating her on the mother's addition to her family. This adds a personal flavour to the encounter, as well as some context into the caller's situation. Furthermore, maintaining patient focus to the call is very important to the challenges where there is no physical connection.

The goal of safe, appropriate and patient focused care was evident in all of the cases. Safety is an element that is always present when it comes to nursing care, and even more important when there is no face to face physical assessment. Accessing care appropriately is embedded within the telenurse process as part of the recommendation. Patient focused care is also critical here by virtue of the fact that telenurses use HIS. Any situation that warrants the use of technology to assist a consumer, (a patient caller in this case) can take the attention away from that consumer. In order to establish and maintain a patient focused encounter, telenurses have developed strategies to achieve this goal.

4.5.2 Decision Ladder Steps

At this point, the decision ladder is introduced from a telenursing practice perspective. Each of the steps within this model is described in Table 3, as well as its frequency of occurrence. The steps are listed with the telenurse description of that step and Rasmussen's original label. For example, #1, the "Phone Indicator" is the telenurse description and "Activation of attention" is from Rasmussen's original model.

Rasmussen Decision Ladder Steps and Terminology	Scenario A Frequency	Scenario B Frequency
1. Phone Indicator (Activation of attention) (IP)	100% (n=8)	100%(n=8)
2. New Caller (Alert) (SK)	100% (n=8)	100% (n=8)
3. Look Around (IP)	n/a	n/a
4. Assessment (Observation, scanning for cues) (IP)	100% (n=8)	100% (n=8)
5. Patient Problem Identified (Focus) (SK)	100% (n=8)	100% (n=8)
6. Identify potential nursing diagnosis/ diagnoses (Identification of System State) (IP)	37.5% (n=3)	62.5% (n=5)
7. Continued Assessment (Seek Information) (IP)	100% (n=8)	100% (n=8)
8. Caller's current health status (State) (SK)	100% (n=8)	62.5% (n=3)
9. Predict consequences if no intervention (Evaluate options, choose relevant goal) (IP)	0% (n=0)	0% (n=0)
10. Triage options (Options) (SK)	0% (n=0)	0% (n=0)
11. Evaluate triage options and choose triage (Evaluate options, choose relevant goal) (IP)	25% (n=2)	25% (n=2)
12. Safe, appropriate, patient focused goal of care (Goals, constraints)	100% (n=8)	100% (n=8)
13. Appropriate triage (Goal) (SK)	0% (n=0)	0% (n=0)
14. Desired health status (Target) (SK)	0% (n=0)	12.5%, (n=1)
15. Triage (Definition of task) (IP)	100% (n=8)	100% (n=8)
16. Disposition outcome (Task) (SK)	100% (n=8)	100% (n=8)
17. Planning care (Planning of procedure) (IP)	0% (n=0)	0% (n=0)
18. Providing the recommended instructions (SK)	100% (n=8)	100% (n=8)
19. Verify Understanding (Seek information) (IP)	100% (n=8)	100% (n=8)
20. Execution of acts (IP)	n/a	n/a

Table 6 Decision Ladder Steps and Correlation within Telenurse Practice.

In addition, each step is labelled as information processing (IP) or a state of knowledge (SK). Scenario A is the potential heart attack patient; Scenario B is the breast feeding mom calling about her new baby. Figure 3 is a diagram of the ladder adapted from Rasmussen's original model. Various formats were used as outlined in the legend to demonstrate how Rasmussen's Decision Ladder was, or was not relevant to telenurse practice. Each step will be described as to how it relates to telenurse practice as well as excerpt of a quote from either the actual call itself or the post call interview.

1. Phone indicator (Activation of attention) Information processing (IP): The telenurse hears a "beep" through headset on the telephone indicating that there is a new caller on the line – 100%, n=8, for any scenario.
2. New Caller (Alert) State of knowledge (SK): A new caller is on the line and the telenurse starts the patient encounter with a salutation and some demographic details to choose the correct chart. This was evident 100% (n=8) of the time in both scenarios:

   N: Hello my name is xxx, I'm one of the registered Telenurses, and may I have your name please? (Telenurse 4, call encounter)
3. Look around (IP) – This step of the decision ladder was not appropriate as it is an activity that is dependent on physical assessment by virtue of the use of the word "look" which implies using one's eyesight to assist in gathering information. Therefore, this step cannot be validated for telenursing and as such.
4. Assessment (Observation, scanning for cues) (IP): this definition is appropriate to telenurse practice, but may include several variations, including assessment, confirmation, and summarization (see Table 2: Decision Ladder definitions). The telenurse begins the call by asking questions:

   N: okay and if I couldn't get a hold of you, feel free to call us back at 811. The information is current, general, and we don't diagnose, how can I help you today

   C: Well I don't feel very well and I'm not sure if I should go and see a doctor or not

   N: okay, can you explain to me who you don't feel well? (Scenario 1, call

encounter)

Both scenarios begin with an introductory question, but once the problem is established, the telenurse focuses the assessment of the symptoms presented. This occurred 100%, (n=8) of the time.

5. Potential problem identified (Focus) (SK): At this point, the telenurse has enough information via assessment to determine a focus – a particular problem that needs some attention. The following quote is an example of this within the heart attack scenario:

   C: ya, that's why I thought it was something I ate, like indigestion, or food poisoning or something,

   N: right, ya, ya, no, all those symptoms, um together um, add up together that they could be symptoms of a heart attack or some serious problems with your heart (Telenurse 5, call encounter)

In the breast feeding mom and baby scenario, the telenurse identified the lack of wet diapers as being a potential problem in the following excerpt:

N: Okay and how many wet and dirty diapers has your baby had in the last 24 hours approximately?

C: um, about 3 but it's usually been about 5-6 per day

N: oh, only 3

N: Three isn't very many

C: no? (Telenurse 1, call encounter)

During this call, the telenurse stated that 3 diapers in 24 hours is not a sufficient amount and could be an indicator that the baby's hydration status may be a problem. A potential problem identified was evident 100%, (n=8) of the time in both scenarios.

6. Reviewing potential nursing diagnosis or diagnoses (Identification of system state) (IP): Now that the telenurse has a focus of concern, she may be reviewing a number of potential nursing diagnoses depending on symptoms. In the heart attack scenario, the following quote describes the potential nursing diagnosis is identified:

   N: and pressure on your chest, and how long has that been going on for?

   C: um, about 40 minutes or so, I also feel a bit nauseous, I thought maybe I ate something bad and so that's why I thought I would call

   R: so, just wondering your thought process here then, you have got these symptoms

   N: um, well, you know there's really, you could ask a few more questions about chest pressure, but that's pretty straightforward, any kind of funny feeling, I'm looking at her age, she's got two other symptoms that could be related to a heart attack, it's not even at that point even particularly necessary to get the health history and again unless the person is hesitant to go in, um, because you know that that's in some instances that might increase the urgency but there is nothing more urgent than calling 911, so, again it sometimes it just comes down to how much effort you need to put into actually convince the person so if they're insistent she mentioned I'm nauseated I thought it was something I ate, so some people will really hang on to that and then you might, um, well okay let's talk, well no no no, it's just whatever, okay, then what's your health history, ok so you

> tell me you have some cardiac history, so then you try and put it altogether, for them, I was willing to go there if that's where she was going to go but this was straight forward (Telenurse 3, call encounter and post cued recall interview)

In this case, the telenurse stated that that the symptoms could be related to a heart attack and so she reviewed these symptoms as a potential nursing diagnosis. This step of the decision ladder was evident in 37.5% of the participants (n=3).

In the breast feeding mom and baby scenario, this particular telenurse was explicit in reviewing nursing diagnoses for the mom and described in the excerpt below:

> *N: let's get back to your breast issues, so there's certainly two possibilities there's engorgement, but that can sometimes move further into a blocked duct or in some cases even a breast infection or mastitis, so we're going to try to work through sort of, what might be going on there (Telenurse 3, call encounter)*

It was very clear to the telenurse as to what cause of the caller's symptoms.

As mentioned earlier, there were situations where it would not be explicit to the lay person in terms of the clinical presentation of the patient as evidenced in the quote below:

> *C: Breast feeding, ya, usually every 2-3 hours, it's just getting difficult because of the pain*
>
> *N: okay, now how much pain are you having there on a scale of 0-10, if 0 is no pain?*
>
> *C: I'd say about a 4-5*
>
> *N: Okay and when did you start getting the pain there?*
>
> *C: It's been about 2 days*
>
> *N: okay, and you haven't seen a doctor or the public health nurse hasn't been*

by?

R: Are you having any initial thoughts of potentially where you might be going here, just based on what you're hearing so far?

N: ya, it sounded like a breast infection, that kind of scenario or symptom (Telenurse 6, call encounter and post cued call interview)

In this situation, the telenurse was focused on asking questions related to a breast infection in order to narrow down the most likely nursing diagnosis. Reviewing nursing diagnosis or diagnoses was evident in 62.5% of participants (n=5).

7. Continued observation (Seek information) (IP): To assist in determining potential nursing diagnoses, the telenurse may need to narrow down the potential problem identified by continuing a more focused assessment. This area is unique in that it is an iterative period of information processing. In the heart attack scenario, this occurred 100% (n=8) of the time and illustrated in the following excerpt:

C: Well I don't feel very well and I'm not sure if I should go and see a doctor or not

N: okay, can you explain to me who you don't feel well? (Telenurse 1, call encounter)

Continued observation is a normal part of a telenurse's assessment in terms of focusing on the problem at hand.

The breast feeding mom and baby scenario was equally evident in continued observation with all participants 100% (n=8) and described in the following quote:

N: okay, so are you breast feeding?

C: ya

N: okay, how often

C: it's been about every 2-3 hours, but it's been difficult because of the pain

N: Okay and how many wet and dirty diapers has your baby had in the last 24 hours approximately?

C: um, about 3 but it's usually been about 5-6 per day (Telenurse 1, call encounter)

In this situation, the telenurse assessed two patients during the same call encounter and asked several introductory questions about potential issues with mom and baby. This particular step within the decision ladder is located at several points along the trajectory, as assessment is an ongoing part of the process.

8. Caller's current health status (State) (SK): After the process laid out in #6, the current health status is understood to the telenurse as the focus of the problem is clear. For example, the telenurse has asked more questions to decide as to if the caller may be having a heart attack or indigestion and then would proceed accordingly. So, back to the heart attack scenario, the caller's health status is recognized in less than a minute into the call as described in the quote below:

   N: … we would be worried that it's your heart, so from our end we would recommend that you hang up and call 911 right now… (Telenurse 6, call encounter)

   The telenurse noted that the potential problem that was identified earlier in the decision ladder evolved into the caller's health status (a potential heart attack). One hundred percent of the participants (n=8) demonstrated this stage of the decision ladder.

In the breast feeding mom and baby scenario, the telenurse identified the health status as illustrated in the excerpt below:

> *N: okay, um, and on a pain scale of 0-10, 0 being no pain and 10 being the worst pain you could imagine, how would you rate your pain?*
>
> *C: um, about a 4 or 5*
>
> *N: okay and does the breast look any different?*
>
> *C: it's a little bit red and blotchy and it's warm*
>
> *N: do you have a fever?*
>
> *C: not that I know of, I don't have a thermometer to check my temperature but I do feel a bit warm*
>
> R: So do you have any initial thoughts about what's going on?
>
> N: she's got an infection and she's going to need to be seen (Telenurse 1, call encounter and post cued recall interview)

During the interview, the telenurse stated that she knew the caller's health status as well as what her recommendation was. This was evident in 62.5% (n=5) of participants.

9. Predict potential consequences if no intervention (Predict consequences in terms of goals and constraints) (IP): Once the caller's current health status is understood, predicting consequences may be explicit or implicit to the caller depending on how the caller receives information. This would serve to assist to inform the options on how to proceed. The data in this research study did not show any explicit discussion of what could potentially happen if there was no intervention; and therefore, in both cases, there was no evidence of this. As an RN, however, it is clear from nursing

knowledge perspective that she would know what would happen if there was no intervention, i.e., if the heart attack patient did not seek care, they could die, but this was not stated explicitly.

10. Triage options (Options) (SK): The telenurse now has options generated to choose a course of action. Again, these options may or may not be explicit. Options may include various symptom topics within the CDSS, or may use a shortcut and decide not to use CDSS. In both cases, none of the participants expressed triage options during the call or the post interview. Again, a telenurse may not overtly say what topics he or she is thinking might be appropriate, but the thought processes may be occurring.
11. Evaluate triage options and choose triage (Evaluate options, choose relevant goal) (IP): The telenurse reviews options, evaluates to determine the most appropriate topic and selects it. Influencing factors include time, personal and professional experience. During the heart attack scenario, 25% (n=2) of participants provided evidence of this. In the following example, the told the caller specifically what she would be looking at:

    N: and we'll take a look here at the symptoms you're experiencing okay, specifically I'm looking at chest problems, okay, with that chest pain….okay, so, um chest pain or pressure or a strange feeling in the chest, you're having, right?

    R: So you knew exactly where to go, what topic

    N: ya (Telenurse 7, call encounter and post cued call interview)

In the breast feeding mom and baby scenario, the results are similar in that 25% (n=2) of participants discussed this stage of the decision ladder with the caller. The following excerpt is an example of this:

> *N: okay, alright, so what I would like to do Emma, is go into my computer into a topic we have about problems after having a baby and will just ask you some yes/no triage questions*
>
> *C: okay (Telenurse 6, call encounter)*

The telenurse explained to the caller about the process of telenurse care, including the topic selection.

12. Safe, appropriate and patient focused goal of care (Goals, constraints) (SK): As discussed at the beginning of this section, this step within the ladder is an overarching goal and should be viewed as an ongoing part of the assessment, planning, intervention and evaluation. The heart attack scenario was explicit in that safety was a priority as described in this quote:

> *N: okay and how is she otherwise, I mean I know you were calling about yourself but I just want to make sure everybody is safe, okay? (Telenurse 2, call encounter)*

In another scenario, appropriateness was discussed:

> N: ya I just like to clarify with them just to make sure, before someone calls 911 I always want to make sure it's actually a 911 call (Telenurse 1, post cued recall interview)

The telenurse wanted to ensure that resources were used appropriately, i.e., dispatching 911 services is expensive not always aptly used, and so the telenurse here wanted to ensure that it was clearly an urgent call.

There was also evidence of a patient focused approach to care within the breast feeding mom and baby scenario:

> *N: okay, so first of all, let me assure you that it's not as natural as you think it should be, most people do have some problems with this, so let me see what we can do to help you, okay?(Telenurse 2, call encounter)*

The telenurse provided some reassurance in order to reduce any potential anxiety that the caller may have. Also worthy to note, is that the beginning of the telenurse call script is to ask for a callback number in case the call gets disconnected for some reason:

> N: uh, yes and could I get the number that you're calling from Norma
>
> C: yes it's….xxx xxx xxxx
>
> N: great and if it becomes necessary to call you back, may I call you back at that number?
>
> C: yes you can
>
> N: great and if I can't reach you there please call us back at 811
>
> C: okay (Telenurse 2, call encounter)

All of the elements of this step (safety, appropriateness of care and patient focus) were evident in both scenarios 100% of the time (n=8).

7. Continued assessment (Seek information) (IP): To assist in clarifying patient continues throughout the encounter and is set here as a placeholder as in the

original decision ladder.

13. Appropriate triage (Goal) (SK): The telenurse has made a decision on how to proceed with triage options with the goal of ensuring the most appropriate topic or method. Both of the call scenarios did not have any explicit evidence of this in the call encounter or the interview – 0% (n=0).
14. Desired Health Status (Target) (SK) – the goal is to get the caller to a desired state of health. The elderly woman who had symptoms indicative of a potential heart attack should be treated so that blood vessels can carry oxygen freely to the heart muscle. The baby who was dehydrated needed to have a normal fluid and electrolyte balance. The postpartum mom who was experiencing pain and warmth in her breast needed to have her breast duct unplugged and thus be able to provide nutrition for her baby asymptomatically. The excerpt below describes this in detail:

    > *N: but in terms of unplugging that duct, there's really a few things, it's a combination of heat, gentle massage, frequent breast feeding and rest (Telenurse 3, call encounter)*

    The telenurse explained that the process of unplugging the duct would result in the desired outcome. This step in the decision ladder was explicit only in this scenario only 12.5% (n=1) of the time.

    The heart attack scenario contained 0% (n=0) of calls that held any overt evidence regarding this portion of the decision ladder.
15. Triage (Definition of task) (IP): The telenurse triages with the CDSS in a particular topic(s) or uses her judgment. In both scenarios, 100% (n=8) of the telenurses

discussed their triage to the callers. An example of this in the heart attack scenario is described in the following excerpt:

C: um I'm at alone right now, my husband's out babysitting the grandchildren and I really don't feel very well and I'm not sure if I need to see a doctor or not

N: can you describe to me how you don't feel well

C: my chest feels kind of tight, like some pressure on it and I feel kind of short of breath

N: okay, are you sitting down right now?

C: ya, and I feel kind of nauseous, I thought maybe it was something that I ate, and I'm kind of sweaty (Telenurse 4, call encounter)

The telenurse asked triage questions to determine the next course of action. The breast feeding mom and baby scenario is more complex as there are two patients involved and the baby's health is dependent on the mother's:

N: Are you feeling dizzy or lightheaded like you could be passing out?

C: no not at all

N: any weakness or trouble standing?

C: no

N: feeling less alert other than the fatigue?

C: no

N: I'm assuming you haven't had a seizure?

C: no

N: you sound like you're breathing well?

C: ya

N: any pain with breathing?

C: nope… (Telenurse 7, call encounter)

The triage is very detailed and lengthy in the postpartum topic as it covers multiple body systems that are affected by the postpartum mother.

7. Continued assessment (Seek information) (IP) – may need to clarify, confirm, summarize before deciding on triage disposition. As previously mentioned, this step of the decision ladder is embedded as a placeholder.

16. Disposition outcome (Task) (SK): The recommended disposition has been generated (either by CDSS, nursing judgment or a combination of both). This stage of the decision ladder was evident in 100% (n=8) of the call encounters. In the heart attack scenario, the following quote illustrates the outcome:

    N: okay, so the recommendation would be for you to go in and see someone today, would you be able to do that?

    C: Ya I can do that (Telenurse 1, call encounter)

    In the breast feeding mom and baby scenario, both the mother and her baby are mentioned as described in this excerpt:

    N: okay, so I think um, with the symptoms you're experiencing, the best thing would be to go and see a doctor today, and I think you should have baby assessed as well simply because the urine output seems to have decreased (Telenurse 2, call encounter)

    The telenurse provided the outcome of the triage so as to communicate the resultant recommendations.

17. Planning care (Planning of procedure) (IP): The telenurse begins to formalize a plan of care for the caller as a result of the CDSS disposition outcome. This information

processing activity was not evident as a distinct activity within the call encounter or interview and thus, 0% (n=0) was the resulted value.

18. Providing the recommended instructions (Procedure) (SK): now discusses how, when and where the caller can access care, may assist with problem solving on how to access (i.e. no car, needs to take a taxi or have neighbor watch children). She may also provide some direction between accessing different points of care if there are choices (i.e. facilities available at a doctor's office walk in clinic or emergency). If home treatment is an option, the telenurse may discuss procedures. This particular step was apparent in 100% (n=8) of the call encounters. An example of this in the heart attack scenario:

    N: I would suggest that you hang up and that you call 911, that way they will get all of your information really quickly, and they'll come to your home, and they'll be able to give you some immediate information, um, they'll be able to hook you up to an ECG and find out what's going on and then make sure that you're safe and that's going to be the safest way for you to get to the hospital right now (Telenurse 2, call encounter)

    Here, the telenurse planned the procedure as well as discussed some of what to expect. In the breast feeding mom and baby scenario, this was also the case:

    N: Actually, if you um, wanna do that and you could take your son with you, when do you think you could go in?

    C: I could probably go in about 45 minutes

    N: that would be perfect, so if the 2 of you could go in, then will you see a family doctor, emergency room or walk in clinic?(Telenurse 1, call encounter)

So, the plan included both mom and baby even though the disposition of the child was higher. This is where there is evidence of patient focused care. The telenurse treated them as a mother-baby unit as opposed to two separate entities.

19. Verify Understanding (Seek information) (IP): Telenurses at Call Centre A always ask the caller if they understand what they need to do in order to ensure that they have comprehended the recommendations. Both scenarios demonstrated evidence in 100% (n=8) of the call encounters. The following quote illustrates the heart attack scenario:

    C: I am by myself but I think I can do that

    N: you think you can do that?

    C: ya

    N: okay then I'm going to let you hang up so you can call 911, okay?

    C: okay

    A simple question or two can make all the difference as to how the caller manages his or her care, especially when they are stressed with urgent, potentially life threatening symptoms. In the case of breast the feeding mom and baby scenario, the postpartum mother has received a great deal of information about some treatment she can do at home, and because she is in pain and likely fatigued, it is very important for the telenurse to ask for verification as shown in the quote below:

    C: okay

    N: okay do you feel like you have a plan?

    C: yes, I guess I should take the baby to the walk in clinic just to see what's happening with the poopy diapers?

    N: ya, uh, well the poopy diapers are okay, but it's more the wet diapers

that we're concerned about, and definitely, unless you start to see a real increase in the next little bit, really focusing on the breastfeeding, in the next few hours, here you're really getting good sessions then you should absolutely be assessed by a doctor

C: okay then

N: is there anything else I can help you with,

C: no I think that's good, thank you

N: okay bye (Telenurse 3, call encounter)

It was important for the telenurse to verify that the caller understood the recommendations provided by the telenurse. In this case, the telenurse had to clarify that the caller needed to watch for urine as opposed to stool in the diaper in order to evaluate their hydration. This simple step can definitely save a great deal of time and potential problems; therefore its inclusion within the decision ladder is very appropriate and necessary. The fact that telehealth nursing lacks a face to face physical encounter makes it is even more important that this verification occurs. In addition, telehealth nursing has many challenges when it comes to communication, such as health literacy, differing languages, age and hearing capacity to name a few, and thus, this step is detrimental to the assurance of a positive outcome.

20. Execution of acts (IP) – There is no relationship here within telenurse practice as the telenurse has done her work and provided the caller with what needs to be done. After the caller relationship is completed, it is up to the caller to follow up on this. Therefore, 0% (n=0) of the call encounters demonstrated this step of the decision ladder as there was no opportunity for this.

In summary, the findings within the study assist to substantiate how Rasmussen's Decision Ladder maps to telenurse practice. In terms of the 20 steps discussed, the table below displays the incidence of the steps mapping to the decision ladder:

Rasmussen Decision Ladder Steps Mapped to Telehealth Nursing and its Incidence	
Present in decision ladder	Incidence
100% of the time	50% (n=10)
62.5% of the time	5% (n=1)
25 % of the time	5% (n=1)
12.5% of the time	5% (n=1)
0% of the time	20% (n=4)
n/a	10% (n=2)

Table 7 Incidence of Rasmussen's Decision Ladder Steps within Telenursing.

Fifty percent of the steps in the decision ladder mapped to telenursing as evidenced by the explicit data. Other than the two steps that do not apply by virtue of the fact that telenursing does not involve a physical encounter, the remaining numbers together equate to 35%. One possible reason that they did not have explicit evidence that was articulated by the telenurse or stated in the call was that the researcher did not ask that question specifically. For example, as previously mentioned within the last section, the telenurse did not tell the patient what the consequences would be if they did not intervene. It is possible that it could happen, i.e. that the telenurse may have to instill some sense of morbidity or mortality in order to have the patient seek care, but in this study, it did not happen. It is worthy to note, that Lintern (2011) discussed the decision ladder and noted "Processes may be either explicit or implicit", (p. 1). This statement clarifies that a caller that was thinking about something may not have verbalized it. That does not equate to its absence of occurring. Individuals do not always say what they are thinking, i.e. as a human being, one might be hungry and want to eat something, but it does not mean one would say it out loud.

The purpose of Table 7 is to outline numerically how Rasmussen's Decision Ladder maps to telenurse practice as per figure 3. As previously mentioned, the legend in figure 3 demonstrates where telenurse practice does or does align with Rasmussen's original framework.

4.6 Conclusion of Findings

To summarize the findings, various research approaches were utilized in order to reach the research objectives as well as answer the research questions posed within Chapter 1. Clinical simulation was used as a methodology to gain an understanding of telenurse workflow while using CDSS. The actual audio data from the call encounter was important to provide simulated, although real time data in order to see how a telenurse truly practices. Although the caller was simulated, the telenurse was instructed to manage the caller as a real patient.

The screen recorded video data was also important in allowing the researcher to analyze how a telenurse walked through the HIS, and specifically, the CDSS. The researcher was able to compare the CHT from the audio data with the number of the amount of navigating that a telenurse performed by reviewing screen turns as well as alerts, inline notes and general health information within the CDSS.

The post cued call approach questionnaire was also integral in acquiring knowledge regarding the call. As previously mentioned, it is not possible to ask a telenurse what she is thinking about while she is engaged with a caller. Immediately following the call encounter, the researcher presented the audio and video of the call and with the telenurse present, begins recording the post-call interview. This data is helpful in catching

moments where the telenurse is thinking about something, perhaps about the HIS or what she is thinking might be going on with the caller, but does not explicitly discuss with the caller. This is where the tacit knowledge becomes explicit and thus, offers more insight to telenurse practice and the decision making process.

Video data also captured the telenurse using the HIS whereby the intention was to identify any telenurse reactions or any evidence of "picture building" as described by Edwards (1994). As previously mentioned, telenurses use this technique as a way of trying to visualize what the caller is experiencing; for example, the telenurse may touch their own arm or leg to understand where the potential problem is located

Finally, some general questions regarding demographic characteristics of the participants, such as their years of experience and area of specialty were included as data. The intent of these questions was to ensure that any factors influencing decision making, whether it may be informing the use of short cuts, or more foundationally enlightening general workflow.

The use of these five data collection methods provided information that was very helpful in achieving the research objectives laid out in the first chapter. Additionally, the rich data will provide answers to the research questions in the next chapter. This process revealed that there are several areas where Rasmussen's Decision Ladder could be mapped to telenurse practice.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

5.1 Introduction

The main purpose of this study was to understand how telenurses make decisions while using HIS, specifically with a CDSS. Furthermore, Rasmussen's Decision Ladder was proposed and tested as a decision making model in order to provide more structured support specific to telenursing practice. The generic coding terminology within the rectangles and circles (information processing and states of knowledge respectively) of Rasmussen's Decision Ladder was used to evaluate how well it maps to telenursing practice, and thus, a model based approach to coding the data was used (Borycki, Lemieux-Charles, Nagle and Eysenbach , 2009). The literature review revealed that the research within the area of telenurse practice was scarce. As telehealth in general is viewed to be a new strategic effort in managing the health care of consumers, it was important to engage in studying this growing method of health care delivery (Stroetmann et al, 2010).

In analyzing the literature review and the data collected within the study, the researcher acquired a better understanding of how telenurses make decisions while using CDSS. Furthermore, the decision ladder was evaluated as a model specific to the domain of telenursing in terms of supporting decision making including the utility of short cuts as well as identifying the factors that influence their use by telenurses. This chapter will review the results of this research from a more specific perspective as well as supplying a response to the five research questions that were the source of inquiry outlined earlier in

this thesis. Furthermore, Rasmussen's Decision Ladder as a proposed model for telenursing will be reviewed and summarized.

5.2 Telenursing and the Decision Making Process

As previously stated, Kushniruk (2001) discussed that the psychological research performed in decision making involves a "decision event" whereby the decision maker is required to understand and contemplate various choices as to how to proceed towards reaching a particular goal. Furthermore, Kushniruk (2002) identified that there is an argument that suggests that "an inherent mismatch between the way humans and computers process information may have potentially detrimental effects upon decision making among health care professionals, necessitating improved understanding of complex decision making" (p. 2). It is clear that decision making is a complex process on its own, but combined while using a HIS as well as managing a patient over the phone as in the case of telenurse practice certainly increases the level of complexity. The majority of nurses' work with patients is face to face. Objective measurements such as blood pressure, pulse and temperature (vital signs) cannot be measured over the phone. Vital signs are so basic to nurses' practice in order to provide fundamental assessment data. In telenurse practice, this is not possible and therefore, she needs to use other strategies to elicit cues such as how easily the caller can speak to evaluate breathing. Therefore, the decision making process of this group of nurses differs significantly from the decision making process of nurses who have face to face encounters with their patients. The inherent uncertainty of what a telenurse is experiencing while caring for a patient on the phone may actually cause the telenurse to upgrade her recommendation of care. This

could be due to a situation where a caller is experiencing symptoms that are more life threatening nature, as in the heart attack caller as noted in this research study. As the goal of care proposed in this paper is for safe, appropriate and patient focused outcomes, the telenurse needs to balance these three aspects of nursing care carefully within her decision making processes. Certainly, the CDSS is available and meant to guide a telenurse's decision making; however, it also adds to the complexity to telenurses by virtue of utilizing the CDSS while simultaneously caring for a patient on the phone. The concept of complexity was mentioned previously in a study by Schleyer and Beaudry (2009) in terms of the context of telenurses navigating through pages of information within a CDSS and subsequently applying the information to a caller's needs while assessing and forming a plan of care. There are clearly many different factors that dictate how telenurses make decisions, and these will be discussed with respect to the research questions.

5.2.1 Telenurses and Decision Making While Using a CDSS

The first research question posed was: how do telenurses make decisions while using a CDSS? Telenurses are constantly making decisions while using a CDSS
in terms of managing patients from the time the call starts until the encounter has ended. Kushniruk (2001) discussed that there were studies indicating that physicians use various methods when presented with "uncertain and ill-structured problems" (p. 367). Although this research does not concern physician encounters, telenurse practice definitely meets the criteria that Kushniruk has described. In fact, telenurses also must manage uncertainty and problems that involve complexity as they have no face to face physical encounter with the patient. The nature of telenurse practice is such that telenurses have no idea as to

what type of patient they will be caring for over the phone as there is no 'hand off' type of report that occurs during shift change as would be the case on a hospital unit. Furthermore, telenurse work is generalized in that they may care for patients young and old as well as care for any type of ailment. Therefore, it can be concluded that any decisions that a telenurse has to make during a telehealth encounter involves the added pressure of never knowing what type of a patient they are going to manage at any point in time.

Kushniruk (2001) also referenced Hammond's work about how factors such as prior exposure and experience can affect decision making. This is very true of how telenurses make decisions in that there are several factors and conditions that can affect decision making in terms of using a CDSS. For example, computer skills are a very fundamental aspect of using a CDSS in terms of typing and navigating through an application. In fact, the requirement for employment at Call Centre A is to have basic computer skills including the use of windows as well as a typing speed of 30wpm. The participants in this study had anywhere from a fair to a very good level of competency in working with computers as noted in Table 8. More specific factors will be explored in the next section of this paper.

5.2.2 Factors Influencing Telenurses' Decision Making with the Use of CDSS

The second research question that was asked was: what factors influence how telenurses make decisions while using CDSS? The study identified a number of different factors outlined in Table 8 below:

Factors that Influence how Telenurses Make Decisions While Using a CDSS
1. Call complexity (here identified as managing two callers as opposed to one)
2. Knowledge and education
3. Knowledge/familiarity of the CDSS
4. Professional experience
5. Personal experience
6. System problems and/or component problems

Table 8 Factors Influencing Telenurse Decision Making.

1. Call complexity (here identified as managing two callers as opposed to one)

In terms of complexity of the situation, two themes were identified. Urgency was noted within the heart attack scenario in terms of how quickly a telenurse felt that a caller needed to seek care based on her assessment. As previously mentioned in the literature review, Leprohon and Patel's (1994) study on decision making strategies reported that nurses used heuristic shortcuts in patients with serious and life-threatening symptoms when using a CDSS. In addition, Kushniruk (2001) identified telephone triage as an area whereby high - performance decision making is associated with ruling out emergent symptoms, such as in the case of the scenario A, a caller with a potential heart attack. This was evident in all of the participants as the mean CHT was 2:14 minutes as outlined in table 5. The telenurses were very well versed in how to manage a patient that may have life threatening symptoms and consequently they recommended seeking care immediately either by having the caller hang up and call 911 or by the telenurse actually performing a live telephone transfer to the British Columbia ambulance service (BCAS).

Complexity of the call was also demonstrated in the situation where two patients are cared for during one call as was the case in the scenario of the breast feeding mom and baby. Not only does the telenurse need to assess the mom, but because of the symptoms the mom has reported (i.e. potential breast infection that may affect the baby's hydration),

the telenurse determined that the baby required assessment as well. So, in this scenario, the telenurse had to care for two patients which would actually require a second patient chart (EMR) to be opened. Also worthy to note, is that the mom's intent may not have been to have her baby assessed, but because the goal of care is to ensure a patient focused encounter, the telenurse looks at the situation from a holistic perspective, and thus, includes the baby as part of the family unit. In terms of managing two patients within the EMR, none of the participants opened a second chart even though it was a policy at Call Centre A as previously mentioned in section 4.3.11. The rationale for telenurses not following this policy was that they found that the system would not save data, which would impact the workflow. Furthermore, telenurses had to navigate through more topics within the CDSS because of the symptoms that mom and baby were experiencing as well as editing the demographics within the EMR while simultaneously trying to communicate and care for the patient.

2. Knowledge and Education

Knowledge was also identified as a factor within this study in terms of nursing education, knowledge of the HIS and CDSS as well as the clinical knowledge related to telenurse practice. These three factors, although similar in definition are distinctly different with respect to how they influenced the telenurses' decision making while using the CDSS.

Nursing education is the foundational element influencing telenurse practice simply because it is required in order to be employed as a RN and of course, a telenurse. For example, all of the telenurses in the heart attack scenario discussed that they easily made decisions using the CDSS because the symptoms reported by the caller (chest pain,

shortness of breath and nausea) are classic symptoms of a heart attack. The breast feeding mom and baby scenario did not highlight basic nursing education explicitly; in fact, clinical knowledge was identified as a factor in only 37.3% (n=3) of the participants. This is largely related to the fact that postpartum and newborn care is more specialized and requires further education of which only a few of the participants possessed.

3. Knowledge of the CDSS

The actual knowledge and familiarity of the CDSS itself was also identified by participants overtly in the case of the heart attack scenario. Fifty percent (n=4) of the telenurses shared that they knew the "chest problems" topic well and knew how to access it quickly as well as what line of questioning was involved. For example, participants knew that the first question within that particular topic provided a complete list of the potential symptoms of a heart attack and that this influenced their decision in using (or not using) the CDSS. In section 4.3.8, it was identified that telenurses consider the CDSS to be a 'safety net' in supporting their decision making. This factor was also applied to the breast feeding mom and baby scenario whereby the participant was not as experienced in maternal and newborn care, and thus, felt that the CDSS was supportive to telenurses decision making.

4. Professional and Personal Experience

Telenurses reported professional experience as a discrete factor with respect to decision making and the use of the CDSS. The majority of participants in the heart attack scenario attributed their professional experience in conjunction with nursing education as important considerations in their decision making. A nurse has learned fundamental skills in managing patients with cardiac related symptoms within their nursing education, but

the nurse is of course required to be alerted to these kinds of symptoms in any kind of setting. Depending on the type of setting, the nurse may have more professional experience in managing these types of patients than others, but regardless, these kinds of scenarios still occur.

Professional experience was also reported as a factor influencing decision making by participants within the breast feeding mom and baby scenario. Some of the participants had specialized knowledge in postpartum and newborn care which was of assistance in some cases. Otherwise, employment in telenursing was discussed within the context of professional experience. This is consistent with the findings described in the previous section where the telenurse's specific knowledge of the information within the CDSS was a factor that influenced her decisions.

Personal experience was an interesting element identified by telenurses in terms of how it influenced CDSS use. This was not evident in the heart attack scenario with respect to the telenurse actually having experienced symptoms themselves or knowing someone that has. Conversely, some of the telenurses in the breast feeding mom and baby scenario disclosed that they had experienced mastitis themselves in the postpartum period. This personal experience was very helpful to the participants in terms of the strategy they used in making decisions while using the CDSS. Here, participants reflected on their own memories of dealing with a diagnosis of mastitis.

5. System Problems and/or their Components

Finally, system problems and/or components were identified as having an influence on how telenurses made decisions while using a CDSS. The telenurses in the heart attack scenario actually did not report any system issues, likely because the call encounter was

so short in length and they only navigated to a few pages if any at all. The breast feeding mom and baby scenario, however, was quite different in that the call length and number of pages visited was significantly higher. In addition, the topics used within this particular scenario happened to include more customizations that were problematic, such as the inline notes and hyposensitive hyperlinks as previously mentioned in the findings chapter. Although these customizations and links may not influence how a telenurse makes decisions explicitly, they may cause some confusion and loss of patient focus as telenurses may have been trying to deal with a system problem. The distracting effects of system problems can actually influence the decision making process because the telenurse now has to appease the caller with an excuse about why they have to wait on the phone for the telenurse to deal with the system problem at hand.

One system problem that was a definite issue with all of the telenurses was the fact that there were two patients instead of one. The policy at Call Centre A warrants that a second chart is to be opened when there are two patients. In reality, none of the telenurses did this, because they stated that performing this task actually caused other system problems, like losing saved data. In fact, avoiding this step influenced their decision making negatively as it became confusing to keep track of the call. For example, telenurses charted incorrectly at times and found that they spent more time navigating the CDSS in order to find the right information for right individual (i.e. the mom as opposed to the baby). Therefore, this confusion negatively impacted how the telenurse made decisions while using the CDSS.

In summary, there were several factors that influenced how a telenurse made decisions while using the CDSS. Knowledge and education, personal and professional experience,

system component problems and complexity of the situation were found to have influenced telenurse decision making. All of the factors contributed in some fashion toward both call scenarios, and this was important to identify in terms of some generalizability across other potential call scenarios.

5.2.3 Aspects that Dictate How and When Telenurses Employ Heuristics (Shortcuts)

The third research question that the study attempted to answer was: what aspects dictate how and when nurses employ shortcuts/heuristics while using a CDSS? This study identified a number of situations whereby telenurses utilized shortcuts when using the CDSS. There was only one area where there was overlap between the literature review and the research study will be outlined in the next few paragraphs:

1. Stress and Fatigue

The literature review identified a number of factors that affected how telenurses made decisions while using a HIS including stress and fatigue. Telenurses in one study reported that they relied more heavily on the CDSS in order to ensure they were providing accurate information (Ernesater et al, 2009). In this study, this was not clearly identified as an aspect in when telenurses use shortcuts, although it was not asked specifically in the participant interview.

2. Novice to Expert

Additionally, the concept of 'novice to expert' was discussed whereby new telenurses relied more on the CDSS than those who were more experienced. In this study, all of the participants had worked as a telenurse for more than 5 years; and as such, the notion of

expertise could not be substantiated. Having said that, it is common knowledge that with more months to years of practice in a particular area of employment, it is typical that an individual would use more rule-based and skill-based approaches when they made their decisions (Lipshitz, 1992). Therefore, although it is not explicitly examined in this study, it is still very likely that a novice telenurse would be more inclined to make decisions using a CDSS more prescriptively, and a more experienced telenurse would more flexibly use a CDSS.

3. Urgency of Situation

Another factor that was identified in the literature review as having an impact on nurse CDSS use is the utility of shortcuts. Shortcuts were used by nurses in Leprohon and Patel's (1994) study of decision making in patients with serious and life-threatening symptoms. This was clearly demonstrated within this study in terms of how a telenurse managed a caller with symptoms potentially indicative of a heart attack. The majority of the participants did not even use the CDSS because the symptoms presented by the callers were so classic of a potential heart attack that the participants wanted to get the caller to the ER as quickly as possible. Telenurses also felt supported by Call Centre A in avoiding the use of the CDSS in these cases because of a policy they had termed "911 Nursing Judgement". This policy was implemented in order to allow telenurses the freedom to practice within their clinical knowledge and expertise and thus deviate from the use of the CDSS. Organizationally speaking, Call Centre A does support the use of shortcuts when a 911 disposition is imminent. This shortcut is illustrated in figure 4 below.

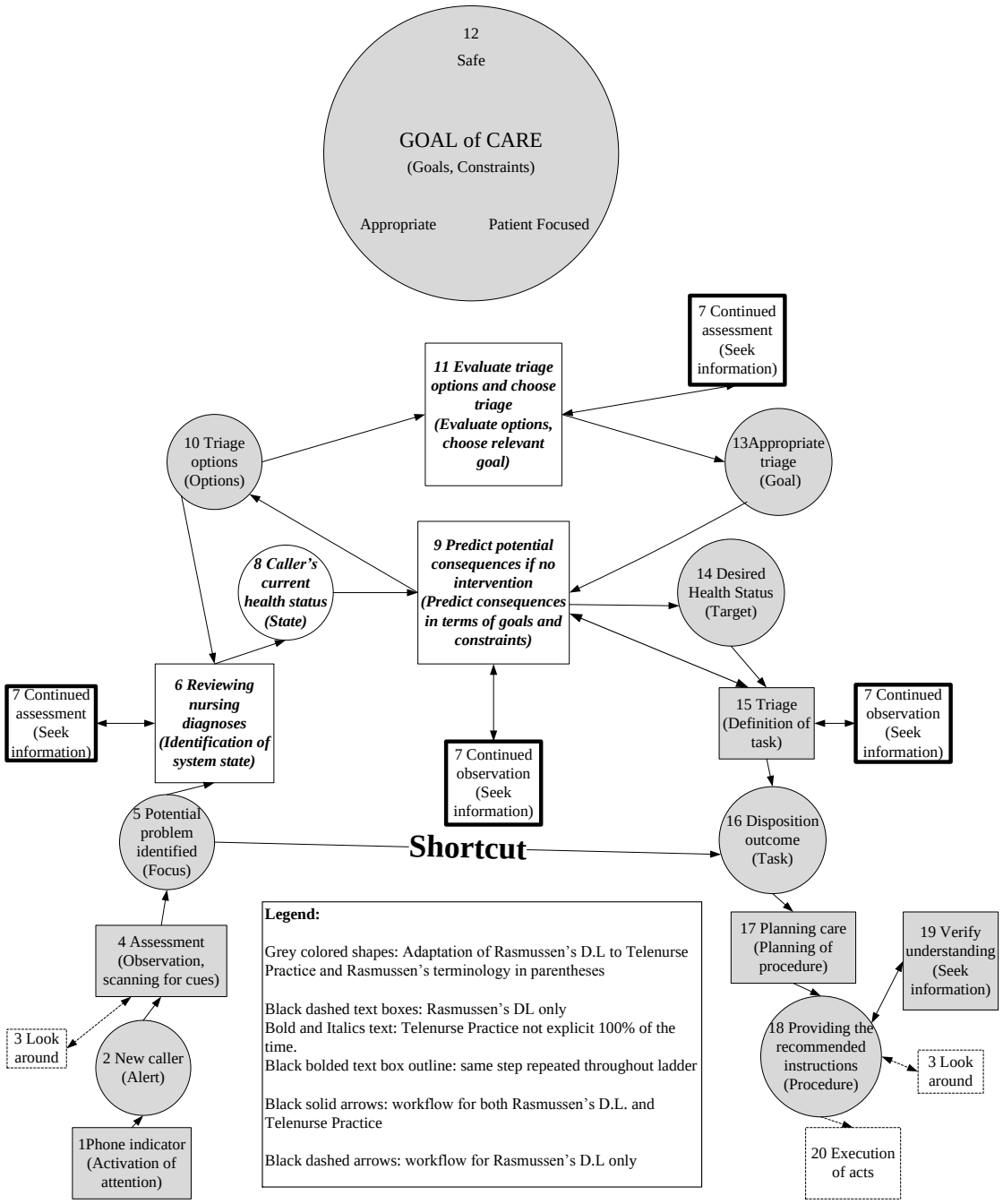

Figure 4: Rasmussen's Decision Ladder as Compared to an Adaptation within Telenurse Practice: Short Cut in Heart Attack Scenario.

The shortcut starts when the telenurse identifies the potential problem (#5) as likely being a heart attack and bypasses the rest of the ladder to the disposition outcome (#16), which is a 911 intervention (as show in figure 4). Again, this is supported by the organizational policy of Call Centre A.

4. Knowledge of CDSS

The knowledge of the CDSS was yet another factor identified as an aspect that may dictate the use of shortcuts. This was also mentioned as a fact influencing decision making (section 5.2.2) in terms of telenurses knowing where to find information because of their frequent exposure to the CDSS by virtue of their employment. In addition to this, telenurses would often be one step ahead in asking callers questions when using the CDSS by clicking either 'yes' or 'no' to questions that they already knew the answers to because of their initial assessment. Rather than duplicate the assessment within the CDSS line of questioning, the telenurse may just click to answer the question. For example, the telenurse has already asked about the breast in terms of color, warmth, pain and swelling. Therefore, the telenurse will answer the question accordingly in the CDSS. The telenurse may also choose to summarize her questioning to verify what the caller has stated previously during the assessment. This particular use of shortcuts adds a layer of patient focus as the telenurse is customizing the CDSS to suit her individual caller. Earlier in this paper, the concept of 'dual triage' was discussed whereby O'Cathain et al (2003) reported that the telenurse would assess the caller and then used the CDSS to supplement the decision making process. Telenurses in this study reported that anyone using the CDSS without using some level of clinical judgment might be construed as a 'monkey' or a

'robot' (O'Cathain et al, 2003). Although in this particular case, the use of shortcuts does involve the use of clinical judgment in order to customize the content of the CDSS. Essentially, in this example, short cuts are truly an indication that telenurses are using critical thinking within the decision making process to provide a patient focused approach to the call encounter. Finally, the situation where the telenurse chose not to open a second chart for the baby was also considered to be a shortcut by the researcher. Although the telenurse reported that performing the task of opening a second chart had some system issues, one could infer that the system problem that is triggered by this task is also a burden to the telenurse as it takes the focus away from the patient as she would now have to attend to a system problem. Figure 5 shows the shortcut where the baby is assessed within the same encounter. This figure illustrates the arrow from the potential problem identified for the breast feeding mom (#5) and looping back to the new caller (#2) who is the baby that has now been identified with a potential problem.

In summary, the use of shortcuts was found to be very different based on the type of scenario, as well as Call Centre A's policy dictating that a telenurse can use nursing judgement in the case of a life threatening situation. In addition, knowledge of the information within the CDSS was noted as influencing the use of shortcuts, particularly when a telenurse felt that it was appropriate to avoid questions. To conclude, the use of shortcuts by telenurses is a clear sign that telenurses use knowledge to inform their clinical judgement and critical thinking when making decisions. In addition, the shortcuts appear to help the nurse meet the goal of patient focused care which will be described in more detail in the next section of this chapter.

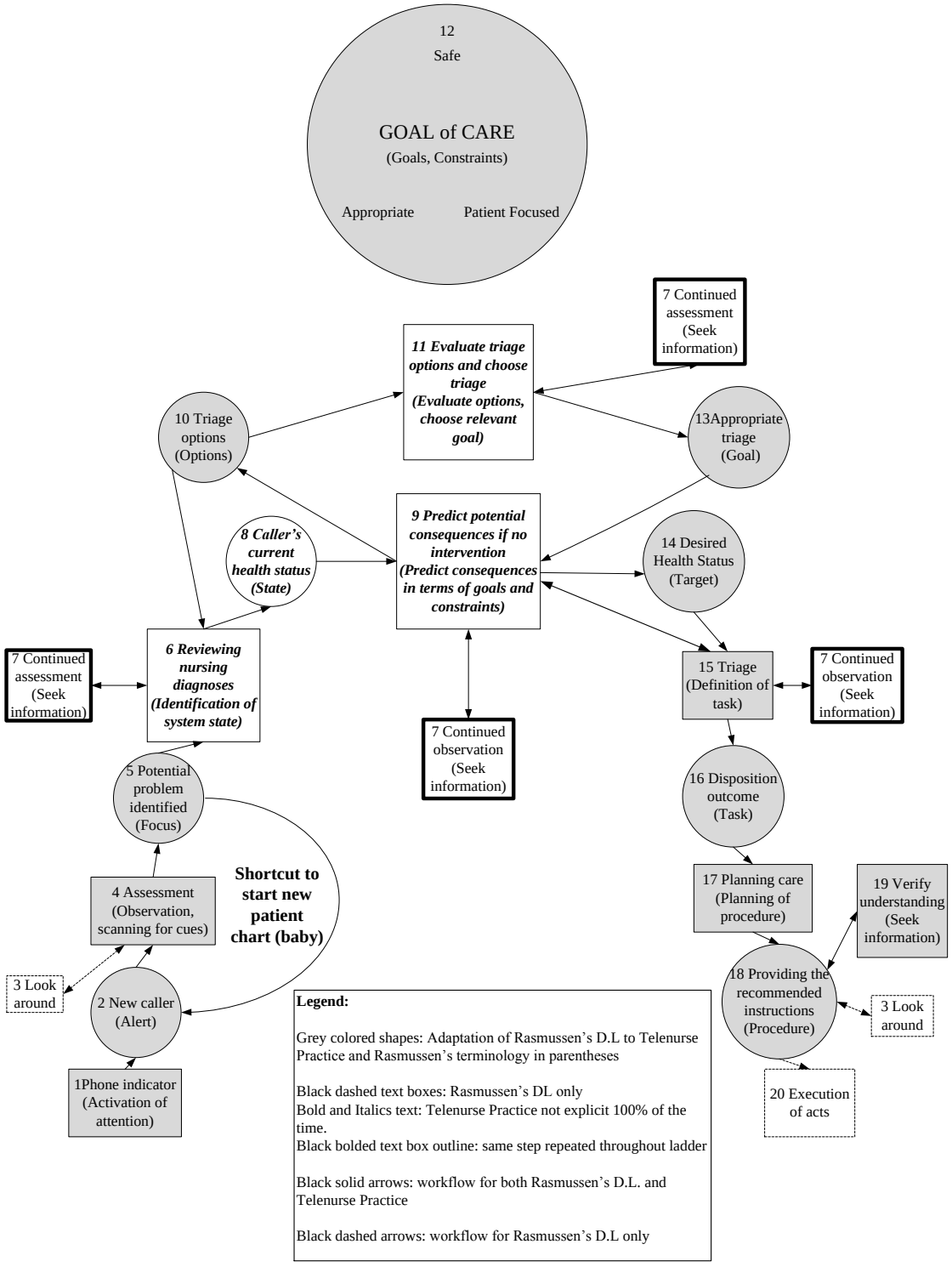

Figure 5: Rasmussen's Decision Ladder as Compared to an Adaptation within Telenurse Practice: Breast Feeding Mom and Baby.

5.2.4 Mapping Rasmussen's Decision Ladder to Telenurse Practice

The fourth research question that was investigated was: how well does the data map to Rasmussen's Decision Ladder and cognitive levels of decision making? In reviewing the numbers from section 4.5.2, table 7, 50% of the elements of the decision ladder mapped fully 100% of the time. The remaining 50% of elements mapped anywhere from 0 to 62.5% of the time. This is not to say that it did not happen at those points, but could have been implicit based on the fact that telenurses do not always state overtly as to how they made a decision. As previously mentioned, people do not always overtly discuss what they will do before they do it, such as in the example earlier provided regarding a person feeling hungry (i.e. the individual may not overtly state this but it does not mean that the individual is not hungry). Table 9 illustrates those steps that were explicitly demonstrated in the data.

Rasmussen Decision Ladder Steps	**Type of Activity**
1. Phone Indicator (Activation of attention)	Information Processing
2. New Caller (Alert)	State of Knowledge
3. Look Around	Information Processing
4. Assessment (Observation, scanning for cues)	Information Processing
5. Potential Problem Identified (Focus)	State of Knowledge
7. Continued Assessment (Seek Information)	Information Processing
12. Safe, appropriate, patient focused goal of care (Goals, constraints)	State of Knowledge
15. Triage (Definition of task)	Information Processing
16. Disposition outcome (Task)	State of Knowledge
18. Providing the recommended instructions	State of Knowledge
19. Verify Understanding	Information Processing

Table 9 Rasmussen's Decision Ladder Steps Mapped to Telenurse Practice Explicitly 100% of the Time.

Although the other steps could not be verified, there is a foundational basis here for a framework to evaluate telenurse practice. As the methodology used for coding the data was model based, Rasmussen's Decision Ladder steps were generic were applied to a

number of different situations. In addition, the interview questions were not specifically designed to ask for details about each step of the ladder because the telenurse specific framework was still being developed and tested as part of this research.

5.2.5 Telenurses Perceptions of How CDSS' Support their Decision Making

The fifth question that was asked was: Do telenurses perceive the CDSS as supporting decision making? The telenurses had mixed opinions about how the CDSS did or did not support decision making depending on the scenario. There were ten questions asked within the post call interview and all of them relate in some way as to how well the CDSS supported telenurse decision making. Table 9 provides a summary of the interview questions (Table 4 lists all of the questions with the data revealed in section 4.3.11):

Post Call Interview Questions
1. Can you describe the process of how you came to a decision about what to do for the case? What strategy did you use?
2. Was the case easy or hard? Why?
3. Did you use your past experience while using the CDSS?
4. Did you have any problems using the system? Please explain.
5. Did you find using the system easy or not? Please describe.
6. Do you have any suggestions on how to improve the system?
7. How did you feel the system affected your decision making skills?
8. Did system make your decision making easier or hard? Explain
9. What factors influenced your decision making?
10. What were the factors that influenced your use of shortcuts?

Table 10: Summary of Post Call Interview Questions.

These questions elicited various responses and again, they were dependent on a number of factors including education, professional and personal experience, system challenges and of course, the scenario itself. So, in terms question #2, for example, "Was the case easy or hard?" all of the telenurses in the heart attack scenario thought it was easy

because the caller presented with classic signs of a heart attack. Conversely, for the same question in the breast feeding scenario, almost all of the telenurses thought it was hard as there were two callers to manage instead of one (i.e. mother and baby). So, it is difficult to respond to such a generalized research question as the responses for any of these questions which have been addressed will be different. There was one comment that was shared among a number of the telenurses which was very relevant to this question. Despite the fact that the two scenarios prompted opposing responses, question #7, "How did you feel the system affected your decision making skills" actually addresses this research question to some degree. More than half of the telenurses in the breast feeding mother and baby scenario thought the system was helpful as a backup (and as mentioned earlier, acted as a 'safety net' – see section 4.3.9). The heart attack scenario was a little different, in that more than half of the participants found that they did not use the CDSS, whereas less than half of telenurses actually felt the CDSS enhanced their decision making by providing a source of information. Therefore, the response to this question is dependent on the factors previously mentioned as well as the type of scenario that the telenurse is managing.

5.3 Study Limitations

There were a number of study limitations that will be outlined in this section of the thesis chapter.

5.3.1 Telenurse Gender

Most nurses are female, including telenurses. No male telenurses participated in this study. Only female telenurses responded to the invitation to participate in the study. There is potential gender bias in terms of the second scenario. The caller in the second scenario was a breast feeding mom with her baby. As previously mentioned, some of the participants may have had personal experiences with breast feeding and developing mastitis. This participant personal experience was reported to have been very influential in cases where a telenurse has made decisions while using the CDSS. Certainly, it is also important to consider that a male telenurse may be better able to manage a caller experiencing a male health issue, especially if the male nurse has also experienced the same problem at some time in their past. To determine if such experiences influence male telehealth nurse decision making, future research needs to consider these gender based influences.

5.3.2 Mock Caller Challenges and Scripting

In this study, telenurses managed mock callers as the patients they were caring for. Ethically speaking, live patients were not utilized as it would be unsafe to start a call with a request to the caller to consent participate in a study. The caller may be experiencing symptoms indicative of a serious illness; and the potential delay in a telenurse discussing the research study and request for consent could be detrimental to their health in terms of delaying care. Without a face to face encounter, it would remain a challenge to engage live callers in clinical studies such as these.

Another challenge to consider is the mock caller's 'acting' abilities. In this study, administrative assistants volunteered to serve as the patient caller with minimal scripting. The researcher tried to provide as much detail as possible in anticipating what the telenurse might ask in assessing the caller, but there were certain questions that came up whereby the mock caller had to nervously produce answers on the spot. In addition, the caller provided responses readily and without difficulty, where in reality, it is often the case that callers may not be as health literate and thus, may need some further probing to provide an accurate response. For example, there is a question that the telenurses asked within the breast feeding mom and baby scenario about how many wet diapers the baby produced in the last 24 hours in order to assess for potential dehydration. The mock caller responded easily and quickly; and this was actually identified by the participants in the study. In reality, postpartum moms do not really count diapers as such. So, the telenurses would have to probe a little deeper to try and assess this further. Also worthy to note, that a baby's diaper is often soiled with stool mixed in with urine, so this again poses a barrier in reality. It is not to say that all mothers would be challenged with this line of questioning, but it is important to point out this limitation where clinical simulation studies using mock callers is concerned.

Another point to add regarding a caller's 'acting' ability is with respect to cues that certain symptoms may affect a caller's communication. A telenurse is very attuned to not only what the caller says, but how it is said. In the heart attack scenario, one telenurse noted that her caller stated she was short of breath, despite the fact that she could speak in full sentences without effort. In reality, this is very important, especially when a caller downplays their symptoms and may deny that they are in trouble. It is in such cases such

that telenurses often need to use strategies to convince callers that they truly need to seek care. Furthermore, background distractions such as the television, babies crying, or a bad telephone connection can offer challenges to call encounters whereas in this study, the environment was such that the call background was quiet and the call was clear.

To conclude, it is always a challenge to try and recreate the real world with simulation. Both the participant and the mock caller were aware that the study was simulated using a scripted encounter.

5.3.3 Potential for Generalizability

Another limitation identified was that this particular study was only performed with two scenarios in mind. Furthermore, this study was done only within a telehealth call centre, which limits the applicability to other clinical settings. In order to generalize this work, it would be prudent to study different clinical areas, such as in public health or even acute care units. Exploring different areas in terms of their complexities would certainly strengthen the outcome and thus provide generalizability across nursing practice.

5.4 Implications for Health Informatics Practice

This study was conducted to learn more about telenurses and their decision making processes when using HIS, specifically CDSS. As telenurse practice is a relatively new and an understudied area of nursing, this research was focused on learning more about telenurse practice in terms of the roles of education, organizational policies, professional practice, quality management as well as information management and information technology services that support HIS use. The decision ladder framework adapted from

Rasmussen for telenursing practice can be used as a framework to evaluate the current state of telenursing at Call Centre A.

Such work may help other call centres in reviewing telenurses; practice and the relationship between nursing practice, decision making and the use of CDSS. Academic institutions that provide nursing, health informatics (particularly telehealth and telemedicine) courses can review this research in order to better understand the factors that influence telenurse decision making and therefore better prepare students for telehealth nursing practice. Nursing/health informatics associations such as the Canadian Nurses Association (CNA) or the Canadian Nursing Informatics Association (CNIA) can also use this research as a framework for guiding competency reviews or performance appraisals. Regulatory bodies may also want to review this research to enhance policy making surrounding telehealth nursing practice.

Generally speaking, this study has highlighted some new information regarding the influential aspects of telenurse practice and the use of CDSS. Some of the study findings are similar to those found in the nursing literature. Other findings are new and emergent. More research is needed to determine if the study findings are specific to Canada or generalizable to other countries that employ telehealth nurses. As well, more clinical simulations studies are needed.

5.5 Future Research

Telenursing is a relatively new approach to providing nursing care delivery that involves the use of HIS. This research has identified a number of factors that can affect decision making while using HIS, specifically CDSS. Furthermore, Rasmussen's

Decision Ladder was tested and validated as a framework that can be used to describe telenursing practice. There were limitations associated with this research. Only female nurses participated in the study. As well, the researcher did not determine if nurses were novices or experts in telehealth nursing.

There are areas; however that could be researched to investigate how Canadian telenursing practice compares to other countries and jurisdictions such as the U.S. and Sweden. The decision ladder framework adapted from Rasmussen's model could be explored further to evaluate its potential as a tool to evaluate telenurse practice. Call Centre A is an organization that employs telenurses to provide health care, but they also provide tele-pharmacy and tele-dietitian services. More research is needed to evaluate the applicability of the work to other disciplines who work in telehealth. Furthermore, next steps could in fact include applying the decision ladder framework to other clinical settings, including bedside nursing, in order to provide generalizability to the research.

5.6 Summary

This research study was performed with the goal of understanding how telenurses make decisions while using a CDSS. The literature review showed that there were few studies published on this subject. Furthermore, even fewer studies used clinical simulation as a research methodology; and in this study, it was valuable in obtaining data that was important to understanding the factors that influence telenurses 'decision making. Certainly, focus groups and interviews are helpful in gathering data in this topic of inquiry, but clinical simulation was chosen as a methodology for identifying potential problems that occur in real-world situations and workflows (Borycki, Kushniruk, Kuwata

&Watanabe 2009). Several aspects of decision making emerged that were shown to influence telenurse practice. In addition, Rasmussen's Decision Ladder was used as a framework to evaluate how it mapped to telenurse practice. This is the first study known to the researcher that provided data to substantiate the factors that influence how telenurses make decisions while using a CDSS. Greenberg (2009) did some work in creating a theoretical framework to describe telenurse practice; however, there was no discussion regarding decision making as well as the use of a CDSS. Therefore, this research can serve to bridge the gap between the telenurse and the technology.

Further research needs to be done to design different scenarios as well as a more tailored line of interview questions to further validate the steps of the decision ladder that were not as explicit. Having said that, the new knowledge gleaned from this study has exciting implications. First, health IT/software organizations need to better understand how telenurses use HIS including CDSS to better align with telenurses' decision making. In addition, the factors identified that influence telenurse practice also need to impact organizational policy and education so as to maximize a telenurse's usability and confidence with using the HIS. As shortcuts were clearly identified as a form of how telenurses use their critical thinking skills, these also need to be supported by organizational policies. This method of health care delivery is new and growing, and therefore, it needs to be nurtured in order to be effective and successful in ensuring that patient care is safe, appropriate and patient focused.

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Appendix A: Consent Form

Health Information Science
University of Victoria

Participant Consent Form

Towards a Framework for Telenurses' Decision Making: The Decision Ladder

You are invited to participate in a study entitled "Towards a Framework for Telenurses' Decision Making: The Decision Ladder" that is being conducted by Danica Tuden.

Danica Tuden is a graduate in the department of Health Information Sciences at the University of Victoria and you may contact her if you have further questions by email - dstuden@uvic.ca .

As a graduate student, I am required to conduct research as part of the requirements for a degree in Masters of Health Information Science. It is being conducted under the supervision of Elizabeth Borycki. You may contact my supervisor at (250) 472-5432.

Purpose and Objectives
The purpose of this research project is to understand the cognitive processes of telenurses' decision making with the use of health information systems, specifically clinical decision support systems. In addition, I would like to identify the factors that influence how telenurses use clinical decision support systems. Finally, I would like to explore the use of heuristics or "short-cuts" by telenurses while using clinical decision support systems. In understanding these objectives, I will be testing a framework (Rasmussen's decision ladder) to see how it fits within the profession of telenursing.

Importance of this Research
Research of this type is important because understanding and thus, enhancing decision making skills through organizational supports and educational opportunities are vital to ensuring a future towards a high quality of telehealth nursing. Therefore, research in this area, including an assessment of other existing models or frameworks, such as that of Rasmussen's decision ladder will serve to facilitate this journey.

Participants Selection
You are being asked to participate in this study because you are a telenurse working in a call centre environment.

What is involved
If you consent to voluntarily participate in this research, your participation will include participating in a clinical simulated call. This involves answering and managing 2 caller scenarios. The caller will be a research assistant who has a script he or she will follow. You will treat this caller as though he or she was a normal caller in the queue. The only exception, is that if you need to transfer the call to any other service, you will only simulate this by verbally stating this, you do not need to actually transfer (you may pretend to touch a button if you like). The computer screens will be recorded so that we can playback and review together after the call. In addition, you will be videotaped. I may also make some notes during the time of the call and

interview. After the call has ended, I will playback the screen recording and ask you to think out loud as we playback the screen recording to understand what you might have been thinking during the call. I may also ask questions at any time during the playback. This will also be video and audio recorded so that I can review the data at a later date. Also, I will ask you some questions about your experience with the health information system, which will also be video and audio recorded. There may be some other technical support staff nearby, but distractions will be kept to a minimum to keep the study as realistic as possible. Your participation in this study should take no longer than 1.5 – 2 hours of time. After your time is over, I will be analyzing and transcribing the data (video, audio, screen recording and notes). I will keep the electronic information on my computer at work and at home, and it will be password protected for security reasons. Any paper records or CD's will be kept in a locked filing cabinet.

Please be advised that information about you that is gathered for this research study only.

Inconvenience
Participation in this study may cause some inconvenience in terms of the actual time spent during the study.

Risks
There are no known or anticipated risks to you by participating in this research.

Benefits
The potential benefits of your participation in this research include gaining a better understanding of the research process. You will be a key contributor to research in telenursing. Furthermore, this research will provide knowledge and understanding to the professional practice of telenursing, thereby offering the appropriate supports necessary to develop and enhance telenursing.

Compensation
As a way to compensate you for any inconvenience related to your participation, you will be given a 10 dollar gift card from Starbucks. If you consent to participate in this study, this form of compensation to you must not be coercive. It is unethical to provide undue compensation or inducements to research participants. If you would not participate if the compensation was not offered, then you should decline. If

Voluntary Participation
Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. If you do withdraw from the study your data will not be used and deleted. A Starbucks card will be provided as a token of appreciation to the telenurse's appreciation. If you decide to withdraw, you will still be compensated.

Researcher's Relationship with Participants
The investigator does not have any reporting relationship to the telenurses. Additionally, none of the committee members have any reporting relationship to the telenurses.

Anonymity
In terms of protecting your anonymity, I will not use your name on any of the data – I will use pseudonyms such as "Telenurse 1, 2, 3", etc.… I will keep all of the data on my home computer in a password protected file and any paper related data will be kept in a locked file cabinet at home. In terms of future publications or presentations, I will not use telenurse names or any organizational affiliates.

Confidentiality
Your confidentiality and the confidentiality of the data will be protected by keeping any electronic information password protected. Any paper records or CD's will be password protected for your security.

Dissemination of Results
It is anticipated that the results of this study will be shared with others in the following ways: Thesis, class or conference presentation and published article.

Disposal of Data
Data from this study will be disposed of after 5 years. Paper copies will be shredded and electronic records will be deleted

Contacts
Individuals that may be contacted regarding this study include researcher, supervisor, and any research assistants.

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your signature below indicates that you understand the above conditions of participation in this study, that you have had the opportunity to have your questions answered by the researchers, and that you consent to participate in this research project.

_____	_____	_____
Name of Participant	*Signature*	*Date*

Visually Recorded Images/Data Participant provides initials, *only if you consent*:

- Photos may be taken of me for: Analysis _____ Dissemination* _____
- Videos may be taken of me for: Analysis _____ Dissemination* _____

*Even if no names are used, you may be recognizable if visual images are shown in the results.

PLEASE SELECT STATEMENT only if you consent:

I consent to be identified by name / credited in the results of the study: _____
(Participant to provide initials)

I consent to have my responses attributed to me by name in the results: _____
(Participant to provide initials)

Future Use of Data *PLEASE SELECT STATEMENT:*

I consent to the use of my data in future research: _____ (Participant to provide initials)

I **do not** consent to the use of my data in future research: _____ (Participant to provide initials)

I consent to be contacted in the event my data is requested for future research: _____
(Participant to provide initials)

A copy of this consent will be left with you, and a copy will be taken by the researcher.

Appendix B: Scripting and Interview Questions

- Start with an introduction of myself and the purpose of the research study
- The objective of this study is to study decision making and test Rasmussen's decision ladder as a potential framework for telenursing
- Computer screen will be recorded by Camtasia© software and reviewed by researcher (me) for cues related to coding within model
- Participant will be also video/audio recorded to watch for any evidence of coding within decision making. Recordings will only be used for this study and will not be distributed
- Tasks will include:
    - Opening a client record (EMR) and entering data
    - Assessment of caller
    - Choosing a health/symptom topic and entering in search engine
    - Choosing the appropriate topic from the returned search
    - Choosing the right section (i.e. Check your symptoms)
    - Following symptom protocol (CDSS)
    - Providing recommendations
    - Ensuring caller verified understanding
    - Close encounter and document in client record (EMR)

Clinical Simulation Scenarios:

1. Female caller 73 years of age with a history of high blood pressure and high cholesterol c/o shortness of breath, diaphoresis, and chest pain
2. Female 32 years of age 3 days postpartum (primip), regular vaginal delivery c/o breast tenderness

Questions to participant prior to task

1. How many years and/or months have you worked at Centre A?
2. Full time or part time?
3. Do you work in another area? Long term care, acute care, community health?
4. How long have you been a nurse?
5. How would you describe your level of competency in working with computers?
6. Have you used computers prior to working here at Centre A? In what capacity?

7. Post test questions (Record)
    a. Can you describe the process of you came to a decision about what to do for the case? What strategy did you use?
    b. Was the case easy or hard? Why?
    c. Did you use your past experience while using the CDSS? Explain
    d. Did you have any problems using the system? Please explain

e. Did you find using the system easy or not? Please describe
f. Do have any suggestions on how to improve the system?
g. How did you feel the system affected your decision-making skills?
h. Did system make your decision making easier or hard? Explain
i. What factors influenced your decision making?
j. Describe shortcuts (i.e. when you did not have to follow CDSS prescriptively). When did you use shortcuts? What were your reasons for using shortcuts?
k. What were the factors that influenced your use of short cuts?

Appendix C: Call Scenarios

1. Female caller 73 years of age with a history of high blood pressure and high cholesterol c/o shortness of breath, diaphoresis, and chest pain.

Mrs. Smith calls in at Centre A telenurse call centre as he is not feeling well. She is home alone right now as her husband is out babysitting the grandchildren. She thinks he needs to see a doctor, but just not sure when. She is 73 old, has a history of high blood pressure and high cholesterol. She takes medication for both of these conditions – Tenormin and Zocor, but she is not sure of the dosages. She has not had any recent surgeries although she has had some tests (blood work and an ECG) as she has been having some ankle swelling. Today she is calling Centre A as she is having some difficulty breathing (evident in his speech). She complains of some pressure on her chest, about 8 out of 10 and feels nauseated. She is sitting down and notes she is sweating. She thought that it might have been something that she ate, perhaps indigestion, but wanted to talk to a nurse to get some advice.

Likely course of action: 911 transfer to ambulance

2. Female 32 years of age 3 days postpartum (primip), regular vaginal delivery c/o breast tenderness.

Mrs. Johnson has just had her first baby 6 days ago. She is 32 years old, otherwise healthy, no medications except for Tylenol for the breast tenderness she is experiencing. Her last dose was 650 mgs about 2 hours ago, and has already taken 3 doses in the last 24 hours with no significant relief. She is trying to breast feed but finding it difficult with the pain. She is not sure if she is still engorged or if something else is going on. She is has some vaginal discharge, but only a mild amount. She admits that she has not been sleeping well as she is trying to get her baby on a proper feeding schedule in addition to the breast tenderness. Her Right breast is particularly sore, and there is some warmth and redness in an area close to the nipple. She does not have any nipple discharge. She says she feels a bit warm, but just not sure if it is because she is tired. She does not have a thermometer to check her temperature. Her baby boy is healthy, was a little bit jaundiced at birth but much better now. He is feeding more so on her left breast than her right as it is quite sore. Baby has been having about 5 -6 wet diapers a day but she does note that it has only been about 3 in the last 24 hours. Baby has tears and soft spot on baby's head is not sunken. Also, has been very fussy and crying more during this time. Mrs. Johnson is a bit worried about this.

Likely course of action: see doctor within the next hour (red zone) both mom and baby to be seen. Mom potential mastitis, baby mild dehydration.

Appendix 4: Ethics Approval

University of Victoria

Human Research Ethics Board
Office of Research Services
Administrative Services Building
PO Box 1700 STN CSC
Victoria British Columbia V8W 2Y2 Canada
Tel 250-472-4545, Fax 250-721-8960
ethics@uvic.ca www.research.uvic.ca

Certificate of Approval

PRINCIPAL INVESTIGATOR:	**Danica Sophia Tuden**	**ETHICS PROTOCOL NUMBER** Minimal Risk - Delegated	**13-350**
UVic STATUS:	**Master's Student**	ORIGINAL APPROVAL DATE:	24-Oct-13
UVic DEPARTMENT:	**HEIS**	APPROVED ON:	24-Oct-13
SUPERVISOR:	**Dr. Elizabeth Borycki**	APPROVAL EXPIRY DATE:	23-Oct-14

PROJECT TITLE: **Towards a Framework for Telenurses' Decision Making: The Decision Ladder**

RESEARCH TEAM MEMBER Co-investigators: Andre Kushniruk (UVic), Alyse Capron (Healthlink BC)

DECLARED PROJECT FUNDING: **None**

CONDITIONS OF APPROVAL

This Certificate of Approval is valid for the above term provided there is no change in the protocol.

Modifications
To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.

Renewals
Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.

Project Closures
When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a "Notice of Project Completion" form.

Certification

This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.

Certificate Issued On: 24-Oct-13

13-350 Tuden, Danica Sophia