

The Development of a Patient Portal for Use During Hospitalization: Pediatric Registered
Nurses' Perspectives

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In Partial Fulfillment of the Requirements
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ABSTRACT

Patient portals are innovative digital health technologies that are impacting nursing practice. A patient portal is an electronic tool that allows patients and parents to access personal health information. There has been a recent focus to implement patient portal technology when children are hospitalized. This manuscript style thesis examines pediatric registered nurses (RNs) perspectives of new technology including patient portals and its impact on nursing care. The first manuscript is a thematic literature review that was conducted to determine pediatric health care providers perceptions of patient portal implementation. Five articles were included in the analysis and only two articles focused exclusively on health care providers views. Four themes summarize the pediatric practitioner's experiences with a portal technology: *The Benefits of the Patient Portal*; *Impact on Provider Workload*; *User-Friendliness of the Patient Portal*; and *Health Care Providers Needs with Portal Implementation*. Pediatric RNs voices are limited in currently published research. Therefore, the second manuscript is an interpretive description study conducted to explore pediatric RNs perspectives of new technology, including a proposed patient portal, on patient care. A total of 10 nurses participated in a semi-structured individual interview. Six themes represent the RNs views of new technology, including a proposed patient portal, and the impact on nursing care during a child's hospitalization. The first three themes: *Standing in Both Worlds*, *Reshaping the Care Triad*, and *Needing Support* embody the nurses' views on the implementation of technology in the pediatric inpatient units they work. The RNs previous experience with health technology implementation informs their perspectives of a new portal technology and its potential impact on patient care. The last three themes encompass the RNs views on the development of a patient portal: *Improving Family Centred Care*, *Connecting with Care*, and *Anticipating Nursing Implications*. Overall, the RNs are anticipating a positive

impact the portal can have on the hospital experience for children and their family members. Even though the nurses report a feeling of standing in both worlds in regards to technology and its varied implementation, they are still optimistic. The RNs are also bringing awareness to the impact of all the new technology, not just a single piece, on patient care and the art of nursing. The integrated discussion provides recommendations to a larger ongoing study and discusses the impact on nursing practice, education, and research. Recruiting and involving pediatric RNs can take considerable time and effort but they can provide valuable insight and feedback on new technology, including patient portals, which may result in more sustained use.

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DEDICATION

To all the pediatric registered nurses who work in the wonderful and challenging emergency, intensive care, and inpatient units!

Table of Contents

PERMISSION TO USE	i
ABSTRACT	ii
ACKNOWLEDGEMENTS	iv
DEDICATION	v
TABLE OF CONTENTS	vi
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS.....	xii
CHAPTER 1 Introduction.....	1
1.1. Purpose and Objectives.....	1
1.2. Background	2
1.2.1. Patient portal adoption	3
1.2.2. Portal use during hospitalization	4
1.2.3. Health care providers views of patient portals	5
1.2.4. Benefits of a patient portal technology	6
1.3. Manuscript Style and Organization of Thesis	7
1.4. Conclusion	7
References	9
CHAPTER 2 Manuscript #2 – Pediatric Healthcare providers experiences with patient portals: A literature review	12
2.1. Abstract.....	13
2.2. Introduction.....	14
2.3 Background.....	15

2.4. Method.....	17
2.4.1. Thematic analysis.....	18
2.5 Results.....	19
2.5.1. Benefits of the patient portal.....	20
2.5.1.1. Improved patient care.....	20
2.5.1.2. Communication.....	21
2.5.2. Impact on provider workload	21
2.5.3. User-friendliness of the patient portal.....	23
2.5.4. Health care provider needs during portal implementation.....	23
2.6 Discussion.....	24
2.6.1. Strengths and limitations.....	27
2.7 Conclusion.....	28
References.....	34
CHAPTER 3 Manuscript #2 – Pediatric registered nurses’ perspectives of the development of a patient portal and the impact of new technology on nursing practice.....	37
3.1. Abstract	40
3.2. Introduction	42
3.3. Background	43
3.4. Methodology and Methods.....	45
3.4.1. Participants and setting	46
3.4.2. Data collection	47
3.4.3. Data analysis	48
3.5. Results	48

3.5.1. Standing in both worlds.....	49
3.5.2. Reshaping the care triad.....	52
3.5.3. Needing support.....	54
3.5.4. Improving family centered care.....	56
3.5.5. Connecting family with care.....	57
3.5.6. Anticipating nursing implications	58
3.6. Discussion.....	61
3.6.1. User-centred design success	61
3.6.2. Digitally connecting with care	62
3.6.3. Technology and the caring profession	64
3.6.4. Strengths and limitations.....	66
3.7. Conclusion.....	67
References.....	69
CHAPTER 4 Integrated discussion.....	77
4.1 Overview.....	78
4.2. Recommendations to Larger Ongoing Study	80
4.2.1. Data flow.....	80
4.2.2. Expectations.....	83
4.3. Implications for Nursing Practice, Education, and Research.....	84
4.3.1. The caring profession	85
4.3.2. Nursing leadership	86
4.3.3. Education programs	89
4.3.4. Nursing research	90

4.4. Factors Influencing the Study.....	91
4.5. Researcher’s Reflections	91
4.6. Conclusion.....	93
References.....	95

LIST OF TABLES

1. Chapter 2 Table 1: Summary of Articles	31
2. Chapter 3 Table 1: Demographic Data	75

LIST OF FIGURES

1. Chapter 2 Figure 1: Database searches.....	29
2. Chapter 2 Figure 2: Thematic mapping of health care providers views of patient portal use in a pediatric setting	30
3. Chapter 3 Figure 1: Low fidelity patient portal example.....	74
4. Chapter 3 Figure 2: Visual representation of data analysis	76
5. Chapter 4 Figure 1: Summary of recommendations to larger ongoing study	98
6. Chapter 4 Figure 2: Sample communication tool for portal trial	99

List of Abbreviations

CNA Canadian Nurses' Association

EHR Electronic Health Record

HCP Healthcare Provider

ID Interpretive Description

RN Registered Nurse

RNAO Registered Nurses' Association of Ontario

UCD User-centred Design

USA United States of America

Chapter 1: Introduction

Connecting patients and families to their health care experience is a rapidly evolving area of research with implications for Registered Nurses (RNs). The integration of patient portals, virtual care visits, and electronic health records are examples of health information technologies that can connect families to their child's care (Patel et al., 2020; Registered Nurses' Association of Ontario (RNAO) & AMS Healthcare, 2020). A patient portal is a way for patients and/or designated family members to electronically access personal health information. The information accessible for viewing varies by institution and setting, but it is typically available through a tablet device provided by the hospital or through an application on a personal electronic device, such as a cell phone (Kelly, Coller, & Hoonakker, 2018; King et al., 2017). Patient portal technology has been evolving for almost a decade, with increased implementation during pediatric hospital stays (Bush, Connelly, Fuller, & Perez, 2016; Kelly et al., 2018; Kelly et al., 2019; Kelly, Hoonakker & Dean, 2016; Runaas et al., 2017). With the increasing adoption of patient portal access during hospitalization, pediatric RNs perceptions need to be considered. This thesis is part of a larger ongoing study on the development and eventual trial of a patient portal for pediatric patients during hospitalization at a hospital in mid-western Canada.

1.1 Purpose and Objectives

The purpose of this interpretive description (ID) study (Thorne, 2016) is to explore the perceptions RNs have on how a parent's use of technology at the bedside may influence patient care on an inpatient pediatric unit. The results provide an overview of several themes that details the RN's views of new technology including the development of a patient portal. The specific research objectives were to:

1. Discover what RN's would like to see incorporated into a new patient portal technology.
2. Explore the perspectives of RN's regarding new technology, including a proposed patient portal, on an inpatient pediatric unit.
3. Utilize the data analysis in the creation of the patient portal, that is part of phase two and three of the larger ongoing study on patient portal development and implementation on a pediatric inpatient unit.

The following two research questions guided the ID study:

1. What attitudes, beliefs, and perceptions do RNs report regarding the development of a portal technology for parents to use at the bedside for inpatient pediatric care?
2. How do RNs believe the introduction of new technologies impact inpatient pediatric care?

1.2. Background

Patient portals have the potential to improve family centered care, safety of care, and the quality of care provided to children (Bush et al., 2016; Bush et al., 2017; Kelly et al., 2016; Kelly et al., 2019; Prey et al., 2014; Schultz & Aderfer, 2018). A patient portal in the pediatric population can allow for parents to access their child's health information electronically. The information accessible for viewing on the portal device varies depending on the health care setting, but typical features have included access to vital signs, medications, test results, and communication abilities with health care professionals (Kelly et al., 2016; Kelly et al., 2018). Parents often perceive patient portals to be beneficial and value the access to information (Britto, Hesse, Kamdar, & Knopf Munafo, 2013; Bush, Stahmer, & Connelly, 2016; Kelly et al., 2019; Kelly et al., 2016; Schultz & Alderfer, 2018). However, health care providers' perceptions regarding the use of patient portals are only beginning to be addressed in the literature. Of the studies that have been done, physicians are the health care providers most often targeted in the

research (Bush et al., 2017; Kruse, Argueta, Lopez, and Nair, 2015). While there has been some inclusion of RNs experiences and perspectives on inpatient portal access in adult care (Hoonakker et al., 2019) the voices of pediatric RNs in regards to this emerging technology are limited and are often combined with other health care providers opinions (Kelly et al., 2016; King et al., 2017, Runaas et al., 2017).

1.2.1. Patient portal adoption.

Overall, patient portal technology has been implemented more widely in the pediatric outpatient department compared to the inpatient hospital setting. In the United States of America (USA) there has been varying adoption rates by caregivers who have been offered electronic access to their child's health record through a patient portal. In one large outpatient study less than 3% of eligible caregivers activated their child's portal (Fiks et al., 2016) compared to a more recent study that had a 64% adoption rate (Szilagyi et al., 2020). However, in a study on a children's inpatient unit in the USA, 90% of the eligible caregivers adopted the patient portal provided during a hospital stay (Kelly et al., 2016). Similarly, a specialized pediatric hematology/oncology unit in the USA reported high use of portal functions by caregivers who accessed the portal during hospitalization (Runaas et al., 2017). This difference could potentially be attributed to how the portal itself is accessed in various settings. For example, in outpatient settings patients typically need access to the Internet and/or a mobile device and socioeconomic status and patient demographics are beginning to be explored as potential barriers to portal uptake (Bush, Vemulakonda, Richardson, Deakyne Davies, & Chiang, 2019). In contrast, inpatient pediatric settings are providing devices, such as a tablet, for parents to access the portal on, which could make activation easier (Kelly et al., 2016, Hoonakker et al., 2019; Runaas et al., 2017).

Adolescents are also very interested in accessing their electronic health records through a patient portal (Miklin, Vangara, Delamater & Goodman, 2019) and in one study, by 15 years of age almost 60% of the adolescents were accessing the portal on their own (without co-parent activation) (Szilagy et al., 2020). Patient and/or parent activation of pediatric portal accounts have risen over the past decade, with the most consistent use appearing during hospitalization.

1.2.2. Portal use during hospitalization.

Recent research in North America has focused on the potential impact of patient portal use during hospitalizations (Kelly et al., 2016; Kelly et al., 2018; Kelly et al., 2019; King et al., 2017; Hoonakker et al., 2019 Runass et al., 2017). Parents are reporting using a portal during their child's hospitalization for accessing information on their child's health status such as: vital signs, medications, and diagnoses; accessing information on health care professionals providing care; accessing test results; and for requesting items like more water or an extra blanket (Kelly et al. 2016; Kelly, et al., 2019, Runaas et al., 2017). The caregivers value the digital access to health information and appreciate the ability to that information view whenever is convenient, which also empowers the parents to be more informed for when the physician's do their daily rounds (Kelly et al. 2016; Kelly, et al., 2019, Runaas et al., 2017). A significant implication in one pediatric study is that "by empowering parents to become active participants in their child's inpatient care, portals have the potential to address medication safety issues" (Kelly et al., 2016, p. 6). This was evidenced by 89% of the parents reporting that the portal improved the safety of their child's care and "...8% of parents reported finding errors in their child's medication list..." (Kelly et al., 2016, p. 5). Parents being able to double check the medication list on the patient portal during hospitalization prevented potential medication errors. The use of portal technology to improve medication safety during hospitalization is being echoed in more recent work by both

parents and health care professionals (Runaas et al., 2017; Kelly et al., 2019; Hoonakker, et al., 2019)

1.2.3. Health care providers views of patient portals.

Pediatric physicians report improved communication with patients and their parents to be the greatest benefit of a patient portal, even though this also presents new challenges to the physician's workload (Bush et al., 2017; Kruse et al., 2015). The communication is often in the form of secure email which allows for parents to ask questions they may not feel comfortable asking in person (Britto et al., 2013; Bush, Stahmer, & Connelly, 2016). However, this creates challenges of work-life balance for physicians of when to reply and parents have expressed concerns about when to expect to receive replies (Bush et al., 2017; Kruse et al., 2015). This concern appears most prevalent when patient portals are used in an outpatient pediatric setting (Britto et al., 2013; Bush, Stahmer, & Connelly, 2016; Bush et al., 2017).

Health care providers believe patient portals will improve patient care and engage caregivers during hospitalization (Hoonakker et al., 2019; Kelly, Carayon, Wetterneck, & Hoonakker, 2017). However, practitioner's views are being reported together with patient and family perspectives, which can create difficulties when trying to determine which of the health care providers specific needs require attention during portal implementation (Kelly et al., 2017; Kelly et al., 2018, Kruse et al., 2015). Pediatric RNs voices are notably limited in the literature. With the increase in portal use during hospitalization pediatric nurses can provide valuable feedback to researchers and are well positioned to support implementation of portal technology on inpatient units.

1.2.4. Benefits of a patient portal technology.

Health care providers and caregivers are reporting similar benefits when patient portal technology is implemented in a pediatric setting. Parents accessing portals in the outpatient setting and physician's view one of the most important benefits to patient portals as improved communication (Britto et al., 2013; Bush et al., 2017). This occurs because the portal provides an easy way for parents to ask their child's physician a question, often through email, which then allows the physician to respond when they have time. Parents value the access to their child's health information, which they believe improves their child's care (Bush et al., 2016; Kelly et al., 2016; Kelly et al., 2019; Kruse et al., 2015).

The most common benefits of utilizing a patient portal during a child's hospitalization are parent engagement and improved patient safety (Kelly et al., 2016; Kelly et al., 2017; Kelly et al., 2019, Runaas et al., 2017). When caregivers have access to their child's health information during hospitalization, they are more informed for physician daily rounds and by reviewing medication lists, have the potential to catch errors (Kelly et al., 2016; Kelly et al., 2017; Kelly et al., 2019, Runaas et al., 2017). Even though benefits are being reported to portal technology adoption, there is still limited use in Canadian hospitals. Lehmann (2015) reports that pediatric nurses are valuable stakeholders from whom input should be sought when making health information technology changes, particularly in the pediatric inpatient setting. The involvement of end-users, such as RNs, in adoption of new health information technology is a concept of user-centered design (Moody, 2015; Risling & Risling, 2020; Tang, Lim, Mansfield, McLachlan & Quan, 2018). As portal technology advances into the inpatient setting, a unique opportunity arises to gain insight from the RNs, which could support more effective development, implementation, and integration of a patient portal.

1.3. Manuscript Style and Organization of Thesis

This thesis is laid out in a manuscript style format. Chapter One includes the background to pediatric patient portal implementation and outlines the manuscript style. Subsequently, two co-authored manuscripts written for publication are included. Both manuscripts are original work with the lead author Katie Nussbaum and contributions from committee members Tracie Risling and Jill Bally. Chapter Two contains Manuscript #1: Pediatric Healthcare Providers Experiences with Patient Portals: A Literature Review. This review was initially undertaken to inform the research completed in Chapter Three and was further updated in 2020 to ensure the most recent work was included. Chapter Three includes Manuscript #2 – Pediatric Registered Nurses’ Perspectives of the Development of a Patient Portal and the Impact of New Technology on Nursing Practice. The results explain pediatric RNs perceptions of new technology, including a proposed patient portal, and how they believe this may impact patient care and nursing practice. To conclude, Chapter Four is an integrated discussion on how new technology including a proposed patient portal, impacts nursing practice, research, and education. Recommendations for future digital health technology research are discussed. Chapter Four also includes the specific recommendations for the portal development in phase two and three of the larger ongoing study.

1.4. Conclusion

With the continuous increase of health information technologies, including patient portals, the pace and increasing overall amount of change can feel overwhelming for nurses, however it is important for RNs to stay competent in digital health technology advancements (Risling, 2017; RNAO & AMS Healthcare, 2020). The Canadian Nurses Association (2017) position statement on *Nursing Informatics* provides recommendations for RN practice, supports the integration of technology with nursing care, and endorses the use of technology that is patient

centered. Recently, the RNAO has reinforced the concept of RNs being competent in health information technologies from undergraduate education and through continued nursing practice (RNAO & AMS Healthcare, 2020).

Patient portal technology has the potential to empower patients and family members during hospitalization by providing them with access to the health information they value and in a way that is often convenient (Kelly et al., 2016; Kelly et al., 2018, Szilagyi et al., 2020). RNs are the health care providers most often caring for children during hospitalization and will need to be competent in this new technology. Therefore, including bedside RNs through portal development and eventual pilot testing will be integral to successful transition and implementation of this technology in health systems. By ensuring pediatric RNs' perspectives were included in the research, there is the potential to shape future use of the portal in other pediatric settings.

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**CHAPTER TWO MANUSCRIPT #1: PEDIATRIC HEALTH CARE PROVIDERS
EXPERIENCES WITH PATIENT PORTALS: A LITERATURE REVIEW**

Manuscript #1 is a thematic literature review conducted to find the gaps in health care providers experiences in patient portal implementation. The results also helped inform the semi-structured interview questions developed for the interviews completed in the research presented in Chapter Three. In 2020 the literature review was updated to ensure more recent work was included. The lead author is Katie Nussbaum with contributions from Tracie Risling and Jill Bally.

2.1 Abstract

Patient portals are innovative health information technologies that allow patients and/or their parents the ability to access personal health information electronically. In the pediatric population most research currently focuses on the outpatient areas, with a recent trend to include hospitalization as part of the patient portal experience. There is also an emerging focus on utilizing user-centred design for health care providers when researching health information technologies. The purpose of this literature review was to examine pediatric health care providers' experiences with patient portals. Through a thematic analysis four themes were interpreted regarding the pediatric health care providers' experiences: The Benefits of the Patient Portal; The Impact on Provider Workload; User-friendliness of the Patient Portal; and Health Care Providers Needs with Portal Implementation. Pediatric health care providers report that patient portals are beneficial to patients and family members, improve patient care, and improve and/or augment communication. More research is needed on the extent to which the patient portal impacts the health care providers workflow. Furthermore, future research should focus on the impact a user-centred design approach could make on the usability of the patient portal and the subsequent implementation in the pediatric population.

Key Words

Patient Portal; Pediatrics; Multidisciplinary; Literature Review; Health Care Provider

2.2. Introduction

Patient portals are innovative digital health technologies that have the potential to improve the quality and safety of care provided to children (Bush et al., 2017; Kelly et al., 2019; Kelly, Dean, Carayon, Wetterneck, & Hoonakker, 2017; Kelly, Hoonakker, & Dean, 2016; Runass et al., 2017). Portal technologies provide patients and their family members the ability to electronically access personal health information. The information available for viewing varies by institution and setting, but general features include: secure electronic communication with a health care provider, medication information, laboratory results, and upcoming appointments (Bush, Connelly, Fuller, & Perez, 2016; Kelly, Coller, & Hoonakker, 2018). The information is often viewed through an application on a tablet device provided by the hospital or through the Internet on a personal electronic device, such as a cell phone (Kelly, et al, 2018; King et al., 2017). Patient portal research has been evolving for almost a decade in the pediatric outpatient setting (Britto, Hesse, Kamdar, Knopf Munafo, 2013; Bush et al., 2016; Bush, Vemulakonda, Richardson, Deakye Davies, & Chiang, 2019; Steiz, Cronin, Davis, Yan, & Jackson, 2017) with an emerging focus on implementing portals for hospitalized children and their parents (Bush et al., 2016; Kelly et al., 2018; Kelly et al., 2019).

Pediatric health care providers (HCPs) are considered key stakeholders in the adoption of new health information technology (Kelly, et al., 2018; Lehman, 2015) and their input in the creation, design, and implementation of new technology is essential (Risling & Risling, 2020). The inclusion of end-users, such as pediatric HCPs, in the research process of technology development in health care is often termed user-centered design (UCD) (Kushniruk & Nohr, 2016; Moody, 2015; Risling & Risling, 2020; Tang, Lim, Mansfield, McLachlan, & Quan, 2018). In UCD researchers directly involve the end-users in the development, implementation

and/or evaluation phases of new technology (Kushniruk & Nohr, 2016; Moody, 2015; Risling & Risling, 2020). Recent studies results are beginning to show the benefits of including HCPs from the initial design phase of new technology (Risling, Nussbaum, Martinez, & Risling, 2019; Risling & Risling, 2020) through continued feedback and evaluation of the technology once implemented (Tang et al., 2018). With the increasing implementation of patient portal technologies in pediatric settings, a thematic literature review was conducted to examine pediatric HCPs experiences with patient portal implementation. The resulting analysis highlights what is already known about HCPs and pediatric patient portal use, and suggestions for future research will also be discussed.

2.3. Background

Patient portal research is in its early stages in the pediatric population although increasing every year. Parents are more readily adopting patient portals when their child is hospitalized (Kelly et al., 2016; Kelly et al., 2019; Runaas et al., 2017) compared to the outpatient setting where there are significantly lower reported adoption rates (Bush et al., 2016; Bush, Vemulakonda, Richardson, Deakyne Davies, & Chiang, 2019; Fiks et al, 2016). Early research in pediatric patient portals has focused on the development of patient portals, parent perceptions of portals, and use of patient portals for managing a child's chronic illnesses (Bush et al., 2016). Currently most studies appear to be conducted in the outpatient setting (Britto et al., 2013; Bush et al., 2016; Bush et al., 2017; Bush et al., 2019; Bush, Stahmer, & Connelly, 2016; Fiks et al., 2016) with one long-term study examining pediatric portal use over seven years (Steitz et al., 2017). Steitz, Cronin, Davis, Yan, and Jackson (2017) found once the patient portal was implemented, the first five years saw the largest increase in patient enrolment and that parents with children 0-2 years of age accessed the portal the most frequently.

Parents are reporting that they want access to their child's health information, that patient portals improve the management of their child's chronic illness, and improve the patient care experience (Britto et al., 2013; Fiks et al., 2016; Kelly et al., 2016; Kelly et al., 2018; Kelly et al., 2019; Runaas et al., 2017). There is a recent increase in patient portal implementation when children are hospitalized and the results are suggesting that the use of patient portals have the potential to empower parents and to improve the safety of care (Kelly et al., 2016; Kelly et al., 2019; Runaas et al., 2017). In a pediatric oncology unit, the greatest benefit of the patient portal system appears to be improved communication between the HCP and the parents (Runaas et al., 2017). The parents in the oncology study were more informed about the information that would be discussed at physician rounds, had access to personalized information about their child's health condition, and the portal augmented care already being provided during hospitalization (Runaas et al., 2017). More recent work is also echoing the same benefits when used in a general pediatric inpatient unit (Kelly et al., 2019).

The adoption rates of patient portal technology vary depending on the setting with a low of less than 3% of eligible parents in the outpatient setting (Fiks et al., 2016) and as high as 90% in the inpatient setting (Kelly et al., 2016). Poor adoption rates in pediatric outpatient departments could be attributed to needing access to the internet in order to activate and to continue to access the portal functions as well as language barriers due to portals provided in English (Bush et al., 2019; Miklin, Vangara, Delamater, & Goodman, 2019). Even though there is a low adoption rate in the pediatric outpatient population, parents are still reporting that the portal is helpful for managing their child's chronic illness (Bush et al., 2016; Bush, Stahmer, & Connelly, 2016; Fiks et al., 2016; Schultz & Alderfer, 2018). These children often have multiple and complex care needs and the portal provides the ability to communicate with a HCP, arrange

appointments, and follow care including laboratory and radiology results. Managing a child's chronic illness can be stressful and there is emerging research that parents who have higher levels of stress are utilizing a patient portal more often (Boogerd et al., 2017). Higher portal activation during hospitalization could be attributed to caregivers being provided a tablet device to view the portal on which may make activation easier (Kelly et al., 2016; Kelly et al., 2019; Runaas et al., 2017).

HCPs are considered key stakeholders to the adoption of new health information technology, such as a patient portal (Kelly, et al., 2018; Lehman, 2015). A few patient portal systems have reportedly been developed with the views of families and HCPs being considered (Boogerd et al., 2017; Runass et al., 2017), while others have utilized a commercial patient portal system and made minimal changes prior to implementation (Kelly et al., 2017). Including end-users in the development, implementation, and/or evaluation process is essential to UCD (Moody, 2015; Risling & Risling, 2020) and could impact the success of the patient portal for families and HCPs. Currently perceptions of HCPs are not well explored in existing studies or are often combined with patient and/or parent perspectives (Bush et al., 2016; Kelly et al., 2018; Kruse, Argueta, Lopez, & Nair, 2015). With the recent trend to include hospitalization as part of the portal care experience, understanding HCPs views will be important. Therefore, a review of the current literature to examine pediatric HCPs perceptions on patient portal implementation was conducted to inform future research. This literature review was guided by the following research question: What are HCPs perceptions on pediatric patient portal use?

2.4. Method

The initial search of published literature occurred from 2017-2018 and the search was repeated in December, 2020 to capture more recent work. The following databases were

searched: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Medline: OVID, were searched with Medical Subject Heading (MeSH) and keywords. In this review, the inclusion criteria were articles written in English, focused on HCPs perspectives of patient portal implementation, and researched in the pediatric population. The pediatric age was defined as 0 to 18 years of age. Hand searching was also completed in an attempt to be as inclusive as possible of all pediatric portal research because at the beginning of the search in 2017 “patient portal” was not consistently in databases as a MeSH heading. See Figure 1: Database Searches for the exclusion criteria. From the research question posed, n = 93 articles were identified. After duplicates and articles that didn’t meet the pediatric population criteria were excluded, n = 24 articles were reviewed for having HCP perspectives with pediatric patient portal use. Of the remaining articles n = 5 included pediatric HCP perspectives on patient portal use and/or implementation in a pediatric setting.

2.4.1. Thematic analysis.

Braun & Clarke’s (2006) six-step process for thematic analysis was applied to the five articles that were included in this literature review including: 1) gathering the literature; 2) initial coding of results; 3) data analysis through mapping of themes; 4) revising themes; 5) creation of final theme mapping; and, 6) final results for publication. Throughout the process, Braun and Clarke (2006) emphasize “the care” the researcher takes going through each step and highlights the importance of acknowledging that themes are interpreted by the researcher.

Step one involved becoming familiar with the literature that already exists through searching of databases and focusing on the final articles kept for inclusion of analysis (Braun & Clarke, 2006). In the second step, initial codes were created by identifying key points and findings from the studies, keeping the context of the original studies in mind (Braun & Clarke).

After the creation of codes, step three involved the beginning search for themes. This process was completed through “thematic mapping” and starting to find overlapping themes of the codes (Braun & Clarke). Braun & Clarke (2006) stipulate “a theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set” (p. 82). In this process similar codes started being placed together and the initial themes created.

Step four involved the revision and refinement of themes to ensure reflection and time is taken to account for how the final thematic map represents the overall research question being asked (Braun & Clarke, 2006). This was completed by referring to the research question posed at the beginning of literature search. In step five the “final thematic map of your data” (Braun & Clark, p. 92) was completed (see Figure 2). The resulting final four themes captured the similar views expressed by HCPs utilizing a patient portal in a pediatric setting.

2.5. Results

Of the published literature on pediatric portal use, five articles were kept for detailed analysis and included in this literature review as they examined HCPs perspectives (See Table 1 for the summary of articles). All of the studies were published between 2016 and 2017, which indicates the research is fairly recent but still not the focus of the majority of pediatric portal research, including more recent study. Most of the studies are mixed-methods with HCPs perceptions being examined using a qualitative methodology (see Table 1). King et al. (2016) was the only study completed in Canada, with the other four taking place in the USA (Bush et al., 2017; Kelly et al., 2017; Fiks et al., 2016; Runaas et al., 2017). Two of the five studies focused solely on the HCPs perceptions (Kelly et al., 2017; Bush et al., 2017) while the other three revealed HCPs perspectives along with parent perspectives of patient portal use in the

pediatric population (King et al., 2017; Fiks et al., 2016; Runaas et al., 2017). The HCPs' varied in each of the studies, but physicians and nurses were the most common. Four themes about the pediatric HCPs experiences using a patient portal were interpreted through the application of Braun & Clarke's (2006) thematic analysis. These themes include: *The Benefits of the Patient Portal*; *Impact on Provider Workload*; *User-friendliness of the Patient Portal*; and, *HCP Needs with Patient Portal Implementation*.

2.5.1. The benefits of the patient portal.

The most common benefit of patient portals reported by HCPs is that they believe the portal technology provides useful information to patients and their family members (Bush et al., 2017; Fiks et al., 2026; Kelly et al., 2017; King et al., 2017; Runaas et al., 2017). The information uploaded and available for viewing on the portal varies but usually includes medication lists, blood work and other test results. The HCPs were often already providing copies of the test results to parents and the portal allowed the parent to electronically view and track the results at their convenience (Kelly et al., 2017; Runaas et al., 2017). Improved patient care and improved communication are added benefits being reported by HCPs when parents are utilizing portal technology in pediatric settings (Bush et al., 2017; Fiks et al., 2016; Kelly et al., 2017; Runaas et al., 2017).

2.5.1.1. Improved patient care.

When parents are accessing and utilizing a patient portal system most HCPs believe this improves patient care (Bush et al., 2017; Fiks et al., 2016; Kelly et al., 2017; Runaas et al., 2017). In the pediatric outpatient setting, portals can improve the management and patient compliance with care (Bush et al., 2017; Fiks et al., 2016). For example, in the study examining the use of a portal in asthma treatment, HCPs found patients experienced improved care management for

children with uncontrolled asthma (Fiks et al., 2016). The HCPs reported being able to reduce emergency department visits because they could provide teaching and make medication adjustments with the portal (Fiks et al., 2016). In the inpatient setting, HCPs reported that the patient portal augments the provision of care by enabling the parents to be more engaged in their child's care during hospitalization (Kelly et al., 2017; Runaas et al., 2017). When parents have access to information on their child's health status during a hospitalization, they were better able to prepare for the daily physician rounds because they could review the information whenever was convenient (Kelly et al., 2017; Runaas et al., 2017).

2.5.1.2. Communication.

All of the studies evaluated HCPs perceptions about the impact of the patient portal on communication with patients and/or parents (Bush et al., 2017; Fiks et al., 2026; Kelly et al., 2017; King et al., 2017; Runaas et al., 2017). Most of these studies indicate that HCPs believe the patient portal improves or augments communication (Bush et al., 2017; Fiks et al., 2026; Kelly et al., 2017; Runaas et al., 2017). The improvement stems from the parents ability to directly communicate with a HCP through a secure email and by having access to the health information to review whenever is convenient for them. During hospitalization, the patient portal did not replace communication with HCPs, but instead acted as a tool to augment and improve the communication flow because the parents already had access to the test results when the health care team did their rounds (Kelly et al., 2017; Runaas et al., 2017).

2.5.2. Impact on provider workload.

Overall, HCPs are concerned about the potential impact portal technology will have on their workload. However, it appears from the initial studies that HCPs over-estimate the burden of patient portal technology on their workload in the inpatient setting (Kelly et al., 2017; Runaas

et al., 2017). The provision of real-time electronic laboratory results was a concern raised by HCPs that they anticipated would increase their workload due to parents having questions or concerns (Kelly et al., 2017; Runaas et al., 2017). After portal implementation, the automatic release of bloodwork results to parents at defined times, did not appear to negatively impact their workload (Kelly et al., 2017; Runaas et al., 2017). Instead HCPs in a pediatric inpatient department ended up using the laboratory result function as an education tool for parents (Runaas et al., 2017).

Physicians reported fewer concerns regarding their workload when using the portal in the inpatient setting compared to when using the portal in the outpatient setting (Kelly et al., 2017; Runaas et al., 2017). In the outpatient setting physicians reported concerns with respect to an increased workload by identifying the extra time required to respond to email and the difficulty balancing work and home life (Bush et al., 2017). This was often the result of parents being able to communicate at all hours of the day and often with unrealistic expectations of when to expect a reply from the physician (Bush et al., 2017).

The impact of portal technology specifically on pediatric nurses' workload is only beginning to be explored. Even though nurses are the HCPs most often in contact with patients and parents using the portal in the inpatient setting, their views are difficult to distinguish (Kelly et al., 2017). In one study, the only difference highlighted was that prior to implementation the majority of nurses were concerned about the patient portal device getting damaged or lost (Kelly et al., 2017). Furthermore, no study focused solely on pediatric nurses' perspectives of portal technology and the demand on workload.

2.5.3. User-friendliness of the patient portal.

All studies examined the challenges HCPs face with patient portal implementation (Bush et al., 2017; Fiks et al., 2026; Kelly et al., 2017; King et al., 2017; Runaas et al., 2017). A common issue was inadequacies in the design and functionality of the portal technology (Bush et al., 2017; Fiks et al., 2026; Kelly et al., 2017; King et al., 2017; Runaas et al., 2017). The user-friendliness of a portal appears to directly impact the HCPs implementation of the portal. For example, in an outpatient study when not all HCPs had access to the patient portal and the system was not set up to include hospitalized patient data, these were perceived as challenges and could have contributed to the lack of use by specialty physicians (Bush et al., 2017). In a hospital wide patient portal system that allowed for hospitalized and outpatient use, the HCPs reported more technical challenges (King et al., 2017) compared to single department use. The challenges included lack of usability in regards to the integration between the hospital system and patient portal, and overall found the portal system not user-friendly (King et al., 2017).

The technical build of the patient portal technologies in the studies were either a commercially available portal or individually designed and built. The user-friendliness of a portal system appears to be enhanced when the system is specifically designed for the unit, such as an oncology unit (Runaas et al., 2017). In this setting the HCPs were able to provide design input, along with patients and families (Runaas et al., 2017).

2.5.4. Health care provider's needs with portal implementation.

The HCPs in this review report similar needs when a patient portal is being implemented. The literature highlights that HCPs consistently need support and coordination, in conjunction with appropriate education, when a patient portal is implemented (Fiks et al., 2016; Kelly et al., 2017; King et al., 2017). If those needs are met, it appears to also increase the adoption rate of

the patient portal by parents (Bush et al., 2017; Fiks et al., 2016). HCPs perceive lack of support in their work to help patients and families sign up and use the portal as additional barriers to using the portal system (Fiks et al., 2016; Kelly et al., 2017; King et al., 2017). When patient portals are being implemented, HCPs need effective education and communication about the portal's functionality and the importance of patient portals to patients and families. As one study suggests, when HCPs do not feel it is worth their time and effort, they are less likely to use it (King et al., 2017). Furthermore, communication back to HCPs about who is using the portal technology is important, because in a larger pediatric hospital setting HCPs did not believe many parents were actually utilizing the portal system (King et al., 2017). This highlights the need for continued education and transparency after implementation.

2.6. Discussion

The recent increase in patient portal research in the pediatric population and the trend to include hospitalization as part of the patient portal care experience indicates that HCP views are necessary and important factors to be considered. The value of patient portal technology to patients and parents does not appear to be understood or emphasized in a broad hospital implementation (Fiks et al., 2016; King et al., 2017) compared to a single unit or smaller scale implementation (Kelly et al., 2016; Kelly et al., 2017; Runaas et al., 2017). In these smaller-scale implementation processes, HCPs are often involved in the process (along with family members) and there is an emphasis placed on educating everyone who uses the portal on what the technology entails and what the expectations are for HCPs (Kelly et al., 2017; Runaas et al., 2017). Furthermore, when HCPs are not provided with the context about how valuable patients and family members find the portal, this could inadvertently be hindering the success of portal technology (King et al., 2017). Consideration should be given to include HCPs in portal

development, implementation, and continued long-term use, as these techniques show potential in other areas of research (Risling & Risling, 2020; Tang et al., 2018).

UCD can be applied anywhere throughout the research process and to various degrees (Kushniruk & Nohr, 2016; Moody, 2015; Tang et al., 2018). Tang, Lim, Mansfield, McLachlan, & Quan (2018) acknowledged that while it was a difficult and time-consuming process, they were able to implement a technology that improved practice and had less of a negative impact on workflow due to the involvement of HCPs. At present, patient portal focus in the pediatric population appears to focus more on the patients and family's needs, along with the adoption rates. While this is necessary and important, HCPs appear to be impacting the success of patient portal implementation. Even though it can be challenging to recruit HCP in research projects in acute care settings, novel research techniques are being utilized to further increase input from bedside HCPs in the development of portal technology (Risling et al., 2019).

Physicians appear to be the HCPs most often involved in the research, which could be due to the increased use in the outpatient setting however, initial research is indicating that nurses are the HCP most often in contact with parents who use the portal when their child is hospitalized (Kelly et al., 2017). In the adult population, nurses' perspectives are beginning to be explored (Gerber, Beg, Duncan, Gill, & Craddock Lee, 2017; Hoonakker et al., 2019; Mayhew, Strudwick, & Waddell, 2018). Communication is a key finding that both positively and negatively impacted the nurses' workflow. Nurses are reporting that a patient portal is beneficial for patients who required written instructions instead of verbal and the portal allows the nurses the ability to communicate with other health care team members prior to replying (Gerber et al., 2017; Mayhew et al., 2018). Similar to the pediatric population, several limitations to portal use are being reported by nurses working with adult patients. As with physicians in the pediatric

outpatient department, managing patient expectations and the increased workload due to emails and messages from patients were reported as challenging (Bush et al., 2017; Gerber et al., 2017; Mayhew et al., 2018). Future research should focus on pediatric HCP's perceptions of patient portals, with an emphasis on a variety of HCP, including nurses. At this time, the voices of pediatric registered nurses are still underrepresented.

Another consideration is that more of the studies in this review reported HCPs' perceptions in conjunction with parents and patients (Fiks et al., 2016; King et al., 2017; Runaas et al., 2017), and at times the responses were combined together. Literature reviews are also combining not only patient/parent and HCPs but also including adult and pediatric populations together (Kelly et al., 2018; Kruse et al., 2015). While one systematic review suggested patient users and HCPs have similar attitudes towards patient portals, there were disproportionately more articles related to patient and or family perceptions compared to HCPs (Kruse et al., 2015). However, in a more recent review for patient portals in hospitalized patients of all ages, the authors highlight the point that while HCP may have similar perspectives to patient and parents their perspectives are not identical (Kelly, et al. 2018).

By incorporating HCP and patient/family perspectives together, an additional argument could be made that this may make it difficult to distinguish the HCP views and needs of the patient portal, especially during implementation. For example, parents are reporting they want more interdisciplinary capabilities in the outpatient setting (Kelly et al., 2016; King et al., 2017; Bush, Stahmer, Connelly, 2016) but HCPs are concerned about the time and effort it takes to use the portal and being unsure if patients and parents are actually using it (King et al., 2017). This is part of the workflow concerns and need for additional support during implementation that HCPs are voicing. One study found that by adding "MyChart Geniuses" (people who knew the

technology and engaged with potential users) improved adolescent portal sign up because they were more aware of the process (Ramsey, Lanzo, Huston-Paterson, Tomaszewki, & Trent, 2018). Having HCPs involved and supported through a “super-user” could be a potential way to improve implementation when the patient portal “goes live”.

By focusing on HCP’s perceptions and needs, there is the potential to improve the patient portal adoption by patients and parents. Additionally, research should consider the differences between inpatient and outpatient portals, because while there are similarities, notable differences in the pediatric population are starting to emerge. Overall, RN’s perspectives remain notably limited in the current literature. With the trend to include a child’s hospital stay as part of the portal experience, there is an opportunity to gain insight and feedback from RNs. Pediatric nurses have the potential to support continued long term use of portal technology.

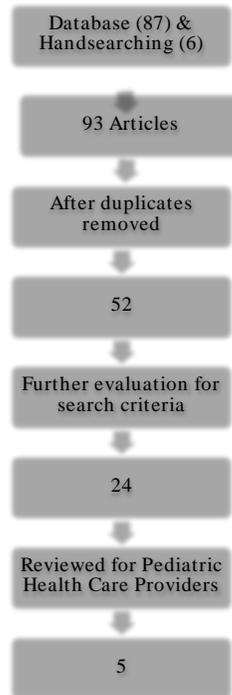
2.6.1. Strengths and Limitations.

A strength of this literature review is that it provides insight regarding pediatric HCPs perspectives on patient portal technology and its implementation. One limitation is the potential to have left out pediatric patient portal research due to the different definitions and names used in portal research throughout the literature. While every effort was made to include the most relevant research, there is always the potential that research was missed. Also, this review only included articles written in English which may have excluded other relevant research. Since this is a thematic summary of the current literature generalizations beyond the pediatric population should be done with caution. Another consideration is the limitation that most studies were not entirely focused on HCPs perceptions which made distinguishing views difficult at times and could have potentially limited the findings of this review.

2.7 Conclusion

With the ever-increasing technological demands placed on HCPs, learning about their thoughts and perceptions of patient portals is important. Pediatric HCPs are reporting that patient portals are beneficial to patients and family members, and that portals improve and augment communication (Bush et al., 2017; Fiks et al., 2016; Kelly et al., 2017; King et al., 2017; Runaas et al., 2017). This is especially important in the pediatric setting where there is a focus on family-centred care, and parents value the access to their child's health information. Additional research is needed on the extent to which the patient portal impacts the HCPs workflow, as it appears to be more disruptive in the outpatient setting compared to the inpatient setting. Furthermore, a focus on the HCPs needs during portal implementation and the value of this technology to the patients and family members also needs to be communicated to HCPs. With the shift to include patient portals for pediatric hospitalized patients, utilizing a UCD approach could be helpful in making the transition more successful in pediatric health settings.

Figure 1: Database Searches



Exclusion Criteria

- Didn't meet the pediatric population
- Adolescents that were included in adult studies were excluded as the focus was adult population and not pediatric or adolescents
- Not focused on patient portal technology use and/or implementation in a pediatric setting
- No health care providers included in study

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Figure 2: Thematic Mapping of Health Care Providers Views of Patient Portal Use in a Pediatric Setting

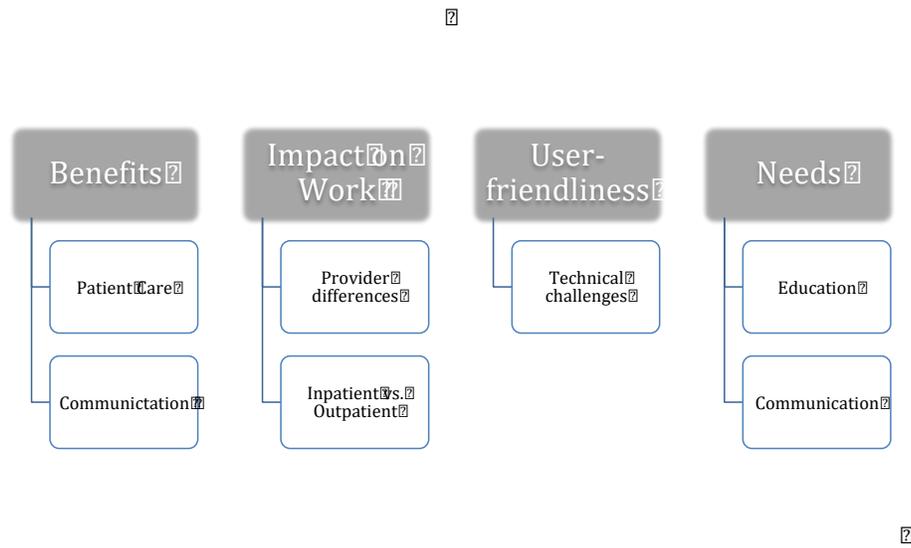


Table 1: Summary of Articles

Source & Country of Origin	Purpose	Sample of HCP	Data Collection Method for HCP	Summary of HCP Views	Implications/Comments
Bush et al. (2017) USA	To examine physician's views of patient portal use.	Physicians n=21	Electronic quantitative survey & telephone interviews with semi-structured questions	<ul style="list-style-type: none"> The patient portal improves patient care, communication, and compliance with care Concerned about the lack of interdisciplinary capabilities and increase workload in regards to email communication 	<ul style="list-style-type: none"> Hospital had integrated electronic health records Nurses were not involved Research occurred after the portal was implemented Outpatient setting
Fiks et al. (2016) USA	To examine a patient portal in the management of asthma in children.	Clinicians (no demographics provided) n=46	Focus group	<ul style="list-style-type: none"> The patient portal was easy to use, aided communication, and improved the management of children with uncontrolled asthma Reported the need for established and defined use of the patient portal in workflow, needing support in the clinic Concerned about broad recruitment of the study and patient portal use 	<ul style="list-style-type: none"> Large study with a low portal adoption rate by parents Parent's and HCPs in same study No reported demographics on the clinicians and it was not explicit who they were Outpatient setting
Kelly et al. (2017) USA	To examine HCPs perceptions of an inpatient portal pre and post implementation on a pediatric inpatient department.	Pre HCP n=94 <ul style="list-style-type: none"> 29 Nurses 45 Physicians 19 other HCPs Post HCP n=70 <ul style="list-style-type: none"> 22 Nurses 33 Physicians 15 other HCPs 	Quantitative survey pre and 6 months post implementation	<ul style="list-style-type: none"> More concerns prior to implementation and many of the HCPs' concerns were not actualized once portal implemented on unit Most HCPs initially perceived the patient portal would negatively impact their workload, however, very few 	<ul style="list-style-type: none"> In the inpatient setting nurses are most often in contact with families using a portal therefore more research should focus on their perceptions

				<p>HCPs actually reported this following implementation</p> <ul style="list-style-type: none"> The patient portal improves patient care, parent's more engaged, family members able to better recognize HCPs, beneficial for parents to access their child's health information and improved parent satisfaction 	<ul style="list-style-type: none"> Electronic health record and outpatient portal already implemented
<p>King et al. (2017) Canada</p>	<p>To examine patient portal impact through parents and health care providers.</p>	<p>HCP n=5</p> <ul style="list-style-type: none"> 1 Nurse 1 SLP 1 OT 2 Physiotherapists 	<p>Qualitative data from focus groups and/or individual interviews at two points in time</p> <p>-the initial interviews were completed a minimum of 2 months after implementation of the patient portal system and then repeated 6-8 weeks following</p>	<ul style="list-style-type: none"> Not overly positive views of patient portal Unsure about the impact on patient engagement but aware that parents found the patient portal useful Concerned about the technical aspects of the patient portal in regards to electronic communication, not knowing which parents were actually using the portal, and not sure if it was worth the time and effort 	<ul style="list-style-type: none"> Few examples of the HCPs' quotes were provided to support analysis HCPs were only a subpart of the research objectives Supports the need for buy-in from HCPs Portal functions were rolled-out in phases and initially implemented in the inpatient units and then into the outpatient departments
<p>Runaas et al. (2017) USA</p>	<p>To examine how an electronic tool (patient portal) impacts care on a specialized inpatient unit.</p>	<p>HCP n=12</p> <ul style="list-style-type: none"> 5 Physicians 1 Social Worker 5 Nurses 	<p>Qualitative semi-structured interviews.</p>	<ul style="list-style-type: none"> Improved communication Augmented patient care and parents were more engaged for physician rounds 	<ul style="list-style-type: none"> Unclear if there were repeat interviews with HCPs as multiple interviews were

	Through parents and HCPs' views.			<ul style="list-style-type: none"> Initially apprehensive about the real-time lab reporting but did not appear to negatively impact nursing workflow 	<p>completed with parents.</p> <ul style="list-style-type: none"> Majority of nurses were not direct bedside nurses Specialized pediatric inpatient unit appears to work well
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HCPs = health care providers OT = occupational therapist SLP = speech language pathologist USA = United States of America

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Chapter Three Manuscript # 2: Pediatric Registered Nurses Perspectives of the Development of a Patient Portal and the Impact of New Technology on Nursing Practice

This chapter incorporates the second manuscript of this thesis, detailing the research results. The formatted manuscript follows beginning with the Abstract (3.1). However, additional methodological explanation is included here to provide a more detailed overview of the research process for the purpose of this thesis. The research was completed by Katie Nussbaum with guidance from Tracie Risling. The lead author of this manuscript is Katie Nussbaum with contributions from Tracie Risling and Jill Bally.

Methodological Approach

Interpretive description (ID) (Thorne, 2016) is the methodology applied to gain insight into the registered nurses (RNs) perspectives of parent use of a new technology at the bedside, such as a patient portal. ID is an appropriate methodology to apply to the research questions for several reasons. First, Thorne (2016) has described ID as a conceptual way to study a problem relating to the applied practice of nursing in a “real world” setting. In this research, a proposed patient portal is being presented to pediatric RNs to gather feedback and determine what impact they perceive this new technology may have on nursing practice. Secondly, utilizing ID strengthens the qualitative approach to the study, as the research questions have a direct application to nursing practice (Thorne, 2016). A third reason for applying ID is that this method supports the subjective experience the research entails (Thorne, 2016). The RNs that participated in the research bring valuable experience and expertise that will help guide the build and eventual implementation of the portal to practice. Knowledge constructed through “lived experiences” and through our social interactions with other people (Lincoln, Lynham, & Guba, p. 103, 2011) will help to improve the eventual trial of the portal in a clinical area by eliciting

feedback from the nurses who will eventually be impacted by this technology (Thorne, 2016). To be able to gather in depth knowledge from the pediatric RNs who participated in the study, in person individual interviews were conducted as it provided the opportunity to gather fulsome responses and explore the research topic (Thorne, 2016). Additionally, my own clinical background and experience in pediatric hospital care impacts how I interacted with the participants in the interviews and interpreted the research findings. However, following the process for credibility, rigour, and reflexivity in qualitative research, I was able to maintain the views and perspectives of the participants in the study (Lincoln et al., 2011; Thorne, 2016).

Credibility and Rigour

To ensure credible results of my qualitative ID study, Thorne's (2016) principles for credibility and rigour were utilized. Her first guiding principle is to maintain epistemological integrity which means there is a need to research the chosen topic (Thorne, 2016). In this case the research questions were developed from the current gap in the literature on RNs perspectives regarding patient portal use in the pediatric setting. This is detailed in the literature review presented in Chapter Two on pediatric health care providers perspectives of patient portal implementation.

A second way to enhance credibility is to demonstrate representative credibility, which Thorne (2016) states is often done through "triangulation". Patton (2015) explains that triangulation can strengthen a study when the researcher takes the time to delve deeper into why there are inconsistencies in the findings. This was achieved through the examination of outlier responses and utilizing my supervisor's experience. Tracie Risling independently analyzed the transcripts of my interviews with the participants and then we were able to compare the results of analysis. Through the comparison of our data, we found that I was achieving the objectives of the

research and maintaining participant focus. A third way that credibility was enhanced was the use of an audit trail from data collection and analysis, through final coding of themes (Thorne, 2016).

Reflexivity

Thorne (2016) recommends the researcher engage in reflexivity to demonstrate interpretive authority. Reflexivity can strengthen qualitative work when the researcher becomes aware of the role they play throughout the study (Robinson Wolf, 2012; Thorne, 2016). Applying reflexivity to this research means understanding that my own experience as a pediatric RN has impacted how I view and interpret the data results from my participants (Charmaz, 2005). In this case, being a bedside RN at the time of the research, meant I understood patient flow, technology, and nursing process in some units and therefore didn't always require extra explanation from the participants about nursing practice. However, care was taken to ensure I was understanding correctly and made sure to delve further to ensure I was understanding the participants perspective. Therefore, I was aware of my own strengths and limitations in pediatric nursing practice. When this is taken in to account it aligns with my philosophical view that I will not bias my results, but rather, as a nurse researcher I am still an important part in creating new knowledge (Charmaz, 2005; Lincoln et al., 2011). Time was also taken to reflect and ensure, that the participants perspectives were coming through. To aid in this self-reflection process, journaling is a technique that Thorne (2016) recommends and was utilized throughout the research process.

3.1 Abstract

Purpose: Advances to digital health technologies are impacting registered nurses' (RNs) practice. A patient portal is a recent technology being used to connect patients and families to their care. The purpose of this interpretive description study was to gain insight into pediatric RNs perspectives of new technology, including a proposed patient portal.

Sample/Setting: The inclusion criteria required the RNs to be working on a pediatric inpatient or intensive care unit at a hospital in mid-Western Canada.

Methodology: A qualitative interpretive description study was completed to understand pediatric RNs' perspectives of the potential impact a new portal technology may have on nursing practice. This research will be applied to nursing practice through the larger ongoing study and recommendations made in the discussion.

Results: Ten pediatric RNs participated in a single individual interview. The majority of the RNs have worked most of their career on a pediatric unit. Six interconnected themes represent the RNs views of technology and the proposed portal on patient care. The first three themes: *Standing in Both Worlds*; *Reshaping the Care Triad*; and *Needing Support* highlight the nurses' views of new technology implementation and these perspectives influence their thoughts on the development of a patient portal. The final three themes relate to the RNs feelings regarding a patient portal and the potential impact on patient care and nursing practice: *Improving Family Centred Care*; *Connecting with Care*; and *Anticipating Nursing Implications*.

Conclusion: Overall the RNs are optimistic regarding the development of portal technology for patients and parents to use during a child's hospital stay. The nurses' previous experiences of technology implementation are informing their perspectives and suggestions for future portal

roll-out. Involving RNs in the development stage has the potential to create a portal that is helpful for nurses and parents and result in continued long-term use.

3.2. Introduction

Registered nurses (RNs) are often considered the largest group of health care providers (HCPs) who care for and interact with hospitalized patients. Advances to health information technology and communication are changing and impacting RN practice (Kaye, 2017; Risling & Low, 2019). Recent digital health technology advances include: barcode medication administration systems, electronic health records, and patient portals, with a rapid increase in virtual care visits (Kaye, 2017; Kelly, Coller, & Hoonakker, 2018; Risling & Low, 2019; Patel et al., 2020). The implementation of health technology into practice is impacting how HCPs provide care to children and their family members. Emerging research is demonstrating that involving HCPs throughout the design, implementation, and/or elevation of a digital health technology can have a positive impact (Kushniruk & Nohr, 2016; Risling & Risling, 2020; Tang, Lim, Mansfield, McLachlan, & Quan, 2018). Involving the end-users, such as RNs, throughout the research process is often termed user-centered design (UCD).

UCD is becoming more common in digital health research, but challenges remain in recruiting HCPs (Risling, Nussbaum, Martinez, & Risling, 2019; Risling & Risling, 2020). In particular, recruiting RNs to participate in the research process continues due to lack of time during working hours and access not being granted by unit managers (Hysong et al., 2013; Matukaitis Broyles, Rodriguez, Price, Bayliss, & Sevick, 2011; Raymond, Profetto-McGrath, Myrick, & Streaan, 2018). Furthermore, unprecedented workload demands combined with high acuity patients means that it can take considerable effort from the research team to recruit RNs (Hysong et al., 2013; Matukaitis Broyles et al., 2011; Raymond, et al., 2018; Risling et al., 2019). Even though these challenges persist, researchers are developing novel data collection techniques to ensure the voice of bedside practitioners is not lost and that they can participate in

UCD research (Risling et al., 2019; Risling & Risling, 2020). Nurses' perspectives are vital not only to the eventual uptake of the technology, but also continued long-term use (Kaye, 2017; Lehmann, 2015; Risling & Low, 2019).

A patient portal is an innovative health information technology that allows patients and/or their family members access to personal health information. The information available on the portal varies by institution and setting, but typically features access to medication lists, laboratory and radiology results, and a way to electronically communicate with HCPs (Bush, Connelly, Fuller, & Perez, 2016; Kelly et al., 2018). Recent research is demonstrating that patient portals empower caregivers, and improves the care experience and safety of care when children are hospitalized (Kelly, Dean, Carayon, Wetterneck, & Hoonakker, 2017; Kelly et al., 2018; Kelly et al., 2019; Runnass et al., 2017).

With the trend to include patient portal access as part of the hospital experience, examining pediatric RNs' perspectives is essential. Utilizing the concept of UCD and the knowledge that RNs perspectives are important, a study was conducted to explore pediatric RNs perspectives of technology and patient care. This research is part of a larger ongoing study on the development and future implementation of a patient portal for pediatric hospitalized patients in a tertiary care setting. Utilizing a qualitative interpretive description (ID) approach (Thorne, 2016), pediatric RNs perspectives and experiences of new technology and how this may impact their view of a new portal technology was explored. Considerations for pediatric nursing practice and future research are also discussed.

3.3. Background

Patient portal technology is a digital health advancement that is being implemented to connect patients and caregivers to their care experience. Portal research is still in the early stages

for the pediatric population, but research is demonstrating that patient portals have the potential to improve family centered care, the quality of care, and safety of care provided to children (Bush et al., 2017; Kelly et al., 2017; Kelly et al., 2019; Kelly, Hoonakker, & Dean, 2016; Runass et al., 2017). The health information available for viewing on a portal is typically displayed through an application on a personal electronic device such as a cell phone or on a tablet device provided by the hospital (Kelly et al, 2018; King et al., 2017). Portal technology has been implemented more widely in the pediatric outpatient departments but progression to include hospitalization as part of the portal experience is occurring (Kelly et al., 2016; Kelly et al., 2019; Runaas et al., 2017). Parents are reporting they value the real-time access their child's health information during hospitalization and that having access to a portal empowers them to be more involved in their child's care (Kelly et al., 2016; Kelly et al., 2019; Runaas et al., 2017). Practitioners are reporting that patient portals improve patient care and improve communication with parents and HCPs, but are also finding technical challenges persist that may be impacting parental use of portals (Bush et al., 2017; Kelly et al., 2017; King et al., 2017; Runaas et al., 2017). Pediatric RN's views on the implementation of patient portal technology has been limited and difficult to distinguish due to research combining all HCPs responses together (Kelly et al., 2017; King et al., 2017; Runaas et al., 2017).

Patient portals augment care during a child's hospitalization because a parent has the ability to electronically view their child's health information at a time that is convenient for them (Kelly et al., 2017; Runass et al., 2017; Kelly et al., 2019). Pediatric HCPs report that when caregivers have access to their child's health information the caregivers were more engaged, improved the safety of care, and improved parent satisfaction of care (Kelly et al., 2017; Runass et al., 2017). By providing parent's real-time access to health information during hospitalization,

HCPs believe the caregivers were more prepared for daily physician rounds and were better able to recognize their child's care providers as they could see pictures of them on the portal (Kelly et al., 2017; Runass et al., 2017). Recently, these same benefits are being echoed by parents when they are able to utilize a portal technology during an inpatient hospital stay (Kelly et al., 2019).

Patient portals that have been developed and/or implemented with a HCP and family focus have had more positive feedback and less reported disruption on HCPs work flow (Kelly et al., 2016; Kelly et al., 2017; Kelly et al., 2019; Runaas et al., 2017). This appears to be occurring more often when portals are implemented during a child's hospitalization compared to outpatient settings as practitioners are already present 24/7. Early research is indicating that HCPs may overestimate the burden of portal technology prior to implementation (Hoonakker et al., 2019; Kelly et al., 2017) as one study post-implementation found very few HCP actually reported challenges to their work load (Kelly et al., 2017). Nurses' views of portal technology and its impact on nursing care are being explored in the adult population (Cronin et al., 2018; Hoonakker et al., 2019; Mayhew, Strudwick, & Waddell, 2018). However, more research is warranted because of the various practitioner disciplines, pediatric RNs perspectives are notably limited. With the trend to include hospitalizations as part of the portal experience for parents, understanding pediatric RNs perspectives will be important for continued long term use.

3.4. Methodology and Methods

A qualitative ID study was carried out to gain insight into pediatric RNs perspectives of new technology, such as a patient portal. Given that Thorne (2016) has described ID as a pragmatic approach to studying an applied discipline's "real world" problem, this methodology is an excellent fit. The goal of this ID study was to gain knowledge about pediatric RN's perspectives of a new portal technology and the impact on patient care to further advance nursing practice. A

qualitative approach is also in keeping with a constructivist paradigm whereby knowledge is constructed through “lived experiences” and through our social interactions with other people (Lincoln, Lynham, & Guba, p. 103, 2011) and was an appropriate method to be able to understand the pediatric nurses’ perspectives. Therefore, the following two research questions guided this study:

1. What attitudes, beliefs, and perceptions do nurses report regarding the development of a portal technology for parents to use at the bedside for inpatient pediatric care?
2. How do RNs believe the introduction of new technologies impacts inpatient pediatric care?

3.4.1. Participants and setting.

Pediatric RNs were recruited from pediatric inpatient units at a single tertiary hospital in a city in mid-Western, Canada. At the time of the study there were three pediatric units located within the hospital: a general pediatric inpatient unit, a pediatric intensive care unit (PICU), and a neonatal intensive care unit. As well, some RNs held positions split with the PICU and pediatric emergency. All the units have RNs, with some units employing Licensed Practical Nurses (LPNs) and Registered Nurse Practitioners. To be admitted to a neonatal or pediatric unit at this hospital, the child needed to be newly born through 16 years of age respectively.

Recruitment of nurses involved purposive sampling through study information posters on the pediatric inpatient unit staff rooms and “snowballing” from other participants through word of mouth and the research conducted with the larger ongoing project. Interested participants reached out via phone, email, or directly in person. Participants from the larger research study who indicated they were interested in future research opportunities were contacted about this study through their preference which was email. For these interested participants, one general email about the intents of this study was sent and only those who replied back were contacted

with more information. To be included in this study the participant needed to be a RN currently working in a pediatric inpatient unit, PICU, or neonatal unit. There was no minimum number of years required to be working and all type of positions were included in recruitment: casual, part-time, or full-time. LPNs were excluded from this study as the focus was RNs, but LPNs were included in the larger ongoing study.

3.4.2. Data collection.

Ethical approval was obtained through the larger ongoing study and written informed consent was obtained with each participant prior to any involvement in research. To maintain confidentiality no names or identifying information was included in the transcripts or analysis. A small token of appreciation for the RNs participation in this study was provided due to the RNs having to complete the interviews outside of work. A semi-structured interview guide with open-ended questions was used to conduct face-to-face interviews. This was to ensure the important questions were asked, but still allow for the individuality of each interview (Patton, 2015). One question was removed after the first few interviews due to the nature of participants struggling to answer and the question not providing fulsome responses (See Appendix 1). Since the patient portal technology was a new concept to the setting and with the awareness that most HCPs would not know what a patient portal was, a low-fidelity mock up was provided as an example as to what a portal could potentially look like (See Figure 1). This provided a reference point for the participants when answering the questions related to patient portals. One interview with each participant was conducted, audio recorded, and professionally transcribed. As well, each interview was checked for accuracy by listening to the audio recording and reading through the transcript.

3.4.3. Data analysis.

The data analysis process was iterative and involved constant comparative analysis whereby interpretation started to occur with the first interview and continued once all the interviews were completed (Thorne, 2016). This iterative approach allowed for the removal of the question that was not providing fulsome responses. Each interview was initially summarized and key words and themes were highlighted. From this initial coding repeating key words were identified and then analyzed to construct the final set of themes. The analysis was also enhanced through the use of what Thorne (2016) identifies as finding the outlier. In this study it was considering the RNs responses who were different and/or contrasting to the group overall.

3.5. Results

A total of 10 RNs participated in individual interviews between December 2017 and May 2018. Most were RNs working full-time in either the pediatric intensive care unit or the general pediatric unit. The majority of RNs in this study reported working the most of their career in a pediatric inpatient unit, with an average of 9.3 years on their respective unit (see Table 1).

Overall, the RN's views regarding the development of a portal technology are formed from their previous experiences of technology implementation in their pediatric acute care settings. A total of six interconnected themes represent the RNs views of new technology implementation, including the proposed patient portal (see Figure 2). The first three themes: *Standing in Both Worlds*, *Reshaping the Care Triad*, and *Needing Support* relate to the RNs experiences and feelings with technology implementation. The last three themes are interconnected to how the RNs are anticipating the new portal technology may impact patient care and nursing practice. These themes capture the RNs perspectives of the portal development: *Improving Family Centred Care*, *Connecting with Care*, and *Anticipating Nursing Implications*.

3.5.1. Standing in both worlds.

A common theme RNs described is the feeling of standing in both worlds in regards to the implementation of new technology and its varied implementation. One particular technology eliciting this response is the electronic health record (EHR). Not all pediatric departments in this study had implemented electronic charting when this study was conducted and the participants reported that this inconsistency created challenges and the need for workarounds in order for practitioners to view parts of the patient health record. Even though most RNs are not able to use the EHR to its full potential at the moment they are reporting benefits in patient care. As well some RNs are anticipating positive outcomes for when the EHR becomes fully operational with electronic charting in all departments and eventual computerized physician order entry. The RNs are constantly bombarded by the influx of new technology which is creating issues in timely and efficient patient care and causing the nurses to consider the implications all these technologies have on their critical thinking – which is a paramount characteristic of RNs.

On most pediatric units in the study, the RNs have the ability to view parts of their patient's EHR and one unit utilizes electronic charting. This difference means that the hospitalized patient's chart is both electronic and paper, creating issues in storing and relaying the information back to other HCP. As RN10 explains:

The part I don't like about it right now, and I know this is probably going to change once everybody is up to speed on the electronic charting, but it's the amount of paper we're wasting printing out all of the stuff, whereas, they could have that information on SCM anyways.

By having the patient records in two places it creates workarounds for printing off charting that was not intended to be paper and some difficulty in navigating the EHR after discharge. As RN 5

explains “its harder to navigate...or you have to go through lots of steps to find exactly what you-what you need if you’re looking through lots of pieces of information I guess”.

RNs are aware that the transition to electronic charting will eventually be occurring in all pediatric units and, thus, are already gathering feedback and opinions from colleagues who have already worked with the electronic charting system. There is an overall feeling that when all pediatric units implement electronic charting it could improve the efficiency and improve upon the challenges that currently exist with the paper and electronic systems. The RNs who have experience working with the electronic charting system have mixed feelings regarding the efficiency and user-friendliness. RN10 explains her own conflicting feelings in the following statement:

...sometimes I find that process kind of long and daunting, and it would you know be easier for me to go back to the old way where all we did was like check boxes and write down a quick note especially in a fast-paced place like peds emerg, I know in PICU that’s probably going to be a lot different because we’re not going to be doing the same vital sign checks you know we do it hourly rather than like fifteen in an hour depending on how many kids come through so I feel but I do like the fact that I can chart while the physician is charting and I have the same access to their lab values so that if they’re busy I can pull them up and just kind of give them a nod or if they’re already looking at somebody else’s or at the same information I don’t have to wait for them to be done to be able to find that information.

There are processes in place to make the charting more efficient which RN10 explains as “acronym expansion” whereby it quickens the amount typing needed. Furthermore, using the EHR to its full potential is highlighted as important and could further benefit the staff. These mixed feelings could also be attributed to the fact that some of the nurse’s in the study work between two charting systems. For example: a nurse spends one shift working in the emergency department where they utilize both electronic and paper charting and then the next shift they are working the intensive care unit with only paper charting. Furthermore, they are having a hard

time envisioning how the electronic charting will be efficient in critical situations because even in the emergency department that charting is still on paper documents.

Inefficient workflow designs are not optimizing the implementation of new technology leading to frustration in some RNs. This is due to the increasing need for access to computers to complete the ordering of tests, view laboratory results, and fitting those computers into spaces that were not designed for this technology. As RN2 explains:

Um, just that I find we don't have enough computers available so I'm often waiting in a lineup to get to a computer. The places where the computers are on the ward are often quite congested-congested area, so during rounds when you are trying to put your tests into the computer, req [requisition] your labs, that kind of thing there are often ten people all clustered around the computer so you can't get to them

RNs understand that technology can improve patient care and safety, but are reporting more concerns when the technology does not equate to efficiency. A frequent technology RNs describe as not being more efficient are intravenous infusion pumps or "smart pumps". These pumps have a built-in safety feature of a medication library that must be utilized to run the medication infusion. RN7 explains her frustration:

Sometimes its like a pain in the butt like the new pumps that we got like I don't know anybody who likes those pumps. I don't know if it has decreased medication errors if it has I think that's great but honestly to go from pushing like three buttons to having to be pushing like thirty-five buttons its pretty frustrating"

This is compounded by the lack of pediatric specific data and the standardization that does not always fit these specialized units. As RN 10 explains:

So like again with the smart pumps, I do feel like it's awesome because we not longer- if you have an antibiotic, you can just type it in and it will give you, you know, the rate and stuff it's supposed to be ran at. That stuff is awesome. The benefits – it kind of is like a drug library on a machine, which is cool. But then like I said it has its drawbacks...I'd say lack of database with the technology. So- and that again (laughing) is linking to the smart pumps just yeah the lack of database. They 're always updating and they're always which is fantastic but again when we're having to push- when we're in a code-type situation and we're trying to use a pump and we can't run at a specific rate that we need to that's a problem...so the lack of database for the smart pumps for sure is a drawback.

The need to improve patient safety with technology is important to nurses but the challenge becomes when the technology does not equate to what the RNs perceive as efficient. They are working between the need to provide safe patient care but are frustrated when it takes longer than they are accustomed. This will be an important consideration for the patient portal and can be evaluated by involving the nurses in the design and implementation process as is being done with the larger ongoing study. Therefore, the RNs are having a hard time envisioning nursing practice where they are not standing in both worlds of electronic and paper charting, and technology that is supposed to improve patient care but appears to take longer. With challenges present in so many existing technological implementations, RNs are cautious about expanding into portal technology and have recommendations to make the transition more seamless. The advancement and variation in technology implementation is changing the development of therapeutic relationships nurses strive to create when caring for children and their families.

3.5.2. Reshaping the care triad.

A second important theme is the awareness that the RNs are having to reshape the nursing – patient – technology - care triad. The introduction of new technology impacts how the RNs conduct their work, which can ultimately impact the development of therapeutic relationships and patient care. Further along the patient care continuum are the ethical boundaries that technology pushes.

Technology can be a tool for engaging family members through teaching and providing information in a way that is meaningful to the caregivers. RN3 exemplified this engagement in the following statement:

I have actually seen him [a physician] like bring an iPad in and show family on his iPad how the blood flow goes through the heart, and it's like an animated version. But it's nice

for families to actually see the blood flow, and they can visualize it...and it's a lot of big words that go over everyone's head and seeing it is a lot easier

This can also positively impact the care experience by appealing to children, as the RNs feel children like technology and enjoy seeing it incorporated to their own care. Children's appreciation of technology could be a potential benefit to the new proposed patient portal.

However, the RNs are concerned about the art of nursing and lack of personal feeling from the use of technology like computers and personal electronic devices. As RN2 explains "I feel that some people will find it impersonal, where "Oh yeah, they make me look at this because they don't even want to come and talk to me". It just depends on the person." This issue is compounded by methods of making the technology more efficient, such as electronic charting that contrast with the ability to build trust and rapport. This is particularly evident in fast-paced settings where there is less time to establish the therapeutic relationship. RN8 summarizes this impact in the following statement:

I mean, like, we have used the what are they called the WOW [work station on wheels] machines or whatever, at the bedside, and sometimes like we have used them, but sometimes I almost find that it takes a little bit away from the patient care and assessment, because I find often that I'm looking at the computer instead of looking at the patient, or if I'm getting their story sometimes I'm sitting there typing out what they're writing instead of really listening and looking at them.

The RNs are highlighting the importance of maintaining professionalism. They are questioning the appearance of being on the computer and the need for adhering to the professional code of conduct in appropriately using technology. Some RNs are embracing the potential for bedside charting, others are concerned about the professionalism, and another mentioned feeling stuck at the bedside. This is moving RNs into an unknown care dynamic.

Moving through the care triad, there is a general feeling that technology improves patient care and that electronic charting will improve patient safety through legibility and improved

interprofessional communication. There is also the consideration of the increased workload that results from more monitoring and charting because of the data being collected. The ethical boundaries are starting to blur, as RN6 explains

But, when you- I guess, from the nature of the beast in the PICU is we're getting to the point where we have so much technology that we can push the boundaries of where ethics lies with some of our patient care... We're starting to come on some very large gray areas with-with some of our patient cares and treatments and kind of definitely have to consider the pros and cons of everything

Inadvertently, RN6 is the only participant to bring up the point that frontline staff, particularly RNs should be involved in the development of technology otherwise context in the unit setting may get overlooked.

... I mean, you go into these marketing- marketing or engineering – that aspect of things, and you know, there's robots taking over people's jobs and it's the nature of the beast if your going to come up with technology, like there's implications, I mean both good and bad. But at what point ethically do you draw the line?

This highlights the importance of UCD and involving front line staff in the development of the new patient portal technology. The care triad of the nurse – patient – and technology is constantly evolving but RNs are highlighting the need for involvement and examining how the big care picture (triad) is impacted by all this technology. Consideration for how the new portal technology may impact nursing care will be important for the research team during implementation.

3.5.3 Needing support.

RNs feel that having support through the implementation and continued use of new technology is important and helpful to the transition to practice. They also frequently discussed the potential impact of technological service disruptions and the negative impact this could have

on workflow. The RNs also often highlight the importance of communication and familiarity with the technology.

Communication is a key piece of the implementation process. Having “super-users”, colleagues who are trained in the new technology and present as support personnel during implementation, has been deemed as helpful by RNs in this study. As well, incorporating the learning from the other units that have already implemented the technology, such as electronic charting, can help make the transition smoother and anticipate potential barriers. RN5 was an outlier in highlighting the importance generational differences in technology comfort amongst nurses. RN5 summarizes this impact “you do way more stuff with technology in school and stuff and we didn’t do that when I went to school”. This will be an important consideration for the portal implementation.

Support and training are also important so that technology is used to its full potential “otherwise the technology goes wasted” (RN10). Another consideration is the RNs familiarity with the technology. If the technology is not used frequently workarounds are created which can decrease the effectiveness. The lack of familiarity with a technology creates trepidation as described by RN9 in the following quote:

So, for me it just – I guess for nurses I think sometimes it increases our anxiety a little bit, just because you walk in and maybe you see a piece of equipment you’re not familiar with, and you’re just like “Oh, okay how do I – how does that work? How – what do I have to do? And if there’s a problem, how do I troubleshoot?”

Therefore, the research team should take into consideration how often nurses will be interacting with the portal and the various levels of technology comfort by the RNs in the unit the portal is being deployed.

The first three themes: *Standing in Both Worlds*, *Reshaping the Care Triad*, and *Needing Support* all impact the perspectives the RNs have on the development of a new patient portal

technology for patients and families to use at the bedside during a child's hospitalization. The nurses' previous experiences with new technology implementation means they are generally optimistic about the new portal, but also highlight the importance of learning from the past and the need to consider the impact all of the technological advances have on nursing practice. The final three themes: *Improving Family Centred Care*, *Connecting with Care*, and *Anticipating Nursing Implications*, represent the nurses' views of the portal technology development and its potential impact in their respective nursing units.

3.5.4. Improving family centered care.

This theme captures the RNs' positive feelings and anticipation that an electronic patient portal could improve family centered care. The RNs feel this can be attributed to children and their familiarity with technology and that they will want to participate in using the portal technology. An electronic portal has the potential to positively impact the care experience during hospitalization through improved knowledge sharing between HCP and families. RN7 explains this in the following quote:

Just a clear communication because I find like you can tell parents the medications like every time you do it but they're stressed out and it's hard for them to remember that kind of stuff so just having it written there would be helpful.

This is echoed by another RN who feels the portal "...would leave the parents and families, they'd have a better understanding of what's going on" (RN4). By improving the information sharing, the RNs also feel that the portal could positively improve the safety of care provided. One frequently mentioned portal feature that the nurses' referred to was including a medication list. The RNs believe if family members have access to their child's medication list on the portal it would be another "double check" further improving the safe administration of medications. Parents having the ability to view information about their child's condition on the portal may

also be helpful if they are unable to attend physician rounds because they can view at a time that is convenient. The following quote from RN5 summarizes this:

Then maybe it's a little bit of a self-service system and then maybe don't have to call the nurse all the time and asked, or if they missed rounds or something maybe some of that information could be on hear as well.

The caveat RNs are pondering is how to manage parental expectations with the design of the patient portal. For example, displaying the "expected day of discharge" is being identified as a potential source of anxiety. "...again, I feel like people take that as though it's set in stone and they get disappointed if it changes" (RN2). The RNs emphasize the need for communication to patients and families about expectations of the portal system and how to adequately ensure it is a useful tool. Overall, RNs believe that a patient portal will improve family centered care by improving the hospital experience, allow for parents to be more involved in care during hospitalization, and improve the knowledge sharing between HCPs and parents.

3.5.5. Connecting family with care.

Another theme central to the patient portal is the idea that the portal could connect the families to their child's care better. Improved communication with HCPs and continuity of information could connect the families in a more consistent manner. RN8 explains this in the following statement:

And you know, it's kind of nice – yeah like, I mean communication is definitely a big thing, like it's kind of a game of telephone, right? Where you don't always get the whole story or the story changes a little bit every time you pass it on. I think it's just a good like consistent – communication tool.

The RNs feel that the portal could help illustrate that hospital stays are dynamic and changing and could potentially help parents understand why the child's hospital stay is longer than initially expected. "...all of a sudden we stumble upon cardiac issues or - and so I mean why – the reason why they're there can change, and sometimes families don't recognize that, that, that- the reason

can change, which ultimately extends the stay” (RN6). Furthermore, it could guide families to the “bigger picture” of their child’s hospital stay and “...but just like say if they come in for something like croup, then maybe like a little explanation of what croup is so they understand what they’re in for and what they expect to see as the illness goes” (RN3).

To connect the family caregivers more to their child’s care, the RNs suggest having a “daily schedule” on the portal and “discharge teaching” so that families can plan when to be at the hospital and have a better understanding of what needs to be accomplished before discharge home. RN10 summarizes a few of the suggestions:

The vital signs at the bottom are really helpful, especially for the weight, because then that could easily be updated rather than searching back in a chart. And then that gives parents good information too...I do like on the side...this kind of goes with that, but a schedule. So if they have bloodwork for six in the morning, an ultrasounds, or if we have a scheduled MRI, or CT, or X-ray. I like that.

Utilizing the patient portal as tool to connect families with their child’s care data could potentially help the knowledge transfer for understanding the child’s condition, reason for hospitalization, expected length of stay, and teaching that will need to occur before discharge.

3.5.6. Anticipating nursing implications.

Relating back to the RN’s prior experience with technology and its implementation, this theme encompasses the RN’s considerations about the potential implications the patient portal could have on their nursing practice. RNs feel the patient portal could have both positive and negatives effects on their workflow. The familiarity of the electronic patient portal to the current manual whiteboard system is eliciting positive feedback. RNs feel the portal is more appealing because the information can be presented in a clearer manner. “I mean right now we have something similar to this, but it’s a whiteboard that we’re writing on ourselves, and I just feel like it gets crowded...” (RN1). As well, most of the RNs feel that the electronic portal system

will be a positive improvement and more efficient compared to the current whiteboard system.

RN7 explains one of the challenges with the current whiteboards:

I think those whiteboards people just get annoyed with them because you can never find the marker and like that sounds like a problem that like, oh it's just get another marker but it's like there's literally no markers, you go where the markers are supposed to be and there the box is empty. Like (laughs) there's just no markers it sounds ridiculous but its true.

In regards to the information provided on the portal, several RNs have voiced concerns about the entry of data into the portal. They feel that if most data does not have to be directly input by the nurses themselves it will be more efficient and most likely well received.

Furthermore, speaking to the information available to family members on the portal, there is the feeling that this is information that families are already asking for and it could be more efficient for RNs because it may answer a lot of questions the families are already asking. Blood work results are a frequent example on the portal that for oncology families would be more efficient.

RN2 speaks to the potential benefit of having a child's laboratory results available to parents to view on the portal in the following statement:

And the recent lab work I think is nice just because I find I'm often chasing paper copies and having to photocopy for parents and that kind of things so it would be nice if they could just have that when they want it.

On the flip side is the concern about the portal creating more questions and the time it would take to answer them, and the impact on the family members this could cause by having to wait for a nurse to be available. As RN6 explains "...if we're not careful going forward about how we would present that information to parents we might actually see a lot of them have a little bit more anxiety and worry with the access to the information". The nurses have suggested providing links to teaching information so that the families could understand why their child is

on a certain medications or have reasons why the bloodwork results are abnormal as potential stopgap.

In regards to implementation of the patient portal there was less discussions about the impact of technological service disruptions on nursing practice, but instead a focus of ensuring confidentiality is maintainable for family members. Again, there was a suggestion for having a “superuser” available when the patient portal was implemented to assist the RNs if needed. It will also be important to consider that even though there is familiarity with the current manual system, the patient portal will be a change in practice and it could take staff time to adjust their practice.

Overall, the RNs are optimistic about having a patient portal at the bedside for patients and family members to access during a hospitalization, with the anticipation that this could positively improve family centered care and further connect the families to their child’s care. These findings are formed from the nurses’ previous experiences with new digital and health technology changes (see Figure 2). While there is the feeling of *Standing in Both Worlds*, the RNs are anticipating positive changes technology can bring and have a feeling of overall readiness for the new portal technology. The nurses are highlighting the importance of *Needing Support* when new technological changes are implemented and will be important with the new patient portal. The rapid increase in digital health technologies are *Reshaping the Care Triad* and it will be necessary for the research team to disseminate how the portal technology is helpful to both staff and parents. Circling back to the proposed patient portal the RNs believe the new technology will aid in *Improving Family Centred Care* because it will enhance the hospital experience and information sharing. Additionally, the nurses are anticipating that electronically *Connecting with Care* will be a positive experience for both parents and children. Utilizing these

findings allows for the research team to be *Anticipating Nursing Implications* for the portal roll out and demonstrates the positive impact of involving nurses in the research for a smooth transition.

3.6. Discussion

The RNs' past experiences and acceptance of digital health technologies are informing their opinions and suggestions for future technology implementation, such as the patient portal. Overall, the nurses are optimistic and positive about the new portal technology development, even though they have experienced frustrations with some of the technology currently in use in their respective units. The RNs in this study enjoyed being part of the research into the development of a new portal technology and being able to begin to conceptualize the portal before it is built, trialed, and potentially implemented on the unit. By gathering feedback at the beginning of development the research team can anticipate and incorporate the nurses' suggestions, which is a benefit of UCD research (Risling & Risling, 2020; Tang et al., 2018). Digitally connecting patients and parent's with care is being reported as a potential benefit of the portal, which also can improve family centred care. Ultimately, the rapid increase in digital health technologies, including a portal, are causing RNs to reconsider the art of nursing.

3.6.1. User-centred design success.

Recruitment of pediatric bedside RNs can take time and effort. However, the nurses' provided valuable insight to the impact of technologies on nursing practice and patient care. This research demonstrates that nurses are interested and want to be involved in research. This is similar to another portal technology that was specifically designed for a pediatric oncology unit (Runnass et al., 2017). The successful adoption rate by parents and positive impact the portal had on patient care and the hospital experience could be attributed to the input the HCPs and family

members had in the design of the portal (Runnass et al., 2017). Tang et al., (2018) also utilized an approach that included the HCPs through the implementation and evaluation of a digital health technology, which resulted in better use by the HCPs because their input was not only being considered, but was actually applied to the implementation of digital health technology.

In a recent integrative literature review studies have focused on nurses' acceptance and attitudes toward health information technology and the attempts to improve post implementation (Kaye, 2017). Kaye (2017) found that involving nurses through the research process was beneficial. The results of this review suggest that utilizing a UCD from the beginning could potentially prevent some of the challenges encountered after implementation and potentially improve the acceptance. The RNs in this study advocated for support when the implementation of the portal "goes live" and this could be from the positive impact "super-users" have made during previous technology implementation. Kaye (2017) also found that "from a clinical practice perspective, this seems to indicate that identification and involvement from early adopters or peer champions might increase acceptance" (p.244). Future research and portal implementation can study the impact of a support person or "super-user" to further substantiate the results of this study. As well, by incorporating the RNs suggestions in this research previous pitfalls and challenges with portal implementation can be avoided (Fiks et al., 2016; Kelly et al., 2017; King et al., 2017).

3.6.2. Digitally connecting with care.

RNs believe the new portal technology could potentially improve family centered care and connect families with care. Our findings are similar to other research results that are demonstrating the ability portals have to improve patient care, safety of care, and involve families in care (Bush et al., 2017; Fiks et al., 2016; Kelly et al., 2016; Kelly et al., 2017; Kelly

et al., 2019; Runnass et al., 2017). The specific sub-population of pediatric oncology patients that the RNs in this study believe would benefit from the portal has been reported in other literature as well (Runnass et al., 2017; Schultz & Alderfer, 2018). Runnass et al. (2017) found that families were more informed for rounds and liked being able to access the information whenever was convenient. It is not uncommon for HCPs to be hesitant and perceive more challenges to a patient portal prior to implementation (Kelly et al., 2017; Hoonakker et al., 2019). However, in this study the nurses were able to provide suggestions and ideas for how to adequately prepare family members and manage their expectations. This may prove to help alleviate hesitation prior to portal implementation.

The need to understand patient and family expectations with portal use and implementation is starting to be shown as important consideration for research and unit leaders. Other studies have demonstrated that when HCPs and families are not on the same page, it decreases the usage by parents and results in both sides feeling unsure (Bush, Stahmer, & Connelly, 2016; Gerber, Beg, Ducan, Gill, & Craddock Lee, 2017; King et al., 2017). As well, differences are starting to emerge regarding the expectations and potential workflow challenges to nurses between the inpatient and outpatient setting (Gerber et al., 2017; Hoonakker et al., 2019; Kelly et al., 2017; Kelly et al., 2018; Runaas et al., 2017). Nurses in an adult oncology outpatient setting cited challenges to work flow and communication further complicated by patient expectations of when to receive responses from communication within the portal system (Gerber et al. 2017). This is similar to the pediatric outpatient settings and physician's perspectives. In contrast, in a pediatric inpatient department, most HCPs actually reported not knowing which families were using the portal (Kelly et al., 2017) which could mean that the communication challenges are not as prominent in the inpatient setting because there is always a

HCP present. In this study, the concern wasn't about communication but about potential anxiety and need to answer questions, which means more research is needed to the impact of the portal on inpatient pediatric nursing practice.

An important consideration moving forward with portal technology that a few nurses' in the study highlight is the ability to maintain privacy and confidentiality amongst family members. How families access and share the portal information is a factor with portal technology implementation beginning to be discussed in the literature (Kelly et al., 2019; Szilagyi et al., 2020). In the USA, there has been varying portal access requirements. For example, hospitalization access has been limited at times to children under 12 years of age due to legal requirements (Kelly et al., 2017; Kelly et al., 2019) or in an outpatient department they have begun providing adolescents the ability to activate the portal on their own (without co-parent activation) (Szilagyi et al., 2020). The Canadian Paediatric Society recommends family centred and informed shared decision making between HCPs, legal guardians, and children as developmentally appropriate (Coughlin, 2018) and therefore, will need to be considered with future portal implementation. Privacy requirements may impact how nurses navigate patient and family care with the portal technology.

3.6.3. Technology and the caring profession.

The reshaping of the care triad for nursing practice is an important finding. Two frequently cited examples of health technology in the study that are having both positive and negative implications on nursing practice are EHRs and smart infusion pumps. The impact of a single technology such as the EHR and the impact on caring and nursing practice is being explored (Gomes, Hash, Orsolini, Watkins, & Mazzocoli, 2016; Schenk et al., 2016). Research is demonstrating that while nurses are spending more time in patients rooms this does not always

equate to improved patient care (Gomes et al., 2016; Schenk et al., 2016). Even though it appears nurses spend more time patient rooms with the EHR and charting at the bedside, does this equate to what a nurse feels is providing adequate care? As Schenk et al. (2016) explain that while nurses spent more time on documentation, medication administration, and chart reviews the “nurses perceptions of caring efficacy slightly decreased” (p.336). This is highlighted by Gomes, Hash, Orsolini, Watkins, & Mazzocoli (2016) who found that “while nurses may spend more time in the patient’s room post EHR deployment, this does not guarantee that it is time well spent in individualizing care and improving the overall patient care experience” (p. 585). The RNs in this study are also concerned about the professional appearance of being on computers and how to still care effectively for their patients and families. What is interesting is that many studies appear to examine each individual health technology and the impact, but what is starting to occur is the result of multiple digital health technologies impacting nursing practice and how all of these combined together are influencing care (Registered Nurses’ Association of Ontario & AMS Healthcare, 2020). Future research should look at how the combination of all the technology is impacting the art of nursing and the nurse – patient – technology - care triad.

Intensive care units have been studied for the effect of overall technology on practice because there is often considered to be a lot of technology based systems in those units, such as invasive blood pressure monitoring, ventilators, and medication infusion pumps (Bagherian, Sabzevari, Mirzaei, & Ravari, 2017; Tunlind, Granstrom, & Engstrom, 2015). However, as this current study is demonstrating, technology is impacting all inpatient pediatric units from the emergency department, to the general inpatient unit, and the intensive care units. Future research should consider examining multiple inpatient pediatric units and the impact of technology on patient care. RNs are excited about new technology that connect patients and children to their

care, but support and the impact on the nursing practice are important factors to consider moving forward.

3.6.4. Strengths and Limitations.

This research focused entirely on pediatric RNs perspectives and the impact of technology, including patient portals, on nursing practice and patient care during a child's hospitalization. It was important to gain insight from the direct bedside RNs who have the potential to be impacted by the new portal technology. Although a sample size of 10 could be considered small, Thorne (2016) advocates for a sample size that is large enough to answer the research questions and obtain meaningful results, which is not always contingent on a certain number. In this study there was depth and variation to the individual interviews which adds to the "information power" (Malterud, Siersma, & Guassora, 2016). Information power can be applied to qualitative research as a way to understand the sample size. In this qualitative research nurse' are researching nurses and the more specific topic of pediatric RNs means a smaller number of participants can be used compared to a more general topic (Malterud et al., 2016). As well, with the application of ID and finding the outlier responses, the results represent a variety of pediatric nursing perspectives (Thorne, 2016). Therefore, in consultation with all authors it was determined that enough interviews had been conducted to gather meaningful results.

This study focuses on the pediatric inpatient setting and differences are starting to emerge from the pediatric outpatient clinic settings so transferability should be considered with caution and future research is warranted. A limitation of this study is that interviews needed to be conducted outside of work time so that may have unintentionally excluded RNs from participating. Transferability of the results to the adult population and other HCPs would be an opportunity for further research.

3.7. Conclusion

Pediatric RN's perceptions of a new patient portal technology are formed from their past experiences with technology and its subsequent implementation. Even with all the technological advancements and devices being deployed in nursing practice, RNs are reporting a feeling of standing in both worlds. This is causing RNs to reconsider their care dynamic using a patient – nurse – technology care triad. The concerns of professionalism and appearance of being on computers are straining their thoughts of what care should be, and what their patients and families will perceive. Furthermore, RNs feel the need for support and adequate education throughout the implementation of technology and continued use, especially for infrequently used technologies. These three themes: standing in both worlds, reshaping the care triad, and needing support influence the RNs perceptions of the development of a new portal technology for their clinical patient population.

RNs in this study believe the portal could potentially improve family centered care and connect families with care. These RNs also highlight the importance of anticipating the implications the portal may have on nursing practice. Overall, the RNs in this study are optimistic and positive about the development of a patient portal. There is also a feeling of familiarity with the portal being similar to a process already in place. Engaging the end-users in the development phase is showing promising results and in keeping with UCD. The findings in this research detail ideas and suggestions the RNs have to improve acceptance and use of the portal technology during a child's hospitalization. Future research should focus on the overall impact of technology on nursing practice and care. As well, RNs should be consulted in the implementation and evaluation of a patient portal technology during hospitalization to support UCD and ensure the technology is meeting the needs of nurses and families.

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Appendix 1: Interview guide

Thank you for taking the time to meet with me today. I am interviewing you to learn about what you think about technology and the development of a patient portal technology for families to use at the bedside. My goal is to gain an understanding of your own unique perspectives. There are no right or wrong answers. Do you have any questions before we begin?

Open-Ended Questions

- Tell me about your experience using technology when you provide patient care?
 - What are some benefits to using technology when you provide patient care?
 - What are some challenges of using technology when you provide patient care?
- How do you believe the introduction of new technology influences patient care?

Patient portals are starting to be used in pediatric inpatient settings. (Show the example of a patient portal.)

- If patients and families were able to electronically access their health information during hospitalization, what features would you like to see?
- How do you feel about having a device, such as a patient portal, at the bedside for families to access during their child's hospitalization?
 - What benefits do you anticipate?
 - What concerns do you have?
 - **What would you like to see happen with this technology? – Removed after interview 3.**
- Tell me about your thoughts on how technology impacts nursing practice?
 - How do you believe technology influences therapeutic relationships?
 - How do you feel about changing to electronic charting?
 - What benefits do you anticipate?
 - What concerns do you have?

Final Closing Question

- Is there anything else you would like to tell me about technology and patient care?

Thank you for taking the time to be a research participant.

Figure 1: Low-Fidelity Patient Portal Example

T. Risling (personal communication, September 8, 2017).

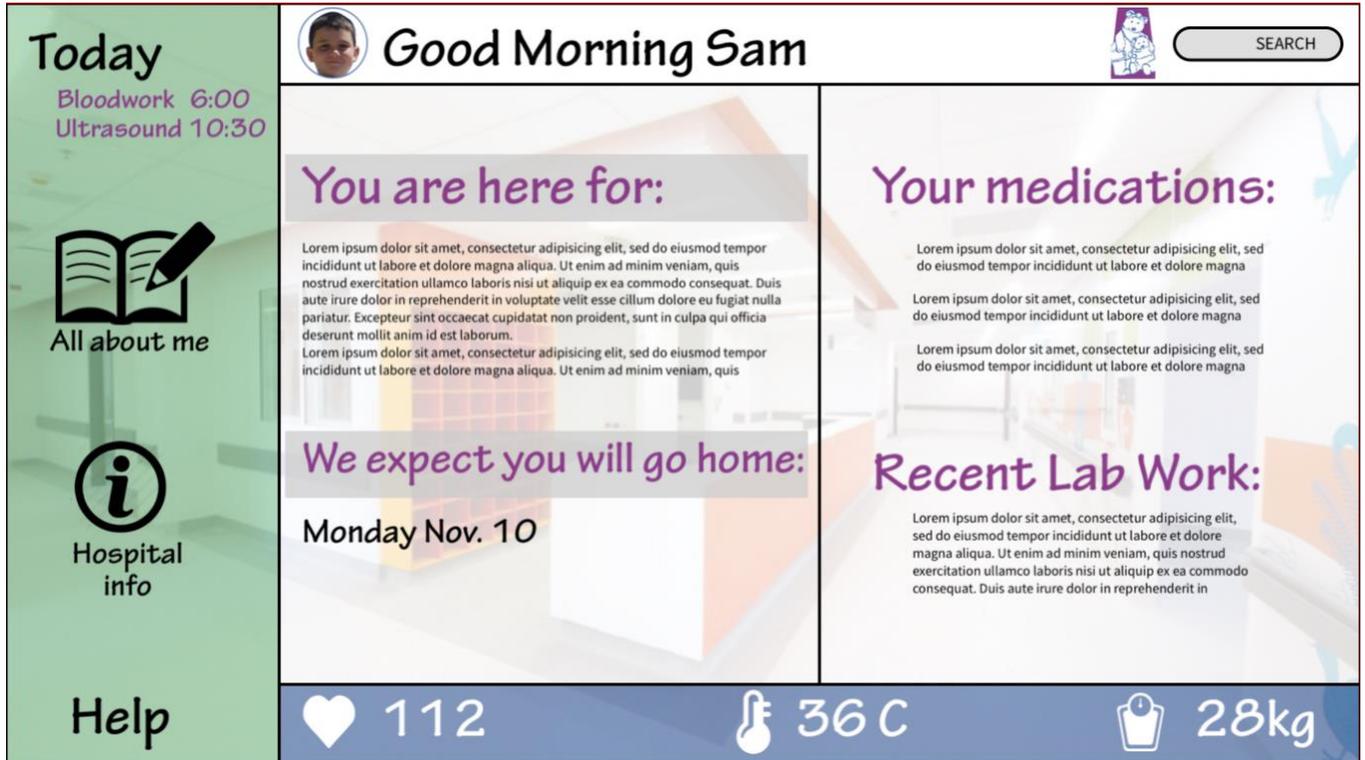


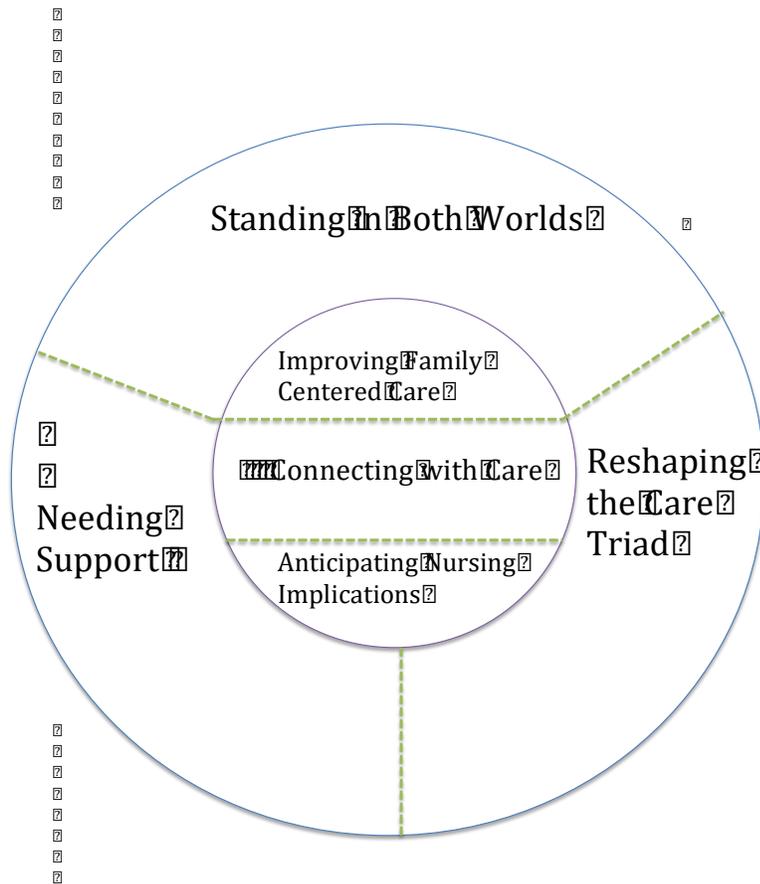
Table 1: Demographic Data

Demographic Data	n (% of participants)
Pediatric Unit of Work	
General inpatient	4(40%)
PICU or NICU	6(60%)
Years on pediatric unit	
0-5 years	4(40%)
6-10 years	4(40%)
>10 years	2(20%)
Age of RN	
25-35 years	7(70%)
36-45 years	1(10%)
>46 years	2(20%)
Years of RN practice	
0-5 years	3(30%)
6-10 years	4(40%)
>10 years	3(30%)
Gender of RN	
Female	10 (100%)

PICU = Pediatric Intensive Care Unit RN = Registered Nurse
NICU = Neonatal Intensive Care Unit

Figure 2: Visual Representation of Data Analysis

The six interconnected themes represent the registered nurses' perspectives of new technology, including a proposed patient portal and the impact on patient care and nursing practice. The three themes in the outer circle are the nurses' previous experiences with technology implementation. The registered nurses' prior experiences inform their views on a new portal technology. The inner purple circle embodies the nurses' perspectives of the development of a new patient portal technology.



Chapter 4: Integrated Discussion

This final chapter integrates the results of the literature review in chapter two and the results of the research in chapter three to nursing practice, education, and research. Chapter three's results also provided insight into RNs perceptions and recommendations for the portal development. These details are included in Chapter four and will be utilized in the larger on-going study that is examining pediatric health care providers and parent's perceptions of the development of a patient portal and its eventual trial.

4.1. Overview

A patient portal is a digital health technology that can provide patients and family members the ability to electronically connect with care. The majority of research in the pediatric population has focused on the outpatient settings (Bush et al., 2017; Bush, Stahmer, & Connelly, 2016; Bush, Vemulakonda, Richardson, Deakyne Davies, & Chiang, 2019; Kruse, Argueta, Lopez, & Nair, 2015; Britto, Hesse, Kamdar, & Knopf Munafo, 2013; Fiks et al., 2016; Szigayli et al., 2020) with a more recent trend to adopt patient portal technology during a child's hospitalization (Bush, Connelly, Fuller, & Perez, 2016; Kelly, Coller, & Hoonakker, 2018; Kelly, Dean, Carayon, Wetterneck, & Hoonakker, 2017; Kelly et al., 2019; Kelly, Hoonakker, & Dean, 2016; Runaas et al., 2017). Pediatric health care providers (HCPs) are important stakeholders impacted by the advancement of portal new technology (Kelly et al., 2017; Kelly et al., 2018; Lehmann, 2015; Risling, Nussbaum, Martinez, & Risling, 2019). However, pediatric nurses' perspectives are currently underrepresented in both research and publication on the evolving patient portal technology.

A thematic literature review was completed to examine the existing research on patient portals and pediatric HCPs' perspectives to identify where the gaps exist. Overall, pediatric HCPs perceptions of portals are often combined together with patient and family member perspectives, and physicians are the practitioners most often represented in the literature (Bush et al., 2017; Fiks et al., 2016; Kelly et al., 2017; King et al., 2017; Runaas et al., 2017). The greater involvement from physicians could be attributed to the higher implementation of portal technology in the pediatric outpatient setting, but incorporating all perspectives (patient, family member, and practitioners) together means the HCPs needs could be underreported. In the results that have been reported, patient portals have the potential to improve the patient care experience

and safety of care during a child's hospitalization (Bush et al., 2017; Fiks et al., 2016; Kelly et al., 2017; Kelly et al., 2019; Runaas et al., 2017), but there are still challenges being reported by HCPs during implementation. Common challenges include lack of user-friendliness of the portal technology for practitioners, difficulty for physicians to balance work and life with the constant ability for caregivers to communicate with the portal, and the need for departmental support during implementation (Bush et al., 2016; Bush et al., 2017; Kelly et al., 2018). These challenges are being reiterated by nurses' in the adult population (Mayhew, Strudwick, & Waddell, 2018; Hoonakker et al., 2019).

With portal technology expanding to include the pediatric inpatient experience, examining pediatric RNs' perspectives is important. Thus, an ID (Thorne, 2016) qualitative study was conducted that explored pediatric RNs' perspectives of new technology, including a proposed patient portal. The pragmatic approach of ID was helpful for analyzing data that has a direct impact on nursing practice. As well, this methodology allowed for the consideration of how my own background in pediatric nursing was helpful in guiding and interpreting the interviews conducted (Thorne, 2016). Overall, the pediatric nurses' previous experiences with technology implementation informs their ideas for how a portal technology may influence their nursing practice. The RNs who participated in the interviews enjoyed being part of the research process and the ability to begin to conceptualize the portal prior to development and use. This is in keeping with other research highlighting the importance of RNs' perspectives, because existing research shows that when the end-users are directly involved in the research process, it improves the reception of the new technology and can improve the long term continued use (Kaye, 2017; Risling & Risling, 2020; Tang, Lim, Mansfield, McLachlan, & Quan, 2018).

4.2. Recommendations to Larger Ongoing Study

The RNs who participated in the research study provided insight into how various technology implementation in their practice is impacting how they provide nursing care to children and their families. The full data analysis is presented in Chapter Three. Overall, the pediatric nurses were cautiously optimistic about the portal technology. Their feedback can support the larger ongoing research on the build and eventual trial of a patient portal during hospitalization. Two overarching recommendations the RNs described about the proposed portal are: how the real-time *data flow* into the portal occurs; and, *expectations* amongst practitioners and caregivers (see Figure 1). These two recommendations highlight what the nurses in the study defined as valuable and important to acceptance of the new portal during the trial phase.

4.2.1. Data flow.

The RNs in the completed study have expressed interest in wanting the input of data into any patient portal system to be as minimal for them as possible. This stems from their current whiteboard system and having to manually keep the information up to date, such as the calendar day, estimated day of discharge, and HCPs caring for the patient, which can at times be challenging due to workload demands. The current low-fidelity whiteboard system is similar to the proposed portal design in the information displayed, but with the whiteboard staff (typically nurses') need to use a dry-erase marker to keep it up to date. There is the potential to link the patient portal with the current electronic health record system employed by the hospital. For example, if the patient weight is electronically documented in the emergency department and the patient is then admitted to an inpatient pediatric unit, the weight could automatically flow onto the portal system from the electronic charting in the emergency department. This would provide

an integrated flow of data instead of a nurse having to go and manually update a whiteboard in each patient room on admission.

Another way information could flow into the patient portal is by incorporating some of the information that is already included on the “status board”. All pediatric departments now utilize an electronic status board that display information back to HCPs or the general public depending on setting. The information available for viewing on the status board varies by department and practitioners but common data includes the HCP caring for the patient, patient diagnosis, and completed test results. Most of the information is directly inputted by HCPs already and by incorporating the status board information applicable to the portal this would allow for an integrated flow of information, which could potentially result in better acceptance by the nursing staff. Another way health information could seamlessly flow in to the portal is through the requisitioning of tests that already occur electronically. For example, if a radiology test is ordered, electronically requisitioned, it would then flow to the status board, alerting HCPs that radiology orders are waiting. This same data could be tethered to the portal as an upcoming test with an expected time similar to the status board. While determining exactly how the link of information will occur is beyond this thesis, it is important to highlight that the RNs emphasize how critical this will be to potential acceptance of the patient portal technology.

The larger ongoing research project has already anticipated the need for an integrated approach to the flow of data between the current electronic health record system and the patient portal and thus have an informational technology leadership member as part of the larger research team. By incorporating the patient portal with the current electronic system right from the development stage, there is the potential to avoid having untethered systems from the start, which can create further implementation challenges (Avdagovska et al., 2020). Lack of

integration of data was also a challenge noted in the literature review (Bush et al., 2017; King et al., 2017). By minimizing the amount of data RNs need to input in the patient portal themselves, this has the potential to positively impact their workflow and attitudes when the portal is trialed.

A concern the RNs raised is about the potential for the patient portal to increase patient and caregiver anxiety by seeing results and information without understanding the context for the specific patient. The nurses' thought a potential stopgap could be ensuring appropriate teaching links or documents are provided on the patient portal. Currently, institutional patient teaching information is already available electronically for nurses and printed off upon discharge, so it could be worthwhile to determine if the those teaching tools could be linked to the patient portal. Another option could be to link in reputable pediatric teaching websites as practitioners already refer patients to those or print the information off for families. Furthermore, this would address the opportunity for using the portal as a teaching tool which the RNs feel is beneficial and important. Another way to address the concern of test result anxiety could be to release the results at a certain time. For example, the results could be available on the portal to view at the start of daily physician rounds, when the healthcare team comes to review the patient. This provides the HCPs the opportunity to explain the results as the patients and families view them on the portal system. Interestingly, the literature review findings showed that the release of test results during hospitalization created more trepidation for HCPs prior to implementation than once actually deployed and in use (Kelly et al., 2017; Runaas et al., 2017). Ultimately focusing communication to the HCPs about the timing and reasoning for the release of test results will need to be addressed during the subsequent portal trial.

4.2.2. Expectations.

Clear expectations for both the HCPs and the patients and family members will need to be established right from the initial implementation stage. The RNs in this study voiced the importance of knowing their roles and expectations when the new portal is rolled-out. This finding is similar to other studies that were included in the literature review, except that the nurses' in this study provided recommendations that can be applied. Communication about the implementation of the inpatient portal system will need to be widely disseminated to pediatric stakeholders such as RNs, physicians, educators, and managers (see Figure 2). This could include clearly stating when the information will be uploaded to the portal such as blood work results, and when parents can expect answers to questions they have about the functionality of the portal. Clearly defining and communicating what information needs to be inputted into the portal system by a nurse or another HCP and what is automatically loaded from the current electronic system will be important. Trouble shooting guides and who to call for technology help will also be helpful to establish from the beginning.

Furthermore, the research team and nursing leadership on the unit implementing the portal must take in to account the time for staff to become familiar and allow for the peaks and valleys that accompany the implementation and continued use. When the portal is trialed the larger ongoing research team has already considered having a dedicated member of the team on the floor and available to staff and parents. Having a member of the research team easy to contact is a process I have also seen work well in my current practice with other research projects. This is similar to the request by RNs in the study for super-users or a "go-to" person. The utilization of super-users is proving to be effective in other technology health research (Kaye, 2017). By having a member of the research team be the "go-to" not only for study

purposes, but also be someone who is familiar with the portal and its functionalities could be very helpful and well received during the trial phase.

4.3. Implications for Nursing Practice, Education, and Research

Technology is advancing into nursing practice more and more every day. From patient portals, electronic health records, non-invasive monitoring measurement devices, standardized medication delivery systems, and virtual telehealth visits. The resulting analysis of the study exploring pediatric RNs perspectives of technology and patient care shows that RNs are optimistic and anticipating positive outcomes when a patient portal is implemented during a child's hospital stay. However, an intriguing result is emerging from the nurses' previous experiences with technology and patient care: Is it the cumulative effect of all the technology, not just each individual piece, that is impacting the RNs practice. Past research has generally focused on the total impact of technology in units considered high use, such as the intensive care unit (ICU) (Bagherian, Sabzevari, Mirzaei, & Ravari, 2017; Tunlind, Granstrom, & Engstrom, 2015) with a more recent literature review examining the impact of digital health technologies throughout nursing practice (Risling & Low, 2019). Additionally, a statement by the Registered Nurses' Association of Ontario (RNAO) (RNAO & AMS Healthcare, 2020) highlights that artificial intelligence and digital health technologies are being deployed in various nursing settings from hospital, outpatient, public health, and long-term care. Therefore, the impact of all digital health technology not just in the pediatric ICU and neonatal ICU, but also the general inpatient pediatric unit and the pediatric emergency department needs to be considered. Furthermore, what does this ultimately mean for the future of nursing practice?

4.3.1. The caring profession

Providing patient care not in spite of all the technology but as a care triad can be considered. The care triad of nursing, patient, and technology is a way for future research to consider the implications of digital health technology and providing nursing care. This means we need to consider how the cumulative effect of all digital health technologies impacts RNs ability to provide safe, effective, holistic, and timely patient care. With the application of UCD approaches we can potentially close the gap on the paucity of digital health research involving RNs (Risling & Low, 2019; Risling & Risling, 2020; RNAO & AMS Healthcare, 2020). By factoring in nurses' perspectives from the initial development phase and through to continued use of new technology there is potential to improve its acceptance. Nurses are critical thinkers who need to be able to take the context of the patient when providing care. As reported by participants in the completed study, the implementation of digital technologies with increased monitoring and data collection abilities means there is ultimately more information nurses have to document and interpret. This may mean that critical thinking is more important than ever because the digital technology is not replacing the RN's ability understand the context of the patient and create meaningful connections, but is instead part of nursing care. However, this can create challenges in how nurses view and provide care.

The professional appearance of being on electronic devices to chart and provide care is an aspect of technology that nurses are grappling with. The Canadian Nurses Association (CNA) (2017) updated their position statement on *Nursing Informatics* to provide recommendations for RNs and technology. The CNA endorses the use of technology that is patient centered and recommends RNs be competent in health information technology. However, this can be challenging for experienced nurses as there has been a rapid increase of digital health

technologies into nursing practice (RNAO & AMS Healthcare, 2020) and this can create difficulties for nurses to stay up to date with all the changes. The nurses' participating in the completed study found it particularly challenging to stay competent in technology that is infrequently used. If a technology is not utilized frequently in practice or to the full potential it creates trepidation for the nurse when they need to utilize it again. Too often this, nursing leadership often provides work standards and quick use guides of the technology, but it can still create anxiety for staff when they are not as familiar with it. Even though staying competent in health technology is part of professional nursing practice, appropriate and continued support by nursing leadership is necessary for continued long-term use (Kaye, 2017; RNAO & AMS Healthcare, 2020).

4.3.2. Nursing leadership

Nursing leadership and management all play a role in the transition of new technology for inpatient hospital departments and will be important in new portal technology roll-out. Consideration for the potential impact of the new technology, such as a patient portal, and timing may need to be factored into staffing and training time. Communication created by the research team can be provided to the nursing leadership staff who can help with the dissemination to RNs and other practitioners. Nurses and HCPs enjoy being part of the research process and RNs are optimistic about the potential benefits of portal use during a child's hospitalization, which is being echoed by adult nurses for their patients during a hospital stay (Hoonakker et al., 2019; Risling et al., 2019). Interestingly, in the Hoonakker et al. (2019) study, nursing leaders such as managers were the practitioners who were most optimistic in a portal implementation. Therefore, it will be critical for unit managers and educators to support nurses for continued long-term use.

Ultimately, nurses' previous experiences with health technology implementation in their department influences how they perceive new technology, such as a patient portal. This will be an important consideration for unit leaders to consider in any new digital health technology deployment. Through the analysis of data on RN's views of technology and patient care, several recommendations can be made to guide nurse educators and managers in improving the new use of technology. Hopefully, this will result in better continued long term use, which is an area that future nursing research can focus on.

The first recommendation is to provide the purpose for the introduction of the new technology. While this sounds simple, nurses and other HCPs need to know why the new digital health technology is being deployed otherwise low uptake may occur (King et al., 2017; RNAO & AMS Healthcare, 2020). When the patient portal is trialed on a pediatric inpatient unit, this can be accomplished by having the research team disseminate a quick guide to staff and unit leaders. In the hospital where the participating RNs work, most departments start the day shift with a "huddle". The huddle can be a place where the research team provides a quick introduction, as this has proved useful in another study (Risling et al., 2019). Nursing leaders can utilize other communication techniques such as placing handouts on communication boards or electronic codes for staff to review on their own time. Providing staff with quick-read resources has been one method units have used in current practice to keep staff informed when information is changing rapidly during the pandemic. The reason for implementing new technology can also be relayed through updates such as emails or staff meetings. Using multiple communication techniques is important to reach as many staff as possible. By providing nursing staff the details for a new health technology change such as a patient portal, there is the potential to improve

continued long term use (Kaye, 2017; Kelly et al., 2017; Risling et al., 2019; Risling & Low, 2019).

Once a new digital health technology is deployed gathering feedback from the end-user, such as RNs, is important. Involving the end-users in the research process is becoming more common and can improve the acceptance and use of new health technology (Risling & Risling, 2020; Tang et al., 2018). By involving the bedside RNs who maybe impacted by the new portal technology being developed, this allows the research team the ability to build a portal that works well for practitioners as well as patients and family members. This UCD approach can be extrapolated and utilized by unit leaders with new technology implementation, even if not part of a research project. Therefore, the second recommendation for new health technology use is continuing to gather feedback from the nursing staff. This can be done through formal methods such as feedback forms and quality improvement leaders, or more informal processes by just talking with the nurses and gathering their input. Learning what works well and what challenges the nurses are facing can help the unit leadership determine how to adjust and get the best use of the new digital technology being used.

With continued use of new technology, the RNs who participated in the study reported needing to know what the outcomes of the new health technology achieved. Thus, the third recommendation is to provide frequent updates on the successes and challenges of the newly implemented technology. The “smart” intravenous infusion pumps were frequently cited as frustrating new technology. While the RNs were somewhat aware of the decision to use the intravenous pumps for improved patient safety, they were still unsure if the pumps were actually safer. Therefore, communicating to the nurses exactly how the pumps are safer, is important. As well, the RNs in the study, struggled with infusion pumps taking more time than they were used

to as it required the nurses to input more information. In the end, nursing leadership needs to take time and communicate the successes, challenges, and continue to support the use of technology that may take a bit longer but is safer for patient care. Furthermore, when the patient portal is trialed it will be important to communicate details about how it is impacting families as well as nursing practice.

4.3.3. Education programs

The rapid increase in digital health technologies can be challenging for nurses to feel they are providing holistic care, which is a cornerstone of the nursing profession. Incorporating technology and the art of caring needs to occur right at the beginning of nursing baccalaureate degree program. While there are often opportunities through lab and simulation to use and practice the technology, preparing new graduate nurses for the reality of ever-changing and increasing technology will be helpful for transition to practice. Currently most nursing students who complete their final practicums in the hospital do not get to practice electronic charting unless their final practicum is in a department that uses electronic charting. However, with the recent move to a new Children's Hospital all pediatric departments are using an electronic status board and will eventually be utilizing electronic documentation. Collaboration between the university and health authority could look to optimize the training of nursing students and how to incorporate the EHR program into the undergraduate nursing education.

This may prove timely as the province has recently amalgamated regional health authorities to a single provincial health authority. Therefore, there will be more provincial similarity in digital health technology used by nursing staff. Even though the portal technology being proposed by the research team is still in development, educating nurses about different means to connect families to their child's care can still occur. One example could be to use the

provincial health portal as a learning platform for the ways in which portals can connect patients and families with care. Due to the rapid increase in digital health technologies, education of nursing students and bedside nurses' needs to include not only the practical elements of the technology but also how it impacts the art of nursing, developing therapeutic relationships, and patient centered care.

4.3.4. Nursing research

This study fills an important gap in pediatric RNs perspectives of new technology implementation and patient portals. The results of the study indicate that RNs are generally optimistic about the development of portal technology but still have suggestions for improving the implementation of technology based on their past experiences. By applying these findings to the larger ongoing study, potential obstacles can be avoided. This is in keeping with the benefits of involving the end-users in the research process (Kaye, 2017; Risling et al., 2019; Risling & Risling, 2020). However, there is still an opportunity to continue to learn more about portal technology and impact on bedside RNs.

Future research should focus on pediatric RNs perspectives of patient portal implementation during a child's hospitalization. Early research from the literature review is indicating that differences are beginning to emerge between the outpatient clinic setting and the inpatient units in the pediatric population. As well, with the rapid increase in digital health technologies, such as patient portals, understanding the shift in the art of nursing practice is important. While there is still a need to study individual technology implementation an opportunity is arising to research the impact of all the technology in pediatric nurses practice.

4.4. Factors Influencing the Study

Conducting qualitative individual interviews was an important part of gaining the pediatric RN's perspectives. Due to the nature of inpatient nursing work and operational approval requirements these interviews needed to be conducted outside of work time. This could have contributed to staff self opting out of the study because they could not afford to take time during their non-scheduled work days. However, the use of ID (Thorne, 2016) was purposeful so we could consider the outlier – in this case the RN who may have different or opposing views offered by participants. With the participants who completed individual interviews there was varying opinions and the authors could extrapolate the opposite views. Offering small tokens of appreciation for participation is considered within the ethical guidelines and it was important to show respect and value for the RN's time.

Another potential contributing factor was the upcoming move the pediatric departments were preparing for. The RNs in the study had already been anticipating and preparing for major practice changes which could have lead to their willingness to be more open to new technology, like a patient portal. Furthermore, this research is part of a larger ongoing study and RNs enjoyed being part of all research conducted by the team and the feedback from others could have potentially informed participants in my study.

4.5. Researcher's Reflections

As a novice researcher tackling the task of having clinical RNs as participants was worth the time and challenges encountered in recruitment. The ID methodology (Thorne, 2016) suited my own abilities as I could continue to reflect on my pediatric nursing practice and how this impacted my thesis research. My experience as a pediatric RN and working in multiple pediatric departments throughout my career meant I knew the various departments where the participants

worked. The RNs appeared to enjoy engaging with a researcher who not only understood nursing practice, but could relate to the successes and challenges described throughout the study.

I remember feeling concerned about the length of time my interviews were taking. This was where not only constant comparative analysis came in very helpful, but also staying in contact with my supervisor. My supervisor's experience and expertise with my topic and chosen methodology was helpful because we reviewed transcripts together. Through this analysis it became clear that there was significant quality in the participants responses. As I reflect back on the whole journey I am wondering if my own experience was helpful in being a nurse researching nurses. I understood topics and technology as I myself had worked with them. The participants didn't have to spend time explaining simple nursing process or procedures as there was an inherent understanding. Due to the this, I could delve into the more fulsome questions right off the start, which allowed for shorter but meaningful responses. Another important consideration is that RNs are very articulate and are used to being able to communicate efficiently. The nurses in this study often considered the benefits and challenges in their own response without the need for prompting. This may speak to the nature of RNs who are critical thinkers and who are used to examining the "bigger picture". However, I made sure to clarify or ask the participants to expand their answers to ensure the objectives of the study were being achieved.

Being part of a larger researcher team has been an eye opening and wonderful experience. So much of health care is impacted by and for nursing and as such, we need to continue to have nurse researchers who explore complex clinical issues. Being able to see how a multi-person, multi-year research project is started and continues, has been an invaluable experience. In the middle of my data analysis I had the opportunity to go to an interpretive

description workshop hosted by Sally Thorne. This was not only helpful but inspiring and reinforced that I had chosen the appropriate methodology for my research project. I share my insights to encourage other researchers who are considering having RNs as participants, as a great research opportunity. Furthermore, there is still a place for qualitative research in time sensitive clinical environments, whereby shorter interview times provide important perspectives. Another consideration is that future grants should account for remunerating RNs because they are an important part of research and their time needs to be taken into consideration. As well, this has the potential to increase recruitment numbers and gain valuable insight.

4.6. Conclusion

Technology is pervading all aspects of nursing practice and RNs are considering how the impact of health technology impacts the art and science of nursing. The rapid use of digital technologies from patient portals and EHRs, to virtual care visits, are impacting nurses however, RNs still lack a voice in the existing literature (RNAO & AMS Healthcare, 2020). It was worth the effort recruiting bedside RNs to my research to explore their perspectives of a new patient portal and the potential impact on their nursing practice. The nurses in this study were generally optimistic about having the new portal technology for families to use during a child's hospitalization. Learning from the RNs' previous experiences with digital health technology implementation can help build a user-friendly portal system for patients and practitioners. The RNs in my study expressed that they enjoyed being part of the research process and having the ability to have input in the design of the development of the portal. This is in keeping with UCD research and there is potential to shape pediatric portal use during hospitalization.

Finally, it is important to keep in mind that there is a cumulative effect of all the digital health technology being implemented for bedside nurses. This is changing the way RNs view the

care they provide to children and their family members. Front-line staff want to be involved in research and see their voices being heard to make changes positively to impact their practice and ultimately improve patient safety and family-centered care.

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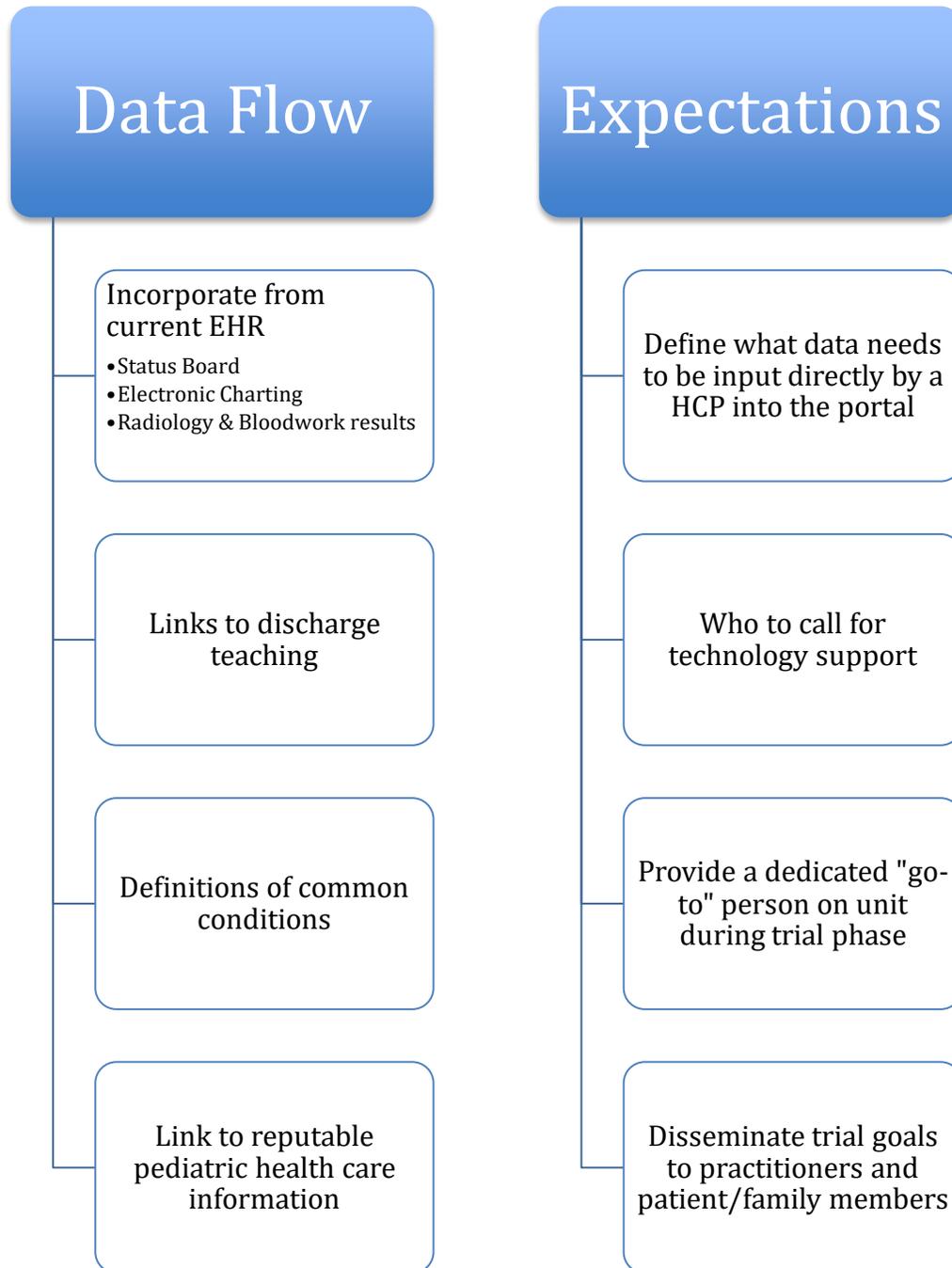
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Figure 1: Summary of recommendations to larger ongoing study

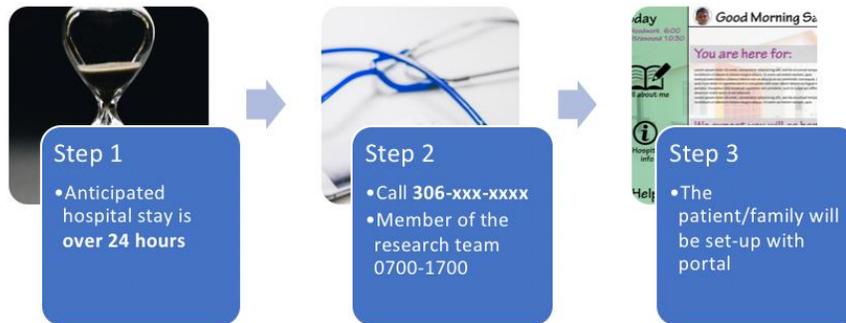


EHR=electronic health record
HCP=health care provider

Figure 2: Sample communication tool for portal trial

Patient Portal Trial on Pediatric Inpatient Unit

A patient portal allows caregivers to electronically connect with care during a hospital stay. If your patient's hospital stay is anticipated to be over 24 hours, let our team know so they can be offered access to the portal system.



FAQ's

1. When will the "go-to" person be available?
 - The person will be on the unit Monday afternoons to connect with new and existing patients
 - Reachable via 306-XXX-XXXX Monday – Thursday -0700-1700 and will come in on request to sign up new patients
2. When will test results such as labs and radiology, be available on the portal?
 - The results will be available for viewing on the portal at _____
 - There are links built into the portal for explanations of the test being completed
3. If the patient/family is unable to log in?
 - Contact "go-to person"
4. If there are issues with the portal function?
 - Contact "go-to person"
5. I have suggestions
 - That's great! Please fill out the suggestion form or attend a quick session on the following dates: ____ or ____ or ____

Thank you for helping connect with care!

