

Registered Nurse Practice and
Information Flow in Long-term Care Nursing Homes

by

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MBA, University of Victoria, 2010
BS, SooChow University, 1984

Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of

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Abstract

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Little is known regarding registered nurse (RN) information management practice in long-term care (LTC) settings. This study identifies LTC RNs' information management practice and needs, which are important for designing and implementing health information technology (HIT) in LTC settings.

Methods: This descriptive qualitative study combines direct observations and semi-structured interviews, conducted at Alberta's LTC facilities between May 2014 and August 2015. The constant comparative method of joint coding was used for data analysis.

Results: Nine RNs from six nursing homes participated in the study. Based on the RNs' existing information management system requirements, a graphic information flow model was constructed.

Conclusion: This baseline study identified key components of LTC RNs' information management system. The information flow model may assist HIT developers with future design and development of HIT solutions for LTCs, serve as a communication tool between RNs and developers to refine requirements and support further LTC HIT research.

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Chapter 1 Introduction

1.1 Motivation

Long-term care (LTC) plays an important role for population health in a healthcare service delivery system. LTC sometimes refers to residential care or complex care, where care is provided to residents (such as seniors and people with disabilities) who have a limited ability to direct their own care and require 24-hour nursing services in facility-based care settings (BC Health Coalition, 2010). In an integrated care approach, facility-based LTC is one part of a continuum of care, “involving an integrated system of care that guides and tracks patient over time through a comprehensive array of health services spanning all levels of intensity of care” (Evashwick, 1989, p.30). Thus, it is important for LTC services to focus on care consistency with effective interventions and care collaboration throughout a patient journey in order to contribute to a comprehensive and responsive health system.

Currently, LTC services face substantial population health challenges with increasing demands for high quality services and capacity. The Canadian population is aging and living longer than past generations, therefore, more care needed. According to a Statistics Canada’s report, 7.1% of the almost 5 million seniors age 65 and older live in care facilities and the proportion of these seniors will increase to approximately one-quarter (25%) of the population over the next few decades (Statistics Canada, 2011). Additionally, residents living in LTC facilities are facing significantly greater needs than before (OLTCA, 2014). The average age of nursing home residents is 85 years old. Between 2009 and 2014, there was an 8.5% increase in

the rate of chronic conditions among LTC residents, and over 93% of the residents suffered from two or more chronic conditions (CIHI, 2009; CIHI, 2013). Multiple chronic diseases and problems with mobility, memory and incontinence are common challenges in residents. As a result, residents are frequently transferred between different care settings (Lipszyc, 2012).

Care collaboration becomes an essential aspect of nursing care in LTC settings. Frontline Registered Nurses (RNs) play leadership roles in care collaboration and they face increasing challenges with clinical information communication in a timely manner because of the limitation of technology tools and provider-to-RN communication. Evidently, handwriting still is a common communication method for nurses to manage information in many nursing homes that slows down work processes; sometimes extra time is required in order to deal with illegible handwriting (Lee, 2009; Roop, 2006).

Along with a patient journey, there is a rapid rise in the need for efficient clinical information sharing across all care settings. Information communication accounts for a large part of care providers' everyday practice to incorporate information interactions in varying care contexts. While the use of health information technology (HIT), such as electronic medical record (EMR) has become increasingly common in acute care settings, LTC sector lags further behind (CHF, 2008; Miller, 2009). By recognizing information disconnection between acute care and LTC as a significant barrier for care collaboration, more HIT solutions have been introduced into LTC settings globally. In Canada, the federal and many provincial governments make every effort working towards enabling health information sharing among all care settings, and LTC has

been included in numerous large scale health information technology initiatives and implementation plans (AHS, 2013; eHealth Ontario, 2013).

Clinical information systems are emerging to involve LTC in order to support continuum of care. Meanwhile, there has also been increasing concerns about the effectiveness of current information technology solutions used in LTC facilities. Challenges in using software to leverage the efficiency of clinical processes were repeatedly reported in some outcome evaluation studies after implementation of the new automated systems in some LTC facilities (Georgiou, 2013; Or, 2014; Yu, 2013).

Clinical processes may be better facilitated by improved design in technology tools. Using a user-focused design approach to integrate users' specific needs during the design and implementation phases may increase users' satisfaction. Nevertheless, up to today, frontline RN (or those RNs who provide direct care) focused requirement studies have not been conducted in Canadian LTC settings; thus, an end-to-end RNs' information flow is unknown.

Information flow analysis has been a promising technique used to gather user requirements at the early stage for information system or application development and design. In a system design and development life cycle (SDLC), an original structured approach is to create an existing system model, and then derive requirements from the existing system model (Satzinger, et al. 2012). During users' requirement analysis, details of business processes and daily operations can be learned and information flows can be modeled to align with business processes, based on users' requirements.

Investigation at users' workplace is considered a practical approach to gather user requirements in order to build a better understanding for operation needs. However, LTC RNs' requirements have not been specified. It is unclear what information RNs required and how these information flow. Thus, frontline RN-users are the study focus, and this investigation is an attempt to understand RNs' perspectives of their requirements.

1.2 Operational Definition

Operational definitions provide detailed descriptions of the concepts and terms by the way they are applied to this study. These descriptions are tied to the context and will provide common and consistent interpretation of meanings under the study.

1.2.1 Long-Term Care

Canadian Healthcare Association (CHA) defines long-term care (LTC) as a facility-based nursing care setting, where care is typically delivered over an extended period of time to residents with complex health needs and who are unable to remain at home or in a supportive living environment (CHA, 2009). Other terms are used across Canada such as nursing homes, residential care facilities, continuing care facilities, special care homes, personal care homes, and long-term care homes.

Because of demographic pressures characterized by more complex physical and mental health issues and increased resident acuteness, LTC has become an increasingly important care setting in continuum care (Laporte & Valdmanis, 2005; Wilson & Truman, 2004; CHA, 2009, Ontario Health Coalition, 2008). With seniors as the fastest-growing segment of the population, the increasing demand for LTC services is experienced in both urban and rural regions of Canada (Alzheimer Society of Canada, 2010).

LTC is highly regulated in Canada. It is a provincial responsibility and falls under each province's regulatory framework (Desimini, 2010). Provincial level governments develop their own strategies, legislative framework, and guidelines to determine the design and administration of LTC and the broader continuing care continuum services to address the needs of the aging population. In some jurisdictions, governments have further delegated the authority to deliver facility-based LTC to regional health authorities, such as Alberta Health services (AHS) in Alberta.

According to CHA, on-site professional nursing services consist of care management and nursing treatments (2009). There are multiple levels of nursing staff working together to manage the wide range of residents' care needs in LTC (Brandburg, 2012). Nursing staff members work collaboratively to management resident care on a day to day basis. Care management activities may include nursing assessments, care planning, charting and reporting, and communication with the care team, residents, and families. Conversely, nursing treatments differ according to each resident's care plan. Common nursing treatments include medication administration, skin and wound care, tube feedings, ostomy care and ventilation assistance, and rehabilitation services.

For accountability and quality purposes, LTC performance and resident outcomes are monitored over time at both the national and provincial level. The Canadian Institute for Health Information (CIHI) operates a national reporting system, the Continuing Care Reporting System (CCRS), to collect clinical, administrative and financial data, as well as information of resident transitions amongst different care settings (CIHI, 2012). There are more than 1,000 LTC facilities from at least eight Canadian provinces or territories submit that reports to CIHI, including the province of Alberta.

1.2.2 Registered Nurse (RN) in LTC

About 10% of the total Canadian RN population plays a significant role in LTC facilities across Canada, where the resident-to-RN ratio is incredible high (CHA, 2013). Primarily, RNs play leadership roles in care management. They are responsible for developing a holistic care plan for each resident, coordinating care that a resident is to receive, and supervising other nursing staff members, such as Licensed Practical Nurses (LPNs) and Health Care Assistants (HCAs) (Brandburg, 2012).

Care collaboration is an importation aspect for RNs to manage residents' complex health conditions. RNs must cooperate with physicians, social workers, dieticians, speech language pathologists, physical therapists (PT), occupational therapists (OT), case managers, pharmacists, respiratory therapists, and other members of the interdisciplinary team, such as a mix of LPNs and HCAs. By working with a multidisciplinary care team, RNs' practices include extensive

communication, and thus have significant needs for consistent clinical information because LTC facilities have little provider-to-RN communication (Lipszyc, 2012; Strain, et al., 2011).

RNs may perform management duties other than nursing skills, depending on the size of facility and the numbers of RNs and LPNs. This study focuses exclusively on those RNs' (or frontline RNs) who provide direct care; therefore, their major purpose of information management is for resident care. RNs' practical nursing skills may include intravenous therapy, enteral tube feedings, wound care, range-of-motion exercises, indwelling urinary catheter care, respiratory therapy, cardiopulmonary resuscitation (CPR), ostomy care, tracheostomy care, management of stable ventilators, and medication administration. Moreover, all nurses provide education, help apply adaptive equipment, and document all care that has been provided.

1.2.3 Long-Term Care in Alberta

In Alberta, LTC is a section of Continuing Care. Continuing Care covers home care, supportive living, and facility living, and LTC refers to the facility living. Facility-based LTC settings refer to either a nursing home or an auxiliary hospital (Alberta Government, 2015, p. iii-iv). Defined by the Government of Alberta, "a nursing home is a facility designated for the provision of nursing home care. Nursing home care means basic care and care provided under an approved program ... An auxiliary hospital is a facility designated for the provision of medical services to in-patients who have long-term or chronic illnesses, diseases or infirmities". In this study, nursing homes or LTC facilities are used exchangeable and both refer to facility-based LTC settings.

Alberta Health services (AHS) works with provincial government for the delivery of facility-based LTC. As reported by AHS at Aug 5, 2015, the total numbers of LTC beds was 14,523, including nursing homes (9,002) and auxiliary hospital (5,521) at 176 sites in 5 zones across the province (AHS index, 2015). According to Strain (2011), the size of LTC facilities range from 20 to 502 beds, with an average of 134 beds. In addition, 98% of these facilities have twenty-four hours a day, seven days a week 24 hours a day onsite RN coverage. Furthermore, the LTC service delivery is approached through AHS in cooperation with non-profit organizations and for-profit organizations, such as Covenant Health (Alberta), a Catholic health care provider in 11 communities across Alberta (CH, 2015).

AHS provides patient assessments based on the needs of LTC. When a patient appears to have complex and unpredictable medical needs requiring a RN to be on site 24/7, the patient will be deemed to have met the criteria to receive long-term care in a LTC facility where the patient will be called a “resident” instead of “patient” in nursing homes.

There is no surprise that residents in Alberta’s LTC facilities are increasingly becoming characterized by complex physical and mental health issues. A recent epidemiological study conducted in Alberta reported that the average age of residents was 84.9; the average number of disease diagnosis per resident was 5.2; 71% of LTC residents have a diagnosis of dementia; and the average number of regularly prescribed medications per resident was 7.9 (Strain 2011).

As mentioned previously, Alberta’s’ LTC facilities submit performance reports to CIHA as well as to AHS. A reporting tool, Resident Assessment Instrument–Minimum Data Set (RAI-

MDS), a comprehensive and standardized nursing assessment tool that allows LTC clinicians or providers (i.e. nurses) to collect clinical data at the point of care and evaluate care needs to guide care planning, was installed in LTC facilities for this purpose. It is frontline RNs' responsibility to submit reports regularly. However, Moffat (2010) found that the usefulness of the RAI-MDS is considerably varied and that it used mainly for administration purpose.

1.2.4 User Requirements

User requirements, in the context of information technology development, refer to the detailed descriptions about what users believe to be essential in an information system (Robertson, 2012). User requirements analysis is to explore, discover, understand, and communicate the requirements. As Hoffer (2011) pointed out, documenting user requirements is a foundational assignment in designing and developing an information system because the documents will provide a baseline for requirements determination and requirements structuring for use in both communication among stakeholders including designers and users, as well as for information system design and modification.

A set of user requirements are important for any software design and development project. During user requirements analysis, aspects influencing users' business operations such as users' work processes, communication methods, information management functional requirements, information needs and information flows can be discovered. In this study, function

requirements and information requirements are the focus because they are important for developing an information flow model.

1.2.5 Information Flow

As mentioned above, information flow is one of the important components in user requirements. A model refers to a graphic representation or a structure, as Checkland pointed out, modeling information flow is a systemic approach for gathering users' requirement because it tackles real-world situations in a structured way (Checkland, 2006). Information flow analysis for a specific user group will allow the analyst to develop a complete understanding of the practice in which information is utilized by users. Alternatively, an information flow model illustrates users' interactions to process information within an existing system.

Similarly, a nursing information flow model is a description of how information is processed through a nursing information management system in a specific care setting. The purpose of nursing information flow analysis is to specify the needs and use of information by nursing staff in performing their professional duties. As Rieder (1983) pointed out, to develop a nursing information flow model, analysts must first understand the nature of the particular care setting and the nurses' awareness of their information needs for performing nursing responsibilities. In other words, users' perspectives about what is needed are essential in nurse-users requirements analysis.

1.3 Study Purpose

The purpose of this thesis was to gain an understanding on LTC RNs' perspectives of needs for clinical information and information flows to support RNs' responsibilities of care collaboration and clinical decision making processes. To achieve the study purpose, a qualitative study design was established with frontline RNs as the center of this study investigation. Specific sets of requirements were developed based on RNs' care tasks and information management activities along with nursing processes. A set of requirements were then used to map an information flow model. Therefore, the objective of the study was to develop a constructive information flow model that can match nursing processes under RNs' practice scope in the context of Canadian collaborative LTC environments.

1.4 Research Question

This study focuses on RNs' requirements in Canadian LTC environments. Thus, the essential research question being addressed is: how does information flow to support RNs' information communication activities in current LTC settings? In pursuit of the research question, subset questions were sought: what are RNs' responsibilities and practices in relation to information management for resident care? How RNs work in the current working environments? What is the required information? How does the required information flow with nursing processes?

Chapter 2: Literature Review

2.1 Introduction

Health information technologies (HIT) are becoming required tools for continuous care across the health care sector. HIT adoption in long-term care (LTC) settings has lagged behind other care settings, such as acute care hospitals, but represents an increasing demand for enabling information sharing and communication for resident care collaboration. An LTC facility has an ever changing and diverse set of residents with a wide variety of care needs and expectations. However, information technology resources for nursing staff members who provide direct care are very limited.

HIT design and development for LTC use, such as electronic health records (EHR), faces significant challenges in relation to user acceptance for usefulness. In a recent study, conducted in Australia's nursing homes after an EHR implementation, Yu identified eight sets of unintended adverse consequences and the top two issues are "inability/difficulty in data entry and information retrieval" and "end-user resistance to using the system" (2013). Vogelsmeier stated that HIT adoption in LTC will change information processing flow, nursing care workflows and internal work processes (2008) and existing designs do not seem to fit into the context of LTC users' work environments and. Thus, better design approaches to target on LTC users' needs are required to optimize user experience.

Meeting users' requirements is critical to the success of a system development and usefulness. The successful compilation and execution of the implementation is dependent on a user requirements specification containing clear, concise and testable requirements. User-centered design requires a user-focused requirements analysis, an analysis based on users' information management activities and an understanding of the needs for information/data and streamlined informant processing flow from systematic point of view. An initiation of user requirements analysis requires a great deal of understanding for the practical needs of individual end-user or user groups' perspectives for technology solutions and information systems.

In general, both information flow analysis and information/data requirements are categorized into user requirements (end-user) in an information system development process. Gathering user requirements is the most important early stage initiative in a HIT project to ensure that design and development can be followed to meet users' needs before implementation (Coplan, 2011). User requirements are written documents, developed by business analysts from implementation project teams through working with end-users together. A baseline user requirements documents at an existing information management structure performs a basic level document to contain users' specific needs of information components and the information flow illustration within present system.

Specifically, information/data requirements should describe the need for data or information that users must have in a system; on the other hand, information flow processes should describe how the required data/information flows upstream and downstream in a system in order to support users' performance. Research has shown that information flow analysis is an

effective method used for understanding user perspectives towards needs regarding HIT design and implantation (Alexander, 2007; Bayley, 2005; Tang, 2007, 2009; Tariq, 2012; Unertl, 2009, 2013).

Understanding explicit users' needs is very important in health care settings because responsibilities for providing care are role specific to meet certain practice standards. It is important to make sure all user groups' needs in a system design are met. Nonetheless, individual user group will also have definite needs because no one analysis can fit all. Particular user groups, such as frontline registered nurses (RN), play a significant role in care collaborations working with both internal nursing staff as care leads and external care providers as care coordinators across various care settings (Alexander, 2014; Brandeis, 2007; Georgiou, 2013; Tariq2012; Taunton, 2004). It will be significant that their multifaceted information communication requirements are acknowledged and differentiated.

With the care leadership roles in LTC settings, RNs' acceptance and satisfaction are of the essence for a successful HIT adoption; however, there is limited research focusing on frontline RNs' requirements. This literature review determines the need of an investigation into LTC RNs' requirements and the need of a baseline of RNs' information flow model in Canadian LTC settings. The focus of this literature review is to address the importance and implications of an RN information flow model related to HIT design, implantation and research.

2.2 Methods

Five databases were searched for this literature review: Applied Science & Technology Index (EBSCO H.W. Wilson), Cumulative Index of Nursing and Allied Health Literature (CINAHL), with Full Text (EBSCO), MEDLINE with Full Text, Web of Science (ISI), and Google Scholar.

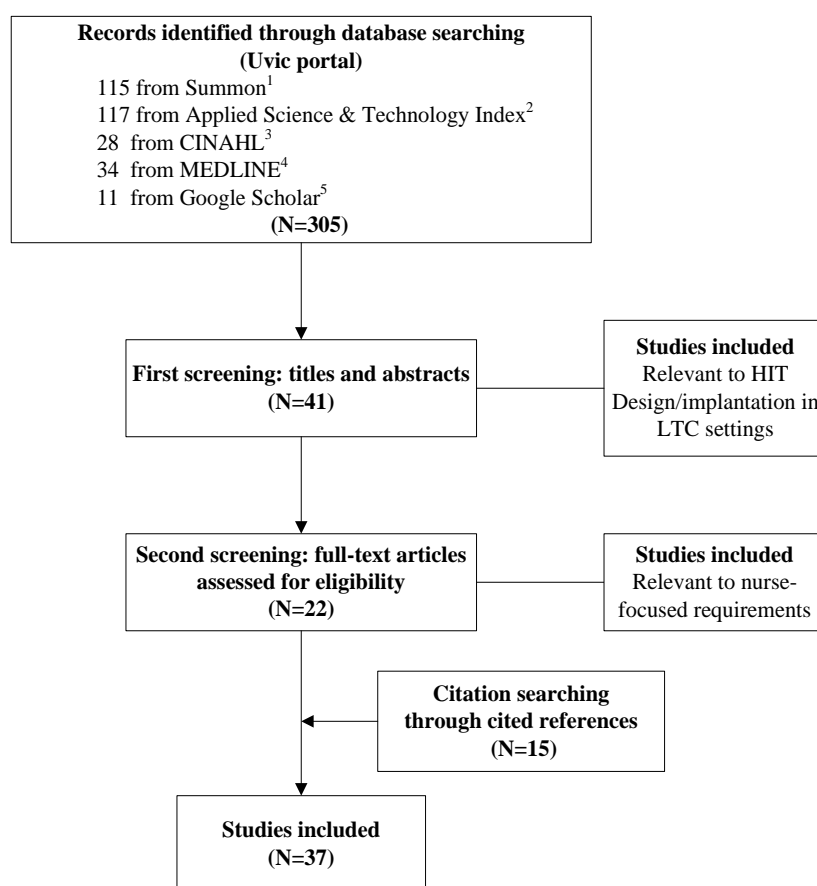
The keywords and related terms were set up based on MeSH-based search in PubMed to explore headings and specific terms with a focus on LTC RN Information Flow. The identified keywords and the related terms (or synonyms) were 1) health information technology (health information technology design or implementation or adoption or evaluation or utilization), 2) information flow (information processing flow), user requirements (needs), 3) nurse or nursing (RNs), and 4) Long-term care (long-term care facilities, nursing homes, skilled nursing facilities, and LTC).

The keywords and terms were applied through a combination searching method to the database searches. For example, keywords searching by using search operators of AND and OR, selecting a field (subject terms, title, abstract) to limit numbers and publication years, plus combining synonyms with OR and distinct concepts with AND, and subject heading searching for the study topic in Google Scholar. Additionally, citation searching through cited references was also applied. Searches were limited to publications in English from 2004 to 2015.

The electronic search of databases identified 305 articles at the initial search from the library portal of the University of Victoria. Based on the study focus, articles were screened

looking for studies in HIT implantation in LTC settings and related nurse-focused requirements in order to include the most relevant papers. After reviewing titles and abstracts, 41 of these articles were selected for full-text review. Following the review of the full text of these articles, 22 articles were selected for inclusion in this review. An additional 15 articles were identified based on reference lists of the included studies. The diagram below (Figure 1) was showed the search strategies and screenings for articles to be included in the study review.

Figure 1 Search Strategies for Literature Review



Note. database searching methods:

1. Summon (115): (health information technology) AND (information flow) AND (nurse or nursing) AND (user requirements) AND (Long-term care) AND (Nursing homes)

2. Applied Science & Technology Index (117): health information technology AND (nursing OR nurse) AND long-term care OR nursing homes AND user requirement AND information flow AND electronic medical records OR electronic health records (N=117)
3. Cumulative Index of Nursing and Allied Health Literature (CINAHL), with Full Text (EBSCO): TI (nursing OR nurse) AND AB (long-term care OR nursing homes) AND (electronic medical records OR electronic health records) OR health information technology AND user requirement AND information flow (N=22)
4. MEDLINE with Full Text: AB (nursing OR nurse) AND AB (long-term care OR nursing homes) AND AB (electronic medical records OR electronic health records) OR AB health information technology AND AB (user requirement AND information flow) (N=34)
5. Google Scholar: nurse "user requirement" "nursing homes" "long-term care" (N=11)

2.3 Results

2.3.1 Overview of Included Studies

Thirty-seven articles were included in this literature review. Among 37 included articles, there are 3 system reviews, 11 pre-design studies, 20 post-implementation evaluation studies, and 3 comparison studies through pre-and-post implementation phases. It is noted that research in relation to HIT design and implementation conducted in Canadian LTC settings was absent among the selected studies. The majority of the articles were performed in the United States of America, with a further seven from Australia, and one each from Hong Kong, Taiwan, Singapore and France.

Reviewing the evidence to date, HIT design for LTC use has significant impacts on nursing practice and care quality in both positive and negative ways (Cherry, 2011; Georgiou, 2013; Kruse, 2015; Or, 2014; Tariq, 2012; Yeh, 2009). The majority of studies identified the significance of careful consideration of nursing staff members' practice needs in the context of specific LTC settings due to the complexity of patient care needs. For example, Tariq (2012) and Georgiou (2013) both identified the complex nature of care collaborative work, the layers of

information exchange for the delivery of quality, and the diverse number of internal and external communication channels and artifacts in LTC settings. Specifically, Georgiou highlighted potential areas of communication dysfunction as a consequence of structural holes, resulting in information disconnections that can adversely affect the continuity and coordination of care for safety and quality, and emphasized the smart design for technology solutions for LTC use in order to address the barriers.

Moreover, Tariq argued that if any HIT system is conceptualized as linear, stepwise and unidirectional, the system will not be able to support the complex coordination requirements of the medication management tasks. This is due to the need for the future system to deal with temporal complexity, support the creation of shared information artefacts and their accessibility, and use synchronous communication channels for coordination.

Another common theme addressed throughout literature is the importance of user involvement in HIT development processes along with user requirements analysis, information process design and implementation. (Kruse, 2015; Or, 2014; Yeh 2009)

For example, Kruse (2015) concluded that clinical user perceptions are major factors in determining EHR adaptation in LTC facilities as user perceptions were found to be the most prevalent barriers of EHR acceptance. Rejecting an EHR may be due to a lack of understanding about the user benefits, lack of useful results from ineffective implementation of the system and failing to achieve expected benefits. All those types of perceptions influence EHR adoption and changes.

Or (2014) also stated that users' perceptions have been found to shape their attitudes toward the technology, eventually determining their adoption or non-adoption. End-users' early involvement could address some of the implementation challenges at the early stage of the implementation to ensure that users' needs are met by including them in the design process. Thus, Coplan recommended a "joint application design" for better HIT project outcome that end-user and IT team designed a computer system together at early stage of project initiation to define high level user requirements (2011). This approach is not only to support decision making when considering the end-users' preferred option, but also to clearly define the system goals for ensuring system quality. Particularly, ensuring direct end-user involvement will result in fewer system and workflow changes after implement.

Little is provided for an end-to-end frontline RN-focused information flow or RNs' requirements. However, researchers have explored information flow issues from several angles, including exploring users' perceptions about their needs for less interrupted information flow at pre-design phase and user experiences through post-implementation and comparison studies. Specifically, discussions associated with user requirements can be found in three main areas: 1) information process flow challenges in relation to nursing practice (Brandeis, 2007; Or, 2014; Tariq, 2014; Unertl, 2013; Vogelsmeier, 2008; Yu, 2013); 2) data and information necessities for information quality (Lindner, 2007; Munyisia, 2011; Nahm, 2006; Ranegger, 2015); 3) communication demands for care collaboration (Alexander, 2014; Cherry, 2011; Georgiou, 2013; Hustey, 2012; Nelson, 2005; Tariq, 2012; Yeh, 2009).

2.3.2 Information Flow Challenges

Information flow analysis has often been used with the goal of developing an in-depth understanding of users' practice and perspectives of needs in order to design context-appropriate informatics tools to streamline nursing care processes. A few studies argue that there are significant gaps between information processing flows and care activities after HIT implementations (Or, 2014; Unertl, 2013; Vogelsmeier, 2008). The interrupted information processes cause workarounds due to nursing staff members encounter difficulties collecting clinical information or being concerned that the new practice workflow may not be safe. Furthermore, workarounds can also be additional workload or work blocks that impact routine nursing practices for everyday care delivery; as a result, nursing staff members lack motivation to use the technology tools (Bayley 2005; Goh 2011; Halbesleben 2010; Vogelsmeier, 2008; Yeh, 2009; Yen 2012; Yu, 2013).

Kruse pointed out that users' perception is one of the most prevalent barriers in EHR adoption (2015). Despite the fact that all users have some common expectations such as user-friendly features, information quality and streamlined workflow (Michel-Verkerke, 2012; Tang, 2009; Unertl, 2013), individual user groups must have specific needs and expectations that can be significantly different between user groups, determined by clinical roles and responsibilities. Inadequate understanding of users and their work has long been recognized as a 'classic mistake' and one of the biggest points of failure in IT development projects. Nevertheless, this mistake continues to be observed because of vague requirements (Boehm, 1991; McConnell, 1996). Defining Clear and complete users' requirements are needed to produce a good solution.

HIT effectiveness can be improved by carrying out user-centered analysis through understanding the characteristics of an individual user group (Dellefield, 2008). An individual user group using HIT requires a different form of information processing according to duties and responsibilities to the context in which users use the solution (Yeh, 2009). Creating generalized requirements is risky as specific needs cannot be accurately defined. User differentiation enables precise user requirements analysis, which can minimize misunderstanding of users' perspectives for HIT solutions and increase adoption rates (Alexander, 2007; Bayley, 2005; Kruse 2015; Nelson, 2005; Tang, 2007, 2009, 2012; Unertl, 2009, 2013). Thus, it is essential to clarify explicitly who the users are in order to address users' needs distinctively.

2.3.3 RNs' Perspectives

RNs have an exceptional role in care collaboration in LTC settings. Frontline RNs' perspectives can be different in comparing the perspectives of acute care RNs in hospitals (Allen 2013, 2014; Hustey, 2012; Kruse, 2015; Nahm, 2006; Vogelsmeier, 2008; Yeh, 2009). Services in LTC are multifaceted, and focus on chronic disease management to prevent deterioration and promote resident independence (Bayley, 2005; Kruse, 2015), which is much different in many respects from traditional acute care services in terms of the goals of care (Georgiou, 2013; Ghorbel, 2013; Marquard, 2010; Tariq, 2012). Thus, LTC nursing is a specialty that involves helping residents who need extended care as they deal with chronic illnesses and disabilities. Collaborative care is organized by RNs through a wide range of coordination with multiple care providers across varied care settings to enable continuity between different levels of care and the

continuum of care, which are especially critical to LTC facilities during periods of care transition when coordination and communication must take place with other healthcare organizations outside of LTC to achieve the best health outcomes (Unertl, 2009).

RNs' need of comprehensive communication has been well addressed by the majority of reports since today's LTC residents and families require increased collaboration, communication and education (Alexander, 2014; Brandeis, 2007; Georgiou, 2013; Hustey, 2012; Nelson, 2005; Or, 2014; Rantz, 2010; Tariq2012;). Care collaboration requires extensive information sharing and communication, which can challenge the design process to achieve fewer interruptions in information flow processes. Georgiou stated that "one of the barriers to information communication technology (ICT) diffusion in aged care is the failure to cater for the complex and interdisciplinary requirements of the aged care environment" (2013, p. 770). RNs' information communication is facilitated by various information resources and information processes within existing information management structures (Georgiou, 2013; Marquard, 2010; Tariq2012; Yu, 2013).

Leading care cooperation, RNs need to perform hands-on information management activities, such as gathering clinical data, documenting clinical findings, and producing resident reports. For effective communication, RNs must make certain that clinical information/data is collected, accurately stored and ready to be retrieved, interpreted and communicated within the multidisciplinary team in order to accomplish and continue cooperative work (Unertl, 2009).

The availability of information/data is extremely important to support RNs' performance. In addition, information/data is also considered as information quality in an information system (Georgiou, 2013; Ranegger, 2015). Information quality indicates that each patient's information is complete, correct, up-to-date and accessible along with users' work processes and practices (Michel-Verkerke, 2012; Tang, 2009; Unertl, 2013).

However, poor information quality may have significant consequences of unwanted clinical outcomes due to communication failure (Unertl, 2009). A few studies have reported issues in relation to data incompleteness and clinical content inadequacy (Ranegger, 2015; Tariq, 2012, 2014; Yu, 2013). For example, Yu pointed out, when the required data was not stored in a clinical information system, nurses had a difficult time doing data entry and information retrieval, and in that case, they did not want to use the information system (2013). Information flow interruptions can be the consequence of data incompleteness and clinical content inadequacy (Alexander, 2008, 2014; Cherry, 2011; Munyisia, 2011; Nahm, 2006) leading to poor system usefulness, which was described as one of the significant "process-based barriers" to information system effectiveness (Or, 2014).

With limited use of HIT solutions, gathering information from various information sources has been a challenging task at current LTC settings. Some studies indicated that the physical aspects of workplace environment factors could have a direct effect on users' information flows because those factors may influence users' practice patterns in terms of information management activities, depending on where and how information is stored. Thus, environment factors should also be considered during a HIT design (Georgiou, 2013; Tariq, 2012;

Unertl, 2013). Unertl identified three key environmental factors to consider in designing a system for LTC, including media (paper-based, verbal, displayed and digital sources), common information space (shift change room, the nursing station, and the computer terminals) and personal information space (personal note, stickers).

Lack of consideration of physical environmental factors during HIT design and implementation may cause problems related to a mismatch between information processing flows and nurse practice (Tariq, 2014). For example, Tariq found that an electronic medication administration record (eMAR) system did not offer a start-to-end solution for nurses to manage medication when existing information sources were not taken into consideration. For example, the eMAR enabled doctors and pharmacists to enter information for medication management; nevertheless, many steps, including medication prescriptions by doctors and communication with the community pharmacists, were still performed manually using paper charts and fax machines, which caused interruptions in information flows. As a result, the eMAR had limited interactivity and inconsistency in data entry, which actually increased workload and workflow blocks.

In order to avoid these types of issues, a good understanding of RNs' physical environment features, primary information resources, and how they utilize information resources is needed.

2.4 Discussion

As RNs' information flow model in Canadian LTC settings is unknown, research is needed because while increasing HIT adoption for LTC has accelerated. While RNs take on leadership roles at all levels of care collaboration, their work demands effective HIT solutions to support information management activities for quality of care. Defining RNs as a specific user group and describing the clinical context in which HIT systems will be implemented may be useful in managing existing challenges related to poor user acceptance and clinical use of HIT.

RNs' needs for information/data and information flow are unclear while research effort on information flow analysis is limited. Instead of studying information flow, researchers are more likely to put efforts into workflow analysis and related user experiences at post-implementation stage. However, Whittenburg argued that information flow was the key in driving nursing workflow because the workflow only presents a pattern of the information process (2010).

Unertl recommended that pursuing information flow model approaches to design information flow at a user's practice setting would support specific users' needs (Bayley, 2005; Tang, 2007, 2009; Unertl, 2009). The advantages of the information flow analysis are user-centered approaches to guide the design and implementation because a mapping information flow process will enable comprehensive understanding of how users work under current working circumstances (Baudendistel, 2015; Tang, 2007; Tariq, 2014; Unertl, 2009). After recognizing nursing staff members' reluctant of using HIT solutions in the studied nursing homes, Yu (2013)

made specific suggestions to information technology designers and analysts that additional efforts should be put into investigating users and users' current work sites in order to gain an understanding of the clinical processes and users' requirements. In this manner, workflow processes may be designed with the aim of enabling the HIT function to comply with user needs and wants.

On the other hand, the lack of specific end-to-end RN investigation was also evident from this literature review. The HIT-related studies conducted in LTC settings mainly focused on single care process, such as medication administration process (Pierson 2007; Tariq, 2012; Vogelsmeier, 2008; Yeh, 2009), in which nurses and nursing staff were studied as a generalized user group. Although RNs have not been studied as a focal user group, the selected studies have led to an understanding of the phenomenon of information processes in specific LTC contexts and have supported the development of RN users' requirements.

A baseline study is necessary to fulfill the gaps in the lack of documentations of RNs' information flows including information/data needs in current LTC settings. Unlike previous studies with broad user focus, this study was tailored to a research designed to specific LTC frontline RNs by examining the RNs' perspectives of needs to map a baseline RNs' information flow model. The model will be based on RNs' responsibilities of information management undertakings with regard to information/data requirements within existing information resources and physical working environments. Thus, the goal of this investigation is to illustrate an end-to-end RNs' information flow for further research.

Chapter 3: Design and Methodology

3.1 Study Design

A qualitative research methodology was designed for this study. A systematic data collection was approached through observations of field settings because participant observation "combines participation in the lives of the people being studied with maintenance of a professional distance that allows adequate observation and recording of data" (Fetterman, 1998, p. 34-35). Qualitative data were collected through direct participant observations and semi-structured interviews of registered nurse (RN) participants in long-term care facilities (LTC) (Jackson & Verberg, 2007).

Collected data were analyzed through the constant comparative method (CCM). The CCM is based on the grounded theory methodological framework developed by Glaser & Strauss (1967) and Lincoln & Guba (1985), and the CCM was first called the clarification and codification of qualitative research methods in 1949 (Glaser & Strauss, 1967, p. 16).

The choice of CCM was influenced by the inductive data coding process that fit with the purpose of the study. The CCM has a process in which any newly collected data is compared with previous data that was collected in one or earlier from different participants, sites, and facilities. Thus, the constant comparisons forced the researcher to incorporate the diversity in the data because it is pertinent to cover all relevant data to aid analysis for better accuracy.

Additionally, Maykut & Morehouse suggested that the CCM method enable researchers to find

patterns in real world settings and present those patterns as they are (1994, p.18). Likewise, this study was set out a similar goal with a strategic intention to understand RNs' practice patterns in existing LTC settings.

By applying the CCM, data collection and analysis continued until data saturation where data started to repeat themselves and additional data did not change analytic results (Guest 2006; Patton, 1990). Because this investigation on RN information flow in LTC nursing homes was still in the beginning stage, an inductive data coding process was adopted to tactic the phenomena of RNs' information needs and information processing in the context of LTC settings.

Prior to the data collection, the design of this study received ethics approvals from the Human Research Ethics Boards, University of Victoria (Appendix A) and the Alberta's Community Health Committee (Appendix B).

The key processes were outlined below:

- 1) Facility selection and RN participant recruitment through invitation distribution to potential LTC facilities and RNs
- 2) Data collection through participant observations paired with participant interviews
- 3) Inductive data analysis

3.2 Recruitment

The recruitment process involved two key steps: facility selection and RN participant recruitment. To prepare for the recruitment, four documents were developed, including:

- 1) Facility Invitation Letter (Appendix D)
- 2) Participant Invitation Letter (Appendix E)
- 3) Consent Form for participant observation and interview (Appendix F)
- 4) Verbal Consent Script (Appendix G)

The purpose of the verbal consent script was to use with the residents in the case that they were receiving care during the observations. Additionally, the reading level was tested and adjusted to the reading level seven, which was considered to be appropriate for the participants to receive them (CLAD, 2014).

3.2.1 Facility Selection

This study was initiated in individual LTC nursing homes in Alberta. Publicly listed LTC facilities were considered for inclusion. The facility selection process was facilitated by levels of leadership support through two across province organizations, the Alberta Health Services (AHS) and the Covenant Health of Alberta (Appendix C). The Facility Invitation Letters were distributed to the potential faculties for seeking operation approvals and administration approvals, and the final six facilities were selected based on clinic accessibility and interested qualified RNs. The LTC facilities without RNs onsite were excluded from this study.

3.2.2 Participant Selection

Nine RN participants were recruited from nine different work sites in six nursing homes. The selection of eligible RN participants was based on the three criteria: 1) a current RN registration; 2) a RN who provides direct care in nursing homes in Alberta; 3) a willingness to volunteer as a participant in this study. Qualified RNs received the Participant Invitation Letter and then the potential participants contacted the researcher directly to express their interest in participating in the study. After a RN contacted the researcher about participation, a copy of the consent form was sent to the RN for review. Once the consent form was signed by the RN, an observation time was scheduled and the RN participant received a confirmation email of the observation timetable.

The Verbal Consent Script was used for residents if a RN participant had interactions with residents during the observation. In the case that residents became involved in the context of observing the RN participants, the researcher asked the RNs to inform the residents about this study and asked residents to provide verbal consent. There were no refusals from involved residents, and after receiving verbal consent, the researcher checked the agreement box on the Consent Script sheets prior the observations.

3.3 Direct Observation

A total of 18 hours of direct observations was taken place during the RN participants' shifts at their work sites. This observational sampling structure sought to fully represent the range of activities at different RN's shifts and different work sites (or floors or wings) so that the observations were conducted in different shift hours for better coverage around RN's activities. In detail, four morning shifts (7am - 3pm), four afternoon shift (3pm - 9pm), and one evening shift (9pm - 7am) were included in the observations. Onsite observations allowed observing the RNs' real working environments, but the selections were based on participants' availability and willingness to take part.

Before each observation session, the researcher provided a brief introduction about the study, answered any participant questions, and then obtained verbal consents made by any residents who were involved. An observation tool (Appendix I) was used to guide and record the observations and notes were taken throughout the observations.

During each observation session, the researcher remained in an unobtrusive location to observe and record the information management activities when the RNs were working and moving around the floor onsites. The activities performed by the RNs were recorded, guided by the observational form, and records contained RNs' activities such as accessing information resources (i.e. log on a computer), gathering information (i.e. take notes), interpreting information (i.e. review a lab report), discussing with other staff members (i.e. shift report) and the ways of handling information at various locations. For example, a collaborative care team conference meeting with multidisciplinary team members was observed and a field note was

taken regarding discussed subjects. Details in the field notes included the types of information or data to be checked, data sources and the locations, nursing tasks and nursing processes, clinical functions related to the activities, information hand-overs between different roles, and information media used to facilitate communication at the working sites. As time allowed, the researcher asked open-ended questions to clarify the observation findings. The questions were mainly associated with the observed tasks, such as practice standards and policies, information needed to support a decision making in a nursing process.

After each observation session, the research collected the blank paper-based forms from the nursing stations of the sites, led by the RNs. The collected forms offered the additional information on the nursing tasks and the task-related information that may not happened during the observations. The collected nursing task forms from individual RN's work site were listed and verified by the RN participants. The RN- related nursing tasks were marked by the RN participants.

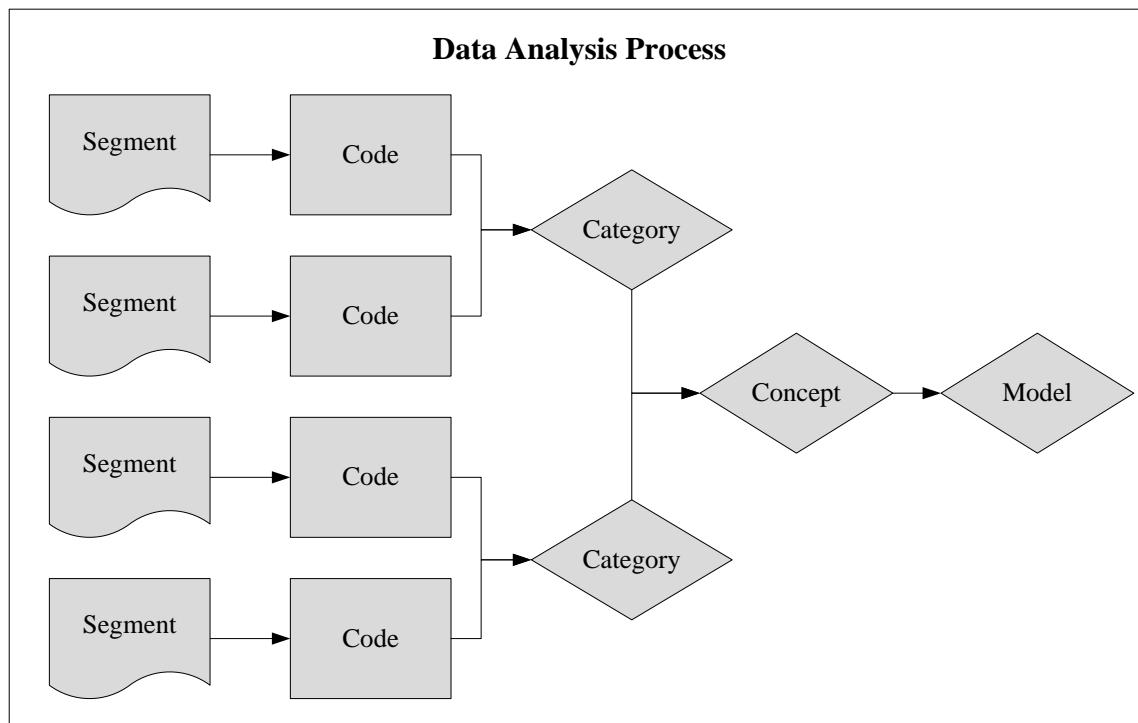
3.4 Semi-Structured Interviews

After the observation, each participant was interviewed for approximately 30 minutes. The purpose of interviews was to confirm observations, understand the information content required for carrying on the care activities, including information sharing and communication. The open-ended communication approach was used during the interviews, guided by the semi-structured interview questions (Appendix H). This semi-structured interview approach ensured a consistent process across all interviews.

All participants received both observations and interviews and the interviews were audiotaped and later transcribed for analysis. The interviews allowed the participants to provide explanations regarding the observational findings, their concerns in finding information and duplicated data entries, and challenges with communication at current practical environments, from their own experiences and practical perspectives.

3.5 Data Analysis

The inductive data analysis process included four steps: 1) breaking down of the collected data and manual coding of the data; 2) the creation of the categories; 3) forming concepts, and 4) establishing a model (Figure 2).

Figure 2 Data Analysis Process**Step 1: Segmentation and Coding**

Data were analyzed throughout data collection. Collected data from the field notes and interview records were entered in an MS Excel spreadsheet where the data were broken into distinct segments. This was done by highlighting key words and focusing on reasoning or questioning their meanings. When a segment has a distinctive meaning, a label was then attached to it. A label (a word or sentence) was selected logically to represent a meaningful idea, such as “nursing process” or “nursing task”. Recurrent data were extracted and merged while a new label was created whenever a new meaning of data was identified. An individual label was signed to a

specific code so that many codes were created (Glaser and Strauss, 1967). The codes were constantly compared on similarities, differences, and relationships and the similar codes were moved together and the related codes were reorganized into groups. According to Taylor and Bogdan, codes are used to develop and refine categories (1984, p.126) so that the next step of the data analysis is to identify categories.

Step 2: Categorization

Categories are mutually exclusive (Strauss & Corbin, 1990). According to Lincoln and Guba, the essential undertaking of categorizing is to bring codes together into a temporary category when codes relate to the same content...and “the process of constant comparison stimulates thought that leads to both descriptive and explanatory categories” (1985, p. 334-341). The temporary categories, therefore, were constantly compared and refined with new data throughout in three dimensions:

- 1) Comparison within a single observation and interview
- 2) Comparison between single observations and interviews from different sites
- 3) Comparison of observations and interviews from different facilities

Constant comparison is a continuous process throughout the data collection and analysis. In this process, new categories were created when there were differences in meaning with existing categories and the existing categories were refined. As a result, each category was distinctive and the code groups in a category were interconnected.

Step 3: Integration of Categories to Concepts

Concepts were formed from merging of the categories. The categories were reorganized at first according to the relationship between categories. After merging those close related categories, six concepts were formed to represent a collaborative structure of RNs' nursing processes that enclosed RNs' responsibilities. Each concept contained a set of nursing tasks and task-related information. Several information sets and sub sets were based on the unique content of information/data in each concept and required information and data were represented by identified information sets.

Step 4: Modeling

Modeling is a process of mapping a set of concepts into a visual representation. A diagram to summarize RNs' requirements was developed to show RNs' perspectives of required information management functions as well as the information/data for an overall view. Based on the identified RNs' requirements, a RNs' information flow model was displayed to set out requirements related to RNs' practice in common LTC situations. In this model, data sets were represented with rectangle boxes and each box contained a title and a set of data for a specific RNs' practice area. Each data set was also identified based on the common information contents in that practice area. The boxes were connected by navigation arrows and the arrows indicated the flow of information. The model described how information messages were passed between nursing processes and the layers of information needed by RNs.

Chapter 4: Results

This chapter summarizes the collected data and the key outcomes of the data analysis by setting out the results to describe aspects in relation to RNs' requirements in response to the study purpose. The results were based on the output of data analysis with gained understanding of RNs' perspectives and the activities regarding their information management at current practice settings. The key factors influencing the ways of information flows will be described in detail.

The first section began with the data analysis process description for applying the CCM. The second section outlined the result of RN participants' demographic characteristics to present the investigation focus. Information communication strategies were followed in section 3 to describe key communication methods regarding information communication at current RNs' practice. In section 4, different types of information spaces were defined to display physical enjoyments in relation to information management activities carried on by RNs at LTC settings. Information resources were introduced in section 5 to describe information capabilities and the services they provide towards RNs' need. As information management activities relies on information infrastructure, such as information resources and information spaces, section 6 listed the common information management activities.

Key functions required by RNs to perform those activates were defined on section 7. Section 8 categorized information content in relation to RNs' needs amount varied work processes. Information content was calibrated in section 9 through a process of differentiation on

the similarities and differences, and then the results were summarized to represent RNs' information requirements. Finally, an RNs' information flow model was illustrated in section 10, based on required information content.

4.1 CCM Data Analysis Process

The data analysis process consisted of displaying data, constant comparisons, and data evaluation. Collected data from the field notes, interview records, and collected template forms were entered in an MS Excel worksheet where the data were broken into distinct meaningful segments. A label was attached to represent a meaning for each segment and then each label was signed to a code. Whenever a new meaning of data was identified, a new label was created, so did a new code. Data, labels, and codes were constantly compared throughout data collection and data analysis on similarities, differences, and relationships between new data and earlier collected data, observations and interviews, different units and facilities.

Related codes were moved together (or joint coding) to form a group (i.e. a group of assessment contained “assesses endocrine system” and “assesses integumentary system”). Related groups were then merged into nine categories and each category was mutually exclusive. For example, the category of assessment was a collection of various assessments. The groups and categories were also constantly compared.

The RNs performed nursing tasks under each category were evaluated by RNs. Categorized nursing task list in a worksheet was emailed to RN-participants via email for

evaluation. The RNs put check marks on those task items if they felt the tasks were necessary for their practice, Returned list was compared included all required nursing tasks, identified by the RNs. Further, six concepts were established from merging some of interated categories. The six concepts were used to map information flow model.

4.2 Participant Characteristics

The Characteristics of the RN participants were summarized. Demographic characteristics of the RN Participants are presented in Table 1. The RN participants in the study had an average age of 38.3. The study included 7 females (78%) and 2 males (22%). The nurses have an average of 9.2 years LTC nursing experiences, and most of them were skilled nurses with an average clinical nursing practice experience of 12.3 years.

Table 1 Participant Demographic Characteristics

<i>Registered Nurses (RNs) (n=9)</i>	<i>n</i>	<i>%</i>
1. Age group		
21-30	2	22%
31-40	2	22%
41-50	5	56%
2. Sex		
Female	7	78%
Male	2	22%
3. Nursing Working Experience		
Average years of working at LTC settings		9.2 years
Average years of being a nurse		12.3 years

The participants worked at different units (or sites or floors or wings) when more than one participants were selected from the same facility. Different practice sites may have a range of variety of chronic disease-specific care, such as a dementia-focused care unit; however, RNs were routinely (i.e. monthly, bi-monthly) transferred from one site to another based on a facility policy, and an RN may be in charge for multiple floors at night shifts.

Their roles in practice were staff RNs who led care as clinical leaders. Nine participants (100%) maintained current nursing license registration with the College and Association of

Registered Nurses in Alberta, a professional organization and regulatory body for nurses in Alberta.

4.3 Information Communication Strategies

Understanding RNs' information management approaches in current LTC setting was particularly important in establishing the RN's needs. Information communication is essential in information flow process as messages can flow in various directions to various parties in a number of information processes, which is essential for RNs to manage care.

Current information management was based on RNs' practical needs in information capture, analysis, sharing, and distribution for resident care. Under the collaborative care approach while having limited information technology resources in place, RNs creatively utilized different strategies to manage challenges for information communication. Table 2 concluded two essential forms of information communication approaches at practice sites.

Table 2 Current Information Management Approaches

	<i>Approach</i>	<i>Examples</i>
Written Method	Electronic	E-Documentation
		Email
		Fax
	Paper-Based	Resident profile binders
		Care plan
		Blank template forms
		RN-Notebook
Verbal Method	Telephone	
	In person	Face to face

4.3.1 Written Communication

The written communication was made up of electronic, paper-based, and display type. First, the electronic form specified any electronic media content that was intended to be accessed by RNs in either an electronic form for electronic display or as printed output such as e-documentation, email, and fax. Both email and fax were regular important tools to support RNs' communication internally and externally.

The use of e-documentation appeared significantly different from facility to facility. E-documentation could be performed through the Resident Assessment Instrument Minimum Data Set (RAI-MDS) software in RNs' desk-top computers at nursing stations, as RNs were authorized to access and be responsible to use the MDS on admission, quarterly report, significant change in health status, and annual report (AHS Continuing Care, 2015). Table 3 showed that the average usage of e-documentation was about 63% with a range between 10% and 95%, reported by the RN participants. One RN explained that the usage of e-documentation "was dependent on the available features within the RAI application, which were provided by the vendor".

Nonetheless, several RNs reported that the e-documentation saved them tremendous time due to less hand-writing; in contrast, other RNs commented that they must take additional time to transfer information from resident charts onto an RAI system in order to submit the reports.

Table 3 E-documentation Ratio

<i>Numbers of Participants</i>	<i>E-documentation (in RAI-MDS) at workplace</i>
1	95%
2	90%
1	75%
1	65%
2	40%
2	10%
Total n = 9	Average = 63%

Second, the paper-based method was preferred by RNs. It was not uncommon to see bookshelves full of resident profile binders and many policy and procedures manuals or employee handbooks at nursing stations. It was noticed that handwritten RN-notebooks were observed at RNs' desks in each of those study sites. A paper-based resident profile was created when a new resident was admitted to a facility. As the information in a resident profile had contributions from all internal and external providers, it was considered the most trustworthy information source. Therefore, handwriting was frequently used by RNs searching for information, storing information, charting, and documentation. In spite of e-documentation used in some facilities, most RNs used handwriting for many types of documentation. The most

common forms of handwritten documentation were care plans, progress notes, medication administration records, resident conference records, and shift summaries. In some sites, shift summaries were printed out, but most RNs still wrote shift summaries on RN-notebooks.

A handwritten RN-notebook was called “the Bible” by several RNs to indicate how its importance as it is heavily used for storing information and keeping track of tasks to share with other RNs. Usually, an RN would review the notes left by the last shift’s RN, and then created a new “to do list” as follow-up tasks in the notebook at the beginning of the shift and checked it regularly throughout the shift. Additionally, some RNs preferred to write shift summaries down in the RN-notebooks to carry with them for shift reports because information on the RN-notebooks are very important for the following shift RNs to maintain consistent care. In this manner, the RN-notebook served as a key platform for RN-to-RN communication.

Several RN participants indicated that they relied on handwriting “for almost everything.” At each study site, preprinted paper-based form templates were available on shelves or in drawers at nursing stations. There were many types of forms that covered various nursing tasks, and an RN could grab a necessary form to chart on it directly, and then attach it into a resident’s profile binder.

Additionally, RNs used personal notes frequently to track information for their own use. Several RNs also had their own personal notebooks to record information at points of care or resident bedsides. Collected information was later transferred into resident profiles after they

returned to their nursing stations either in computers (the RAI) or on paper-based resident profiles. Some RNs expressed that they felt secure when they had a paper-based documentation on hand because they could find information more easily in comparison with finding information in a computer system, which they perceived as requiring more time to locate information in the computer system when they had urgent needs.

Finally, the display type specifically indicated the tools used to post information on doors and walls inside facilities. These types of display media, such as white boards (or information boards) and paper posters, were easy to observe at facilities and mainly used for internal communication. Whiteboards were usually placed in hallways to show care activity schedules and assignees' name as reminders, not particularly for RNs to use but for all care providers, such as activities done by LPNs and HCAs. Displayed information was updated constantly after a task was done and this allowed RNs to monitor care activities conveniently.

4.3.2 Verbal Communication

Two types of verbal communication were identified: telephone and face-to-face. RNs used verbal communication as another effective communication method in practice. Direct verbal communication had been considered as the best choice, acknowledged by most of RNs. For example, a shift report was considered as the most important communication in a shift for information updates between RN-to-RN and RN-to-LPN, and shift reports were done verbally through face-to-face interactions.

Verbal communication was used regularly and frequently for certain communication content and the content for the various types of verbal communication were showed in Table 4.

Table 4 Verbal Communication Types

<i>Method</i>	<i>Examples</i>
1. Telephone	<p>With physicians</p> <p><i>Confirmation on medications</i></p> <p><i>Transcription of Orders</i></p> <p><i>Incident reports to family physicians</i></p> <p><i>Request Referrals to specialists</i></p> <p><i>Schedule visits</i></p> <p>With pharmacies</p> <p><i>Request medications</i></p> <p><i>Confirm Drug reorders</i></p> <p><i>medication incidents</i></p> <p>Check on lab results</p> <p>Referrals (i.e. dietitian services, social worker)</p> <p>Communication with residents' family members</p>
2. In person	<p>Resident Care Conference</p> <p>Shift meeting (RN-to-RN, RN-to-LPN)</p> <p>Resident education sessions</p> <p>Assessments</p> <p>Nursing staff training</p> <p>Check on/follow up nursing tasks on progress with other nursing staff members</p>

RNs made phone calls frequently and telephone was commonly used to reach people for both internal staff members and external providers. Particularly, telephone was used as a primary tool for external communication, such as contact physicians, pharmacists, and external referrals. For example, it was observed that one RN was assigned to make calls to deal with things such as verifying drugs with pharmacists or conforming resident appointments or referrals when there were two RNs working at the same site during a morning shift.

Face-to-face communication was very common and a preferred approach in RNs daily routine work. Direct communication with residents was important to help motivate residents; additionally, RNs carried out in person communication to follow-up on care procedures that were assigned to other nursing staff members to perform.

4.4 Information Spaces

Information spaces, in this study, indicated physical locations where information exchanges occurred inside facilities. As RNs made use of physical locations in their information management practice, the use of information spaces was imperative to understand because the physical locations used for information exchange could alter the flow of information. Two types of information spaces were observed comprising shared information space and personal information space (Table 5).

Table 5 Information Space Type

<i>Space Type</i>	<i>Example</i>
1. Shared Information Spaces	Nursing station
	Medication room
	Staff room
	Resident room
	White board
	Computer
	RN-note book
2. Personal Information Space	Hand writing personal note
	Personal notebook
	Sticky note

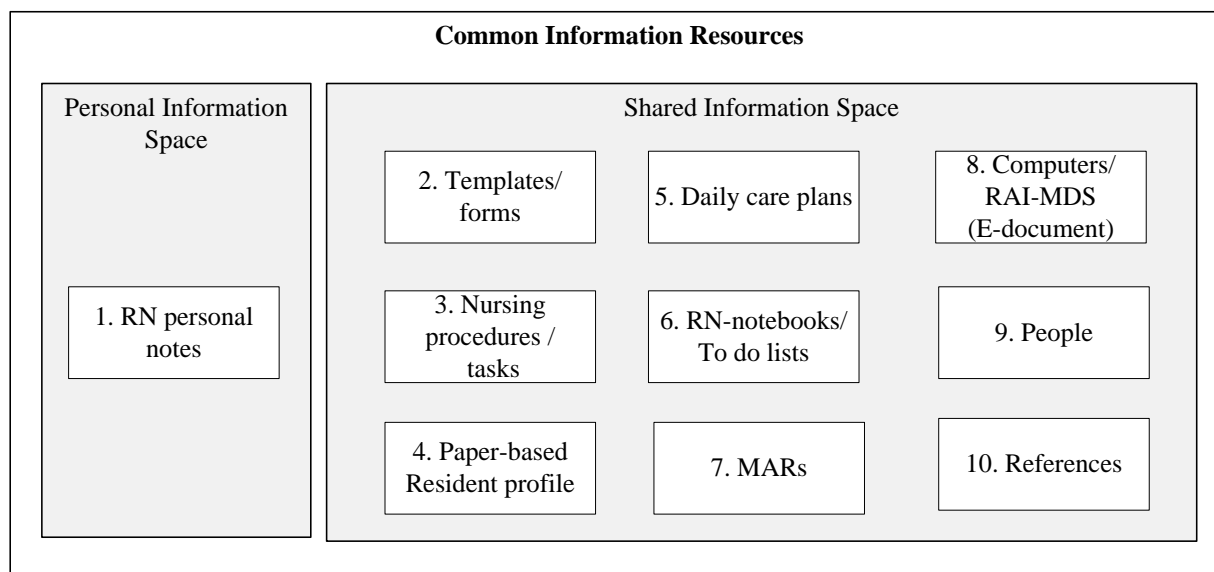
Specifically, a shared information space indicated the locations where information was stored for group users to access conveniently. For example, a nursing station was a typical shared information space where all RN staff members were able to access information resources, such as RAI application in computers, resident profiles, RN's notebooks, blank paper form templates, reference books, telephones, or fax machines. In contrast, a personal information space specified a place to store information for individual use only. For instance, a personal notebook could be a sticky note, which was used commonly by RNs to take notes during a procedure or an assessment at a resident's bedside. In this way, they would not have to worry if they forgot the

measurements or results when they checked multiple residents in one trip. Eventually the information on personal notes would be transferred into formal documentations on a resident profile, either in a computer system or paper-based resident binders.

4.5 Information Resources

The purpose for defining information resources was to describe information capabilities and the services they provide, relevant to the situation where RNs worked, as perceived by RN participants, without reference to specific solutions. Information resources meant the sources of information for someone and they could be people, who could provide knowledge and information, or equipment, such as a book or a computer, which contained information, or work processes and nursing tasks because data or information would be generated. For example, a care plan was a document outlining the plan of care so that it was an important information resource for RNs to guide care.

Ten essential information sources were identified and displayed on Figure 3 to exhibit commonly used information resources that support RNs' work processes in current LTC settings.

Figure 3 Information Resources

Note. The numbers of information resources may be different depending on how information resources were organized. In some facilities where RNs used e-document significantly more than others, a numbers of information resources would be included in one resource.

Because information resources were derived from RNs' operation needs for information, knowing the types of information resources resided in which information spaces could help to understand how RNs moved around to perform information management activities.

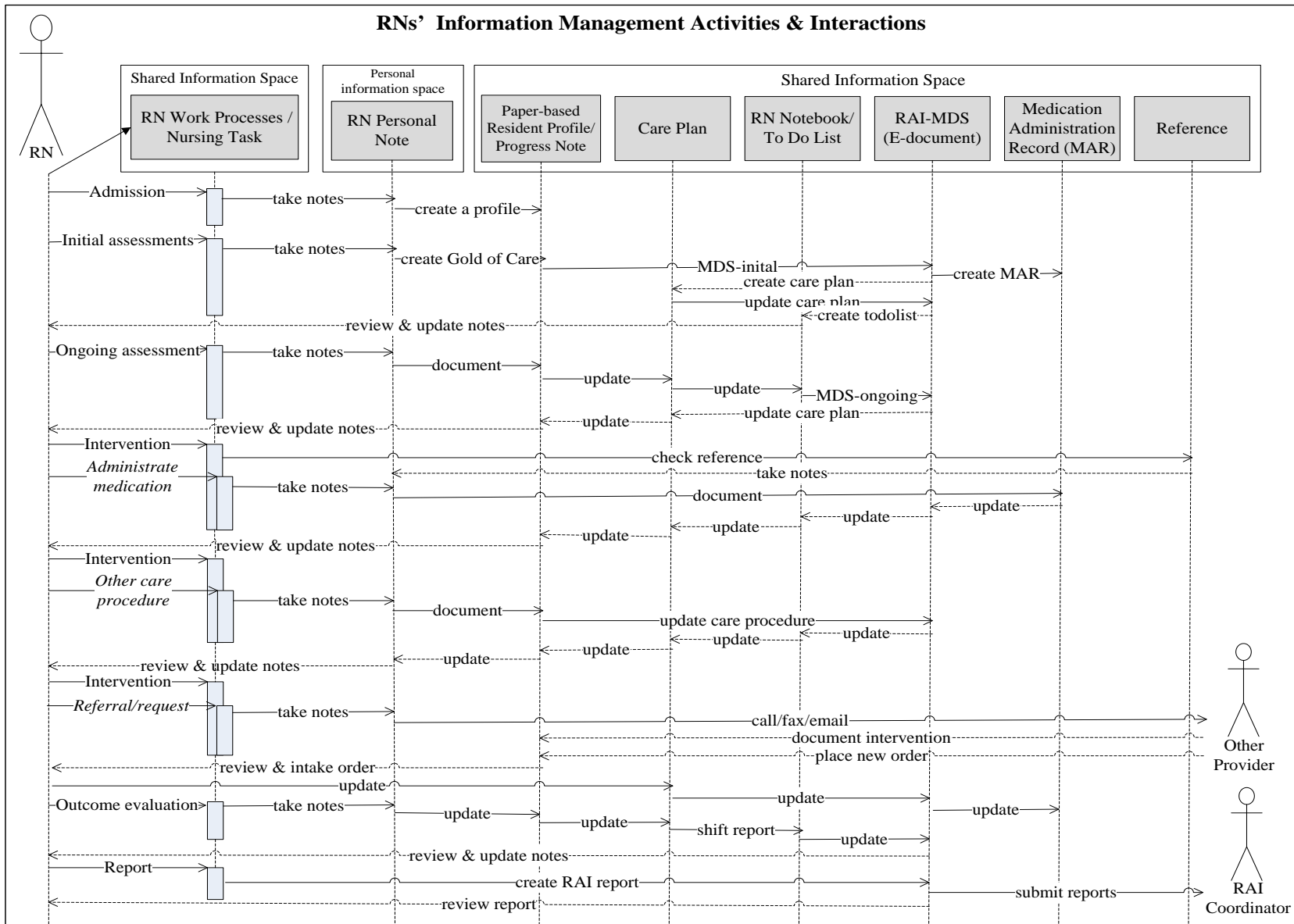
The figure also shows the relationship between information resources and information spaces that each information resource had a physical location. Because RNs' care tasks were highly depended on information, they have a need to be able to reach information resources whenever there was a need for information. More information resources they had, more moving around they experienced.

4.6 Information Management Activities

RNs' information management activities were based on the responsibilities to deliver holistic, patient-focused care. To approach quality care, RNs applied the nursing process framework, a scientific method to guide the best nursing practise. A nursing process is a goal-oriented process to facilitate critical thinking and decision making, and it is a 5-steps information driven process including assessment, diagnosis, planning, implementation, and evaluation (Canadian Nurses Association, 2016), and this process is appropriate to every nursing action.

In practice, RNs generated nursing knowledge and care decisions based on information that they must constantly perform information management activities for each nursing task. Thus, collecting, analyzing, interpreting and organizing data occurred at every step of care procedures. Figure 4 demonstrated common types of information management activities along with key care procedures and RNs' interactions with varied information resouces in different information spaces.

Figure 4 RNs' Information Management Activities & Interactions



The diagram above illustrates the key activities that RNs perform information management practices and processes, including the purposes of care tasks at points of care, the information resources to be reached, and the information moving processes, based on common procedures in most visited nursing homes. In the diagram, key activities had been structured into swimlanes (information resources) to show information movement among different information resources from one to another.

The repeated data entry actions are also shown on the diagram. Sometimes, for the same purpose, one piece of information was documented multiple times onto separate information resources. For example, an RN must document the given medications on the Medication Administration Record (MAR) because a MAR (or eMAR) is the report that serves as a legal record of the drugs administered to a patient at a facility by a health care professional. After the RN recorded the given medication information in the MAR, this information is also required to enter the RAI system for reporting purpose. The RN then may update the medication information including the resident's response to the medication on the RN-notebook, the care plan, and the paper-based resident profile in order to make this information available to other care providers. Thus, the same information was repeatedly documented multiple times.

Basically, RNs gathered clinical information through performing nursing tasks (such as giving medication, providing wound care) at points of care, reviewing or searching historical and relevant information through information resources. They

then analyzed the collected information, and finally they documented the decisions (information) to resident profiles that allowed other providers to review and share.

4.7 Function Requirements

Understanding how RNs worked and required functions to manage information were particularly important in establishing the RN's requirements. This is due to the need to identify which functions are crucial for allowing RNs to carry out their every-day work. For example, functions must support activities, based on procedures and business functions. Four essential fundamental functions were identified, based on RNs' activities of information management. The required functions include collection, classifying, storage, and distribution, and the description for each function was outlined along with examples, showed in Table 6.

Table 6 Function Requirements

<i>Function</i>	<i>Description</i>	<i>Example</i>
1. Collection	Responsible for gathering data at points of care or from information sources (i.e. Lab task results)	Care task result (i.e. Assessment result) Review information (i.e. lab) Take notes Check reference Take order Care conference
2. Classifying	Accountable for organizing data and information through analysis and critical thinking	Produce RAI-MDS report To do list Shift report
3. Storage	For conducting nursing documentation, an important component of RNs' professional and legal responsibility in practice	Documentation <ul style="list-style-type: none"> • <i>MAR</i> • <i>Progress note</i> • <i>Interdisciplinary entry</i> • <i>Update information</i> • <i>GOC/ Care plan</i> • <i>Daily care plan</i> • <i>Resident profile</i>
4. Distribution	Sharing information through communication for	Referrals Drug list to pharmacy

collaborative care, such as
information requests and returns
among multidisciplinary
providers

4.8 Information Content

In this study, information content refers to the amount of information required in a RN information management system to support the RNs' practice in daily operations. In order to map information flows, RNs' current information content must be understood, analyzed, and documented in advance. RNs' nursing tasks such as direct care and care collaboration must be supported by information.

In practice, RNs perform many different types of tasks and each type of tasks may require different types of information content. RNs' tasks were organized into eight categories based on the purposes and relationships of one to another. Additionally, an additional non-task category was formed to contain items of reference information, such as policies and procedures and lab reference books. Thus, 9 categories of RNs' tasks were identified including: 1) administration/discharge/transfer (ADT); 2) assessment; 3) plan of care; 4) order

/transcription of orders; 5) medication administration; 6) specimen collection; 7) care after death; 8) report; 9) reference (Table 7).

Table 7 Information Content Categories

Nine Categories of Information Content

1. Administration/Discharge/Transfer (ADT)

Resident Profile

Demographics

- *Resident*
- *Resident leave of absence sign out record*
- *Family contact*
- *Notification of health contact vacation/absence form*

Health History

- *Immunization history*
- *Home medication history*
- *Best possible medication history (bpmh)*
- *Health diagnosis history*

Initial Assessment

- *Pain Assessment*
- *Minimum Data Set (MDS)*
 - Background (Face Sheet Or IDAD- Record-Routine) information

at admission

- Tracking record (data validation at day 7 and then day 14)
- *MRSA And VRE admission screening*
- *Medical assessment-admission (facility & Alberta Health Wellness)*
- *Initial skin assessment*

Plan of Care

- *Goals of Care Designation (GCD) order*
- *Advance care planning tracking record*
- *Consent form*
- *Agreement*
 - Managed risk negotiated agreement
 - Service agreement
- *Consultation request / referral*
 - Internal service referral form
 - Direct care referral to form

2.Assessment

Behavior Log

- *ABCC Model (Antecedents/Behavior/Consequences/Care Strategies)*
- *Behavior Tracking Tool (Dementia Observation)*
- *Pittsburgh Agitation Scale Scoring Sheet (Agitation In Patients With Dementia)*

Assesses Endocrine System

- *Diabetes progress record*

Assesses Integumentary System

- *Completes braden assessment scale*
- *Wound assessment/progress tool*
- *Ostomy assessment and treatment record*

Assesses Neurological System

- *Neuro/vital signs record*
- *Pain assessment tool*

Assesses Gastrointestinal System

- *oral assessment*
- *laxative list*
- *nasogastric tube*

Assesses Reproductive/Genitourinary Systems

- *UTI checklist*

Assesses Musculoskeletal Systems

- *Safe client handling functional assessment record*

Patient Safety

- *Postoperative phase-resident personal item labeling*
- *Palliative care pathway assessment*
- *Wander guard monitoring*
- *Significant events-social*
- *Incident report*

3. Plan Of Care

Comprehensive Care Plan

Discharge Care Plan

Continuing Care Program

- *Daily care plan*
- *Vital signs flowsheet*

Resident Care Conference

- *Conference worksheet*
- *Conference record*

4. Order /Transcription of Orders

Order Recorder Sheet

Reconciled Admission Medication Orders

Medication Reconciliation and Physician's Orders

Physician Standing Orders

LTC Standing Orders

Pneumococcal Vaccine

Drug Reorder Sheet- Pharmacy

5. Medication Administration

Medication Administration Record Discrepancy Report

INR (Anticoagulation) Therapy Flow Sheet

Narcotic Transport Report/Narcotic Check

Warfarin Flow Sheet

Pharmacy -Resident Status Form

Medpass Supplement Program Record

Medication Incident Tracking Communication Log

6. Specimen Collection

Collects Specimens-MRSA Culture Results Form

Obtains Swab From-Microbiology Requisition-Diagnostic Lab

7. Care After Death

Significant events-medical

Attending physician's medical certificate of death

8. Report

Shift Report

- *Rn-lpn shift report sheet*
- *Rn/lpn communication sheet*
- *Unit shift report*
- *Shift exchange request form*
- *Signature identification log-staff*

Collaborates with Other Health Care Members/Service Providers

- *Resident care conference (care decision)*
- *Interdisciplinary notes*
- *Dietitian services referral form*
- *Diet request/change form*
- *Palliative care referral*
- *Behavior tracking scale – pharmacy*
- *Respiratory therapy*
- *Organ procurement program*

- *Laboratory services*
- *Social worker*
- *Out-patient radiology consultation form*
- *Diagnostic imaging services: requisition process/patient preparation for DI procedures/hours of operation*

Education Request Form

- *Diabetes education: glucometer training/diabetes educator/referral*

Equipment List

9. Reference

Facility Policy

- *Program and/or Unit policies*
- *Administrative policies*
- *Re-admission/admission checklist*
- *Consent*
- *Confidentiality Adult Restraint Manual*
- *Telephone orders*
- *Patient transfers*
- *Death report*
- *Do Not Resuscitate (DNR)/Advanced Health Care Directive*
- *Safety guide for patients, their family and friends*
- *Computer Services: password application/order/entry training/nursing module training/electronic documentation*
- *Workers' Compensation Board (WCB)-Alberta (Worker handbook-injury*

reporting, benefits and services)

Procedure Policy

- *Anaphylaxis protocol*
- *Medication refrigerator temperature log-medication safety*
- *Infection control / ISOL*
- *Clearing protocol for known in-patients with positive MRSA/VRE*
- *Wound care*
- *Focus charting*
- *Fentanyl patch order check list*
- *Low blood sugar treatment (Hypoglycemia protocol)*
- *Standards of Care from RN Association*

RN Practice Standards

- *RN Scope of Practice from ABRN Association*
- *CNA Code of Ethics*

Education/knowledge

- *Perry and Potter textbook*
 - *Compendium of Pharmaceuticals and Specialties (CPS)*
 - *Nursing Drug Handbook*
 - *Nursing Lab Handbook*
-

Each category is formed by a group of tasks or items, and each category is related to the same subject area associated with RNs work processes. For example, the category of reference collects all sources of reference information that RNs may frequently need. Specifically, the book of Compendium of Pharmaceuticals and Specialties (CPS) was a particular important reference that RNs must use to check medication interactions on the CPS before administering any medication to residents.

Because each category is exclusive with a purpose specific to the needs of a particular subject area being listed, the content categories consequently are able to help identify different sets of RNs information requirements.

4.9 Information Requirements

RNs information requirements were represented by six sets of information, derived from the mentioned nine categories on the previous section. A label was assigned to each set of information to describe the main purpose appropriately and make the information set easy to understand. Each set of information also reflects the information collocation with multiple sub-sets of information. The information sets consist of 1) administration/discharge/transfer (ADT); 2) assessment; 3) care plan; 4) intervention, with two sub-sets of medication and care procedure; 5) report; 6) reference. Table 8 displays the 6 sets of information including their sub-sets.

Table 8 Information Requirements

<i>Information Sets</i>	<i>Sub-sets</i>
1. ADT	Resident Profile <ul style="list-style-type: none"> Demographics (Resident) Health History <ul style="list-style-type: none"> • <i>Diagnosis</i> • <i>Family</i> • <i>Medication</i> • <i>Immunization</i> Consent
2. Assessment	MDS <ul style="list-style-type: none"> • <i>Initial</i> • <i>Ongoing /Outcome Evaluation</i> Vital Signs
3. Care Plan	GCD <ul style="list-style-type: none"> Comprehensive Care Plan Daily Care Plan
4. Intervention	Medication <ul style="list-style-type: none"> Order <ul style="list-style-type: none"> • <i>LTC standing order</i> • <i>Physician order</i> • <i>Pharmacy order</i>

Medication Record

- *Medication administration record (MAR)*
- *High risk medication*
- *Medication discrepancy*

Care Procedure

Procedure Type

Progress Record

5. Report

People

- *Resident*
- *Provider*

Internal Care Staff

- *General practitioner (GP)*
- *NS practitioner*
- *Occupational therapist (OT)*
- *Physical therapy*
- *LPN*
- *HCA*
- *Social worker*

External Provider

- *Family GP*
- *Specialist*
- *Pharmacist*

Organization

- *Site*
- *Floor*
- *Facility*
- *Clinic*
- *Hospital*

Report Type

- *Shift report*
- *Care conference report*
- *RAI-resident summary*

Referral

- *Referral type*
- *Request*
- *Appointment*

6. Reference

Resident Education

Policy & Procedure

Nursing Knowledge Source

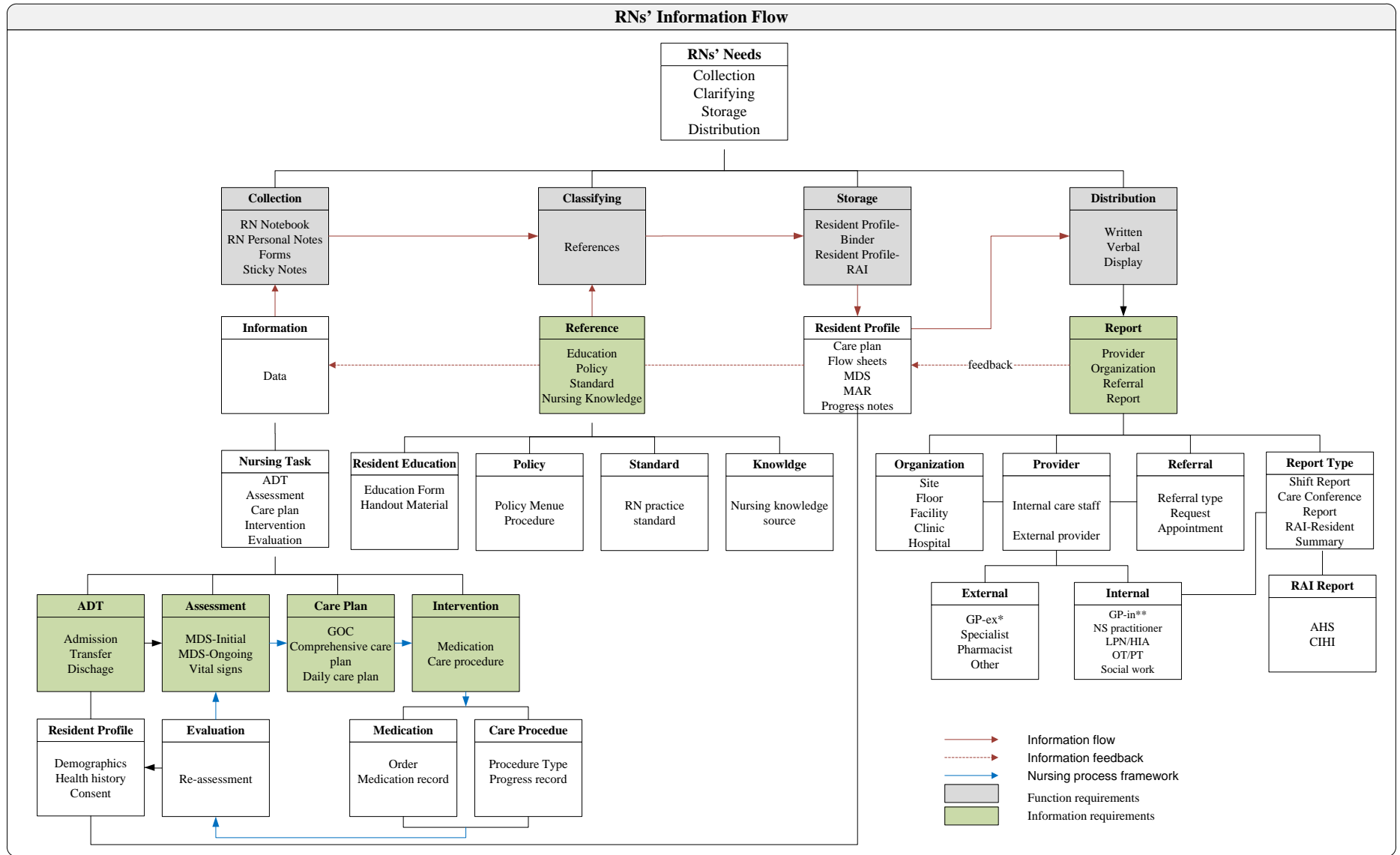
RN Practice Standards

The information sets and sub-sets were able to support RNs' practice on the need for information. For example, under the label of the report, three sub-sets are included: report type, people, and organization. The report type could have many different types of reports such as shift reports or care conference reports. After a report is created, the report may then be distributed to individual provider or organization as needed. Thus, the 3 sub-sets of information were available for RNs to create and also share reports.

4.10 Information Flow Model

The required information sets were the main components in an information flow model. Figure 5 shows how parts of individual information sets were converted into a diagram, which represents an RNs information management system with the needed information and directions of information flow.

Figure 5 RNs' Information Flow Model



Note. GP in* indicate that the general practitioner (GP) worked for a facility

GP ex** indicate that the GP worked independently

In the diagram, an existing RN information management system is outlined to demonstrate a straightforward structure including the key components that were required for RNs' every day work.

For example, key required information management functions (collection, classifying, storage, and distribution) were fundamental in current RNs' information management system which supported RNs' accountabilities in care collaboration. There was generalized relationship between an individual function and the information sets. The relationships and forward flow are represented by solid arrows; information feedback is presented by dashed arrows in the diagram as shown in figure 5.

Specifically, the Collection was linked to Information/data, generated by Nursing Tasks (associated with four sets of information: ADT, Assessment, Care plan, and Intervention); meanwhile, the sets of Reference and Report also contributed to the Collection because the Feedback information was important for assisting RNs to make clinical decisions for nursing tasks and deciding which types of tasks should be chosen. The collected information was then analyzed and interpreted (classifying), supported by both Reference (i.e. nursing knowledge) and Report (i.e. feedback or updated information from other care providers) and recorded on the resident profiles. The sorted information were clinical decisions (i.e. renew a daily care plan) or clinical outcomes that must be documented on the resident profiles either on the paper-based binders or the RAI applications. The documentations were ready to be shared or utilized for reports that could be distributed to other providers through the function of Distribution. Thus, information enrichment was generated to support its information processing as provided by the

four key functions. The diagram obtained from the information sets could be used as a baseline reference of RNs' requirements for information and information flow.

Chapter 5 Conclusions

This study was set out to explore RNs' information flow model in LTC settings and has identified the nature of RNs' practice and work environments in existing RNs' information management infrastructure at LTC settings. The study has also sought to provide RNs' baseline requirement documentation to support HIT design and development for LTC users. Currently, literature on this subject specifically focusing on RNs' information flow or RNs' requirements in the context of LTC settings do not exist. This study sought to understand RNs' role and impact of interventions on care collaboration, information resources used for communication, required information/data for performing resident care, and then answers the question: How does information flows support RNs' tasks of information communication in current LTC settings?

This chapter provided the outputs of the investigation on RNs in LTC nursing homes in the province of Alberta. Five sections in this chapter included: 1) major findings were summarized in the first section; 2) In the discussion section, reflections were made towards the significance of this study investigation and lessons learned, 3) A conclusion was provided; 4) Finally, recommendations were made for next steps.

5.1 Major Findings

This study includes nine direct observations in six LTC nursing homes in Alberta, Canada, and each observation was followed up with an interview. The observations were conducted during different shift hours at each participant's work sites including mornings, afternoons, and evenings; an interview followed each observation.

RNs' activities were recorded as well as their interactions with residents, nursing staffs, and other providers. During data analysis, collected data were constantly compared based on similarities and differences cross-site and cross-participant.

The main findings are chapter specific and were summarized within the respective chapter 4 (Results). Findings were synthesized in order to answer the study's research questions.

5.1.1 RNs' Work Environment

RNs' practice environment includes two essential aspects: information space and information resource. Both aspects play important roles in current RN's information management system.

5.1.1.1 Information Resources

Information resources indicate the sources of information and contained or produced data that is crucial for RNs' practice in relation to information, knowledge, decisions, and communication. Ten commonly used information resources by RNs were identified, including 1) RN-personal notes; 2) facility-specific templates/forms; 3) nursing processes/tasks; 4) paper-based resident profile; 5) daily care plans; 6) RN-notebooks; 7) medication administration records (MAR); 8) computers/software application (RAI-MDS); 9) people; 10) references (i.e. books).

5.1.1.2 Information Spaces

Information spaces, in contrast, are physical locations for information resources. Because information spaces were closely related to information resources, both of them presented important characteristics in RNs' information management system. Two types of information space were identified: shared information spaces and personal information spaces. Despite every RN had a personal information space for personal use, there were many different types of shared information spaces in LTC settings, such as the nursing station, medication room, computer, and RN-note book. Each shared information space contained certain information resources, and RNs were very familiar with where to find information resources in order to find specific information (Figure 3).

It is important to note that only the RN-personal notes were located in personal information space, while other resources were located in shared information spaces. When multiple information resources were located in different locations, RNs often spent more time searching information or took multiple trips to reach those information sources.

5.1.2 RNs' Responsibilities

The key responsibility for RNs in LTC settings was leadership for care collaboration. Care collaboration was accomplished through multifaceted operations and extensive communication, and thus highly relies on clinical information availability. Internally, RNs led a

care team to manage care tasks and organized information from clinical findings and cooperate with other care providers or specialists for arranging specialized care services such as physical therapy (PT), occupational therapy (OT), based on individual resident's care needs.

For best practice, RNs were accountable for applying a nursing practice framework (or nursing process) for making decisions on all nursing actions. A nursing process is a 5-step information driven course of actions including assessment, diagnosis, planning, implementation, and evaluation (Canadian Nurses Association, 2015). Based on the five steps, RNs utilize, analyze and organize discrete clinical data to generate nursing knowledge, and this information was then used to make care decisions for the type of care required for the resident and types of nursing actions or care collaborations to be pursued.

In correspondence to the nursing process framework steps, RNs' information management activities are allied with steps including: collection, classifying, storage, and distribution. These four types of activities are fundamental to support RNs' best practice. Thus, they are not only responsibilities that RNs must perform, but are also the essential functions that RNs must have as a part of their information management systems.

5.1.3 Information Requirements

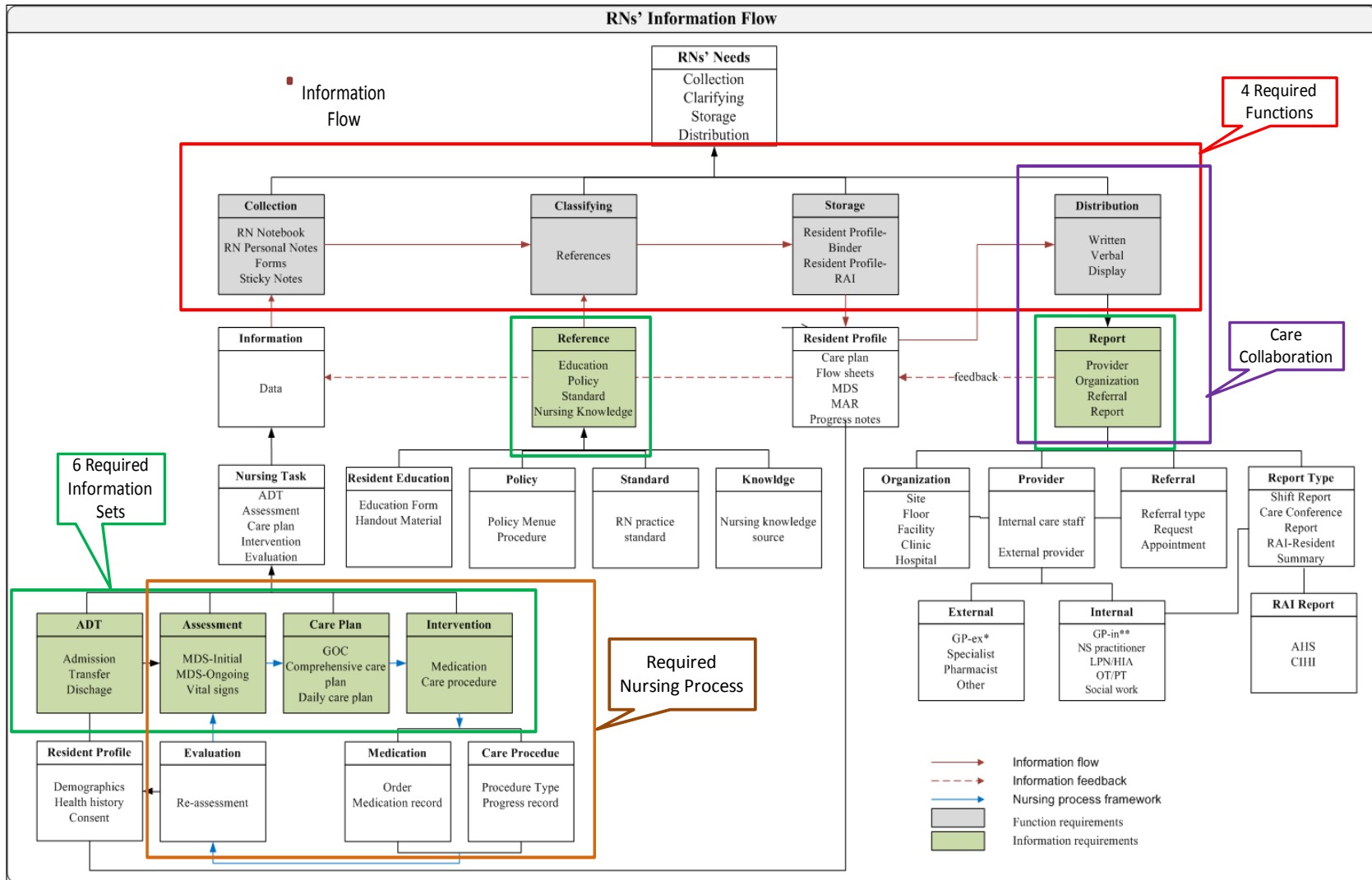
Six sets of information were identified to be required by RNs to perform care tasks and communication. The information sets included: 1) Admission, discharge, transfer (ADT); 2)

Assessment; 3) Care Plan Intervention; 4) Intervention (with two sub-sets: Medication & Care Procedure); 5) Report; 6) Reference. Each set /sub-set of information served as a high level collection of information in a subject area, contributed by a group of attributes, and each attribute contained specific information content (Table 8).

5.1.4 Information Flow Model

A graphical information flow model was developed in Chapter 4 Result (Figure 5) to represent a generalized model of information processing flow within a RN's information management system in a typical LTC setting. Figure 6 outlined RNs' needs in respect to functions requirements, information requirements, information flows, care collaboration, and required nursing process.

Figure 6 RNs' Requirements Summary



Specifically, RNs' information management was supported by four basic functions of collection, classifying and storage, and distribution, six sets of information: ADT, assessment, care plan, intervention, report, and reference, as well as the required information flow processes, information flow directions, a required nursing process and a structure of care collaboration.

An information flow appeared to be a cycle and had two directions: moving forwards and moving backwards, as feedback flows. Forwarding flow started with the function of information collection to gather data. Then, the data moved forward for analysis during classifying. Sorted information was then documented on resident profiles to store (storage) where information was available for distribution to all access-authorized providers for care collaboration or to use.

Other care providers provided information as feedback flows. After other providers' care interventions, they contributed new clinical information into resident profiles stored in LTC facilities. The information feedback allowed RNs to review, and to trig the next nursing actions. Clinical information was enriched through both an information flow cycle, additionally, a nursing process cycle for generating nursing knowledge.

5.2 Discussion

This section provided reflection and implications of this study investigation with respect to the research questions in order to achieve better understanding on RNs' requirements.

5.2.1 Complex Care Environment

Several previous studies demonstrated the complex, interruption-oriented communication patterns in LTC settings (Alexander, 2014; Cherry, 2011; Georgiou, 2013; Nelson, 2005; Tariq, 2012) and the complexity and interruptions were observed as described in the nursing homes.

It is noted from this study that care collaboration is managed through multiple layers of operations across different care settings, such as acute care hospitals, primary care clinics, public health clinics (i.e. immunization), and palliative care for end-life care. The communication to reach out different types of services is unlimited; meanwhile, communication channels for information exchange are limited. Paper-based forms are commonly used for resident referrals and transfers. In order to prepare descriptive information for transfers, RNs are responsible to collect needed clinical information from multiple information resources as they are either in various locations or external resources, such as previous providers who provided care.

Information inputs from multiple care service providers, particularly external providers may or may not be shared with RNs in certain situations. For example, a resident was cared by an external specialist outside of nursing homes, or an internal provider may not have documented care interventions and outcomes in the facility owned resident profiles. As a result, RNs need to search for care intervention information from those providers to make updates on the daily care plan and RAI-MDS system in order to conduct up-to-date performance reports in a regular basis.

The lack of a shared information platform results in inconsistent clinical information, and consequently may result in the requirement of additional work to organize information which may also result in duplicated data entries.

Or (2014) reported that poor usage on the use of clinical information system in nursing homes were results of the systems not matching nurses' needs. This pattern is consistent with the outcomes of this study. This study investigation found that the usage for RN's e-document had substantial differences, measuring between 10%-95%, though all RN participants, particular the RNs with lower usage, expressed eagerness to use more electronic information management options if the technology could better support their needs.

Despite there are many information resources which RNs need to handle, RN participants repeatedly mentioned a few specific needs that are essential for their practice. Specifically, a few RNs wished to have more complete information content in their current solution, especially for areas such as medication administration records, immunization management and consent management as those are important information for maintaining care quality.

Additionally, several RNs wished that the RAI-MDS could have better features for resident assessments. For example, after performing a fall assessment on a resident, a nurse will enter a score into the RAI-MDS tool. However, there is no space to document clinical findings. This is important because when a RN observes a significant high score in the MDS, the RN needs to know the clinical explanation for the unusual score. Since MDS only contains scores,

the RN must either go speak with the nurse who performed assessment or go look for answers in a progress note, stored in the resident profile in a binder.

Furthermore, RNs expect better integration between technology applications and other electronic devices, such as printers and fax machines. Some RNs mentioned that although they can use e-document for "almost everything", they cannot print out a referral form or transfer form directly with the resident's demographic information on the form. Thus, RNs have to fill out the form by handwriting.

The usage of technology such as e-document is also reflective of RNs' activities with information management. With higher percentages of technology usage, the less numbers of information resources that RNs will have due to the merge of some information resources into technology solutions. Thus, RNs can then electronically collect and sort all data within a computer system. However, handwriting paper forms are still required largely for information distribution and communication due to the limitations of integration as mentioned above.

It is noticed that the levels of technologic integration and usage in a facility is also affected by the types of ownership of the facility. Not-for-profit nursing homes tend to have higher levels of technology usage and also higher levels of integration of those systems into resident management processes. This finding is consistent with Alexander's study, conducted in United States of America (2008).

Effective training may play an important role in technology usage. Although all participants have previous training with the RIA-MDS application, some RNs mentioned that there exists a big difference in RIA-MDS usage between RNs within the same facility. Some RNs mentioned about the difficulties of finding information in a computer system, resulting with RNs feeling that too much time is spent in searching for information leading to RNs retracting back to paper-based methods of documentation. Thus, getting nursing staffs used to computers and having improved training methods and tools by identifying RNs' different learning needs may be a way to enhance technology usage.

5.2.2 Implications

The developed RNs' information flow model can be used as a communication tool between RNs and the analyst or development team to validate the requirements as it is easy to understand. For RNs, the model presents the real RNs' information management world that is familiar to the RN-users, while the visual diagram gives a full picture of the RNs' required components for clinical practice.

Additionally, the model is represented by simple language and does not use the Unified Modeling Language (UML) format as RNs do not need to deal with those notation and rules. For developers, it will be beneficial to have the RNs' requirements in a manner that will be easy to translate to a standard UML model, and thus, it is a worthwhile output for analysts, designers and the implementation team.

Furthermore, detailed baseline data collection requires tremendous time for analysts to understand the context of user's practice and care settings, which have been considered as one of the greatest challenges for HIT design and implementation (Unertl, 2009). Thus, this model can serve as a reference to facilitate the move from a large amount of detailed baseline data to standard models within the projects' constrained timelines.

By designing and building an information system based on RNs' needs and expectation, the ultimate desired outcome is a system which satisfies the RNs' needs. As an early investigation on RNs' requirements in LTC setting, this study specifically focuses on frontline RNs with no predefined requirements, and it was RN- driven. It should be made aware that RNs' demographic characteristics may have influence on their perspectives towards technology and the ways of their practice. For example, the usage technology such as e-document may vary between younger RNs and senior RNs. However, RNs' requirements on information /or data are responsibility or task-related needs, thus, the categories in the RNs' tasks could assist the analyst in specifying the information requirements to represent commonly needed information content by RNs for clinical practice.

It also should be made aware that RNs' responsibilities may be facility-specific. Working in LTC, RNs' responsibilities may not be the same, depending on the size of the facility, numbers of RNs available, RN to LPN ratio and care intakes. For example, the study investigation found that some frontline RNs not only provided directly resident care in care lead roles, but also carried out duties as managers with additional administration activities. A clearly

defined RNs' needs for design should be facility-specific and RN role-specific in piloting new information system to facilitate the success of HIT projects.

5.2.3 Limitations

This study produced observational findings from the involvements of six nursing homes in Alberta, Canada regarding ways in which existing information flow processes, which largely rely on numerous information resources, can impact RNs' practice in terms of the efficiency, quality, and safety for care delivery.

Although it is a limited sample of LTC facilities, which may not be generalizable to other settings, the contextual findings are revealing in terms of imperative information and communication challenges. Such findings can contribute to improving the design of HIT systems in order to produce further gains for LTC facilities.

5.3 Conclusions

Despite what has been often reported about the benefits of user-focused requirement analysis, this study identified major influencing factors in current RNs' information management system as well as a visual information flow model with required components. The benefits of the graphic model diagram have been clearly outlined and categorized to be easily understood for communication between RNs and analysts or designers. Furthermore, the RNs' information flow model offers a baseline that may assist analysts and HIT development teams to further prioritize, organize, and validate requirements as well as transform the baseline data to system requirements

when initiate the design and development of HIT solutions for LTC use. The findings also indicated that the HIT adoption in LTC settings needs to tailor for the complex and multidisciplinary requirements for care collaboration at the typical care environment.

5.4 Recommendation

Despite consistent and repeated evidence that HIT adoption in LTC can be challenging, resource-demand, failure-prone and unfit for purpose, future studies may consider aiming to achieve a larger scope of investigation to sample the respondents from facilities in different provinces across Canada. That way, better accuracy baseline data will be achieved through the width of the investigation resulting in more generalizable results.

This study brings together work in key areas of RNs requirements. In order to support HIT adoption in LTC settings, more research is needed for user requirements, including other nursing user groups, such as LPNs and HCAs because both user groups are not only the data contributors but also the data users. Therefore, their needs must be considered during HIT design and implementation in order to build a shared information management platform for all users.

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Appendix

Appendix A Research Review Board Approval, University of Victoria

 University of Victoria	Human Research Ethics Board Office of Research Services Administrative Services Building PO Box 1700 STN CSC Victoria British Columbia V8W 2Y2 Canada Tel 250-472-4545, Fax 250-721-8960 ethics@uvic.ca www.research.uvic.ca										
	<h3>Certificate of Approval</h3>										
PRINCIPAL INVESTIGATOR: Quan (Jen) Wei UVic STATUS: Master's Student UVic DEPARTMENT: HEIS SUPERVISOR: Dr. Karen L. Courtney; Dr. Omar Shabestari	<table border="1"> <tr> <td>ETHICS PROTOCOL NUMBER</td> <td>13-447</td> </tr> <tr> <td colspan="2">Minimal Risk - Delegated</td> </tr> <tr> <td>ORIGINAL APPROVAL DATE:</td> <td>27-Jan-14</td> </tr> <tr> <td>APPROVED ON:</td> <td>27-Jan-14</td> </tr> <tr> <td>APPROVAL EXPIRY DATE:</td> <td>26-Jan-15</td> </tr> </table>	ETHICS PROTOCOL NUMBER	13-447	Minimal Risk - Delegated		ORIGINAL APPROVAL DATE:	27-Jan-14	APPROVED ON:	27-Jan-14	APPROVAL EXPIRY DATE:	26-Jan-15
ETHICS PROTOCOL NUMBER	13-447										
Minimal Risk - Delegated											
ORIGINAL APPROVAL DATE:	27-Jan-14										
APPROVED ON:	27-Jan-14										
APPROVAL EXPIRY DATE:	26-Jan-15										
PROJECT TITLE: Registered Nurse Practice and Information Flow in Long-term Care Nursing Homes RESEARCH TEAM MEMBER None DECLARED PROJECT FUNDING: None											
<h4>CONDITIONS OF APPROVAL</h4> <p>This Certificate of Approval is valid for the above term provided there is no change in the protocol.</p> <p>Modifications To make any changes to the approved research procedures in your study, please submit a "Request for Modification" form. You must receive ethics approval before proceeding with your modified protocol.</p> <p>Renewals Your ethics approval must be current for the period during which you are recruiting participants or collecting data. To renew your protocol, please submit a "Request for Renewal" form before the expiry date on your certificate. You will be sent an emailed reminder prompting you to renew your protocol about six weeks before your expiry date.</p> <p>Project Closures When you have completed all data collection activities and will have no further contact with participants, please notify the Human Research Ethics Board by submitting a "Notice of Project Completion" form.</p>											
<h4>Certification</h4> <p>This certifies that the UVic Human Research Ethics Board has examined this research protocol and concluded that, in all respects, the proposed research meets the appropriate standards of ethics as outlined by the University of Victoria Research Regulations Involving Human Participants.</p> <div style="text-align: center;">  Associate Vice-President Research Operations </div>											
Certificate Issued On: 27-Jan-14											

13-447 Wei, Quan (Jen)

Appendix B Research Approval, Community Health Committee, Alberta



Health Research Ethics Board of Alberta
 Community Health Committee
 1500, 10104 - 103 Avenue NW
 Edmonton, Alberta, T5J 4A7
 Telephone: (780) 423-5727
 Fax: (780) 429-3509
 Email:
<https://iriss.ucalgary.ca/%22mailto:communityhealth@hreba.ca/%22>

CERTIFICATION OF RESEARCH ETHICS REVIEW

This is to acknowledge that the following study has been reviewed and on behalf of the Health Research Ethics Board of Alberta (HREBA) – Community Health Committee (CHC) has been approved.

Ethics ID: HREBA.CHC-14-0019
 Principal Investigator: Karen Courtney
 Co-Investigator(s): Omid Shabestari
 Student Co-Investigator(s): Quan Wei
 Study Title: Registered Nurse Practice and Information Flow in Long-term Care Nursing Homes
 Sponsor (if applicable):

Effective: May 30, 2014 **Expires:** May 30, 2015

The following documents have been reviewed and are approved for use:

- Appendix2 Facility Invitation Letter - version 2
- Appendix3 Participant Invitation Lette version 2
- Appendix6 - proof of having made a request for facility permission
- Appendix7- RE_ question for my research study (MSc in health informatics)
- Appendix5 - Verbal Consent Script-version 2

- Appendix4 - Consent Form - version 2
- Appendix9 - Interview Questions
- Appendix8 - Observation Tool
- Appendix10 - 599 Proposal
- Appendix1 - Ethics Approval from Uvic
- Appendix 13 - Research Work Plan
- ARECCI Ethics Screening tool-Jen
- Appendix 14 - Proposed Schedule

This Committee has been constituted following the *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* (TCPS 2) and deliberations of the CHC included all elements of the TCPS 2 and those described in Section 50 of the Health Information Act (HIA).

Members of the CHC who are named as investigators or co-investigators in research studies do not participate in discussion(s) related to, nor vote on, such studies when they are presented to the Committee. It is not our policy to release the names of the Committee membership, however, an outline of its composition can be provided.

Please refer to the accompanying letter for conditions of approval.


Approved on behalf of CHC by,

XXX , HREBA-CHC

Date:

June 17, 2014

Appendix C Research Operation/Administration Approval, Covenant Health

RESEARCH CENTRE		
	<p>Covenant Health</p>	
<p>January 12, 2015.</p>		
<p>Karen Courtney, email: <input type="text" value="redacted"/> RE: 1628; HREBA,CHC-14-0019, Registered Nurse Practice and Information Flow in Long-term Care Nursing</p>		
<p>Dear Dr. Courtney,</p> <p>Thank you for submitting information on your research study to the <i>Covenant Health Research Centre (CHRC)</i>. I am pleased to inform you that your study has received <i>Covenant Health Operational/Administrative Approval</i> for St Michael's Health Centre, St Therese Villa, Mary Immaculate Hospital, St Mary's Health Care Centre, Mineral Springs Hospital, Bonnyville Health Centre, Our Lady of the Rosary Hospital, Youville Home, St Joseph's Auxiliary Hospital, Edmonton General Continuing Care Centre and Killam Health Centre.</p>		
<p>We have a copy of the current <i>Health Research Ethics Board (HREBA)</i> approval letter on file. We do not require that you submit protocol amendments as these will be reported to HREBA; however, it is important that we receive updated copies of:</p> <ul style="list-style-type: none"> • HREB approval letters; • consent forms; • study information sheets; and, • Reports of serious adverse events if applicable. 		
<p>We would also appreciate a copy of your final research report and any associated published articles upon completion of the study. You are eligible to submit a paper, article or abstract for inclusion in the "<i>Covenant Health Research</i>" publication. The CHRC may reference your name, study name, and location of study in various <i>Covenant Health</i> research publications, reports, sessions or internal website, unless you advise us to the contrary in writing.</p>		
<p>All documents can be emailed to research@covenanthealth.ca or mailed to the <i>Covenant Health Research Centre</i>, Misericordia Community Hospital, Cabrini Centre R07-3, 16940-87 Avenue, Edmonton, Alberta, T5R 4H5.</p>		
<p>If you would like to subscribe to our Research Notes, please provide your consent by clicking on the link and providing your preferred email address. https://www.surveymonkey.com/s/6BGXNZ6</p>		
<p>On behalf of the CHRC, I would like to extend our congratulations and wish you success with this project. If you have any questions or require assistance, please do not hesitate to contact the office at (780) 735-2274.</p>		
<p>COVENANT HEALTH RESEARCH CENTRE (CHRC)</p> <div style="border: 1px solid gray; width: 150px; height: 50px; margin: 0 auto;"></div>		
<p>/CI</p>		
<p>16940 87 Avenue Edmonton AB T5R 4H5</p>	<p>Tel 780.735.2274</p>	<p>CovenantHealth.ca</p>

Appendix D Facility Invitation Letter

Subject Line: Research opportunity for long term care registered nurses (RN)

Dear Manager,

My name is Jen Wei. I am a graduate student in the School of Health Information Science at the University of Victoria (Uvic). Previously, I worked as a community nurse in long-term care (LTC) settings in Victoria, BC, and was trained as a MD with over 7 years of practice. I also hold a MBA (Uvic) and currently lead data management in the Clinical Information System (CIS) program in Alberta Health Services (AHS).

The purpose of this study is to develop an Information Flow Model. This will help introduce technology into LTC settings. AHS's 5-year IT Plan has a vision of "one person, one record." Soon, continuing care such as LTC will use technologies like electronic medical records (EMR) and be part of provincial CIS. Studies show these IT changes will be more successful if the needs of RNs for patient care are met. LTC has been considered to be more complex than other patient care settings as nurses must work within a multidisciplinary team environment to coordinate care for the patients with more complex care requirements.

This study will focus on understanding RN's needs for clinical data and information with a goal of developing a constructive Information Flow Model that will match patient care processes and RN practices in the context of Canadian LTC settings.

I would like to invite your facility to participate in the research study.

Involvement for your facility would be:

1. Providing permission for the study to take place at your facility
2. Forwarding a *Participant Invitation Letter* (I will provide you) to your RNs

Your RNs can participate in the study by contacting me. My contact information is in the *Participant Invitation Letter*. Please tell them that participation is voluntary.

Involvement for RNs would be:

1. An observation during their shift (up to 2 hours) on
 - how data is collected
 - types of data collected
 - how data is shared
2. A short follow-up interview (up to 30 minutes)

I understand that a nurse's clinical work is the first priority. A nurse can cancel an observation or interview at any time. They may reschedule even after it has started. Some of the observations may include an RN working with a patient. I will request a verbal consent from patients before an observation. If a patient is unable to consent or declines, I will reschedule for another time. I will not record patient information.

I will inform your staff about the limits to confidentiality. I will also tell them about the professional and legal requirement for disclosure.

The Health Research Ethics Board of Alberta (HREBA) – Community Health Committee (CHC) has granted ethics approval of this project. If you have any complaints or concerns about the ethical conduct of this project, please contact:

HREBA – Community Health Committee

Suite 1500, 10104 - 103 AVE, Edmonton AB, T5J 4A7

Phone: (780) 423-5727 / Toll-free: 1-877-423-5727 / Email: communityhealth@hreba.ca

The Health Research Ethics Board of University of Victoria has granted ethics approval of this project. If you have any complaints or concerns about the ethical conduct of this project, please contact:

The Human Research Ethics Board (HREB), University of Victoria

PO Box 1700 STN CSC, Victoria, BC, Canada V8W 2Y2

Phone: 250-472-4545, Fax: 250-721-8960, Email: ethics@uvic.ca

The supervisor of this study:

Karen Courtney, RN, PhD, Associate Professor, Graduate Adviser

University of Victoria, School of Health Information Science

PO Box 1700 STN CSC Victoria BC V8W 2Y2

Phone: XXX Fax: XXX/ Email: XXX

If you would like to participate or have any questions, please contact me at XXX or call XXX

Thank you in advance for your interest in this project

Sincerely,

Jen Wei, MBA (researcher)

MSc Informatics student, University of Victoria

Appendix E Participant Invitation Letter

Subject Line: RN Participants being sought for a research study on information flow in LTC settings

Dear RNs,

My name is Jen Wei. I am a graduate student in the School of Health Information Science at the University of Victoria (Uvic). Previously, I worked as a community nurse in long-term care (LTC) settings in Victoria, BC, and was trained as a MD with over 7 years of practice. I also hold a MBA (Uvic) and currently lead data management in the Clinical Information System (CIS) program in Alberta Health Services (AHS).

The purpose of this study is to develop an Information Flow Model. This will help introduce technology into LTC settings. AHS's 5-year IT Plan has a vision of "one person, one record." Soon, continuing care such as LTC will use technologies like electronic medical records (EMR) and be part of provincial CIS. Studies show these IT changes will be more successful if the needs of RNs for patient care are met. LTC has been considered to be more complex than other patient care settings as nurses must work within a multidisciplinary team environment to coordinate care for their patients with more complex care requirements.

This study will focus on understanding your needs for clinical data and information with a goal of developing a constructive Information Flow Model that will match patient care processes and your practices in the context of Canadian LTC settings.

Participants must:

- be registered RNs
- provide direct patient care
- work in LTC settings in Alberta

Your involvement will be:

1. A two-hour observation during your shift. I will observe how you collect data, the types of data you gather, and how data is stored and communicated.
2. A ½ hour follow-up interview. I will use an audio recording device.

Participation in this project is voluntary. You may leave the study at any time without giving a reason. There will be no consequences if you choose not to participate.

There are some possible benefits from the study. You may become more aware about how you process information. You may also discover ways to be more efficient. If you are interested, I will send you the *Consent Form*. This form has more detailed information about the study. After you sign the form, I will confirm a schedule with you for the observation and interview. Your signed consent form will be collected prior the observation; A copy of the consent form will be provided to you and the original signed consent form will be taken by the researcher to retain in the study records.

I understand that clinical work is your first priority. You may cancel an observation or interview at any time. You may reschedule even after it has started. Some of the observations may include

you working with a patient. I will request a verbal consent from patients before an observation. If a patient is unable to consent or declines, I will reschedule for another time. I will not record patient information.

The limit to confidentiality may include:

1. The observation at your facility
 - Your co-workers might know that you are participating.
2. The professional and legal requirement for disclosure
 - I will explain this to you and remind you before starting the observation.

If you are interested or have any questions, please contact

The researcher: Jen Wei

- email: XXX
- Cell phone: XXX

The Health Research Ethics Board of Alberta (HREBA) – Community Health Committee (CHC) has granted ethics approval of this project. If you have any complaints or concerns about the ethical conduct of this project, please contact:

HREBA – Community Health Committee

Suite 1500, 10104 - 103 AVE, Edmonton AB, T5J 4A7

Phone: (780) 423-5727 / Toll-free: 1-877-423-5727 / Email: communityhealth@hreba.ca

The Health Research Ethics Board of University of Victoria has granted ethics approval of this project. If you have any complaints or concerns about the ethical conduct of this project, please contact:

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PO Box 1700 STN CSC, Victoria, BC, Canada V8W 2Y2

Phone: 250-472-4545, Fax: 250-721-8960, ethics@uvic.ca

The supervisor of this study:

Karen Courtney, RN, PhD, Associate Professor, Graduate Adviser

University of Victoria, School of Health Information Science

PO Box XXX

Phone: XXX/ Fax: XXX/ Email: XXX

Thank you in advance for your interest in this project

Jen Wei, MBA (researcher)

MSc in Health Information, University of Victoria

Appendix F Participant Consent Form

Project Title: Registered Nurse Practice and Information Flow in Long-term Care Nursing Homes

You are invited to participate in a research study. The study is called Registered Nurse Practice and Information Flow in Long-term Care Nursing Homes.

Jen Wei is conducting this study. Ms. Wei is a graduate student in the School of Health Information Science at the University of Victoria (Uvic). Previously, she worked as a community nurse in long-term care (LTC) settings in Victoria, BC, and was trained as a MD with over 7 years of practice. She also holds a MBA (Uvic) and currently works for the provincial Clinical Information System (CIS), AHS. This study is part of her Master's program. Her supervisor is Karen Courtney, RN, PhD, Associate Professor, Uvic.

If you have questions, please contact:

The researcher: Jen Wei

- email: XXX
- Cell phone: XXX

The supervisor of this study: Karen Courtney, RN, PhD, Associate Professor, Graduate Adviser

University of Victoria, School of Health Information Science

PO Box XXX

Phone: XXX/ Fax: XXX/ Email: XXX

Purpose and Objectives

The purpose of this study is to develop an Information Flow Model. This will help introduce technology into LTC settings. AHS's 5-year IT Plan has a vision of "one person, one record." Soon, continuing care such as LTC will use technologies like electronic medical records (EMR) and be part of provincial CIS. Studies show these IT changes will be more successful if the needs of RNs for patient care are met. LTC has been considered to be more complex than other patient care settings as nurses must work within a multidisciplinary team environment to coordinate care for the patients with more complex care requirements.

This study will focus on understanding your needs for clinical data and information with a goal of developing a constructive Information Flow Model that will match patient care processes and your practices in the context of Canadian LTC settings.

Importance of this Research

Little is known about LTC information flow while LTC service has become an increasingly important health sector for population health. Because that RNs play an integral role in LTC settings due to the lack of physicians onsite, and also RNs hold supervisory roles over other nursing staff such as licensed practical nurses (LPN) and nursing assistants. Being the primary care coordinators in managing patient care in the LTC setting, RNs are therefore the single most

significant group who will be in charge the tasks of information management and become intensive users of information. Thus, their perspectives on information needs and practice will be fundamental for studies of LTC information flow.

Participants Selection

- You are a registered nurse (RN) working in a nursing home in Alberta.
- You provide direct patient care.

What is involved?

To participate in this research you will:

1. Have an observation session (2 hours) on
 - How you collect data
 - Types of data you collect
 - How you share data at work
2. Have a follow-up interview (30 minutes)

The researcher will take notes during the observation. She will audio record the interview.

Inconvenience

The interview takes 30 minutes. You may feel uncomfortable about the observation.

Benefits

There are no direct benefits and the potential benefits for you include:

- Learning about how you currently gather and share information
- Learning to avoid unnecessary or duplicated data entry

Voluntary Participation

- You do not have to participate in this study. It is completely voluntary.
- You can stop at any time.
- You can stop without giving us a reason.
- If you quit the study, we will not use your data and will destroy it.

Anonymity

We use number codes for participants. Your personal information is confidential.

Confidentiality

- We will collect your data using a number code system. We will protect your personal information.
- We will use password-protected encryption for data storage. Ms. Wei is the only person who can access the data. She will use a laptop with an access password. She will store it in a locked cabinet in her home office.
- The results of the study will not include information that identifies you or your workplace.
- The observation will happen at your facility. Your co-workers might find out that you are participating. This could limit confidentiality. The researcher will talk to you about this issue.

- Professional and legal requirements for disclosure can limit confidentiality. If the researcher sees an unethical behaviour, she must report this to the regulatory body. The researcher will talk to you about the possible risks. The researcher will tell you again you before the observation.

Sharing Results

The results of this study may be shared with others in the following ways:

- Published article or presentation at a meeting
- Thesis, including storage in the University of Victoria online thesis repository

The results will not show any information about you.

Disposal of Data

Data will be kept for five years after the completion of this study. After five years, all data will be destroyed. The researcher will shred papers and erase all information from the laptop.

Contacts

- You may contact Jen Wei (researcher) and Karen Courtney (supervisor). Their contact information is on the first page.
- The Health Research Ethics Board of Alberta (HREBA) – Community Health Committee (CHC) has granted ethics approval of this project. If you have any complaints or concerns about the ethical conduct of this project, please contact:
HREBA – Community Health Committee
Suite 1500, 10104 - 103 AVE, Edmonton AB, T5J 4A7
Phone: (780) 423-5727/ Toll-free: 1-877-423-5727/ Email: communityhealth@hreba.ca
- The Health Research Ethics Board of University of Victoria has granted ethics approval of this project. If you have any complaints or concerns about the ethical conduct of this project, please contact:
The Human Research Ethics Board (HREB), University of Victoria
PO Box 1700 STN CSC, Victoria, BC, Canada V8W 2Y2
Phone: 250-472-4545, Fax: 250-721-8960, Email: ethics@uvic.ca

Please sign the line below to indicate you:

- Understand the conditions of participation in this study
- Had the opportunity to ask the researcher any questions you have
- Consent to participate in this research project

Name of Participant

Signature

Date

A copy of the consent form will be provided to you and the original signed consent form will be taken
by the researcher to retain in the study records.

Appendix G Verbal Consent Script

Project Title: Registered Nurse Practice and Information Flow in Long-term Care Nursing Homes

Hi, my name is Jen Wei. I am a graduate student in the School of Health Information Science at the University of Victoria (Uvic). Previously, I worked as a community nurse in long-term care (LTC) settings in Victoria, BC, and was trained as a MD with over 7 years of practice. I also work for Alberta Health Services (AHS) in the Clinical Information System (CIS) program currently. I have a supervisor for this study, Dr. Karen Courtney, from the Uvic. My study is about registered nurse practice and information flow in long-term care nursing homes.

Importance of this Research

Little is known about LTC information flow; in other words, it is not clear how patient information be stored and shared. I am here to observe your RN in order to understand her practice on using information. This understanding will help future technology implementation.

Participants Selection

You are invited to take part in this research study because we would like to observe your nurse.

What is involved?

If you agree to participate in this study, I will watch your nurse in your room. I may take notes about the type of information your nurse uses and shares with your other health providers. I may take notes about how your nurse finds the information as well. I will not ask questions, so your care will not be interrupted. I will leave when your nurse finishes your care. I will not write down any of your personal information.

Inconvenience

You may be uncomfortable being observed.

Benefits

There is no direct benefit to you from being in this study.

Voluntary Participation

You are free to agree or disagree to take part in this study, and you can change your mind at any time. If you want me to stop, just let me know and I will leave the room. Please let me know if you have any questions about your rights. You may also contact my supervisor, Dr. Courtney.

Anonymity

In order to protect you, I will not record any your personal information, I only take notes on the nurse.

Confidentiality

Your information will be protected and the study will not include any identifiable information, which means no one can identify you from this study

Dissemination of Results

This study will be shared with others in two ways:

- published article or presentation at a scholarly meeting
- thesis, to be stored in the library of the University of Victoria

However, no person will be identified in the sharing of results.

Disposal of Data

After five years, the data are to be destroyed:

Permission to process

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

Do I have your permission to observe your nurse in your room?

Permission to proceed

Date: -----

Box Checked by the researcher, Name: -----

Contacts

- The researcher:
Jen Wei: XXX
- The supervisor of this study:
Karen Courtney, RN, PhD, Associate Professor, Graduate Adviser
University of Victoria, School of Health Information Science
PO Box XXX
Phone: XXX/ Fax: XXX/ Email: XXX
- The Health Research Ethics Board of Alberta (HREBA) – Community Health Committee (CHC) has granted ethics approval of this project. If you have any complaints or concerns about the ethical conduct of this project, please contact:
HREBA – Community Health Committee
Suite 1500, 10104 - 103 AVE, Edmonton AB, T5J 4A7
Phone: (780) 423-5727 / Toll-free: 1-877-423-5727 / Email:
communityhealth@hreba.ca
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The Human Research Ethics Board (HREB), University of Victoria
PO Box 1700 STN CSC, Victoria, BC, Canada V8W 2Y2
Phone: 250-472-4545, Fax: 250-721-8960, Email: ethics@uvic.ca

A copy of this verbal consent will be taken by the researcher by the researcher to retain in the study records.

Appendix H Semi-Structured Interview Questions

Semi-Structured Interview Questions

Demographic information

What age group you belong to? 21-30, 31-40, 41-50, 51-61+

How many years of nursing experience do you have?

How many years have you worked in LTC?

Do you use electronic documentation in your workplace?

If you are not documenting electronically, how are you documenting?

Identify tasks of information exchange

I saw you were taking notes sometimes, what do you do with those notes you took?

What types of information you need to collect and document after seeing a patient?

If a patient needs to see her doctor, what do you do?

Is there any time you read or write the same information more than once? When?

Before your shift, what type of information you receive from the previous RN? Does the information impact on your shift?

Identify strengths, challenges, and suggestions regarding information intervention under current working condition

How do you feel about your ways of data and information management?

If there are 3 things that you can change, what are they?

Do you see any step that was not necessary and can be avoided?

Appendix I Observation Tool

Observation Tool

1. General Information

Observation Date

Observer

Facility address

Participant pseudonym (RN -facility 1st letter-# of observation session)

Event

purpose

Location

2. Information Media Types

Digital Media:

- Email
- Fax
- Telephone

Pager

Paper-Based Media:

Displayed Media:

- White Board

Verbal Media:

- Face To Face

3. Information Content and Function Types

Demographics

Historical Information

Care plan

Reminders and To-Dos

Alerts

immediate action

Scheduling

Reporting

4. Information Spaces

Common Information Spaces

Personal Information Space*

Appendix I Observation Tool – cont.

Observation Tool

5. Types of Information Processes

Information Access

Review New And Previous Test Results

Review Diagnostic Image

View Previous Nursing Notes

Review Notes From Other Providers

Review Medications

Review Mar

Information Input

Document Patient Vital Signs And Disease Specific Variables

Document Performed Procedure Process Note

Document Patient Progress Notes (PPR)

Document Given Medication

Document Incident

Communication

Send and Receive Messages to Other Staff Members

Check Schedule to See If Patients Have Appointment

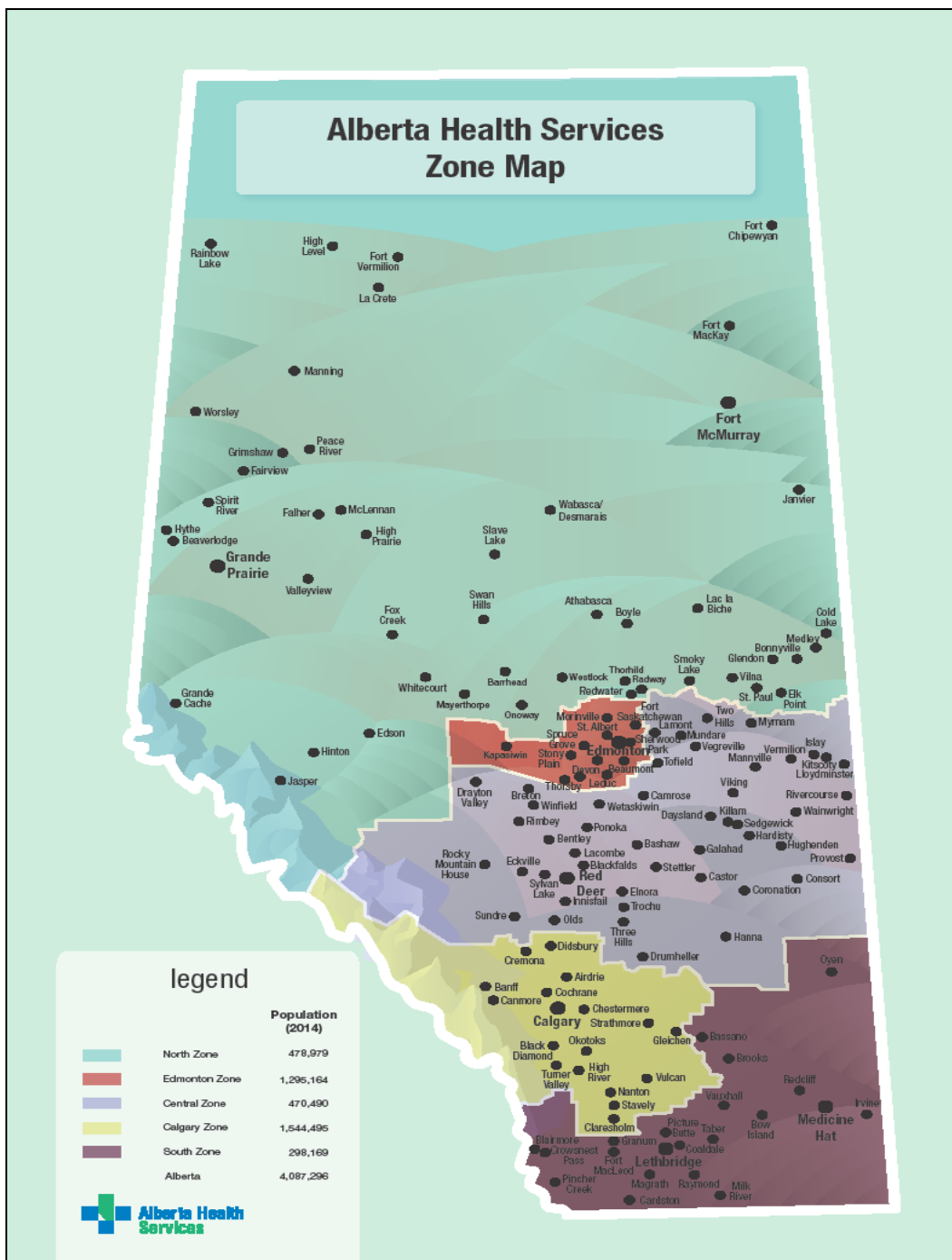
Review Note from Other Providers

Communication to Make Appointment For a Patient

Communicate with Patients or Family

Note: Personal information space is an information space that a person uses to write or store information, such as handy notebook, sticky notes.

Appendix J AHS Map: North Zone and Central Zone, Alberta



Note: Adopted from AHS Insite, 2015. Retrieved from <http://www.albertahealthservices.ca/1532.asp>

Appendix K Covenant Health Map: Hospitals & Care Centres, Alberta



Note: Adopted from Covenant Health website, 2015. Retrieved from <https://medicalstaff.covenanthealth.ca/medical-staff-resources-services/physician-orientation/misericordia-physician-orientation/covenant-health-structure-leadership/facilities-map?2979>