11-16-2021 10:00 AM

Understanding the Current State of Health Information Exchange in Long-Term Care Homes

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Nursing

Abstract

Research Questions: The research questions within this thesis aimed to examine the current state of health information exchange (HIE) processes within the Canadian long-term care (LTC) setting and identify opportunities to improve these processes through the proliferation of health information technology (HIT).

Methods: The first study undertook a scoping review following Levac et al's. approach to the methodology. Next, an interpretive study using semi-structured interviews and Hsieh and Shannon's conventional content analysis methodology was undertaken.

Findings: The scoping review highlighted that effective HIE processes are susceptible to variations in HIT resources, workload, and social and organizational cultures. The findings of the interpretive study describe common breakdowns in HIE processes and identifies opportunities to connect fragmented information flows through HIT proliferation.

Significance: We recommend accelerating the implementation and adoption of HIT to facilitate intra- and inter-organizational HIE for direct-care providers, to strengthen the efficiency of HIE processes, and to improve the safety and quality of care within the LTC sector.

Keywords: Health information exchange, communication, information sharing, documentation, long-term care, health information technology, electronic health record

Summary for Lay Audience

The term *health information exchange* (HIE) in healthcare largely describes how healthcare providers gather and share information about patients or long-term care (LTC) residents that is needed to make decisions during care delivery. Technology can be a useful tool to improve the efficiency of HIE, but the long-term care (LTC) sector has been slow to use technology to its full potential during HIE processes. Consequently, care quality within the LTC sector is impacted by providers using inefficient HIE processes while the complexity of coordinating healthcare for these residents increases. Improving HIE processes in LTC is important because healthcare providers need the right information, at the right time, to make decisions about residents' care. This thesis consists of two studies that aim to understand the current state of HIE within LTC to identify opportunities to improve these processes through increased technological adoption. The first research study is a scoping review of the literature on the topic of HIE within Canadian LTC to understand current processes, gaps in HIE that might be closed by technology adoption, and opportunities for future research. The second study in this thesis co-creates an understanding of the current state of HIE within LTC through semi-structured interviews with LTC providers; through this study, researchers built an interpretive understanding of current HIE processes and identified opportunities for improvement through increased technological adoption. Increasing technology within LTC is an important opportunity to improve HIE and the quality of healthcare within this sector; however, careful consideration of social, organizational, and cultural factors impacting a healthcare providers level of technology adoption is important to consider alongside implementing new technological processes.

Co-Authorship Statement

Kendra Cotton completed the following thesis under the supervision of Dr. Richard G. Booth and advisement of Dr. Josephine McMurray who will be co-authors on publications resulting from this manuscript.

Acknowledgements

I would like to acknowledge my mom, dad, sister, friends, nursing colleagues, academic supervisors, and classmates who have all been important supports throughout my academic journey. I would also like to acknowledge all the nurse leaders that I have encountered throughout my nursing career who have inspired me to undertake an interest in nursing research. Specifically, I would like to thank my supervisor Dr. Richard Booth, for taking the time to speak with me as a second-year nursing student about achieving a future in nursing research, and for his insightful contributions which helped shape this thesis and myself as a future nursing researcher. I would also like to extend my gratitude to Dr. Josephine McMurray for her support, guidance, and innovative ideas which motivated me throughout the writing of this thesis.

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Chapter 1: Introduction

Background and Significance

An estimated 100,000 residents (Wilkinson et al., 2019), requiring 24-hour coordinated, professional health and personal care services, are collectively cared for by Ontario's long-term care (LTC) sector (Estabrooks et al., 2020; Wodchis et al., 2016). Providing care to support LTC residents' who live with complex health needs generates a considerable amount of information that must be exchanged to support informed care decisions by various regulated care providers (RCPs) and unregulated care providers (UCPs) in the circle of care (Alexander et al., 2020; Kruse et al., 2017). Health information exchange (HIE) is the gathering and sharing of health information between healthcare providers or healthcare settings for care provision purposes and is an important process in ensuring quality healthcare (Georgiou et al., 2013; Hersh et al., 2015). A considerable amount of funding has been dedicated to support the adoption of health information technology (HIT) in Canada, or more broadly the "hardware, software, and infrastructure required to collect, store, and exchange electronic health information" (Dobrow et al., 2019, p.1079). For example, investments by Health Canada in HIT during the SARS-CoV-2 pandemic approximate at "$240.5 million to increase access to virtual services and digital tools to support Canadians' health and wellbeing… in addition to the $50 million in incremental federal funding allocated to Canada Health Infoway to further support provincial and territorial efforts" (Health Canada, 2021, Quick facts section, pt. 1 and 3). Specifically, fully functional interoperable electronic health records (EHRs) have been a priority because of their potential to positively impact quality of care outcomes through improvements in the exchange of information (Caspar et al., 2016; Gauthier et al., 2019; Tharmalingam et al., 2017). Previous inquiry into HIE highlights that "effective communication and appropriate transfer of information is necessary

during care transitions to avoid patient safety risks and health care system costs" (Georgiou & Hagens, 2016; Tharmalingam et al., 2017, p. 318). However, the LTC sector has been the slowest amongst all health sectors to adopt fully functional EHRs (Cherry et al., 2008; Kruse et al., 2015). Contributing to the lag in HIT adoption is Ontario's *Long-Term Care Homes Act* (Government of Ontario, 2007) which does not require a single integrated digital health record; consequently, in the absence of further inquiry strengthening evidence to influence policy changes, adoption of HIT will continue ad hoc, rather than in a system-wide and deliberate fashion.

A layered mixture of processes continues to drive HIE within LTC (Wong et al., 2021). Incomplete HIT adoption contributes to LTC providers engaging in a hybridized mix of formal HIE processes, including paper-based and electronic documentation (Stolee et al., 2019). Informal HIE processes fill gaps in communication created by workload and time constraints, technology workarounds, and technological difficulties. The quality of those informal HIE processes is influenced by the quality of providers' working relationships and may include verbal reports or informal artifacts, such as a post-it notes (Caspar et al., 2016; Wagner et al., 2014).

The authors of this study aim to understand HIE using a sociotechnical lens (Sittig & Singh, 2015) because both social and technological processes influence the success of HIT adoption in LTC. Furthermore, sociotechnical theory is useful to understand HIT adoption within the complexity of organizational and professional cultures that shape factors influencing the success of HIT and its impact on related care outcomes (Sittig & Singh, 2015; Westbrook et al., 2007). The social processes within LTC are unique because UCPs are responsible for approximately 90% of the care a LTC resident requires including bathing, feeding, and behaviour monitoring (Afzal et al., 2018; Hewko et al., 2017). Despite UCPs being the "eyes and

ears" of RCPs (Afzal et al., 2018, p. 16), UCPs are most often siloed from the rest of the care team and have a greater reliance on informal HIE processes to inform their care provision (Caspar et al., 2016). Out of the estimated 100, 000 UCPs providing care across health sectors in Ontario, the workforce is estimated to be predominantly female (>90%) and approximately half of UCPs are foreign born with English as their second language (Afzal et al., 2018; Estabrooks et al., 2015). UCPs have historically been disempowered by social and organizational cultures within LTC; however, they should be empowered to be "informed members" (Afzal et al., 2018, p. 16) of the care team by understanding and ensuring their information needs are understood and met.

Statement of Reflexivity

This statement of reflexivity is written to acknowledge the influence of myself as a researcher on the choice of research topic, the research questions, the measures, the analyses and interpretation of the interview transcripts, and the knowledge produced from this inquiry (Manderson et al., 2006). Reflexivity is important to promote the quality of qualitative research because it is a way for the researcher to demonstrate their sincerity and increases the transparency of the research process (Tracy, 2010).

I chose to consider improving HIE processes in LTC through HIT as the focus of inquiry within this thesis because of past experiences and frustrations related to experiences of disempowerment in the role of a UCP in a for-profit LTC. As a registered nurse (RN), I have worked in rehabilitation and hospital organizations which prioritize the adoption of HIT; I noticed a difference in the level of HIT adoption, HIE processes, and social and organizational cultures between my LTC experience and experience outside of that sector. As I chose the research topic of this thesis, I drew upon my past experience as a UCP within LTC and current

experiences as a RN working throughout the SARS-CoV-2 pandemic; importantly, I developed the research question as I worked within the Ontario healthcare system as it coped with the collapse of the LTC sector during the pandemic. Therefore, to be transparent, I am an RN with professional values, I drew upon past experiences as a UCP, and I am influenced by current social values shaping the dialogue surrounding past and current issues impacting LTC care quality.

Statement of Study Purpose

The two inquiries comprising this thesis examined the current state of HIE within the Canadian LTC setting to understand how this process might be improved through increased proliferation of HIT. First, following Levac et al's., (2010) scoping review methodology which builds on Arksey and O'Malley's (2005) original description of the methodology, I conducted a scoping review into the state of HIE processes in LTC. The scoping review led to the development of four themes: (1) *an overview of the dynamic state of HIE within LTC*; (2) *providers' efforts to engage in formal HIE processes*; (3) *opportunities to close information* gaps*: Informal HIE processes*; and (4) *the evolving role of electronic communication in the HIE processes driving LTC*. Each of the themes highlights issues related to LTC providers not fully adopting HIT which is exacerbating the gap between expectations of efficiency within HIE processes to provide quality care and the realities of HIE during front-line care. The second inquiry builds upon knowledge developed within the scoping review. An interpretive study using semi-structured interviews with front-line providers (Ponterotto, 2005; Weaver & Olson, 2006) and Hsieh and Shannon's (2005) conventional content analysis methodology was used to co-construct an understanding of the current state of HIE in LTC. The findings of the interpretive study describe three common breakdowns in this process that could be improved by the

proliferation of HIT: (1) the asymmetrical nature of HIE; (2) a reliance on layers of formal and informal HIE processes; and, (3) incomplete adoption of electronic HIE processes and adoption of electronic processes that reinforce existing communication breakdowns.

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Chapter 2: A Scoping Review - Understanding Health Information Exchange Processes Within Canadian Long-Term Care

Introduction

Adults over the age of 65 comprise one of the fastest growing cohorts in the Canadian population, representing 17.2% of the Ontarian population in 2019 (Government of Ontario, 2020). Further, older adults disproportionately experience chronic health conditions and utilize more health services than other age cohorts (Griffith et al., 2019; Maresova et al., 2019; Salive et al., 2013). This increased experience of chronic health conditions necessitates an increased need to access and integrate a variety of healthcare services (Maresova et al., 2019; Wodchis et al., 2016). For some older adults, accessing LTC is a valuable factor in supporting quality of life, especially for those who require 24-hour, coordinated, professional health and personal care services (Estabrooks et al., 2020; Wodchis et al., 2016). Ontario's LTC sector collectively cares for an estimated 100,000 residents each year (Wilkinson et al., 2019). Residents of Ontario's LTC homes commonly live with one or more chronic health conditions, with approximately 90% experiencing some level of cognitive impairment (Kruse et al., 2017; Wilkinson et al., 2019). Providing care to support the complex health needs of LTC residents generates substantial amounts of health information; this information must be documented, shared, and acted upon by the various regulated care providers (RCPs) and unregulated care providers (UCPs) in the circle of care (Alexander et al., 2020).

UCPs who commonly provide "80-90% of direct care" (Caspar et al., 2016, p. 962) to residents in LTC are often disconnected from the rest of the healthcare team's information exchanging processes despite being central to direct care activities. UCPs are typically responsible for personal care duties like bathing, dressing, and toileting; so, they need to receive

and share health information to provide quality person-centered care (Just et al., 2021). The sequestering of health information from UCPs was highlighted by Caspar et al. (2016), who interviewed UCPs and described them walking into care situations "blind" (p. 957). Exchange of information is necessary to understand the nature of the care needed to meet LTC residents' complex health and personal care needs effectively and safely. Consequently, understanding the current state of health information exchange (HIE) among LTC providers is a prerequisite to the provision of quality healthcare for LTC residents and is the focus of this chapter (Ancker et al., 2015; Rudin et al., 2014).

HIE, when considered as a verb, is the act of sharing a patient's health information between healthcare providers or healthcare settings (Hersh et al., 2015). For example, information is collected and shared using documentation, both paper and electronic (Georgiou et al., 2013). HIE should also be understood as a noun, that describes a network entity that members of an interprofessional team take part in, to facilitate exchange of information in support of coordinated healthcare (Sittig, & Singh, 2015; Sittig et al., 2020). In this review, HIE is referred to as any action or process that a provider engages in to receive and share health information for the provision of healthcare to LTC residents whether digital, paper-based, or verbal reports between providers (Caspar et al., 2016; Sittig et al., 2020). Over the last two decades, health information technology (HIT) has become a commonplace mechanism to facilitate HIE (Gartner & Canada Health Infoway, 2018; Georgiou et al., 2013). The term HIT broadly describes a complex ecosystem of "hardware, software, and infrastructure required to collect, store, and exchange electronic health information" (Dobrow et al., 2019, p. 1079). Ideally, HIT use can facilitate HIE by providing a digital architecture for appropriate information to be shared between care providers in real-time, to support clinical decision-making (Hersh et

al., 2015). Investment in HIT has contributed to improved access to information for both UCPs and RCPs (Alexander et al., 2020); however, the LTC sector has been among the slowest to adopt HIT and digital HIE processes (Gartner & Canada Health Infoway, 2018). Even when a LTC facility possesses HIT, access and use of electronically stored information and the capacity to contribute to electronic documentation varies between RCPs and UCPs (Bender et al., 2017). Consequently, providers in LTC use a fragmented array of digital, fax, telephone, paper-based, and verbal HIE processes (Georgiou et al., 2013; Hersh et al., 2015) that can contribute to gaps in communication which compromises provision of quality care (Caspar et al., 2016; Wilkinson et al., 2019). As investments in HIT continue to expand, understanding and describing the current state of HIE processes utilized by LTC care providers is an important step in identifying opportunities for improvement (Gartner & Canada Health Infoway, 2018).

Methods

Study Design

Following Arksey and O'Malley's (2005) methodology, this scoping review examines the academic peer-reviewed literature on HIE processes used in LTC and identifies research gaps to guide future research. The protocol for this review was developed using the Joanna Briggs Institute *2020 Manual for Evidence Synthesis* (Peters et al., 2020). Research objectives were addressed using the scoping review methodology described by Levac et al., (2010) which builds on Arksey and O'Malley's (2005) original description of the methodology and consisted of the following steps: (1) identifying the research question; (2) identifying relevant studies; (3) article selection; (4) charting the data; and, (5) collating, summarizing, and reporting results.

Identifying the Review Question

The purpose of this scoping review is to describe the HIE processes used within LTC and to identify key research gaps, especially related to HIE and technology. The research question used to guide the scoping review was: *What is the current state of HIE processes used by UCPs and RCPs caring for residents in Canadian long-term care facilities?* As recommended by Levac et al. (2010) the research question guiding the scoping review was made purposefully broad but clear enough in its articulation around the central concepts of interest, including HIE, UCPs and RCPs, and the target population of LTC residents.

Identifying Relevant Articles

All research article typologies were deemed eligible for inclusion, including quantitative designs, qualitative methods, and other forms of peer-reviewed literature (Tricco et al., 2016). Inclusion criteria included: (1) English language; (2) publication in a peer-reviewed journal; (3) Canadian context; (4) published within the 10-year search limit (2010-2020); and (5) focus on elements of HIE within LTC settings, as related to the care of residents. Exclusion criteria included: (1) Non-English language, (2) non-peer -reviewed publications, (3) outside the 10-year search limit, and (4) articles that did not discuss HIE processes. The primary researcher (KC) in consultation with a medical librarian and other members of the scoping review team developed the search syntax (Table 1), based on elements of the research question.

Table 1.

Scoping Review Search Syntax

Search Topic	Key Words
Health Information Exchange	Health Information Exchange, Information Sharing, Communication, Electronic Health Records, Health Information

	Technology, Documentation, Care Transition, Protocol, Interoperability, Health Data Exchange
Long-Term Care	Long term care, Long-Term Care, LTC, Long-Term Care Facility, LTCF, Nursing Home

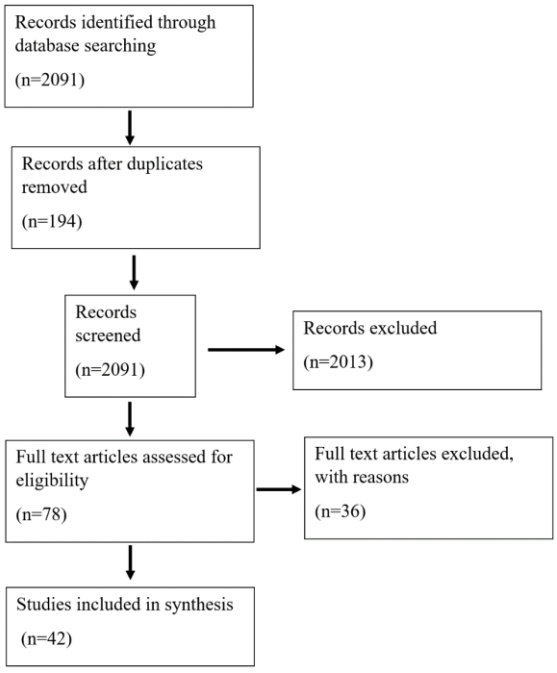
CINAHL, Scopus, and Medline databases were searched in October 2020, and citations were extracted and imported into Covidence literature review software (Veritas Health Innovation, 2021). The search strategy was limited to 10 years (2010-2020), to focus on contemporary examples of HIE within LTC facilities.

Results

After removing 194 duplicates, the search yielded 2091 citations for title and abstract screening.

Figure 1.

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Diagram (Tricco et al., 2018).



Article Selection

Two reviewers (KC and RT) independently screened all 2091 citations, selecting 78 citations for independent full-text review. Discrepancies were resolved through discussion and consensus. After a full-text review, 42 articles were retained for data extraction (see Appendix A).

Charting the Data

Key items of information from each article included within the full-text review (Arksey & O'Malley 2005) were entered into a common worksheet that was iteratively generated by KC and RT to ensure all relevant variables related to the research question were extracted (Levac et al., 2010). This process included independently charting the same five articles, discussing discrepancies till consensus was reached, and refining the data extraction worksheet (Levac et al., 2010). The charting framework was applied to all 42 research articles included in the scoping review so that standard information on the topic of HIE in LTC was collected. During data extraction, reoccurring key items extracted from included articles were charted into topic domains from which final themes emerged (Braun & Clarke, 2006; Clarke & Braun, 2018). Each topic was analyzed for patterns which are reported as the final themes, including (1) *an overview of the dynamic state of HIE within LTC*; (2) *providers efforts to engage in formal HIE processes*; (3) *opportunities to close information gaps: Informal HIE processes*; and (4) *the evolving role of electronic communication in the HIE processes driving LTC*.

Themes

An Overview of The Dynamic State of HIE Within LTC

Formal and informal HIE processes are used by both RCPs and UCPs to organize, perform, and evaluate healthcare services in LTC facilities. How HIE processes integrate within

daily workflow at each LTC facility is variable (Heckman et al., 2016; Tharmalingam et al., 2017). Care providers at LTC facilities have a variable approach to HIE driven by social and workload factors within the healthcare environment, such as time, staffing availability, and the quality of hierarchical professional relationships; and the availability and use of different formal HIE resources, such as paper-based charts, electronic health records (EHRs), communication binders, activity of daily living (ADL) instructions, faxes, and in-person or telephone verbal reports (Caspar et al., 2016; Parashar et al., 2018; Tate et al., 2020). Articles reviewed described informal HIE processes that are heavily relied on by UCPs, who play a strong supportive role within LTC by executing care and treatment plans, and gathering information for other providers (Afzal et al., 2018; Tate et al., 2020). Use of informal HIE processes, such as a verbal report or artifacts, like a post-it note on a keyboard, is dependent on good quality working relationships to build effective communication channels (Caspar et al., 2016; Wagner et al., 2014). Use of formal HIE processes is driven by access to and engagement with organizational resources (Caspar et al., 2016). A combination of paper and electronic records are the most common formal processes; for example, most participants (86%) in a study of 21 LTC care staff across 6 Canadian provinces used both paper-based and electronic HIE processes (Tharmalingam et al., 2017)

Providers' Efforts to Engage in Formal HIE Processes

Documentation is an important formal HIE process used to guide LTC providers in their care duties, especially to facilitate continuity of care when all members of the care team cannot be present to observe care activities (Ellis et al., 2012; Gauthier et al., 2019). RCPs have professional documentation guidelines but also rely on other providers' documented observations of a resident's health status and behaviours. Documentation, collected over time by various

providers, affects care plan decisions because it informs RCPs of health information that they may not have been available to observe in person (Ellis et al., 2012; Heckman et al., 2016). For example, physicians providing care in LTC facilities report relying on paper-based communication binders and behavioural assessment tools as formal processes to document behavioural patterns and inform care decisions (Penko et al., 2020). Some documentation requirements are particularly burdensome, such as balancing documentation demands in the face of time constraints (Desveaux et al., 2019; Grinman et al., 2019; Kaasalainen et al., 2010b). Further challenges occur when UCPs are required to verbally report health information to RCPs for it to be formally documented, this is particularly problematic when RCPs are not available or approachable (Desveaux et al., 2019). Consequently, providers report that documented health information in LTC lacks detail and is not updated in a timely fashion, especially related to patient-centered care and reportable behaviours or signs and symptoms required for evidence-informed care plan decisions (Desveaux et al., 2019; Ellis et al., 2012; Voyer et al., 2014).

Outdated or incomplete formal clinical documentation negatively impacts providers' ability to plan and make care decisions. Documentation is used by both UCPs, who provide 80-90% of daily personal care, and RCPs who allocate much of their time to indirect care activities, like care planning (Caspar et al., 2016; Gauthier et al., 2019; McCloskey, 2011). RCPs are particularly impacted by gaps in or poor-quality HIE; this is especially true for physicians and nurse practitioners (NPs), both of whom oversee and direct a LTC residents' care utilizing the benefit of other RCPs' and UCPs' direct care perspective (Desveaux et al., 2019; Kassalainen et al., 2010b; Hurlock-Chorostecki et al., 2015). UCPs are not professionally required to maintain formal records, rather their role is to carry out care plans and inform RCPs of pertinent information (Tate et al., 2020). However, monitoring changes and documenting complex medical

conditions requires knowledge, skills, and critical thinking for which UCPs do not receive training (Caspar et al., 2016). Consequently, any documentation by UCPs is closely related to the expectations and information needs of an RCP who must inform, advise, and direct a UCPs care activities and subsequent documentation requirements (Alamri et al., 2015; Desveaux et al., 2019; Tate et al., 2020). Conversely, UCPs experienced challenges executing care due to incomplete, outdated, or inaccurate documentation by RCPs preoccupied with other workload demands (Caspar et al., 2016). A qualitative thematic analysis by Gauthier et al (2019) revealed that individualized ADL care plans are often not updated in a timely fashion per resident care requirements. Other authors highlighted the negative impact of workload pressures on the quality of clinical records and documentation, including information directing resident-centered care and recent medical updates (Desveaux et al., 2019; Sims-Gould et al., 2010; Song et al., 2020).

The use of communication binders and interdisciplinary progress notebooks were common examples of formal HIE artifacts used to update members of the care team on the health status of LTC residents; however, descriptions of their implementation and use varied significantly in the articles included in this review (Ellis et al., 2012; Suter et al., 2014; Tharmalingam et al., 2017). For example, some LTC facilities reported the use of a written communication binder to document health status, but not all of these binders are accessible to the entire care team - some are shared only between RCPs (Kaasalainen et al., 2010b; Tate et al., 2020; Wei & Courtney, 2018). Paper-based medication administration records (MARs) are also particularly commonplace and susceptible to HIE inefficiencies when members of interdisciplinary care teams are relied on to transcribe and update medication orders (Ellis et al., 2012; Fei et al., 2019). Paper-based MARs lack the functionality of electronic medication administration records (eMARs) and may impede a LTC provider’s workflow (Fei et al., 2019).

Further, paper-based MARs commonly relied on parallel, adjunct communication channels to assist in the medication administration process, including verbal and faxed medication orders requiring transcription onto the paper MAR, in comparison to directly inputted medication orders which an eMAR is capable of (Kaasalainen et al., 2010a; Wei et al., 2018). Paper-based MARs have been found to be more prone to errors than eMARs due to time constraints, transcribing errors, disruptions in a task, and workload pressures. (Fei et al., 2019; Gauthier et al., 2019). LTC facilities with eMARs experience efficiencies in medication HIE processes because the eMARs were capable of automatic medication updates, supporting clinical information needs in a timely fashion, and improving the safety of medication administration (Fei et al., 2019; Kaasalainen et al., 2010a; Kruse et al., 2017; Tharmalingam et al., 2017).

Opportunities to Close Information Gaps: Informal HIE Processes

Brief one-to-one verbal reports between care providers are the dominant informal HIE process used within LTC, especially by UCPs (Caspar et al., 2016). Reviewed literature highlighted a breakdown in communication across professional disciplines, particularly between UCPs and RCPs (Andersen & Spiers, 2016; Bender et al., 2017; Strachan et al., 2014). Caspar and colleagues (2016, p. 954) describe "microsystems of care" that are defined by HIE processes; one system regulated by professionals whose information exchange is formal and textual, and another system where unregulated providers' exchange information is oral and ad hoc. RCPs have privileged access to available formal HIE documentation and processes, such as paper or electronic documentation and interprofessional care team meetings (Bender et al., 2017; Suter et al., 2014). For example, RCPs gain privileged personal information during family care conferences to which UCPs, who provide intimate care, are not generally invited or allotted the time to attend, and which is not always shared with the UCP under the assumption that there is

no “need [for them] to know this information” (Caspar et al., 2016; Gauthier et al., 2019, p. 1611). Although informal HIE is valuable, there is a lack of established organizational measures for LTC providers to engage in these processes (Cammer et al., 2014; Tate et al., 2020). Informal HIE processes not only serve to support downstream information dissemination for UCPs providing direct care, but also upstream information dissemination for RCPs planning care activities (Caspar et al., 2016). UCPs provide the bulk of daily resident direct care and therefore have valuable insight into health information useful to other members of the care team (Afzal et al., 2018). Some RCPs report seeking out UCPs’ informal insights to guide care decisions (Caspar et al., 2016; Heckman et al., 2016; Suter et al., 2014). In contrast to RCPs preference for formal HIE processes, informal verbal reports were found to be highly valuable and favoured by UCPs to facilitate effective HIE (Gauthier et al., 2019).

Most verbal reports occur ad hoc during found time, such as “hallway chats” (Caspar et al., 2016; Stolee et al., 2019, p. 416). UCPs often lack access to formal processes and documentation systems, necessitating the use of informal “watch and wait” strategies for an opportune time to exchange health information with other providers (Caspar et al., 2016, p. 960). This is a particularly precarious position for UCPs - they must purposefully disrupt their own time-constrained workflow and also the workflow of another provider (Caspar et al., 2016; Tate et al., 2020). Ironically, RCPs are being interrupted by UCPs during critical tasks, such as medication administration (when they are in the same place as the rest of the care team), and when the likelihood of distraction, not recording, and forgetting verbal communications is high (Caspar et al., 2016).

A verbal report at change of shift, or shift report, is not formally required in LTC, but is common among providers and described as essential to HIE; yet to engage in this process

requires staff to arrive early for work to speak with peers during an unpaid period of time prior to the initiation of their shift (Caspar et al., 2016; Gauthier et al., 2019). Nursing staff described shift report between UCPs and RCPs as burdensome, as they required information sharing on "72-85 residents in 10 minutes" (Caspar et al., 2016, p.957). A lack of formal organizational processes to facilitate verbal reports is reflective of the professional hierarchy within LTC facilities that commonly favours individuals managing care, verses individuals doing the care (Andersen & Spiers, 2016; Strachan et al., 2014). The strength of informal HIE processes available to individual LTC providers has been found to be largely dependent on the quality of workplace relationships, which are often circumscribed by professional hierarchical power dynamics (Caspar et al., 2016; Gauthier et al., 2019). UCPs primarily communicate with regulated nursing staff to receive the information they do not have access to within their role, but which is relevant to the execution of their duties. Informal HIE is necessary because in facilities without communication protocols, UCPs did not have access to care plans (Tate et al., 2020; Wagner et al., 2010; Wei & Courtney, 2018). Furthermore, UCPs lack authority to make care decisions and their workflow is centered around completing basic care activities such as bathing and feeding according to the care plan (Caspar et al., 2016; Desveaux et al., 2019). Consequently, RCPs presume that UCP roles do not require them to have access to health information beyond basic care needs, and thus exclude them by not sharing it (Alamri et al., 2015; Gauthier et al., 2019). However, as advocated by Afzal et al. (2018), they suggest that UCPs should be viewed as "informed members" of the care team because they are the "eyes and ears" of RCPs (Afzal et al., 2018, p. 16).

The Evolving Role of Electronic Communication in the HIE Processes Driving LTC

In the articles examined for this review, electronic HIE facilitated by some form of EHR system within LTC settings appears to be relatively commonplace. While electronic HIE was reported in some form in all the reviewed articles, adoption is low and improvements in the use of EHR systems to facilitate HIE in LTC is required (Bender et al., 2017; Fei et al., 2019; Heckman et al., 2016; Or et al., 2014). Documentation facilitating HIE within LTC is described as a layered and hybridized mix of paper and electronic processes (Caspar et al., 2016; Stolee et al., 2019). Two articles found that providers attributed limited levels of electronic HIE to a lack of supporting technology, difficulty with workflow integration, and/or a lack of interoperability with external information systems (Caspar et al., 2016; Gauthier et al., 2019).

Low levels of access to and adoption of EHRs by LTC providers, may result in perceptions that the EHR is not always read or considered reliable (McCloskey, 2011). Poor reliability of EHR information was demonstrated in a survey of 103 LTC facilities by Penko et al, (2020), who investigated the usefulness of EHR tools in supporting HIE; they found that documentation held within EHRs is rarely relied on as a clinical support tool. Information captured within an EHR is most commonly inaccessible to UCPs, who describe access to login credentials as a common barrier (Bender et al., 2017; Caspar et al., 2016; Gauthier et al., 2019). Technical issues, information overload, and taking time away from direct care, are further barriers to adoption (Gauthier et al., 2019; Or et al., 2014). Stolee et al. (2019) describe overwhelming amounts of information from various sources, both electronic and paper health records, that impede providers' ability to access the accurate and timely information when making care decisions. Furthermore, EHRs in LTC are poorly integrated with direct care activities; in three studies reported providers transcribing health information into the EHR

system from informal paper records collected at the point of care when EHRs are unavailable (Gauthier et al., 2019; Or et al., 2014; Wei & Courtney, 2018). LTC providers reported additional barriers to EHR adoption due to technical difficulties with electronic documentation processes resulting in incomplete records (Or et al., 2014; Wei & Courtney 2018). Information is also found to be lacking during care transfers when a LTC facility's EHR lacks the capacity to share health data meaningfully across different EHR systems so that all providers in the circle of care can access information needed for care (Heckman et al., 2016; Stolee et al., 2019). Risks associated with adhering to privacy legislation may contribute to low levels of EHR interoperability (Stolee et al., 2019). Consequent of poor interoperability across EHRs in the LTC sector, researchers have reported that use of the EHR is a fragmented and unreliable source of HIE during care transfers with information from some care providers being absent (Heckman et al., 2016; Stolee et al., 2019).

One functionality of EHRs that is almost universally appreciated by LTC providers is the electronic medication administration record (eMAR). In comparison to the paper-based medication administration record (MAR), the eMAR is commonly reported by researchers to be a safer and more efficient approach to medication administration in LTC (Fei et al., 2019; Stolee et al., 2019; Kaasalainen et al., 2010a). Efficiency in eMAR processes can improve a provider's workflow by eliminating manual order transcription processes which are prone to human error and time constraints (Fei et al., 2019). eMARs are a source of practical support because of access to clinical histories, professional resources, and decision support tools such as a medication reference manual (Fei et al., 2019; Kaasalainen et al., 2010a). Furthermore, eMARs reduce information gaps, positively influence the quality and safety of care, and reduce medication errors (Fei et al., 2019).

In addition to improved medication administration processes, researchers described the value that effective electronic HIE can bring to current paper-based documentation, such as filling information gaps through improved access to information (Gauthier et al., 2019; Tharmalingam et al., 2017). The use of an EHR can facilitate timely and efficient dissemination of resident information so that the right provider has the right information at the point of care when that information is needed (Bender et al., 2017). Furthermore, EHR systems can support care provision through decision support tools and error safeguards such as digital alerts and colour coding; therefore, having the potential to improve the safety of care processes across the LTC sector (Bender et al., 2017; Or et al., 2014; Penko et al., 2020).

Conclusion

The literature examined in this review highlighted significant findings related to the current state of HIE processes that are utilized by UCPs and RCPs in the provision of healthcare to LTC residents in Canada. HIE is described as a dynamic process in which UCPs and RCPs engage with various formal and informal HIE resources that influence care. LTC providers engage in processes of observing, collecting, exchanging, documenting, coordinating, and pursuing action on health information to fulfill their role (Desveaux et al., 2019; Voyer et al., 2019). Currently, there are gaps between the expectations of HIE required for quality healthcare and the realities of HIE processes that influence the provision of care (Carson et al., 2019; Gauthier et al., 2019). Effective HIE processes are susceptible to variations in professional roles and responsibilities, HIT resources, professional hierarchical influences, and time constraints. Therefore, formal and informal HIE processes driving healthcare delivery in LTC must both be resourced and function alongside one another to connect fragmented information flows (Cammer et al., 2014; Desveaux et al., 2019; Voyer et al., 2019). When HIE and workload pressures

collide, UCPs delivering most of the personal care rely on knowledge of the residents gained through experience, proximity, and familiarity over time, or report “walking in blind” (Caspar et al., 2016, p957). Fragmented HIE processes result in information gaps that influence care (Caspar et al., 2016). The development of efficient, supportive organizational processes that facilitate informal HIE, such as verbal reports and accelerating the adoption of HIT, are areas for further research to improve HIE and care quality in LTC. For example, during the SARS-CoV-2 pandemic, HIE processes became a critical step in controlling facility outbreaks; specifically, the screening, testing, notification, and contact tracing of asymptomatic staff members (Estabrooks et al., 2020; Stall et al., 2020).

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Chapter 3: Understanding the Current State of Health Information Exchange in Ontario's Long-Term Care Homes

Introduction

Health information technology (HIT) can be broadly described as "a wide range of technologies that store, share, and analyze health information" (Kruse & Beane, 2018, p. 1). Between 2007 and 2015 alone, HIT adoption has accrued "over $16 billion in quantifiable benefits" (Gheorghiu & Hagens, 2017, p 2). A recent systematic review by Kruse and Beane (2018) affirms that increasing adoption of HIT stands to benefit "providers, consumers, and policy makers alike" (p. 5). However, inquiry, investments, and adoption of HIT within the long-term care (LTC) sector have lagged in comparison to all other health sectors; consequently, the extent to which LTC providers access necessary information to inform their care provision to residents is not well understood (Canadian Healthcare Technology, 2016; Tharmalingam et al., 2017). Furthermore, inquiry into HIT has focused on regulated care providers (RCPs), yet unregulated care providers (UCPs) play a unique role within the LTC sector as they are responsible for approximately 90% of care provision (Afzal et al., 2018; Heckman et al., 2017; Hewko et al., 2017). UCPs are defined within the literature and this study as providers with varying direct care roles not licensed by a regulatory body, specifically responsible for "playing a supportive role in providing assistance to regulated health professionals by carrying out the care and treatment plans developed by the regulated professionals" (Afzal et al., 2018, p. 3; Ontario Nurses Association, 2020). Because of a strong reliance on UCPs for care provision, the social dynamics of the interprofessional team within LTC are unique from other health care sectors that are dominated by RCPs (Caspar et al., 2016; Heckman et al., 2017); consequently, increasing understanding of how the proliferation of HIT should be done to meet all LTC providers information needs and empower UCPs in their provision of care is necessary.

Health Information Exchange (HIE), the "electronic sharing of clinical information among [various providers]" (Hersh et al., 2015, p. 2), is an important factor in the quality of care received within LTC; furthermore, HIE processes can be improved by mindfully increasing adoption of HIT within LTC to meet information needs of providers (Caspar et al., 2016; Kruse & Beane, 2018). Based on Sittig and Singh's (2015) sociotechnical model for studying HIT within complex healthcare systems, the authors of this study believe that HIE should also be understood from a social lens, rather than a purely technological lens, because HIE involves a variety of formal and informal processes which must interact as a network entity that members of an interprofessional team take part in, to facilitate exchange of information in support of coordinated healthcare (Sittig et al., 2020). Furthermore, because the LTC sector lags in adoption of HIT, HIE within this sector cannot be understood from a purely technological lens. Consequently, understanding the interactions between social dynamics driving informal HIE processes and the hybridized mix of paper-based and HIT-based HIE processes is important to identifying HIE gaps, understanding the information needs of providers, and improving the provision of quality care within the LTC sector (Caspar et al., 2016; Heckman et al., 2017). In this study, HIE is referred to as any action or process that a provider engages in to receive and share health information for the provision of care to LTC residents which may include electronic, paper-based, or verbal reports between providers (Caspar et al., 2016; Sittig et al., 2020).

Concerns of information overload, disorganized information, and misinformation needed to be rapidly addressed during the SARS-CoV-2 pandemic to prevent poorly organized information flow that often arises during times of crises, poorly impacting care delivery due to information being "highly variable of quality and relevance" (Zeng et al., 2020, p. 2). The magnitude of impact felt from the SARs-CoV-2 pandemic within the LTC sector was

exacerbated by longstanding deficiencies in HIT adoption which contributed to a lack of effective infection prevention and control, electronic documentation capabilities, and virtual care capacities needed to support care delivery during the pandemic (Bielska et al., 2020). Increasing HIT adoption within the LTC sector can improve the management of resident information and facilitate timely decision making in support of quality care provision; this is especially important within the resource and workload strained context of the SARs-CoV-2 pandemic (Kruse et al., 2017). In their 2021 evidence summary, the *International Long-Term Care Policy Network* describe the important purpose that evolving the role of HIT leveraged within LTC played in facilitating effective resident care during the pandemic; specifically, "using technology to monitor patients, replace face-to-face consultations,… data sharing purposes, to provide training and guidance, to model outbreaks, and predict outcomes for [LTC residents]" (Discussion section, para. 1). Advancement of HIT was necessary during the pandemic response to facilitate necessities such as providers working from home, advanced infection control measures, and care decision support; furthermore, experts advocate that further advancement of HIT should be considered a means by which to improve quality in care processes in LTC (Alexander et al., 2020; Estabrooks et al., 2020).

Study Purpose

Historical undervaluing of the long-term care sector by successive Canadian governments (Webster et al., 2021; Wong et al., 2021) has long been moderated by relying on the work of care partners, and the absence of external disasters (Barken et al., 2017). The SARS-CoV-2 pandemic tested these systemic vulnerabilities and the LTC sector collapsed, revealing an "underprepared and underequipped" system that experienced widespread system failure and was unable to protect the wellbeing of its residents during the pandemic (Stall et al., 2020, p. 946). The

advancement of HIT to facilitate electronic HIE is considered a means by which to improve quality in care processes; however, the LTC sector has been among the slowest to adopt technological advancements (Georgiou et al., 2013; Kruse & Beane, 2018, Kruse et al., 2018). Wong et al. (2021) describes that the LTC sector had been called upon prior to the SARS-CoV-2 pandemic to modernize infection control practices, but incomplete adoption of HIT persisted and negatively impacted the LTC sector's ability to cope during the pandemic. Consequently, gaining insight into current HIE processes is important to identify opportunities for improvement (Lyhne et al., 2012); especially in understanding how increasing technological adoption might have facilitated HIE processes during the SARS-CoV-2 pandemic (Herath & Herath, 2020). The purpose of this study is to gain insight and describe how LTC providers engage in various HIE processes throughout their workflow, and identify opportunities for improvement, especially through adoption of contemporary technologies. The research questions ask:

1. How do LTC providers currently see, conceive, and propagate health information related to the care continuum of LTC residents, including the management of communicable disease spread; and,

2. How might HIE processes be improved by increased adoption of HIT?

To address the research questions, we conducted semi-structured interviews with LTC providers aimed at exploring the HIE processes used within their workflow. This study reports on the findings of these interviews and provides insights into current HIE processes utilized within LTC and implications for increasing efficacy of these processes, specifically through increased technological adoption.

Methodology

To understand the evolving role of HIT in LTC, a socio-technical approach which appreciates that technology and electronic HIE operate from within social, technological, and organizational contexts is useful to inform the research question and methodology (Sittig, & Singh, 2015). This research stems from the interpretive paradigm wherein the researcher and participants engage in interactive dialogue to co-construct an understanding of the phenomena under study, HIE, through the eyes of the participants in their lived situation (Ponterotto, 2005; Weaver & Olson, 2006). LTC providerss' understanding and engagement with HIE processes, especially those leveraging HIT, are important to the efficacy of these processes; therefore, understanding the meanings LTC providers attach to HIE processes from an interpretivist paradigm is useful to address the research question (Goldkuhl, 2012). The phenomenon, HIE, was studied through interviews undertaken with LTC providers to discuss broadly the current HIE processes utilized in the provision of care because "in an interpretive study it is essential to create a holistic understanding of the studied area; not only an understanding on its different parts" (Goldkuhl, 2012, p. 138). Interviews took place between March 2021-May 2021. Interview data underwent qualitative analysis based on Hsieh and Shannon's (2005) conventional content analysis. Conventional content analysis was applied to emerge qualitative codes and content interpretations of the HIE processes that LTC providers engage in during their everyday workflow.

Sampling

As a qualitative interpretive study, no efforts were made to seek a statistically representative sample of participants to interview. It was expected that a sample of 12-20 participants would supply enough data to help qualitatively stabilize and saturate preliminary

insights related to HIE processes of LTC providers (Morse, 2000). Purposive sampling was utilized to obtain a sample of 12 people who provided deep and meaningful insights related to HIE processes in LTC because qualitative research seeks to explore, undercover, and generate meaning surrounding phenomena (Patton & Ritzer, 2007). Quality in qualitative research can be established through providing readers with rich descriptions of a phenomena that may give them a sense of renascence allowing for knowledge transfer as the reader emerges the research message with similar experiences (Tracy, 2010). Participants were recruited from LTC homes in Ontario for participation in this study using a third-party individual "to protect the potential participants' identity/confidentiality, and also to promote voluntary recruitment" (WREM, 2018, p.2). Through the third-party individuals, an email message with an invitation to participate in the study was emailed to LTC providers across Ontario. Potential participants interested in the study or requiring further details were then invited to contact the primary investigator directly. The third-party individual was the only individual involved in distributing the study invitation, and no members of the research team were engaged in any other aspect of recruitment (MacDougall & Fudge, 2001). After contacting the primary investigator, potential study participants were provided via email with a letter of information, a consent form, and an invitation to ask any further questions about the study. People who agreed to participate in the study mutually scheduled an interview with the research team.

Inclusion and Exclusion Criteria

Given the exploratory nature of this study, the inclusion and exclusion criteria were purposively broad to recruit as many different LTC providers as possible. For inclusion, providers needed to have worked at their respective LTC organization physically for at least three months so that the interviewee was knowledgeable about their workflow and HIE

processes. For exclusion, LTC providers who had not worked at their respective organization physically for at least three months were be deemed to be ineligible to participate in the study.

Data Collection

Interviews were conducted virtually through Western University's secured virtual conferencing platform, Zoom. The interviewer utilized a semi-structured interview guide so that the participants were asked the same questions about HIE processes in LTC, but questions specific to the interviewee and emergent constructs might also be interrogated. Questions were "worded so that responses are open ended" (Turner, 2010, p. 756), allowing for participants to fully express detailed, data rich responses and reducing researcher biases within the interviewing process (Turner, 2010). Semi-structured interviews enabled the researchers to gain in-depth insight into the independent perspective (Williams, 2015) of LTC providers on HIE processes. With consent, all interviews were audio-recorded for transcription. For ethical reasons, identifiable information (e.g., names, locations, etc.) were not included in the transcriptions generated; rather, pseudonyms were assigned before the interview and were used to identify specific participants in the study and to ensure their privacy.

Data Analysis

Interview data underwent qualitative assessment based on Hsieh and Shannon's (2005) conventional content analysis to interpret HIE processes that LTC providers engage in during their everyday workflow. Interview data were coded and categorized utilizing an emergent approach rather than pre-developed codes and categories. After reviewing the interview transcripts, the first version of the coding structure noted the similarities and differences across participant's narratives. Further analysis of interview transcripts allowed the researchers to collapse the codes into content categories which finalized elements of the analysis and

interpretation (Hsieh & Shannon, 2005). To assist in this process, NVivo 11 (a qualitative analysis software) was used to organize coding and data analysis.

Findings

The study sample is drawn from 11 LTC homes within Ontario: 4 in Central Ontario, 4 in Northern Ontario, 2 in Eastern Ontario, and 1 in Southern Ontario. The sample (N=12) consists of female-identifying providers including: (1) Seven regulated care providers (RCPs), including nurse practitioners (NPs), registered nurses (RNs), and a registered practical nurse; (RPN) and (2) five unregulated care providers (UCPs) including: Two personal support workers (PSWs), two therapeutic recreation professionals, and a dietary aide (See Appendix B). Eleven participants reported full time employment status and one reported working part-time over a period of 5 months to thirteen years.

Information Asymmetry

The term information asymmetry, has its underpinnings within management research, and has been defined as "a condition wherein one party in a relationship has more or better information than another" (Berg et al., 2019, p. 123). Asymmetric information theory has been invoked in a variety of domains beyond management research, including organization theory and social network theory (Bergh et al., 2019; D'Cruz, & Kini, 2007; Major, 2019). Bergh et al.'s, (2019) systematic review examining information asymmetry across various subfields, defined the term as a situation or context "when a party has access to privileged or private information" (p. 129). Connelley et al. (2011) expanded further on the concept by outlining that "information asymmetries arise between those who hold that information and those who could potentially make better decisions if they had it" (p. 42).

Participants describe asymmetrical HIE processes arising from RCPs having greater access to LTC residents' formalized health information than UCPS; this asymmetry is described by participants in different fashions. For instance, most participants describe how RCPs "more readily" (Participant 7, RPN) access information through formalized documentation, describing that "they use a different charting system than [the UCPs] do" (Participant 8, PSW).

Furthermore, managers, physicians, and nurse practitioners have the greatest access to information and are often asked questions by UCPs and RCPs to provide data that informs the provision of direct care, for example, regarding lab results:

> Only physicians and nurse practitioners have [access to] Clinical Connect [provincial electronic medical information database] so [nurses] kind of are blindsided there. (Participant 5, RN).

Managers are described as a good access point for information, but are not always available during the obligatory 24-hour care processes in long-term care:

> I also like to get report from some of the managers sometimes…I like to get to know [information] from them too because they tend to always have a different kind of information…it's hard to know that [information], especially for me when I work evenings [and] I don't see any managers or I see maybe one or two but then they're leaving by four and my shift starts at three. (Participant 9, RPN)

> Breakfast is before the manager's meeting time and you just guess, it's guessing or calling PSW's, or calling front desk and hoping that someone knows the information or knows the answer to the question. (Interview 12, Dietary Aide)

UCPs often lack "formalized sharing ways" (Participant 1, NP) and commonly "communicate with each other" (Participant 9, RPN) to exchange information. In addition, UCPs

sometimes rely on a “higher up [provider or manager]” (Participant 7 RPN, Participant 10 PSW, & Participant 12 Dietary Aide) to inform them of important information for care provision, or to ensure that information observed by the UCP is formally captured in documentation and/or acted upon. UCPs access to formalized HIE is focused on the documentation of tasks:

> The PSW’s don't really have a [formal] way to say ‘this is what I am observing’ …all you can really do is look [into documentation] and see the tasks that they've done. (Participant 1, Nurse Practitioner)

Verbal HIE is the preferred and primary method used by UCPs to gather and share information:

> [Resident] care plans would be the most we see as PSW's. We can always ask the RPN if we think anything is different or if we want more information that [he/she] could tell us. (Participant 10, PSW)

> Whatever you need, there is access to, you just kind of have to ask the right people and sometimes it takes more than one person to find the answer to your question (Participant 8, PSW)

Conversely, to make informed care decisions, RCPs describe intentionally seeking out UCPs for information they have gained through their role which is in closer proximity with the residents. RCPs describe UCPs as being “out of the [formal information] loop” (Participant 7, RPN). UCPs expressed that it would be useful to have increased access to formalized HIE processes to guide the execution of direct care duties.

> If someone had an abusive history it would be nice to be able to read up on that so that you're more aware of how you [should] do your care. If there was abuse or anything like that, it's nice to know that before going in there so you don't trigger them while doing

> care. That type of stuff I'd rather see, [in addition to] how they transferred. (Participant 10, PSW)

Care plans are supposed to be a central source of information for all care providers which reflects a resident's care needs; however, sometimes RCPs have access to privileged information that should be, but is not, included within the care plan. UCPs often need to know a comprehensive history of the resident to properly inform their care duties. One PSW shared an account of how accessing an accurate history of a resident was directly relevant to current care provision. Yet even when UCPs have access care plans they do not always accurately reflect a resident's care needs despite that information being available to other members of the care team:

> We have this new [resident] and I didn't know that she couldn't have a shower, because it triggered her, and I tried to shower her on her [scheduled] shower day. And then I told the nurse [the resident became triggered in the shower], and [the nurse] was like 'oh yeah she doesn't like the water'...well, how am I supposed to know that. Afterwards I looked in her care plan and there was nothing there [identifying this specific care need]. (Participant 8, PSW)

A "Hodgepodge" of HIE Processes

LTC providers describe utilizing a multitude of HIE devices and processes within their workflow; most commonly, HIE is broken into layers of informal (i.e., verbal report, leaving a sticky note) and formal processes (i.e., electronic and paper documentation). Participants describe gaps in communication that occur because HIE commonly occurs across a confused mixture of layers (i.e., a hodgepodge) (Cambridge Dictionary, n.d.); for example, information is very commonly "shared between verbal reporting, [the electronic chart], and paper charting" (Participant 3, NP).

> As far as health information exchange, we have a whole hodgepodge of ways that we do things that can lead to information slipping through the cracks or being missed. (Participant 1, NP)

> PSW staff only have access to [part of the electronic chart] where they input tasks, so how much somebody has eaten, drank, or the amount of assistance that they need; so, all of their information just goes in under a task flag. Then, the information from the registered staff goes into a progress note [on the electronic chart], and then when the physicians come, they don't even look in the electronic health records [because] they still have a hard chart; and so, they look at the paper chart. (Participant 1, NP)

Accessing crucial information is time consuming, yet necessary to deliver informed care to LTC residents.

> If I can't find exactly what I need, like if the notes aren't detailed in [the electronic chart], [then] I need more information. Part of my whole role is almost like being a detective gathering that information from everybody especially the people closest to that resident. (Participant 3, NP)

LTC providers believe formalized HIE might be more efficient "if it was one way or the other way instead of having a bit of both [paper and electronic documentation]" (Participant 8, PSW). Informal verbal HIE is characterized by LTC providers as being valuable to fill in information gaps in formal documentation. Gaps commonly occur due to time constraints and a lack of access to formally exchange information within organizational documentation:

> I often gather information from both sources, the PSW and RPN because without that information I don't get a good history. And, if you don't have a good history, it's harder to

> develop your plan of care, or to follow up and to see how things are progressing and to make things better for that resident right, so it's absolutely vital. (Participant 3, NP)

> The staff need to do a lot in a little time so they will use the method that they only have to communicate to the most important or the least amount of information. So, charting is not always complete and I might just get a voicemail that says a resident isn't feeling well and there's nothing charted, there's no vitals. But, then when I go and speak to them [the direct care staff], then there's a whole story there. (Participant 1, NP)

Nevertheless, one participant described how a reliance on verbal reports for HIE amplified gaps in information:

> I see things falling through the cracks, because it becomes like the telephone game where you start losing information through verbal reports rather than things being formally documented (Participant 1, NP).

Managers commonly had regularly scheduled meetings to ensure timely HIE of up-to-date data:

> They have two manager meetings every day: one at 10:30AM and one at 2:30PM. Just for 10 minutes where they go over isolation, if something happened, if someone fell, if someone wasn't cooperating. (Interview 12)

However, information from the managers meeting was not formally exchanged between all providers; furthermore, LTC care providers describe needing and having to search for information discussed within the managers meetings. For example, participants 7 (RPN) and 12 (Dietary Aide) described a lack of access to isolation lists during the SARS-CoV-2 pandemic which identified residents who required providers to engage in additional infection control practices during care; consequently, direct care providers created their own isolation lists:

> There is an isolation book, but that's nursing developed, yeah, not management. I think that only happened maybe like six months ago [approximately November 2020, 7 months after the SARS-CoV-2 pandemic was declared]. And that was just the nurses just being fed up, and sick of it [not having an isolation list]; and then, the PSWs can also just go and look at the book and be like okay I have to still get on PPE for this person. (Participant 7, RPN)

> There weren't formal charts, but the other food and beverage manager and I would make our own charts for who needed isolation, and this and that… yeah we just kind of made our own, like just on a slice of paper whatever stuff we needed [to know]. (Participant 12, Dietary Aide)

HIE artifacts (i.e., a slip of information in a pocket or post-it notes taped to the wall) are described as important informal HIE processes that are necessary to fill gaps in formal HIE process which excluded some care providers.

Formalized HIE processes at shift change were time consuming and often involved LTC providers arriving early. These unpaid hours ensured effective HIE at hand-off. UCPs were not always included in the formal shift change report process as overlapping scheduled duties prevented attendance:

> I pull a 24-hour report, and only the residents that have had charting done on them will be in that report, so I might be looking at charting for 80 people. It takes me about 45 minutes to go through the report and make notes and sometimes I have to go from that 24-hour report into their electronic health record to gather more information. (Participant 1, NP)

> It was just RPNs who are involved in the handover. Sometimes, I would try to get the PSWs to listen. But if we were getting phone calls from patients, and bells were going off, [PSWs] would run so I could get my report. (Participant 7, RPN)

> I, for my own sanity, would get there. Like quarter after 10 [45 min early]… I would say that me coming in early for my shift was the way I was able to make [being informed for care provision] happen. (Participant 7, RPN)

The nature of the LTC workforce, commonly comprised of part-time and casual staff who lack the depth of knowledge that full-time staff gain through familiarity during direct care experiences with residents, impacts the quality of care:

> I've seen a lot of casuals if they're not familiar with the floor, they're trying to get used to the floor right away and they might not know the patient's nuances of like how their behaviours are, so they might not pick up on it. I think in that sense, unfamiliarity can cause things to be missed. (Participant 5, RN)

> [When] I was full time, I memorized everything and, I noticed when things were astray. But then when I worked part time. I would actually come early to make sure I read all the report [for] all the days I missed. (Participant 5, RN)

Increasingly during the SARS-CoV2 pandemic, LTC homes are utilizing agency care providers to fill staffing gaps; however, agency staff are siloed from the organization's formal HIE processes because their role is temporary:

> [Online documentation] doesn't help the outside nurses that come in that don't have access to it [the online chart], like, they cannot log in and see what we're charting about and they aren't able to chart as well. (Participant 9, RPN)

> It was a lot easier to find information from PSW's, nurses were a bit difficult because a lot of the nurses were contract nurses from an [outside] agency. So, they were only there every once in a while. (Participant 12, Dietary aide)

If information is unavailable and required for care, LTC providers often "ask other employees who've been there longer" (Participant 10, PSW).

> People couldn't do my job without me there because I knew all of this stuff, and all of this stuff I just knew by memorizing and because I was told it. So, if I had to tell someone how to do my job I would have to write it all down fresh for them, I couldn't just hand them like, oh, this is the file that you do this job with… it was mostly verbal training or information passing. (Participant 12, Dietary aide)

When HIE is a "hodgepodge", duplication and switching between systems create inefficiency, frustration and distress that directly and indirectly impacts safety and the quality of care:

> I have to go back to the [paper] notes [from the electronic record] so those are the times where it slows me down. (Participant 3, RN)

Technology Facilitating HIE

Some HIT is common within LTC and useful to facilitate HIE. Some participants revealed that they "get the most information from reviewing the electronic health record" (Participant 1, NP). Most participants described that HIT provides "easier access" (Participant 5, RN; Participant 9, RPN) to information that is more "organized" (Participant 9, RPN) because it is contained "in one place" (Participant 3, NP).

> The flow of information is easier [with HIT], it's less work if everybody knows where they can get the information that is always the most up to date. (Participant 1, NP)

> [HIT] makes things, the treatment of residents or medical concerns, addressed in a timely manner. [HIT] allows [for] more efficient communication between team members. And the sharing of any medical information is generally more efficient as well, there's not so such a time of a delay. (Participant 3, NP)

Common and useful features of HIT in LTC include a 24-hour report of resident changes, alerts reminding providers of tasks or hazards, and access to prior documentation which enables providers to "look back over time [to] see patterns and changes" (Participant 1, NP). Furthermore, HIT can improve quality of care by facilitating "more efficient" (Participant 4, NP) HIE which can save providers "an exponential amount of time" (Participant 7, RPN) allowing them to focus on the provision of care.

> I think [using HIT], it's just safer and I think it's easier because you're not running around to all these different spots trying to figure out what's happening. (Participant 7, RPN)

> We have flags that are embedded in our [HIT] system that tell us that somebody has eaten less than 50% of their meals for the last three days which tells us that their intake is not good and that can often indicate that they're coming towards the end of their life, or they're ill. (Participant 1, NP)

Participants preferred to work with electronic medication administration records (eMARs) rather than a paper medication administration record (MAR), which lacked the added safety of imbedded alerts:

> I wish we had an eMAR. If I needed to know if a person took their medications crushed, I had to go and look in the [paper] MAR, and then, if I needed to know if they had any dietary restrictions I had to go to their individual patient binder, so I didn't give them

> something they're allergic to. Just [documenting] everything electronically, it would make so much more sense, and it would be faster, and in my opinion, you don't run the risk of [having] multiple [points of access to] information in different charts and missing something. (Participant 7, RPN)

Consequent to the SARS-CoV-2 pandemic, “a lot of things have gone digital” (Participant 11, Director of Recreation) to facilitate “virtual consults” (Participant 2, RN). For example, LTC providers began accessing video conferencing and documentation changed to facilitate virtual assessments:

> Since all this [SARS-CoV2 pandemic] they're [physicians and NPs] not able to visit us in person like they used to. (Participant 2, RN)

> I don’t need to have the NP or MD be there physically, but if I need their opinion I would say [technology] has sped up that process. (Participant 2, RN)

> Pictures in our skin and wound app will link to the [electronic health record]. So that's the place where NP and MD [are] able to see those pictures and [make a care decision]. (Participant 2, RN)

However, information exchanged within HIT may experience similar constraints to analog HIE due to limitations in access and use:

> The registered staff have access to the entire electronic health record where they can actually write progress notes, and the PSW staff only have access to [part of the electronic chart] where they input tasks. (Participant 1, NP)

> A lot of it [HIE] was verbal and signage [during the SARS-CoV2 pandemic]. We didn't really use technology for that at all. Although I think that we could have. Absolutely. (Participant 1, NP)

Lab results, which commonly informed direct care, were always exchanged between providers through fax and/or paper documentation rather than electronic documentation.

> We have the paper chart where [providers] orders, lab results, history, and physical assessment notes go. (Participant 1, NP)

> The lab would have the date they received the blood and processed it, but I would have no idea when the results actually came back. I'd find results that were like, 14 days old, and the doctor hadn't seen them because [the labs] had just been pushed under a bunch of other papers and [this happened with] things that were pretty important, like potassium being a little high or sodium being a little bit low. Things that could negatively impact [a person's health], especially a geriatric population. (Participant 7, RPN)

Sometimes the reduced convenience and accessibility of HIT were a barrier to its use:

> Right now, especially with our outbreak we have a large number of outsiders, [agency care providers], coming in to help us [with short staffing]. So, with paper [documentation] it's just easier access for them, it's not so technical, [and] it's very straightforward. (Participant 9, RPN)

> It's just that we just don't have time to pull our iPad off of our cart and then just go [login] and do all those things, [online charting requirements], when we can just pull out a piece of paper. (Participant 9, RPN)

Furthermore, electronic HIE is commonly disrupted by insufficient or absent infrastructure such as "poor internet" (Participant 2, RN).

> It's bad. Our computer system goes down all the time and then you don't know anything. So, that's the flip side of relying on technology is that when it doesn't work, it really affects your ability to do information gathering and that type of thing, like we can still

> take care of our residents but getting information, you can't do it if everything's on the computer and the computer is down. (Participant 1, NP)
>
> Sometimes when our internet doesn't work, none of us can chart. [Management will] expect a couple days later for us to go back into that day [the internet was down] and chart everything and sometimes you just don't have enough time in the day. So, it's a little frustrating on that aspect. (Participant 8, PSW)

The benefits of HIT in improving HIE processes cannot be realized within LTC organizations that lack sufficient infrastructure, such as Wi-Fi.

Discussion

The findings of this study affirm what previous authors have noted, in that the asymmetrical nature of HIE in LTC creates gaps in formal information flows necessitating providers' use of supplemental informal HIE processes to ensure they are fully informed prior to care provision. Comparatively, Tate et al. (2020) discusses experiences of "hierarchical staffing structures and communication in LTC settings" (p. 851); Caspar et al.'s (2016) work on the influence of organizational systems on HIE in LTC offers insight into the effects of asymmetrical HIE from providers operating within "microsystems of care based on these communication methods" (p.954). Additionally, Strachan et al. (2014) found that "the hierarchical and resource-poor nature of many LTC settings contributes to ineffective information flow" (p. 363). Based on participants descriptions of HIE processes in LTC, the authors of this study hypothesize that many gaps in HIE arise from the asymmetrical nature of HIE; consequently, there is a need to streamline formal communication processes to improve HIE.

Participants in this study describe asymmetrical HIE within their workflow, specifically that RCPs have greater formalized access to HIE processes than UCPs. Consequently, UCPs rely

on intentional engagement with informal HIE processes (i.e., verbal handoff or leaving a sticky note) to gather and share information necessary for care provision. While challenges to HIE with and in long term care are well documented, there is an absence of research exploring the concept of information asymmetry within the LTC sector. The findings of this study will expand the health care discourse to include information asymmetry within LTC providers HIE processes (Caspar et al., 2016; Gauthier et al., 2019; Tate et al., 2020). HIE in LTC is structured so that access to view and contribute to a resident's formalized records is permissions-driven and determined by job description. UCPs formal HIE is recognized only related to the completion of personal care tasks or behaviour tracking; all other information a UCP may gather is often unrecognized formally, exchanged informally, or not exchanged at all. The findings of this study highlight that the asymmetrical nature of HIE in LTC results in providers lacking formal access to information that is crucial to care provision. Conversely, UCPs are often unable to contribute to certain sections of formal documentation which necessitates that they exchange some information informally for it to be captured and acted upon.

LTC organizations have structured HIE so that UCPs are excluded from many formal HIE processes despite their proximity to residents and deep understanding of their wellbeing; this creates a gap in formal HIE. Information gathered by UCPs, and critical to their and RCPs' care provision, is often neither formally recorded nor shared. Informally searching for and gathering information to fill gaps in formal HIE exacerbates time and workload constraints and impacts a LTC provider's ability to ensure effective HIE while maintaining quality care. Within the context of a workspace with asymmetrical HIE, participants describe being "overstretched for work" (Participant 7, RPN) and that the volume of HIE is "difficult [to manage] because there are so many more residents than staff" (Participant 12, Dietary Aide). As HIE becomes

increasingly electronic, HIE contributes to “improved management of clinical documentation that enable[s] better decision making” (Kruse et al., 2017, p. 7). Adoption of electronic HIE processes in LTC is improving information flow (Kruse, & Beane, 2018; Kruse et al., 2017); yet ironically, permissions-based access to the systems is perpetuating the asymmetrical nature of HIE and as a result, gaps in communication persist within electronic processes. Participants in this study describe how access to view and contribute to sections within the EHR is dependent on a provider’s job description. Consistent with previous authors, we found that gaps in communication persist when information is charted in exclusive sections of the EHR, especially when “none of the [UCPs] [has] access to these computerized assessments; indeed, the majority [is] not aware of their existence” (Caspar et al., 2016; p. 957). The variability of access to information within the EHR suggests that rather than diminish the effects of information asymmetry on HIE, increasing adoption of technology may reinforce existing asymmetries. Despite technological advancements, information asymmetries have been perpetuated and so providers continue to experience frustrations related to wasted time searching for missing information.

> The more time [available to nurses], [and] the less time we're having to look for information and document information in multiple places, the more time we have to focus on our patients which is ultimately the most important part of healthcare; that's why we're in healthcare is for people. Time is everything in healthcare, and so to have five to ten extra minutes for my patients and not have to rush them that would have mean everything to me. It would, yeah, because that [experiences of time constraints] was just a lot of moral and ethical distress because of having to rush people and knowing the care was maybe not the best care I could give. (Participant 7, RPN)

LTC providers express that information must be increasingly streamlined to be "concise [as] they only have so much time" (Participant 1, NP). HIE is something LTC providers expressed that they "try [their] best to do it in a timely manner, [but] have to prioritize" (Participant 2, RN), especially the care needs of the residents. Without streamlining formal HIE processes to close gaps in communication, informal HIE processes continue to be a necessity rather than supplementary. However, informal HIE processes are susceptible to creating gaps in communication because of time and workload constraints; for example, "If [PSW's] are called into something else, they can't be part of a [shift change] report" (Participant 3, NP).

Greater attention to how new technologies might exacerbate information asymmetry is needed to ensure accelerated adoption of HIT. Implementations should be preceded by pilot programs that work out kinks and at the very least have a neutral impact on providers' access to information relevant to daily care. Ideally, new technology adoption should itself be preceded by an analysis of clinical and daily care workflows to examine legacy rules that restrict access to information, to ensure they are justified and not mindlessly imbedded in new applications' permissions. Information gaps caused by asymmetrical access to resident information should be addressed to ensure every care provider has timely access to the right information for high quality care provision.

In this study, and others, care provision is managed through multiple layers of HIE processes using paper-based documents, electronic records, informal exchange (i.e., verbal handoff), and archaic technology such as faxed records (Caspar et al., 2016; Wei & Courtney, 2018). One study participant accurately described the layered HIE

processes as a “hodgepodge” (Participant 1, NP) because having to access multiple layers of information exchanging processes results in confusion and frustration.

Slow and incomplete adoption of electronic HIE processes necessitates a reliance on layered HIE and contributes to the “complex, interruption-oriented communication patterns in LTC” (Wei & Courtney, 2018, p. 281). LTC organizations often do not enable EHRs to their full capacity and most commonly, providers express that activation of “pharmacy and laboratory interfaces [is] needed” (Schoville, 2017, p. 24). Previous authors have highlighted the workload, productivity, and safety benefits of adopting electronic medication administration records (eMARs) which eliminate previously asynchronous processes (Kruse et al., 2020). Participants describe current pharmacy and laboratory processes as cumbersome because of the various steps involved in managing non-electronic pharmacy and laboratory information, including faxing, keeping track of couriered paper copies, making phone calls for verbal orders, and transcribing pharmacy orders. Additionally, behavioural assessment tools, despite being used routinely, are lacking within the EHR; for example, one participant [10, PSW] described a one-day delay in documenting behaviours because she did not have the authority to initiate the paper behaviour tracking form independently and had to ask an RCP to supply it. This finding is consistent with Penko et al., (2020) who found in a survey of 103 Canadian LTC homes that “only 10% of respondent organizations are applying technology to support the use of behavioural assessment tools at present” (p. 9). There are important limitations to relying on layered HIE across paper and electronic records; namely, that paper-based records do not align with electronic records, resulting in data hoarding (Stone et al., 2003) and an absence of consistent practices around the storage,

visualization, or interpretation of residents' information to allow for informed clinical decision-making (Penko et al., 2020)

A significant amount of LTC providers' time is spent searching for and gathering information that they are unable to access or is dispersed amongst various paper-based and electronic records, or exists in the working memory of UCPs, creating additional workload for already time-pressed providers by "add[ing] to the complexity of information gathering" (Lyhne et al., 2012, p.458). Participants interviewed within this study discussed how they believe the current HIT should be improved to capture all necessary information, ultimately improving the efficacy of HIE, and preventing workarounds such as UCPs reliance on informal HIE:

> We kind of have like a little of everything. It would be nice, and I think more efficient, if we could draw it all into the electronic health record that everybody had access to. (Participant 1, NP)

> I think eventually we could put the physicians' orders online, as well as the labs and x-ray results, to get that [information to LTC providers in a] quicker and more accessible [way]. So yeah, absolutely. I think there's room for [increasing HIT]. (Participant 3, NP)

> I think there's certain ways [HIT] could be fixed…but I think technology really did help [HIE processes improve]. It does help a lot if it's used in a good way, in a proper way, in a systematic way. I think [increasing HIT adoption] would be very beneficial to healthcare...maybe there's a different way instead of paperwork… I think in health technology there could be a way to make [HIE] more efficient (Participant 5, RN)

> I think cutting down on the number of places where the information is located [and] just putting it in one single area that has everything you need right there, …but just having the

> information in one spot so you're not having to run around and try and fight for the information, and then if your co-worker does forget to tell you something, or doesn't know the answer, well at least I only have to look in one spot and I can dig through there. (Participant 7, RPN)

Full adoption of electronic HIE processes may positively impact the efficiency of HIE, care coordination, and quality of care provision (Kruse et al., 2017). However, the *Long-Term Care Homes Act* (*LTCHA*) (Government of Ontario MOHLTC, 2010) does not require a single integrated healthcare record, and there are few policy or operational incentives to support fully electronic HIE processes. LTC providers state that electronic HIE processes often add value to their overall workflow through "both the systems themselves and their effects on productivity and quality of care" (Tharmalingam et al., 2016, p. 7). However, implementation of electronic HIE is an onerous task that requires substantial up-front investment in financial and human resources and end-user adoption of the system (Gesulga et al., 2017), in addition to recurring costs for hardware, software, and system maintenance.

The SARS-CoV-2 pandemic exacerbated existing issues with HIE as the pandemic response required both increased and more efficient HIE. While HIE should have been efficient in response to the pandemic, for the aforementioned reasons, the HIE systems in LTC, unable to perform adequately in a normal environment, were unable to respond and became part of the problem in the dynamic environment created by the pandemic. Participants described that:

> The environment was unsafe for me [and] it was unsafe for them [the residents], in the sense of Covid, but also the lack of information being passed around properly, the lack of information being audited, and made sure that everything is up to date was just…it was like unbelievable, it is unreal. (Participant 7, RPN)

> We wouldn't really get the [Covid swab] results sometimes [the lab] would call the floor but usually went through the [manager]. So [Covid test results] went through management staff because they kind of took that initiative about that, but the same time [management] never really kept up to date with us on night shift, or on the weekend there was a struggle getting that information to us... if [the information] did get to [the nurses on shift], it would be a little late or it would get *kerfuffled* [mixed up], or maybe I have to reach out to management to be like 'so what's going on here' and push for information. (Participant 5, RN)

The current state of HIE within the context of the pandemic has increased the research and policy focus on "modernizing infection control measures" (Wong et al., 2021, p. 8). Previous inquiries by Ontario's Ministry of Health and LTC (MHLTC) and eHealth Ontario had made specific recommendations to improve the uptake of HIT across the province in 2016, yet unmet recommendations from the inquiry continue to include: (1) The MHLTC identifying policy and regulatory implications of expanding HIT and adapting surrounding policy and funding accordingly, (2) examining reasons for low uptake of HIT, (3) ensuring healthcare organizations comply with contractual requirements as service-delivery partners to adopt HIT, and (4) establishing interoperability standards within policy to ensure participation of all healthcare organizations in implementing fully electronic HIE processes. Consequently, despite an awareness of the need for change, the processes driving care delivery within Ontario's LTC sector, especially HIE, were sorely underprepared to cope with the SARS-CoV-2 pandemic and the LTC sector experienced widespread system collapse (Stall et al., 2020; Wong et al., 2021).

Conclusion

The findings of this study describe three common breakdowns in how LTC providers currently see, conceive, and share health information related to the care continuum of LTC residents: (1) The asymmetrical nature of HIE, (2) a reliance on a mixture of layers of formal and informal HIE processes (i.e., a hodgepodge), and (3) incomplete adoption of electronic HIE processes and adoption of electronic processes which reinforce existing communication breakdowns. The sample size for this study included 12 LTC providers and limits the understanding of providers experiences with HIE processes across the province; however, the study is interpretive in nature and the sample was sufficient for the researchers to co-create an initial shared understanding of the phenomena to support future inquiry (Patton & Ritzer, 2007). Increasing adoption of technologies designed to meet providers' HIE needs is sorely needed to eradicate the reliance on a potentially dangerous "hodgepodge" (Participant 1, NP) of information exchanging processes. Currently, gaps in HIE persist and valuable time is wasted because providers must search and gather information from a variety of sources. There is an opportunity to streamline present HIE processes within LTC by adopting carefully designed electronic processes that should aim to meet providers information needs and eliminate time wasted by providers who are currently forced to engage in a broken system of HIE processes. Further research into the design of HIT (i.e., the EHR) is necessary to understand LTC providers information needs and address the asymmetrical nature of HIE. Participants positively describe workflow efficiencies utilizing electronic HIE processes, suggesting that increased technological adoption in LTC might improve current HIE processes; specifically, by streamlining HIE within a common source.

Despite confirmed and potential benefits of electronic HIE, there is a lack of provincial policy to encourage increased adoption of electronic HIE processes which would eliminate the various steps involved in managing non-electronic information alongside current semi-electronic processes. The LTCHA (2007) might be updated to promote increased technological adoption since the act, in its current form, neglects ongoing breakdowns within HIE by stating:

> There is no requirement that the plan of care (or the 24-hour admission care plan required by section 24 of the Regulation) be in a single document. The plan of care, or parts of the plan of care, may be called something other than a 'plan of care' by the Home. The plan of care may include one or more documents in the Home commonly referred to as care plans, kardex, goal statements, Medication Administration Records (MAR), Treatment Administration Records (TAR), Physician Order sheets and Medical Directive sheets, bath lists, physiotherapy/ activation plans, recreational activities plans, snack lists and diet books used by dietary staff when preparing and serving meals. (Government of Ontario, MOHLTC, 2010).

Future research should focus on identifying policy and regulatory implications of expanding HIT so that supportive policy and funding can be adapted accordingly. Specifically, there is a need to increase understanding of how the LTCHA (2007) might be adjusted to increase the accountability of participating healthcare organizations for streamlined inter and intra-organizational HIE processes through the adoption of HIT.

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Chapter 4: Implications for Practice and Research

Introduction

This research study sought to understand how LTC providers currently conceive, access, generate, and disseminate health information related to the continuum of care for LTC residents, including the management of communicable diseases. Furthermore, this study sought to understand how HIE processes might be improved by increasing the adoption of information technology.

Increased HIT adoption has made some remarkable impacts on the efficacy of HIE processes within LTC; namely, technological growth in LTC is due, in part, to its ability to coordinate resident care, ease access to information, and improve the quality and accuracy of documentation which in turn positively affects the quality-of-care provision (Liping et al., 2019). However, the LTC sector is amongst the slowest within the healthcare industry to adopt HIT (Cherry et al., 2008); Kruse et al.'s (2015) systematic review on implementation barriers attributed "the cost, perceptions and implementation process as the most significant factors that affect EHR adoption by LTC [homes]" (p. 6).

Implications for Practice and Research

Given the simultaneous effects of key factors (i.e., social and technical components) which must successfully interplay to influence the success of HIT interventions, a socio-technical model is a useful conceptual tool with which to guide the authors of this study in understanding future clinical practice and research opportunities that would increase HIT adoption within the current state of HIE processes (Sittig & Singh, 2015). Based on the socio-technical model, the implications of this study should "address the complex relationships

between the HIT hardware, software, information content, and the human-computer interface" (Sittig & Singh, 2015, p.2).

The key insights to inform future inquiry, clinical, and leadership practice from this study, based on interpretive analysis of participant descriptions of common experiences, is that gaps in HIE negatively impact quality-of-care outcomes in LTC. The findings of this study highlight that increasing adoption of information technology poses an opportunity to close common gaps in communication experienced during clinical practice and streamline the current "hodgepodge" (Participant 1, NP) of HIE processes. Future inquiry into that nature of end-user interactions (Sittig & Singh, 2015) and its application to the alignment of new technologies to end-user information needs (Meehan, 2017) will help accelerate adoption of HIT within practice; and help diminish barriers to adoption, like the asymmetrical nature of HIE within LTC. LTC providers commonly related HIE to quality-of-care, and recounted experiences needlessly searching for and gathering information for use and dissemination, or being unable to access means to exchange necessary information. Information gaps created by lack of access to resident and provider-generated data must be addressed to ensure each care provider has timely access to the right information to support high quality care provision.

Because RCPs are often furthest from, and UCPs the closest to the point of care, it is crucial that the accelerating the role of HIT in HIE is designed to ensure optimal communication amongst the entire care team to promote increased accuracy, consistency, and continuity of care provision between all the various care providers (Strachan et al., 2014). Future research should (1) focus on building a greater awareness of end-user interactions (Sittig & Singh, 2015); (2) pay attention to how new technologies can and should be aligned with end-user information needs (Meehan, 2017); and (3) focus on empowering UCPs within HIE processes (Strachan et al.,

2014) to promote accelerated adoption of HIT and streamline HIE, while avoiding exacerbating the existing asymmetrical nature of HIE within LTC. LTC providers should be engaged within future inquiries because they possess valuable insights (Tharmalingam et al., 2017).

Further, LTC providers should be engaged in the process of increasing HIT adoption; specifically, so that HIT is designed to diminish information gaps by meeting end-user information needs (Strachan et al., 2014). Consistent with the tenets of Sittig and Singh's (2015) socio-technical theory, ongoing education and technological support with HIT should be available to help positively shape LTC providers perspectives of HIT, prevent disengagement, and prevent misunderstanding, frustrations, and workarounds due to technical difficulties (Meehan, 2017). Furthermore, basic infrastructure needs to be put in place to support accelerated HIT adoption. Participants commonly report experiences of poor Wi-Fi signal impacting their decisions to adopt or workaround the use of electronic information exchanging processes; for example, participants describe that in experiences of poor Wi-Fi, information may be exchanged verbally rather than documented and exchanged electronically. The SARs-CoV-2 pandemic changed the way LTC homes operate to support the health, social, and emotional wellbeing of residents; namely, all interactions that could be were substituted remotely through technology, including care and social interactions (Ickert et al., 2020). Experiences of poor Wi-Fi are commonly reported by the LTC providers interviewed in this study and impeded care and social interactions. Policy should be put in place to require LTC homes to have "robust technological infrastructure to support ongoing virtual connections. In older buildings, this may include things like wall-mounted Wi-Fi extenders" and adequate staffing to facilitate the management of various virtual connections (Ickert et al., 2020, p. 3).

Conclusion

Ontario's Ministry of Health and Long-Term Care (MHLTC) began establishing infrastructure to support the adoption of HIT in 2002 with a mandate to establish a fully operational EHR for every Ontarian across the province; however, "while some individual systems have been developed to collect and provide specific types of patient health information, they do not have complete information and full functionalities, and there is still no provincially integrated system that allows easy and timely access to all this information" (MHLTC & eHealth Ontario, 2016). A fully operational EHR requires the cooperation and coordination of all health sectors to ensure HIT is compatible across health services and that all health information collected is localized within one EHR, including community health, hospitals, laboratory, and pharmacy services. Investments in HIT have been estimated "over $16 billion in quantifiable benefits" (Gheorghiu & Hagens, 2017, p 2). Two professional bodies have specific mandates to establish fully functional EHRs federally and provincially (i.e., Infoway and eHealth Ontario respectively); however, until there are regulatory requirements for the adoption of minimal technology standards, adoption of HIT will proceed ad hoc. Currently, healthcare organizations do not have to participant in EHR projects, there are no requirements for standardization or interoperability between electronic systems, there is a lack of regulatory oversight by Infoway or eHealth Ontario to support their partner organizations who are implementing EHRs, and there is reduced annual funding (i.e., from $426 million in 2014/15 to $300 million in 2016/17) impacting organizations ability to complete projects underway (MHLTC & eHealth Ontario, 2016). Consequently, without legislation to mandate the adoption of a fully functional EHR, health

organizations, including LTC, will continue to operate with partially functional systems which contribute to gaps in communication and negatively impacts care provision.

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Appendix A: Scoping Review

Descriptive data on included articles: study design, publication year, sample characteristics and location

Literature Results					
		Study Design	**Location**	**Population**	**Journal**
Afzal et al.	2018	Scoping review	Canada	63 studies	International Journal of Older People Nursing
Alamri et al.	2015	Qualitative thematic analysis	Ontario	12 LTC homes	BMC Geriatrics
Andersen & Spiers	2016	Ethnography	Western Province	Interview data from 22 care aides were analyzed	Journal of Gerontological Nursing
Bender et al.	2017	Focus groups	Across Canada	192 staff volunteers and 20 resident/family	Healthcare Management Forum
Cammer et al.	2014	Case Study	Saskatchewan	1 representative facility	The Gerontologist
Carson et al.	2019	Quality improvement summary	London, Ontario	2 hospitals and 5 LTC homes	Journal of the American Medical Directors Association
Caspar et al.	2016	Ethnography	Canada	3 LTC homes, 42 participants (healthcare providers (hcp)	Qualitative Health Research
Cummings et al.	2018	Observational mixed methods	Kelowna, British Columbia and Edmonton, Alberta	13 LTC facilities and one ED in Kelowna; 25 LTCs in Edmonton	Journal of Aging and Health
Desveaux et al.	2019	Qualitative process evaluation	Ontario	29 interviews from 13 nursing homes	The Journal of Continuing Education in the Health Professions
Ellis et al.	2012	Qualitative descriptive	Ontario	22 licensed nurses from 2 LTC homes	Canadian Journal of Nursing Research

Fei et al.	2019	Mixed method study	Calgary	3 LTC homes	Canadian Journal of Nursing Leadership
Gauthier et al.	2019	Qualitative thematic analysis	Canada	8 care aides from 3 LTC homes	Journal of Nursing Management
Grinman et al.	2019	Literature review and proposal	Greater Toronto Area and Calgary	based on clinical and quality improvement work and literature reviews	Healthcare Quarterly
Heckman et al.	2016	Iterative consensus approach	Ontario	30 LTC professionals	Canadian Journal on Aging
Hurlock-Chorostecki et al.	2015	Qualitative self assessment tool	Ontario	149 Nurse-Practitioners working across acute and LTC	Journal of the American Association of Nurse Practitioners
Hurlock-Chorostecki et al.	2016	Phenomenology	Ontario	52 health care providers	International Journal of Nursing Sciences
Kaasalainen et al.	2010 A	Cross-sectional survey	Southwestern, Ontario	165 nurses from 9 LYTC homes	Canadian Journal of Nursing Research
Kaasalainen et al.	2010 B	Case study	Hamilton, Ontario	two LTC homes using 7 focus groups and 10 interviews with 53 participants	Canadian Journal on Aging
Kilpatrick et al.	2019	Qualitative descriptive	Québec	91 interviews	Journal of advanced nursing
Knopp-Sihota et al.	2019	Cochrane-style systematic review	Canadian Authors	31 studies	Journal of the American Medical Directors Association
Lapalme & Doucet	2018	Cross-sectional survey	Québec	31 health care providers	International journal of nursing studies
Mahmud et al.	2013	Quantitative descriptive	Winnipeg, Manitoba	154 influenza outbreaks	Influenza and Other

		statistical analysis			Respiratory Viruses
Marshall et al.	2016	Quantitative time observational series	Halifax, Nova Scotia	10 LTC homes	Journal of the American Board of Family Medicine
Martin-Misener et al.	2015	Mixed methods survey	Canada	23 Nurse-Practitioners across 4 nursing homes	Journal of Clinical Nursing
McCloskey et al.	2015	Cross-sectional observational workflow study	New Brunswick	368 hours of observation across 7 nursing homes	International Journal of Nursing Studies
McCloskey	2011	Ethnography	Eastern Canada	One nursing home and one ED	Journal of the American Geriatrics Society
McGregor et al.	2015	Retrospective observational study	Saskatchewan	135 LTC homes	Canadian Journal on Aging
Or et al.	2014	Qualitative thematic analysis	Canadian Authors Based in Hong Kong	Field observations and 18 interviews	Journal of Medical Systems
Parashar et al.	2018	Quantitative retrospective chart review	Toronto, Ontario	200 charts reviewed	Canadian Journal of Emergency Medicine
Penko et al.	2020	Random mixed-design survey	Canada	103 LTC homes	Aging & Mental Health
Sims-Gould et al.	2010	Ethnography	Ontario	110 bed LTC home with 18 deaths, 40 staff interviewed	Journal of Palliative Care
Song et al.	2020	Cross-sectional study	Western Canada	93 urban nursing homes	JAMA network open
Stolee et al.	2019	Ethnography	British Columbia and Ontario	Observations and interviews with 134 staff, patients and family	Journal of the American Medical Directors Association
Strachan et al.	2014	Qualitative descriptive design	Ontario	33 nurses participated in 5 focus groups from 4 LTC homes	Nursing Research

				ranging from 96-251 residents	
Suter et al.	2014	Case study	Alberta	60 staff, 5 residents and four managers across three LTC sites	Health Sociology Review
Tate et al.	2020	Ethnography	6 Provinces in Western Canada	5 nursing homes and 20 healthcare providers	Journal of Applied Gerontology
Tharmalingam et al.	2017	Quantitative descriptive statistics	Canada	21 healthcare providers	Studies in health technology and informatics
Voyer, et al.	2014	Prospective observational study	Québec City and Montréal, Québec	168 nurses and 214 residents across 7 LTC homes	Clinical Nursing Research
Wagner et al.	2010	Focus group	Ontario	Four focus groups with nurses and four sessions	Clinical Nursing Research
Wagner et al.	2011	Observational cohort study	Central Ontario	635 residents across 8 nursing homes	Journal of the American Medical Directors Association
Wagner et al.	2014	Participatory action research	Urban Canadian City	56 huddles over 12 weeks with 2-7 direct care staff each huddle	Canadian Journal on Aging
Wei & Courtney	2018	Qualitative descriptive	Alberta	9 Registered Nurses from 6 LTC homes	Applied Clinical Informatics

Appendix B: Interpretive Study

Descriptive Table of Study Participant Demographics

ROLE	AGE	EXPERIENCE AT CURRENT FACILITY	EMPLOYMENT STATUS	SIZE OF LTC	FUNDING	LOCATION
NP	35-55	2.5 years	Full time	169 beds	For profit	Central Ontario
RN	20-35	2 years	Full time	45 beds	For profit	Central Ontario
NP	35-55	13 years	Full time	210 beds	Not-for-profit	Central Ontario
NP	35-55	8 years	Full-time - consults	Consults in 10 LTC homes	Employed by a not-for-profit organization	Central Ontario
RN	20-35	4 years	Full time	120 beds	For profit	Central Ontario
THERAPEUTIC RECREATION	20-35	2 years	Full time	143 beds	Not-for-profit	Northern Ontario
RPN	20-35	3 months	Full-time	205 beds	For profit	Eastern Ontario

PSW	20-35	2 years	Part-time	200 beds	For profit	Northern Ontario
RPN	20-35	2 years	Full time	217	For profit	Eastern Ontario
PSW	20-35	3 months (5 years LTC experience)	Full time	430 beds	Not-for-profit	Northern Ontario
DIRECTOR OF THERAPEUTIC RECREATION	20-35	5 months	Full time	47 beds	For profit	Southern Ontario
DIETARY AID	20-35	9 months	Full time	130 beds	For profit	Northern Ontario

Appendix C: Ethics Approval Letter

Western Research

Date: 2 November 2020

To: Dr. Richard Booth

Project ID: 116766

Study Title: Workflow Analysis: Understanding the Current State of Health Information Exchange in Ontario's Long-Term Care Homes

Study Sponsor: western university

Application Type: HSREB Initial Application

Review Type: Delegated

Full Board Reporting Date: 17/Nov/2020

Date Approval Issued: 02/Nov/2020 04:09

REB Approval Expiry Date: 02/Nov/2021

Dear Dr. Richard Booth

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above mentioned study as described in the WREM application form, as of the HSREB Initial Approval Date noted above. This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Ethics_StudyProtocol_Cottonf	Protocol	28/Oct/2020	2
Interview Guide_Cottonf	Interview Guide	28/Oct/2020	2
telephone consent script_Cottonf	Written Consent/Assent	28/Oct/2020	1
LOIandConsent_Cottonf	Written Consent/Assent	28/Oct/2020	2
Recruitment.email_Cotton_OntLTCf	Email Script	28/Oct/2020	3
Recruitment.email_Cotton_GNAOf(1)	Email Script	29/Oct/2020	3

No deviations from, or changes to, the protocol or WREM application should be initiated without prior written approval of an appropriate amendment from Western HSREB , except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Ms. Nicola Geoghegan-Morphet , Ethics Officer on behalf of Dr. Philip Jones, HSREB Vice-Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Curriculum Vitae

ACADEMIC HISTORY

- Studying a Master of Science in Nursing September 2019 – present, Western University.
- Bachelor of Science in Nursing, September 2015 – April 2019, Western University.

PROFESSIONAL ROLES

- Registered Nurse - Parkwood Institute, Neurological Stroke, Spinal Cord Injury, and Acquired Brain Injury Rehabilitation Units.
  - October 2019 - present.
- Registered Nurse - University Hospital, Clinical Neurosciences Unit
  - March 2021 – present

PROFESSIONAL INVOLVEMENT

- Ontario Nursing Association member September 2019 – present.
- Nursing Research Interest Group member 2019 – present.
- Geriatric Nurses Association of Ontario member 2017 – present.
- Registered Nursing Association of Ontario member 2016 – present.

GRANTS

- 2X $15,000 Ontario Graduate Scholarship, 2019 – 2020 and 2020-2021.
- $2000 Western Scholarship of Excellence 2015.

ACADEMIC ACCOMPLISHMENTS, ROLES, & RESEARCH CONTRIBUTIONS

- International conference presentation: *A Scoping Review: Understanding Health Information Exchange Processes Within Canadian Long-Term Care.* Western University, Nursing Legacy Research Conference May 25th, 2021.
- Facilitator for Interprofessional Education Day 2021 at the Schulich School of Medicine
- Led a scoping review project, submitting for publication February 2021: Cotton, K., Treesh, R., Booth, R. G., & *McMurray, J. (2021). A Scoping Review: Understanding Health Information Exchange Processes Within Canadian Long-Term Care.*
- Research assistant for Dr. Richard Booth; Study in recruitment phase: *Examining the influence of communication strategies related to COVID-19 on mental health and homelessness in the community*
- Research assistant for Amanda McIntyre (RN, PhD candidate); Study in research ethics board phase: *evaluating nursing's role and contribution to stroke rehabilitation.*
- Western University: teaching assistant September 2020 – April 20201.
- *Publication: Booth, R.G., Strudwick, G., McMurray, J., Chan, R., Cotton, K., & Cooke, S. Future directions (Chapter 14). In Hussey, P. & Kennedy, M. (Eds.). Introduction to nursing informatics (5th ed.). New York: Springer.*