Information and Communication Technologies (ICTs) Enabling Integrated Primary Care for Complex Patients: A Protocol for a Scoping Review

Farah Tahsin (✉ farah.tahsin@hotmail.com)

University of Toronto Dalla Lana School of Public Health <https://orcid.org/0000-0001-9077-7670>

Alana Armas

: Bridgepoint Collaboratory for Research and Innovation

Apery Kirakalaprathapan

Western University

Heather Cunningham

University of Toronto Gerstein Science Information Centre

Mudathira Kadu

University of Toronto Institute of Health Policy Management and Evaluation

Jasvinei Sritharan

: Bridgepoint Hospital

Carolyn Steele Gray

Bridgepoint Collaboratory for Research and Innovation

Protocol

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Abstract

Introduction

An increasing number of individuals are living with multiple chronic conditions, often combined with psychosocial complexities. For these patients with complex conditions, an integrated primary care model that provides care coordination and a team-based approach can help manage their multiple needs. Information and communication technologies (ICTs) are recognized as a critical enabler of integrated primary care. A better understanding of the use of ICTs in an integrated care setting and how ICTs are being leveraged would be beneficial to identify knowledge gaps and could lead to successful implementation for ICT-based interventions.

Objective

This study will systematically scope the literature on the topic of ICT-enabled integrated healthcare delivery models for patients with complex care needs to identify which technologies have been used in integrated primary care settings.

Method

This study protocol outlines a scoping review of the peer-reviewed literature, using Arksey and O'Malley's (enhanced by Levac et al.) scoping review methodology. Peer-reviewed literature will be identified using a multi-database search strategy. The results of the search will be screened, abstracted, and charted in duplicate by 6 research team members.

Discussion

The key findings of the study will be thematically mapped to describe the implemented ICTs aimed for complex patients within the integrated primary care model and interactions of the elements (ICT, health model, and targeted patients). This review will be the first step to formally identify how ICT is used to support integrated primary health care models. The results will be disseminated through peer-reviewed publications, conference presentations, and special interest groups.

Background

Across Canada and globally, there is a growing number of individuals living with one or more chronic conditions, alongside of additional psychosocial challenges and socioeconomic factors (1). This patient population often referred to as patients with complex conditions (hereby referred to as PCC), tends to experience disability, functional decline, poor quality of life, and are among the highest users of the healthcare system (2). This patient group also reports higher levels of dissatisfaction with their care compared with less complex counterparts (3). As health systems globally are experiencing a growth in the population of patients with complex health needs (4), many are seeking to shift from old disease-centric models, focusing on treating illnesses in isolation, towards person-centered and integrated models

focusing on treating the whole person (5,6). Recent study findings suggest that being able to access person-centered health and social care from providers with whom they have a positive and respectful relationship can improve multimorbid patients' care experience (7).

Primary health care is a crucial starting point in this movement towards whole-person care as it is often patients' first contact of care in their community and where they receive continuous, comprehensive care (8). In the last decade, Wagner's Chronic Care Model (CCM) (9) has been widely used to design coordinated primary health care to resolve the issue of fragmented care when managing chronic conditions. CCM aims to promote care for individuals with chronic conditions that encompass community and health care services. With the recent expansion in the adoption of eHealth technologies to support care delivery, an eHealth enhanced CCM model (eCCM) has been proposed (10). This model acknowledges the importance of information and communication technologies (ICTs) in enabling communication between patients and care providers as part of chronic care management. By using ICTs patients are empowered with information and their care team is better engaged and proactive, which leads to more productive interactions between patients and their primary care teams (10). The CCM and eCCM are useful for helping understand integration in support of chronic disease management for individual patients. However, these individual-level interactions are often couched within a larger system context. Valentijn et al.'s Rainbow model of Integrated Care (RMIC) (11) helps to understand the wider context of integrated care, taking a population-health perspective to identify how health and social care can be integrated at clinical, professional, organizational and system levels. While the emphasis of the CCM is on the provider and patient, the RMIC acknowledges other key players in the delivery of integrated care such as, system and policy-level stakeholders in roles that include governance, finance, and other decision-makers linked to health systems. RMIC considers ICTs as valuable in improving the comprehensiveness of care and communication within and outside of health systems to deliver person-centered care and improve care continuity for patients with complex conditions.

While there have been some case-based studies of the use of ICT in the model of integrated primary health care (12,13), there are currently no reviews available to document what ICTs are being put in place to support these models, and how these ICTs are enabling the process of care delivery. This scoping review seeks to bring together the current research in this space to provide a more extensive overview of the state of ICT in support of integrated primary health care delivery for patients with complex care needs. By scoping the literature we hope to identify promising approaches and current gaps that could help to guide future research, technology development, and implementation in this space.

Study objective

The objective of this scoping review is to systematically scope the literature on the topic of ICT-enabled integrated primary care delivery models for PCC in order to 1) map how technology is used to support PCC in integrated primary care models and 2) identify specific characteristics and features of ICTs that enable key activities of integrated care delivery.

Methods

For this scoping review, we will follow Arksey and O'Malley's (14) scoping review framework that was enhanced by Levac et al. enhanced (15) (**Table 1**). Each of these stages is described in detail below.

Table 1. Scoping review stages

<div><div>1. Identifying the research question</div><div>2. Identifying relevant literature</div><div>3. Study selection</div><div>4. Charting the data</div><div>5. Collating, summarizing and reporting findings</div><div>6. Consulting and translating knowledge</div></div>
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Stage 1: Identifying the research question

The primary research question for this study is: **“What are the information communication technologies that are used in the delivery of integrated primary care for patients with complex care needs?”** The study will also address a secondary research question: “How are these technologies used as part of the model of care?”

To answer the research questions the definitions outlined in Table 2 below were used to guide the development of the major concepts employed in the search strategy.

Table 2: Definitions of eHealth, integrated care, patients with complex chronic needs primary health care

Concept	Definition
eHealth (16,17)	Health services and information delivered by the combined use of the internet and other electronic communication technologies. This is a broad definition of eHealth. Thus, eCCM model is used to categorize eHealth based on the primary functions of a technology (i.e. decision support).
Integrated care model (11)	A coordinated collaborative, multidisciplinary (two or more health professionals involved) and person-centered care delivery system. In this review, an integrated care model is defined according to Valentijn's Rainbow Model of Integrated Care because of the model's broader focus on integrated care.
Patients with complex care needs (1)	Individuals with multiple chronic conditions, often aggravated by additional psychosocial challenges. The complexity of their conditions impacts treatment, health outcomes, and quality of life.
Primary health care (18)	The first point of contact that includes key elements such as "disease prevention, health promotion, population health, and community development within a holistic framework, to provide essential community-focused health care" (p. 1).

Stage 2: Identifying relevant literature

Relevant studies for this review will be identified through searching electronic databases of the published literature which will include: Ovid MEDLINE, Ovid EMBASE, EBSCO CINAHL, Ovid PsycINFO, and the Wiley Cochrane Library. The search strategy for Ovid MEDLINE was first developed with support from the team's information scientist (HC) and has been peer-reviewed using the Peer Review of Electronic Search Strategies (PRESS) tool. The MEDLINE search strategy is included in Appendix A. This search strategy will be then translated over to the remaining databases. A "*primary care*" filter, which was developed and validated by Gill et al. (19) will be applied to the searches. The literature search will be limited to articles published after 2000; articles published before this date may be less relevant to current ICT integrated primary care model landscape (20).

Stage 3: Study selection

The study selection process will comprise two levels of screening: (1) title and abstract review and (2) a full-text review. Both levels will be conducted in duplicate using the knowledge synthesis software Covidence. At both levels of screening, any discrepancies between reviewers will be discussed and resolved by the research team collaboratively. The PRISMA framework (21) will be used to guide study selection process (Figure 1) and the Preferred Reporting Items for Systematics Review and Meta-Analysis protocols (PRISMA-P) extension for scoping review guidelines (22) (Appendix 2, Table 1) will be used to guide reporting of the study findings.

To be included the studies will meet the inclusion and exclusion criteria listed in Table 3. As this scoping review targets general complex patients, we excluded cancer patients and patients with a mental disorder. Patients with cancer often require a different treatment pathway than non-cancer patients (23). Similarly, patients with a mental disorder often receive a different treatment protocol and diagnostic procedure than

their counterparts with biophysical conditions (24) (25). Studies focused exclusively on individuals younger than 18 are also excluded as ICTs designed for these individuals involve parental consent and subsequently a unique approach to ICT adoption.

Table 3: Inclusion/Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
1. Any published articles including quantitative, qualitative, mixed or multi-methods research, including both comparative (eg. randomized, controlled, cohort, quasi-experimental) and non-comparative (eg. survey, narrative audit) methods, educational materials and reports	1. The target population for the study is individuals younger than 18.
2. The intervention has a digital-enabled healthcare model or digital health technology	2. The target population for the study is individuals with cancer or mental disorder.
3. The intervention is based on an integrated healthcare model or team-based care	
4. The intervention includes patients with complex care needs	
5. The intervention takes place within primary care.	

Stage 4: Data extraction

All included studies will be reviewed and charted independently by six team members using a pilot-tested data abstraction form. Charting is a technique for organizing and interpreting data by sifting, categorizing, and sorting material, according to key issues and themes (14). We will run the data abstraction pilot-test on a random selection of included articles to ensure consistency across reviewers. Necessary changes will be made and shared with the team before abstracting the remaining articles. The collected data will be stored and compiled in Microsoft Excel for data validation and coding. Table 4 shows the data that will be extracted from the selected literature:

Table 4: Data extraction framework

Domain	Information to be extracted
Citation summary	<ul style="list-style-type: none"> ● Author(s) ● Title ● Study citation ● Research design ● Study location
Characteristics of the patient population	<ul style="list-style-type: none"> ● Age ● Gender and/or sex ● Type and number of health conditions ● Any additional characteristics provided (ie. marital status, education level, ethnicity, etc.)
Characteristics of the integrated primary care	<ul style="list-style-type: none"> ● Setting (inpatient, outpatient, community-based or rehabilitative care) ● Type of service providers and description of roles ● Components of integrated/collaborative care
Characteristics of the implemented technology	<ul style="list-style-type: none"> ● Attributes of technologies (functionality, use, and roles of technologies in the given care setting) ● Aims/purpose of the implemented technology ● Duration of the technological intervention
Facilitators and barriers to implementation	<ul style="list-style-type: none"> ● Description of the factors that inhibit or facilitate the implementation of ICTs for complex patients in the integrated primary care model

Stage 5: Data summary and synthesis of findings

The charted data will be organized, coded, and thematically analyzed. Based on the extracted data, each study will be coded based on 1) their primary function (i.e., delivery care tool, self-management support) and 2) the characteristics of integrated care settings (i.e. professional-level integration, clinical level integration). Using a deductive coding approach (26) the key elements of eCCM (10) will be used to determine the primary function of the identified ICTs, whereas RMIC (11) will be used to identify characteristics of the care setting (see Table 5).

After coding of charted data, an evidence map (27) will be generated to help identify research gaps and future research needs in the ICT-field implemented in integrated primary care for patients with complex conditions (Appendix 3, Figure 2). Typically, an evidence map provides a broad overview of existing evidence in a research area and presents results in a user-friendly format (27). This mapping exercise will

be useful for this scoping review to visually present the comparisons across the interventions, the linkages of evidence, the presence of any contradictory evidence, and potential outlying factors.

Table 5: Key elements of the Rainbow integrated Model of Care (RMIC) and the eHealth enhanced chronic care model (eCCM)

Concept	Key Elements	Example
RMIC (11)	Clinical integration: Refers to the coordination of person-focused care in a single process across time, place and discipline	The care model supports seamless individual care planning, individual case management, etc.
	Professional integration: Inter-professional partnerships and coordination of services across multiple disciplines	The care model supports multidisciplinary care within and between the organizations (i.e. general physician and community nurse)
	Organizational integration: Inter-organizational coordination of services across multiple organization (e.g., contracting strategic alliances, knowledge networks, mergers), including common governance mechanisms to deliver comprehensive services to a defined population	The care model is supported by organizational integration such as coordination of services between long term care and primary health care
	System integration: A horizontal and vertical alignment of rules and policies within a system	The care model is within a structured integrated care model network such as the Veterans Health Administration (28)
	Functional integration: Refers to how the key support functions (i.e., financial, back office and Information management system) are coordinated	The care model is situated in an integrated network where financial, information and management system are coordinated (i.e. federal funding allotted in the network)
	Normative integration: Refers to the maintenance of coherent and shared mission, vision, and culture between disciplines, external stakeholders, and organizations.	The care model is placed in an integrated network where a mutual aim/vision is shared across stakeholders (i.e. reduce wait time)
eCCM (10)	eCommunity resources: Refers to developing strategies that link with community organizations and virtual health-related eCommunities	Health-related social networks and virtual communities that facilitate care connections
	Health systems enhancements: Refers to the strategies in place to support patient engagements and self-management support	Web-based health platforms, mobile health that support quality improvement
	Delivery system design enhancements: Refers to the systems in place to promote teamwork practice to deliver care efficiently	Electronic Health Records (EHRs), web-based health platforms that facilitate information sharing
	Self-management support enhancements: Refers to the patients' active role in managing their care	Health apps and online resources that support patients' self-management skills
	Clinical decision support enhancements: Refers to providers and health consumers' access to evidence-	Online platforms, EHRs to virtually access protocols and

based clinical guidelines, protocols, care standards and self-management resources to make an informed decision	guidelines
Clinical Information Systems Enhancements: Refers to managing information systems (i.e. patient databases, patient portals/Personal health records) to facilitate efficient care	mHealth apps and online platform to coordinate care and monitor patients' health status

Stage 6: Knowledge translation and stakeholder consultation

Levac et al. propose that the knowledge translation and consultation phase employ an opportunity for stakeholder engagement (15). To address stakeholder involvement, we will share our preliminary research findings with external healthcare policymakers and researchers to validate search results and support knowledge translation efforts. Special interest group members of the International Foundation for Integrated Care (IFIC) will be consulted for expert opinions on our scoping review findings (29). This special interest group consists of a wide range of membership with representation from research and academia, health care management, front line providers, government authorities/policymakers, patients and families, as well as private stakeholders. Members of this special interest group have a background in the development, adoption, and/or evaluation of digital health solutions in models of integrated care. Furthermore, we will prepare educational materials and presentations to disseminate study findings to multidisciplinary health teams, caregivers, and patients and at relevant national and international conferences. Results will also be published in a peer-reviewed journal and infographics will be developed for easy uptake by a wider user audience.

Discussion

To our knowledge, this is the first review that will comprehensively identify the existing ICTs used to support the health and social care needs of complex patients within an integrated primary care model. This scoping review will inform future research and key stakeholders about the important roles that these technologies play to improve patients’ and providers’ care experience. In addition, this review will identify potential gaps in the current ICT landscape that could improve care coordination, communication, and disease management among complex patients.

Abbreviations

- PCC: Patients with complex conditions
- ICTs: Information and communication technologies
- RMIC: Rainbow model of integrated care
- eCCM: eHealth enhanced chronic care model
- IFIC: International foundation for integrated care

Declarations

Ethics approval and consent to participate: Not Applicable

Consent for publication: Not Applicable.

Availability of data and materials: Search strategies are available in the appendix 1.

Competing interests: Not applicable

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Author contributions: **FT:** conceptualization, writing-first draft; **AA:** conceptualization, writing-first draft, reviewing and editing; **HC:** writing-critical review, search strategy development; **AK:** writing-first draft, and editing; **MK:** writing-critical review and editing; **JS:** writing-critical review and editing; **CSG:** conceived and designed the study, writing-initial draft, reviewing and editing, supervision of the project.

Guarantor: Farah Tahsin

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Figures

PRISMA 2009 Flow Diagram

Figure 1

Prisma 200 Flow diagram (21)

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix2Table1PRISMAScR.pdf](#)
- [Appendix1Searchstrategy.pdf](#)