PROTOCOL

Open Access

Information and Communication Technologies (ICTs) enabling integrated primary care for complex patients: a protocol for a scoping review

Farah Tahsin[1*] , Alana Armas[1,2], Apery Kirakalaprathapan[3], Heather Cunningham[4], Mudathira Kadu[1], Jasvinei Sritharan[1] and Carolyn Steele Gray[1,2]

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 six research team members.

Discussion: The key findings of the study will be thematically analyzed to describe the implemented ICTs aimed for complex patients within the integrated primary care model. The finding will highlight what types of ICTs are being put in place to support these models, and how these ICTs are enabling care integration. 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.

Keywords: Patients with complex chronic conditions, Integrated primary care, Information and communication technologies, Primary care, Multi-morbidity

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].. As of 2021, 33% of Canadians live with two or more chronic conditions [2]. This

*Correspondence: farah.tahsin@mail.utoronto.ca

[1] Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, Canada
Full list of author information is available at the end of the article

Tahsin *et al. Systematic Reviews*   (2022) 11:193

Page 2 of 9

patient population often referred to as patients with complex conditions, tends to experience disability, functional decline, poor quality of life, and are among the highest users of the healthcare system [3]. This high healthcare usage can cause economic burden on health system [4]. This patient group also reports higher levels of dissatisfaction with their care compared with less complex counterparts [5]. As health systems globally are experiencing a growth in the population of patients with complex health needs [6], 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 [7, 8]. 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 [9].

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 [10]. In the last decade, Wagner's Chronic Care Model (CCM) [11] has been widely used to design coordinated primary health care to resolve the issue of fragmented care when managing chronic conditions. CCM was developed through a review of interventions tailored for patients with chronic conditions [12]. The validity of CCM has been confirmed through Cochrane Collaboration reviews [13] as well as in multiple primary care settings among patients with chronic conditions [14–16]. 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. eCCM has also been developed through literature review [17]. Although eCCM has not been validated through empirical evidence yet, it provides an organizing framework to explore the typologies of ICTs used to support patients with chronic conditions in the primary care setting, which makes this model highly relevant for this scoping review.

eCCM model acknowledges the importance of information and communication technologies (ICTs) in enabling communication between patients and care providers as part of chronic care management [17–19]. ICT is a broad term. For this study, we follow the World Health Organization (WHO)'s the definition of ICT [20], which is health services and information delivered by the combined use of the internet and other electronic communication technologies [21, 22].. ICT encompasses multiple health technologies such as telehealth, telemedicine, mobile health-based interventions, etc. 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 [17]. 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) [23] 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. RMIC was initially developed through a literature review as well as expert consultation [23]. RMIC has been validated in multiple integrated primary care settings and among chronic patient populations [23–25]. 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. Table 1 describes the key elements of eCCM and RMIC.

Previous studies have identified that ICTs can enable care integration in the primary care models through various mechanisms such as information sharing across interdisciplinary team members and enabling synchronous/asynchronous patient-provider communication [27, 28]. However, 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 patients with complex conditions in order to (1) map how technology is used to support patients with complex conditions in integrated primary care models and (2) identify specific characteristics and features of ICTs that enable key activities of integrated care delivery.

Tahsin *et al. Systematic Reviews*   (2022) 11:193

Page 3 of 9

Table 1 Key elements of the Rainbow integrated Model of Care (RMIC) and the eHealth enhanced chronic care model (eCCM)

Concept	Key elements	Example
RMIC [23]	**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 multi-disciplinary 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 [26]
	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 [17]	**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-based clinical guidelines, protocols, care standards, and self-management resources to make an informed decision	Online platforms, EHRs to virtually access protocols and 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

Tahsin *et al. Systematic Reviews* (2022) 11:193

Page 4 of 9

Methods

For this scoping review, we will follow Arksey and O'Malley's [29] scoping review framework that was enhanced by Levac et al. [30] (Table 2). Each of these stages is described in detail below.

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?"*

To operationalize the guiding research question, we have added the following sub-questions:

(1) Which information communication technologies (e.g., electronic medical records, virtual care, telehealth, monitoring, sensors, patient portals) are being used for patients with complex care needs? What are the functionalities and characteristics of these technologies?
(2) How are these technologies being used in the integrated primary care model in terms of care integration?
(3) What factors are associated with a successful implementation of ICTs in the integrated primary care models?

To answer the research questions, the definitions outlined in Table 3 below were used to guide the development of the major concepts employed in the search strategy.

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. These five are frequently used databases for health sciences literature, therefore, suggested by the research librarian. However, this may be a limitation for this review as we do not plan to include any technology-specific database.

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 Additional file 1. 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. [31] 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 the current ICT integrated primary care model landscape [32].

Stage 3: Study selection

The study selection process will comprise two levels of screening: (1) a 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 [33] will be used to illustrate the study selection process and the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) extension for scoping review guidelines [34] (Additional file 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 4. To ensure an included article is peer-reviewed, we will check whether the article is published in any peer-reviewed journals. 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 [35]. Similarly, patients with a mental disorder often receive a different treatment protocol and diagnostic procedure than their counterparts with biophysical conditions [36, 37]. 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 2 Scoping review stages

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

Tahsin *et al. Systematic Reviews* (2022) 11:193

Page 5 of 9

Table 3 Definitions and operationalized search strategies of eHealth, integrated care, patients with complex chronic needs primary health care

Concept	Definition	Search strategy for each domain
eHealth [21, 22]	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, eeCM model is used to categorize eHealth based on the primary functions of a technology (i.e., decision support).	exp Technology/ OR exp Medical Records Systems, Computerized/ OR exp informatics/ OR exp computing methodologies/ OR exp Technology, Radio-logic/ OR exp Telecommunications/ OR exp Management Information Systems/ OR exp Diagnosis, Computer-Assisted/ OR ((communicat* or health* or informat* or comput* or medical) adj3 (technol* or system* or applicat* or pro-cess*)).tw,kf. OR(electronic adj3 record*).tw,kf. OR(ehealth or electronic health or telehealth or tele-health or telemedicine or tele-medicine or telecommu-nicat* or tele-communicat* or videoconferenc* or video-conferenc* or virtual care or teleradio* or tele-radio* or telemetry or mobile app* or informatics or computer-assist* or computer assist* or mobile health or mhealth or m-health or software or EHR? or EMR?).tw,kf. ((virtual or remote or distance or mobile or video) adj3 (consult* or health or medicine)).tw,kf.
Integrated care model [23]	A coordinated collaborative, multi-disciplinary (two or more health profes-sionals 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.	exp "Delivery of Health Care, Integrated"/ OR "Continuity of Patient Care"/ OR exp Patient Care Planning/ OR exp Patient-Centered Care/ OR exp Patient Care Management/ OR Patient Care/ ORexp Interprofessional Relations/ OR ((Integrat* or multidisciplin* or interdisciplin* or interprofession* or team* or coordinat* or comprehensive or shar* or manage* or organi?ed or coop* or seamless or continu*) adj3 (care or healthcare or service* or deliver* or com-municat* or relation* or treatment* or strateg* or program* or system*)).tw,kf. OR Team*.tw,kf. OR ((Case or cases or care or transition* or patient* or disease* or treatment*) adj3 (manage* or plan*)).tw,kf. OR(patient adj3 (cent?ed or tailored or integrat* or orient* or orient* or focus*) adj3 care).tw,kf. OR ((Linked or network* or structur*) adj3 care).tw,kf. OR (Care adj3 (coordinat* or continu* or guid* or transmural)).tw,kf. OR ((Critical or clinical) adj2 pathway*).tw,kf.
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.	exp Chronic Disease/ OR exp Comorbidity/ OR ((chronic* or complex or multi* or concurren* or co-occur* or co occur* or co-exist* or co exist* or dual or permanent or nonrevers* or non-revers*) adj2 (diagnos* or disease* or ill* or condition* or insufficienc* or disorder* or sick*)).tw,kf.OR (multimorbid* or multi-morbid* or comorbid* or co-morbid* or CCC).tw,kf. OR (poly-patholog* or polypatholog*).tw,kf. OR (pluri-patholog* or pluripatholog*).tw,kf.
Primary health care [10]	The first point of contact that includes key elements such as "disease preven-tion, health promotion, population health, and community development within a holistic framework, to provide essential community-focused health care" (p. 1).	(clinic* or practi* or primary or physician* or refer* or visit* or outpatient* or consult* or family or communit* or ambulatory or centre? or center? or office).ti,ab.

Tahsin *et al. Systematic Reviews*   (2022) 11:193

Page 6 of 9

Table 4 Inclusion/exclusion criteria

Inclusion criteria	Exclusion criteria
1. Any published articles including quantitative, qualitative, mixed, or methods research, including both comparative (e.g., randomized, controlled, cohort, quasi-experimental) and non-comparative (e.g., survey, narrative audit) methods, hand search of any relevant articles of systematic and scoping reviews	1. The target population for the study is individuals younger than 18.
2. The intervention has an ICT-enabled healthcare model or has an ICT component	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 or include primary care in the integrated care model.	

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 [29]. 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. We will not appraise the methodological quality or risk of bias in the included studies which is consistent with scoping review guidelines [38]. Table 5 shows the data that will be extracted from the selected literature:

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 [39], the key elements of eCCM [17] will be used to determine the primary function of the identified ICTs, whereas RMIC [23] will be used to identify characteristics of the care setting (see Table 1). We will also report the results with descriptive statistics with absolute and relative frequencies. This descriptive synthesis approach aligns with scoping review guideline [38].

Stage 6: Knowledge translation and stakeholder consultation

Levac et al. propose that the knowledge translation and consultation phase employ an opportunity for stakeholder engagement [30]. 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

Table 5 Data extraction framework

Domain	Information to be extracted
Citation summary	• Author(s) • Title • Study citation • Research design • Study location
Characteristics of the patient population	• Age • Gender and/or sex • Type and number of health conditions • Any additional characteristics provided (i.e., marital status, education level, ethnicity)
Characteristics of the integrated primary care	• Setting (inpatient, outpatient, community-based or rehabilitative care) • Type of service providers (i.e., general physician, nurses)
Characteristics of the implemented technology	• Attributes of technologies (functionality, use, and roles of technologies in the given care setting) • Aims/purpose of the implemented technology
Facilitators and barriers to implementation	• Description of the factors that inhibit or facilitate the implementation of ICTs for complex patients in the integrated primary care model

Tahsin *et al. Systematic Reviews*   (2022) 11:193

Page 7 of 9

International Foundation for Integrated Care (IFIC) will be consulted for expert opinions on our scoping review findings [40]. 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.

Anticipated timeline
The study is currently in the study selection process. Electronic database searches were completed till December 2021, which yielded 52, 128 articles. After title and abstract screening 293 studies were selected for full text review. Ultimately, 31 studies met the eligibility criteria. As the next step, we will conduct data extraction and data synthesis for the 31 studies. The authors anticipate that the results of the study will be submitted by September 2021.

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.

Limitation
There are some limitations to this protocol. Consistent with the scoping review methodology, the scope of the research objective is broad [41]. However, we have chosen the scoping review method over systematic review because this study aims to identify relevant evidence and concepts on a broad and complex topic; meaning

the definition and types of ICTs [21, 22] and the definition of integrated primary care [23] is heterogeneous; hence, it would be difficult to operationalize a systematic review on the topic. Additionally, we intend to include a heterogeneous study design to provide a comprehensive overview of relevant ICTs in the integrated primary care context. This approach is appropriate given the literature in ICTs and integrated care is still quite formative so we anticipate many studies at more developmental stages of research (such as exploratory and co-design studies) as opposed to clinical trials.

Abbreviations
ICTs: Information and Communication Technologies; RMIC: Rainbow Model of Integrated Care; eCCM: eHealth enhanced chronic care model; IFIC: International Foundation for Integrated Care.

Supplementary Information
The online version contains supplementary material available at https://doi.org/10.1186/s13643-022-02057-5.

Additional file 1. Search strategy-OVID MEDLINE.

Additional file 2: Table 1. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist.

Availability of data and materials
Search strategies are available in Additional file 1.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
[1]Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, Canada. [2]Bridgepoint Collaboratory for Research and Innovation,

Tahsin *et al. Systematic Reviews* (2022) 11:193

Page 8 of 9

Lunenfeld-Tanenbaum Research Institute, Sinai Health, Toronto, Canada.
³School of Public Health and Health Systems, University of Waterloo, Kitchener, Canada. ⁴Gerstein Science Information Centre, University of Toronto, Toronto, Canada.

References

1. Schaink AK, Kuluski K, Lyons RF, Fortin M, Jadad AR, Upshur R, et al. A scoping review and thematic classification of patient complexity: offering a unifying framework. J Comorbid. 2012;2(1):1–9.

2. Geda NR, Janzen B, Pahwa P. Chronic disease multimorbidity among the Canadian population: prevalence and associated lifestyle factors. Arch Public Health. 2021;79(1):60.

3. Hajat C, Stein E. The global burden of multiple chronic conditions: a narrative revie[1] C. Hajat and E. Stein, "The global burden of multiple chronic conditions: a narrative review," Preventive Medicine Reports, vol. 12. Elsevier Inc., pp. 284–293, 01-Dec-2018.w. Prev Med Rep. 2018;12:284–93.

4. Zulman DM, Pal Chee C, Wagner TH, Yoon J, Cohen DM, Holmes TH, et al. Multimorbidity and healthcare utilisation among high-cost patients in the US Veterans Affairs Health Care System. BMJ Open. 2015;5(4):e007771.

5. Burgers JS, Voerman GE, Grol R, Faber MJ, Schneider EC. Quality and coordination of care for patients with multiple conditions: results from an international survey of patient experience. Eval Health Prof. 2010;33(3):343–64.

6. Roberts KC, Rao DP, Bennett TL, Loukine L, Jayaraman GC. Prevalence and patterns of chronic disease multimorbidity and associated determinants in Canada. Health Promot Chronic Dis Prev Can. 2015;35(6):87–94.

7. Bickerstaffe S. Towards Whole Person Care. [online] Ippr.org. 2013. Available at: https://www.ippr.org/files/images/media/files/publication/2013/11/whole-person-care_Dec2013_11518.pdf.

8. Reuben DB, Tinetti ME. Goal-oriented patient care - An alternative health outcomes paradigm. N Engl J Med. 2012;366(9):777–9.

9. Kuluski K, Peckham A, Gill A, Gagnon D, Wong-Cornall C, McKillop A, et al. What is Important to Older People with Multimorbidity and Their Caregivers? Identifying Attributes of Person Centered Care from the User Perspective. In J Integr Care. 2019;19(3):4–4.

10. Starfield B. Primary care: an increasingly important contributor to effectiveness, equity, and efficiency of health services. SESPAS report 2012. Gac Sanit. 2012;26(SUPPL.1):20–6.

11. Wagner EH. The role of patient care teams in chronic disease management. Br Med J. 2000;320(7234):569–72.

12. Coleman K, Austin BT, Brach C, Wagner EH. Evidence on the chronic care model in the new millennium. Health Aff. 2009;28(1):75–85.

13. Renders CM, Valk GD, Griffin SJ, Wagner E, van Eijk JT, Assendelft WJ. Interventions to improve the management of diabetes mellitus in primary care, outpatient and community settings. Cochrane Database Syst Rev. 2000;2000(4):CD001481.

14. Davy C, Bleasel J, Liu H, Tchan M, Ponniah S, Brown A. Effectiveness of chronic care models: opportunities for improving healthcare practice and health outcomes: a systematic review. BMC Health Serv Res. 2015;15(1):194.

15. Austin B, Wagner E, Hindmarsh M, Davis C. Elements of effective chronic care: a model for optimizing outcomes for the chronically ill. Epilepsy Behav. 2000;1(4) [cited 2021 Nov 4]. Available from: http://www.idealibrary.com.

16. Bodenheimer T, Wagner EH, Kevin Grumbach M, Corresponding Author W. Improving primary care for patients with chronic illness the chronic care model, Part 2. Innov Prim Care JAMA. 2002;288:1909–14 Available from: www.jama.com.

17. Gee PM, Greenwood DA, Paterniti DA, Ward D, Miller LMS. The eHealth enhanced chronic care model: a theory derivation approach. J Med Internet Res. 2015;17(4):e86 https://www.jmir.org/2015/4/e86. 2015 Apr 1;17(4):e4067.

18. Gammon D, Berntsen GKR, Koricho AT, Sygna K, Ruland C. The Chronic Care Model and technological research and innovation: a scoping review at the crossroad. J Med Internet Res. 2015;17(2):e25.

19. Siminerio LM. The role of technology and the chronic care model. J Diabetes Sci Technol. 2010;4(2):470–5.

20. World Health Organization (WHO). eHealth: World Health Organization - Regional Office for the Eastern Mediterranean. [cited 2022 Apr 20]. Available from: http://www.emro.who.int/health-topics/ehealth/

21. Eysenbach G. What is e-health? J Med Internet Res. 2001;3(2):E20.

22. Shaw T, McGregor D, Brunner M, Keep M, Janssen A, Barnet S. What is eHealth (6)? Development of a conceptual model for ehealth: qualitative study with key informants. J Med Internet Res. 2017;19(10):e324.

23. Pim P. Valentijn, Sanneke M. Schepman, Wilfrid Opheij, Marc A. Bruijnzeels. Understanding integrated care: a comprehensive conceptual framework based on the integrative functions of primary care. Int J Integr Care. 2013;13(1).

24. Valentijn PP, Pereira F, Sterner CW, Vrijhoef HJM, Ruwaard D, Hegbrant J, et al. Validation of the Rainbow Model of Integrated Care Measurement Tools (RMIC-MTs) in renal care for patient and care providers. PLoS One. 2019;14(9):e0222593.

25. Boesveld IC, Valentijn PP, Hitzert M, Hermus MAA, Franx A, de Vries RG, et al. An Approach to measuring integrated care within a maternity care system: experiences from the maternity care network study and the Dutch birth centre study. Int J Integr Care. 2017;17(2):6.

26. Perlin JB, Kolodner RM, Roswell RH. The Veterans Health Administration: quality, value, accountability, and information as transforming strategies for patient-centered care. HealthcarePapers. 2005;5(4):10–24.

27. Steele Gray C, Barnsley J, Gagnon D, Belzile L, Kenealy T, Shaw J, et al. Using information communication technology in models of integrated community-based primary health care: learning from the iCOACH case studies. Implement Sci. 2018;13(1):1–14.

28. Morton K, Dennison L, May C, Murray E, Little P, McManus RJ, et al. Using digital interventions for self-management of chronic physical health conditions: a meta-ethnography review of published studies Europe PMC Funders Group. Patient Educ Couns. 2017;100(4):616–35.

29. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Re Method: Theory Pract. 2005;8(1):19–32.

30. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. Implement Sci: IS. 2010;5(1):69.

31. Gill PJ, Roberts NW, Wang KY, Heneghan C. Development of a search filter for identifying studies completed in primary care. Fam Pract. 2014;31(6):739–45.

32. Everall AC, Guilcher SJT, Cadel L, Asif M, Li J, Kuluski K, et al. Patient and caregiver experience with delayed discharge from a hospital setting: A scoping review. Health Expect. 2019;22:863–73.

33. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Revista española de cardiología (English ed). 2021;74(9):790–9.

34. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169(7):467–73.

35. Evans JM, Grudniewicz A, Gray CS, Wodchis WP, Carswell P, Baker GR. Organizational context matters: a research toolkit for conducting standardized case studies of integrated care initiatives. Int J Integr Care. 2017;17(2):9.

36. Nutting PA, Gallagher KM, Riley K, White S, Dietrich AJ, Dickinson WP. Implementing a depression improvement intervention in five health care organizations: Experience from the RESPECT-Depression trial. Adm Policy Ment Health Ment Health Serv Res. 2007;34(2):127–37.

37. Thielke S, Vannoy S, Unützer J. Integrating mental health and primary care. Prim Care - Clin Office Pract. 2007;34(3):571–92.

38. Peters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. JBI Evid Implement. 2021;19(1):3–10.

39. Creswell JW, Creswell JW. Qualitative inquiry & research design : choosing among five approaches. 2nd ed. Thousand Oaks: Sage Publications; 2007.

40. Digital Health Enabling Integrated Care Webinar Series - IFIC. [cited 2021 Dec 22]. Available from: https://integratedcarefoundation.org/events/digital-health-enabling-integrated-care-webinar-series-2

41. Munn Z, Peters MDJ, Stern C, Tufanaru C, McArthur A, Aromataris E. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Med Res Methodol. 2018;18(1):143.

Tahsin *et al. Systematic Reviews*   (2022) 11:193

Page 9 of 9

Publisher's Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.