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Virtual communities of practice to improve clinical outcomes in healthcare:

Protocol for a 10 year scoping review

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Abstract

Introduction: Virtual communities of practice (VCoPs) use a common online platform to provide healthcare professionals with the opportunity to access highly specialised knowledge, build a professional support network, and promote the translation of research evidence into practice. There is limited reporting of how best to design and administer VCoPs within healthcare organisations. The primary aim of this scoping review is to identify the best methods used to establish and maintain VCoPs. We also aim to ascertain potential barriers and facilitators to the implementation of VCoPs, determine the best methods for their evaluation, and discover the impact of VCoPs on clinical practice. Findings shall be used to develop a flexible framework to guide the establishment and facilitation of a VCoP for healthcare professionals.

Methods and analysis: A five stage scoping review process will be followed based on Arksey and O'Malley's framework and refined by the Joanna Briggs Institute Methodology. An initial limited search of PubMed and CINAHL will identify relevant studies and assist with search term development. This will be followed by a search of 5 online databases to identify papers published from January 2010 until November 2020. Papers will be independently screened by two reviewers, and data extracted and analysed using a reporting framework. Qualitative data will be analysed thematically and numerical synthesis of the data will be conducted.

Ethics and dissemination: The results of this scoping review will highlight the best ways to design and manage VCoPs in healthcare organisations. The findings will be presented at relevant stakeholder workshops, conferences and published in peer-reviewed journals. Ethics approval is not required for this scoping review.

Strengths and limitations of this study

-We will identify methods used to establish and maintain VCoPs in healthcare and shed light on the facilitators and barriers to implementation.

-The findings will guide the establishment and facilitation of a VCoP for health professionals on falls prevention in hospitals

-This review will be limited to studies in English written in the last 10 years.

Introduction

Healthcare organisations have a responsibility to deliver high quality, cost effective care by implementing evidence-informed policy and practice. [1-3] Despite the growing number of clinical guidelines produced by government agencies to improve effectiveness and quality of care, [4] frequently there are gaps between research evidence and clinical practice. [5-8] Communities of practice (CoP) were initially developed in business to promote the management and sharing of knowledge, and aim to stimulate innovation, and organisational value. [9] Communities of practice have been implemented within health care settings to foster mutual learning and knowledge sharing outside the silos of discipline-specific professional expertise. [10]

Communities of practice within healthcare involve groups of people who share an interest in a particular topic and a desire to deepen this knowledge and expertise by interacting with others regularly, in order to refine their expertise and mastery. [11 12] Communities of practice provide a forum for developing and implementing evidence-based practice. [13] They facilitate the delivery of high quality, cost-effective care. The three main elements characterising CoPs identified by Wenger et al (2002) are community (collective learning through social interactions), domain (within a particular area of interest), and practice (developing, sharing and maintaining knowledge). [11] Examples of CoPs where professionals have sought further education, development and innovation in a particular practice area, include the promotion of a new measurement tool in child and youth mental health care, [14] promotion of recovery-oriented practices in mental health care, [15] and the management of COVID 19. [16]

The advantages of CoPs within healthcare include the joint analysis of practical experiences and information among their members. [10] They allow members to openly discuss concerns and acknowledge errors, encourage in-situ learning, shared decision-making and coordination of experimentation. [10] Communities of practice, however, cover a variety of initiatives that can differ greatly in their aims, design, mode of operation and utilisation of technology. [17] Whilst CoPs aim to promote standardisation of practice

and the establishment of interpersonal relationships that encourage knowledge sharing, there is diversity in how and why they are implemented. [18] CoPs in healthcare have been found to be complex, multifaceted programs that vary in composition, intended purpose and use a variety of models for members to share their knowledge. [18] The diversity of CoPs, can be influenced by various social, cultural and individual factors, such as clinical leadership, support and commitment for quality management, regular communication, and availability of accurate and relevant data. [19] Their establishment requires a flexible framework that will guide their formation and ongoing operational procedures. [18]

Advances in technology-based communication and the growth of the internet has led to a rapid increase in the sharing of health information globally. Health professionals can now utilise virtual communities of practice (VCoPs) to share their knowledge. [20 21] VCoPs use a wide variety of media to establish a virtual collaborative space including social media sites, videoconferencing and websites. [22] The creation of VCoPs means that health professionals who are geographically dispersed, can use virtual communities for learning, support, continuing professional education, knowledge management and information sharing. [20 21] Being a member of a VCoP can be a great opportunity for healthcare professionals to share and gain access to highly specialised knowledge. [23] VCoPs also allow healthcare professionals to build a professional support network and promote the translation of evidence into daily practice, by accessing a common platform. [24 25]

The successful design and management of VCoPs depends on the characteristics of the virtual community. [17] Members of CoPs and VCoPs are likely to experience very different environments because of the primary way they interact. [22] Computer-mediated interactions are likely to make it more difficult for members to build mutual knowledge, trust, a sense of belonging and open exchange of ideas. [26 27] Factors found to affect knowledge sharing in online communities identified in the literature include individual factors, technological factors and social factors. [28-31] Individual factors include the contributions of members, with active participation being essential for the VCoP to grow and develop. [23] Active participation refers to members' knowledge-exchange activities, such as posting questions on online community boards, engaging in live chats, participating in online and videoconferencing discussion sessions and providing

asynchronous answers and feedback in discussion threads. [32 33] Active participation is influenced by members' motivations, personalities, time available and values. [11 23 32-34] Social factors include the social interaction amongst members within the group and the roles of group moderators, whilst technological factors involve technical and usability issues. [23] A 7 year longitudinal study by Antonacci et al (2017) showed the growth of VCoPs for healthcare professionals to be related to the presence of a centralised leadership structure and the frequent rotating of leadership over time. [23]

By providing a platform for health care professionals to collaborate towards a common purpose, VCoPs can bridge the gap between research evidence, policy-making and implementation of clinical guidelines. [35] The problem of falls in healthcare facilities worldwide, can be used to illustrate this point. Falls are associated with marked morbidity, mortality, increased length of stay and re-admissions. [36-40] To ensure healthcare professional systematic translation of falls prevention clinical guidelines into practice, appropriate implementation strategies need to be employed. [41] To attempt to address these problems across multiple sites of a residential aged care organisation, one team used a web-based falls prevention CoP. [34] The operation of a VCoP in falls prevention was found to be achievable if staff were given sufficient time, and provided with suitable training and support. [42] Barriers to sustainability were identified such as members' capabilities for using ICT applications and lack of dedicated time provided by management for web-based participation. [34] All of these points could be considered when establishing a VCoP in falls prevention.

It is essential to clarify effective methods of VCoPs for knowledge synthesis and translation into practice. Given the limited reporting of a standard approach to the design and administration of VCoPs within healthcare organisations, a scoping review shall be conducted to determine the nature of reported VCoPs within this context. Our scoping review will provide a new and detailed analysis of the extent of the literature on VCoPs in clinical healthcare published in the last 10 years. It aims to identify the methods used to establish and maintain VCoPs, ascertain potential barriers and facilitators to the implementation of VCoPs, determine the best methods for evaluation of VCoPs and discover the impact of VCoPs on clinical

practice. This information will then be used to develop a flexible framework that will guide the establishment and facilitation of a VCoP for healthcare professionals on falls prevention in hospitals.

Methods and analysis

The methodological structure will follow Arksey and O'Malley's framework for scoping reviews, [43] which was refined by the Joanna Briggs Institute. [44] The protocol was drafted using the PRISMA-ScR checklist, [45] which was revised by the research team (LS, DJ, MM, DK). This checklist has five sections: (a) identifying the research question, (b) identifying relevant studies, (c) identifying the study selection criteria, (d) charting the data incorporating both quantitative and qualitative thematic analysis, and (e) collating, summarising and reporting the results.

The review stages

Stage 1: Identifying the research question

Scoping reviews are a form of knowledge synthesis that present a broad overview of the evidence on a topic of interest, without addressing study quality, and can be used to identify key concepts for a topic area and identify any knowledge gaps. [44] The concepts underpinning a research area can be mapped by systematically searching, selecting, and synthesising existing knowledge. [43 46]

The initial research question is, (i) What is the extent of reported research on VCoPs in healthcare (for clinical purposes) published in the last 10 years (2010 to current)? Further secondary research questions were added to focus the review and provide guidance for setting up and conducting our own VCoP for falls prevention, (ii) What methods were used to establish and maintain the VCoPs (was there a framework for VCoP development, who were the participants, how was it coordinated, what were the methods of communication and knowledge exchange?), (iii) What potential barriers and facilitators have been identified during the implementation of VCoPs? (iv) What methods of evaluation of VCoPs have been employed? (v) What has been the impact of the VCoPs on clinical practice?

Stage 2: Identifying relevant studies

Eligibility criteria: In a scoping review, the three elements of population, concept and context are used to establish inclusion and exclusion criteria. [44] The population details the relevant characteristics of participants, the concept is the principal focus of the review, and the context describes the setting under examination. In this scoping review, the concept is Virtual Communities of Practice for the purposes of improving clinical outcomes. Communities of Practice that describe themselves as 'virtual', 'on-line' or 'web-based' are included. VCoPs that have been conducted in a clinical educational setting and are purely for the purposes of education rather than the exchange of knowledge, will be excluded. The population of interest is any healthcare professionals who are part of a VCoP for the purposes of building and exchanging knowledge, developing individual capabilities, ensuring their practice is evidence-based, and enhancing interprofessional collaboration. The context is any healthcare setting. Healthcare settings are defined as acute or sub-acute hospitals, residential aged care facilities, rehabilitation facilities, long-term care facilities or VCoPs that were conducted by health professionals working in community healthcare.

To be included, articles should be peer-reviewed and in the English language. Included articles can be any existing literature on VCoPs including primary research studies, systematic reviews, meta-analyses, guideline implementation, grey literature and commentaries. They should report on any aspect of VCoPs that have been implemented in a healthcare setting. The articles need to be accessible as full text, and published between January 2010 and October 2020.

Search strategy: A three step approach will be developed by the study group in collaboration with an academic librarian. The librarian will execute the searches on behalf of the study group.

(i) There will be an initial limited search of PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL), to identify relevant studies to assist with search term development, based on the research questions and purpose of the study. The librarian will assist us to guide a rigorous analysis process to identify the best search terms and strategy related to VCoPs in healthcare. The process will be iterative, to ensure all relevant search terms are captured.

(ii) Words in the title and abstract of the initial retrieved papers and indexing terms will be analysed and used to classify the articles.

(iii) A second comprehensive search across PubMed, CINAHL, CENTRAL, PsycINFO and Education Resources Information Center (ERIC) from January 2010 to October 2020 will be conducted, to ensure VCoPs are contemporary in terms of design and content. The reference lists of all identified reports and articles will be searched for additional studies meeting the inclusion criteria. We will retrieve all supplementary files that are referred to in the included papers and any papers that are referred to in a particular study that were part of the research project. The search for unpublished studies will include Trove and ProQuest Theses and Dissertations Global. We will also search for grey literature using Google and Google Scholar.

Appendix 1 shows the initial search strategy to be executed in CINAHL and PubMed.

Stage 3: study selection

All studies identified from the search strategy will be uploaded to the online systematic review software, Covidence. [47] Two reviewers will independently screen the titles and abstracts of retrieved papers. The full texts of identified papers will be obtained and assessed by two independent reviewers, to identify studies that meet the inclusion criteria. Discrepancies will be resolved through discussion and if necessary, consensus will be achieved via a third reviewer. The results of the search will be presented in a PRISMA flow diagram. [45]

Stage 4: data charting

Data from eligible studies will be charted independently by two researchers using a data extraction chart developed in Covidence. [47] The chart will capture the relevant information on key study characteristics (for example, year of publication, country of origin, type of research, setting, study population of those in the VCoP), objectives, terminology used, development (activities undertaken at the inquiry, design and launch stages), evaluation methods, outcomes and key findings related to the review questions. This process will be iterative and variables may be identified following complete review of the full texts. The same two reviewers will compare and merge the data into a final dataset. Conflicts at the

data merging stage will be resolved by discussion until consensus is reached. If a consensus cannot be reached, a third study group member will be consulted. The data extraction form will be piloted on a random sample of 10 included articles by the two primary reviewers and modifications will be made as required.

Stage 5: collating, summarising and reporting the results

The synthesis of extracted data will include thematic analysis for the qualitative data. Quantitative data will be summarised using frequency analysis, with the counts and percentages of articles for each category calculated. Data synthesis will be an iterative process with new categories and themes identified through ongoing analysis. For the qualitative analysis, two reviewers will categorise the key components independently in Excel. Through discussion they will develop a coding framework. The coding framework will be piloted on a random sample of 10 included articles by the two primary reviewers and modifications will be made as required. One of the primary reviewers will then code the remaining articles according to the final framework. Quantitative results will be summarised in tables, charts and diagrams as indicated by the data, to allow for easy comparison. Following synthesis and analysis of the data best practice methods to establish and maintain VCoPs, barriers and facilitators to establishing VCoPs, approaches to evaluation, and the impact of VCoPs on clinical practice, will be identified.

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Ethics and dissemination

This scoping review does not require ethics approval as data will be obtained through review of existing published literature. Study findings will be presented at relevant consumer stakeholder meetings,

conferences and public forums, and published in peer-reviewed journals. The findings will inform the future direction of the development and evaluation of a VCoP to promote best practice falls prevention in hospitals.

Authors' contributions: LS was involved in study conception, preliminary literature review, writing and editing of the protocol, scoping review framework and analysis, design of the search strategy and content expert input. DJ was involved in study conception, editing of the protocol, content expert input, and preliminary literature review. MM and DK were involved in editing of the protocol, provided general guidance to the research team, were involved in study conception and content expert input. All authors have made substantive intellectual contributions to the development of this protocol. All authors read and approved the manuscript.

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

Funding: This scoping review is being conducted as a part of an NHMRC funded public-private partnership (#GNT1152853) which aims to utilise implementation science principles to enable both clinicians and patients to better mitigate future risk of hospital falls and to reduce falls rates. The partnership is between the Healthscope private hospital network, Holmesglen Institute and Australian universities.

Data sharing: Data from this study will be available by emailing the lead author, Louise Shaw: louise.shaw@holmesglen.edu.au

Patient and public involvement: As this study is a scoping review of existing literature, no patients or public will be involved.

Appendix 1: Search strategy for CINAHL and PubMed

S1	**CINAHL limited to 2010 onwards and ENG Lang** TI "communit* of practice" title search only	479
S2	TI "communit* of practice" OR AB "communit* of practice" Title and abstract only	1310
S3	COMPLETE Strategy for CINAHL **(TI "communit* of practice" OR AB "communit* of practice") AND (TI (virtual OR online OR electronic OR web OR "social media" OR network* OR twitter* OR facebook OR listserv*) OR AB (virtual OR online OR electronic OR web OR "social media" OR network* OR twitter* OR facebook OR listserv*) OR (MH "Internet") OR (MH "Social Media+") OR (MH "World Wide Web+") OR (MH "software+") OR (MH "Social networking+") OR (MH "listserv"))** **IN COVIDENCE**	480
S4	**PUBMED 2010 onwards ENG lang** "community of practice"[Title] OR "communities of practice"[Title]	326
S5	"community of practice"[Title/Abstract] OR "communities of practice"[Title/Abstract]	1058
S6	COMPLETE strategy for PUBMED ENG Lang 2010 onwards **("community of practice"[Title/Abstract] OR "communities of practice"[Title/Abstract]) AND ("virtual"[Title/Abstract] OR "online"[Title/Abstract] OR "electronic"[Title/Abstract] OR "web"[Title/Abstract] OR "social media"[Title/Abstract] OR "network*"[Title/Abstract] OR "twitter*"[Title/Abstract] OR "facebook"[Title/Abstract] OR "listserv*"[Title/Abstract] OR "social networking"[MeSH Terms] OR "internet"[MeSH Terms:noexp] OR "social media"[MeSH Terms] OR "software"[MeSH Terms])** **IN COVIDENCE**	392

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5-6
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	This is a protocol paper
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6-7
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	7-8
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	See appendix
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	8
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	8-9
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	8-9
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	9

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	9
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	N/A for protocol
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	N/A for protocol
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A for protocol
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	N/A for protocol
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	N/A for protocol
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	N/A for protocol
Limitations	20	Discuss the limitations of the scoping review process.	N/A for protocol
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	N/A for protocol
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A for protocol

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

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Virtual communities of practice to improve clinical outcomes in healthcare: Protocol for a 10 year scoping review

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Virtual communities of practice to improve clinical outcomes in healthcare:

Protocol for a 10 year scoping review

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Abstract

Introduction: Virtual communities of practice (VCoPs) use a common online platform to provide healthcare professionals with the opportunity to access highly specialised knowledge, build a professional support network, and promote the translation of research evidence into practice. There is limited reporting of how best to design and administer VCoPs within healthcare organisations. The primary aim of this scoping review is to identify the best methods used to establish and maintain VCoPs. Findings shall be used to develop a flexible framework to guide the establishment and facilitation of a VCoP for healthcare professionals to ensure the translation of falls prevention clinical guidelines into practice.

Methods and analysis: A five stage scoping review process will be followed based on Arksey and O'Malley's framework and refined by the Joanna Briggs Institute Methodology. An initial limited search of PubMed and CINAHL will identify relevant studies and assist with search term development. This will be followed by a search of 5 online databases to identify papers published from January 2010 until November 2020. Papers will be independently screened by two reviewers, and data extracted and analysed using a reporting framework. Qualitative data will be analysed thematically and numerical synthesis of the data will be conducted.

Results and dissemination: The results of this scoping review will highlight the best ways to design and manage VCoPs in healthcare organisations. The findings will be presented at relevant stakeholder workshops, conferences and published in peer-reviewed journals.

Strengths and limitations of this study

-The scoping review will identify methods used to establish and maintain VCoPs in healthcare.

-The review will provide detailed analysis of the extent of the literature on VCoPs in healthcare published in the last 10 years

-The review will be limited to studies in English written in the last 10 years.

- VCoPs that are purely for teaching purposes, for example on-line learning, will be excluded.

Introduction

Communities of practice within healthcare involve groups of people who share an interest in a particular topic, and a desire to deepen their knowledge and expertise by interacting with others regularly. [1 2] They foster mutual learning and knowledge sharing outside the silos of discipline-specific professional expertise, [3] provide a forum for developing and implementing evidence-based practice, [4] and facilitate the delivery of high quality, cost-effective care. The three main elements characterising CoPs identified by Wenger et al (2002) are community (collective learning through social interactions), domain (within a particular area of interest), and practice (developing, sharing and maintaining knowledge). [1] Examples of CoPs where professionals have sought further education, development and innovation in a particular practice area, include the promotion of a new measurement tool in child and youth mental health care, [5] promotion of recovery-oriented practices in mental health care, [6] and the management of COVID 19. [7]

The advantages of CoPs within healthcare include the joint analysis of practical experiences and information among their members. [3] They allow members to openly discuss concerns and acknowledge errors, encourage in-situ learning, shared decision-making, and coordination of experimentation. [8] Whilst CoPs aim to promote standardisation of practice and the establishment of interpersonal relationships that encourage knowledge sharing, there is diversity in how and why they are implemented. [9] CoPs in healthcare have been found to be complex and multifaceted. They vary in composition, intended purpose and use a variety of models for members to share their knowledge. [9] The diversity of CoPs, can be influenced by various social, cultural and individual factors, such as clinical leadership, support and commitment for quality management, regular communication, and availability of accurate and relevant data. [10] Their establishment requires a flexible framework that will guide their formation and ongoing operational procedures. [9]

Advances in technology-based communication and the growth of the internet has led to a rapid increase in the sharing of health information globally. Health professionals can utilise virtual communities of practice (VCoPs) to share their knowledge. [11 12] More recently, the COVID-19 pandemic has significantly

limited physical interactions and meetings for sharing of expertise, and therefore, the relevance and utility of VCoPs is more evident. [13] VCoPs provide the opportunity to stay connected and informed, by the sharing of emerging resources and dissemination of research on health issues. [13] VCoPs use a wide variety of media to establish a virtual collaborative space including social media sites, videoconferencing and websites. [14] The creation of VCoPs means that health professionals who are geographically dispersed, [15] can use virtual communities for learning, support, continuing professional education, knowledge management and information sharing. [11 12] Being a member of a VCoP can be a great opportunity for healthcare professionals to share and gain access to highly specialised knowledge. [16] They allow healthcare professionals to build a professional support network and promote the translation of evidence into daily practice, by accessing a common platform. [17 18] VCoPs have a key role in promoting interprofessional learning and collaboration, with virtual modes of communication helping to reduce professional barriers and encourage communication within and between healthcare professions. [19]

The successful design and management of VCoPs depends on the characteristics of the virtual community. [8] Members of CoPs and VCoPs are likely to experience very different environments because of the primary way they interact. [14] Computer-mediated interactions are likely to make it more difficult for members to build mutual knowledge, trust, a sense of belonging and open exchange of ideas. [20 21] Factors found to affect knowledge sharing in online communities identified in the literature include individual factors, technological factors and social factors. [22-25] Individual factors include the contributions of members, with active participation being essential for the VCoP to grow and develop. [16] Active participation refers to members' knowledge-exchange activities, such as posting questions on online community boards, engaging in live chats, participating in online and videoconferencing discussion sessions and providing asynchronous answers and feedback in discussion threads. [26 27] Active participation is influenced by members' motivations, personalities, time available and values. [1 16 26-28] Social factors include the social interaction amongst members within the group and the roles of group moderators, whilst technological factors involve technical and usability issues. [16] A 7 year longitudinal study by Antonacci et al (2017) showed

the growth of VCoPs for healthcare professionals to be related to the presence of a centralised leadership structure and the frequent rotating of leadership over time. [16]

Healthcare organisations have a responsibility to deliver high quality, cost effective care by implementing evidence-informed policy and practice. [29-31] Despite the growing number of clinical guidelines produced by government agencies to improve effectiveness and quality of care, [32] frequently there are gaps between research evidence and clinical practice. [33-36] By providing a platform for health care professionals to collaborate towards a common purpose, VCoPs can bridge the gap between research evidence, policy-making and implementation of clinical guidelines. [37] To attempt to address the problems of translating falls prevention clinical guidelines into practice across multiple sites of a residential aged care organisation, one team used a web-based falls prevention CoP. [28] Member engagement with the ICT applications of asynchronous discussions and accessing evidence were low, with a number of barriers and facilitators to web-based CoP operation identified. [28] Barriers to sustainability included members' capabilities for using ICT applications and lack of dedicated time provided by management for web-based participation. [28] However, the operation of a VCoP in falls prevention was found to be achievable if staff were given sufficient time, and provided with suitable training and support. [38] All of these points could be considered when establishing a VCoP in falls prevention.

It is essential to clarify effective methods of VCoPs for knowledge synthesis and translation into practice. Given the limited reporting of a standard approach to the design and administration of VCoPs within healthcare, a scoping review shall be conducted to determine the nature of reported VCoPs within this context in the last 10 years. It aims to identify the methods used to establish and maintain VCoPs and ascertain potential barriers and facilitators to the implementation of VCoPs. This information will then be used to develop a flexible framework that will guide the establishment and facilitation of a VCoP for healthcare professionals on falls prevention in hospitals to assist the translation of clinical guidelines into practice.

Methods and analysis

The methodological structure will follow Arksey and O'Malley's framework for scoping reviews, [39] which was refined by the Joanna Briggs Institute. [40 41] The protocol will use the PRISMA-ScR checklist, [42] which was revised by the research team (LS, DJ, MM, DK). The framework has five sections: (a) identifying the research question, (b) identifying relevant studies, (c) identifying the study selection criteria, (d) charting the data incorporating both quantitative and qualitative thematic analysis, and (e) collating, summarising and reporting the results.

The review stages

Stage 1: Identifying the research question

Scoping reviews are a form of knowledge synthesis that present a broad overview of the evidence on a topic of interest, without addressing study quality, and can be used to identify key concepts for a topic area and identify any knowledge gaps. [43] The concepts underpinning a research area can be mapped by systematically searching, selecting, and synthesising existing knowledge. [39 44]

The primary research question is:

(i) What is the extent of reported research on establishing VCoPs in healthcare (for clinical purposes) published in the last 10 years (2010 to current)?

Secondary research questions add focus to the review and provide guidance for setting up and conducting a VCoP for falls prevention:

(ii) What methods are used to establish and maintain VCoPs (What frameworks are used for VCoP development, who are the participants, how is it coordinated, and what are the methods of communication and knowledge exchange?),

(iii) What potential barriers and facilitators are identified during the implementation of VCoPs?

The authors are aware and prepared for themes and recommendations that arise from the literature that are beyond these research questions and will amend and update the questions as required.

Stage 2: Identifying relevant studies

Eligibility criteria: In a scoping review, the three elements of population, concept and context are used to establish inclusion and exclusion criteria. The population details the relevant characteristics of participants, the concept is the principal focus of the review, and the context describes the setting under examination.

Participants: The population of interest is any healthcare professionals who are part of a VCoP for the purposes of building and exchanging knowledge, developing individual capabilities, ensuring their practice is evidence-based, and enhancing interprofessional collaboration.

Concept: The concept is Virtual Communities of Practice for the purposes of improving clinical outcomes. Communities of Practice that describe themselves as 'virtual', 'on-line' or 'web-based' are included. They should report on of the establishment and maintenance of VCoPs that have been implemented in a healthcare setting for health professionals.

Context: The context is any platform used by healthcare professionals to support virtual interactions in healthcare for knowledge advancement and sharing of ideas. VCoPs that are purely for teaching purposes, for example on-line learning, will be excluded.

Types of evidence sources: To be included, articles should be peer-reviewed and in the English language. Included articles can be existing literature on VCoPs including primary research studies of any design (quantitative, qualitative and mixed methods), systematic reviews, meta-analyses, guideline implementation. Exclusions include grey literature, commentaries and any other opinion pieces. The articles need to be accessible as full text, and published between January 2010 and October 2020.

Search strategy: A three step approach will be developed by the study group in collaboration with an academic librarian. The librarian will execute the searches on behalf of the study group.

(i) There will be an initial limited search of PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL), to identify relevant studies to assist with search term development, based on the research questions and purpose of the study. The librarian will assist in guiding a rigorous analysis process to identify the best search terms and strategy related to VCoPs in healthcare. The process will be iterative, to ensure all relevant search terms are captured.

(ii) Words in the title and abstract of the initial retrieved papers and indexing terms will be analysed and used to classify the articles.

(iii) A second comprehensive search across PubMed, CINAHL, CENTRAL, PsycINFO, Cochrane Library and Education Resources Information Center (ERIC) from January 2010 to October 2020 will be conducted, to ensure VCoPs are contemporary in terms of design and content. The reference lists of all identified reports and articles will be searched for additional studies meeting the inclusion criteria. We will retrieve all supplementary files that are referred to in the included papers and any papers that are referred to in a particular study that were part of the research project.

Appendix 1 shows the initial search strategy to be executed in CINAHL and PubMed.

Stage 3: Study selection

All studies identified from the search strategy will be uploaded to the online systematic review software, Covidence. [45] Two reviewers will independently screen the titles and abstracts of retrieved papers. The full texts of identified papers will be obtained and assessed by two independent reviewers, to identify studies that meet the inclusion criteria. Discrepancies will be resolved through discussion and if necessary, consensus will be achieved via a third reviewer. The results of the search will be presented in a PRISMA-ScR flow diagram (see Figure 1). [42]

Figure 1: PRISMA-ScR flow diagram example

Stage 4: Data charting

Data from eligible studies will be charted independently by two researchers using a data extraction chart developed in Covidence. [45] The chart will capture the relevant information on key study characteristics (for example, year of publication, country of origin, type of research, setting, study population of those in the VCoP), objectives, terminology used, development (activities undertaken at the inquiry, design and launch stages), barriers and facilitators to VCoP development, outcomes and key findings related to the review questions. This process will be iterative and variables may be identified following complete review of the full texts. The data extraction form will be trialled by two reviewers on a random sample of 10 included articles to ensure that all relevant results were able to be captured, and

modifications will be made as required. After this, the same two reviewers will independently chart the data for all included studies, and then compare and merge the data into a final dataset. Conflicts at the data merging stage will be resolved by discussion until consensus is reached. If a consensus cannot be reached, a third study group member will be consulted.

Stage 5: collating, summarising and reporting the results

The synthesis of extracted data will include thematic analysis for qualitative data. Quantitative data will be summarised using frequency analysis, with the counts and percentages of articles for each category calculated. Data synthesis will be an iterative process with new categories and themes identified through ongoing analysis. For the qualitative analysis, two reviewers will categorise the key components independently in Excel. Through discussion they will develop a coding framework. The coding framework will be piloted on a random sample of 10 included articles by the two primary reviewers and modifications will be made as required. One of the primary reviewers will then code the remaining articles according to the final framework. Quantitative results will be summarised in tables, charts and diagrams as indicated by the data, to allow for easy comparison. Following synthesis and analysis of the data best practice methods to establish and maintain VCoPs, barriers and facilitators to establishing VCoPs, approaches to evaluation, and the impact of VCoPs on clinical practice, will be identified.

Ethics and dissemination: The results of this scoping review will highlight the best ways to design and manage VCoPs in healthcare organisations. The findings will be presented at relevant stakeholder workshops, conferences and published in peer-reviewed journals. Ethics approval is not required for this scoping review.

Summary

VCoPs are becoming increasingly popular, yet the best methods of how to establish them have not been realised. The proposed scoping review will follow an updated, five step rigorous methodology for conducting scoping reviews as described by the Joanna Briggs Institute. The review will provide new and detailed analysis of the extent of the literature on VCoPs in healthcare published in the last 10 years. It will highlight the best methods for establishing and maintaining VCoPs within a healthcare setting. It will also

outline any potential barriers and facilitators to developing a VCoP in a healthcare setting. The findings will inform the development of a standardised but flexible framework for the translation of falls prevention clinical guidelines into practice.

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Ethics and dissemination

This scoping review does not require ethics approval as data will be obtained through review of existing published literature. Study findings will be presented at relevant consumer stakeholder meetings, conferences and public forums, and published in peer-reviewed journals. The findings will inform the future direction of the development and evaluation of a VCoP to promote best practice falls prevention in hospitals.

Authors' contributions: LS was involved in study conception, preliminary literature review, writing and editing of the protocol, scoping review framework and analysis, design of the search strategy and content expert input. DJ was involved in study conception, editing of the protocol, content expert input, and preliminary literature review. MM and DK were involved in editing of the protocol, provided general guidance to the research team, were involved in study conception and content expert input. All authors have made substantive intellectual contributions to the development of this protocol. All authors read and approved the manuscript.

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

Funding: This scoping review is being conducted as a part of an NHMRC funded public-private partnership (#GNT1152853) which aims to utilise implementation science principles to enable both clinicians and patients to better mitigate future risk of hospital falls and to reduce falls rates. The partnership is between the Healthscope private hospital network, Holmesglen Institute and Australian universities.

Data sharing: Data from this study will be available by emailing the lead author, Louise Shaw:

louise.shaw@holmesglen.edu.au

Patient and public involvement: As this study is a scoping review of existing literature, no patients or public will be involved.

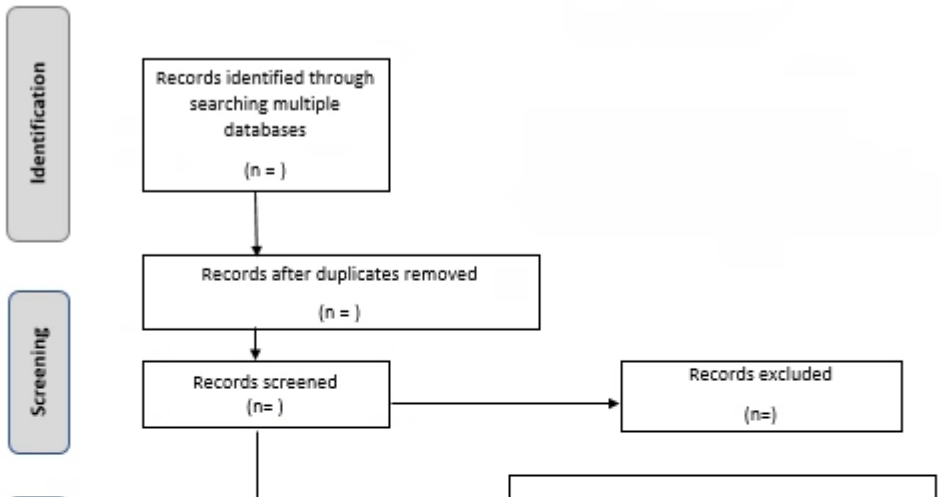

Figure 1: PRISMA-ScR diagram example for scoping review results

Appendix 1: Search strategy for CINAHL and PubMed

S1	**CINAHL limited to 2010 onwards and ENG Lang** TI "communit* of practice" title search only	479
S2	TI "communit* of practice" OR AB "communit* of practice" Title and abstract only	1310
S3	COMPLETE Strategy for CINAHL **(TI "communit* of practice" OR AB "communit* of practice") AND (TI (virtual OR online OR electronic OR web OR "social media" OR network* OR twitter* OR facebook OR listserv*) OR AB (virtual OR online OR electronic OR web OR "social media" OR network* OR twitter* OR facebook OR listserv*) OR (MH "Internet") OR (MH "Social Media+") OR (MH "World Wide Web+") OR (MH "software+") OR (MH "Social networking+") OR (MH "listserv"))** **IN COVIDENCE**	480
S4	**PUBMED 2010 onwards ENG lang** "community of practice"[Title] OR "communities of practice"[Title]	326
S5	"community of practice"[Title/Abstract] OR "communities of practice"[Title/Abstract]	1058
S6	COMPLETE strategy for PUBMED ENG Lang 2010 onwards **("community of practice"[Title/Abstract] OR "communities of practice"[Title/Abstract]) AND ("virtual"[Title/Abstract] OR "online"[Title/Abstract] OR "electronic"[Title/Abstract] OR "web"[Title/Abstract] OR "social media"[Title/Abstract] OR "network*"[Title/Abstract] OR "twitter*"[Title/Abstract] OR "facebook"[Title/Abstract] OR "listserv*"[Title/Abstract] OR "social networking"[MeSH Terms] OR "internet"[MeSH Terms:noexp] OR "social media"[MeSH Terms] OR "software"[MeSH Terms])** **IN COVIDENCE**	392

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5-6
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	This is a protocol paper
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6-7
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	7-8
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	See appendix
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	8
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	8-9
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	8-9
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	9

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	9
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	N/A for protocol
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	N/A for protocol
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A for protocol
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	N/A for protocol
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	N/A for protocol
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	N/A for protocol
Limitations	20	Discuss the limitations of the scoping review process.	N/A for protocol
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	N/A for protocol
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	N/A for protocol

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.