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Nurse-led virtual interventions in managing chronic diseases: a protocol for a systematic review of randomised controlled trials

Xingjuan Tao,1 Weishan Zhu,1 Mingzi Chu,2 Yuanyuan Zhang1

ABSTRACT

Introduction Technology advances are changing nursing practice; however, nurse-led virtual care for chronic disease management has not yet been adequately explored and described. This study will review and analyse the effects of nurse-led virtual services and describe the virtual intervention characteristics relevant to the scope of nursing practice in chronic disease management.

Methods and analysis This study will systematically review randomised controlled trials evaluating the effects of nurse-led virtual care interventions on patients with chronic conditions. Databases including PubMed, Embase, Web of Science, CINAHL, Chinese National Knowledge Infrastructure, Wanfang (Chinese) and VIP Chinese Science and Technology Periodicals will be searched. All studies will be screened and selected using the criteria described in 'population, intervention, comparison, outcome and study design' format. Relevant studies will be searched using the reference lists of eligible studies and review articles. The risk of bias will be assessed using the Joanna Briggs Institute Quality Appraisal Form. Two reviewers will independently extract data from all the included studies using a standardised data extraction form on the Covidence platform. RevMan V.5.3 software will be used to perform the meta-analysis. Data synthesis will be conducted with descriptive synthesis by summarising and tabulating the data and presenting them according to the research questions.

Ethics and dissemination Formal ethical approval is not required as the data used in this systematic review are abstracted from the pre-existing literature. The results of this study will be disseminated through peer-reviewed journals and conference presentations.

INTRODUCTION

Chronic disease management involves monitoring and coaching on self-management and behaviour change, all of which require ongoing support from healthcare providers. The COVID-19 pandemic has led to challenges and innovations in caring for patients with chronic diseases. To address the patients’ continuum of care and health needs and limit disease transmission, new approaches to virtual chronic disease management have skyrocketed. Virtual care is not a novel concept. It encompasses ‘any interaction between patients and/or members of their circle of care, occurring remotely, using any form of communication or information technologies, with the aim of facilitating or maximising the quality and effectiveness of patient care’.1 Virtual care goes beyond the use of video and telephone, and it includes applications of technologies, such as email, secure messages and remote monitoring. Before the COVID-19 pandemic, patients and healthcare providers were hesitant to engage with virtual care. With technological advances in healthcare and the COVID-19 pandemic, virtual care has expanded significantly and is likely to continue expansion to assure that patients safely access care and effectively engage in chronic disease management. A global survey from 47 countries showed that 80% of healthcare providers adapted to new ways of virtual healthcare via telephonic or video technology.2 It has been reported that virtual care adoption accelerated after the arrival of COVID-19,3 and for those who did engage, satisfaction was high.4 The pandemic has forced the healthcare system toward

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This systematic review will report results strictly adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
⇒ The international literature will be compiled to understand the effects of nursing practices that integrate virtual health into chronic disease management.
⇒ The characteristics of the nurse-led interventions will be extracted using the Temple for Intervention Description and Replication Checklist.
⇒ Integrating different chronic diseases may cause significant heterogeneity in study interventions and outcomes.


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1Shanghai JiaoTong University School of Nursing, Shanghai, China
2Department of Nursing, Shanghai Ninth People’s Hospital, Shanghai JiaoTong University School of Medicine, Shanghai, China

Correspondence to Yuanyuan Zhang; zhangyy@shsmu.edu.cn

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1 Shanghai JiaoTong University School of Nursing, Shanghai, China
2 Department of Nursing, Shanghai Ninth People’s Hospital, Shanghai JiaoTong University School of Medicine, Shanghai, China

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1 Shanghai JiaoTong University School of Nursing, Shanghai, China
2 Department of Nursing, Shanghai Ninth People’s Hospital, Shanghai JiaoTong University School of Medicine, Shanghai, China

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widespread use of virtual care and leveraged virtual care options in combination with in-person care.

Individuals with chronic disease require continuous and comprehensive healthcare. Virtual care interventions have been shown to provide efficient and effective healthcare by offering an evidence-based approach to providing timely communication, patient education, goal setting and referring to dispersed healthcare teams.\cite{5, 6} Several systematic reviews and meta-analyses summarised the intervention contents and tools adopted in mobile health-based self-management programmes and proved their potential benefits in facilitating clinical and patient outcomes.\cite{7–9} Smithson et al found that virtual chronic disease management is a viable and safe alternative to traditional care, and recommended virtual care be an adjunct, rather than a replacement, to face-to-face care.\cite{10} Virtual chronic disease management often involves interacting with different individuals, such as patients, families and healthcare professionals, at different levels within an organisation.

Nurses have been valued for ‘being there’ for the patient and their family members during the most challenging moments and are expected to have insight into how chronic disease impacts a patient’s life and therefore are eminently suited to coach patients.\cite{11} New technologies allow virtual nursing care to improve patient engagement and quality of care and provide a work environment that uses their clinical expertise without requiring their physical bedside presence.\cite{12} Nurses contribute to the virtual service delivery in chronic disease management, either as independent practitioners or as collaborative team members.\cite{13} Zaslavsky et al revealed that nurses (registered and licensed practical nurses) had higher levels of acceptance of digital technologies relative to behavioural health consultants and primary care providers (eg, physicians).\cite{14} The study further identified that nurses preferred the adoption of digital health technologies for case management, promoting healthy behaviours and self-management. A Canadian national survey on the use and impact of digital health technologies on nursing practice showed that nurses’ involvement in virtual care expanded up to ninefold from 2017 to 2020.\cite{15}

Technological advances are changing nursing practice by providing remote symptom monitoring, automatic detection and appointment alerts, just in time personalised self-management coaching and behavioural, emotional and social support in chronic disease management. Previous studies have demonstrated the effects of nurse-led virtual care interventions for improving symptom management, self-care behaviour, weight and glucose control, blood pressure control and quality of life for patients with chronic diseases.\cite{16–19} A recent Canadian study reported that nurse practitioners, clinical nurse specialists and licensed practical nurses were more likely to use virtual care technologies than registered nurses, and nurses’ perception of their skills in using digital technologies was associated with perceived quality of care.\cite{20}

Advanced practice nurses have been at the forefront of telehealth for decades and play a pivotal role in delivering virtual care and should strengthen their leadership in digital technology-enabled chronic disease management, not just delivery of care.\cite{21} In light of the rapid expansion of technologies to deliver healthcare virtually, it is pivotal to find nurses’ roles in the new model of healthcare. However, little is known about the virtual tasks undertaken by nurses across designations that add value to patient care by supporting nursing practices and processes. Hence, a systematic review synthesising the outcomes of nurse-led virtual care for chronic disease is needed to provide implications for clinical nursing practice in the age of technology. This systematic review will describe the effects of nurse-led virtual interventions, as well as virtual interventions that are relevant to the scope of nursing practice in chronic disease management.

**Review questions**

The following research questions are proposed:

1. **Primary review questions.**
   - To what extent is a nurse-led virtual intervention effective for improving outcomes in chronic disease management?
   - Which outcomes are significantly influenced by nurse-led virtual interventions in chronic disease management?

2. **Secondary review question.**
   - What aspects of nurse-led virtual interventions are devised for chronic disease management?

**METHODS AND ANALYSIS**

**Design**

This will be a systematic review of the literature. The review protocol was developed based on the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) Protocols guidelines.\cite{22} The protocol proposal was registered in PROSPERO (CRD42022361260). The project began in July 2022 and is expected to be completed by July 2023. If we need to amend this protocol, we will describe the changes and provide the rationale and data for each amendment.

**Eligibility criteria**

A systematic literature search will be performed based on the population, intervention, comparison, outcome and study design (PICO-SD). The population (P) of this study will be adult patients aged >18 years with chronic diseases including chronic respiratory disease, chronic heart failure, chronic kidney disease, diabetes mellitus, hypertension and rheumatoid arthritis. Interventions (I) will be all nurse-led virtual interventions. For this review, a nurse-led intervention is defined as a care intervention designed toward an individual patient that was driven and delivered by a registered nurse. Virtual interventions, as defined in this review, refer to any interaction between patients and members of their circle of care occurring remotely, using any form of virtual technology to facilitate or maximise the quality and effectiveness of patient care.
care. These include established technologies such as telemedicine (e.g., phone-based or video-based consultations) that have arisen over the past few decades, alongside newer communication platforms such as asynchronous consultation via SMS text messaging, email, patient portals and third-party applications (apps). Study interventions will involve nurse–patient interactions using any form of digital technology. Trials that included other health professionals were included if the intervention was predominantly nurse managed. The control (C) will include either other or no intervention. Outcomes (O) are healthcare outcomes. A healthcare outcome is defined as any parameter that demonstrates an effect on a nurse-led virtual service. The study design (SD) will include randomised controlled trials (RCTs) that describe nurse-led services in ambulatory, outpatients, general practice, primary health or community care settings. Articles published until 25 July 2022 in English or Chinese will be included in the review.

As for exclusion criteria, studies on any pharmacological-only or surgical-only interventions and interventions delivered by healthcare professionals who are not professionally qualified nurses will be excluded. Virtual interventions that only included remote monitoring without patient-provider interactions will be excluded. We will also exclude letters, editorials, poster presentations, protocols and studies with no outcomes.

Information sources
Databases including PubMed, Embase, Web of Science, CINAHL, Chinese National Knowledge Infrastructure, Wanfang (Chinese) and Chinese Science & Tech Journals will be searched for eligible articles. We will also search for the grey literature using ProQuest Dissertations and the reference lists of eligible studies and review articles.

Search strategy
The search terms used to identify the articles will be based on three key concepts: nurse-led, virtual care and chronic diseases. Literature search strategies will be developed using medical subject headings and text-word related to these concepts. The databases will be systematically searched using a combination of the keywords, that represent the concepts of ‘nurse-led care, virtual care, chronic conditions and RCT’. The study outcomes were not entered into the literature search process but were assessed during the screening phase. An example PubMed search is presented in Table 1.

Study records
Data management
All citations from searches will be managed using an EndNote database and then added to Covidence for removal of duplicates, screening of titles and abstracts, full-text, risk-of-bias assessment, extraction of study characteristics and outcomes, and export of data and references. Prior to the formal screening process, the team will undertake a calibration exercise to pilot and refine the screening criteria.

Selection process
Two reviewers will independently screen titles and abstracts according to the inclusion and exclusion criteria. Paired reviewers will then screen the full-text reports and decide whether these meet the eligible criteria. The reasons for exclusion will be recorded and detailed in the PRISMA flowchart. Discrepancies between reviewers will be resolved through discussion. A third reviewer will be approached as needed to adjudicate disagreements.

Data collection process
Two members of the team trained in review methodologies will independently extract data from all included studies using a standardised data extraction form, which will be pilot-tested. The Covidence platform will be used to record the data extraction results, and a data comparison will be performed to reduce potential errors and inaccuracies.

Data items
We will extract the following data: (1) study identification: authors, year of publication, country, study design, study setting and number of study centres; (2) participant characteristics: number of participants, sex, average age and types of chronic diseases; (3) intervention characteristics: name of the intervention, aim of the intervention, contents of the intervention, virtual elements of the intervention, interventionists, amount, frequency and duration of the intervention; and (4) outcomes: outcome of the intervention, instruments used for outcome measurement and reported statistical results of the intervention effectiveness.

Outcomes and prioritisation
The primary outcome of this study is individual effectiveness, which includes functional, physiological and psychological health; health behaviour, health knowledge and attitudes; and quality of life. The secondary outcomes are individual-related organisational effectiveness, including service utilisation, patient satisfaction and continuity of care.

Risk of bias in individual studies
The quality of each included study will be evaluated using the Joanna Briggs Institute Quality Appraisal Forms (checklist for RCTs). Two reviewers will independently assess the quality of the studies, and a consensus on the overall quality will be reached through discussion. A third reviewer will be consulted if the discrepancies cannot be resolved between the first two reviewers. Studies will not be excluded based on their quality. The appraisal results will be presented narratively.

Data synthesis
There will be heterogeneity among the disease groups, patient populations and outcome measures across the
The same outcome indicators. The I² statistics will be used for the meta-analysis if three or more articles report the same outcome indicators. The I² statistics will be used for the meta-analysis.

### Table 1: Search strategy for PubMed

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<td>OR &quot;nurse-run&quot;</td>
<td>OR &quot;nurse-managing&quot;</td>
<td>OR &quot;nurse-managing&quot;</td>
<td>OR &quot;nurse-coordinated&quot;</td>
<td>OR &quot;practice patterns, nurses&quot; [MeSH Terms]</td>
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5. 1 AND 2 AND 3

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included studies. The effect of nurse-led virtual care interventions will be analysed by disease groups. A meta-analysis will be conducted if three or more articles report the same outcome indicators. The I² statistics will be used to assess the heterogeneity of the effect size. RevMan V.5.3 software (revman.cochrane.org) will be used to perform the meta-analysis.

Data synthesis of the intervention characteristics will be conducted using descriptive synthesis by summarising and tabulating the data and presenting them according to the research questions. Virtual care will be categorised by virtual care modalities: telephone, videoconferencing, store and forward, remote monitoring, websites and apps, and further differentiated into purely synchronous interactions, purely asynchronous, or combined synchronous and asynchronous interactions, and hybrid and standalone interventions. Synchronous delivery facilitates remote real-time feedback with both audio and visual cues available. Hybrid interventions are services with eHealth and traditional in-person elements, whereas standalone interventions include only virtual elements. Intervention characteristics will be extracted using the Temple for Intervention Description and Replication Checklist (TIDieR), which includes a brief name, why, what, provider, how, where, when and how much, tailoring, modifications and how well. The level of nurse delivering the virtual care interventions will be categorised into generalist, specialist and advanced nurse. The types of interventions will be further grouped according to the role of nursing in telehealth, including programme development and implementation, direct patient and family contact, and nurse-to-healthcare professional collaboration.
Ethical considerations
Because the data used in this systematic review will be abstracted from the existing literature, approval from an ethical committee is not required. If the protocol is amended, a rationale for the changes will be provided.

Validity and reliability
This systematic review will report results strictly following the PRISMA guidelines to ensure validity and reliability. Nurse-led virtual interventions will be summarised following the TIDieR checklist and guidelines.

Patient and public involvement
Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination of this research.

DISCUSSION
Virtual care interventions as a way of monitoring patients in their homes have received particular attention during the COVID-19 pandemic. Research has identified that virtual care interventions are generally used to facilitate counselling, online learning, information sharing and health outcomes tracking. The modalities of virtual care interventions include teleconferencing, video conferencing, emails, messaging, health apps, personal health records, patient portals and eHealth services used via the internet. Previous studies have highlighted that virtually delivered healthcare is cost-effective. Faced with virtual care transformation, nurses should actively strengthen their relationship with digital technology to create high-quality and accessible services for patients and communities. Evidence supports that advanced practice nurses can provide a wide array of chronic disease care services safely and cost-effectively. Thus, optimising the contribution of nurses to virtual care interventions during chronic disease management through evidence-based approaches can clarify the value of nursing care. However, nurse-led practices in virtual care interventions have not been adequately explored or described. Therefore, it is necessary to explore the features and structure of nurse-led virtual care, which benefit patients with chronic diseases. This systematic review attempts to explore the effects of nurse-led virtual care and identify intervention characteristics that are designed and delivered in virtual formats in chronic disease management.

This review may have several potential limitations. First, different chronic diseases and diverse virtual care characteristics may cause significant heterogeneity in the study interventions and outcomes. Second, we will include RCTs in English or Chinese, which may overlook studies in other languages. Third, studies without details of the interventionists or those that are poorly reported may not be included.

This systematic review will identify potentially optimal nurse-led virtual interventions for chronic disease management. It is expected that the results of this review will aid in the design, implementation and evaluation of nurse-led virtual services aimed at patients with chronic conditions. Our findings can also identify existing research gaps in nurse-led virtual care that can be investigated in future studies.

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Contributors
XT and YZ are the guarantors. Contributions to concept and design: XT, WZ, MC and YZ. Data analysis and interpretation: XT, WZ, MC and YZ. Drifting the article: XT, WZ and MC. Revising critically: XT, WZ, MC and YZ. All authors have agreed on the final version.

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Competing interests
None declared.

Patient and public involvement
Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication
Not applicable.

Provenance and peer review
Not commissioned; externally peer reviewed.

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ORCID iD
Xingjuan Tao http://orcid.org/0000-0002-7954-1760

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