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Supervised exercise delivered via telehealth in real time to manage chronic conditions in adults: a protocol for a scoping review to inform future research in stroke survivors

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ABSTRACT

Introduction Increasing physical activity reduces secondary stroke risk factors, but many stroke survivors have low levels of physical activity. Supervised exercise delivered via telehealth has the potential to overcome barriers to increased physical activity in stroke survivors. Our scoping review will examine the emerging field of supervised exercise delivered via telehealth to map the available evidence in relation to its efficacy, acceptability, safety and feasibility in chronic conditions to inform future research into its ability to increase physical activity.

Methods and analysis The methodological framework of Arksey and O'Malley will be applied to our scoping review. A systematic search of Medline, CINAHL, Scopus, Cochrane, Pedro and Embase; hand searching of pertinent studies' reference lists; and consultation with experts in the field will identify relevant papers. Studies involving participants with a chronic condition who undertake supervised exercise delivered by a health professional via telehealth targeted at improving secondary stroke risk factors or involving lower limb weight-bearing exercise will be included. Study selection and critical appraisal of individual studies will be carried out independently by two authors with discrepancies resolved by a third author. Quantitative and qualitative data will be charted using a standardised form. Results will be tabulated and narratively summarised to highlight findings relevant to the review's research questions and to inform recommendations for future research.

Ethics and dissemination Our review will significantly contribute to the knowledge base of exercise and rehabilitation delivered via telehealth and its application in chronic conditions, including stroke. Findings will be relevant to researchers, healthcare workers and policy-makers and will be disseminated through publication and presentations. Only secondary deidentified data will be included, therefore ethics approval will not be sought. This protocol is not registered as PROSPERO currently excludes scoping reviews.

Strengths and limitations of this study:

- Our comprehensive scoping review will bring together research findings regarding supervised exercise delivered via telehealth to inform its future application to research and practice across chronic conditions.
- The inclusion of all research study designs will ensure the breadth of evidence regarding supervised exercise delivered via telehealth is captured.
- We will use a published framework to optimise transparency and methodological rigour.
- To facilitate accurate analysis of the evidence and its role in informing future research, quantitative studies will be individually assessed for bias and qualitative studies will be individually assessed for methodological rigour.
- A limitation of this review will be the exclusion of unpublished literature for which authors are unable to provide sufficient additional information, and research not published in English.

INTRODUCTION

Stroke is the second leading cause of death and burden of disease worldwide.[1 2] The number of people experiencing stroke is increasing, with estimates predicting 70 million stroke survivors and 12 million stroke related deaths worldwide in 2030[3]. Secondary prevention of stroke is currently inadequate with incidence rates as high as 40%.[4] Secondary strokes tend to be more severe with a mortality rate nearly double that of first stroke.[5] Effective secondary prevention strategies must be significantly improved to prevent the impact of stroke recurrence.

Lifestyle interventions which involve increasing physical activity in stroke survivors can improve secondary stroke risk factors.[6 7] Despite this, stroke survivors frequently have low activity levels.[8–10] Simply providing prompts and encouragement is not sufficient to achieve increases in physical activity in stroke survivors.[9] The potential importance that *supervision* of exercise plays in increasing physical activity in stroke survivors is emerging

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in the evidence. Research has found supervised exercise is superior to unsupervised exercise in increasing long-term physical activity levels in stroke survivors.[11] Furthermore, stroke survivors have identified support provided by qualified staff during supervised exercise was a key facilitator for increasing physical activity.[12] Supervised exercise can also improve walking ability,[13] mobility,[14] balance[14] and endurance[14] in stroke survivors; all key elements of physical function which are positively associated with physical activity levels in this population.[15]

Barriers to physical activity identified by stroke survivors include transport,[16 17] economic constraints,[16] distance[17] and a perceived lack of appropriate services.[16] Marzolini *et al* found barriers to physical activity identified in their study also increased with increased socioeconomic disadvantage.[17] Telehealth uses 'telecommunications and virtual technology to deliver health care outside of traditional health care facilities'.[18] This rapidly evolving mode of service delivery has significant potential to improve equity of service delivery and overcome barriers such as access, distance, cost and transport. Evidence is emerging across chronic conditions regarding the application of supervised exercise delivered via telehealth.[19–24] Preliminary research indicates these interventions may be feasible,[21] improve self-efficacy[20] and reduce costs of exercise programme delivery.[24]

Stroke-related impairment may impact the safety and efficacy of supervised exercise delivered via telehealth to reduce secondary stroke risk factors. Stroke survivors are commonly affected by impaired cognition,[25] physical ability[26 27] and poststroke fatigue.[28] Internationally, the potential for supervised exercise to optimise stroke survivor safety is recognised. The American *physical activity and exercise recommendations for stroke survivors*[29] and the *Canadian stroke best practice recommendations: Secondary prevention of stroke*[30] suggest the consideration of health professional supervised exercise where co-morbidity,[29 30] falls risk[30] and level of disability[29] present a risk. Seventy-nine percent of stroke survivors are reported to have at least one cardiovascular co-morbidity, while over a quarter have at least two.[31] Falls are common post stroke[32–34] and 45% of community dwelling stroke survivors have been found to fall at least once in a 12-month period.[34] Supervised exercise delivered via telehealth may provide a safe and accessible way to increase physical activity for stroke survivors at risk of falls or cardiac events. Preliminary evidence has found telehealth rehabilitation for improving motor function in stroke is at least as effective as its centre-based equivalent.[35] However, the safety and efficacy of supervised exercise training for the reduction of secondary stroke risk factors (including aerobic and resistance training) delivered via telehealth remains largely unexplored.[35]

Focusing on supervised exercise due to its significant potential to support increased physical activity in stroke survivors, our scoping review will map the available evidence surrounding supervised exercise delivered via telehealth in chronic conditions. This will provide an understanding of current evidence to inform clinical trials in stroke. Our specific research questions are as follows.

With regard to interventions involving supervised exercise delivered via telehealth in chronic conditions:

1. What population groups have been included in the research and what are the key characteristics of the interventions delivered (including: frequency, duration and intensity; types of exercise included and telehealth modalities used)?
2. What are health professionals', participants' and carers' experiences of, or attitudes towards, supervised exercise delivered via telehealth?
3. What strategies have been used to optimise safety, feasibility, delivery and adherence?
4. What are the barriers and limitations to these interventions and what strategies have been used to mitigate these?
5. What is the effectiveness and cost-effectiveness of telehealth-supervised exercise sessions for reducing secondary stroke risk factors?

METHODS AND ANALYSIS

Scoping reviews enable the mapping of research findings and identification of gaps in research evidence while providing a source of knowledge translation.[36–38] We have chosen the scoping review method to evaluate the evidence surrounding supervised exercise delivered via telehealth in chronic conditions because scoping reviews are suited to areas of research where outcomes are not well established[37] or are heterogeneous in nature.[38] We will use the framework of scoping reviews first described by Arksey and O'Malley[36] which requires *identifying the research question; identifying relevant studies; study selection; charting of the data;* and *collating, summarising and reporting the results*. The refinements to the Arksey and O'Malley[36] framework suggested by Levac *et al*[37] and Peters *et al*[39] will also be considered to optimise transparency and methodological rigour.

To optimise reporting this scoping review protocol uses the Preferred Reporting Items for Systematic Reviews and Meta-analyses Protocols (PRISMA-P)[40 41] method (online supplementary appendix 1). Since not all items in the PRISMA-P are relevant to scoping reviews, we have adapted the items with reference to the PRISMA extension for Scoping Reviews (PRISMA-ScR)[38] where needed. Our scoping review was initiated on 1 September 2018 and is to be completed by 30 May 2019.

Identifying the research question

The five research questions of our review are identified in the introduction of this paper. These questions will inform future research into supervised exercise in stroke survivors by mapping and identifying gaps in the available evidence regarding supervised exercise delivered via telehealth in chronic conditions.

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Table 1 Study selection criteria

	Inclusion	Exclusion
Population	Chronic health condition Adult, 18 years and older.	Healthy participants (including those with a body mass index less than 30).
Intervention	Supervised exercise delivered via telehealth where: ► The majority of supervised exercise is delivered via telehealth and this supervision involves observation in real-time (visual, or via other continuous physiologic monitoring). ► The exercise sessions provide opportunity for participant and health professional feedback to ensure exercises are carried out correctly and safely. ► Exercise that impacts or is intended to impact cardiovascular disease risk or involves lower limb weight bearing.	Exercise delivered to participants located onsite at a healthcare facility. Exercise occurring with a health professional present at the participant's site (eg, expert remotely supervising novice health professional on telehealth). Exercise not supervised by a health professional.
Comparison	Any.	Nil exclusion criteria.
Outcome	All.	Nil exclusion criteria.
Publication Type	Published primary research studies, including both qualitative and quantitative research. Primary research protocols which have been published. Abstracts of unpublished studies for which authors can be contacted and provide sufficient information to enable accurate analysis.	Text. Opinion papers. Letters. Literature reviews. Systematic reviews. Meta-analyses. Not published in English.

We define the key terms of the scoping review's questions as follows:

- *Supervision*: real-time monitoring (visual, or through other continuous physiologic monitoring such as echocardiogram or heart rate) by a health professional with the opportunity for participants to receive and provide health professionals feedback in real time to ensure the exercise is being carried out safely and correctly.
- *Exercise:* our review will consider exercise as physical activity targeted at outcomes that impact cardiovascular disease (and secondary stroke) risk factors, including hypertension, hyperlipidemia, dysglycemia or daily physical activity. To ensure our review captures all evidence relating to the research question regarding the safety of supervised exercise delivered via telehealth and its implications for falls risk, the definition of exercise will also include any intervention involving lower limb weight bearing, for example balance training.
- *Telehealth:* The application of telecommunications and virtual technology to provide healthcare outside of conventional healthcare facilities (WHO, 2018).[18]

Identifying relevant studies

Studies will be included in the review if they meet the eligibility requirements set out in table 1.

All published primary research studies will be included in the review. The exclusion criteria includes otherwise healthy participants with a body mass index (BMI) <30 to ensure a consistent definition of the chronic condition *obesity* as a BMI of 30 or greater.[42] In order to accurately capture current approaches to real-time supervised exercise delivered via telehealth in this rapidly evolving field, we will also include published trial protocols and abstracts of unpublished studies for which authors can be contacted to provide sufficient information. Studies included in the scoping review will not be limited by year of publication.

Study selection

We will conduct a comprehensive, systematic search of Medline, CINAHL, Scopus, Cochrane, Pedro and Embase databases. The search strategy will be developed in consultation with a senior research librarian and will include use of the relevant index terms and keywords for 'exercise' and 'telehealth'. We will hand search the reference lists of all included studies as well as relevant systematic reviews. Experts in the field will be contacted to identify any other pertinent research. We will contact authors of abstracts of unpublished studies retrieved and request they provide information to enable accurate analysis of their research.

Full details of the databases' draft search strategies are shown in online supplementary appendix 2.

Studies identified through the search strategy will be exported from each database to EndNote X8.2 and then exported to covidence for removal of duplicates and screening of titles and abstracts. Covidence will be used to manage data throughout the remainder of the review. All titles and abstracts will be independently reviewed by two authors and conflicts will be resolved by a third author. To optimise the reliability of screening of titles and abstracts all authors will participate in the screening of the initial 150 studies for inclusion using the selection criteria

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(outlined in table 1). The authors will then then meet to resolve any issues or ambiguities found in the criteria. Following title and abstract screening, full texts of potentially relevant studies will be assessed for eligibility by two authors independently, with any discrepancies resolved by a third author. To support the inherently iterative nature of scoping reviews,[36–39] authors will communicate regularly to discuss the selection process. Any refinements made to the selection criteria will be recorded. The selection process will be reported using a PRISMA 2009 Flow diagram.[43]

Data charting

Data charting is the method used for extracting data in scoping reviews.[36 38] It allows researchers to capture a breadth of information including detail on processes to provide further context to the research outcomes.[36] We will develop a standardised electronic form to chart the data. All authors will pilot the data charting form with the initial five studies to ensure the data extracted optimally addresses the research questions[37] and then meet to discuss and resolve any issues identified. This process will also facilitate the reliability of the data charting. The remainder of the data will be charted by one author and checked by a second author. Any discrepancies will be resolved by a third author. The iterative nature of scoping reviews means the data charting form may require adaptation during the data charting process.[36–39] Regular communication between authors will occur to identify, in a timely manner, any need for modification to the data charting form. All significant alterations to the data chart will be recorded.

To avoid inclusion of duplicate data we will identify and group multiple publications relating to the one research project prior to the charting of the data. The study details and outcomes chosen for charting are guided by The Cochrane Collaboration's *Checklist of items to consider in data collection or data extraction*[44] and the recommendation of Arksey and O'Malley (2005).[36] Where available these will include, but are not limited to: bibliographic information; study aims/purpose; research design; number of participants; duration of intervention and follow-up; date; setting; country; co-morbidity; socio-demographics; and specific category of chronic condition. Where available the intervention data extracted will include frequency, intensity, time and type of exercise intervention and any control or comparison groups; the number of intervention groups; the type of telehealth modality used; adherence; satisfaction; and other methods of exercise delivery or support used in the study. All reported outcome measurements will be charted. Details of outcomes which directly inform the research questions including economic viability, intervention feasibility, intervention safety (including adverse events), cardiovascular risk factor indicators (including blood pressure, level of physical activity, cholesterol, lipid profiles, insulin resistance) will be prioritised. Any other key findings or recommendations not captured through the above process which specifically relate to our research questions will also be charted.

All papers included in the scoping review will be critically appraised. We have chosen to undertake critical appraisal for two reasons. The first, to facilitate accurate identification of evidence gaps which Brien *et al* highlights can be difficult without the assessment of evidence quality.[45] The second, is to optimise recommendations made for practice to ensure they are based on sound evidence.[39] We will use *The Cochrane Collaboration's tool for assessing risk of bias*[44] to assess the bias of each individual, quantitative study. We will use the *Consolidated Criteria for Reporting Qualitative Research* checklist[46] and the *Mixed Methods Appraisal Tool (MMAT) – Version 2011*[47 48] to individually assess qualitative and mixed methods studies for methodological rigour respectively. This critical appraisal will be carried out by two independent authors who will meet to discuss and resolve any discrepancies found in their assessments, with adjudication by a third author if necessary.

Collating summarising and reporting of results

Our scoping review will be reported using the PRISMA-ScR.[38] The results will be summarised and reported to prioritise the findings relevant to the specific research questions. Quantitative data and the results of individual studies' critical appraisal will be presented in tabular format. Qualitative data will be analysed thematically and collated concisely into a tabular format. If needed, further narrative description will be provided to aid interpretation of the results. Visual or diagrammatic representation of data will occur to aid its summary or conceptualization as needed.

To aid the synthesis of the results we will provide a narrative summary of the findings most pertinent to the review's research questions. Knowledge gaps in the research evidence and their implications will also be recognised through a narrative summary. Our key findings, informed by the critical appraisal of individual studies, will be used to make recommendations for future research and practice relating to supervised exercise delivered via telehealth.

The breadth of research evidence included in this review enables the comprehensive mapping of interventions involving supervised exercise delivered via telehealth aimed at reducing cardiovascular disease risk factors. As such, caution should be taken when interpreting the findings for individual patient populations. Another potential limitation of the study is the oversight of relevant papers due to the exclusion of grey literature. This has been done to ensure research quality can be assessed to optimise recommendations for practice. These and any further limitations identified during the scoping review process will be acknowledged.

Patient and public involvement

There will be no patient or public involvement in our scoping review.

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Ethics and dissemination

The findings of our scoping review will be disseminated through presentation at appropriate forums or conferences. The completed scoping review will also be submitted for publication in a peer reviewed journal and form part of a PhD thesis. Findings will be directly translated to inform the development of a supervised exercise programme delivered via telehealth that will be pilot tested and evaluated in terms of effect on reducing secondary stroke risk factors. We will use only secondary de-identified data in the scoping review, therefore ethics approval is not required.

DISCUSSION

The high mortality rates and the significant burden of disease resulting from secondary stroke must be addressed. Our review will explore emerging research in relation to the efficacy, acceptability, safety, economics and feasibility of supervised exercise delivered via telehealth. This research has the potential to provide strategies to overcome current barriers in the translation of evidence for physical activity in stroke survivors to reduce stroke recurrence.

This review will significantly contribute to the knowledge base of exercise and rehabilitation delivered via telehealth. The breadth of research captured means it has implications beyond stroke care to broadly inform the application of supervised exercise and rehabilitation via telehealth. It is anticipated that our findings will be relevant to researchers, healthcare workers and policy-makers at a national and international level .

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Contributors All authors made significant intellectual contributions to the protocol. CE conceived the idea for the scoping review. ERR (guarantor) and CE conceptualised and drafted the research questions and study selection criteria, while CMS, EAL, NAF and AP contributed to their further development. ERR developed the study methodology with EAL, CMS, NAF, AP and CE providing feedback for refinement. All authors contributed to the drafting and editing, and approved the final manuscript.

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