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Cognitive prehabilitation for geriatric patients undergoing elective surgery: a PRISMA-P-compliant protocol for a systematic review

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ABSTRACT

Introduction The ageing of the population, as well as advances and improvements in surgery, and anaesthesia have greatly increased the demand for surgical services in geriatric patients. Neurocognitive disorders are the most common complications experienced in the postoperative period by older individuals. Improving perioperative brain health in older adults has become key actions for the multidisciplinary perioperative care teams. This comprehensive systematic review will assess the effectiveness and safety of cognitive prehabilitation programmes prior to surgery on cognitive functional capacity and postoperative cognitive outcomes in geriatric patients undergoing elective surgery.

Methods and analysis This protocol was prepared using the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols. The following key electronic bibliographic databases will be searched from inception to July 2022: MEDLINE, EMBASE, CINAHL, CENTRAL, PEDro, PsycINFO, CBM, CNKI, WANFANG database and VIP. We will include randomised controlled trials published in English or Chinese that examine the effects of cognitive prehabilitation programmes on geriatric patients undergoing elective surgery. To construct the search strategy, the Patient, Intervention, Comparison, Outcome, Study scheme will be used. Two reviewers will independently complete the study screening, selection, data extraction and quality rating. The Physiotherapy Evidence Database scale will be used to assess the methodological quality of the included studies. A narrative or quantitative synthesis will be conducted based on the final data. The planned start and end dates for the study were 1 September 2021 and 1 August 2023.

Ethics and dissemination Ethical approval will not be required for this protocol. The results of the final review will be disseminated via peer-reviewed journals and conference presentations.

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STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This is a Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA)-Protocol-compliant protocol for a systematic review, the final review will be conducted in line with the PRISMA statement and the guidance of the Cochrane Handbook for Systematic Reviews of Interventions.

⇒ The following key databases will be searched: MEDLINE, EMBASE, CINAHL, CENTRAL, PEDro, PsycINFO, CBM, CNKI, WANFANG database and VIP.

⇒ Two reviewers will independently complete the study screening, selection, data extraction and quality rating. Possible disagreement will be resolved by discussion or with consultation of a third author.

⇒ The age subgroup, baseline cognitive status, surgical specialty, type of surgery performed, method of cognitive prehabilitation delivery (home based, face to face) may lead to a large degree of heterogeneity.

⇒ The scarcity of randomised controlled trials may be the main limitation of the study.

INTRODUCTION

The population in the world is rapidly ageing. While the number of people aged 60 years or older was 1 billion in 2019, this number is expected to be 1.4 billion by 2030 and 2.1 billion by 2050.[1] The ageing of the population, as well as advances and improvements in surgery, and anaesthesia have greatly increased the demand for surgical services in this patient population, of which the rate has increased even faster than that of population ageing.[2 3] It is estimated that older adults have a high burden of surgical disease, nearly double that of younger counterparts.[4 5] Furthermore, more than half of the surgical procedures performed are provided to those over 65 years of age.[2 6]

Older surgical patients are at high risk for postoperative complications and functional decline.[3 7] Furthermore, surgical and anaesthesiological events representing the 'damaging hit' to the brain, may lead to cognitive decline through several perioperative factors, especially in older patients.[8] Neurocognitive disorders (NCDs) are now recognised as the most common complications experienced in the postoperative period

by older individuals.[9 10] It is well demonstrated that advanced age is the most significant and independent risk factor for postoperative cognitive disturbances after non-cardiac major surgery.[11 12] Previously, the nomenclature associated with postoperative cognitive impairments has been limited to postoperative delirium (POD) and postoperative cognitive dysfunction (POCD).[13] Until very recently, an overarching term perioperative neurocognitive disorders (PND) has been recommended for cognitive impairments identified in the perioperative period.[9 14] It was aligned with terminology of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, and adopted the root term 'NCD'.[15] The recommended umbrella term thus incorporates preoperative cognitive impairment, POD occurring in the hours to days after the procedure, as well as longer-lasting cognitive decline diagnosed up to 30 days (delayed neurocognitive recovery) and up to 12 months after surgery (postoperative neurocognitive disorder).[9 14] It has been reported that a significant percentage of older patients experienced POD or POCD. The incidence of POD is approximately 20%–45% among older surgical patients[16–18]; POCD is experienced by 5%–55% of older patients.[16 19] As outlined previously, these neurocognitive complications are linked with functional decline, longer length of stay (LOS) in hospital, overall reduced quality of life (QOL) and increased mortality.[20–22]

Multiple perioperative and postoperative interventions have been introduced to minimise the surgical stress response, including enhanced recovery after surgery (ERAS) or previous fast-track surgery (FTS) protocols, which can lead to a reduction in postoperative complications and shorter LOS.[23 24] The ERAS practices have largely focused on optimising surgery and anaesthesia techniques, in-hospital medication, care and nutritional support, while there's little focus on patient optimisation in the preoperative period.[25] One area of growing interest that is not currently included within ERAS protocols is the use of prehabilitation programmes. Prehabilitation is the process of improving the functional capability of a patient prior to surgery, thereby increasing adaptive capacity of the patient to withstand the surgical stress and reduce the risk of complications, especially in those with comorbidities and frailty.[26–28] There is diversity in forms and contents of prehabilitation programmes, either in multimodal or unimodal way, but all share the key goal of improving patients' functional, clinical and patient-oriented outcomes preoperatively and, ultimately, postoperatively.[29] Emerging evidence suggests a benefit of prehabilitation before surgery, and in November 2018, prehabilitation has been introduced in preoperative checklists of the Strong for Surgery programme, a quality initiative hosted by the American College of Surgeons.[30]

The majority of older adults are worried about their brain health, and are starting to ask what actions can be done to protect their cognitive function if they undergo surgery.[31 32] With the urgent need for more resources to improving perioperative brain health in older adults, the research literature is growing rapidly, and addressing this issue has become key actions for the multidisciplinary perioperative care teams.[32 33] Cognitive intervention programmes have been shown to be effective in improving cognitive function in older adults,[34 35] while their benefits within a prehabilitation programme prior to surgery are less clear. In recent years, there is growing interest in cognitive prehabilitation for improving perioperative brain health.[36] The aim of cognitive prehabilitation is to optimise brain functioning and augment cognitive reserve before surgery to mitigate POD/POCD, and this approach may contribute to perioperative brain functioning of geriatric patients.[37–39] However, some results were not as positive as expected.[40] Until now, there has been no systematic review targeting cognitive prehabilitation for geriatric patients. Therefore, we seek to perform a systematic review and meta-analysis specifically evaluating the impact of cognitive prehabilitation programmes prior to surgery on cognitive functional capacity and postoperative cognitive outcomes in geriatric patients undergoing elective surgery.

METHODS

Study registration

This protocol and was prepared using the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) Protocols.[41] The final systematic review will be conducted in line with the PRISMA statement,[42] and the guidance of the Cochrane Handbook for Systematic Reviews of Interventions.[43] The planned start and end dates for the study were 1 September 2021 and 1 August 2023: conception and design of the study (September 2021), preliminary literature accumulation (October 2021), registration (October 2021), completion of protocol (December 2021), the formal process of conducting this systematic review (July 2022), drafting and revising of the final review (August 2023).

Inclusion criteria

Studies will be included in final review if they meet the following inclusion criteria:

► Types of participants: older patients (≥60 years of age) who were scheduled to undergo elective operation, with no restriction on race and gender.
► Types of interventions and comparators: participants in the experimental group received prehabilitation programmes or preoperative cognitive interventions (cognitive stimulation, training and rehabilitation) aiming at improving cognitive function or status, and postoperative cognitive outcomes. Participants in the control group received standard or usual care, or no cognitive prehabilitation under the same treatment programmes.
► Types of outcome measures: the primary outcomes of interest included the incidences of POD and POCD; the secondary outcomes of interest included cognitive function measured by relevant cognitive testing
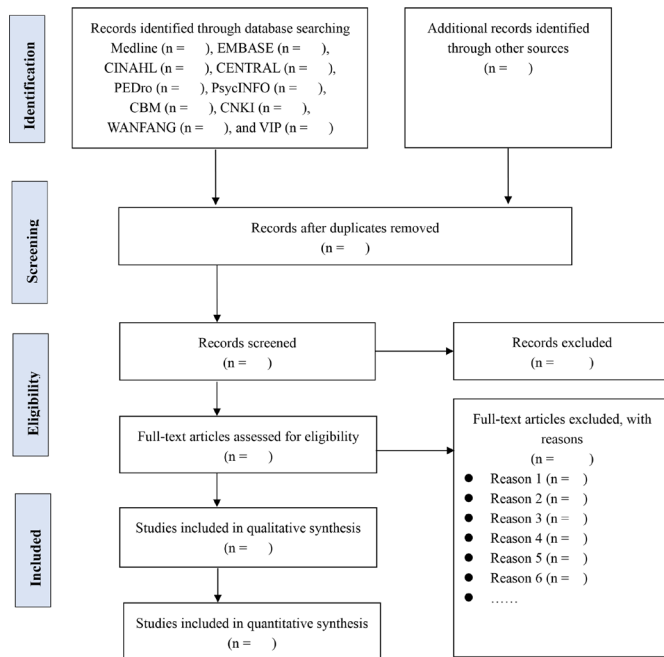
Figure 1 Flow chart of the study selection procedure.

battery or scales (eg, confusion assessment method, delirium rating scale-revised-1998, trail making test, digit span test, digit symbol substitution tests, stroop word colour test, mini mental state exam),[44] LOS, any postoperative complications (eg, overall rate of complications, scored by Clavien-Dindo grading system, and the comprehensive complication index), health-related QOL (measured by validated questionnaires), mortality, patient adherence and acceptability, and adverse events.

► Study design and language: randomised controlled trials (RCTs) reported in English or Chinese published as full-text manuscripts will be included. Studies will be excluded if they were protocols, review articles, editorials, case reports, conference proceedings/abstracts, dissertations, reported in books or lacking available data for analysis.

Search strategy
The following key electronic bibliographic databases will be searched systematically from inception to July 2022:
► MEDLINE.
► EMBASE.
► CINAHL.
► Cochrane Central Register of Controlled Trials (CENTRAL).
► Physiotherapy Evidence Database (PEDro).
► PsycINFO.
► Chinese Biomedical Literature Database (CBM).
► China National Knowledge Infrastructure (CNKI).
► WANFANG database.
► Chinese Scientific Journal Database (VIP).

To construct the search, the Patient, Intervention, Comparison, Outcome, Study scheme will be used, the search strategy will search for 'prehabilitation' AND 'PND/POD/POCD' AND 'RCTs'. For each of the 'intervention', 'outcome' and 'study design' concept, we will combine synonyms and MeSH terms with the 'OR' operator. The proposed search strategy for MEDLINE via Ovid can be found in online supplemental appendix 1. This strategy will be adapted for use in the other databases. In addition, we will handsearch the reference lists of all the included trials, relevant reviews and publications on the topic, to identify any potentially eligible studies.

Study selection
The specific bibliographic software Endnote (V.X9) will be used to store, organise and manage data. The retrieved publications will be imported into Endnote and any duplicates will be identified and removed. Two review authors (YH and NS) will independently screen the titles, abstracts and keywords of relevant studies for their eligibility according to the predefined criteria. After preliminary screening, the remaining studies will subsequently undergo a detailed full-text review, and the explicit reasons for exclusion of excluded studies will be recorded. Disagreements will be solved by discussion or consultation with a third author (AZ). The study selection procedure will be depicted in the PRISMA flow diagram (see figure 1).[41]

Data extraction and management
Data extraction will be accomplished by using a predesigned data extraction Excel form. The form shall contain the following information:
► General information: study title, journal, publication year, authors, country/region of study, aim of study, registration status, sources of funding, and possible conflicts of interest.
► Study characteristics: study design, method of randomisation, allocation concealment, baseline comparability of groups, method and object of blinding, completeness of outcome data.
► Participants: age, gender, education, diseases, sample size, baseline characteristics, surgical specialty, type of surgery performed, anaesthetic technique, depth and agents, whether the study was conducted under ERAS/FTS protocols or conventional perioperative care, comorbidities.
► Interventions: timing, type, frequency, intensity, duration, method of cognitive prehabilitation delivery, and content and components of prehabilitation programmes. Description of control group intervention.
► Outcomes: primary and secondary outcome measurements, time points reported (preoperative, postoperative), follow-up duration, adverse events.

The same two review authors (YH and NS) will independently extract the above data, and any disagreements will be solved by discussion or consultation with a third author (AZ).

Quality assessment

Two review authors (YH and NS) will independently evaluate the risk of bias of each included study using the Physiotherapy Evidence Database (PEDro) scale.[45] Possible disagreement will be resolved by discussion or with consultation of a third author (AZ). The PEDro scale is considered to be a valid and reliable measure of the methodological quality of RCTs in the field of physiotherapy.[45] This scale consists of 11 itemised criteria, and considering that the first item is not used to calculate the score, the scale has a possible range of 0–10, with higher scores suggesting higher quality. On this scale, the cut-off for high quality of methodology is a score ≥6 points.[45]

Data analysis and synthesis

The Cochrane Review Manager V.5 software will be used for meta-analysis. Each of the included study and outcome measure will be assessed for suitability for meta-analysis. In our study, a meta-analysis concerning the effect of cognitive prehabilitation programmes will be carried out if at least two studies used the homogeneous outcome measure.

For dichotomous data, the OR with 95% CIs will be computed, and for continuous data, the standardised mean differences with 95% CI will be computed. The χ^2 test and I^2 statistic will be used to quantify the heterogeneity across studies.[43 46] If p>0.1, and I^2 <50%, a fixed-effect model will be used for data combination; if p>0.1, and I^2 ≥50%, a random-effect model will be used for data combination, and obvious heterogeneity is considered between the studies; if p≤0.1, statistical significance is considered in this case, and a subgroup analysis or a narrative description of the findings will be performed.[43]

When sufficient data are available, planned and prespecified subgroups will be conducted based on age subgroup, baseline cognitive status, surgical specialty, type of surgery performed, method of cognitive prehabilitation delivery (home based, face to face), to explore factors that might be related to the strength of the effect. if data permitted, sensitivity analyses will be used to investigate the influence of each individual study on the overall meta-analysis summary estimate, in order to examine the robustness and reliability of the results.

If more than ten trials are included in a result of a meta-analysis, a funnel plot will be constructed to assess publication bias.

The overall quality of each summarised evidence will be assessed using the Grading of Recommendations Assessment, Development and Evaluation approach in five specified domains, and will be rated as high, moderate, low or very low according to the assessment.[47] Two review authors (YH and NS) will independently assess the quality of the evidence using GRADEpro software (https://gradepro.org), and possible discrepancies will be resolved through discussion or consultation with a third author (AZ).

Patient and public involvement

This protocol for a systematic review does not directly involve patients or the general public. The data will be collected from published articles retrieved from the main databases and manual searches.

Ethics and dissemination

Ethical approval will not be required for the performance of this protocol. Findings of this review will be disseminated in a peer-review journal.

DISCUSSION

This review will systematically and specifically evaluate the impact of cognitive prehabilitation prior to elective surgery on cognitive functional capacity and postoperative cognitive outcomes in older patients. This review will be relevant for geriatric patients undergoing elective surgery and their multidisciplinary perioperative care teams. Prehabilitation represents a shift away from the impairment driven, reactive model of management towards a proactive model that enables patients actively participating in their own care.[26] Particularly, it is possible that those at higher risk of poor outcomes, such as frail older patients, have been reported to may be the very patient population who stand to gain the most from prehabilitation.[48 49] This protocol adheres to the current status of the research in this field, and we hope that the final review will be helpful in providing a valuable reference for future evidence based and fundamental research to refine cognitive prehabilitation for geriatric patients before elective surgery.

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