

The effectiveness of prehabilitation for adults having elective surgery: a systematic review protocol

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Review question/objective

The objective of this review is to identify the effectiveness of prehabilitation on postoperative outcomes of adults undergoing elective surgery.

More specifically, the objective is to identify the impact of prehabilitation on postoperative complications and patient readmission, postoperative length of stay, postoperative rehabilitation required and postoperative health related quality of life (HRQOL).

Background

Prehabilitation is defined as a process of improving the functional capability of a patient prior to surgery so the patient can withstand any postoperative inactivity and associated decline,^{1,2} or, in other words, to get the patient to a better place before surgery.

An aging population

In 2011, the World Health Organization³ estimated that the number of people aged 65 years or over will increase from 524 million to 1.5 billion by 2050. The “baby boomers”, born between the years 1945 and 1965, started reaching 65 years in 2011 and are now impacting society, particularly in relation to health care resources.⁴ As people are living longer, the demand for elective surgery is increasing,⁵ resulting in longer waiting times that have the potential to cause further deterioration, deconditioning due to pain and immobilization for patients awaiting surgery. Determining the waiting time prior to surgery can be complex. The patient’s journey (Figure 1) for an elective surgical procedure in Australia usually involves the patient who has a debilitating and deteriorating condition being referred by their general practitioner (GP) and being put on the elective surgery waiting list at a given hospital.

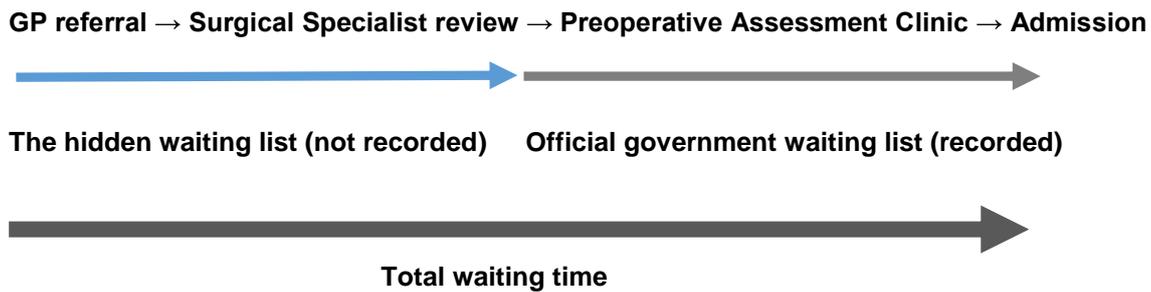


Figure 1: The patient pathway for elective surgery

The trajectory for a patient on an elective surgery waiting list can be lengthy, up to two years,^{6,7} and sometimes described as “a game of snakes and ladders”.⁸ Over time they progress up the waiting list and may hit a “snake” in the system that sets them back, or may reach a “ladder” that allows them to progress more rapidly.⁸ The time the patient is referred by the GP until the patient is seen by the surgical specialist “understates the real time people wait for surgery”, according to the Australian Medical Association, labelling this as “the hidden waiting list”.^{9(p9)} When the patient is assessed by a surgical specialist at the hospital for suitability and is then categorized by urgency for surgery,² the official waiting time commences⁵ and reporting of the wait time is then documented.⁶ As a result, the functional waiting time for the patient is usually much longer than that reported.

In due course, the patient selected for surgery would be contacted by the hospital and reviewed at the preoperative assessment clinic prior to the elective surgery admission, usually one month prior to surgery, unless it is delayed or cancelled due to the patient’s condition.¹⁰ Any significant delay to surgery may result in deterioration in health status whereby the patient may experience continual unrelenting pain, restricted movement and mobility, lengthening of suffering, loss of function including toileting and self-care, and uncertainty about the timing of their surgery, which may lead to an increase in dependence on others and possible relocation to a higher care facility or even mortality.^{8,11-14}

Although all efforts should be made to reduce waiting times for surgery, this period represents a timely opportunity for prehabilitation which may provide the support needed to better manage the patient.¹⁵ It should be noted that prehabilitation may increase the waiting time as comorbidities are addressed and education provided for the patient’s safety.¹⁶

Prehabilitation

Waiting for surgery is an inevitable consequence of today’s public health system. The prehabilitation model serves as an important approach to supporting the patient while waiting for surgery and to allow them to function to the best of their ability and capability, manage the pressure and challenges of the surgery, and undertake rehabilitation successfully so they can return to their own environment with better outcomes. These included less pain, improved function, more independence and better quality of life.¹⁷ Prehabilitation is defined as a strategy to support the patient to enhance their functional capacity and enable them to withstand the stresses of surgery and associated inactivity.^{1,17} Lemanu et al. also describes “the concept of prehabilitation as challenging to the traditional models of recovery by initiating the recovery process preoperatively”.^{17p711}

The concept of prehabilitation has a reasonably long history and is not always related to preparation for surgery. During World War II, many military conscripts were being rejected on medical grounds. The first

recorded paper on prehabilitation was published in 1942 espousing the notion that a military conscript would be medically screened and treated in respect to their health and comorbidities, resulting in a higher number of acceptances.¹⁸ Prehabilitation has also been used in sport involving preparatory exercises and intensive training resulting in reduced injuries.^{1,14}

In the surgical context, prehabilitation was seen as a method that would prepare patients for the predicted stressors and inactivity using physical exercise to improve their functional capacity.¹ The patient's ability to function to their normal physical capacity can deteriorate because of inactivity, and even though the surgery may have been successful, the patient can still decondition.¹⁹ Deconditioning is defined as: "the multiple changes in organ system physiology".^{19(p735)} This can result in a change in the ability to perform activities of daily living (ADLs) such as transferring, ambulating, toileting, washing and dressing, increased hospital stay due to postoperative complications and morbidity, and compromised quality of life.¹⁴

Killewich states that "it is responsible to ensure that patients are provided with the best quality of care and the greatest opportunities to return to their pre-operative functional status and quality of life",^{19(p743)} and good holistic and timely preparation for the patient undertaking elective surgery set them up for the best possible outcome. Those patients eligible for the surgery following the specialist assessment and involved in a prehabilitation program "must have their individual goals and objectives set, which are significant, measurable and attainable".^{1(p48)} Not all patients are suitable candidates for prehabilitation, especially those with major trauma, an acute catastrophic medical condition¹ and frailty whereby the patient may be in a state of increased vulnerability to stressors prior to surgery.²⁰

Prehabilitation in the form of therapeutic exercise is a method of increasing physical activity to improve physical fitness. This action is to counteract any physical decline before and after surgery, and to improve the patient's capacity to carry out daily functional tasks.^{14,21} While there is no single set of clearly defined protocols found in literature, a generic program would include warm-up exercises and aerobics up to two to three times per week, strengthening exercises two days per week, and flexibility exercises and functional task training two to three times per week.^{1,14} Physical functional performance can be measured using validated tools such as, the Timed Up and Go Test, the Six-Minute Walk Test, the Barthel Index or the Katz ADL.¹⁴

Prehabilitation can be much broader than focusing on physical conditioning as it can also encompass other interventions such as nutritional counselling, protein supplement and anxiety reduction.²² Functional capacity is not only measured by physical capacity related to cardiorespiratory function, but also the patient's ability to perform daily tasks while dealing psychologically with the present condition by attempting to remain in control of their life despite the fact they may potentially be enduring pain and body deterioration waiting for surgery.¹⁷ Therefore the goal of prehabilitation is to assess and support the patient physically, psychologically and socially,²³ and to allow them to accept responsibility and assume appropriate self-care,²⁴ even well before their surgery. Other interventions may include physical assessment and activities of daily living (ADLs), and provision of education on self-care (nutrition, smoking, weight loss, medications and self-exercise program).^{7,15,22,25,26} Supporting the patient while at home by having an occupational therapist, physiotherapist and/or social worker complete a home assessment for aids (walking frames, wheelchair and self-help poles), equipment (rails and ramps) and services (counselling, meals on wheels, taxi vouchers and legal documentation) may assist in maintaining their independence and lessen any risk.²⁷⁻³⁰ Health staff can familiarize the patient with the hospital facility and surgical pathway, help them understand the concept of rehabilitation and encourage them to remain positive.^{7,31}

A paper reviewing the effect of prehabilitation to improve patients with severe disability from hip or knee osteoarthritis reported on patients having benefited from the program which included exercise and education prior to their surgery.¹⁵

An evidence-based review which considered patients with major joint surgery concluded that:

“... clinical pathways and protocols with multimodal interventions (pre-operative education and nutrition, pre-emptive analgesia, neuromuscular electrical stimulation, pulsed electromagnetic fields, peri-operative rehabilitation, modern wound dressings, standard surgical techniques, minimally invasive surgery, and fast-track arthroplasty units) could lead to better functional outcomes and reduced overall cost associated with hip and knee arthroplasty.”^{32(p7)}

There were a number of systematic reviews that address some aspects of prehabilitation with varying conclusions.^{14,17,33,34} Santa Mina et al.³³ conducted a systematic review and meta-analysis on the effects of preoperative physical conditioning, including an exercise program and addressing the psychological impact on patients 18 years or older undergoing curative or palliative surgery and concluded that prehabilitation may reduce length of stay and provide physical benefits postoperatively. Barbay³⁴ conducted a systematic review on preoperative exercises for patients undergoing total knee or hip arthroplasty. The results were inconclusive due to the lack of strong research evidence although they stated that preoperative exercises had some postoperative benefit. Lemanu et al.¹⁷ conducted a systematic review on the effect of preoperative exercise on the cardiorespiratory function for patients undertaking major surgery. They concluded that there were only limited data to suggest that any physiological enhancement had associated clinical benefits.¹⁷ Cabilan, Hines and Munday, who had recently undertaken a systematic review on preoperative exercise interventions for patients 18 years or older undergoing surgery, concluded that:

“...postoperative outcomes cannot be achieved within a short period of time, and without maintaining the level of fitness. Osteoarthritis patients undertaking prehab did not benefit in function, quality of life (QOL) or pain, however it may reduce admission to acute rehabilitation.”^{14(p167)}

The systematic reviews and papers discussed above all involved patients undergoing physical exercise to improve physical function and capacity prior to their elective surgery.^{1,14,15,17, 32-35} Some reviews restricted their scope to orthopaedic surgery,^{1,15,32,35} another involved joint replacement, and cardiac and abdominal surgery,³⁶ while another focused on the patient's frailty prior to surgery.²⁰

In a more recent systematic review released in February 2015, only psychological prehabilitation was used prior to cancer surgery³⁷ where many of the papers that were reviewed undertook the intervention days and sometimes several weeks prior to the surgery.

From the evidence reviewed, a prehabilitation model is seen as a timely, holistic approach to preparing and supporting the patient for surgery.²⁴ Therefore the proposed systematic review will search for any evidence in regard to prehabilitation programs having multimodal interventions, i.e. greater than one intervention, which would reduce any duplication of previous reviews.^{22,32} The review period may include the initial GP referral up until one month prior to surgery, eliminating any crossover between the preoperative assessment clinic interventions and other short term programs that may be identified as a prehabilitation program. Physical exercise would be included in the review provided that there is at least one other intervention. Unlike all previous systematic reviews, day surgery will be included in the study as examples of orthopaedic arthroplasty are now performed as day or outpatient surgery.^{38,39}

Interventions may include: an initial contact with the patient while at home gathering relevant information, maintaining communication throughout the waiting period, undertaking a holistic assessment, identifying and referring any comorbidity that may impact on the surgery, and providing education to improve their physical condition.⁷ The patient may also be referred to a program that improves their physical capacity.^{15,17}

The effectiveness of a prehabilitation program will be measured in relation to decreased postoperative complications, length of stay, patient readmission, rehabilitation required, increased functional capacity and improved HRQOL in order to return back to their environment or respite/facility. Determining the effectiveness of prehabilitation for adults having elective surgery is the main aim of the systematic review.

Keywords

Prehabilitation; preoperative care; preoperative care/methods; preoperative care/rehabilitation

Inclusion criteria

Types of participants

This review will include studies on adult patients, aged 18 years or over, who are undertaking elective surgery in hospitals, including day surgery.

Types of interventions

This review will include any prehabilitation programs and strategies that support early intervention. These include interventions such as early physical assessment, nutritional counselling, protein supplementation, weight loss initiatives, patient education, psychosocial support, self-instructed physical program and/or professional intervention for improved physical function, including physiotherapy and comorbidity resolve. These intervention strategies will be compared with the “usual care” patients receive prior to surgery. Only studies with multimodal prehabilitation interventions would be selected.

Studies that include interventions initiated within one month prior to surgery will be excluded. This is to distinguish between prehabilitation interventions and short term interventions such as preoperative assessment clinics. Interventions addressing exercise therapy as the only component will not be included as this has been covered in previous reviews.

Types of outcomes

This review will explore the following postoperative outcomes:

Primary outcomes: postoperative complications and patient readmission, length of stay, length of rehabilitation required and HRQOL.

Secondary outcomes: delay in surgery, admission into respite or residential care.

Health Related Quality of Life outcomes will be measured using the MOS (Medical Outcomes Study) 36-Item Short-Form Health Survey (SF-36).⁴⁰

Types of studies

This review will consider experimental and epidemiological study designs including randomized controlled trials, non-randomized controlled trials, quasi-experimental studies, before and after studies, prospective and retrospective cohort studies, case control studies and analytical cross sectional studies for inclusion. As studies are likely to vary considerably both in terms of populations, interventions and outcomes, the review

will also consider descriptive epidemiological study designs including case series, individual case reports and descriptive cross sectional studies where higher level studies are not identified for those criteria.

Search strategy

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized in this review. An initial limited search of MEDLINE and CINAHL will be undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies.

Studies published in English will be considered for inclusion in this review due to the lack of resources for translation services. There will be no date exclusion.

The databases to be searched include: PUBMED, CINAHL, EMBASE, Scopus, Cochrane Central Register of Controlled Trials (CENTRAL), PEDro and OTseeker.

The search for unpublished studies will include: Mednar and OpenGrey.

Initial search terms to be used will be:

prehabilitation, pre-habilitation, prehab*, preoperative care*, preoperative care/methods*, preoperative care/rehabilitation*, preoperative rehabilitation, pre-surg*, presurgical, preoperative training, prehabilitation clinic and prehabilitation nurse.

Assessment of methodological quality

Quantitative papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

Data extraction

Quantitative data will be extracted from papers included in the review using the standardized data extraction tool from JBI-MASARI (Appendix II). The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Primary authors would be contacted to seek their assistance in providing the raw data for missing outcomes.

Data synthesis

Quantitative papers will, where possible, be pooled in statistical meta-analysis using JBI-MASARI. All results will be subject to double data entry. Effect sizes expressed as odds ratio (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. Heterogeneity will be assessed statistically using the standard Chi-square and also explored using subgroup analyses based on the different quantitative study designs included in this review. Where statistical pooling is not possible, the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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Appendix I: Appraisal instruments

MAStARI appraisal instrument

JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Was the assignment to treatment groups truly random?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were participants blinded to treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Was allocation to treatment groups concealed from the allocator?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were those assessing outcomes blind to the treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were the control and treatment groups comparable at entry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were groups treated identically other than for the named interventions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in the same way for all groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

JBI Critical Appraisal Checklist for Descriptive / Case Series

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Was study based on a random or pseudo-random sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the criteria for inclusion in the sample clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Were confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. If comparisons are being made, was there sufficient descriptions of the groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info

Comments (Including reason for exclusion)

JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

Appendix II: Data extraction instruments

MAStARI data extraction instrument

**JBI Data Extraction Form for
Experimental / Observational Studies**

Reviewer Date

Author Year

Journal Record Number

Study Method

RCT Quasi-RCT Longitudinal
 Retrospective Observational Other

Participants

Setting _____

Population _____

Sample size

Group A _____ Group B _____

Interventions

Intervention A _____

Intervention B _____

Authors Conclusions:

Reviewers Conclusions:

Study results

Dichotomous data

Outcome	Intervention () number / total number	Intervention () number / total number

Continuous data

Outcome	Intervention () number / total number	Intervention () number / total number