

Prehabilitation:

Key principles for preparing patients for surgery

September 2022

Surgical Services Taskforce

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aci.health.nsw.gov.au

AGENCY FOR CLINICAL INNOVATION

1 Reserve Road St Leonards NSW 2065

Locked Bag 2030, St Leonards NSW 1590

T +61 2 9464 4666

E aci-info@nsw.health.gov.au | aci.health.nsw.gov.au

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Key principles for improving patient condition before surgery

Prehabilitation is a process that aims to enhance a patient's physical and psychological function to support them before, during and after surgery.

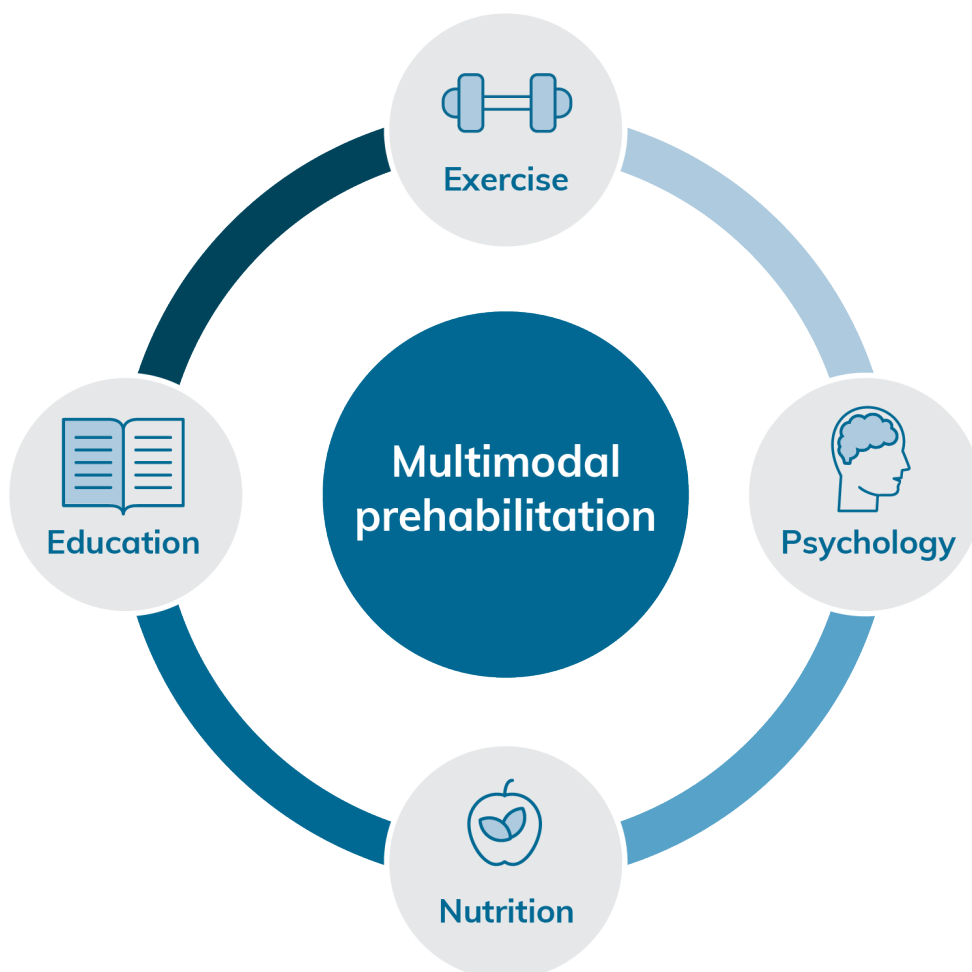
Prehabilitation before major surgery can lead to:

- a faster recovery
- better patient experiences and outcomes
- and savings for the healthcare system.¹

Prehabilitation enables people waiting for elective surgery to prepare for surgery by promoting healthy behaviours by prescribing of exercise, nutrition, education and psychological interventions.^{2, 3} (See Figure 1.)

Best practice for surgical prehabilitation focuses on the physical and mental aspects of surgery by decreasing pre-surgical risk factors and optimising the patient's functional capacity.⁴ It also addresses the patient's welfare via interventions designed to improve health and wellbeing.

Figure 1: Elements of multimodal prehabilitation



Prehabilitation is part of a continuum of care that starts from referral for surgery through recovery, rehabilitation, discharge and beyond. Prehabilitation encourages long-term healthy lifestyle behaviours. It aims to empower patients as active participants in their care, maximising resilience to undergo surgery and improving health outcomes in the long term.

There are five key principles that underpin the provision of prehabilitation for patients waiting for elective surgery in NSW. They broadly state that prehabilitation programs should:

1. Meet the needs of the local community.
2. Include interventions that are informed by evidence in literature.
3. Establish referral pathways and assessment mechanisms.
4. Embed patient engagement and preoperative education to ensure patients are partners in their care.
5. Support prehabilitation program sustainability.

Prehabilitation is a valuable program that supports patient-centred care. However, it is important to acknowledge that not all clinical sites will have ready, or frequent, access to a dedicated multidisciplinary team that can undertake the program. This document has been developed based on:

- current evidence in literature
- the experiences of three NSW hospitals that have implemented surgical prehabilitation programs
- the outcomes for patients in these programs.

Each site's prehabilitation program has been influenced by local resourcing and staffing. Local data collection and audits are encouraged to monitor outcomes and identify program development opportunities. They also help to determine whether innovative

options (such as linking prehabilitation to rehabilitation services and physiotherapist-led prehabilitation) can improve outcomes, while managing local resources.

1. Meet the needs of the local community

Design of a prehabilitation program to support patients undergoing surgery should be based on the needs of the local community.

Prehabilitation can be delivered in many forms, including:

- nutritional supplements
- dietary education
- weight reduction strategies
- strength and endurance training
- optimising comorbid conditions, such as diabetes, respiratory function, cardiac disease and anaemia
- optimising functional abilities
- reducing health limiting behaviours, such as smoking, drug use and excess alcohol consumption.

Identifying the range of interventions available within a prehabilitation program allows the program to be adaptive and responsive to individual patient needs. Some interventions are best suited to patients who have more time available to participate in the program before surgery, for example to modify health behaviours. Other interventions can be achieved in a shorter period of time, such as nutritional supplementation, and are suitable for patients who have a more time-sensitive surgical intervention.⁵

To meet local community needs, a prehabilitation program requires:

- support from the hospital executive team, including appropriate resourcing and governance
- team members who are passionate advocates for prehabilitation and surgical patient outcomes
- leveraged experience, care pathways and advice from existing programs and services where possible
- patients who have potential for benefits to be realised
- patient-centred care through proactive patient engagement and collaborative decision making between clinicians and patients
- comprehensive patient selection criteria (inclusion and exclusion) to ensure suitable patients are identified
- flexibility to accommodate time-sensitive surgeries⁶
- a variety of delivery modes, including virtual participation, to meet the needs of patients who are geographically or socially isolated.⁶

2. Include interventions that are informed by evidence in literature

Exercise program

Face-to-face exercise programs to improve cardiovascular health, strength and respiratory function may be implemented within the hospital setting, ambulatory care and community settings. Or the program can be delivered through partnerships with external providers, such as private gyms or physiotherapy services.

Alternative program delivery models, such as virtual gym classes or app-based programs,

can also be considered to allow patients to complete self-directed programs at their own pace.⁷

Baseline, post-program and post-operative measures can be monitored in person by prehabilitation team members, or self-reported using tools, such as **Duke Activity Status Index**. Assessment of physical function can be undertaken in a virtual environment, such as stepping tests and pedometer daily step counts. Or patients can use clinically-led functional assessment tools such as the 6-minute Walk Test, shuttle tests, or cardiopulmonary exercise tests.⁸ (See Resource 1: Sample exercise monitoring tool.)

There is a range of options for exercise programs that can be implemented based on the patient's baseline physical health, goals of care and types of surgeries being prioritised by the local prehabilitation program. The 30 second sit-to-stand test can be used for testing leg strength and endurance in older adults as it is easy to undertake in the clinical setting and indicative of functional mobility and frailty and correlated with aerobic fitness. Falls prevention may also be considered as a focus for some exercise programs depending on the patient group.

Education material

Understanding what to expect from their surgical journey empowers patients to become active participants in their health and make informed decisions in collaboration with their care team. Information should be provided as early as possible and cover:

- what happens at admission
- how long they will stay in hospital
- what happens after discharge
- expectations of side effects

- recovery after surgery
- the opportunities to participate in prehabilitation activities.

Patients report satisfaction in being able to use the time before surgery to prepare, and having an improved understanding of what to expect on admission and discharge.⁹ Post-discharge support and planning can be used to support the patient's activities of daily living (ADL) function and ongoing recovery. Discharge education can be initiated during prehabilitation programs to support recovery.

Education materials should be designed in partnership with patients and carers. The materials need to consider health literacy and the needs of culturally and linguistically diverse populations. They can draw on the experiences of patients and carers to meet the information needs of future participants. Resources may be provided as:

- information sheets
- audio recordings or videos
- face-to-face information sessions
- pre-recorded information sessions.

Nutritional support

Malnutrition and sarcopenia are key preoperative risk factors, particularly in the elderly and frail.⁹ All patients need a nutritional screen before surgery using the recommended malnutrition screening tool, malnutrition universal screening tool or preoperative nutrition score.

A nutrition assessment may then follow using the subjective global assessment or patient generated subjective global assessment.

If a patient is identified at risk of malnutrition, nutritional supplementation, such as oral nutritional support and food fortification, can be implemented within a short time frame. This makes it suitable for urgent elective

cases where procedures are indicated within 30 days. Oral nutritional support is recommended for a minimum of seven days before major surgery for patients at risk of malnutrition. It can be provided in conjunction with patient education to:

- optimise nutritional status
- correct preoperative malnutrition
- support exercise training and body composition modulation.

Nutritional support protocols should be developed collaboratively and agreed by dietitians and surgical, anaesthetic and perioperative clinicians. The protocols need to support improved patient outcomes while continuing to meet preoperative preparation requirements, such as fasting and fluid restriction.¹⁰

Psychological support

While many prehabilitation programs focus on optimising a patient's physical condition before surgery, there is increasing recognition of the impact of psychological health on outcomes.

Assisting patients to manage preoperative anxiety, depression and self-efficacy is associated with improved post-operative quality of life, particularly for patients with cancer.^{3, 11}

Building on more general education elements of a prehabilitation program, support specific to psychological health may include:

- screening patients to assess their risk of psychological morbidity in the perioperative period, in particular risk of delirium or exacerbation of cognitive impairment
- psychologically informed interventions to address patient pain beliefs, attitudes, emotions and engagement with supporting

health behaviours, such as post-operative rehabilitation

- relaxation techniques, such as guided imagery, breathing exercises and affirmations
- strategies to meet functional needs that help reduce anxiety, such as stress management and coping techniques
- strategies to identify warning signs of low mood, anxiety and post-operative adjustment
- therapeutic intervention for clinical management of depression or anxiety.

For all models of prehabilitation support, novel interventions where there is no evidence available should be established within a research framework to provide appropriate governance in linking theory to clinical practice.

Evidence in literature and practice identifies several assessment tools to monitor participant functional, psychological and nutritional status. To fully realise the potential and measure benefits of a prehabilitation program, these assessment tools – and the timeframes in which they are administered – should be standardised to create consistency across different services and to evaluate broad program outcomes. While such standardisation is not in place, there is an opportunity to develop a statewide prehabilitation model with standardised elements of patient assessment and program evaluation to contribute to this evidence base.

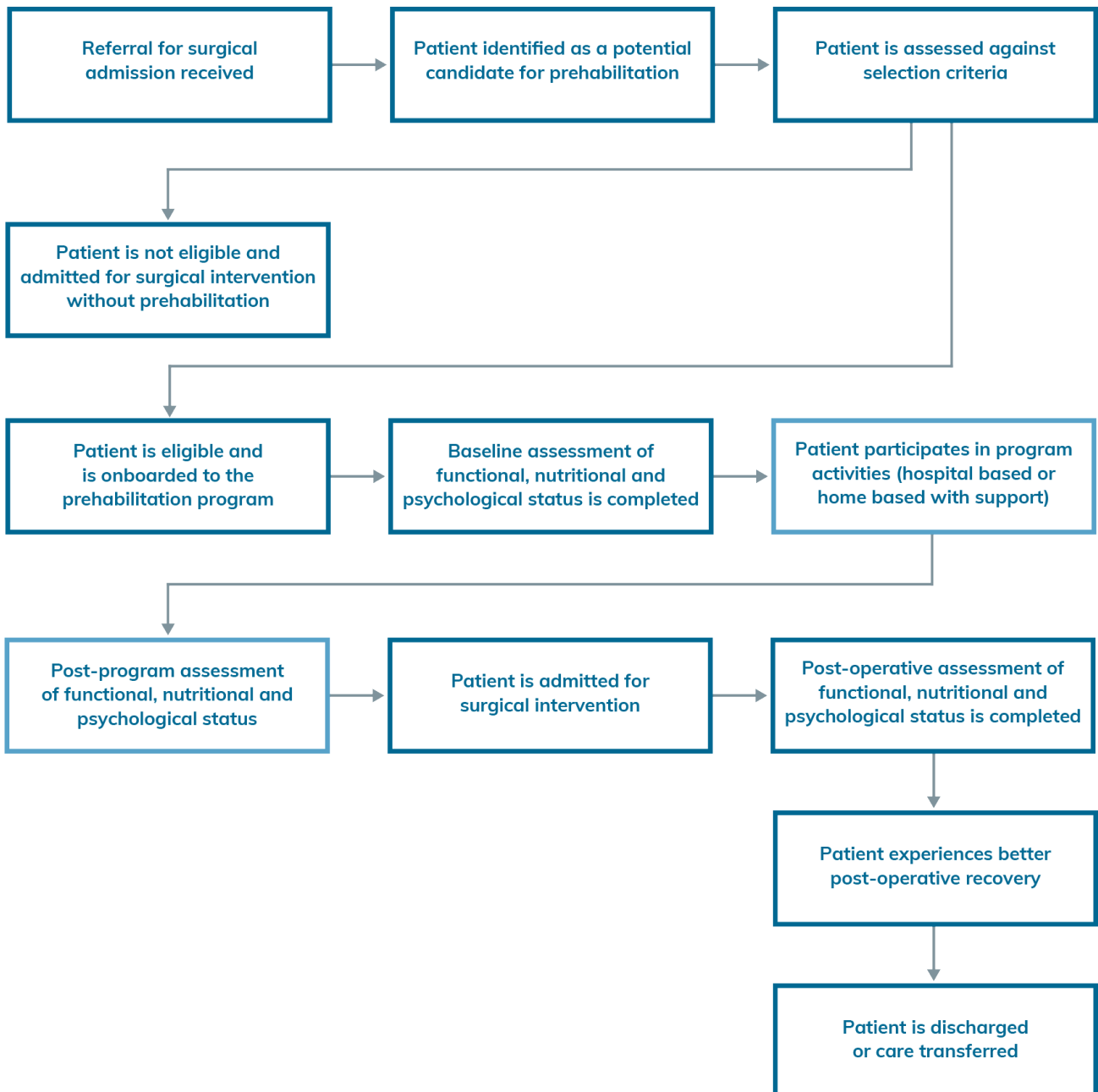
3. Establish referral pathways and assessment mechanisms

Communication is a cornerstone of prehabilitation programs, with coordination between allied health, surgical, anaesthetic and medical teams crucial to effective program function.

It is recommended that services implementing prehabilitation programs:

- define and share patient eligibility criteria (see Resource 2: Examples of patient selection criteria)
- define patient screening tools and suitable preoperative pathways, for example, high risk clinics
- identify links with existing services, such as outpatient clinics, collaborative care teams and rehabilitation services
- create mechanisms for clinicians to refer patients to the program
- embed the prehabilitation program into the surgical care journey and hospital surgical service model. (See Figure 2).

Figure 2: Example of a high-level service model



Integration of referral pathways into electronic clinical information systems, where feasible, should occur to create an easily accessible and streamlined process.

Similarly, patient screening tools, assessment protocols and equipment should be agreed and made available to all relevant prehabilitation team members. This will support consistency in program delivery and timely assessment of patients commencing the program.

Where a patient is ineligible, unwilling, or unable to participate, communication pathways back to referring clinicians should be in place. Comprehensive assessment mechanisms and appropriate referral pathways should include:

- communication of the pathways
- patient selection criteria built into referral pathways to streamline patient identification
- processes to link high-risk patients to other services where relevant
- consistent use of validated screening tools (or included as part of preoperative assessment)
- use of validated, consistent physical, psychological and nutritional assessment tools at defined points in the patient journey. These should be pre-program, post-program and post-operatively at a minimum
- clear processes to identify appropriate, tailored interventions for individual patients
- consultation mechanisms to incorporate allied health expertise where appropriate, including physiotherapists, speech pathologists occupational therapists, exercise physiologists, dietitians, social workers and psychologists.

4. Embed patient engagement and preoperative education to ensure patients are partners in their care

Prehabilitation programs are founded on the principle that patients are active participants in their health and their care journey.

To support this, program on-boarding mechanisms should be approached in a shared decision-making way. They should include methods to share prehabilitation expectations with patients and how they can make contributions to their recovery.

Proactive engagement of patients in the program and a shared understanding of prehabilitation drives participation and retention rates. A patient's prehabilitation needs should be evaluated at the time the patient is referred for surgery and regularly throughout the prehabilitation process to support shared decision making.

Shared decision making involves discussion and collaboration between a patient and their healthcare provider. It is about bringing together the patient's values, goals and preferences with the best available evidence about benefits, risks and uncertainties of treatment, to reach the most appropriate healthcare decisions for that person.

Setting care goals and building a collaborative care plan can create a shared decision-making process with the patient. Clinicians should consider the patient's individual needs and preferences, taking into consideration the medical health, physical functioning, comorbidity, psychological and social needs of the person. They can develop shared decision-making when they are providing patients with information and empowering them to be partners in their own care.

Support of a patient- and family-centred approach should be developed through encouraging family and carers to accompany patients during prehabilitation. Connection with Aboriginal health liaison officers should occur when appropriate.

5. Support prehabilitation program sustainability

To ensure the sustainability of a prehabilitation program, governance, clinical leadership, resourcing and monitoring must be given appropriate consideration.

Beyond definition of the prehabilitation program model, such as the planned interventions and patient cohorts, a detailed implementation plan is recommended to support the change in practice.

This should outline:

- key stakeholders
- roles and responsibilities
- communication plan
- financial and physical resourcing
- governance model
- monitoring metrics
- an evaluation plan.

Early attention to these elements assists in:

- generating local sponsorship for the program
- managing the change during implementation
- transitioning prehabilitation projects to business-as-usual care for preoperative surgical patients. (More information on governance is outlined in the Enablers section.)

Monitoring and evaluation should be embedded into your program. Results will drive program sustainability and commitment to ongoing resources for prehabilitation programs. Patient-reported measures are recommended for prehabilitation programs to support a strong evidence base.

Creating a prehabilitation team

Multidisciplinary teams are essential to delivering a comprehensive prehabilitation program. The members of the will depend on the program model and intervention types.

When designing and implementing a program, roles and function should be considered in the context of local need and resources. (See Resource 3: Example of a prehabilitation team).

Engagement with primary care

Patients often have complex medical conditions or participate in unhealthy behaviours that require assistance from primary health networks (PHNs) before and after surgery. In particular, general practitioners (GPs) can provide valuable support.

It is important to engage and communicate effectively with PHNs and GPs to understand how they can work alongside prehabilitation to optimise patient outcomes.

Benefits of PHN and GP engagement include:

- reduced variation in quality of care
- reduced duplication in delivery of care
- improved understanding of the services available in primary care and surgical services
- increased productivity because of focused care
- reduced inconsistency in care

- reduced confusion for patients and staff
- improved utilisation of available skills
- enhanced ability to share learning and skills.¹²

Other services that may contribute to patient optimisation outside of prehabilitation itself include rehabilitation, and alcohol and other drug services.

Additionally, rehabilitation medicine clinicians, oncologists, occupational therapists, pharmacists, speech pathologists, mental health practitioners and pain specialists can offer their expertise to patients before, as well as after, surgery.

Enablers for implementation

Governance and clinical oversight

Clinical leadership is an essential requirement for implementing a new program. It is best to have a prehabilitation team that meets regularly to manage the program. Clinical and executive leadership is integral to ensure programs are comprehensive and sustainable. Also identify local champions to promote the program and changes to business as usual.

Implementation should be guided by an agreed project plan that is appropriately resourced. A communication plan should accompany the project. Local steering committees and working groups should also be established to support the team to design and implement a locally relevant prehabilitation program.

It is essential to identify all relevant stakeholders who may be affected by the introduction of a prehabilitation program. This includes clinical and non-clinical staff, patients and executive leadership.

Steering committees or working groups should include surgical, anaesthetic, allied health and nursing clinicians. Developing and agreeing on clinical pathways will assist with generating consensus regarding design and management of a prehabilitation program.

Resourcing

A new program has the potential to effect resourcing. It is important that expectations are set regarding what can be achieved using available resources.

For example:

- Are there opportunities to partner with primary care providers, Aboriginal medical services and existing community programs or incorporate prehabilitation protocols into HealthPathways?
- Can links with rehabilitation medicine services be established to build on existing infrastructure and referral pathways to create a more seamless patient journey?
- Is it feasible to recruit a prehabilitation program coordinator using existing resources?
- Will the responsibility be incorporated into an existing role?
- Can elements of the program be delivered under supervision by students undertaking clinical placements or junior medical staff?
- Is there sufficient space and equipment readily available? Is there a hospital gym or can this be outsourced? Are there consultation or education rooms nearby?
- How will patient information be delivered, in hard form and via electronic media?
- Can the existing information technology infrastructure support virtual capability of delivery?
- Can the home environment, or adaptive strategies to support activities of daily living management, be arranged for program delivery?

Consideration needs to be given to the impact the program will have on physiotherapy and other allied health and medical or nursing services to support preoperative patient optimisation.

This may also include physical resources such as the:

- capacity of the hospital gym

- availability of exercise equipment
- availability of loan assistive equipment, personal care and mobility aids
- availability of consultation rooms, clinic space and education spaces.

Other resources may include supply of nutritional supplements, printing prehabilitation pathways and patient education resources.

It may be feasible to link resources associated with an Enhanced Recovery After Surgery (ERAS) model of care, should the facility have this in place.

ERAS use strategies to optimise the patient's condition for surgery and recovery to achieve an earlier discharge from hospital for the patient and a more rapid resumption of normal activities after surgery.¹³ ERAS and prehabilitation share many common features in the preoperative, intraoperative and post-operative phases.

Commitment to gathering and evaluating data

Collection and auditing of data is an important element in implementing a prehabilitation program.

It is also important to monitor compliance with program design and communication pathways. Measuring program performance and evaluation can be achieved by collecting specific data.

Monitoring metrics

A suite of data points may be collected and reviewed to monitor and evaluate a prehabilitation program. (See Table 1.)

Table 1: Examples of monitoring metrics

Type of measure	Measure	Specific metres
Process	Access to prehabilitation	Total eligible patients and total program referrals received
Process	Uptake of prehabilitation	Proportion of eligible patients enrolling in prehabilitation
Outcome	Completion of prehabilitation	Proportion of enrolled patients completing prehabilitation
Outcome	Functional, nutritional, and psychological change	Difference between baseline assessment and post-program assessment (for patients completing the program), can be followed up post-discharge at regular intervals, e.g. six weeks, 12 weeks
Outcome	Discharge destination	Planned discharge destination versus actual destination (program participant cohort and usual care cohort)
Outcome	Hospital length of stay	Acute episode of care length of stay for surgical intervention (program participants compared with usual care cohort)
Outcome	Unplanned return to operating room	Return to operating room for surgical intervention (program participants compared with usual care cohort)
Outcome	Unplanned intensive care admission	Proportion of patients admitted to intensive care without advanced notice for invasive monitoring and stabilisation (program participants compared with usual care cohort)
Outcome	Unplanned hospital readmission	Presentation to emergency room within 28 days of discharge following surgical intervention (program participants compared with usual care cohort)
Impact	Patient readiness for surgery	Patient-reported readiness for surgery (pre- and post-program comparison)
Impact	Patient satisfaction	Trend analysis of patient-reported experience measures using a validated measurement tool (program participant cohort and usual care cohort)

A prospective data analysis may assist in supporting a business case for developing a prehabilitation program. Consider how and when data points will be collected and who will be responsible.

It is recommended that data should be collected at baseline, post-prehabilitation program and post-operatively to illustrate outcomes of the program and post-surgery outcomes. Data collection may include:

- physical assessment
- psychological assessment
- nutritional outcomes
- post-operative outcomes including complications
- length of hospital stay
- quality of life
- patient experience
- cost.

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- Nepean Hospital.

Appendix: Toolkit of resources to assist with prehabilitation delivery

Resource 1: Sample exercise monitoring tool

This sample exercise record for high intensity interval training using a stationary exercise bike is provided courtesy of John Hunter Hospital.

Target intensity: breathlessness 4-5 and/or 12-16

Class		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Pre-exercise	Date																
	SpO ₂																
	Pulse rate																
	Breathlessness																
Bike high intensity interval training	Watts (high intensity interval)																
	Watts (moderate intensity interval)																
	Breathlessness																
	Effort (rated perceived exertion)																
	Leg fatigue																
	SpO ₂																
	Pulse rate																

Initial prescription

Five-minute warm up.

High intensity interval: two-minute intervals at 50% of the difference in work rate between peak and activity target.

Moderate intensity interval: three-minute intervals at 80% of work rate where activity target was achieved.

Start with four intervals of each in the first week and then increase to six intervals from week two.

Progression

Maintain the structure and timing of the intervals. Increase the workload.

If peak heart rate drops by 5-10 bpm and/or rating of perceived exertion drops below 15 during the high intensity component, first increase high intensity intervals watts by increments of 5% W_{max} (rounded up to nearest five watts).

The next increase will be the moderate intensity component by the same 5% W_{max}. Then alternate increases in this way. Maintain six intervals of each throughout program.

Symptoms are recording at the end of the final high intensity interval.

Resource 2: Examples of patient selection criteria

Existing prehabilitation programs in NSW public hospitals identify the following patient selection criteria for eligibility into their local program. These are intended to provide examples only and do not preclude other services from identifying alternative patient cohorts within their local service who may benefit from participating in prehabilitation.

Cohort	Patient inclusion criteria	Exclusion criteria
Planned major surgery, including: <ul style="list-style-type: none"> laparoscopic colorectal resection upper abdominal, or large incisional hernia repairs - cystectomy major gynaecology surgery - oesophagectomy pelvic exenteration major head and neck surgery 	<ul style="list-style-type: none"> Aged at least 18 years of age Medical clearance to undertake exercise Willingness to participate in program elements and follow up Undergoing considerable risk surgery (e.g. major, intra-cavity surgery, usually open and will have a risk of mortality or major morbidity that is at least 3%) Considered to be lower risk and undergoing neoadjuvant chemotherapy 	<ul style="list-style-type: none"> Unable to give informed consent or follow instructions due to cognitive difficulties Conditions preventing exercise training Undergoing minimal risk surgery
Planned thoracic, major upper abdominal surgery	<ul style="list-style-type: none"> Patient is agreeable and consents to the intervention and any follow up Aged at least 18 years Medical clearance to undertake exercise Waiting for thoracic, major upper gastrointestinal or open colorectal surgery Aged at least 70 years and waiting for a laparoscopic colorectal resection, laparoscopic cholecystectomy or large incisional hernia repairs 	<ul style="list-style-type: none"> Emergency surgery Current hospital inpatients Day surgery or procedures pending clinical judgement Unable to give informed consent or follow instructions due to cognitive difficulties Conditions preventing exercise training
Planned surgery for stage I-III colorectal or upper gastrointestinal cancer (research study)	<ul style="list-style-type: none"> Aged at least 18 years Pre and post-operative clinical staging confirmed stage I-III colorectal or upper gastrointestinal cancer, or limited 	<ul style="list-style-type: none"> Unable to do exercise or take nutritional supplements for physical or medical reasons

	<p>stage IV colorectal cancer (e.g. limited liver metastases planned for resection) or upper gastrointestinal cancer that is potentially curable with surgery</p> <ul style="list-style-type: none"> • Elective colorectal cancer or upper gastrointestinal resection scheduled >14 days after time of referral to study and where baseline assessment can be started to allow a minimum of 10 days of the intervention prior to surgery • Medical clearance for exercise • Willing to attend supervised exercise sessions at the Sydney Cancer Survivorship Gym at Concord Repatriation General Hospital or by virtual care (video) one to two times per week until surgery • European Co-operative Oncology Group performance status of 0-2 • Willing to complete patient-reported outcome questionnaires and exercise and dietary logs • Willing to take prescribed high protein supplements until surgery • Agreeable to 30 day follow up. 	<ul style="list-style-type: none"> • Taking immunonutrition oral supplements during the intervention • Unable to give informed consent or follow instructions due to cognitive difficulties • Currently undergoing neoadjuvant chemotherapy or radiotherapy. Patients will be eligible for participation on completion of neoadjuvant chemotherapy or radiotherapy providing there is at least 14 days before surgery.
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Resource 3: Example of a prehabilitation team

Role	Function
Executive leader	Places a high priority on the value of prehabilitation and the outcomes produced. Makes a realistic appraisal of resources and has influence within the organisation
Program coordinator (can be any of roles below, or in addition to below)	Oversees service, organises multidisciplinary team discussions, coordinates patient interventions
Clinical lead (can be program coordinator, any of roles below, or in addition to below)	Chairs steering committee or working group, reports to executive leader
Administrative officer	Reviews referrals, contacts patients, coordinates appointments
Physiotherapists or exercise physiologists	Performs initial assessments, creates tailored exercise programs, supervises exercise, provides ongoing assessments, generates prehabilitation evidence
Occupational therapist	Performs initial assessments, organises equipment and supports required to improve and sustain functional abilities
Senior nursing staff in surgical specialities areas	Delivers specialty education, provides psychosocial care, follows patient journey, facilitates individualised patient care
Surgical staff from relevant specialty areas	Promotes cultural change to colleagues, undertakes patient surgical risk assessments, provides leadership and direction when needed, generates prehabilitation evidence
Anaesthetic staff	Liaises with preadmission clinic (if any), promotes cultural change to colleagues, undertakes patient anaesthetic risk assessments, provides leadership and direction when needed, generates prehabilitation evidence
Respiratory physician	Provides specialty advice around respiratory health, function and clinical management
Geriatrician	Provides advice for older people and people living with frailty
Social worker, psychologist, or counsellor	Conducts initial assessments, provides psychosocial care to patient and family and carers, liaises with Aboriginal health liaison officers and interpreters as needed, generates prehabilitation evidence
Rehabilitation physician	Contributes to patient-program definition, identifying likely rehabilitation needs before admission for surgery. Facilitates continuity of care through linking elements of the patient journey before, during and after the acute care episode
Dietitian	Performs initial assessments, creates tailored nutritional programs, provides ongoing assessments and education

Data manager	Creates database, links with surgical clinical reviewers, if any, for National Surgical Quality Improvement Program insights, collects data, provides analysis, identifies issues and successes, reports on outcomes, assists with surveys, assists in evidence generation
Discharge coordinator	Facilitates early discharge planning