QSCIS Clinical Pathway:

Management of Pressure Injuries with Surgical Reconstruction

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Research Team

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The Hopkins Centre
Research for Rehabilitation and Resilience

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The QSCIS Backbone

Purpose of this Clinical Pathway

- To support consistent and standardised processes in the management of pressure injuries (PIs) requiring surgical reconstruction (flap surgery) in people with spinal cord injury (SCI) with the aim of minimising complications following this procedure.
- To clearly define the roles and responsibilities of all members of the multidisciplinary team (MDT) in delivering clinical care and rehabilitation for this patient cohort.

Background

PIs are a common and serious complication for people with spinal cord injury/disease (SCI/D), in some cases requiring complex surgery and long hospital admissions to treat and heal[1-4]. PIs can impact a person psychologically, physically, financially, and their ability to perform their activities of daily living[1,5-7].

PIs are classified according to the National Pressure Injury Advisory Panel staging system[8]. While Stage 1 and 2 PIs are often managed conservatively, surgical management is generally required for the management of more complex Stage 3 and 4 PIs[6]. This involves debridement and flap surgery[6].

Flap surgery for the management of PIs generally involves use of local axial flaps with a well-defined blood supply[9]. These can be categorised as fasciocutaneous, which comprise skin, subcutaneous tissue and deep fascia; or myocutaneous flaps, comprising the skin, subcutaneous and deep fascia, and underlying muscle[6,9].

Complications following flap surgery are common. A 2025 audit of 9 years of flap surgery data from the Spinal Injuries Unit (SIU) revealed that 89% of patients experience a complication postoperatively. Complications can be classified as either local or general, both of which can impact postoperative recovery. Local complications, such as wound dehiscence, local infection, haemorrhage, seroma or haematoma formation, flap necrosis, and flap failure, usually occur early in the postoperative period. General complications, including pneumonia, urinary tract infection, and new hospital-acquired PIs, may arise at any time during admission. Being overweight was associated with a 54% increase in predicted rates of total complications, highlighting the need to optimise weight preoperatively and to manage weight during prolonged periods of bed rest postoperatively. Other factors which were associated with the development of local or general complications are: number of PIs at admission, previous flap surgeries, osteomyelitis, spasticity, increased pain during admission, diabetes mellitus and urinary incontinence.

The high postoperative complication rates contribute to prolonged hospital admissions, with an average of approximately 6 months in the SIU. A 2025 qualitative study exploring the experiences of people with complications following flap surgery and the clinicians managing them highlighted multiple challenges faced throughout these long admissions. These challenges include: significant psychological impact including boredom, frustration, low mood, loss of autonomy and the challenge of dealing with uncertainty; physical impacts of immobility and discomfort, frequent weight gain, impact on family, relationships and employment, as well as other aspects of the person's life; and the challenge of managing expectations and dealing with setbacks.

This study showed the importance of establishing care routines for appropriate offloading, regular skin checks and education; having appropriate access to specialised MDT care and appropriate equipment, including adequate funding; optimising general health, for example, nutrition, diabetes mellitus, smoking cessation; and optimising mental health through a variety of strategies including, but not limited to, access to psychology and social work services. To alleviate boredom associated with prolonged bed rest, the person undergoing flap surgery should be engaged in meaningful activities where possible: vocational (through appropriate assistive technology and set-up), avocational (via engagement with leisure, recreation or diversional therapy), or facilitation of social interaction with other patients or their families and significant others. The physical environment and staffing should ideally facilitate these activities.

In some situations, surgical reconstruction is not feasible due to the absence of suitable surgical options or the presence of comorbidities, necessitating conservative management instead. The comorbid factors may be related to current physical health, psychological wellbeing, assessment of ability to adhere to strict bed rest regimen and/or to ongoing substance use such as alcohol or nicotine (whether smoked or other nicotine products). Conservative management may include prolonged periods of bed rest and regular wound assessments and dressing changes.

Whether the PIs are managed with reconstructive flap surgery or via conservative management, a coordinated MDT approach in the inpatient and/or community setting is required to reduce the likelihood of complications or recurrence and to promote healing.

Skin Management and Rehabilitation Team (SMART)

The SMART provides outpatient and inpatient services. The weekly SMART clinic is attended by the plastic surgeon, SIU rehabilitation medicine physician and clinical nurse, and is supported by the MDT Spinal Outreach Team (SPOT). The inpatient service has 4 beds allocated within the SIU for elective admission of patients with SCI/D who were deemed suitable to undergo flap surgery for the management of their PIs. The inpatient service involves weekly MDT ward rounds and case conference discussion. The MDT is responsible for adherence with the surgical protocol, graded mobilisation and sitting regimen.

Roles and Responsibilities within the inpatient MDT:

- **Rehabilitation medicine physician:** Medical oversight, risk factor management, team coordination.
- **Plastic surgeon:** Surgical interventions, including planning; flap monitoring, wound reviews.
- **Clinical nurse consultant:** Wound assessment and monitoring, education to ward nursing staff regarding daily care, positioning, patient education, PI prevention, continence assistance, skin integrity maintenance advice, discharge planning.
- **Dietitian:** Nutritional optimisation and weight management.
- **Occupational therapist (OT):** Review and optimisation of personal and instrumental activities of daily living (ADLs), skin education, positioning, and review/scripting of equipment, discharge planning.
- **Physiotherapist (PT):** Assessment and optimisation of respiratory and physical health; provision of range of movement and conditioning programs; functional rehabilitation including bed mobility and transfer training; seating review and equipment trials or scripting (with pressure mapping when clinically indicated); education on skin and positioning strategies; and discharge planning.
- **Social worker:** Psychosocial assessment, counselling and psychoeducation for patients and families, capacity building, enabling community connections and referrals, advocacy, navigating funding streams and other systems, discharge planning.
- **Psychologist:** Mood, psychological history and risk assessment, support emotional and psychological wellbeing, manage acute distress and encourage engagement throughout admission.

- **Leisure/Recreation therapist:** Support patient wellbeing through appropriate leisure and recreational activities.
- **Aboriginal and Torres Strait Islander liaison officer:** Offer cultural, emotional and social support, and facilitate communication between patients, their family and the MDT (if required).
- **Rehabilitation Facilitator:** this role is undertaken by one of the above team members. This is a key contact for the patient during their admission whose role is to orientate the patient to the unit and coordinate family meetings (goal planning meetings).

The Clinical Pathway

1. Preoperative Optimisation (Outpatient/Referral Phase)

Aim: Optimise patient health and risk factors prior to admission for flap surgery

Key Activities:

- Referral to SMART Clinic for consideration of flap surgery for PI with completion of referral form by a medical practitioner already involved in patient's care. If the patient is already known to an SIU consultant, this referral should be discussed with them.
- If deemed appropriate for review, the referral is accepted, and the patient is waitlisted for SIU SMART Clinic appointment. Regardless of outcome of SMART referral, the patient is to be linked with General SIU Clinic (if not already known to QSCIS or not routinely engaging). Ideally, the patient should have a holistic assessment in the General SIU clinic prior to being reviewed in the SMART clinic.
- SPOT is to be notified of the acceptance of a SMART referral (by those triaging the referral) and request made to provide updated summary of involvement to date. If SPOT not already involved, then request to commence MDT review and liaison with existing community services to ensure appropriate assessments and interventions are already in place.
- Comprehensive intake assessment undertaken by SIU rehabilitation medicine physician during SMART Clinic to commence preoperative screening and determine whether further MDT assessment and involvement in the community is required.
- Surgical assessment at time of SMART Clinic review.

- Preoperative screening completed to appropriately identify the risk of flap complications and possible mitigation strategies using the PRECISE tool, which is currently being trialled. Outcomes of the completed PRECISE tool document is to be discussed with the patient and their health-care providers.
- Nutritional assessment and intervention (dietitian input and recommendations). Avoid routine prescription of high protein, high energy diets and/or oral supplements unless specifically indicated on the nutritional assessment.
- Smoking, vaping and use of other illicit substances:
    - Patients advised to cease nicotine smoking, nicotine replacement therapy or other nicotine products at least 6 weeks prior to surgical date and are to be provided details to access counselling, such as Quitline, and referred to the GP to provide ongoing support with smoking cessation, including consideration of appropriate pharmacological management.
    - Assess for smoking or vaping of any other substances, whether prescribed or illicit. Liaise with GP or other appropriate medical practitioner to establish a plan to cease all smoked and vaped products prior to admission.
    - Assess for use of other illicit substances or large quantities of alcohol and liaise with GP and/or addiction medicine physician to safely cease consuming these agents prior to admission.
- Assess for the presence of osteomyelitis, noting that the diagnosis of osteomyelitis is difficult to establish.[10] Medical imaging alone (e.g., CT or MRI) tends to over-diagnose osteomyelitis and hence cannot be relied upon to make a diagnosis. Close correlation of clinical and radiological features should be considered as an MDT (involving infectious diseases, radiology, plastic surgery and rehabilitation medicine teams).
- Comorbidity management:
    - Optimisation of cardiovascular disease, respiratory disease, diabetes mellitus, peripheral vascular disease, renal disease and other comorbidities including liaison with relevant specialists if required to support perioperative planning
    - Blood tests: FBC, ELFTs, Folate, B12, Iron Studies, Zinc, HbA1c, Fasting Lipids
    - Imaging as clinically indicated: Echocardiogram if cardiovascular disease present
    - Renal Surveillance scans (USS KUB/XR KUB or CT KUB) within last 12 months
    - Respiratory Function Tests if evidence of respiratory dysfunction or disease

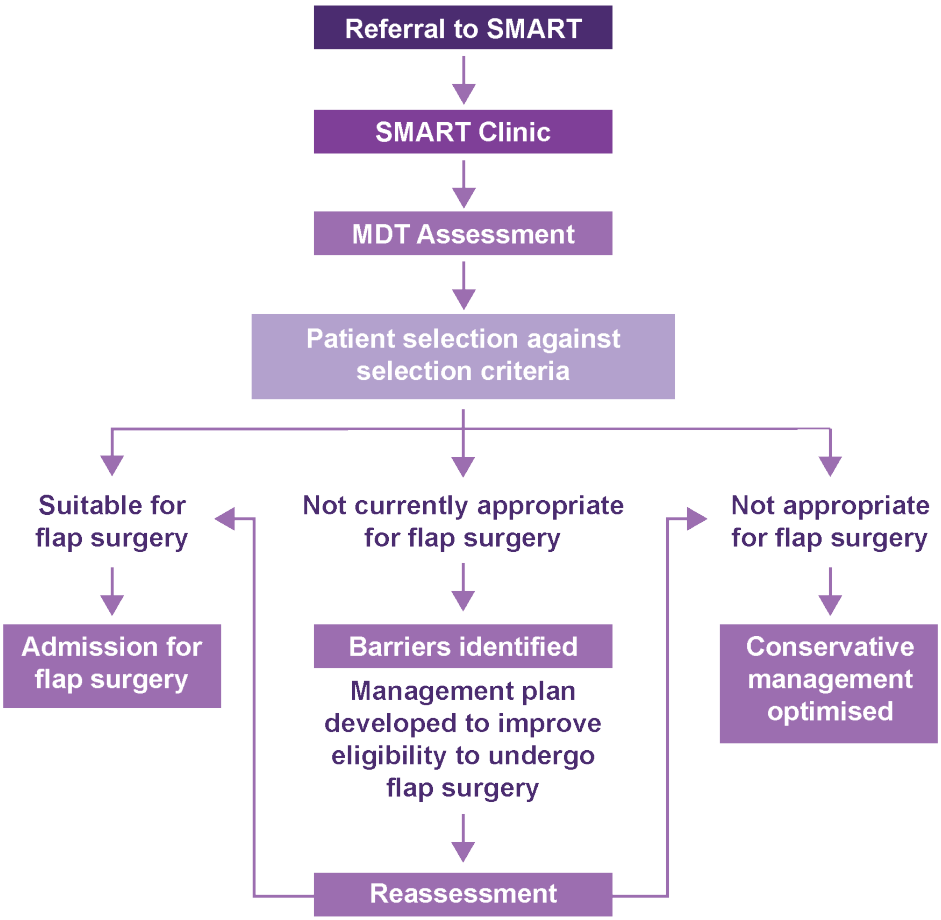
  - Consider the need for Sleep Studies especially if the patient's neurological level of injury is above T6 and/or they have signs and symptoms of sleep disordered breathing.
  - Liaise with any other medical specialists as appropriate e.g., cardiology, hepatology, psychiatry etc.

- Optimisation of SCI-specific management / conditions and comorbidities, including review of the management of bowel, bladder, spasticity and autonomic dysfunction prior to admission for surgery.
- Review the patient's pain and their ability to maintain the appropriate positioning that will be required to fully offload the surgical site post flap surgery.
- Quality of Life assessment completed to highlight barriers to participation in plan of care. At this point, consider the need to refer to a psychologist for an assessment and to develop positive coping strategies to support a prolonged admission.
- Referral to a community social worker may also be warranted to address funding issues, optimise personal care supports, and review financial concerns prior to admission, where relevant.
- Initiate equipment reviews and pressure-redistribution strategies/ positioning implemented in the home/community setting to support reducing the size of wounds and assisting with strict offloading that will be required post flap surgery during the patient's hospital admission.
- Assess overall skin integrity and optimise management of co-existing skin conditions.

Preoperative assessment should be coordinated by an experienced MDT to evaluate surgical suitability and optimise the patient's physical and psychological condition prior to admission.

- Following review of all assessments, results of screening and discussion among the MDT, a decision is made regarding appropriateness of proceeding to reconstructive (flap) surgery with one of the following outcomes:
    - Appropriate to proceed with flap surgery: the MDT facilitate any further assessments and/or planning for SIU admission.
    - Not currently appropriate to proceed with surgery: the MDT identify and implement management strategies together with their community MDT and local health professionals to optimise circumstances prior to surgery. Further reviews organised to determine whether patient becomes appropriate to proceed with flap surgery after necessary interventions.
    - Not appropriate for flap surgery: the MDT provide recommendations to the patient's community healthcare providers to optimise conservative management in the community.

Figure 1: The Clinical Pathway – Assessment Flowchart



Once deemed appropriate for flap surgery:

- Pre-operative education
    - The patient is given verbal and written information about flap surgery. Expectations for surgery and required behaviours during the hospital admission are explained, and a rehabilitation agreement is provided.
- Multi-resistant organism (MRO) screen: ESBL, MRSA, VRE, CRE.
- Patient will be formally waitlisted for surgery.
- A member of the SMART will contact the patient as early as possible to advise of upcoming bed availability in SIU.
- Discuss the feasibility and requirement to bring own equipment to hospital for admission to be assessed, used and/or modified.
- Discuss recreation, work or other activities the patient would like to engage in whilst on prolonged bed rest. Advise the patient to bring the necessary activities from home for admission (if applicable).

2. Inpatient Planning and Work-up

Aim: Prepare for surgery, ensure patient readiness, mitigate surgical risks

Key Activities:

- Elective admission to SIU prior to surgical date once bed availability confirmed and appropriate MRO screening completed. Ideally the patient should be admitted at least one week prior to surgery to be seen by the MDT on their weekly round and to enable holistic assessment prior to surgery.
- Preoperative anaesthetic and medical clearance and optimisation.
- Review of rehabilitation agreement and revisit discussions regarding postoperative management plan and expectations during admission.
- Review and adjust bowel and bladder regimens to minimise risk of incontinence contaminating surgical wound or creating new areas of skin concerns such as incontinence associated dermatitis.
    - Insertion of indwelling catheter (IDC) for patients who perform intermittent clean self-catheterisation (ICSC) or void spontaneously; and optimisation of bowel regime including transition to performing bowel therapy in bed in preparation for postoperative management.

  - If the patient is admitted with an IDC or suprapubic catheter (SPC), change prior to theatre to avoid issues during early postoperative period of bed rest.
- Review and optimise pain management, using pharmacological and non-pharmacological strategies with an MDT approach.
- Review and optimise spasticity management.
- Nutritional optimisation continues (dietitian review and updated weight on admission to ward). Develop strategies to avoid weight gain throughout admission.
- Psychological preparation and support as needed with social work and psychology input.
- OT and PT assess and implement strategies for:
  - optimal bed positioning and ability to engage in leisure, study or work activities while in bed,
  - equipment and mobility needs,
  - pre-surgery posture and seating, and plan for post-surgery phase, for example, make any equipment adjustments, source alternative trial options if alternative equipment might be required post-surgery.
- OT to review plan for hoist sling size and type that is likely to be required postoperatively, with support from PT and nursing.
- Social work to review available funding and liaise with the patient, the MDT, and key community contacts to determine whether these are likely to be adequate for discharge, or whether additional funding and supports are likely to be required.
- Nursing and OT to set up appropriate pressure redistribution mattress and bed for admission (e.g., alternating air mattress or air-fluidised bed).
- Nursing education and preoperative skin care protocols. In discussion with the MDT, determine safe offloading positions to be adopted postoperatively and manual handling considerations.
- Final pre-surgical review and patient consent completed by plastic surgery team.
- Commence discharge planning.

3. Postoperative Management

Aim: Support wound healing, prevent complications, maintain health during immobility; once wound healed, commence graded return to sitting and other usual activities; reconditioning.

> *Note that the timeframes below are guides only and clinical judgement is required to guide progression through each phase of recovery postoperatively. This requires collaborative decisions made by the MDT, taking into consideration patient factors, surgical factors, environmental factors and potential complications which may impact on recovery.

Postoperatively, the patient is reviewed weekly by the SMART MDT, attended by the plastic surgeon, rehabilitation medicine physician, clinical nurse consultant, physiotherapist and occupational therapist. This review occurs in the SIU, with the patient lying on the bed, allowing for wound review. Other clinical assessments and reviews occur throughout the week as indicated.

Immediate Postoperative Phase (~Week 0–1*)

Key Activities:

- Strict bed rest and offloading of flap in side-lying or prone positioning (strict pressure relief positioning protocol to be enacted by the SMART MDT) on appropriate pressure redistribution mattress (e.g., alternating air mattress, air-fluidised bed). When using an alternating air mattress with adjustable cell deflation, *cells beneath the pelvis should remain inflated*, as deflation may increase pressure over the flap (with minor positional changes e.g., due to spasticity) or contribute to the development of new PIs.
- Routine postoperative observations of vital signs per hospital guidelines.
- Monitor closely for autonomic dysreflexia (AD) if patient at risk (SCI level T6 or above). If AD occurs, avoid sitting the patient up if possible, as this places the suture line at risk of breakdown and flap at risk of necrosis. Instead, use the reverse Trendelenburg position of the bed to tilt the whole bed up if necessary. Manage other aspects of AD as per usual protocol.

- Ongoing thorough skin integrity assessment with each episode of pressure area care, including all bony prominences, especially opposing side to flap repair (greater trochanter if positioned in side-lying).
- Postoperative dressings to stay in-situ unless there are specific clinical concerns requiring these to be taken down. Dressings are taken down Day 1 by a member of the plastic surgery team. Generally, routine dressings are not required beyond this time unless specific indications arise.
- Wound cares that allow for wound to remain clean and offloaded as specified by the plastic surgeon e.g., twice daily betadine paint to suture line.
- Flap monitoring for complications (monitor flap colour, oedema, signs of wound breakdown and wound discharge which can be indicative of dehiscence, infection, seroma/haematoma formation, flap failure) and promptly escalate concerns to the treating team.
- MDT approach to pain management: pharmacological and non-pharmacological strategies for managing pain in the postoperative period, including review of positioning.
- Commence venous thromboembolism prophylaxis when clinically appropriate or as per surgical operative notes. TEDS and SCUDS are in situ on return from theatre, these can be discontinued in the days following surgery upon advice of the medical team.
- Bowel elimination and hygiene cares to be attended in bed. Maintain bladder and bowel continence. May need further medical review given prescription of new medications and anaesthesia can impact bowels.
- Nutritional support provided by dietician.
- Respiratory physiotherapy including Deep Breathing Exercises and airway clearance techniques prescribed by the PT if clinically indicated. Other respiratory management strategies depending on clinical need to be determined by medical, PT and nursing teams.
- Monitor for general complications such as pneumonia, urinary tract infections and other systemic illnesses.
- Ongoing psychosocial support.
- Recording of surgical drain(s) output until removed. Management of closed, low-pressure surgical drains as per hospital guidelines. Surgical drains are usually left in-situ and on suction for at least 7 days, guided by plastic surgeon.

- Ongoing review of nutrition and development of strategies to avoid weight gain.
- Referral to a recreation/leisure therapist to start exploring opportunities for engaging in recreation activities, if appropriate.

Ongoing Bed rest Phase (~Weeks 2–3*)

Key Activities:

- Continue with strict bed rest and pressure redistribution positioning protocols as determined by the repositioning frequency required by the individual (planned and documented by SMART MDT). Ongoing strict offloading of the flap until cleared to commence 'free bed mobility' (see below).
- Wound/flap review with each episode of pressure redistribution and repositioning.
- Maintain bowel and bladder continence. Bowel elimination to continue in bed.
- Psychosocial support – psychological support to address anxiety, low mood, and reduced ability to implement coping strategies while resting in bed. Engaging the wider social networks and connection opportunities to address the impacts of isolation and boredom.
- Sutures usually removed after 2 weeks as directed by plastic surgeon. Suture line to be cleansed as per local hospital procedure or as determined by plastic surgeon.
- Once sutures removed, nursing staff to commence moisturising the surgical scar twice daily or as otherwise prescribed.
- Once sutures removed and if no other clinical concerns (e.g., PIs or fragile skin over the greater trochanter), can commence using prone trolley for showering. Transfer to shower trolley via PAT Slide and x2 slide sheets. This is normally attended every second day during this time period. Ensure flap viability can be maintained throughout transfer and hygiene activities (i.e. transfer and shower to occur with side-lying on opposite side to flap repair).
- At week 3, or once wound healing assessed to be adequate, commence **hip ranging** and **free bed mobility** (laying supine and on side of flap with bed flat, starting with 30-60 minutes at a time (as clinically indicated) and building time up as clinically indicated with review of area pre- and post for any changes. This is generally determined by the MDT during the weekly joint ward round.
- Consider commencement of gentle upper limb strengthening program if clinically indicated.
- Continue to explore options for engaging in recreation, leisure, study or work activities.

- Ongoing review of nutrition and development of strategies to avoid weight gain with extended bed rest.
- Continue with discharge planning.

Initial Rehabilitation Phase (~Weeks 4+*)

Key Activities:

- Once skin is fully healed commence the sitting regimen. This will be determined by the SMART MDT and documented in the patient's chart by the SIU medical team. Earliest time to consider sitting is at 4 weeks postoperatively.
    - Usually start at 30mins sitting and increase gradually per sitting protocol. Sitting protocol to be varied by the MDT depending on clinical assessment (see Table 1 below).
    - Use of a sling/hoist to transfer into the wheelchair with an appropriate pressure redistribution cushion under guidance of the MDT (high-risk pressure redistribution cushion with air medium is usually required for commencement of graded return to sitting).
    - MDT skin assessments are to be conducted pre- and post-sitting on every occasion, ideally by same team member. These skin assessments are key in

guiding progression through the sitting regimen. If there are any concerns for skin integrity (flap, suture line or other skin areas), return to bed rest and review with the MDT, including medical team. If skin is intact but at-risk or fragile, a slower progression through the sitting regimen may be required.

Table 1: Graded return to sitting protocol

Day	Sitting time (morning)	Sitting time (afternoon)
1		30 minutes
2	30 minutes	30 minutes
3	30 minutes	45 minutes
4	45 minutes	45 minutes
5	45 minutes	1 hour
6	1 hour	1 hour
7	1 hour	1.5 hours
8	1.5 hours	1.5 hours
9	1.5 hours	2 hours
10	2 hours	2 hours
11	2 hours	2.5 hours
12	2.5 hours	2.5 hours
13	2.5 hours	3 hours
14	3 hours	3.5 hours
15	4 hours	4 hours
A minimum of 2 hours bed rest and offloading of the flap is advised between the two daily sits. Once 4 hours are reached, this becomes logistically challenging, and often the second sit is shorter. After 4 hours, progress as tolerated, increasing by no more than 1-hourly increments daily.		

- Sitting in bed is still prohibited.
- Assess suitability for commencing a reconditioning program in the therapy gym. This will be dependent on skin integrity and other comorbidities, however, aim to commence a gym program once a 2-hour sitting tolerance is achieved.
- Continue with discharge planning.

Late Rehabilitation Phase (~Weeks 6+*)

- Once tolerating 4-5 hours of continuous sitting further assessment of equipment and transfers is undertaken. Each of the following will be undertaken sequentially with order to be determined in consultation with the MDT and patient:
    - Only one change to equipment made at a time to ensure each change does not cause any issues with patient's skin. Thorough inspection and assessment of skin integrity to be attended pre- and post- equipment change trial. If at any point the skin shows signs of deterioration, return to bed rest may be required until skin is again healed. Once skin is healed, sitting is recommenced usually at a shorter duration and increased again in increments per sitting protocol.
    - SMART MDT consideration of readiness for commode/shower chair or bath bench trials. Begin with short dry sit (15-30 minutes to assess tension on scar line, positioning and contact with flap). Assess whether equipment suitable or whether modification or alternative equipment required before progressing. Thereafter, progress time to accommodate an over-the-toilet bowel regimen and progress to wet sit (i.e. showering).
    - SMART MDT to consider changing/downgrading mattress (if clinically appropriate) in consultation with patient and reviewing transferring method (if patient was transferring by any other method than sling/hoist).
    - Review any other equipment required for discharge from hospital.
    - Consideration of progression trials of pressure redistribution cushion for wheelchair if clinically appropriate.
    - Ongoing review of equipment by the MDT at each step of the process, with consideration for interface pressure mapping.
    - Consideration of returning to usual bladder management method if previously managing bladder with ICSC or spontaneous voiding once clinically appropriate.

Main principle: only one change at a time. This could involve changes to equipment or activity, e.g., increasing sitting time, commencing self-catheterisation, change to transfers.

- Engage in a reconditioning rehabilitation program following prolonged bed rest. This might include engagement in the therapy gym and an individualised independent exercise program.
- Continue with patient education throughout admission.
- Continue with discharge planning, including review of equipment, community access and transport needs, funding and personal supports.
- Organise a goal planning meeting (or multiple if required) with the MDT to facilitate discharge planning and smooth transition to community.

4. Discharge Planning and Follow-up

Aim: Support safe return home and reduce risk of recurrence

Discharge Criteria:

- Flap site well healed and stable.
- Tolerance of sitting sufficient to manage at home with available personal supports, including travel home.
- Functional goals met for ADLs and transfers.
- Bowel and bladder continence managed.
- Home environment deemed suitable, with required equipment funded and sourced.
- Appropriate funding in place to support any change to care needs.
- Education provided to patient and/or carers on skin checks, pressure area care, and ongoing management.
- Community supports and referrals to be arranged, including:
    - If necessary, handover and formal carer training undertaken by MDT to patient's usual support team to ensure smooth transition to community.
    - Post-discharge SIU clinic review to be booked 6-8 weeks following discharge.
    - Refer and handover to community MDT, including private providers, as required.
    - Formal handover to SPOT to facilitate any ongoing community support if required.

> The patient should continue to receive coordinated MDT support on discharge to reduce the likelihood of recurrence.

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Patient Information Sheet: Flap Surgery for Pressure Injuries for people with Spinal Cord Injury

Why flap surgery may be needed

Pressure injuries happen in people with spinal cord injury or spina bifida. They are sometimes called pressure ulcers or pressure sores. Pressure injuries can be hard to heal and can affect your health, daily life, and mood.

Sometimes pressure injuries can heal without surgery. But if the wound is severe, your doctors may suggest **flap surgery**. This means moving skin, and sometimes the tissue or muscle under the skin, from a nearby part of the body to cover the wound.

Your spinal cord injury team will talk with you carefully before deciding on surgery.

Risks and complications

Unfortunately, some problems are common after flap surgery. These problems may be:

- **Directly around where the surgical scar is:** slow healing of the wound, infection, bleeding, fluid build-up, or flap failure (where the flap doesn't work). Flap failure is rare but may mean you need another surgery.
- **Other health problems:** chest or urine infections, new pressure injuries, or other medical issues.

These problems can slow down healing, delay recovery, and make your hospital stay longer.

- **Minimum stay:** about 3 months.
- **Average stay:** about 6 months.
- **Sometimes longer** if healing is slow or problems happen.

Getting ready for surgery

Your team may ask you to do a few things **before** surgery to help your flap heal well. These may include:

- Spend less time sitting before surgery.
- Stop smoking and vaping (including nicotine and marijuana) at least 6 weeks before surgery.
- Keep your blood sugars under control (if you have diabetes).

- Practise lying in positions you will use after surgery.
- Check your equipment (wheelchairs, cushions, etc.) and how you transfer.
- Review your care supports and funding.

A psychologist or social worker may also help you build coping skills to prepare for your long hospital stay and strict bed rest.

Coming to hospital

When you are ready, you will go on the waiting list for a bed in the Spinal Injuries Unit (SIU). The SIU is located at the Princess Alexandra Hospital in Brisbane.

- You may not get much notice before your admission. We do our best to let you know as soon as we know a bed is available.
- Bring your equipment (wheelchairs, commodes, cushions, etc.) with you so your health team can review it before surgery.
- Bring your phone or other devices that will help you stay in touch with friends and family. You might want to bring other things to help you pass the time when you are on full-time bed rest.
- In hospital, you will rest on an air mattress in bed and practise the positions you will use after surgery.
- In hospital, your bowel care will be done in bed, and you will have a catheter for bladder care.

What to expect after surgery

Early Recovery

- **No pressure** can be put on your surgical area until it is healed.
- You will lie on the opposite side to your surgery or your stomach, on a special air mattress.
- All of your personal cares, like bowel care and washing, will be done in bed.
- Surgical drains are usually taken out after about 1 week.
- Your stitches will come out in 2–3 weeks.
- You may usually start showering on a trolley after your stitches are out.
- During this stage you will still be resting in bed with the bed flat.

- The multidisciplinary team: rehabilitation doctor, plastic surgeon, nurse, physiotherapist and occupational therapist will review you together once a week.
- Your wound will be checked frequently by nurses and other members of your care team.

If your wound is healing well:

- After about 3 weeks, you may be able to spend short times lying on your back or on the same side where the surgery happened.
- Your physios will help with gentle hip movement.
- You may start sitting after 4 weeks, but only once the wound is fully healed. For many people, sitting actually begins later than 4 weeks.

Once you start sitting, we take things slowly:

- Your first sit might be for about 30 minutes on an air cushion.
- Depending on your skin, the time you sit might increase slowly every few days. We may need to slow down or reduce your sitting time if there are any issues.
- It can take 2 weeks or more to build up to 4–5 hours of sitting in one go.
- At first, transfers will be done using a hoist.

Using equipment again

- Once you can sit for longer (at least 4-5 hours in one sitting), you may use a commode or shower chair/ bench.
- All equipment will be checked to make sure it is safe and protects your skin. This includes looking at your usual mattress, commode, and wheelchair and cushion set up, and deciding if they are safe to keep using. Sometimes we may suggest changing your equipment to keep your skin protected.
- If you normally do your transfers without a hoist, we can begin practicing these again. This can be challenging because your muscles may be weaker after a long time in bed. Some people may still need to use a hoist for safety instead of doing horizontal transfers.

Managing your bladder

While in hospital, your bladder may be managed by:

- Indwelling catheter (IDC)
- Suprapubic catheter (SPC)
- Ileal conduit

This is because you will not be able to do catheters yourself in bed or get out of bed to go to the toilet. If you used in/out catheters or emptied your bladder normally before your surgery, we will get you back doing this before you leave hospital.

Key Messages

- Flap surgery and recovery take time, requires teamwork and is different for each person.
- With the right preparation, support and follow-up, your pressure injury will heal well.
- When you are in hospital, your team will check your wound often and adjust your rehabilitation program as needed.
- When you leave hospital, it is important to keep looking after your skin. There is always a chance a pressure injury could happen again.
- Your care team will work with you to help you keep looking after your skin and to notice any problems early. They will also work with the people caring for you to help keep your skin healthy.
- Your team is here to help. Please ask questions any time.

PRECISE Tool:
Pre-flap Comprehensive Interdisciplinary Screening and Evaluation

(Affix identification label here)

URN:

Family name:

Given name(s):

Address:

Date of birth: Sex: ☐ M ☐ F ☐ I

Factor	Tick	Assessment	Mitigation
MEDICAL			
Medical Comorbidities		**Optimal:** No medical comorbidities.	
		Acceptable: Mild systemic disease e.g., well controlled DM/HTN, mild lung disease, stable IHD (>12 months post intervention, MI).	
		Possibly acceptable after mitigation: One or more moderate-to-severe systemic diseases. E.g., poorly controlled DM/HTN/COPD, active hepatitis, implanted pacemaker, moderate reduction in ejection fraction, ESRD with dialysis, history of recent (3-12month) MI, cardiac stent, stroke, TIA.	
		Unacceptable: Severe systemic disease that is constant threat to life. E.g., recent (<3 months) MI, cardiac stent, severe heart valve dysfunction, severe reduction in ejection fraction, sepsis, DIC, ARDS, ESRD without dialysis, end-stage liver disease.	

Tobacco Use		**Optimal:** No prior tobacco use.	
		Acceptable: Prior tobacco use, but none for at least 6 weeks.	
		Unacceptable/Mitigatable: Tobacco use within the last 6 weeks and actively engaged with tobacco cessation interventions.	
		Unacceptable/ Not Mitigatable: Tobacco use within past 6 weeks and not actively engaged with tobacco cessation interventions.	
Weight		**Optimal:** Normal BMI (BMI 16-21.9).	
		Acceptable: Borderline (BMI 22-29.9).	
		Unacceptable/Mitigatable: Underweight (BMI <16) or overweight/obese (BMI >30) and actively working on strategies to normalise weight.	
		Unacceptable/ Not Mitigatable: Underweight (BMI <16) or overweight/obese (BMI >30) and not engaged in working on strategies to normalise weight.	
NUTRITION			
Nutrition		**Optimal:** healthy diet at all times	
		Acceptable: healthy diet most of the time	

		Unacceptable/Mitigatable: unhealthy diet large proportion of the time and actively engaged with dietitian to optimise nutrition.	
		Unacceptable/ Not Mitigatable: unhealthy diet large proportion of the time and not actively engaged with dietitian to optimise nutrition.	
SURGICAL OR POSTOPERATIVE CONSIDERATIONS			
Location of pressure injury and availability of surgical options		**Optimal:** Ischial tuberosity, greater trochanter, sacrum or coccyx locations. No prior flap surgeries or scars in area. Healthy skin.	
		Acceptable: Ischial tuberosity, greater trochanter, sacrum or coccyx locations. Prior flaps or scars at same site but flap options still available.	
		Unacceptable/Mitigatable: Ischial tuberosity, greater trochanter, sacrum or coccyx pressure injuries with no flap options due to poor surrounding skin quality, large wound size, or presence of urethrocutaneous or rectocutaneous fistula.	
		Unacceptable/ Not Mitigatable: Perianal area or other pressure injuries which cannot be easily offloaded in sitting. No suitable flap options due to previous flaps or scarring at same site.	
		Optimal: Demonstrated ability to tolerate post-operative positioning for extended periods of time.	This will be confirmed in SIU prior to surgery

Tolerate post-operative positioning		**Acceptable:** Minor discomfort with required positioning but demonstrated ability to tolerate positioning for extended periods of time.	
		Unacceptable/Mitigatable: Unable to tolerate required positions for extended periods of time e.g., due to pain, medical comorbidities, psychological factors but engaged with treatment plan to manage these issues.	
		Unacceptable/ Not Mitigatable: As above but issue not amenable to treatment or patient not accepting of treatment.	
SCI/D SPECIFIC CONSIDERATIONS			
Bladder management		**Optimal:** Continent or urinary collection system is in place with sustainable plan and maintenance of dry skin.	
		Acceptable: Appropriate bladder management is in place, but with rare or minimal incontinence or catheter bypass, and able to keep pelvic skin dry.	
		Unacceptable/Mitigatable: Bladder management is inappropriate, or incontinence is more than minimal, and patient is willing to follow recommendations.	
		Unacceptable/Not Mitigatable: Bladder management is inappropriate, or incontinence is more than minimal, and patient is not willing to follow recommendations.	

Bowel management		**Optimal:** Colostomy present, or consistently continent of stool with effective bowel program (including while on bedrest).	
		Acceptable: Effective bowel program is in place, but with rare minimal incontinence that causes minimal to no soiling of skin.	
		Unacceptable/Mitigatable: Occasional to more frequent incontinence with skin soiling, and patient is willing and able to follow recommendations to establish effective bowel program or get a colostomy.	
		Unacceptable/Not Mitigatable: As above, except patient is not willing or able to follow recommendations.	
Spasticity management		**Optimal:** Minimal or no spasticity in the lower body.	
		Acceptable: Mild-moderate spasticity of the lower body that cause <10° of hip motion and do not cause pelvic shear forces or a shift in body position.	
		Unacceptable/Mitigatable: Moderate-severe spasticity of lower body that cause >10° of hip motion and/or shift in body position.	
		Unacceptable/Not mitigatable: Same as above but unable to adequately treat or patient not accepting of treatment.	
		Optimal: No autonomic dysfunction.	

Autonomic dysfunction		**Acceptable:** Occasional autonomic dysfunction (orthostatic hypotension, autonomic dysreflexia or temperature dysregulation).	
		Unacceptable/Mitigatable: Significant autonomic dysfunction, undergoing investigations or causative factors established, patient accepting of treatment.	
		Unacceptable/Not mitigatable: Same as above but unable to adequately treat or patient not accepting of treatment.	
THERAPY			
Equipment: primary mobility device		**Optimal / Not applicable:** Equipment provides effective pressure distribution and positioning, and is expected to meet post-surgical discharge needs. Patient able to complete pressure redistribution techniques on the equipment. Equipment minimises shearing and friction.	
		Acceptable: Can assume low level of skin risk to support comfort/function**:** Equipment has capacity to be adjusted/modified to provide adequate pressure redistribution and positioning to be suitable for post-surgical needs.	
		Unacceptable/Mitigatable: Moderate to high risk of skin injury; patient agrees to mitigation. Equipment item likely to be unsuitable post-surgery and patient willing to explore replacement.	
		Unacceptable/Not mitigatable: Moderate to high risk of skin injury; patient declines mitigation	

Equipment: toilet or bath aid		**Optimal / not applicable:** Equipment provides effective pressure redistribution and positioning, and is expected to meet post-surgical discharge needs. Patient able to complete pressure redistribution techniques on the equipment. Equipment minimises shearing and friction.	
		Acceptable: Can assume low level of skin risk to support comfort/function. Equipment has capacity to be adjusted/modified to provide adequate pressure redistribution and positioning to be suitable for post-surgical needs.	
		Unacceptable/Mitigatable: Moderate to high risk of skin injury; patient agrees to mitigation. Equipment item likely to be unsuitable post-surgery and patient willing to explore replacement.	
		Unacceptable/Not mitigatable: Moderate to high risk of skin injury; patient declines mitigation	
Equipment: sleeping surface		**Optimal / not applicable:** Equipment effective pressure redistribution and positioning, and expected will meet post-surgical discharge needs. Patient able to complete pressure redistribution techniques on the equipment. Equipment minimises shearing and friction.	
		Acceptable: can assume low level of skin risk to support comfort/function	

		Unacceptable/Mitigatable: Moderate to high risk of skin injury; patient agrees to mitigation. Equipment item likely to be unsuitable post-surgery and patient willing to explore replacement.	
		Unacceptable/Not mitigatable: Moderate to high risk of skin injury; patient declines mitigation	
Care for equipment (e.g., cushions)		**Optimal / Not applicable:** Patient or caregiver follows recommendations accurately and consistently.	
		Acceptable: Variability in performance; can assume a low level of risk to support comfort/function	
		Unacceptable/Mitigatable: Unsafe; lacking consistent proper technique; faulty/inappropriate equipment; patient engaged in optimising safety and care for equipment	
		Unacceptable/Not mitigatable: Declines mitigation.	
Transfers: primary mobility device		**Optimal / Not applicable:** Patient or caregiver shows consistency to perform safe transfers at all times of the day.	
		Acceptable: Variability in performance; can assume a low level of risk to support comfort/function	
		Unacceptable/Mitigatable: Unsafe; lacking consistent proper technique (e.g., shear present); patient engaged in optimising safety	
		Unacceptable/Not mitigatable: declines mitigation	

Transfers: shower/toilet aid		**Optimal / Not applicable:** Patient or caregiver shows consistency to perform safe transfers at all times of the day.	
		Acceptable: Variability in performance; can assume a low level of risk to support comfort/function	
		Unacceptable/Mitigatable: Unsafe; lacking consistent proper technique (e.g., shear present); patient engaged in optimising safety	
		Unacceptable/Not mitigatable: declines mitigation	
Transfers: vehicle		**Optimal / Not applicable:** Patient or caregiver shows consistency to perform safe transfers at all times of the day.	
		Acceptable: Variability in performance; can assume a low level of risk to support comfort/function.	
		Unacceptable/Mitigatable: Unsafe; lacking consistent proper technique (e.g., shear present); patient engaged in optimising safety.	
		Unacceptable/Not mitigatable: Declines mitigation.	
PSYCHOSOCIAL			
Depression / Anxiety / PTSD		**Optimal:** No diagnosis.	
		Acceptable: Past diagnosis but no active symptoms.	

		Unacceptable/Mitigatable: Symptoms with established diagnosis or suspicion for meeting criteria, requiring further assessment. Patient being effectively treated and willing/able to engage in treatment.	
		Unacceptable/Not mitigatable: Symptoms with established diagnosis or suspicion for meeting criteria, requiring further assessment. Patient unwilling/unable to engage with treatment.	
Other serious mental illness		**Optimal:** No diagnosis of serious mental illness (e.g., schizophrenia, bipolar disorder).	
		Acceptable: Past diagnosis of serious mental illness with no active mania, delusions, or hallucinations.	
		Unacceptable/Mitigatable: Current diagnosis of serious mental illness, undergoing treatment (regular MH support, medication) and with willingness and ability to engage with treatment.	
		Unacceptable/Not mitigatable: Current diagnosis of serious mental illness, not being effectively treated and patient unwilling/unable to engage with treatment; or disease treatment resistant.	
Cognition		**Optimal:** No cognitive concerns.	
		Acceptable: Some concerns for cognition; should not interfere with ability to adhere to protocol.	

		Unacceptable/Mitigatable: Concerns for cognition that may interfere with protocol, but can be mitigated; patient engaging with neuropsychologist if appropriate.	
		Unacceptable/Not mitigatable: Cognitive concerns that may interfere with adherence to protocol, not currently able to be mitigated.	
Drug and alcohol use		**Optimal:** No history of illicit drug use and no current alcohol use (abstinent at least 1 year).	
		Acceptable: Past illicit drug use (>1 year ago) and/or current alcohol use within recommended limits.	
		Unacceptable/Mitigatable: Current illicit drug use (includes medicinal cannabis in smoked or vaped form) and/or problematic alcohol use; willing to engage in therapies to abstain.	
		Unacceptable/Not mitigatable: Current illicit drug use (includes medicinal cannabis in smoked or vaped form) and/or problematic alcohol use; unwilling to engage in therapies to abstain.	
Coping		**Optimal**: Has appropriate coping strategies; willing to use them; open to additional support.	
		Acceptable: Has coping strategies; not willing to use them; open to increasing willingness and accept support.	

		Unacceptable/Mitigatable: Does not have coping strategies but willing to accept support to develop strategies.	
		Unacceptable/Not mitigatable: Does not have coping strategies and unwilling to accept support; or difficulty in developing adequate strategies despite supports being in place.	
Personal supports and Funding		**Optimal:** Current level of personal care/ supports and funding suitable for post-surgical discharge planning.	
		Acceptable: Current level of personal care/supports and funding suboptimal; but does not pose significant barriers to optimal post-surgical discharge planning.	
		Unacceptable/Mitigatable: Current level of personal care/supports and funding inadequate; willing to explore options to optimise supports and funding options.	
		Unacceptable/Not mitigatable: Current level of personal care/supports and funding inadequate; not willing/able to be mitigated.	

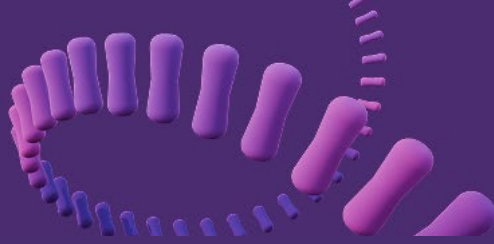
Interpretation Guidelines (PRECISE Tool)

	Green	Lower risk of post-flap complications. Likely suitable to proceed with flap surgery.
	Yellow	Increased risk of post-flap complications. Requires careful clinical consideration before proceeding.
	Red	Very high risk of post-flap complications. Conservative (non-surgical) management may be more appropriate.

Notes:

- This tool does not replace a full multidisciplinary (MDT) assessment. It is a guide to support decision-making on readiness and suitability for flap surgery and must be considered alongside other clinical assessments.
- It can also be used as an adjunct tool to support communication with the patient and their other health care providers.
- Adapted from Eddy et al. (2025).

Eddy, B., Murphy Kruse, M., Arneson, T., Hussung, J., Greenwood, D., Stien, C., King, C., Simone, A., Goldish, G., Kaka, A., Choudry, U., Cayci, C., & Olney, C. M. (2025). Implementation and clinical impact of an interdisciplinary tool to promote skin integrity after flap surgery in Veterans with spinal cord injury. *The Journal of Spinal Cord Medicine,* 48(3), 415–428. https://doi.org/10.1080/10790268.2024.242043

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