

# Spinal cord injury bladder management

A guide for clinicians in non-specialist units

JUNE 2023

Neurogenic bladder is the loss of normal bladder function. It may be due to a spinal cord injury when there is an interruption of neural pathways between a person's brain and urinary system, resulting in reduced or no control of the bladder and urination.

This resource is for healthcare professionals who provide care to people with spinal cord injury (SCI) in a non-specialist context who have limited access to specialist resources.

It focuses on bladder management, particularly from the time of acute care and covers:

- what needs to be done immediately
- developing an individualised bladder management plan
- implementing routine care.

The goals include maximising the person's quality of life, minimising health complications and ensuring that bladder management techniques meet the lifestyle and needs of the person with SCI. This includes optimising fluid intake, nutrition and lifestyle to reduce bladder-related complications and assist self-management.

## Contents

At a glance	1
Summary	2
Bladder care with spinal cord injury	3
Management actions	10
Referrals and community-based SCI care	15
About the project	17
Background	18
Additional resources	20
References	22
Appendix 1: Trial of void protocol	25
Appendix 2: Trial of void – consumer education sheet	26

# At a glance



## Basic principles

To help prevent catheter-associated urinary tract infection, apply the basic principles for urinary catheter insertion and management in acute care.

Ensure catheter patency (that urine is draining effectively). Check for catheter or tubing kinks, catheter blockage and that the drainage bag is placed below the level of the bladder.

Routinely inspect the skin and immediately change position of tubes and devices if there are signs of irritation.

To help prevent device-related pressure injury, take care with placement of any catheter or drainage device.

## Immediate actions

- Insert an indwelling urethral catheter immediately if a spinal cord injury is suspected. Ideally remove it as early as possible when long-term bladder management is determined based on comprehensive assessment.
- Assess bladder impairment type via neurological examination after the initial period of spinal shock, and urodynamic study ideally within three months.
- Develop an individualised, interdisciplinary bladder management plan that supports self-management.



## Planning

- Key aims of a bladder management plan are to:
  - maintain bladder health and continence
  - ensure that management techniques meet the needs, budget and lifestyle of the person with SCI.
- Review the bladder management plan more often in response to serious or persistent bladder conditions or a major change in circumstances.
- Annual review of the urinary tract by a general practitioner or healthcare professional is recommended. This may include ultrasound, blood tests (EUC, eGFR) and urine test (ACR). Where indicated, review may include x-ray, CT scan, renal ultrasound or urodynamic study.



## Routine care

- Indwelling catheters see [page 13](#).
- Intermittent catheters see [page 13](#).
- Spontaneous voiding see [page 13](#).
- Appropriate fluid intake is generally 2-3 litres of water per day
  - unless fluid restrictions are required.

# Summary

**Neurogenic bladder occurs when there is an interruption of neural pathways between a person's brain and urinary system, resulting in reduced or no control of the bladder and urination.**

There are two types of neurogenic bladder most commonly experienced by people with spinal cord injury (SCI), regardless of whether their injury is complete or incomplete. These are:

- an overactive bladder – a bladder that holds less urine and spasms as it fills
- an underactive bladder – a bladder with absent, or sluggish, reflex response to bladder fullness resulting in stretching overfilling and overflow leakage.

A mixed neurogenic bladder can also occur. This is where different urinary tract muscles, with roles in urine storage and expulsion, are differently overactive or underactive.

Immediately after a SCI, a person may experience spinal shock. This is a temporary condition that changes a person's bladder function and management while present. See the section, [Acute care stage specific considerations](#).

A person-centred bladder management program is established as early as possible after the period of spinal shock has passed. The goal is to maximise the person's quality of life and minimise health complications that may arise from a neurogenic bladder. Key aims are:

- to maintain bladder health and continence
- ensure that bladder management techniques meet the lifestyle and individual needs of the person with SCI.

General considerations that are the foundation of any bladder management program are to optimise:

- fluid intake
- nutrition
- lifestyle.

These can reduce bladder-related complications and assist self-management.

# Bladder care with spinal cord injury

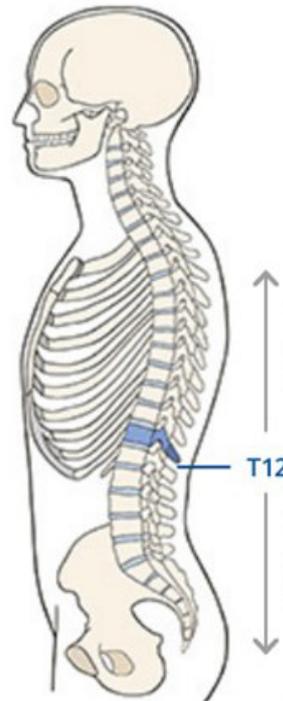
Neurogenic bladder is a condition in which messages carried by nerves between the brain and bladder are interrupted by illness or injury, such as SCI.<sup>1,2,3</sup>

The person’s sense of bladder fullness, and/or their urge to hold or expel urine, is altered. This is most commonly experienced as either an overactive or underactive bladder, depending on the level of SCI.

- An overactive/ upper motor neuron (UMN) bladder is a bladder that holds less urine and spasms as it fills. It presents as frequent, low-volume urination. It is associated with injury to the spinal cord at or above T12 vertebral level.
- An underactive/ lower motor neuron (LMN) bladder is a bladder with no, or very weak, reflex response to bladder fullness resulting in stretching, overfilling, overflow leakage and risk of high residuals. An underactive bladder is associated with injury to the spinal cord below T12 vertebral level.
- A mixed neurogenic bladder can also occur, where different urinary tract muscles, with roles in urine storage and expulsion, are differently overactive or underactive.

People with either complete or incomplete SCI may have a neurogenic bladder.

**Figure 1: Neurogenic bladder type associated with level of spinal cord injury**



**Overactive bladder**

At and above T12 vertebral level (sacral nerves are intact): Overactive or spastic (hyperreflexic) bladder

**Underactive bladder**

Below T12 vertebral level (sacral nerves are damaged): Underactive or flaccid (areflexic) bladder

Note: Sacral nerves are responsible for controlling the bladder.

Source: Middleton JW, Arora M, McCormick M and O’Leary D (2020).<sup>4</sup>

## Acute care specific considerations

During the period of spinal shock post-injury that lasts up to six weeks, the bladder does not typically contract in order to empty. An indwelling urethral catheter prevents overdistension of the bladder.<sup>5</sup>

The indwelling urethral catheter should only be removed once there has been a comprehensive assessment, and a long-term bladder management plan is developed in consultation with appropriate specialties (such as spinal or urology).

## General (post-acute) considerations for long-term bladder management

A neurogenic bladder following SCI is associated with incontinence, higher risk of urinary tract infections (UTI) and complications related to bladder and kidney health. Therefore, an appropriate bladder management program must be developed.

The goal of a bladder management program is to maximise the person's quality of life and minimise health complications that may arise from neurogenic bladder.<sup>6</sup>

### Key aims

Maintain bladder health and continence

- Distension of the bladder should be avoided. A distended bladder in a person with normal bladder capacity is approximately 500ml. However, people with an overactive neurogenic bladder can have extremely limited bladder capacity (e.g. could be less than 100ml). People with an underactive neurogenic bladder are at increased risk of bladder distension, as they are often able to hold large volumes.

- Residual urine after emptying to be less than 100ml, ideally less than 50ml.
- Complications such as UTI, stones, strictures and autonomic dysreflexia are minimised (through prevention, early identification and rapid management).

Ensure that bladder management techniques meet the lifestyle and individual needs of the person with SCI, considering:

- the type of bladder impairment
- renal function
- mobility (particularly regarding sitting balance and hand function)
- cognitive ability
- personal factors, such as budget, way of life, access to personal care and motivations for managing different bladder care options.<sup>7</sup>

All bladder management methods require:

- consistency
- high standards of hygiene
- monitoring of signs and symptoms for complications, such as UTI, pressure injuries caused by bladder management devices and autonomic dysreflexia.

### Fluid intake, nutrition and lifestyle

Adequate hydration, a healthy diet and regular exercise help to boost bladder health and prevent complications such as stone formation and constipation.

Maintaining good hygiene all the time is a good way to prevent and mitigate infection, especially when attending to bladder management.

## Medication

Anticholinergic medication may be recommended for people with SCI to relax overactive bladders and reduce high bladder pressure. This will help to decrease incontinence and other complications such as ureteric reflux. After the period of spinal shock has passed, most people with overactive/ UMN SCI will need anticholinergic medication. However, for people with mixed or underactive/ LMN SCI, videourodynamic (VUD) study and specialist advice are required to determine the need for anticholinergics.<sup>8</sup>

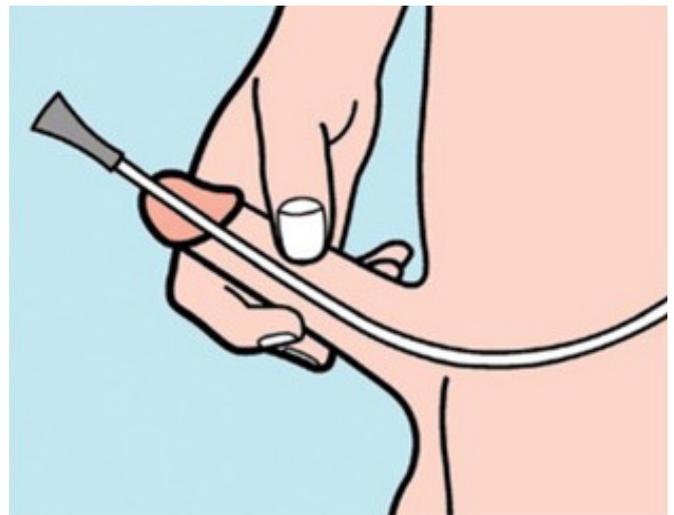
The most common anticholinergic medication is oxybutynin (sold as Ditropan). Solifenacin (Vesicare) may be used when Ditropan is not tolerated. Transdermal medications (e.g. oxybutynin patches, sold as Oxytrol) may be used if the person with SCI is unable to tolerate oral medications. There are alternative medications for people in circumstances where oral or transdermal anticholinergic medications are unsuitable.<sup>9</sup> For example, intravesical botulinum toxin (Botox) administered via cystoscopy every six to nine months.

Oral or transdermal medications may be used simultaneously with intravesical Botox to optimise overactive bladder management. In an overactive bladder, sphincter muscle or bladder outlet spasms can affect the ability of the bladder to empty completely.

For some people, specialists may recommend oral alpha-adrenergic blockers to relax the bladder sphincter. Botulinum toxin (Botox) injection into the sphincter muscle may be required.<sup>10</sup>

Current research does not support taking Hiprex with vitamin C or cranberry as an effective treatment of UTI in people with neurogenic bladder.<sup>11, 12, 13</sup> If cranberry is thought to be helpful, tablets are recommended rather than juice that has added sugar.<sup>14</sup>

Figure 2: Intermittent catheterisation - male



Source: ACI Urology Network (2019)<sup>17</sup>

To help prevent build-up of drug-resistant bacteria in people with SCI, probiotics with lactobacillus reuteri RC-14 and lactobacillus GR-1 may be considered.<sup>15</sup> Where antibiotics are required, use exactly as prescribed. For frequent UTIs, specialist advice may be sought and continued low dose antibiotics may be recommended.

## Spontaneous voiding

Occasionally some people with SCI may be able to safely initiate voiding, with complete emptying, in response to the body's signals of a full bladder. However, most people post SCI require assistance to empty their bladder safely and effectively – usually using some form of catheterisation.

## Catheterisation

Where any type of catheterisation is assessed as the most appropriate bladder management option, there are SCI-specific considerations to be aware of, in addition to each hospital's general procedures. (See the section, [Catheter associated urinary tract infection](#).) Indwelling catheterisation can be urethral or suprapubic. Intermittent catheterisation is attended via the urethra only.

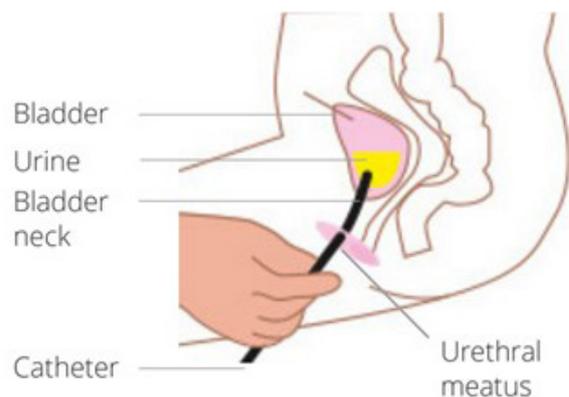
### Clean intermittent catheterisation

Intermittent catheterisation ('in out' catheterisation) is generally the preferred method of catheterisation as it has the lowest complication rate.<sup>16</sup> It remains the safest method of bladder management for avoiding colonisation with drug-resistant bacteria.<sup>15</sup>

Clean intermittent catheterisation (CIC) every four to six hours suits people with SCI who:

- have sufficient hand function and necessary cognition for self-catheterisation or access to carer-attended catheterisation
- are not sensitive to urethral pain
- are willing and motivated to catheterise every four to six hours
- have adequate bladder outlet resistance
- have well-controlled detrusor muscles (see [medication](#))
- do not have abnormal urethral anatomy.

Figure 3: Intermittent catheterisation – female



Source: Middleton JW, Arora M, McCormick M and O'Leary D (2020)<sup>18</sup>

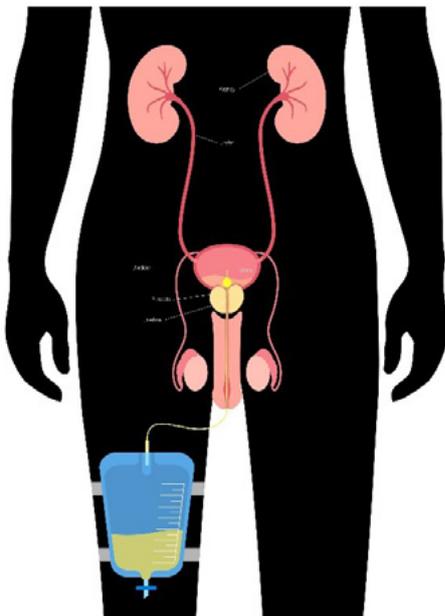
### Indwelling catheterisation

While intermittent catheterisation is the preferred method for people with SCI, for people who are unable or unwilling to attend intermittent catheterisation the recommendation is for indwelling catheterisation.

Suprapubic catheters are preferred for people who require indwelling catheters permanently. This is because indwelling urethral catheters can damage the urethra, penis and sphincter muscles, and the muscles around the lower urinary tract. They can also be an interference for sexually active people.

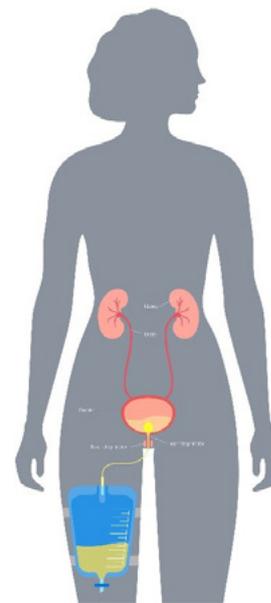
Suprapubic catheterisation is a reversible surgical procedure always performed by a urologist under anaesthetic.

Figure 4: Indwelling catheterisation – male



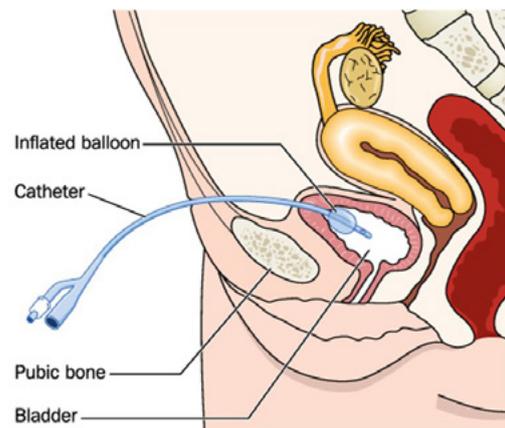
Source: Adobe Stock Image

Figure 5: Indwelling catheterisation – female



Source: Adobe Stock Image

Figure 6: Suprapubic catheterisation



Source: Middleton JW, Arora M, McCormick M and O'Leary D (2020)<sup>18</sup>

### Urinary diversion

When all other conservative neurogenic bladder management options have been exhausted, surgical interventions such as urinary diversion may be considered.<sup>19</sup>

## Conditions and complications

People with a neurogenic bladder because of SCI are at risk of a range of complications.<sup>20</sup> These are most commonly due to infections associated with urine staying too long in the urinary tract or backing up into the kidneys. Catheters increase risk of infection. Indwelling catheters are also at risk of blocking. People with SCI have a higher risk of stone formation and bladder cancer.

Earliest possible identification and management of bladder health risks is crucial for preventing the onset of autonomic dysreflexia and other serious complications. Table 1 provides a basic outline of common bladder complications and conditions and how they may present in people with SCI. The treatment notes are prompts for further reading only. See [Table 2](#) for links to comprehensive resources.

## Catheter associated urinary tract infection

Catheter associated urinary tract infection (CAUTI) is a preventable complication for people with catheters that can impact their health, length of stay in acute care, future risk of drug-resistant infections and quality of life.<sup>22, 23, 24</sup>

The NSW Clinical Excellence Commission has published a suite of resources to prevent CAUTI by improving catheterisation practices in health settings. A link to their tools and resources is in [Table 2](#).

Autonomic dysreflexia (AD) is most commonly triggered by a bladder-related cause. Please familiarise yourself with the [Treatment Algorithm for Autonomic Dysreflexia \(Hypertensive Crisis\) In Spinal Cord Injury](#).

**Table 1: Basic outline of bladder conditions and complications**

Condition/ complication	Symptoms	Diagnosis and treatment notes
<b>Urinary tract infection (UTI)</b>	<ul style="list-style-type: none"> <li>• Increased incontinence</li> <li>• Fever, chills</li> <li>• Sweating</li> <li>• Feeling unwell</li> <li>• Increased spasms</li> <li>• Sediment, stones, blocking catheters</li> <li>• Bladder pain and urgency if sensation is present</li> <li>• Autonomic dysreflexia (AD)</li> <li>• Blood in urine</li> <li>• Malodorous urine</li> </ul>	<ul style="list-style-type: none"> <li>• Asymptomatic bacteriuria is not usually treated</li> <li>• Increase fluid intake as this helps to dilute urine and flush out bacteria</li> <li>• Symptomatic UTI should be treated by appropriate antibiotics.</li> <li>• If UTI is suspected change the catheter and obtain a clean sample before starting antibiotics</li> </ul>

Table 1: Basic outline of bladder conditions and complications (cont.)

Condition/complication	Symptoms	Diagnosis and treatment notes
<b>Bladder/kidney stones</b>	<ul style="list-style-type: none"> <li>• Recurrent UTIs</li> <li>• Lower back, abdominal, bladder pain if sensation is present</li> <li>• Blood in urine</li> <li>• Unable to pass urine</li> <li>• Sediment, stones, blocking catheters</li> <li>• Increased spasms</li> <li>• Fever, chills</li> <li>• Feeling unwell</li> <li>• Autonomic dysreflexia (AD)</li> </ul>	<ul style="list-style-type: none"> <li>• Small stones may be passed by drinking a lot of water</li> <li>• Cystoscopy, and the use of laser to crush the stones</li> <li>• Lithotripsy, which uses shock waves to break up kidney stones</li> <li>• Sometimes larger stones need removal with open surgery</li> <li>• People with SCI receiving treatment for stones should be observed for signs of urosepsis</li> <li>• Monitor renal function</li> <li>• Consider referral to a dietitian for long-term prevention</li> </ul>
<b>Hydronephrosis</b>	<ul style="list-style-type: none"> <li>• In a person with SCI, the usual signs and symptoms may not be obvious</li> <li>• An ultrasound of the kidneys can detect hydronephrosis at an early stage</li> </ul>	<p>As a matter of urgency:</p> <ul style="list-style-type: none"> <li>• address cause of condition</li> <li>• nephrostomy may be required</li> <li>• consult with urology</li> </ul>
<b>Bladder cancer</b>	<ul style="list-style-type: none"> <li>• People with a long-term SCI have an increased risk of bladder cancer, 5 to 7 times higher than the general population</li> <li>• It is important to have a high index of suspicion for bladder cancer, because it is often asymptomatic</li> <li>• Blood in urine</li> <li>• Dark urine</li> <li>• Frequent urination</li> </ul>	<ul style="list-style-type: none"> <li>• Regular cystoscopy and bladder biopsy to be performed by a urologist in people most at risk</li> <li>• Consult with oncology and urology</li> </ul>
<b>Autonomic dysreflexia – in people with SCI level at or above T6</b>	<p>Most episodes of autonomic dysreflexia are caused by bladder issues, particularly bladder distension. See <a href="#">Treatment Algorithm for Autonomic Dysreflexia (Hypertensive Crisis) In Spinal Cord Injury</a> the autonomic dysreflexia management guidance on the ACI website.</p>	

# Management actions

Actions to manage the acute care stage, catheterisation and establishment of a bladder management program,<sup>25,26</sup> are outlined below:



## Immediate actions

High-priority steps, especially relevant or important to know for the first few days of care following injury



## Planning

Actions related to health planning and management



## Routine care

Regular actions required for day-to-day care



## Immediate actions<sup>27</sup>

- Insert an indwelling urethral catheter immediately if SCI is suspected.
- Refer to your hospital's procedures for catheterisation.
- Consider the positioning and securement of the catheter and drainage device, to ensure effective drainage and to help prevent device-related complications such as pressure injury and urethral trauma. Routinely inspect areas of the skin in contact with tubes and change their position immediately if there are signs of irritation. If necessary protective barriers, padding or tapes can be used to minimise risk of skin damage.
- Develop an interdisciplinary bladder management plan in consultation with a referring SCI unit (SCIU), individualised to the person's needs and to guide self-management.
- An indwelling urethral catheter is ideally removed as early as possible in line with the person's bladder management plan.
- Spontaneous voiding could be trialled with incomplete spinal cord injury, only once consultation with a SCIU or spinal rehabilitation team has occurred. This will help determine long-term bladder management options. It can be initiated at any time after the initial period of spinal shock. A protocol for Trial of Void is at [Appendix 1](#) and a Trial of Void consumer education sheet is at [Appendix 2](#).



## Planning

- As part of a person's bladder management plan, neurological examination and VUD study (usually performed from three months post-injury) may be used to assess bladder impairment.
- Bladder management recommendations may change over time, independent of the person's initial spinal cord neurological assessment.
- Revise the bladder management plan annually, or more often in response to serious or persistent bladder conditions or major change in circumstances.<sup>28</sup>
- Annual review of the urinary tract by a general practitioner (GP) or healthcare professional may include ultrasound, blood tests (EUC, eGFR) urine test (ACR).
- Less frequently, review may include x-ray, CT scan, renal ultrasound or VUD study.
- Regular cystoscopy and bladder biopsy by a urologist are recommended for early detection of bladder cancer in people with SCI who are most at risk, such as people who have recurrent UTIs or long-term indwelling catheters.



## Routine care

- Appropriate fluid intake is 2-3 litres of water per day. Limiting drinks that have a diuretic effect such as coffee and alcohol is recommended. However, for people using intermittent catheterisation, fluid intake may need to be adjusted so that hydration considerations are balanced with manageable frequency of catheterisation. Fluid restrictions due to a person's clinical condition or comorbidities should be maintained.

## Indwelling catheters

- Indwelling catheters are best secured to the side of the leg to reduce kinks and pulling. Alternate the leg that they are attached to every 24 hours. This is to help prevent urethral erosion, suprapubic site hypergranulation and device-related pressure injury.
- Monitor indwelling catheters at least every four hours for kinks or blockages (e.g. from stones or sediment build-up). If the catheter is blocked, change it immediately to prevent autonomic dysreflexia and other complications.
- Change drainage bags weekly.
- Catheters should be kept clean and changed regularly in line with local facility policy, or if clinically indicated.
- **Catheters must not be clamped at any time**, including before a renal ultrasound, for people with SCI because there is a risk of autonomic dysreflexia and/or bladder distension.
- Replace the catheter immediately following removal to avoid complications.
- Where necessary, urine samples to test for UTIs or other bladder conditions should be collected after a fresh catheter change, to reduce risk of a false positive result.
- Follow the basic principles for CAUTI prevention (see [Additional resources](#)).

## Intermittent catheterisation

- For people with SCI using intermittent catheters, pre-lubricated and hydrophilic catheters can reduce risk of UTIs and trauma to urethra.
- Typically, intermittent catheterisation is every 4-6 hours, depending on a person's bladder capacity and fluid intake.



### Reflex voiding

- Some males with long-term established SCI may already use voiding techniques. This is where bladder voiding is triggered by suprapubic tapping, or crede manoeuvre (external bladder compression) in conjunction with an external urinary collection device. Monitor for signs of complications, such as high residual urine volumes and recurrent UTIs.
- These techniques are **not recommended** for people with new SCIs.
- If clinicians in non-specialist settings need further information on how to support this voiding technique, or if there are signs of complications in a person using it, contact a SCIU at the Royal North Shore Hospital, the Royal Rehab or the Prince of Wales Hospital (see [Referrals and community-based SCI care](#)).

# Referrals and community-based SCI care

Bladder management requires continued interdisciplinary support and specialist input from a range of medical and allied health services. This is regardless of whether the person has been living with SCI for weeks or years.

An interdisciplinary approach to assessment and planning is best practice. This means that specialists are aware of each other’s work with the person and contribute to a single integrated care plan. Usually this is through a lead healthcare professional, such as a GP or a nominated member of an acute care team.

## Common referrals

### Spinal specialist

Spinal specialists can provide overall systems review to ensure bladder management is optimised. Contact details for NSW specialist SCI services are outlined in the adjacent table. Further information is available at the [Agency for Clinical Innovation \(ACI\) Spinal Cord Injury Referral Directory](#).

Metro spinal services	
<b>Royal North Shore Hospital (RNSH) Spinal Cord Injury Unit</b>	Phone (02) 9926 7111
<b>Royal Rehab Spinal Cord Injury Unit</b>	Phone (02) 9808 9269
<b>Prince of Wales Hospital Spinal Cord Injury Unit</b>	Phone (02) 9382 2222
<b>NSW Spinal Outreach Service</b> Multidisciplinary transitional outreach program for people discharged from the SSCIS units.	Phone (02) 9808 9666
Regional spinal services	
<b>Hunter Spinal Cord Injury Service (community-based rehab)</b>	Phone (02) 4925 7888
<b>Royal Newcastle Centre (inpatient rehabilitation for low/incomplete SCI)</b>	Phone (02) 4921 3000
<b>Port Kembla Hospital Rehabilitation Service</b>	Phone (02) 4223 8203
<b>Rural SCI Service (RSCIS)</b> Network of nine specialist medical/multi-disciplinary spinal clinics per year across rural NSW.	Phone (02) 9808 9666

**Continence nurse**

Continence nurses assist with development, monitoring and review of bladder management plans and monitor complications and conditions that impact continence of people with SCI.

**Occupational therapist**

Occupational therapists can support rehabilitation with the goal of achieving as much independence as possible with bladder management. They also advise on equipment and aids.

**Dietitian**

Well-balanced diets and appropriate hydration are important factors for bladder management. This is because dietary and fluid intake habits are associated with rates of UTIs, bladder and kidney stones and other bladder health issues.

**Urologist**

People with SCI may need to have their bladder and sphincter behaviour re-assessed throughout their lives. This is to account for changes associated with their health (including women's reproductive health and cycles), impairment level and ageing.

**Physiotherapist**

Physiotherapists can assist by training functional skills to optimise independence with voiding, increasing hand function to increase dexterity and strength to open leg bag valves, apply leg straps or hold urine bottles. They can also optimise muscle strength of hamstrings for long sitting during catheterisation and if patients have a urinary leak (LMN lesions), training of pelvic floor muscles can be introduced.

**Medical practitioner**

Medical practitioners such as GPs support and monitor bladder health. This can be done via regular screening and coordinating referrals to specialists as needed.

**Other specialists**

As per an interdisciplinary approach other specialists, such as psychologists or social workers, may influence a person's bladder management plan.

# About the project

This is one of four clinical resources on the provision of SCI care, developed primarily for clinicians who work with people with SCI in non-specialist settings. These include resources on bladder, bowel, skin and AD. They have been developed to fill a knowledge gap identified by non-specialist services to support the co-design of a Spinal Cord Injury Networked Model of Care.

The purpose of this clinical resource is to provide a summary of considerations for SCI care, sufficient to guide basic care and support clinicians to seek further information.

Information about the impact is outlined in the [Summary](#), followed by bladder management that includes:

- immediate actions
- planning
- routine care.

These two sections are best read together, to gain a full picture of how and why.

# Background

This is a clinical resource on bladder management for people with SCI, particularly from the time of injury in acute care.

The target audience is healthcare professionals who are providing healthcare to people with SCI in a non-specialist context, with limited access to specialist resources. An intended outcome of this resource is to reduce unwarranted variation in care for people with SCI between specialist and non-specialist sites.

## Spinal cord injury

Spinal cord injury is damage to the spinal cord. As the spinal cord is a critical neural pathway between the brain and the rest of the body, SCI results in reduced function and mobility. The reduction can be to different extents, depending on the type and level of injury. The damage to the spinal cord may be complete or incomplete. Also, the higher the injury to the spine, the more parts of the body will have reduced or no function or mobility.

In Australia, SCIs may be the result of a trauma such as a motor vehicle collision or a workplace injury, or as a result of non-traumatic causes such as infection, cancer or degenerative disorders.

Polytrauma patients, who present with multiple traumatic injuries and SCI, may require a different care approach to what is outlined in this resource. In such circumstances, this resource should be used alongside specialist multi-trauma policies and guidelines.

People not diagnosed with SCI, but who present with neurological deficit from other conditions, such as spina bifida or multiple sclerosis, may also benefit from the information and actions in this resource. However, the focus of this resource is people with SCI.

## Consultation and evidence review

This resource was developed in line with the ACI Principles for Developing Clinical Guidance (2021).

Consultation with healthcare professionals was facilitated by the NSW State Spinal Cord Injury Services. The process included these actions.

1. Formation of a working group that included clinicians from non-specialist settings to determine training needs and ensure content was fit for purpose, and clinicians with specialist knowledge to ensure content was current and evidence-based.
2. The working group met via regular online meetings to co-produce and refine the core content in this resource. The regular meetings had their own value, beyond delivering this resource. They contributed to a shared understanding and shared language between specialist and non-specialist clinicians on matters related to SCI care.
3. Final consultation with key healthcare professionals in non-specialist and specialist SCI units was conducted for review and approval.

To inform the development of this resource, a PubMed search was conducted on 31 August 2022 of terms ("spinal cord injuries" OR "paraplegia" OR "quadriplegia") and ("neurogenic" AND "bladder management") filtered from 2014 to 2022. Broader studies were opportunistically gathered from snowball searches informed by reference lists of key articles and stakeholder advice.

Google was searched for grey literature using key terms such as ("spinal cord injury" AND "bladder management") and ("neurogenic" AND "bladder management"). Only the first three pages (or top 30 hits) of the search results were screened.

## Guideline review

Clinical guidelines that inform this work include those by the Spinal Cord Injury Rehabilitation Evidence (SCIRE)<sup>29</sup> and the Consortium for Spinal Cord Medicine.<sup>30</sup>

## Further information

This resource is an adjunct to other more detailed resources currently available on bladder management for people with SCI. It functions as:

1. a framework of basic care and is intended as a starting point for further discussion with SCIU specialists
2. a complement to local policies and guidelines on bowel management and related areas of care, that supports staff to develop a deeper understanding of the needs of people with SCI that builds on their current practice – not an alternative or replacement resource.

A range of more detailed resources, with different purposes and target audiences, has been used in the development of this document. They provide further information for people with SCI, their families and diverse professionals in the care team. See [Table 2. Resources for further information](#).

## Additional resources

Table 2: Resources for further information

Purpose	Includes information on
<p><a href="#">Management of the Neurogenic Bladder for Adults with Spinal Cord Injuries</a> fact sheet NSW Agency for Clinical Innovation (ACI), 2014</p>	
<p><b>Target:</b> Non-specialist healthcare professionals involved in bladder assessment and management for people with SCI</p> <p><b>Content:</b> Functional anatomy; impairment following SCI; bladder management goals and recommendations</p> <p><b>Total pages:</b> 15</p>	<ul style="list-style-type: none"> <li>• Bladder conditions</li> <li>• Bladder management in acute care</li> <li>• Catheterisation and reflex voiding</li> <li>• Day-to-day management actions</li> <li>• Health planning and maintenance</li> </ul>
<p><a href="#">Health Maintenance for Adults with Spinal Cord Injuries</a> fact sheet NSW Agency for Clinical Innovation (ACI), 2014</p>	
<p><b>Target:</b> Non-specialist healthcare professionals involved in health plans for people with SCI</p> <p><b>Content:</b> Health maintenance recommendations for key areas of health and functioning for people with SCI, including kidney and bladder</p> <p><b>Total pages:</b> 1 page for kidney and bladder with other relevant general sections such as Red flags and Additional resources in this 15-page fact sheet</p>	<ul style="list-style-type: none"> <li>• Health planning and maintenance</li> </ul>
<p><a href="#">Health Maintenance Tool - How to stay healthy and well with a spinal cord injury A tool for consumers from consumers</a> See the section, The bladder and its associated problems SCI Wellness Project – Royal Rehab with University of Sydney and icare, 2020</p>	
<p><b>Target:</b> People with SCI</p> <p><b>Content:</b> Know about your bladder and kidneys; check if you have a problem; prevention; management of bladder and kidney problems; further resources</p> <p><b>Total pages:</b> 32</p>	<ul style="list-style-type: none"> <li>• Bladder conditions</li> <li>• Catheterisation and reflex voiding</li> <li>• Day-to-day management actions</li> <li>• Health planning and maintenance</li> </ul>

Table 2: Resources for further information (cont.)

Purpose	Includes information on
<a href="#">Catheter associated urinary tract infection (CAUTI) prevention website</a> , suite of resources NSW Clinical Excellence Commission, 2016	
<p><b>Target:</b> Acute care settings</p> <p><b>Content:</b> Resources to help reduce the number of CAUTIs in acute care settings, including basic principles; implementation steps (for resources); indications for catheter use; catheter insertion; maintenance and care; catheter removal; audit and investigation; education.</p>	<ul style="list-style-type: none"> <li>• Bladder conditions</li> <li>• Catheterisation and reflex voiding</li> <li>• Basic principles for prevention of CAUTI</li> </ul>
<a href="#">Your bladder</a> fact sheet Forward Ability Support (previously Paraquad), 2019	
<p><b>Target:</b> People with SCI</p> <p><b>Content:</b> Bladder functioning – normal and following SCI, main types of bladder management, daily management actions, managing risk of UTI, financial assistance for bladder management, health support and further resources.</p> <p><b>Total pages:</b> 2</p>	<ul style="list-style-type: none"> <li>• Bladder conditions</li> <li>• Day-to-day management actions</li> </ul>

## References

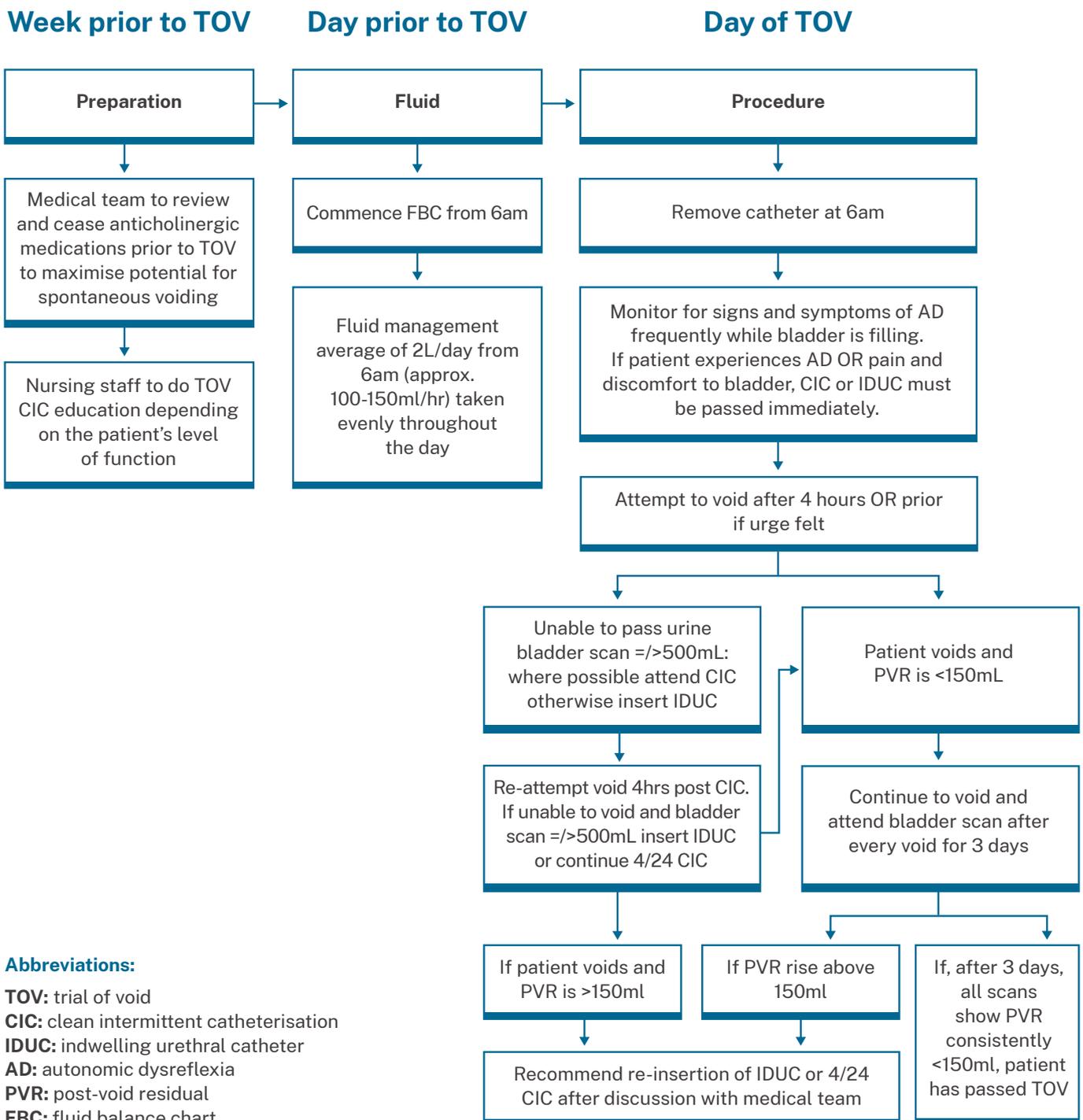
1. Panicker JN. Neurogenic bladder: epidemiology, diagnosis, and management. *Semin Neurol*. 2020 Oct;40(5):569-579. DOI: 10.1055/s-0040-1713876.
2. Milligan J, Goetz LL, Kennelly MJ. A primary care provider's guide to management of neurogenic lower urinary tract dysfunction and urinary tract infection after spinal cord injury. *Top Spinal Cord Inj Rehabil*. 2020 Spring;26(2):108-115. DOI: 10.46292/sci2602-108.
3. Goldmark E, Niver B, Ginsberg DA. Neurogenic bladder: from diagnosis to management. *Curr Urol Rep*. 2014 Oct;15(10):448. DOI: 10.1007/s11934-014-0448-8.
4. Middleton JW, Arora M, McCormick M, et al. Health maintenance tool: How to stay healthy and well with a spinal cord injury. A tool for consumers by consumers; Warning signs, P.14 [Internet]. NSW, Australia: SCI Wellness Project, Royal Rehab; 2020 [cited May 2023]. Available from: <https://www.icare.nsw.gov.au/-/media/icare/unique-media/global-header/news-and-stories/news/health-maintenance-toolkit-a-guide-for-people-with-spinal-cord-injury/spinal-cord-injury-health-maintenance-toolkit.pdf>
5. Welk B, Schneider MP, Thavaseelan J, et al. Early urological care of patients with spinal cord injury. *World J Urol*. 2018 Oct;36(10):1537-1544. DOI: 10.1007/s00345-018-2367-7.
6. Vamour N, Dequierez PL, Segulier D, et al. Early interventions to prevent lower urinary tract dysfunction after spinal cord injury: a systematic review. *Spinal Cord*. 2022 May;60(5):382-394. DOI: 10.1038/s41393-022-00784-z.
7. Romo PGB, Smith CP, Cox A, et al. Non-surgical urologic management of neurogenic bladder after spinal cord injury. *World J Urol*. 2018 Oct;36(10):1555-1568. DOI: 10.1007/s00345-018-2419-z.
8. Middleton JW, Arora M, McCormick M, et al. Health maintenance tool: How to stay healthy and well with a spinal cord injury. A tool for consumers by consumers; Effects of a spinal cord injury on bladder and kidney function, P.7 [Internet]. NSW Australia: SCI Wellness Project, Royal Rehab; 2020 [cited May 2023]. Available from: <https://www.icare.nsw.gov.au/-/media/icare/unique-media/global-header/news-and-stories/news/health-maintenance-toolkit-a-guide-for-people-with-spinal-cord-injury/spinal-cord-injury-health-maintenance-toolkit.pdf>
9. Kuo HC. Clinical application of botulinum neurotoxin in lower-urinary-tract diseases and dysfunctions: where are we now and what more can we do? *Toxins (Basel)*. 2022 Jul 18;14(7):498. DOI: 10.3390/toxins14070498.
10. Middleton JW, Arora M, McCormick M, et al. Health maintenance tool: How to stay healthy and well with a spinal cord injury. A tool for consumers by consumers; Effects of a spinal cord injury on bladder and kidney function, P.7 [Internet]. NSW Australia: SCI Wellness Project, Royal Rehab; 2020 [cited May 2023]. Available from: <https://www.icare.nsw.gov.au/-/media/icare/unique-media/global-header/news-and-stories/news/health-maintenance-toolkit-a-guide-for-people-with-spinal-cord-injury/spinal-cord-injury-health-maintenance-toolkit.pdf>
11. Lee B, Haran M, Hunt L, et al. Spinal-injured neuropathic bladder antisepsis (SINBA) trial. *Spinal Cord*. 2007 Aug;45(8):542-50. DOI: 10.1038/sj.sc.3101974
12. Jepson R, Williams G, Craig J. Cranberries for preventing urinary tract infections. *Cochrane Database Syst Rev*. 2012 Oct 17;10(10):CD00132. DOI: 10.1002/14651858.CD001321.pub5

13. Le B, Bhuta T, Simpson J, et al. Methamphetamine for preventing urinary tract infections. *Cochrane Database Syst Rev*. 2012 Oct; 2012(10): CD003265. DOI: 10.1002/14651858.CD003265.pub3
14. Middleton JW, Arora M, McCormick M, et al. Health maintenance tool: How to stay healthy and well with a spinal cord injury. A tool for consumers by consumers; How to prevent a urinary tract infection, P.16 [Internet]. NSW Australia: SCI Wellness Project, Royal Rehab; 2020 [cited May 2023]. Available from: <https://www.icare.nsw.gov.au/-/media/icare/unique-media/global-header/news-and-stories/news/health-maintenance-toolkit-a-guide-for-people-with-spinal-cord-injury/spinal-cord-injury-health-maintenance-toolkit.pdf>
15. Toh S, Lee B, Simpson J, et al. Effect of probiotics on multi-resistant organism colonisation in persons with spinal cord injury: secondary outcome of ProSCIUTTU, a randomised placebo-controlled trial. *Spinal Cord*. 2020 Jul;58(7):755-767. DOI: 10.1038/s41393-020-0420-z.
16. New PW. The evidence supporting single-use intermittent catheters in people with spinal cord injury. *Spinal Cord Ser Cases*. 2020 Sep 30;6(1):89. DOI: 10.1038/s41394-020-00339-5.
17. NSW Agency for Clinical Innovation (ACI). Clean intermittent urethral catheterisation in adults: Guide [Internet]. Sydney, NSW: ACI; Sept 2019 [cited May 2023]. Available from: [https://aci.health.nsw.gov.au/\\_data/assets/pdf\\_file/0003/553647/ACI-Urology-Intermittent-urethral-catheterisation.pdf](https://aci.health.nsw.gov.au/_data/assets/pdf_file/0003/553647/ACI-Urology-Intermittent-urethral-catheterisation.pdf)
18. Middleton JW, Arora M, McCormick M, et al. Health maintenance tool: How to stay healthy and well with a spinal cord injury. A tool for consumers by consumers; Ways to empty your bladder, P.9 [Internet]. NSW Australia: SCI Wellness Project, Royal Rehab; 2020 [cited May 2023]. Available from: <https://www.icare.nsw.gov.au/-/media/icare/unique-media/global-header/news-and-stories/news/health-maintenance-toolkit-a-guide-for-people-with-spinal-cord-injury/spinal-cord-injury-health-maintenance-toolkit.pdf>
19. Chen SF, Kuo HC. Interventional management and surgery of neurogenic lower urinary tract dysfunction in patients with chronic spinal cord injury: a urologist's perspective. *Low Urin Tract Symptoms*. 2022 May;14(3):132-139. DOI: 10.1111/luts.12434.
20. Nseyo U, Santiago-Lastra Y. Long-term complications of the neurogenic bladder. *Urol Clin North Am*. 2017 Aug;44(3):355-366. DOI: 10.1016/j.ucl.2017.04.003.
21. Liu N, Zhou M, Biering-Sørensen F, et al. Iatrogenic urological triggers of autonomic dysreflexia: a systematic review. *Spinal Cord*. 2015 Jul;53(7):500-9. DOI: 10.1038/sc.2015.39.
22. Linsenmeyer TA. Catheter-associated urinary tract infections in persons with neurogenic bladders. *J Spinal Cord Med*. 2018 Mar;41(2):132-141. DOI: 10.1080/10790268.2017.
23. Chang SC, Zeng S, Tsai SJ. Outcome of different approaches to reduce urinary tract infection in patients with spinal cord lesions: a systematic review. *Am J Phys Med Rehabil*. 2020 Nov;99(11):1056-1066. DOI: 10.1097/PHM.0000000000001413.

24. Kinnear N, Barnett O'D, Callaghan M, et al. The impact of catheter-based bladder drainage method on urinary tract infection risk in spinal cord injury and neurogenic bladder: a systematic review. *Neurourol Urodyn*. 2020 Feb;39(2):854-862. DOI: 10.1002/nau.24253.
25. Kreydin E, Welk B, Chung D, et al. Surveillance and management of urologic complications after spinal cord injury. *World J Urol*. 2018 Oct;36(10):1545-1553. DOI: 10.1007/s00345-018-2345-0.
26. Wyndaele JJ. The management of neurogenic lower urinary tract dysfunction after spinal cord injury. *Nat Rev Urol*. 2016 Dec;13(12):705-714. DOI: 10.1038/nrurol.2016.206.
27. Panicker JN, Fowler CJ, Kessler TM. Lower urinary tract dysfunction in the neurological patient: clinical assessment and management. *Lancet Neurol*. 2015 Jul;14(7):720-32. DOI: 10.1016/S1474-4422(15)00070-8.
28. Przydacz M, Chlosta P, Corcos J. Recommendations for urological follow-up of patients with neurogenic bladder secondary to spinal cord injury. *Int Urol Nephrol*. 2018 Jun;50(6):1005-1016. DOI: 10.1007/s11255-018-1852-7.
29. Hsieh J, Ethans K, Benton B, et al. Bladder management following spinal cord injury. In: Eng JJ, Teasell RW, Miller WC, et al, editors. Vancouver, Canada: Spinal Cord Injury Research Evidence Professional (SCIRE); 2020 [cited May 2023]. Available from: <https://scireproject.com/evidence/bladder-management/introduction/>
30. Consortium for Spinal Cord Medicine. Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals [Internet]. USA: Consortium for Spinal Cord Medicine; 2008 [cited May 2023]. Available from: <https://www.pvanewengland.org/wp-content/uploads/2020/11/early-acute-management-in-adults-with-spinal-cord-injury.pdf>

# Appendix 1: Trial of void protocol

If there are individual circumstances you are concerned with, contact an expert clinician (see Referrals)



## Appendix 2: Trial of void – consumer education sheet

### Important points to remember when commencing a trial of void

A trial of void is a test to see whether your bladder has returned to normal and you can pass urine normally and safely. If your trial of void is successful, you may be able to permanently remove your urinary catheter.

1. Before the trial of void, your doctor will usually stop any medications that keep your bladder relaxed.
2. During the trial, it is essential to keep track of how much fluid you are drinking and to follow the recommended daily fluid intake guidelines.
3. After your catheter is removed, you must attempt to void every four hours and each void will be measured.
4. After each void, you need to have a bladder scan to assess how much urine remains in the bladder after you have voided.
5. During the trial, if you experience an urge, have a desire to void or become uncomfortable, attempt to pass urine normally.
6. If possible, put your feet up during the day to stop too much fluid building up in your legs and feet as this can lead to your body producing large volumes of urine after you lie down at night.
7. Monitor for any signs and symptoms of a urinary tract infection including:
  - burning/stinging sensation during voiding
  - cloudy and/or concentrated urine
  - smelly urine
  - fever/chills

- increase in spasms in lower leg, abdomen or bladder
- nausea or headache
- low back pain or other aches
- feeling tired, unwell or as if you are getting the flu.

If at any time you are concerned about your bladder function, medications or suspect that you have a urinary tract infection, ensure that you discuss this with your nurse or doctor.

The Agency for Clinical Innovation (ACI) is the lead agency for innovation in clinical care.

We bring consumers, clinicians and health-care managers together to support the design, assessment and implementation of clinical innovations across the NSW public health system to change the way that care is delivered.

The ACI's clinical networks, institutes and taskforces are chaired by senior clinicians and consumers who have a keen interest and track record in innovative clinical care.

We also work closely with the Ministry of Health and the four other pillars of NSW Health to pilot, scale and spread solutions to healthcare system-wide challenges. We seek to improve the care and outcomes for patients by re-designing and transforming the NSW public health system.

Our innovations are:

- person-centred
- clinically led
- evidence-based
- value-driven.

[aci.health.nsw.gov.au](http://aci.health.nsw.gov.au)



AGENCY FOR  
**CLINICAL  
INNOVATION**

*Our vision is to create the future of healthcare,  
and healthier futures for the people of NSW.*