

# Bladder Changes after Spinal Cord Injury

Authors: SCIRE Community Team | Reviewed by: [Bonnie Nybo](#) | Last updated: 3 January 2019

Bladder changes are common after spinal cord injury (SCI). This page provides an overview of the types of bladder changes that happen after SCI and the basics of bladder care.

## Key points

- Most people with SCI experience some bladder changes after injury, but the type and symptoms depend on the characteristics of the injury.
- There are two main types of bladder problems after SCI:
  - *Spastic (reflex) bladder* involves unpredictable emptying caused by overactive bladder muscles. It happens with injuries above T12.
  - *Flaccid (non-reflex) bladder* involves an inability to empty the bladder because of 'floppy' and underactive bladder muscles. It happens with injuries below T12.
- People with SCI are also at risk of complications like urinary tract infections, autonomic dysreflexia (if above T6), kidney and bladder stones, and kidney damage.
- Bladder care after SCI involves developing a regular bladder routine that meets your unique bladder needs. This may include a variety of treatments, such as catheters, medications and injections.

## What is neurogenic bladder?

*Neurogenic bladder* is bladder dysfunction caused by damage to the nerves, brain or spinal cord. After a spinal cord injury, nerve signals that normally allow the brain and bladder to communicate with one another cannot get through. This can affect bladder sensation and control.

Bladder changes after SCI are different for everyone. Some people experience only mild changes to how the bladder works (such as greater sense of urgency when the bladder is full); while others experience complete loss of bladder sensation and control.

The symptoms of neurogenic bladder depend on the characteristics of the SCI, such as the level and completeness of the injury. There are two main types of neurogenic bladder after SCI, spastic bladder and flaccid bladder (see below).

### Neurogenic bladder is different from other bladder problems

There are many different types of bladder problems that are not caused by nerve damage. For example, bladder problems may be related to aging or problems with the pelvic floor muscles. However, neurogenic bladder is very different and needs to be treated with specialized care.

## Why do bladder changes happen after SCI?

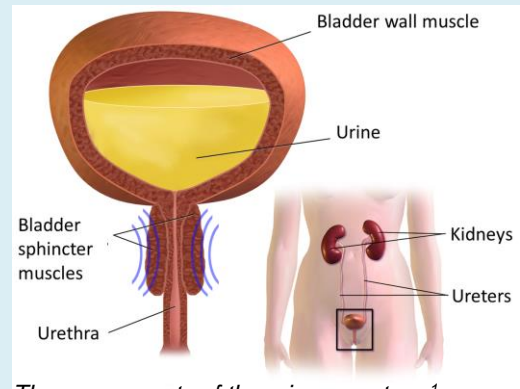
### The urinary system

The urinary system helps the body filter and remove waste products and excess fluids. It consists of the kidneys, ureters, bladder, urethra, and bladder and sphincter muscles.

The kidneys filter the blood to produce urine, which is passed to the bladder through narrow tubes called ureters. The bladder is a sac that collects urine. It is connected to a tube called the urethra, through which urine passes out of the body.

Filling and emptying of the bladder are partly controlled by the bladder muscles:

- The bladder wall muscle (detrusor muscle) is smooth muscle that covers the outside of the bladder. When it contracts, it squeezes the bladder and pushes urine out through the urethra. When it is relaxed, the bladder is loose and can be filled with urine.
- The bladder sphincter muscles (urethral sphincter or valve muscles) are two muscles which surround the exit of the bladder like a ring. When they tighten, they close off the urethra and hold urine in the bladder. When they relax, they allow urine to drain. The internal sphincter muscle is controlled unconsciously and the external sphincter muscle is controlled consciously.



*The components of the urinary system.<sup>1</sup>*

### How does the bladder work when the spinal cord is intact?

When the bladder is not full, the bladder wall muscle is relaxed and urine produced by the kidneys passes through the ureters to fill the bladder. The bladder sphincter muscles are tightened so urine does not leak out.

When there is enough urine to stretch the bladder walls, a nerve signal is sent up the spinal cord to tell the brain that the bladder is full. Because the brain controls the external sphincter muscle, urine can be held until an appropriate time to empty.

When the bladder is to be emptied, signals are sent from the brain down the spinal cord to cause the coordinated squeezing of the bladder wall muscle and relaxation of the bladder sphincter muscles to allow urine to pass through the urethra and out of the body. Control of urination involves both bladder reflexes (in which emptying is triggered when the bladder is full) and voluntary control (in which urine can be held until a socially appropriate time to empty).

### The bladder after SCI

When the spinal cord is injured, nerve signals that normally allow the brain and bladder to communicate with one another cannot get through. This can lead to changes to bladder control and sensation.

## Bladder control

Signals from the brain are needed for the bladder muscles to contract and relax properly. If these signals cannot get through, the bladder muscles may contract too much, too little, or at the wrong times, depending on whether the person has spastic or flaccid bladder.

## Bladder sensation

When the bladder is full, the nerve signals that would normally be sent up the spinal cord to the brain are interrupted. This can lead to reduced ability to feel sensations from the bladder, such as when it is full.

## What is spastic bladder?

*Spastic bladder* (also called ‘reflex bladder’ or ‘overactive bladder’) is when the bladder wall muscle is overactive. Spastic bladder happens because the brain can no longer control reflexes in the bladder muscles. This leads to tension in the bladder wall muscle when it is supposed to be relaxed and spasms of the bladder muscles which cause emptying. Spastic bladder happens when the spinal cord is injured above T12.

Usually, the bladder sphincter muscles are also overactive and cannot coordinate very well with the bladder wall muscle. This is called *detrusor dyssynergia* or *detrusor sphincter dyssynergia (DSD)*. When this happens, the bladder sphincter muscle tightens while the bladder wall muscle contracts, like squeezing a balloon that is tied off. This can cause high pressures within the bladder that can damage the bladder and kidneys.

## Symptoms of spastic bladder:

- Loss of control of bladder emptying (incontinence), leading to random emptying (accidents), inability to empty when you want to and leaking
- Reflex emptying in response to things like touching the thigh or abdomen
- People who have some bladder sensation may experience sudden strong urges or a frequent need to urinate
- Incomplete emptying of the bladder caused by poor coordination of the bladder wall muscle and bladder sphincter muscles (detrusor dyssynergia)
- Reduced or complete loss of bladder sensation

## What is flaccid bladder?

*Flaccid bladder* (also called ‘non-reflex bladder’ or ‘underactive bladder’) occurs with injuries below T12-L1 (i.e cauda equina injuries). In this situation the bladder wall muscle is ‘floppy’ and cannot squeeze to empty the bladder.

Flaccid bladder happens because there is a loss of both input from the brain and reflexes from the spinal cord. This causes the bladder wall muscle to stay loose and ‘floppy’ all the time. When this happens, the bladder wall muscle cannot squeeze the bladder to empty urine.

Usually, the external sphincter muscle is also overly relaxed, causing leaking during activities like transfers and coughing. However, the internal sphincter muscle is often in spasm and does not relax enough to allow urine to pass out of the body easily.

## Symptoms of flaccid bladder:

- Inability to empty the bladder, including loss of reflex emptying
- Incomplete bladder emptying, leading to some urine remaining in the bladder after emptying (urinary retention)
- Damage to the walls of the bladder when they are overstretched
- Backflow of urine back to the kidneys (reflux), which can damage the kidneys
- Reduced or complete loss of bladder sensation

## How are bladder changes diagnosed?

### Bladder examination

Bladder changes are diagnosed primarily through a bladder examination. A bladder examination typically involves several components:

- Your health provider will ask you questions about your medical history, symptoms, bladder routine, and current treatments.
- You may be asked to complete a ‘urinary diary’ and/or detailed questionnaires about your bladder care. This often involves recording how often you empty your bladder, how much urine is produced each time, and details about your fluid intake (what you drink, when and how much).
- A physical examination may involve an inspection of the abdominal, pelvic and genital areas, as well as neurological testing of your reflexes, muscle strength, and sensation.

### Other testing

Other testing may also be done if your health providers need further information.

#### Urine culture

A urine culture and sensitivity test involves collecting urine in a sterile container to test for infection. Urine samples are usually collected mid-stream while emptying so the test is more accurate. If the sample is collected from an indwelling catheter, the catheter should be changed first. Samples are never taken from a urine drainage bag.

#### Blood tests

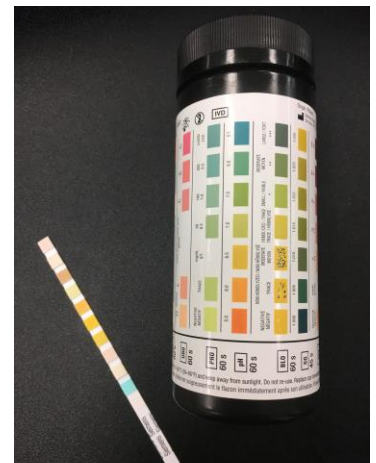
Blood tests may be used to identify if there is an infection or to test kidney function. This usually involves testing for blood urea nitrogen (BUN) and creatinine. This test may be done if there is concern about kidney function and possible kidney damage.

#### Ultrasound

Ultrasound is an imaging technique that uses sound waves to visualize deep tissues. Ultrasound imaging may be done over the kidneys (called renal ultrasound) to detect possible damage, kidney stones and infections.

#### Urodynamic testing

Urodynamic testing includes special tests that can be used to look at bladder pressures and urine flow. It can test how the bladder acts when it fills and empties, how well it coordinates, and the pressure within the bladder. This test may involve urinating into a special container that can measure the flow and volume of urine, insertion of a catheter to measure the leftover urine, and inserting water into the



*The dipstick or urine test strip is a basic diagnostic tool for identifying presence of substances or infection in urine.<sup>2</sup>*

bladder to measure your ability to prevent emptying. It may also involve the use of electrical measurement of muscle activity by placing a small catheter into the rectum.

Typical urodynamic measures:

- **Bladder Capacity:** The amount of urine the bladder can hold.
- **Voiding Efficiency:** The amount of urine voided compared to the amount in the bladder before voiding. More efficiency means less urine is left in the bladder.
- **Bladder Compliance:** The ability of the bladder to stretch in response to an increased amount of urine in the bladder. Allowing the bladder to stretch as more urine accumulates there is desirable. Without the stretch there will be large increases in pressure, which is damaging to the urinary tract.

### Imaging

Other imaging, such as x-ray, computed tomography (CT), and magnetic resonance imaging (MRI) are sometimes used for further investigation of bladder problems.

### Cystoscopy

*Cystoscopy* (sometimes called a ‘bladder scope’) is the use of a very small camera that can be inserted into the urethra to look at the urinary tract. Cystoscopy can be used to identify bladder stones, bladder health issues or damage including bladder cancer. It can also perform therapeutic procedures if needed such as removing tissue or stones.

## How are bladder changes managed?

### Early bladder care

In the early hospital phase right after injury, the circulatory system is stabilizing and the prevention of infections and other complications is the priority. During this phase, an indwelling catheter is placed in the bladder to constantly drain urine from the bladder. The catheter will be changed regularly and maintained in a sterile way by your nurse.

### Bladder care in rehab and after

After the acute phase, bladder care will involve transitioning to more long-term bladder care techniques and developing a suitable bladder routine. Keep in mind that spastic bladder and flaccid bladder happen for different reasons and are managed differently.

## Bladder routines

A bladder routine is a regular routine of bladder techniques and treatments that are done every day to maintain bladder function and health. This usually involves techniques to regularly empty the bladder, prevent leaks, and avoid serious complications long-term.

Every person's routine is different and often involves trial and error to find the methods that best meet your unique symptoms, abilities, preferences, and lifestyle. There is a wide range of different techniques and treatments that may make up your routine, including catheters, medications, and methods of stimulation like electrical stimulation.

Other things to consider when developing a bladder routine:

- Timing and amount of fluids
- Caffeine and alcohol consumption
- Scheduling of bladder emptying (such as how long between catheterizations, before going to bed or certain activities, after drinking fluids)
- What type of equipment to use, such as type of catheter and collection bag for different situations
- What to do if you have a bladder infection or other new health problem
- Regular assessment of bladder care with your health team

## Spastic bladder management

The goals of spastic bladder management are to reduce overactivity in the bladder wall muscle which causes accidents, leaking, and wetness; as well as preventing high pressures within the bladder. This may include treatments such as:

- Indwelling catheters, condom catheters, and/or intermittent catheterization to drain the bladder
- Reflex voiding may help to empty the bladder for some people
- Anticholinergic medications may help to relax the bladder muscles
- Botulinum toxin (Botox) injections to help relax the bladder muscles
- Bladder augmentation surgery to increase the capacity of the bladder to hold urine

## Flaccid bladder management

The goals of flaccid bladder management are to regularly empty the bladder to prevent overfilling and increased pressure in the bladder; and to prevent leaking and wetness. This may include treatments such as:

- Intermittent catheterization or indwelling catheters
- Condom catheters or pouches may be used to catch leaks but not for emptying
- Alpha-adrenergic blockers may help to relax the bladder sphincter muscles
- Botulinum toxin (Botox) injections
- Surgical techniques such as sphincterotomy or stents

## Urinary catheters for bladder management

*Urinary catheters* are pieces of equipment that are used to drain urine from the bladder. There are many different ways that catheters are used.

Refer our chapter on [Urinary Catheters](#) for more information

### Intermittent catheterization

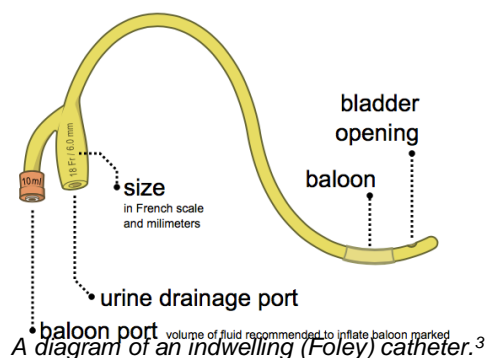
*Intermittent catheterization* is when a catheter is inserted and removed through the urethra to drain the bladder at regular intervals throughout the day. Bladder emptying with intermittent catheterization must be done hygienically and on a regular schedule.

Intermittent catheterization is usually used by people who have enough hand function to perform the procedure independently. It is the closest method to normal bladder function, where the bladder fills continuously for a period of time and then empties all at once.

### Indwelling catheters

Indwelling catheters (such as Foley catheters) are catheters that are inserted directly into the bladder and remain in place to continually drain the bladder. Indwelling catheters may be inserted through the urethra (called urethral catheters) or through a surgically created hole through the abdomen (called suprapubic catheters).

Indwelling catheters are usually used if inserting your own catheter independently is difficult or there are concerns about leaking between sessions of emptying.



### Condom catheters (only for males)

Condom catheters are catheters that resemble a condom and are placed over the penis and connected through tubes to a collection device. Condom catheters are usually used by people that leak in between emptying or for individuals who have the ability to trigger emptying by causing a spasm of their bladder (called reflex voiding).

One of the main concerns of condom catheters is incomplete bladder drainage, which can cause kidney damage. A careful medical examination is needed to ensure that condom catheters are a safe option for use.



An example of a condom catheter, for male use.<sup>4</sup>

### Catching leaks

Some people may use medical ‘penis pouches’ (loosely fitted bags that can be placed around the penis), pads, or other devices to catch small leaks in between catheterizations. These will depend on the person and their risk of other problems like pressure injuries, and should be discussed in detail with your health providers before using.

## Reflex voiding for bladder management

*Reflex voiding* is a technique that can be used by some people with spastic bladder to stimulate urination. Reflex voiding is usually done by tapping over the bladder lightly and repeatedly with the fingertips or the side of the hand to stimulate reflexes in the bladder muscles. This technique can be used to help improve bladder emptying during intermittent catheterization and when using condom catheters. However, only a small number of people can use this technique safely without increasing the pressure too high in the bladder. Speak to your health team for more information about this technique.

### Many reflex voiding techniques are not recommended

Older techniques for reflex voiding such as the *Valsalva maneuver* (increasing abdominal pressure by holding the breath and bracing) and the *Crede technique* (applying manual pressure onto the bladder through the abdomen) **are no longer recommended** because they can cause too much pressure in the bladder, which can damage the kidneys.

## Medications and injections for bladder management

Several medications may be used to help manage bladder problems after SCI. These may help to relax overactive muscles or cause the bladder muscles to contract, depending on the type of bladder change experienced. A number of other medications may also be used for different aspects of bladder treatment after SCI.

### Inserting liquid medications into the bladder

Some medications may be dissolved in a liquid solution and introduced into the bladder through a catheter after emptying. The solution is then left in the bladder until the next urination. This is called an *intravesical instillation*. Intravesical installations may be used because their effects are more specific to the bladder, instead of throughout the whole body like oral medications are.

### Anticholinergic medications

*Anticholinergic medications* (sometimes called *antimuscarinic medications*) are used to relax muscle spasms in the bladder wall muscle. This can help to reduce pressure within the bladder, increase the ability of the bladder to hold urine, and help reduce incontinence.

There are many different types of anticholinergic medications, with the most common being oxybutynin (Ditropan, Ditropal XL, Oxytrol, Uromax), tolterodine (Detrol), fesoterodine (Toviaz), trospium chloride (TCL, Trosec), propiverine hydrochloride (Mictonorm), darifenacin (Enablex), and solifenacin (Vesicare). These can be taken by mouth or administered directly into the bladder in a liquid form.





## Alpha-adrenergic blockers

*Alpha-adrenergic blockers* are medications that are used to encourage the bladder sphincter muscles to relax to allow urine to flow out of the body. This can help with bladder emptying and help prevent urinary retention. Common alpha-adrenergic blockers that may be used include tamsulosin, mosixylyte, terazosin, and phenoxybenzamine.

## Botulinum toxin injections



Injecting small doses of some strains of *botulinum toxin* (*Botox*) into muscles can help to reduce muscle spasms. Injections into the bladder wall muscle or the external sphincter muscle can help to relax these muscles to help prevent leaking and incontinence or to improve bladder emptying. The effects of these injections can last for 6 to 12 months.

## Other medications

- *Capsaicin*, a chemical commonly found in hot peppers, and its derivative *resiniferatoxin*, may be administered as a liquid into the bladder to help increase bladder capacity and reduce urinary frequency, leaking, and bladder pressures related to bladder wall muscle overactivity.
- *Nociceptin/orphanin phenylalanine glutamine* is another medication with effects similar to capsaicin and resiniferatoxin. It may also be given into the bladder to reduce overactivity in the bladder wall muscle.
- Medications that are normally used to treat spasticity may also help with bladder problems related to spastic bladder. For example, *baclofen* and *clonidine* may help with bladder function after SCI.
- *Phosphodiesterase-5 (PDE5) inhibitors* such as *tadalafil* and *vardenafil* may help to reduce overactivity in the bladder wall muscle and increase bladder capacity.
- *4-Aminopyridine (fampridine)* improves the transfer of nerve signals, which may help individuals regain sensation and control of the bladder sphincter muscles to improve emptying.



*Capsaicin is commonly found in hot peppers.<sup>7</sup>*

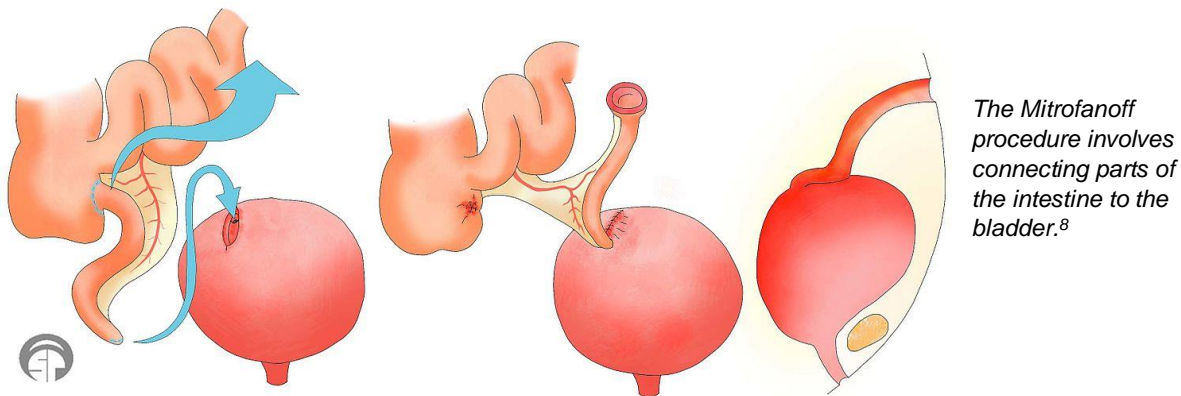
## Bladder surgery and stents for bladder management

Bladder surgery is usually only considered if other less-invasive treatments are not effective. Surgical procedures that may be used include the Mitrofanoff procedure, bladder augmentation, sphincterotomy (for males), and urethral stents.

### Mitrofanoff procedure

The *Mitrofanoff procedure* involves the use of the appendix or part of the intestine to create a channel between the abdomen and bladder. The channel self-seals shut when the catheter is removed. This channel can be used for insertion of a catheter for intermittent catheterization. The urine can then be drained into a

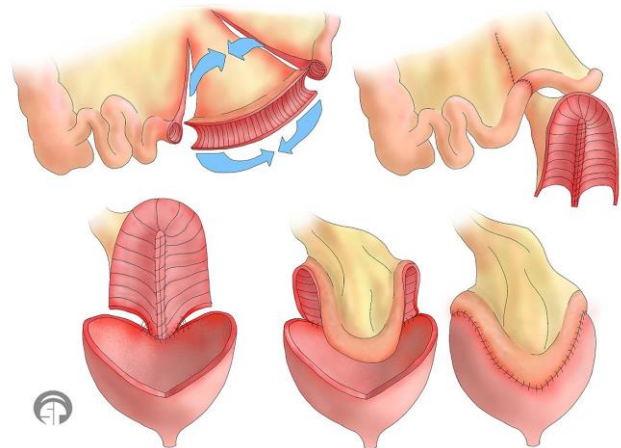
cup or toilet. This may be useful for people who have difficulty self-catheterizing directly into the urethra, and is often used for women (who have greater difficulty inserting catheters).



## Bladder augmentation

*Bladder augmentation* (also called *augmentation cystoplasty*) is a procedure in which the bladder is made bigger to create more room to hold urine. This is done by removing a segment of the intestine and stitching this tissue to an incision into the bladder to make the bladder bigger. Bladder augmentation may help to reduce pressure in the bladder and help to prevent incontinence related to spastic bladder.

*Bladder augmentation is a surgical procedure done to enlarge the bladder by using parts of the intestine.<sup>9</sup>*



## Sphincterotomy (for males)

*Sphincterotomy* is a surgical procedure where the internal sphincter muscle (the circular muscle that surrounds the outlet of the bladder) is cut to weaken the muscle. This is done to improve bladder emptying if this muscle is causing difficulties emptying. After a sphincterotomy, bladder emptying will happen; therefore, you must wear a collection device.

## Urethral stents

*Urethral stents* are prosthetic tubes (usually coils of metal) with openings on both sides that are inserted into the opening of the bladder to hold it open. This is done to allow for improved bladder emptying for people with difficulty emptying due to overactivity in the bladder sphincter muscles.

## Electrical stimulation and other treatments for bladder management

Electrical stimulation can be used to activate muscles. Electrical stimulation may be used to assist with bladder problems after SCI by stimulating activity in the bladder muscles to help control muscle function.

### Electrical stimulation



Electrical stimulation can be used to stimulate the nerves to help normalize the activity of the bladder muscles. Stimulation of the sacral nerves through the implantation of a stimulator and electrodes may help to improve control of bladder emptying. This is sometimes referred to as neuromodulation.

Refer our chapter on [Functional Electrical Stimulation](#) for more information!

Commercially available electrical bladder stimulation systems such as the Vocare system may be used for this purpose. However, these systems may not be available in all locations or for all individuals because of their cost.

### Acupuncture

Acupuncture and electroacupuncture have also been suggested as treatment options to help with bladder function by influencing nerve signals related to bladder function.

Refer our chapter on [Acupuncture](#) for more information!

## What other complications are related to bladder changes?

Changes to bladder function after SCI can lead to greater risk of developing bladder complications.

### Urinary tract infections

Refer our chapter on [Urinary Tract Infections](#) for more information!

A common side effect of bladder problems and their treatments is infections of the bladder and kidneys. These are known as *urinary tract infections* or *UTIs*.

Urinary tract infections can be a very serious problem when severe, and if left untreated, they can lead to a life-threatening condition called sepsis. In the early days of SCI care, complications of urinary tract infections were the most common cause of death after SCI.

Today, treatment and prevention of urinary tract infections is much more effective and infections can be treated effectively in most cases. However, it is very important to take steps to prevent infections and to seek out treatment for new infections as soon as they are detected.

The symptoms of urinary tract infections are not always easy to recognize. They usually consist of both generalized symptoms of infection and symptoms related to urination, such as:

- Fever, chills, or tiredness
- Cloudy, red (from blood), or bad-smelling urine
- More frequent or severe muscle spasms
- Autonomic dysreflexia (in people with injuries above T6)
- An urge to urinate often (if sensation is present)
- Pain or burning feeling while urinating (if sensation is present)
- Pain in the abdomen or back (if sensation is present)

If you suspect you might have a urinary tract infection, contact a health provider as soon as possible. Urinary tract infections are usually treated with antibiotics. However, keep in mind that people who use indwelling catheters or intermittent catheterization will often have bacteria in their urine that does not cause symptoms. It is recommended that antibiotics are **not** taken to treat bacteria unless you also have symptoms.

## Kidney and Bladder stones

*Kidney and bladder stones* are solid pieces of material that form within the kidneys or bladder. They form because of high concentrations of minerals in the urine and other factors. If these stones become large, it can be difficult to pass them out of the body in the urine, leading to pain and other symptoms. Stones in the kidney can interfere with the filtering of blood and drainage of urine to the bladder. Stones in the bladder can block the flow of urine.

People with SCI are at risk of developing kidney or bladder stones because of changes to how the urinary system works. A number of different factors can contribute to kidney stones, such as improper use of catheters, urinary tract infections, not drinking enough water, backup of urine to the kidneys, and high levels of calcium in the body.

The symptoms of kidney and bladder stones may include:

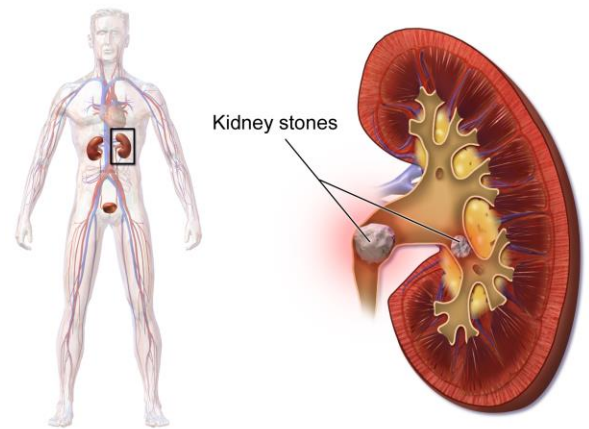
- Pain in lower back or abdomen (if sensation is present)
- Frequent urinary tract infections
- Increased sweating
- Blood in the urine
- Increased spasms
- Seeing stones in the urine
- Nausea and vomiting
- Burning or pain during urination (if sensation is present)

Kidney and bladder stones that do not cause symptoms are not treated, but are allowed to pass out of the body on their own. Kidney stones that do cause symptoms are treated with a number of different treatments including medications, *extracorporeal shock wave lithotripsy* (a form of treatment using ultrasound waves to break a stone into smaller pieces), *ureteroscopy* (using a thin scope that is inserted into the urethra to break up or dislodge a stone), and surgery. Many bladder stones can be removed at the time of cystoscopy.

## Kidney damage and failure

Long-term bladder problems, especially when poorly managed, can damage the kidneys. When kidney damage has progressed to the point where the kidneys no longer function effectively, it is called kidney failure or renal failure.

Bladder problems after SCI can lead to kidney damage if the bladder frequently overfills and cannot empty. Bladder overfilling can result from poor bladder care (such as not emptying the bladder completely or regularly). This can lead to high pressures in the bladder that cause urine to back up to and damage the kidneys.



*Kidney stones are solid mineral 'stones' that form in the kidneys or bladder.<sup>11</sup>*

Kidney failure is permanent and is treated with dialysis or kidney transplants. Early consideration and careful bladder management throughout life is the most important part of preventing kidney damage long-term. This may include catheterizing regularly and on-time, emptying the bladder completely each time, and regularly checking in with your doctor about your bladder care.

## Bladder cancer

There is an increased risk of bladder cancer among people who use indwelling catheters. However, screening recommendations are controversial since we do not yet know who needs to be screened, how often, and how soon after injury. Speak to your health provider for more information.

## Other related problems

Bladder changes after SCI can also contribute to a number of other medical conditions, such as:

- Bladder complications can cause increased spasticity
- Bladder complications can trigger episodes of autonomic dysreflexia (with injuries above T6)
- Wetness from bladder complications can contribute to skin irritation and breakdown

## The bottom line

Bladder changes are common after SCI. Bladder care is an important part of self-management after SCI to prevent complications and maintain good health and quality of life.

Bladder care after SCI involves developing a regular bladder routine that meets your unique bladder needs. This may include a variety of techniques and treatments, such as catheters, medications, injections and other treatments. Speak to your health team about which bladder management options are best for you. Regular follow up with your doctor is recommended yearly.

For a list of included studies, please see the Reference List. For a review of what we mean by ‘strong’, ‘moderate’, and ‘weak’ evidence, please see [SCIRE Community Evidence Ratings](#).

## Related resources

SCIRE Community. Bowel Changes after Spinal Cord Injury. Available from:  
<https://community.scireproject.com/topic/bowel/>

SCIRE Community. Urinary Catheters. Available from: <https://community.scireproject.com/topic/urinary-catheters/>

## Abbreviated reference list

This page has been adapted from SCIRE Project (Professional) “Bladder Management” Chapter:

**Hsieh J, McIntyre A, Iruthayarajah J, Loh E, Ethans K, Mehta S, Wolfe D, Teasell R. (2014). Bladder Management Following Spinal Cord Injury. In Eng JJ, Teasell RW, Miller WC, Wolfe DL, Townson AF, Hsieh JTC, Connolly SJ, Noonan VK, Loh E, McIntyre A, editors. Spinal Cord Injury Rehabilitation Evidence. Version 5.0: p 1-196.**

Available from: <https://scireproject.com/evidence/bladder-management/introduction/>

Full reference list available from: <https://community.scireproject.com/topic/bladder/#reference-list>

Glossary terms available from: <https://community.scireproject.com/topics/glossary/>

### Image credits

1. Modified from: [Urinary Sphincter](#) ©BruceBlaus, [CC BY-SA 4.0](#)
2. Image by SCIRE Community Team
3. [Foley catheter EN](#) ©Olek Remesz, [CC BY-SA 3.0](#)
4. [Cewnik zewnetrzny 0211](#) ©Sobol2222 assumed (based on copyright claims), [CC0 1.0](#)
5. [Medications](#) ©Steve Buisinne, [CC0 1.0](#)
6. [Syringe](#) ©Arek Socha, [CC0 1.0](#)
7. [Chili](#) ©PublicDomainPictures, [CC0 1.0](#)
8. [Mitrofanoff](#) ©Aphelpsmid, [CC BY-SA 4.0](#)
9. [Ileocystoplasty JPEG](#) ©Aphelpsmid, [CC BY-SA 4.0](#)
10. [Synapse](#) ©Clker-Free-Vector-Images, [CC0 1.0](#)
11. Modified from: [Nephron Anatomy](#) ©BruceBlaus, [CC BY-SA 4.0](#)

Disclaimer: This document does not provide medical advice. This information is provided for educational purposes only. Consult a qualified health professional for further information or specific medical advice. The SCIRE Project, its partners and collaborators disclaim any liability to any party for any loss or damage by errors or omissions in this publication.