A WOMAN'S UROLOGIST
RESTORING CONFIDENCE

Neurogenic Bladder

What is a neurogenic bladder?

A neurogenic bladder (NGB) is one that is affected by a condition that affects your neurological or “nervous” system, this includes diseases of or injuries to the brain, spinal cord and nerves to the body. As a result, there are many causes of a NGB that may include diseases like Multiple Sclerosis and Parkinson’s Disease, injuries to the spinal cord, being born with a condition that affects the spine like Spina Bifida, a metabolic condition like diabetes or an injury to the spine or nerves or previous surgery.

A Woman’s Urologist has specialist training in the management of the NGB, this is called “Neuro-urology”. For you to understand the condition of NGB, it helps to understand the normal urinary tract and how it works in simple terms.
The bladder and kidneys are part of the urinary system. These are the organs that make, store, and pass urine. When the urinary system is working well, the kidneys make urine and move it into the bladder. The bladder is a balloon-shaped organ that serves as a storage unit for urine. It is held in place by pelvic muscles in the lower part of your belly or abdomen.
When it is not full of urine the bladder is relaxed. Nerve signals in your brain let you know that your bladder is getting full. Then you feel the need to urinate. The brain tells the bladder muscles (detrusor muscle) to squeeze (or "contract"). This forces the urine out through your urethra, the tube that carries urine from your body. Your urethra has muscles called sphincters. They help keep the urethra closed so urine doesn't leak before you're ready to go to the bathroom. These sphincters open up when the bladder contracts.
When you go to the toilet to pass urine, this occurs due to a well co-ordinated reflex between your brain and spinal cord that is then transmitted along the nerves to the bladder. The signals pass like an electrical current and interruption to the signal will lead to problems with bladder filling and/or bladder emptying.

Bladder filling normally happens due to signals that allow it to relax while the urine fills and not increase in pressure as the volume increases inside it. The bladder wall must remain relaxed and “compliant” for this to occur without

triggering the need to empty. This is a function of both the nerves allowing the relaxation and the tissues of the wall itself being soft. A bladder that loses this capability becomes rather like filling a hot water bottle, it becomes stiff, and the pressure rises as it fills.

Once the normal bladder is filled to an appropriate level (around 350-500ml) at a low pressure and you are somewhere it is socially appropriate to pass urine, there is a signal from the bladder wall back to the spinal cord, up to the brain and back down again that allows “switching” in the spinal cord and the external sphincter, which is the valve that keeps you dry or continent, relaxes and then the bladder contracts.

Symptoms related to having a NGB will depend on what part of the well co-ordinated system of filling or “storage” and emptying or “voiding” have been interrupted.

Storage symptoms produce a need to go to the toilet frequently or a sense of urgency which is the desire to empty that is difficult to defer or put off. In severe cases this can lead to leakage at this point, this is called urgency incontinence. Frequency overnight is called nocturia. It is considered significant if you are needing to get up to empty more than once a night.

A bladder diary as you will see, is a very good way of documenting these symptoms for your health care team and can give much insight into the disturbance. These collection of symptoms of frequency, urgency (with or without leakage) and nocturia are sometimes called overactive bladder (OAB). OAB can be caused by a neurological problem but can have no cause found.

Voiding symptoms are those of poor flow, difficulty starting the flow, the flow itself stopping and starting and a sensation you have not emptied. In extreme cases you may not be able to pass urine at all this is called urinary retention. If your neurological problem effects the spinal cord in the upper parts, called the cervical or thoracic cord, this inability to relax the external sphincter to void can be quite marked and lead to a lot of spasm which may be felt and difficulty emptying. This has the complicated name, detrusor-sphincter-dyssynergia (sometimes called DSD) as the lack of a good reflex leads to the sphincter and bladder muscle fighting one another.

If there is an impact on the bladder contracting, this can also lead to poor emptying (Under Active Bladder or UAB) and symptoms related to poor flow. Like in plumbing, if there is poor flow, it is sometimes the “pipe” or urethra or external sphincter, and sometimes the “pump” or in this instance the bladder, poorly contracting that is contributing. Sometimes the only way to make this important distinction is with a special test called urodynamics.

What are the causes?

This nerve damage can be the result of diseases such as multiple sclerosis (MS), Parkinson's disease or diabetes. It can also be caused by infection of the brain or spinal cord, heavy metal poisoning, stroke, spinal cord injury, or major pelvic surgery. People who are born with problems of the spinal cord, such as spina bifida, may also have this type of bladder problem. Depending on where the condition effects the nervous system, the symptoms may differ.

Examples of neurological conditions that can affect lower urinary tract function

	CONGENITAL AND PERINATAL CONDITIONS	ACQUIRED, STABLE CONDITIONS	ACQUIRED, PROGRESSIVE OR DEGENERATIVE CONDITIONS
BRAIN CONDITIONS	Cerebral palsy	Stroke, Head injury	Multiple sclerosis, Parkinson's disease, Dementia, Multi systems atrophy
SUPRASACRAL SPINAL CORD CONDITIONS	Spinal dysraphism (such as myelomeningocele)	Spinal cord injury	Multiple sclerosis, Cervical spondylosis with myelopathy
SACRAL SPINAL CORD OR PERIPHERAL NERVE CONDITIONS	Spinal dysraphism, sacral agenesis, Anorectal anomalies	Cauda equina syndrome, Spinal cord injury from radical pelvic surgery	Peripheral neuropathy

What are the symptoms?

STORAGE SYMPTOMS	VOIDING SYMPTOMS	COMPLICATIONS
• Frequency >8 per day • Nocturnal >1 per night • Urgency • Urge incontinence	• Poor flow • Intermittent flow • Poor emptying • Retention or not being able to void at all	• Urinary leak/ incontinence • Urinary tract infection • Back pressure on kidneys may make you generally unwell or not be felt at all

The symptoms of a NGB can seriously affect your quality of life. They may make it difficult for you to get through your day without interruptions. You may feel afraid to go out with friends, take holidays, do everyday things or work productively. You may be afraid you may not be able to find a bathroom when you need one. Some people begin to cancel activities and withdraw from their lives. NGB may affect your work and your relationships. You may feel tired, depressed, anxious and lonely. If you are experiencing incontinence, the leaking urine can sometimes cause skin problems or infections.

How is Neurogenic Bladder Diagnosed?
As a NGB involves the nervous system and the bladder, as such, both systems need to be evaluated by your Women's Urologist.

Firstly, a Women's Urologist will ask you a number of questions to understand your medical history. This should include information about the symptoms you are having, how long you have had them, and how they are changing your life. A medical history will also include information about your past and current health problems. You should have a list of the over-the-counter and prescription drugs you usually take. Your health care provider should also ask you about your diet, and about how much and what kinds of liquids you drink during the day.

Physical Examination
A Women's Urologist will examine you to look for something that may be causing your symptoms. In women, the physical exam will likely include your abdomen, the organs in your pelvis (a vaginal examination) and your rectum.

Bladder Diary
You may be asked to keep a bladder diary, where you will note how often you go to the bathroom and any time you leak urine to help document the frequency, nocturia, leakages and fluid intake. This will help a Women's Urologist learn more about your day-to-day symptoms.

Other Tests you will need

1. Urine Culture: a sample of your urine to test for infection or blood.
2. Blood Test: A blood test to look for kidney function
3. Ultrasound scan of the kidneys and bladder: to look for any back pressure on the kidneys (they may look swollen with fluid), any stones or any other abnormalities and also to look at the outline of the bladder, see if there is anything abnormal within it and see how well it empties. Please go to the test if you can with a comfortably full bladder but do not overfill. The scan is all done one the outer of your tummy and sides there is no internal scan. Other imaging tests are required depending on the condition, the severity and if you have had any complications. These may include an x-ray or a CT scan. Sometimes more imaging is needed to look at the brain and spinal cord.
4. Urodynamics are a specialised test of bladder function - how it works and what is happening with storage or filling and emptying or voiding, especially as it relates to your kidneys. The studies are explained in another section and are most important in NGB. Often a cystoscopy is done at the time of the urodynamics, a cystoscopy is the passage of a small

lighted telescope no bigger than a catheter into the bladder via the urethra to look at the lining of the bladder and urethra. This allows them to rule out other causes of your symptoms.

What are the treatment options?
Neurogenic bladder is a serious condition, but when it is watched closely and treated the best way, patients can see large improvements in their quality of life.

Specific treatment for NGB will be decided by a Woman's Urologist based on:

- your age, overall health and medical history
- the cause of the nerve damage
- the type of symptoms
- the severity of symptoms
- your tolerance for certain drugs, procedures or therapies
- the expectations for the course of the condition
- your hand function and mobility
- your desire for treatment, social situation and social support

There are many options for treatment. Some patients will require only monitoring. It is very important to have ongoing monitoring, particularly if you were born with a condition contributing to the NGB or you have a spinal cord injury. You need to consider yourself an expensive car that needs a tune up each year! This is to prevent kidney injury.

To achieve the first priority of preventing kidney injury, a bladder that fills and stores at low pressure and then a system of emptying that is complete and low pressure is needed.

Providing treatments are effective in producing the low pressure of storage and good emptying, there is then a much less risk of incontinence and urinary tract infection which are the next priorities and the problems that will significantly impact on your quality of life.

There is often some overlap of treatments, but they fall under four main headings.

1. Storage treatments for OAB
2. Emptying treatments for “pump” or UAB
3. Emptying treatments for “pipe” or issues voiding
4. Management of complications

1. Storage treatments for OAB

OAB is a very common problem for women with NGB. It is also the most common type of bladder problem in people who have multiple sclerosis. The most common symptom of OAB is the sudden and unexpected urge to urinate that you can't control. To manage your OAB symptoms you may be offered the treatment options listed below.

Lifestyle Changes: For many patients with less serious nerve damage, the first treatments used are often lifestyle changes. These are changes you can make in your daily life to control your symptoms. General measures like reducing caffeine and other bladder irritants (coffee, tea, alcohol, fizzy drinks, citrus fruit and spicy foods), weight loss and good bowel habits are helpful.

Scheduled voiding: With this method, you follow a daily schedule of going to the bathroom. Instead of going when you feel the urge, you go to the bathroom at set times during the day. Depending on how often you go to the bathroom now, your health care provider may ask you to urinate every 2 to 4 hours, whether you feel you have to go or not.

Pelvic floor contractions (“Quick Flicks”) and bladder training: These can help decrease that "gotta go" feeling when it hits. Some call these exercises "quick flicks" because you quickly squeeze and release the muscles in your pelvis several times. When you get that "gotta go" feeling, squeeze and then relax your pelvic floor muscles as quickly as you can. Do "quick flicks" several times in a row when you feel the urge to go. This sends a message to your nervous system and back to your bladder to stop squeezing. As your bladder stops squeezing and starts relaxing, your "gotta go" feeling should lessen. When you do this exercise, it helps to be still, relax and concentrate just on the "quick flicks."

Your Women’s Urologist can explain this exercise in more detail and may refer you to a physiotherapist for more assistance. You may also be encouraged to delaying urination a few minutes. You slowly increase the time to a few hours. This helps you learn how to put off voiding, even when you feel an urge.

Medication: Drugs may be used if lifestyle changes don't help enough. Some drugs for OAB symptoms relax overactive bladder muscles. Other drugs can help stop your bladder from contracting.

Some drugs are delivered through the skin with a patch. A Woman's Urologist will follow you closely to look for changes and any side effects of these drugs. To get the best results, a Woman's Urologist may ask you to take different doses of the drug, or you may be given a different drug to try. Sometimes behavioural therapy (exercises and delaying voiding as above) will be used along with drugs.

The commonest drug prescribed is Oxybutinin, either as a tablet (Ditropan) or as a patch (Oxytrol patch). Oxybutinin acts to stop the contractions that cause the urge but also can cause dry mouth, constipation and sometimes changes in cognitive (thinking) capacity. Solifenacin (Vesicare) and Darifenacin (Enablex) are newer versions of Oxybutinin and may have lesser side effects but they are not on the government Pharmaceutical Benefits Scheme (PBS) and hence are expensive for patients.

Another alternative medication that works through a different pathway to relax the bladder is Mirabegron or Betmiga. This can also be combined with one of the Oxybutinin like drugs. Betmiga is also not on the PBS. (See information sheet on Medications for OAB).

Treatment with Botulinum Toxin A (Botox®) is used to help patients who have overactive bladder because of a brain or spinal cord disease or injury. You and A Woman's Urologist will decide if this is right for you. When injected into the bladder muscle, this drug may help keep it from contracting too often. Over time, this treatment wears off in some people. It may need to be repeated in 6 months or a year. A urologist should follow you closely to watch for side effects, including urinary retention (not emptying your bladder completely). If you do have problems emptying your bladder completely after injections, you may be required to use a catheter (thin, hollow tube) to empty your bladder (CIC), at least for a short time.

2. Emptying treatments for "pump" or UAB
Underactive bladder is a condition in which you aren't able to empty your bladder completely – or at all. You may hesitate before urine flows, or you may have to push urine out. Your urine may only come out in dribbles. Treatment options for underactive bladder symptoms are listed below.

Lifestyle Changes: Some of these therapies are the same as for OAB, and again, are often the first therapies used to treat a NGB. They consist of changes in the way you live day-to-day to help control symptoms.

Scheduled voiding: With this method, you follow a daily schedule of going to the bathroom. Instead of going when you feel the urge, you go to the bathroom at set times during the day. Depending on how often you go to the bathroom now, your health care provider may ask you to urinate every 2 to 4 hours, whether you feel you have to go or not.

Double voiding: After urinating, wait a few minutes and then try again to empty your bladder.

Medications: There are few drugs that can help with bladder emptying. Occasionally a drug like Tamsulosin, which is a commonly used drug for men with prostate problems is used. A Woman's Urologist will discuss if this is a good option for you. There are side effects and the effect to empty the bladder is subtle and alone unlikely to fully relieve the issue.

Catheters: Using a catheter can help you empty your bladder. A catheter is a thin, straw-like tube that is inserted into the urethra when you need to drain urine.

Clean intermittent catheterization (CIC or ISC): This is something you can learn to do yourself. Depending on your symptoms, A Woman's Urologist may ask you to do this 3 to 4 times a day, leaving it in only long enough to empty your bladder. Sometimes clean intermittent catheterization can help improve how your bladder works after several weeks or months. However, CIC can be hard for some people whose nerve damage or other health issues cause hand coordination problems.

Advantages of CIC:
- No foreign body (catheter) in bladder
- Has very low infection rate
- You will be continent (not leak) and not require an appliance if a continuous drainage program with a catheter is the alternate option
- Your bladder capacity is maintained (continuous catheters lead to the bladder becoming smaller and stiffer).
- Sexual function is not impaired
- Good body image is maintained

Disadvantages of CIC:
- The technique may require moderation of fluid intake
- Reasonable manual dexterity/hand function is required
- A good standard of personal hygiene is necessary

Continuous catheterization: Some patients may have a different kind of catheter inserted to drain urine at all times.

3. Emptying treatments for "pipe" or issues voiding or poor resistance/continence

a) Poor sphincter function and stress incontinence
Sometimes this can be treated with surgery. There are many procedures used for women with leakage that occurs when you are active, these are similar treatments offered to women without NGB. There are however special considerations in women with NGB and these need to be discussed with A Woman's Urologist.

There are slings that can be fashioned from your own tissue (Pubovaginal Sling) and there are agents that can be injected like fillers (bulking agents) which are made of a gel to improve your leakage.

Artificial sphincter: This device helps treat severe urinary incontinence when the real sphincter muscle isn't working correctly. Surgery is required to place the sphincter cuff around the urethra while a pump is placed under the skin in the labia. The pump is used to open the sphincter and allow you to pass urine. This is a very uncommonly used operation in women generally.

b) Detrusor-Sphincter-Dyssynergia (DSD)
This is the condition described above where your sphincter won't relax and allow you to void smoothly. Sometimes the simplest treatment is in fact OAB medication and CIC as many patients will also have OAB symptoms. Sometimes Botulinum Toxin A can be in*jec*ted to relax the sphincter.

4. Management of complications and surgery for NGB
Surgery is used to help some patients with more serious types of NGB.

Surgery with *Bladder augmentation (augmentation cystoplasty)* where par*t of* the intestine or bowel is used and attached to the walls of the bladder. This increases the size of the bladder and helps it store more urine. It is relatively uncommonly needed in NGB due to the use of Botulinum Toxin A, however in some cases there is need for this procedure to lower the bladder pressure for good kidney health.

Urinary diversion surgery: In this procedure the surgeon creates an opening called a stoma. Urine moves through the stoma to a collection pouch.

Questions To A Woman's Urologist
- What causes neurogenic bladder?
- Can neurogenic bladder be prevented?
- Will I need to have tests to find out what is causing my neurogenic bladder?
- Would you explain each test and why you are recommending them?
- What types of treatment are available for neurogenic bladder?
- Are there side effects of treatment?
- What are the pros and cons of each type of treatment?
- What treatment do you recommend for me and why?
- What happens if the first treatment doesn't help?
- Are there any lifestyle changes I can make that could help my symptoms?