

# *Intermittent catheterisation*

The gold standard  
for neurogenic bladder  
management



GO FOR  
GOLD



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# Introduction

Neurogenic bladder dysfunction, resulting in urinary disorder, is a major problem for affected patients – not only because of the impact on their quality of life, but also due to the risk of serious complications.

There are many bladder management options for patients with neurogenic bladder. They include intermittent urethral catheterisation, indwelling urethral or suprapubic catheterisation, timed voiding, use of an external catheter (for men), as well as pharmaceuticals and surgery.<sup>1</sup> The appropriate choice for each patient depends on their symptoms and

condition (disability, manual dexterity, and coordination), as well as cost-effectiveness, technical complexity, and potential complications; and quality of life is a prime consideration.<sup>2</sup> Whichever bladder management method is selected, it must ensure a low bladder pressure, improve continence, improve quality of life, and where possible restore lower urinary tract function.<sup>2</sup> The consequences of not achieving these primary objectives can include complications (such as infection, calculi) and reduced quality of life, as well as kidney damage and renal failure.

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#### Good bladder management<sup>2</sup>

- Protection of the upper urinary tract
- Improvement of urinary incontinence
- Restoration of (parts of) lower urinary tract function
- Improvement of quality of life

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#### Inadequate bladder management<sup>2</sup>

- High back pressure on the kidneys results in hydronephrosis, renal damage, renal failure
  - Incontinence
  - Residual urine predisposes to urinary tract infection
  - Poor quality of life
- 

This booklet provides evidence of the benefits of intermittent catheterisation over other methods of bladder management.

# History of catheters

Catheterisation is an ancient technique, with a variety of materials employed historically including rolled up palm leaves and metal tubes.

The 19th century was pivotal to catheter evolution. In 1836, the angulated 'coudé' (meaning 'elbow' in French) tipped catheter was introduced, and was later patented by Tiemann. Then in 1860, thanks to Goodyear's vulcanisation process for rubber, Nelaton created a soft tubular red rubber catheter with a solid, straight tip and one eye. In 1935, Foley invented a catheter with an inflatable balloon attached to the catheter tip as a retainment mechanism, a design used since for indwelling catheters. Suprapubic catheterisation was preferred in the first part of the 20th century, because physicians feared that urethral catheterisation would introduce infections. By World War II, the majority of centres in the

USA practiced bladder emptying with an indwelling Foley catheter.

In 1966, intermittent catheterisation every 6 hours with a 'non-touch' sterile technique was introduced at the Spinal Injuries Centre in England by Guttman, because it seemed to prevent urosepsis. However, it was considered time consuming and costly. In 1976, Llapides demonstrated that a strict aseptic technique was unnecessary and that a simple, atraumatic 'clean intermittent catheterisation' technique could be used successfully in patients with neurogenic bladder dysfunction. This finding led to the more widespread use of intermittent catheterisation, reducing mortality and morbidity for spinal cord-injured patients, and initiated the development of safe single-use catheters (Figure 1).

## Catheter innovation has led to improved healthcare and reduced mortality

Survival rates for spinal cord-injured patients have improved considerably over the last century, especially in the first year following the injury.<sup>3</sup> Although historically, urinary tract disease was a major cause of death in spinal cord-injured patients, mortality rates attributed to genitourinary disorders have since decreased.<sup>4,5</sup> This was shown in a study of 834 people with long-term spinal cord injuries (≥20 years post-injury), which found that renal deaths decreased over time and the pattern of causes of death approached that of the general population.<sup>4</sup> Hence, although genitourinary disorders accounted for 43% of deaths occurring in the 1940s and 1950s, by the 1980s and 1990s this was only 10%.<sup>4</sup>

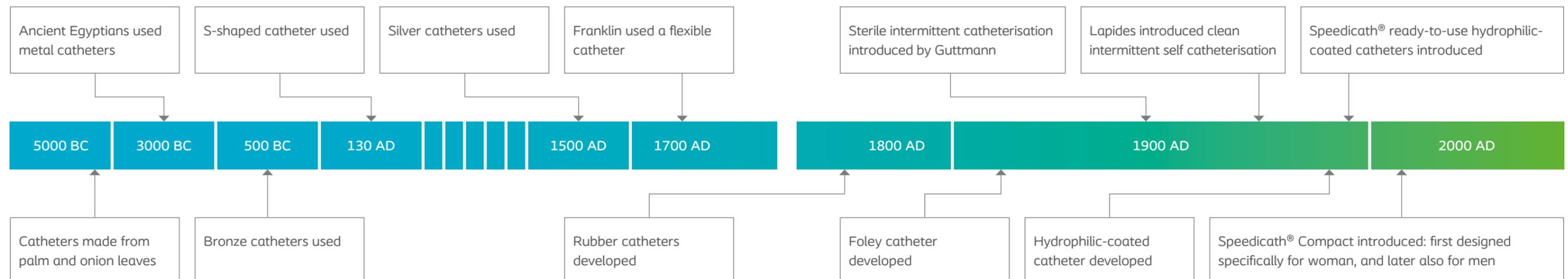
Modern urological care has improved morbidity and mortality in spinal cord-injured patients<sup>4-8</sup>

The factors associated with the reduced genitourinary mortality include improvements in medical care and access to antibiotics, but also better urinary tract management.

However, some of the older methods of bladder management – specifically, indwelling catheters – still carry a relatively higher risk of mortality.<sup>8</sup>

Indwelling catheters have been associated with a higher risk of mortality than other bladder management methods<sup>8</sup>

Figure 1. Timeline of catheter innovations



# Intermittent catheterisation is the gold standard

Better urinary tract management results in better clinical outcomes and reduced mortality and morbidity. Although people with neurogenic bladder are at risk of urinary tract complications, these can be minimised by optimal bladder management.

The gold standard for management of the neurogenic bladder is intermittent catheterisation.<sup>2</sup> The safety of long-term intermittent catheterisation using conventional uncoated catheters has been studied<sup>9,10</sup> and reviewed.<sup>11</sup> The most frequent complication of intermittent catheterisation is urinary tract infection, with other complications including prostatitis, calculi, urethral bleeding, strictures, and (rarely) urethritis and epididymo-orchitis.<sup>11</sup> The prevention of complications requires education of all involved, good patient compliance, the use

of a suitable catheter material and a good catheterisation technique.<sup>11</sup>

## Urinary tract complications are lower for intermittent catheterisation compared with older methods

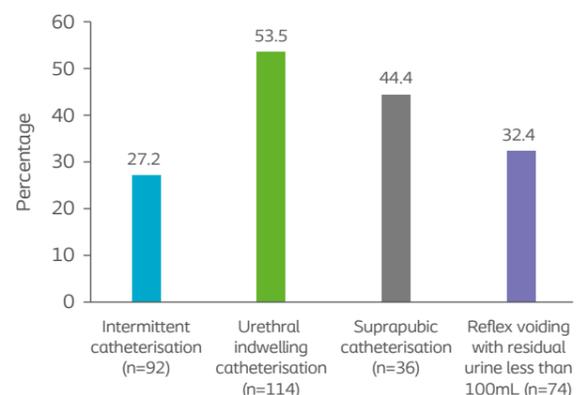
Compared with indwelling catheters, intermittent catheterisation approximately halves the occurrence of urinary tract complications (53.5% and 27.2%, respectively)<sup>7</sup> (Figure 2).

## Urinary tract infection is reduced for intermittent catheterisation compared with indwelling catheters

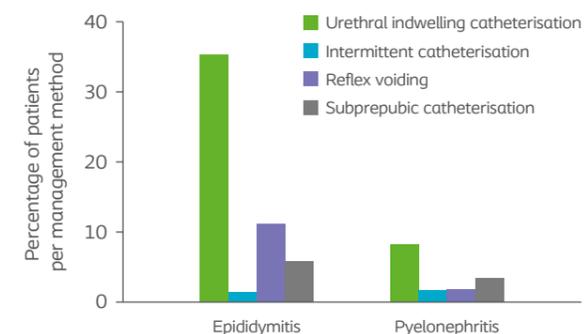
Urinary tract infection is a frequent complication for people with spinal cord injury and/or neurogenic bladder, although the available studies vary considerably in methodology (for example, acute versus chronic spinal cord-

**Figure 2.** Intermittent catheterisation approximately halves urinary tract complications compared with indwelling catheters<sup>7</sup>

Overall risk of urinary tract complications in 316 spinal cord-injured patients



**Figure 3.** Intermittent catheterisation significantly reduces the occurrence of infectious complications compared with indwelling catheters<sup>7</sup>



injured patients, versus mixed populations including neurogenic bladder of other aetiologies). There are also differences between studies in the definition of urinary tract infection. However, clinically evident urinary tract infection that is symptomatic or treated is clearly a common problem, affecting 61-81% of patients and being recurrent in 22-25%.<sup>12,13</sup> In one retrospective study of 316 spinal cord-injured patients followed up for 18.3 ± 12.4 years, 94% were treated at least once for clinical lower urinary tract symptoms.<sup>7</sup> Similarly, a rate of 0.68 episodes per 100 person-days was reported in a prospective study of 128 acute spinal cord-injured patients.<sup>14</sup>

Compared with indwelling catheters, intermittent catheterisation is associated with a lower risk of urinary tract infection. This has been reported in multiple studies with various patient populations,<sup>7,13-17</sup> and was confirmed by a systematic review of the risk factors for urinary tract infection in spinal cord dysfunction patients that concluded that intermittent catheterisation was associated with fewer infections than indwelling catheters.<sup>18</sup> Recurrent urinary tract infection is also less frequent – in one study, the rate for intermittent catheterisation (31.2%) was nearly 20 percentage points lower than the rate for indwelling catheters (50%)<sup>13</sup> (Figure 3).

## Intermittent catheterisation reduces the risk of urinary tract infection compared with indwelling catheters<sup>7,13-18</sup>

## Intermittent catheterisation reduces the risk of other urinary tract complications

Compared with older methods of bladder management, intermittent catheterisation also significantly reduces other urinary complications in spinal cord-injured patients:

- The occurrence of calculus, stricture, periurethral abscess, and vesicoureteral reflux was significantly lower for intermittent catheterisation compared with indwelling catheters.<sup>7</sup>
- Urinary tract dilatation and vesicoureteral reflux were significantly less frequent for intermittent catheterisation versus other

methods (tapping, abdominal straining, Crede's manoeuvre, indwelling catheter, or spontaneous voiding).<sup>19</sup>

- Upper urinary tract distress was experienced by 7% of patients on intermittent catheterisation versus 32% for reflex voiding.<sup>20</sup>

## Patients benefit clinically from intermittent catheterisation

Intermittent catheterisation regularly and completely empties the bladder, leading to a persistently low bladder pressure, minimal volumes of residual urine and a reduced risk of backflow of urine, consequently minimising bladder and renal complications. Less frequent catheterisation can lead to greater bladder-storage volumes and increased risk of infection.<sup>2,11,21,22</sup>

Patients benefit clinically from successful intermittent catheterisation, with the consequent reduced morbidity.<sup>7</sup> This depends on compliance. The most important factors contributing to compliance with long-term intermittent catheterisation are continence and the ability to perform intermittent catheterisation independently.<sup>10</sup>

## Additional patient benefits

For the patient, there is a big difference between coping with their bladder management and properly living life. Intermittent catheterisation has a positive impact on patients' quality of life, including: improvements in urinary symptoms, less incontinence, and fewer complications; and better sleep, independency, and self-confidence; as well as a normal sex life.<sup>23</sup>

## Antibiotic concerns

Reducing the risk of urinary tract infection with intermittent catheterisation can help in the global fight against antibiotic resistance. With the high frequency of urinary tract infection in these patients,<sup>7,12-14</sup> and antibiotics required for some cases,<sup>2,23</sup> the consequences can be great. Antibiotic resistance in bacteria that cause urinary tract infections is a widespread and major problem.<sup>24,25</sup> Reducing the prevalence of urinary tract infection can only help the antibiotic resistance problem.

# Guidelines and further information on IC

## Key evidence

Guidelines support the recommendation that intermittent catheterisation should be performed 4-6 times per day in people who are unable to void normally<sup>2,26</sup> (Table 1).

Similarly, the Consortium for Spinal Cord Medicine guidelines are that intermittent catheterisation should be considered for individuals who have sufficient hand skills or a willing caregiver to perform the catheterisation.<sup>26</sup> Since the normal capacity of the bladder is less than 500 mL, catheterising the bladder every 4-6 hours prevents over-distention of the bladder.<sup>26</sup>

The European Association of Urology Nurses guidelines detail the nursing considerations, and recommend that intermittent catheterisation should be performed in the presence of a residual urine volume and symptoms or complications arising from it.<sup>23</sup> The three underlying categories of lower urinary tract dysfunction requiring intermittent catheterisation include detrusor dysfunction, bladder outlet obstruction, and post-operative cases.<sup>23</sup>

**Table 1. European Association of Urology recommendations for catheterisation<sup>2</sup>**

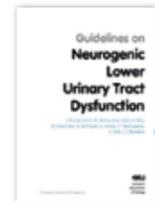
**Grade of recommendation\***

Intermittent catheterisation is the standard treatment for patients who are unable to empty their bladder	A
Patients should be well instructed in the technique and risks of intermittent catheterisation	
Aseptic intermittent catheterisation is the method of choice	B
The catheter size should be 12-14 Fr	B
The frequency of intermittent catheterisation is 4-6 times per day	B
The bladder volume should remain below 400 mL	B
Indwelling transurethral and suprapubic catheterisation should be used only exceptionally, under close control, and the catheter should be changed frequently. Silicone catheters are preferred and should be changed every 2-4 weeks, while (coated) latex catheters need to be changed every 1-2 weeks	A

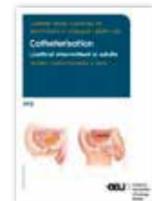
\*A: Based on clinical studies of good quality and consistency addressing the specific recommendations and including at least one randomised trial  
 B: Based on well-conducted clinical studies, but without randomised clinical trials  
 C: Made despite the absence of directly applicable clinical studies of good quality



Consortium for Spinal Cord Medicine<sup>26</sup>



European Association of Urology<sup>2</sup>



European Association of Urology Nurses<sup>23</sup>

Please see reference list for download URL

## Effect of bladder management on urological complications in spinal cord injured patients

Weld KJ, Dmochowski RR. J Urol 2000;163(3):768-72

### Objective

The objective of this study was to investigate the association between bladder management methods with urological complications in spinal cord-injured patients.

### Methods

Retrospective review of medical records from 316 post-traumatic spinal cord-injured patients (313 males and 3 females), with mean follow up of  $18.3 \pm 12.4$  years.

### Results

The data show that spinal cord-injured patients using intermittent catheterisation were less likely to experience urological complications compared with the other bladder management methods investigated (Figure 4).

- Compared with indwelling catheters, intermittent catheterisation approximately halves the overall occurrence of urinary tract complications (53.5% and 27.2%, respectively).
- The infectious complications epididymitis ( $p < 0.001$ ) and pyelonephritis ( $p < 0.001$ ) occurred significantly more frequently in urethral indwelling catheter users compared with intermittent catheter users. Epididymitis was also significantly more common with spontaneous voiding compared with intermittent catheterisation ( $p = 0.006$ ).

- Stones in the upper urinary tract or bladder were significantly less frequent in users of intermittent catheterisation compared with urethral indwelling catheters ( $p < 0.001$ ); and bladder stones were significantly less frequent for intermittent catheterisation compared with spontaneous voiding ( $p = 0.005$ ), and suprapubic catheters ( $p < 0.001$ ).
- Urethral strictures were significantly more frequent with urethral indwelling catheters than with intermittent catheterisation ( $p < 0.001$ ), suprapubic catheters ( $p = 0.002$ ), and reflex voiding ( $p < 0.001$ ). Periurethral abscess was also significantly more common with urethral indwelling catheter than intermittent catheterisation ( $p < 0.001$ ).
- From radiographical findings, the occurrence of vesicoureteral reflux was significantly lower with intermittent catheterisation compared with urethral indwelling catheters ( $p < 0.001$ ) and suprapubic catheters ( $p = 0.003$ ).

### Conclusions

Clean intermittent catheterisation was shown to be the safest method in terms of having the lowest potential for urological complications.

## Complications of intermittent catheterization: their prevention and treatment

Wyndaele JJ. Spinal Cord 2002;40(10):536-41

### Objective

This literature review aimed to evaluate the complications seen in patients on intermittent catheterisation and intermittent self-catheterisation.

### Methods

An international literature review was performed to identify the most relevant articles on the subject published during the previous 25 years. The prevalence and importance of complications associated with intermittent catheterisation were assessed, including urinary tract infections, and their management. The review included patients using uncoated, prelubricated and hydrophilic-coated catheters.

### Results

Urinary tract infection was one of the most frequent complications of intermittent catheterisation. The prevalence varied widely in the literature due to variations in definition, methodology and other factors, but frequencies of symptomatic bacteriuria in the region of 53% have been reported. With long-term intermittent catheterisation (5 years), 81% of patients required treatment for at least one urinary tract infection, 22% had two or three per year, and 12% had four or more per year. However, a

systematic review concluded that patients on intermittent catheterisation had fewer infections than those with indwelling catheters.

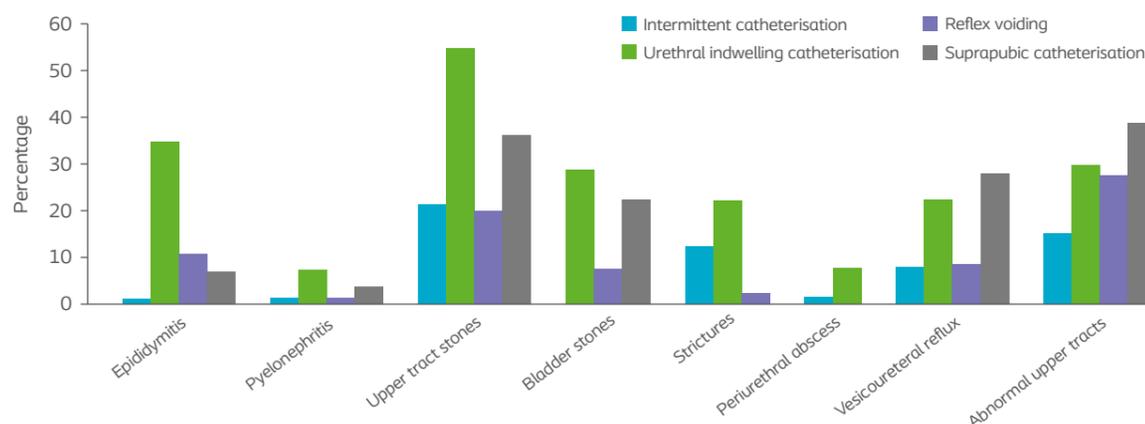
### Conclusions

The author concludes that there are strong arguments that intermittent catheterisation is safe and effective for neurogenic bladder dysfunction due to a spinal cord lesion. Of the complications, urinary tract infection was the most frequent and important, with prostatitis – and less commonly, epididymitis and urethritis – also occurring. Previous treatment with indwelling catheters was identified as a risk factor for chronic infection and urinary sepsis. Preventing complications requires education, patient compliance, the use of a suitable catheter material and the application of a good catheterisation technique. The author also commented that the use of hydrophilic-coated catheters may be able to reduce the rate of complications.

### Comment

The author's call for proof of the benefits of hydrophilic-coated catheters over uncoated catheters has subsequently been obtained through comparative studies.

Figure 4. Occurrence of urological complications



## Clean intermittent self-catheterization: a 12-year follow up

Wyndaele JJ, Maes D. J Urol 1990;143(5):906-8

### Objective

This early study assessed the long-term effects and complications of clean intermittent catheterisation using uncoated catheters with lubricant.

### Methods

This retrospective study analysed data from 75 patients (33 males, 42 females), most of whom had neurogenic bladder dysfunction (69/75, including 32 with spinal cord injury), who performed intermittent catheterisation for a mean of 7 years (range 1.5-12 years). Assessments included incidence of urinary tract infection, and continence and complications.

### Results

Bilateral hydronephrosis was relieved in 14/19 patients following intermittent catheterisation. Chronic or recurrent urinary tract infections were present in 42% of patients, although patients with positive urine cultures were not necessarily symptomatic, and in general, symptomatic infections were found to be related to poor technique or catheter misuse.

Complications occurred in 15/75 (20%) of patients, including urethral stricture, false passage, meatitis, meatal stenosis, epididymitis, bladder calculus, and pyelonephritis. The use of small catheters, together with liberal lubrication, did not appear to prevent urethral irritation and trauma in the long term.

### Conclusions

In general, chronic intermittent catheterisation provided good clinical results. The authors concluded that it remains to be seen as to 'whether patients who use hydrophilic catheters will do better during long-term follow-up.'

### Comment

The author's call for proof of the benefits of hydrophilic-coated catheters over uncoated catheters has subsequently been obtained through comparative studies.

## Risk factors for symptomatic urinary tract infections in individuals with chronic neurogenic lower urinary tract dysfunction

Krebs J, Wöllner J, Pannek J. Spinal Cord 2015 Dec 1. doi: 10.1038/sc.2015.214. [Epub ahead of print]

### Objective

This study aimed to investigate the association of bladder management, as well as patient and injury characteristics, with the occurrence of patient-reported, symptomatic and recurrent urinary tract infections in patients with chronic neurogenic lower urinary tract dysfunction.

### Methods

This retrospective study at a tertiary urological referral centre in Switzerland analysed data from 1104 patients (821 males, 283 females) with chronic neurogenic lower urinary tract dysfunction (mean duration of 20.3 ± 11.6 years) who had presented between 2008 and 2012.

### Results

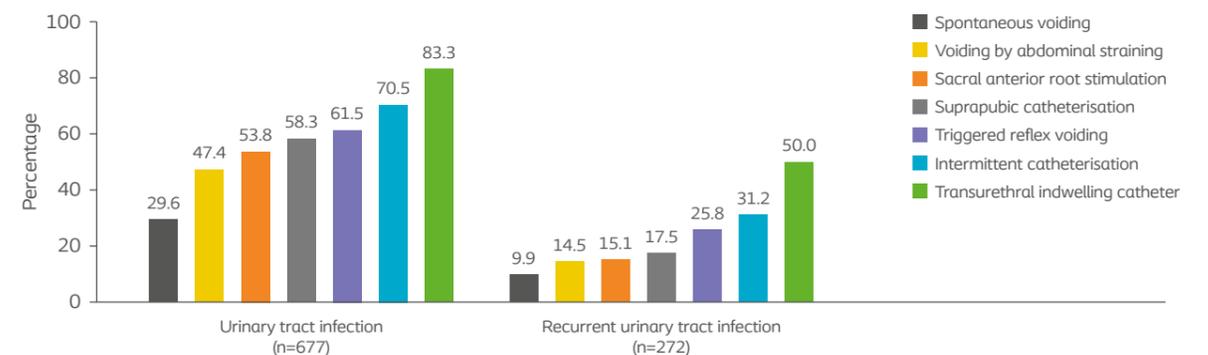
Bladder evacuation method was a significant ( $p \leq 0.004$ ) predictor of urinary tract infection (symptomatic and recurrent). The greatest annual number of infections was observed in

patients using a transurethral indwelling catheter (indwelling catheter), which was associated with a 10-fold increased odds of symptomatic urinary tract infection and a 5-fold increased odds of recurrent infection compared with spontaneous voiding. The rate of symptomatic urinary tract infection was 70.5% for intermittent catheterisation and 83.3% for indwelling catheter (Figure 5). The rate of recurrent urinary tract infection was 31.2% for intermittent catheterisation and 50.0% for indwelling catheter.

### Conclusions

The authors concluded that "the bladder evacuation method is the main predictor for symptomatic urinary tract infection in individuals with neurogenic lower urinary tract dysfunction. Indwelling catheters showed the highest odds of symptomatic urinary tract infection and should be avoided whenever possible."

Figure 5. Occurrence of urinary tract infection in patients with neurogenic bladder



# Clean intermittent catheterisation from the acute period in spinal cord injury patients. Long term evaluation of urethral and genital tolerance

Perrouin-Verbe B, Labat JJ, Richard I, et al. *Paraplegia* 1995;33(11):619-24

## Objective

This study aimed to assess the incidence of complications of clean intermittent catheterisation in a population of patients with spinal cord injury, and to determine the factors associated with long-term compliance.

## Methods

This was a retrospective study of 159 patients (113 males, 46 females) using clean intermittent catheterisation from the acute period of spinal cord injury. Intermittent catheterisation was temporary in 92 patients, with 74 achieving another voiding mode (3-360 days), and was used in the medium to long term (mean 2 years 8 months) by 67 patients. All patients used 12-14 Fr PVC catheters with lubricant. The frequency of urinary tract infection and rate of urethral strictures, and reasons for long-term acceptance were evaluated.

## Results

Symptomatic lower urinary tract infection occurred in 28% of patients, whilst asymptomatic cytobacteriological infection was seen in 60% of patients (Figure 6). Men had significantly more symptomatic and asymptomatic infections

than women. The rate of epididymitis was 10% and urethral strictures was 5.3% overall, but this increased to 28.5% and 19%, respectively, in the group of patients on long-term (>5 years) intermittent catheterisation. The most important factor for acceptance of long-term intermittent catheterisation was continence, followed by the ability to perform it independently.

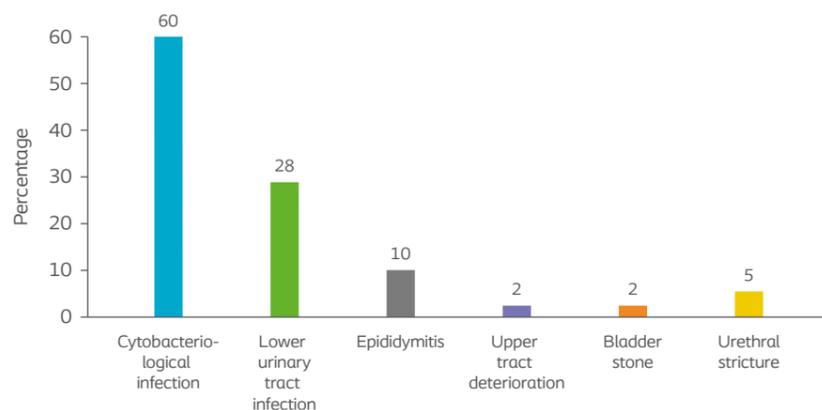
## Conclusions

Clean intermittent catheterisation minimises urinary complications in spinal cord-injured patients. Despite this, long-term problems of urethral tolerance and epididymitis resulting from persistent infection remain with uncoated PVC catheters. Further studies of long-term intermittent catheterisation in patients using non-reusable hydrophilic catheters are required to establish whether these complications can be prevented.

## Comment

The author's call for proof of the benefits of hydrophilic-coated catheters over uncoated catheters has subsequently been obtained through comparative studies.

Figure 6. Overall rate of complications



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