Fortnightly Review

Intermittent catheterisation: simple, safe, and effective but underused

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Twenty five years ago Lapides and coworkers showed that intermittent catheterisation was a safe and effective way of managing patients with urinary retention or incontinence due to neuropathic or hypotonic bladder.^{1,2} This technique has transformed the lives of people rendered housebound by bladder problems and has preserved the kidneys of children with spina bifida³⁻¹⁰ and of adults with spinal cord injury.¹¹⁻¹⁵ Intermittent catheterisation is a clean but not sterile technique. It entails inserting a catheter into the bladder, emptying out all the urine, and then removing the catheter. This is performed several times a day by the patient or carer. It puts the patient in control of emptying the bladder and safeguards the kidneys by providing drainage.

Despite initial misgivings most people find intermittent catheterisation unexpectedly easy.^{11,16,17} Children as young as 4 years old and adults in their 80s have learned to catheterise themselves (fig 1).¹⁸⁻²⁰ Disability does not preclude a trial of self catheterisation. Girls with spina bifida have been taught to catheterise themselves despite having paraplegia, severe spinal deformity, and absent perineal sensation.²¹ Patients with multiple sclerosis catheterise themselves undeterred by intention tremor and poor eyesight.^{17,22,23} Patients with spinal cord injury who are confined to a wheelchair catheterise themselves and

Summary points

- Intermittent catheterisation is indicated for patients with neuropathic or hypotonic bladder who cannot void effectively and are liable to renal damage, urinary tract infections, and incontinence
- By promoting drainage and eliminating excessive residual urine, intermittent catheterisation safeguards the kidneys, reduces symptomatic urinary tract infections, and improves continence
- It puts patients in control of their bladder and enhances independence, self esteem, and quality of life
- Severe disability is not a bar. Patients have mastered the technique despite immobility due to paraplegia, loss of feeling in the perineum, intention tremor, spinal deformity, extreme old age, blindness, and mental handicap
- Many patients with neuropathic bladder need to catheterise frequently to prevent damage to the urinary tract from unperceived overdistension and high pressures
- Mismatch between a high fluid intake and infrequent catheterisation is the commonest reason for patients remaining incontinent
- Many more patients should be given the opportunity to try intermittent catheterisation as it can transform a person's life. If it is not successful all other options remain available as no surgery has been performed

Fig 1—By learning to catheterise herself, this 5 year old girl with incontinence due to spina bifida was able to attend mainstream schooling. At age 24 she is still catheterising seven times a day. Her glomerular filtration rate remains normal despite severe vesicoureteric reflux in infancy (published with patient's permission and with permission of the Lancet⁹)

prefer this method of catheterisation to other methods on offer.^{12,24} Follow up has shown that intermittent catheterisation is a first line treatment with few complications and excellent long term results.^{12,14,17,25}

Many suitable patients, however, are not being given the opportunity to use intermittent catheterisation.²⁶ Their doctors may be unfamiliar with the technique, fear an increased risk of urinary tract infections, or consider their patient to be too old or too disabled.^{16,27} This article describes the method, identifies patients who might benefit, and suggests ways of overcoming potential problems.

Rationale of intermittent catheterisation

The box shows the effects of intermittent catheterisation.

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Effects of intermittent catheterisation

- The bladder can empty completely and under the patient's control
- Residual urine is eliminated, thereby reducing symptomatic urinary infections
- Urinary drainage is ensured, thus preventing or improving dilatation of the upper urinary tract

Incomplete emptying of bladder—A bladder that retains a large volume of residual urine soon fills to capacity, causing frequency, urgency, nocturia, or incontinence. Urinary stasis leads to urinary tract infections and calculi. By eliminating residual urine, intermittent catheterisation enables the bladder to function more effectively as a reservoir, relieves symptoms, and reduces the incidence of symptomatic urinary infections.^{3 9 16 22 25 28}

Obstructive uropathy—Many patients with a neuro-pathic bladder have an overactive sphincter, causing obstruction of the bladder outlet and dilatation of the upper urinary tracts. A combination of a contracting urethral sphincter with hyperreflexic bladder contractions (detrusor-sphincter dyssynergia) accelerates the damage. If the obstruction of the bladder outlet is overcome by intermittent catheterisation then dilatation of the upper urinary tracts is reduced and renal function improved.^{6 22}

Reflux nephropathy—Vesicoureteric reflux associated with neuro-pathic bladder often causes renal damage. The risk is increased by obstruction of the bladder outlet, high intravesical pressure, or urinary infection. Intermittent catheterisation can reduce or eliminate vesicoureteric reflux.^{5 8 10 14}

Indications

Diagnoses—People suffering from voiding difficulties or incontinence associated with a large volume of residual urine may be helped by intermittent catheterisation regardless of whether they have a neuro-pathic bladder (fig 2). The box shows the commonest causes of neuro-pathic bladder for which intermittent

* Spinal dysraphism 95, multiple sclerosis 24, spinal tumour 13, prolapsed intervertebral disc 10, spinal cord injury 8, diabetic neuropathy 7, paraplegia of unknown cause 4, neuropathic bladder of unknown cause 4, spinal vascular accident 4, transverse myelitis 3, meningitis and encephalomyelitis 3, cerebral palsy 2, Paget's disease 1, cerebellar syndrome 1, systemic lupus erythematosus 1

Fig 2—Diagnoses and presentations of 208 patients aged 8 weeks to 87 years who used intermittent catheterisation

Commonest causes of neuro-pathic bladder

- Spina bifida
- Multiple sclerosis
- Spinal cord injury
- Spinal tumour
- Prolapsed intervertebral disc
- Diabetic neuropathy

catheterisation is used. In neurologically normal patients a hypotonic bladder may be associated with pelvic problems or old age.^{1 16-18 20} Intermittent catheterisation is also used in patients with prolonged postoperative retention¹⁹ or urethral obstruction.^{17 29} The technique is of particular value in women because their alternatives for managing incontinence are less satisfactory than men's.

Children—Children with neuro-pathic bladder are especially vulnerable. Renal failure may develop in early infancy as a result of functional outflow obstruction, vesicoureteric reflux, detrusor-sphincter dyssynergia with raised intravesical pressure, and

urinary infections. These children need detailed urological assessment and monitoring.^{7 8 10 30} Intermittent catheterisation may be indicated to protect the upper renal tracts at an age before continence is an issue.^{7 31}

Symptoms—The commonest presenting symptoms are incontinence and acute retention. A history of hesitancy and straining to void, urgency, frequency, suprapubic discomfort, and recurrent urinary tract infections may indicate longstanding urinary retention. Patients with neuro-pathic bladder who lack sensation may be unaware of a full bladder and present with painless overflow incontinence or silent renal failure.

Prerequisites

The two essentials for a trial of intermittent catheterisation are a large volume of residual urine and a motivated patient or carer.^{1 11 17 18 21 23}

Excessive residual urine implies adequate bladder capacity and sphincter activity (table 1). It may be

Table 1—Neuropathic outflow obstruction and effectiveness of intermittent catheterisation

	Overactive sphincter	Weak sphincter
Before starting intermittent catheterisation:		
Bladder	Palpable	Impalpable
Residual urine	Large volume	Small volume
Renal risk	Severe	Less severe
Urinary tract infections	Often	Occasional
With intermittent catheterisation:		
Incontinence	None	Improved
Renal risk	Greatly reduced	Slightly reduced

suspected on examination (because of a visible or palpable mass, dull to percussion), confirmed by ultrasound or contrast x ray examination, and measured by catheterisation. The greater the volume, the better the prospects of the patient remaining dry with intermittent catheterisation. Such patients are also at higher risk of renal damage as long as the obstruction remains unrelieved (table 1). But if the residual urine is less than 100 ml in an adult, intermittent catheterisation is unlikely to keep the patient dry.

Motivation varies widely among patients. A patient recently disabled whose bladder now dominates and restricts all activities may overcome formidable obstacles to regain control.²³ In contrast, a child who has been incontinent since birth may regard the management of incontinence as the mother's concern and be unwilling to make the considerable effort needed to become independent. A committed and enthusiastic teacher is also essential.¹⁸

Procedure

ASSESSMENT

Physical examination should include testing for pin-prick sensation in the saddle area. Sensory loss in the second to fourth sacral dermatomes ("numb bum"), implies diminished awareness of a full bladder (fig 3). A sensory loss that extends to the third lumbar dermatome suggests that catheterisation will be painless. Basic investigations include urinalysis, blood biochemistry tests (urea, creatinine, glucose, and electrolytes), and visualisation of the whole urinary tract by ultrasonography or intravenous urography. A plain x ray will show urinary calculi and spinal abnormalities. In children urodynamic assessment should include a cystogram to detect vesicoureteric reflux. Outside this

Fig 3—Mother catheterising her 5 year old son. Catheterisation should be especially gentle in patients lacking urethral sensation—a toy may help a child to relax (published with mother's and son's permission)

group of highly vulnerable patients detailed investigation is not always needed.^{3 8 30} Patients are sometimes denied a trial of intermittent catheterisation purely because of an adverse urodynamic study. For example, a hyperactive detrusor shown by such a study may become normal if the bladder is emptied effectively³⁰ or if anticholinergic drugs are used.^{6 11 22}

TEACHING THE TECHNIQUE

Patients are taught catheterisation in hospital or in their own home by a doctor, continence adviser, or appropriately trained nurse.³² The rationale and benefits of intermittent catheterisation are explained, and the patient is reassured that it should be neither painful nor dangerous. If doctor or patient is unaware of urinary retention, the large volume of residual urine obtained provides convincing proof of the need for catheterisation. Clear diagrams, and a mirror if needed, help patients to become familiar with their anatomy. They are given illustrated instructions and a telephone number to use for advice. Although some patients learn catheterisation in a single teaching session, others need weeks of help, advice, and reassurance. The support of a fellow user of intermittent catheterisation is invaluable.^{16 21} A booklet³³ or a list of "dos and don'ts" can also be useful (box).

Table 2—Fluid balance in child using intermittent catheterisation

	Bladder holds	No of times catheterised per day	Fluid intake	Result
Problem	200 ml	4	1600 ml	Retention persists or patient is incontinent, or both
Solution	200 ml	5	1000 ml	Kidneys safer Patient drier

Advice for patients

Dos

Catheterise at least four times a day
Always carry a catheter with you, and use it before your bladder overfills
Catheterise even where facilities are inadequate

Be particularly gentle if sensation is lacking
If necessary use a water soluble lubricant, not petroleum jelly

Don'ts

Don't wait for the urge to void before catheterising
Don't drink more than your bladder will hold between catheterisations
Don't use disinfectants in a higher concentration than recommended
Don't treat asymptomatic urinary tract infections
Don't stop intermittent catheterisation unless your residual urine is less than 50-100 ml

Drainage is more important than drinking

Patients are taught to catheterise themselves lying down, standing up, or sitting on a lavatory, chair, or wheelchair. They wash their hands and around the urethral orifice or use a "baby wipe" (moistened antiseptic wipe). Male patients should use a water soluble lubricant, not petroleum jelly. Patients with normal sensation may need a local anaesthetic gel—for example lignocaine—while learning the technique. The catheter is inserted gently until the urine flows. The urine is collected in a jug or bottle or is directed into the lavatory. Once the urine has stopped flowing the catheter should be rotated and then, if no urine drains, slowly withdrawn.

HOW OFTEN TO CATHETERISE

Catheterisation must be frequent enough to prevent the bladder becoming overdistended¹¹ and to keep the patient dry. Patients should normally catheterise at least four times a day^{6 10 12 13 15 21}—more frequently in children and patients with a high fluid intake or small capacity bladder. The volume obtained on catheterisation gives an estimate of bladder capacity and suggests how much can be drunk between catheterisations if the patient is to remain dry. Patients soon learn to balance fluid intake with frequency of catheterisation (table 2). Silent overfilling readily occurs in patients with neuropathic bladder, and the volume obtained on catheterisation should not be allowed to exceed 300-400 ml.²⁵ To ensure frequent catheterisation the technique is kept simple, and patients may catheterise without washing if necessary. No bedtime drinks should be taken unless the patient catheterises during the night. A daily intake of 1.5 litres is sufficient.¹¹

CATHETERS AND CATHETER CARE

Plastic catheters can be supplied on prescription at the rate of five a month.²⁶ Sizes 6-10F are used for children and 10-14F for adults. The cost of plastic catheters available on prescription ranges from 32p to £2.25 each (*UK Drug Tariff*, December, 1995). Low friction catheters may be useful.²⁹ Stainless steel catheters (for female patients only) are easy to use and last a lifetime but are not available on prescription. For small babies a 10 cm piece cut from the gastric end of a size 4 or 6 infant feeding tube is used.

The care of catheters is controversial. Some patients carry their catheter loose in a pocket and neither sterilise nor renew the catheter. Others use a new catheter each time. A compromise between these two extremes is to treat catheters with the same care as a baby's feeding bottle. After use they should be rinsed through with tap water and then either boiled together once a day and stored dry or immersed in sodium hypochlorite solution 0.016%—for example, 2.5 ml Milton No 2 in 300 ml of water.^{6 16 28} Clean catheters can be carried in a new plastic bag.¹ But even with the most casual catheter care, symptomatic urinary tract infections are rare. Infections are more of a problem in patients who catheterise infrequently or in those with established renal damage.^{16 28}

Follow up

Patients should be seen frequently until they are confident about catheterisation. It is important to check that the bladder is being completely emptied, either by ultrasound examination or by changing the position of the patient and moving the catheter to see if this produces more urine. Constipation should be treated if an overfull rectum makes catheterisation difficult or prevents complete drainage. Long term follow up includes checking blood pressure, urinalysis, blood biochemistry tests, an annual visualisation of the urinary tract by ultrasound examination, and a plain x ray to exclude a silent urinary calculus.

SATISFACTION

Patients for whom anxiety about incontinence or urinary frequency dominated their activities away from home are delighted to regain control of their bladder. Disabled patients who catheterise themselves in a wheelchair no longer need to remain within reach of a specially adapted lavatory. Freedom from cumbersome external appliances does much to restore self esteem even if an incontinence pad is still worn as a precaution.^{12 16} Partners are pleased if enuresis ceases and the patient no longer voids on intercourse or smells of stale, retained urine.²⁷ Skin damage and sacral pressure sores heal. Children become more independent and able to mix socially.^{3 21} The morale and wellbeing of both children and their parents may improve appreciably.²²

About two out of three patients who learn intermittent catheterisation continue to use it indefinitely.²⁵ For them it becomes a way of life, some taking no longer to catheterise than other people do to void. Contact with the medical services declines, and hospital admissions generally cease altogether.^{12 17 23} Table 3 shows the results of a trial of intermittent catheterisation in 208 patients.

Table 3—Trial of intermittent catheterisation in 208 patients

Successful outcome:	158
Continuing intermittent catheterisation	138
Catheterisation no longer needed*	20
Unsuccessful outcome:	50
Unsatisfactory	24
Too difficult**	17
Method unacceptable	9

*Four patients reserved intermittent catheterisation for episodes of acute retention.

**Excluding children with spina bifida catheterised by their parents, who may not be able to catheterise themselves when they are older.

URINARY TRACT INFECTIONS

Symptomatic urinary tract infections are rarely a problem and respond promptly to appropriate antibacterial treatment, more frequent catheterisation, and an increased fluid intake. Asymptomatic infections are common but rarely need treating.^{4 6 14 15} Only 10-25% of people who catheterise themselves maintain a persistently sterile urine.^{13 22 25} Prophylactic anti-

bacterials are not generally recommended^{14 16 18 28} except in young children with vesicoureteric reflux.^{5 31} The box shows the difference in frequency and severity of urinary infections before and after the start of intermittent catheterisation.

Complications

During the learning period complications are due to trauma and infection, and many patients experience a little bleeding. The risk of trauma is greater in male patients and in those lacking urethral sensation. Once patients become proficient at catheterising, complications are infrequent, particularly in female patients.²⁶ Complications include bladder calculi, urethritis, urethral stricture, false passage, and epididymo-orchitis.^{8 17 25} The incidence of complications (15/75 (20%) during a mean of seven years' follow up¹⁴) compares favourably with that after surgery for incontinence.^{4 34 35}

Overcoming problems

Technical difficulties—Many patients abandon intermittent catheterisation because they are not given sufficient help in overcoming problems. In male patients sphincter spasm may prevent the catheter entering the bladder. If the sphincter fails to relax on waiting, a different catheter—stiffer, narrower, or curved—may be effective.¹² In female patients a failure to obtain urine is usually because the catheter has been inserted into the vagina. Locating the urethral meatus can be difficult for women whose perineum is numb or whose legs have a tendency to adductor spasm. Such patients need preliminary practice at identifying the meatus with a finger tip. A device which holds legs in abduction and incorporates a mirror can be of help.²⁴

Persistent wetness—This is usually due to an imbalance between fluid intake and frequency of catheterisation. A fluid balance chart may suggest simple adjustments (table 2). If these are unsuccessful a urodynamic study may show an unstable hyper-reflexic bladder or an incompetent bladder sphincter. An unstable bladder can be treated with drugs with an anticholinergic effect, such as oxybutynin, imipramine, or propantheline.²⁶ Ephedrine is occasionally effective for leakage due to an incompetent sphincter.^{6 11 12 22} But people who catheterise themselves may tolerate some dampness because they are delighted to be so much drier than previously.

Schooling—Intermittent catheterisation needs careful planning and cooperation between the patient, parents, school staff, and medical services. The child needs privacy and an understanding teacher and a trusted adult to turn to in an emergency. Parents, because of their experience, are usually the best people to advise on their child's needs and to teach the care assistant. Children may learn to catheterise themselves between the ages of 5 and 7 years and should be encouraged to manage their own padding while still small and agile. The ultimate aim is for the child to achieve independence.

Urinary infections before and while using intermittent catheterisation

Before starting intermittent catheterisation

Severe infections are likely to be frequent
Infections are unresponsive when the bladder retains urine
Pyelonephritis may occur
Mild infections are often not noticed
Urine specimens may be difficult to obtain

When using intermittent catheterisation

Severe infections are rare
Infections respond promptly when the bladder is well drained
Pyelonephritis is rare
Bacteriuria generally occurs but needs no treatment
Urine specimens are easy to obtain from the catheter

Conclusion

Intermittent catheterisation is one of the major advances in urology. Users of the method are among the most satisfied and grateful of all patients.

For a free copy of the *User's Guide to Intermittent Catheterisation* please send a self addressed A5 envelope with 29p stamp to GMH at the address given above.

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Lesson of the Week

Insidiously evolving, occult drug interaction involving warfarin and amiodarone

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Interactions between warfarin and amiodarone may continue after amiodarone has been withdrawn, so more frequent monitoring of the international normalised ratio is advisable

Amiodarone is often prescribed in the treatment of supraventricular, junctional, and ventricular tachycardia, atrial fibrillation, and tachycardias associated with Wolff-Parkinson-White syndrome. Its advantages are its high degree of efficacy and the lack of negative inotropism. However, its use is complicated by its long half life, its side effects—for example, phototoxicity, skin discoloration, neuropathy, hepatitis, thyroid dysfunction, pulmonary fibrosis, and corneal microdeposits—and interactions with other drugs, including warfarin. The interaction between warfarin and amiodarone that results in prolongation of the prothrombin time and a risk of bleeding is well known,^{1,3} and has been attributed to interference with the hepatic degradation of warfarin.⁴ We report here a patient in whom this interaction was encountered in an apparently paradoxical manner.

Case report

A 72 year old man developed atrial fibrillation after coronary artery bypass graft surgery, and treatment with amiodarone (600 mg daily) was started. A fortnight later he had two transient ischaemic attacks. At that time, 18 days after starting amiodarone, the dose of amiodarone was reduced to 400 mg/day and anticoagulation with warfarin was started. When the patient's prothrombin time appeared to have stabilised (table) he was discharged from hospital taking warfarin 2 mg and 2.5 mg on alternate days. Eighteen days later

he was admitted to hospital with gross haematuria and an international normalised ratio of 4.7. Following transfusion of fresh frozen plasma and withdrawal of warfarin, the international normalised ratio became normal. Investigation of the urinary tract, including cystoscopy, showed no abnormality. Between the beginning of warfarin treatment and admission to hospital for haematuria no new drugs were started and nor was the dose of any other drug changed.

Discussion

Amiodarone is a very lipid soluble drug with complex pharmacokinetics.⁵ It is metabolised by the

International normalised ratio and dose of warfarin after start of warfarin

Days after start of warfarin	Dose of warfarin (mg)	International normalised ratio
1	2.5	1.2
2	3	1.5
3	2.5	1.7
4	3	2.0
5	2.5	2.2
6 and thereafter	2 and 2.5 on alternate days	
18 (presented with haematuria)		4.7 and later 4.2

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