Adult Urinary Obstruction, Retention and Bladder Scanning

A Self Directed Resource Package

Developed by the Home and Community Care (HACC)/Medical Aids Subsidy Scheme (MASS) Continence Project

February 2011

ROYAL COLLEGE of NURSING Australia

This publication has been endorsed by the Royal College of Nursing, Australia according to approved criteria.

Queensland Government

hacc home and community care

A JOINT COMMONWEALTH AND STATE/TERRITORY PROGRAM PROVIDING FUNDING AND ASSISTANCE FOR AUSTRALIANS IN NEED

First Edition 2008

ISBN: 978-1-921707-09-4

HACC/MASS Continence Project
Medical Aids Subsidy Scheme
41 Southgate Avenue (PO Box 281)
CANNON HILL QLD 4170
Phone: (07) 3136 3665
Email: MASS-ContinenceAids@health.qld.gov.au

HACC/MASS Continence Project Team 2010 -2011
Christine Leech, Occupational Therapist, Senior Project Officer
Audrey Burgin, Continence Nurse Advisor, Project Officer
Lesley Osborne, Executive Support Officer

External Reviewers
Yvette Sullivan, Nurse Practitioner Urology,
Redcliffe Hospital, Qld

Julie Westaway, Continence Nurse Advisor,
Toowoomba Community Health, Qld

Marco Hake, Continence Nurse Specialist,
Nurse Practitioner candidate, Urology/Continence/Stomal Therapy, Albany Hospital, WA

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1. Introduction

Background

This self directed resource package has been developed by the Home and Community Care (HACC)/Medical Aids Subsidy Scheme (MASS) Continence Project team, to support the clinical skill of bladder scanning.

The objectives of this resource package are to discuss adult urinary obstruction, retention and bladder scanning, and to:

- understand the anatomy and physiology of the urinary tract
- explain the examination of a client
- identify urinary obstruction
- discuss causes of urinary obstruction
- identify urinary retention
- discuss the consequences of urinary retention
- understand the reasoning for use of a bladder scanner
- interpret bladder scanner readings
- identify professional competence and accountability.

Use of a bladder scanner is not a complex procedure. Manufacturers of bladder scanners provide a variety of educational resources on operational procedures and how to obtain a bladder volume reading. The manufacturers' representatives are readily available to demonstrate the use of the bladder scanner to clinicians and to discuss any problems. Some manufacturers may also have developed a competency on clinical assessment and the use of their machine.

While the manufacturer's resources emphasise performing the actual bladder scan, there is limited information readily available on:

- the causes and impact of urinary obstruction and retention of urine
- professional responsibilities of clinicians to act upon results obtained from a bladder scan
- the need for clinicians to work within their scope of practice and competence.

Clinical decisions about when and how to treat urinary obstruction are crucial. A delay in decompression or a failure to decompress an overly distended bladder can have serious consequences. On the other hand, over-aggressive management can lead to inappropriate treatment such as the use of catheters with the possibility of associated infections. The interpretation of the results requires a wider knowledge and higher level of competence.

In order to competently assess urinary obstruction, urinary retention and interpret a bladder scan reading, it is necessary for the clinician to:

- have knowledge of the anatomy and physiology of the urinary system
- understand some of the conditions responsible for urinary obstruction and urinary retention
- link clinical symptoms with a bladder scan recording
- apply best practice management principles.

2. How to use the self directed resource package

The self directed resource package has been developed in sections that address topics relevant to urinary obstruction, urinary retention and bladder scanning. At the end of each section are recommended references, readings and questions for self assessment.

The self directed resource package does not include a competency assessment for users of bladder scanners, as the HACC/MASS Continence Project team does not promote one bladder scanning machine in favour of another. Employer organisations have different credentialing requirements for assessment of health professionals. Bladder scanning competence includes formal learning and clinical assessment. Therefore health professionals should ensure their employer has given approval for bladder scanning to be undertaken, has a policy, procedure, and competency standards for performing bladder scanning, and provides necessary training prior to undertaking the procedure.

Endorsement

The HACC/MASS Continence Project team is an authorised provider of Royal College of Nursing, Australia (RCNA) endorsed courses. On completion of this learning package, a registered nurse who is a member of the RCNA and enrolled in the Life Long Learning Program (3LP) will be able to apply to the RCNA for awarding of ten Continuous Nursing Education (CNE) points.

The Australian Health Practitioners Regulation Board July 2010 standards require a minimum of twenty hours continuing professional development per year. Successful completion of this self directed learning package, including recommended readings and self assessment exercises accounts for ten hours of professional development, with non RCNA members (nurses and allied health professionals) being eligible for points. Individuals should maintain their own professional development records. The HACC/MASS Continence Project team also recommends that nurses and other health professionals advise their employer of their self assessment and completion of the self directed resource package.

User feedback

Following completion of this self directed resource package, the health professional is requested to complete the evaluation form and forward the form to the HACC/MASS Continence Project either by fax (07) 3136 3666 or post to PO Box 281, Cannon Hill, Qld, 4170.

3. Anatomy and physiology of the urinary tract

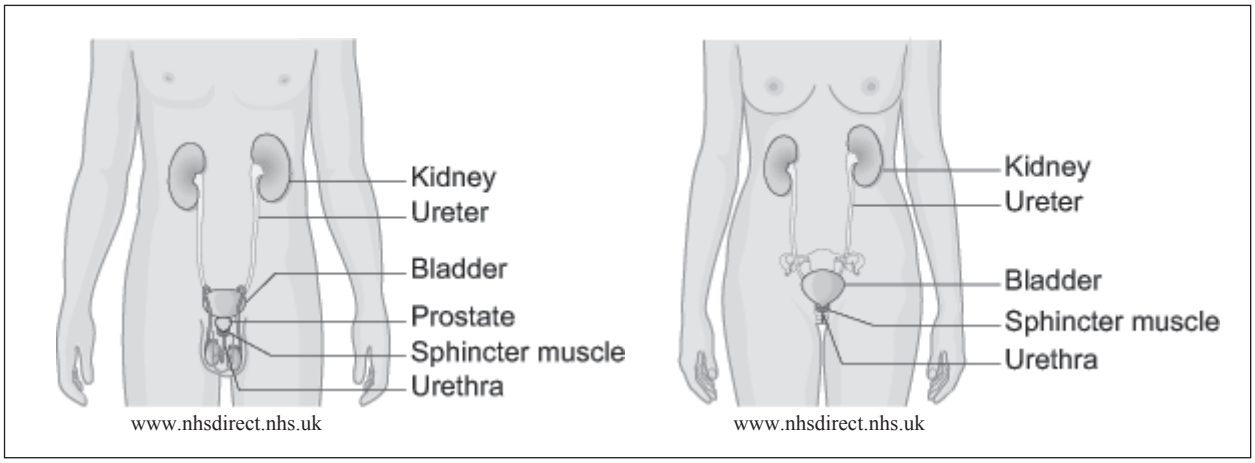
The urinary tract comprises of two sections:

(a) The upper urinary tract

- 2 kidneys
- 2 ureters

(b) The lower urinary tract

- 1 urinary bladder
- 1 urethra
- 2 urethral sphincters (internal and external)



Male (L) and female (R) urinary systems. Diagrams sourced from www.nhsdirect.nhs.uk

Kidneys

The kidneys are a pair of bean-shaped brown-red organs which lie on the posterior wall of the abdomen outside the peritoneal cavity, from the twelfth thoracic vertebra to the third lumbar vertebra. The right kidney is slightly lower than the left due to the location of the liver. Kidney size in the adult ranges from 5-7cm in width, 2-5cm in thickness, and 10-12cm in length. The adult kidney weighs approximately 150g depending on body size and weight, but tends to shrink with age. The kidneys perform the major work of the urinary system. Their role is to filter the blood and produce waste in the form of urine (Beynon & Nicholls, 2004).

Kidney Function

The functions of the kidneys are:

- urine formation
- excretion of waste products
- regulation of electrolytes, acid-base balance and red blood cell production
- control of water balance and blood pressure
- renal clearance
- synthesis of vitamin D to active form

- secretion of prostaglandins
- regulation of calcium and phosphorus balance
- activation of growth hormone (Smeltzer, Bare et al., 2008).

Ureters

The ureters are narrow fibromuscular tubes approximately 24-30cm long, which carry urine from the renal pelvis in the kidneys to the trigone area of the bladder wall. Movement of urine is facilitated by peristaltic contraction of the smooth muscles in the walls of the ureters.

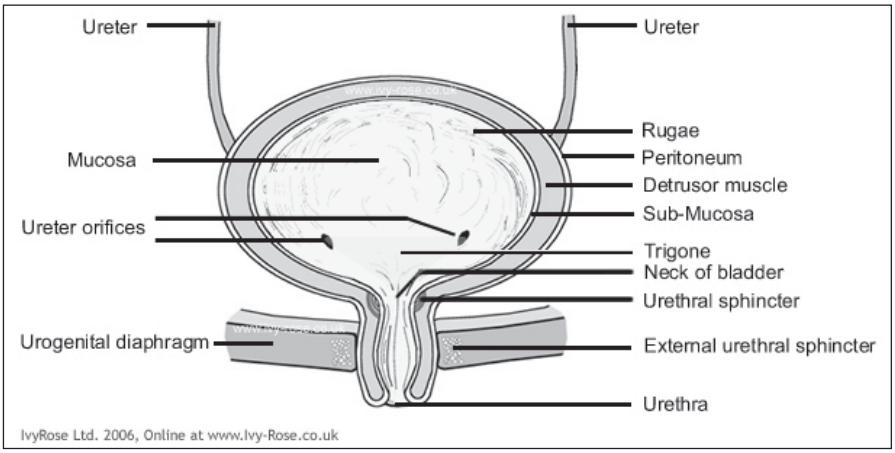
Both ureters enter the trigone area of the bladder wall at an oblique angle, called the uterovesical junctions. The angling of this junction creates a functional valve which prevents urine reflux up the ureters to the kidneys during bladder filling and voiding (Smeltzer, Bare et al., 2008).

Urinary bladder

The urinary bladder (a reservoir that stores and expels fluid) is a hollow muscular organ, shaped like a balloon and situated in the lower front part of the pelvis just behind the pubic bone. The bladder wall contains four layers. The outer layer, the adventitia, is made up of connective tissue. The second layer is the smooth muscle layer known as the detrusor muscle. Beneath the detrusor is a submucosal layer of loose connective tissue that lies between the detrusor and the innermost mucosal lining, which is impermeable to water and prevents reabsorption of urine stored in the bladder. The adult bladder capacity is approximately 300-500mL (Smeltzer, Bare et al., 2008).

In males, the base of the bladder lies between the rectum and pubic symphysis, while in females the base is below the uterus and anterior to the vagina. At the base of the bladder is a small triangular area called the trigone. This area is highly sensitive to stretch, and becomes irritated by foreign bodies such as catheters. The urinary bladder is supported in place by muscles and ligaments, the anterior vagina, endopelvic fascia, arcus tendinous, fascia pelvis, and bony pelvis (Balmforth, Mantle et al., 2006).

As the normal bladder fills, it gradually stretches to hold the increasing volume of urine, thereby keeping the pressure inside the bladder at a constant low level. During micturition, the detrusor muscle compresses the bladder, pushing urine into the urethra (Smeltzer, Bare et al., 2008).



Female bladder and urethra. Sourced from www.Ivy.Rose.co.uk

Urethra

The urethra, a thin-walled muscular tube that drains urine from the bladder, arises from the bladder neck at the base of the bladder and terminates at the external meatus.

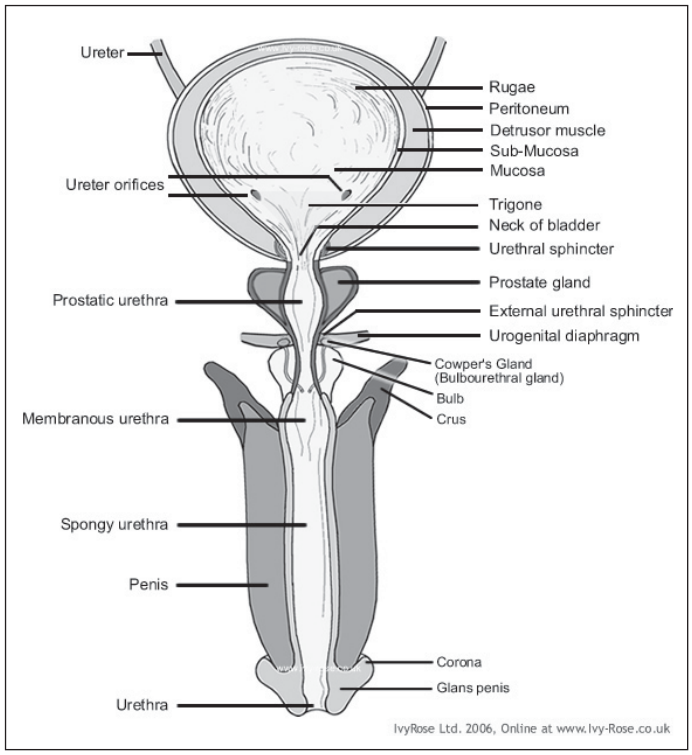
Female urethra

The female urethra is a straight tube, only 3-5 cm long, passing through the muscles of the pelvic floor (levator ani), with its external meatus opening anteriorly to the vagina.

Male urethra

The male urethra is S-shaped, approximately 18–22cm long. Its function is to transport urine and semen. It comprises four regions:

- prostatic urethra (3-4cm) – passes through the prostate gland, which lies just below the bladder neck and surrounds the urethra posteriorly and laterally
- membranous urethra (2cm) – passes through the pelvic floor musculature
- bulbar urethra (1.5cm) – surrounded by the bulb of corpus spongiosum
- penile urethra (approximately 15cm) – opens at the urethral meatus (spongy urethra) (Smeltzer, Bare et al., 2008).



Male bladder and urethra. Sourced from www.Ivy.Rose.

The prostate gland

The chestnut shaped prostate gland is located around the bladder neck and prostatic urethra. Its size increases in men over 50 years of age. While not part of the urinary tract, the anatomical relationship of the prostate gland and the urethra is an important consideration, as it is often a cause of urinary obstruction (Beynon & Nicholls, 2004).

Urethral sphincters

The internal and external urethral sphincters are two rings of muscle between the base of the bladder and the external meatus.

Internal sphincter

At the junction of the bladder and the urethra (bladder neck), a thickening of the detrusor muscle forms the internal urethral sphincter, which keeps the bladder neck closed so urine is not involuntarily passed. The internal sphincter is not under voluntary control.

External sphincter

An inner longitudinal smooth muscle layer and an outer circular striated muscle layer make up the external sphincter, which is under voluntary control. Designed for providing support and prolonged contraction, the striated muscles contract to raise urethral closure pressure during sudden rises in intra-abdominal pressure, such as during coughing, sneezing, laughing and running, thereby maintaining urinary continence (Beynon & Nicholls, 2004; Smeltzer, Bare et al., 2008).

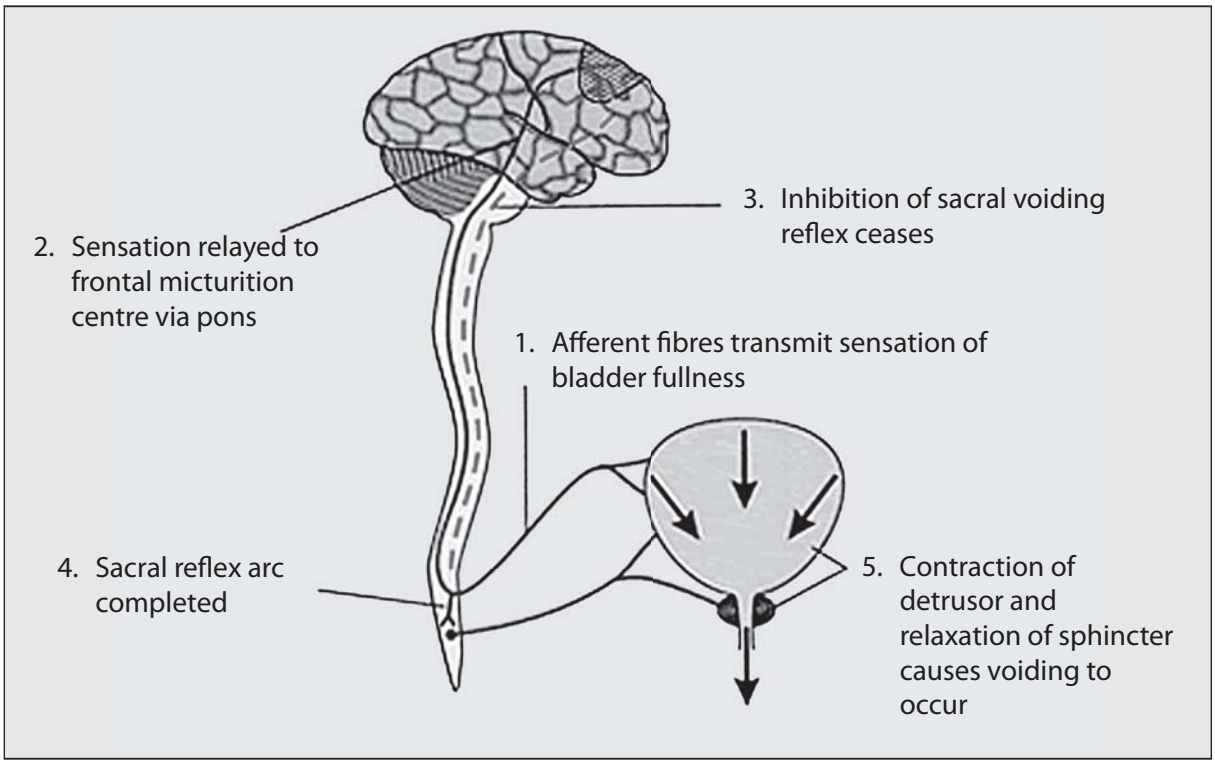
Physiology of the urinary tract

The lower urinary tract is innervated by three sets of peripheral nerves:

- parasympathetic nerves from the sacral area of the spinal cord which stimulate the detrusor and relax the external urethral sphincter
- lumbar sympathetic nerves which inhibit the bladder body and stimulate the bladder base and urethra
- somatic nerves such as pudendal nerves which supply the external urethral sphincter and associated mechanisms in the pelvic floor.

Voiding

The Sacral Micturition Reflex (SMR) is the basic spinal reflex involved in bladder emptying and occurs in the region of the spinal cord between S2 and S4. In the adult with an intact spinal cord, the decision to void involves a conscious process (voluntary control), involving the cortical micturition centre (CMC).



Voiding

Woodward, S. 1996. British Journal of Nursing, Vol 5(15) Reproduced with permission from the Mark Allen Group known as MA Healthcare.

During normal voiding, the SMR ensures that the detrusor muscle contracts at the same time as a decrease in resistance inside the urethra occurs, due to relaxation of the urethral sphincter muscles and pelvic floor muscles. As the intravesical pressure increases during voiding, the intraurethral pressure simultaneously decreases.

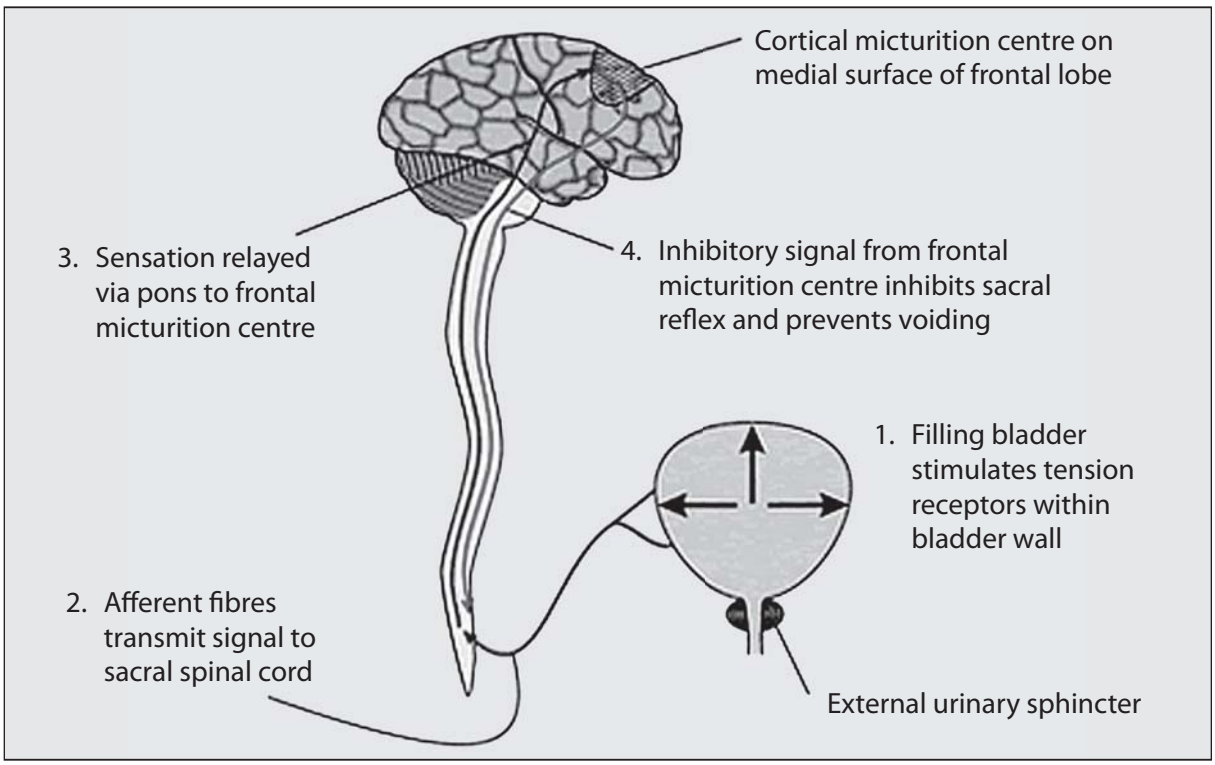
Several supraspinal regions of the brain influence the sacral micturition centre (SMC), allowing voluntary voiding to occur, including the right inferior frontal gyrus, the hypothalamus and the pontine micturition centre (PMC). Nerve fibres from the PMC descend via the spinal cord resulting in contraction of the detrusor and relaxation of the urethral sphincter. The PMC therefore augments the neural influences already present within the SMC, causing a strong, sustained detrusor contraction and external urethral sphincter relaxation, so that the bladder empties completely.

Other supraspinal regions of the brain have strong inhibitory influences on voiding. Their collective influence promotes bladder storage. It is therefore possible for the 'higher centres' of the brain to 'switch' on or off the output from the PMC to the SMC.

When the pelvic nerves are damaged, interruption of the parasympathetic pathways can reduce the ability of the detrusor smooth muscle to contract, thereby reducing the pressure within the bladder when voiding. As a result, the bladder fails to fully empty, and residual urine may remain in the bladder at the end of voiding, increasing susceptibility to urinary tract infections.

Storage

As the bladder fills, sensory information is relayed through the spinal cord to the cortical micturition centre via the sympathetic and somatic pathways. The sympathetic pathway excites the internal urethral sphincter, leading to a gradual contraction of the urethra with simultaneous relaxation and stretching of the detrusor (Chai & Steers, 1996). This relaxation throughout the whole of the storage phase is essential to allow the bladder wall to stretch while filling occurs. The somatic pathway involves pudendal nerve innervation via the external urethral sphincter to the pelvic floor.



Storage of urine

Woodward, S. 1996. British Journal of Nursing, Vol 5(15) Reproduced with permission from the Mark Allen Group known as MA Healthcare.

Other supraspinal influences during the storage phase come from the basal ganglia and cerebellum (Rosenweig, 1992). The pons sends information to the sacral micturition centre and provides continuous excitation to the somatic motor neurons supplying the external urethral sphincter and pelvic floor (Blok & Holstege, 1998; Blok, Sturms et al., 1998).

Tonic activity of the external urethral sphincter gradually increases during bladder filling. A continuous tonic contraction of the levator ani is also present at a subconscious level, known as the voluntary guarding reflex (Chai & Steers, 1996). Damage to the sacral and perineal nerves (e.g. through radical prostatectomy, herniated lumbar disc, pelvic fracture or vaginal delivery) causes damage to somatic nerve pathways, reducing the ability of the levator ani and external urethral sphincter muscles to contract. This results in decreased intra-urethral pressure, which may lead to urinary incontinence.

Lower urinary tract symptoms

Lower urinary tract symptoms (LUTS) are urinary storage or emptying symptoms which include urgency, frequency, hesitancy and weak urinary stream. LUTS can occur in men and women of all ages (Newman & Wein, 2009).

Readings

1. Richardson, M. 2006, The Urinary System, Part 1 – Introduction. *Nursing Times*, vol. 102, no. 40, pp 26-27.
2. Richardson, M. 2006, The Urinary System, Part 2 – Anatomy of the Kidneys. *Nursing Times*, vol.102, no 41, pp 26-27.
3. Richardson, M. 2006, The Urinary System, Part 3 – Kidney Function. *Nursing Times*, vol, 102, no. 42, pp. 28-29.
4. Richardson, M. 2006, The Urinary System, Part 4 – Bladder Control and Micturition. *Nursing Times*, vol. 102, no 43, pp 26-27.

Self assessment questions

1. Identify and describe the importance of three anatomical considerations when performing male catheterisation.

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2. What is the importance of the internal and external urinary sphincters on continence?

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3. Identify how kidney malfunction may affect a person's urine output.

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4. Describe the implications of damage to the pontine micturition centre on the voiding mechanism.

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4. Client examination

Any client presenting with urinary problems should have a post void residual (PVR) urine recording as part of a basic assessment. PVR is the volume of urine remaining in the bladder immediately after micturition, and can be estimated in several ways including abdominal palpation and percussion, post void fills during urography, radionuclide scan, urinary catheterisation, and both abdominal and vaginal ultrasound. A correct physical examination may detect a distended bladder and provide an estimate of bladder volume.

A thorough assessment is essential for any client presenting with a history or complaint of urinary problems, and while there are many investigations that can be undertaken, the importance of obtaining a detailed history cannot be overestimated. Subjective and objective assessments should include:

- Medical history
- Surgical history, including urological and gynaecological history
- History of voiding and lower urinary tract symptoms, including continence aids and management strategies used
- Visual inspection of urine
- Voiding pattern (frequency, urgency, hesitancy, dysuria)
- Cognitive, physical and functional abilities
- Medication history, including drug allergies
- Completion and review of bowel and bladder diaries (intake, output, hydration)
- Review of investigations performed (e.g. urinalysis, urine culture, radiology, pathology)
- Bowel status
- Interpretation of results
- Evaluation
- Plan of care
- Referral and review.

Assessment is necessary to identify any underlying cause/s and/or contributory factors, and to develop a treatment and management plan. Health professionals who are ideally positioned to carry out an initial continence assessment include primary, secondary and tertiary clinicians, particularly registered nurses. A bladder diary is useful as part of the initial assessment, to determine minimum, maximum and average voids, frequency, nocturia, fluid intake and type. Physical examination is an essential component of an assessment, but is sometimes omitted due to a lack of staff training and deemed competency (Gray, 2000a; Newman, Gaines et al., 2005).

The examination and any other possible interventions should be explained to the client and consent to proceed must be obtained. The abdomen should then be examined gently with warm hands, with the client lying in the supine position with his/her head raised on one pillow.

After visual examination for any abnormal swelling, or abnormality to skin or genitalia, gentle abdominal palpation should be performed to reveal any abdominal tenderness, mass, or palpable bladder or other fluid filled features such as cysts (Winder, 2001).

Bladder fullness is identified on percussion as a dull sound, which represents fluid. This is easily distinguished from the surrounding bowel, which produces a more resonant sound, representing air. Percussion for an enlarged bladder should commence well above the umbilicus, progressing downwards from a resonant area into a dull one.

Upon percussion, dullness of the bladder to the level of the umbilicus indicates at least 500mL of urine in the bladder, and a bladder containing 1,000mL or more will extend well above the umbilicus. Light abdominal palpation also reveals the enlarged bladder, which is appreciated as a midline mass extending upward from the suprapubic area. Deep palpation is not recommended, because it produces significant discomfort. Tenderness and suprapubic pain over a distended bladder helps to distinguish painful acute retention from the more insidious and generally painless chronic retention. If diagnosis is unclear or multifactorial, referral for higher level assessment may be necessary (Altschuler & Diaz, 2006; Aning, Horsnell et al., 2007; Steggall, 2007).

Relying solely on an examination of the abdomen has several drawbacks as this is an unreliable method for detecting urinary retention, which is defined as being the volume of post void residual urine. Abnormal findings should be referred on to a medical or nurse practitioner.

Readings

1. Colley, W. 2003, The assessment of continence problems in adults. *Nursing Times*, vol. 99, no. 29, pp 50-51.
2. Winder, A. 2001, Assessment and investigation of urinary incontinence, Norton, C Ed. Nursing for Continence, pp 33-35.

Self assessment questions

1. What would you explain to a client about an examination and assessment?

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2. Explain the difference between bladder palpation and percussion.

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3. What information should be included in an assessment of a client with urinary problems?

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5. Urinary obstruction

Urinary obstruction may occur at any point in the urinary tract, from the kidneys to the urethral meatus. Some secondary causes include calculi, tumours, strictures, trauma, congenital and anatomical abnormalities. Urinary obstruction is classified according to the anatomy involved, with the clinical presentation varying according to the location, duration and degree of obstruction.

Ideally, urine output should equal fluid input. Inadequate output occurs when renal function is affected or outflow is obstructed.

A thorough assessment which includes the history and a physical examination is required to determine causes of insufficient urine output. Prompt assessment, treatment and management are essential to ensure that damage to any part of the urinary tract is minimised and irreversible bladder and kidney damage is avoided. This may include bladder scan, catheterisation and measurement of PVR.

Upper urinary tract obstruction

This refers to an obstruction of the kidneys and/or ureters. Obstruction may present as flank pain, back pain, groin pain, nausea and vomiting. Bilateral or unilateral kidney or ureter obstruction can cause uraemia, with symptoms such as weakness, peripheral oedema and changes in mental status (Burton, 2007). This is a medical emergency and requires prompt referral and treatment.

Adult upper urinary tract obstruction may be due to:

- Aortic/abdominal aneurysm
  Aneurysm may obstruct ureter/s either by direct compression or perianeurysmal fibrosis
- Calculi
  Stones in the kidney/s or ureter/s can block or slow urine flow
- Carcinoma
  Carcinoma of the kidney, ureter, uterus, prostate, bladder, colon, or rectum can obstruct or directly invade the upper tracts
- Congenital condition
- Injury
  Trauma of the ureter/s or kidney/s due to blunt or penetrating injury
- Papillary necrosis
  Disorder of the kidneys in which all or part of the renal papillae die. Can be due to pyelonephritis, urinary tract obstruction, diabetes mellitus, sickle cell anaemia, cirrhosis of the liver and analgesic abuse

- Pregnant uterus
  The gravid uterus may cause ureteral obstruction due to the increasing growth of the foetus and volume of amniotic fluid
- Retroperitoneal fibrosis
  Dense plaques of fibrous tissue develop behind the peritoneum and cause the ureters to become encased and obstructed
- Tuberculosis
  Causes strictures of the lower ureter due to the chronic inflammatory condition (Choong & Emberton, 2000; Gray, 2000a).

Lower urinary tract obstruction

This refers to an obstruction of the bladder and/or urethra. Obstruction can present as voiding dysfunction such as urgency, frequency, nocturia, decreased stream, hesitancy, incontinence, post void dribbling, and sensation of inadequate bladder emptying. If urinary retention is present, the client may exhibit suprapubic pain, or a palpable bladder may be detected on physical examination (Burton, 2007).

Adult lower urinary tract obstruction may be due to:

- Anaesthetic agents, recreational or illicit drugs
- Prostatic hyperplasia
  Enlargement of the prostate gland, which may compress the urethra and impede the flow of urine from the bladder. Histology confirms malignancy or non-malignant hyperplasia
- Bladder neck dyssynergia
  The smooth muscle that surrounds the urethral opening at the bladder fails to relax during urination. This is rare in women. The cause is not known, but may be neurological or due to emotional distress
- Cancer of prostate or bladder
  Malignant tumour which forms in the tissue of the prostate or bladder. Early prostate cancer may cause no symptoms, but if present, symptoms are similar to prostatic hyperplasia.
- Detrusor sphincter dyssynergia
  An abnormal contraction of the striated sphincter during micturition, causing obstruction of the bladder outlet. It may be caused by spinal injuries above S2 and below the pons, congenital defects and acquired conditions such as Multiple Sclerosis, Human Immunodeficiency Virus, Systemic Lupus Erythematosus and Transverse Myelitis
- Faecal impaction
  Faeces in the rectum can cause an outflow obstruction by pressing on the bladder or urethra
- Foreign bodies

- Medications
  Antispasmodics, antihistamines and anticholinergics may cause dysfunction of bladder sphincter control
- Pelvic tumour/mass
  The mass itself may cause obstruction, while surgery for pelvic tumours can affect pelvic nerves and result in denervation of the bladder affecting the ability to void
- Spinal or cerebral lesions
- Trauma
- Urethral calculi
  Condition in which stones migrate from the upper renal tract or bladder and lodge in the urethral lumen
- Urethral stenosis
  Narrowing of the urethra may occur due to atrophy of urogenital organs in postmenopausal women, or urethral scarring following urethrotomy, anterior vaginal repair or traumatic catheterisation
- Urethral stricture
  Occurs primarily in males causing a narrowing of the urethral lumen and affecting urinary flow. Any section of the urethra may be affected
  (Choong & Emberton, 2000; Gray, 2000a).

Reading

Busuttil-Leaver, R. Reconstructive surgery for the promotion of continence, in Fillingham, S. and Douglas, J. 2005, *Urological Nursing*. pp. 135-159.

Self assessment questions

1. Identify the organs of the upper urinary tract.

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2. Identify the organs of the lower urinary tract.

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3. Explain how a male urethral stricture can affect voiding.

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4. List four potential causes of lower urinary tract obstruction that may necessitate catheterisation.

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6. Urinary retention

When urinary retention occurs, urine flow is impeded, causing distension of the urinary tract proximal to the point of obstruction. This in turn increases localised structural pressure, and can distort the urinary tract anatomy. If left untreated, permanent kidney damage, renal failure or bladder rupture can occur.

Post void residual urine is defined as the volume of urine left in the bladder at the end of voiding. In the older client, it is thought to be a common finding, even when there is no underlying physical obstruction. It may occur with bladder outlet obstruction (in men) or as an age-related decrease in detrusor contractility in both men and women, and is more common after 55 years of age. Significant daily variations in individual post void residual urine can occur for no known reason, with the greatest residual volumes generally measurable in the early morning.

Vaginal prolapse, history of incontinence, diabetes and neurological diseases such as stroke, Parkinson's disease etc. are also clinical risk factors for urinary retention. Griffiths, Kondo et al. (2005) recommend that post void residual be assessed in older clients with urinary incontinence, as it may influence treatment. Indeed, a bladder scan is recommended as an essential component of assessment of any older client with urinary incontinence (Fonda, 2006). In frail older adults with incomplete bladder emptying, interpreting the clinical significance of post void residual should be done with caution to avoid under or over treatment. The decision on when to treat post void residual in frail older adults who are asymptomatic or with limited symptoms is complex, and is best determined by subjective and objective clinical assessment.

The key points are to:

- identify incomplete bladder emptying
- interpret the clinical significance of the residual urine
- undertake the best intervention and management.

Failure to identify significant post void residual may cause irreversible harm. Bladder over distension can develop due to poor management of acute or chronic distension following pelvic surgery or epidural/spinal anaesthesia, but may also be idiopathic in older women (Dorflinger & Monga, 2001) and men (Sullivan, 2010). Bladder over distension may result in irreversible detrusor damage due to ischaemic and neuropathic changes within the bladder wall (Groutz & Blaivas, 2002). However, over-aggressive management can result in over treatment such as inappropriate catheterisation.

Used correctly, bladder scanners can provide accurate and reliable indications of bladder volumes and post void residuals, and may assist in determining the need for catheterisation (Ostaszkiewicz, 2007; Stevens, 2005). A guideline for the nursing assessment and management of urinary retention in elderly hospitalised patients has been recently published and includes a flow chart for guiding the management of urinary retention in elderly hospitalised patients (Figure 1, p19). It is recommended that PVR findings be interpreted in collaboration with a medical practitioner (Ostaszkiewicz, O'Connell et al., 2008).

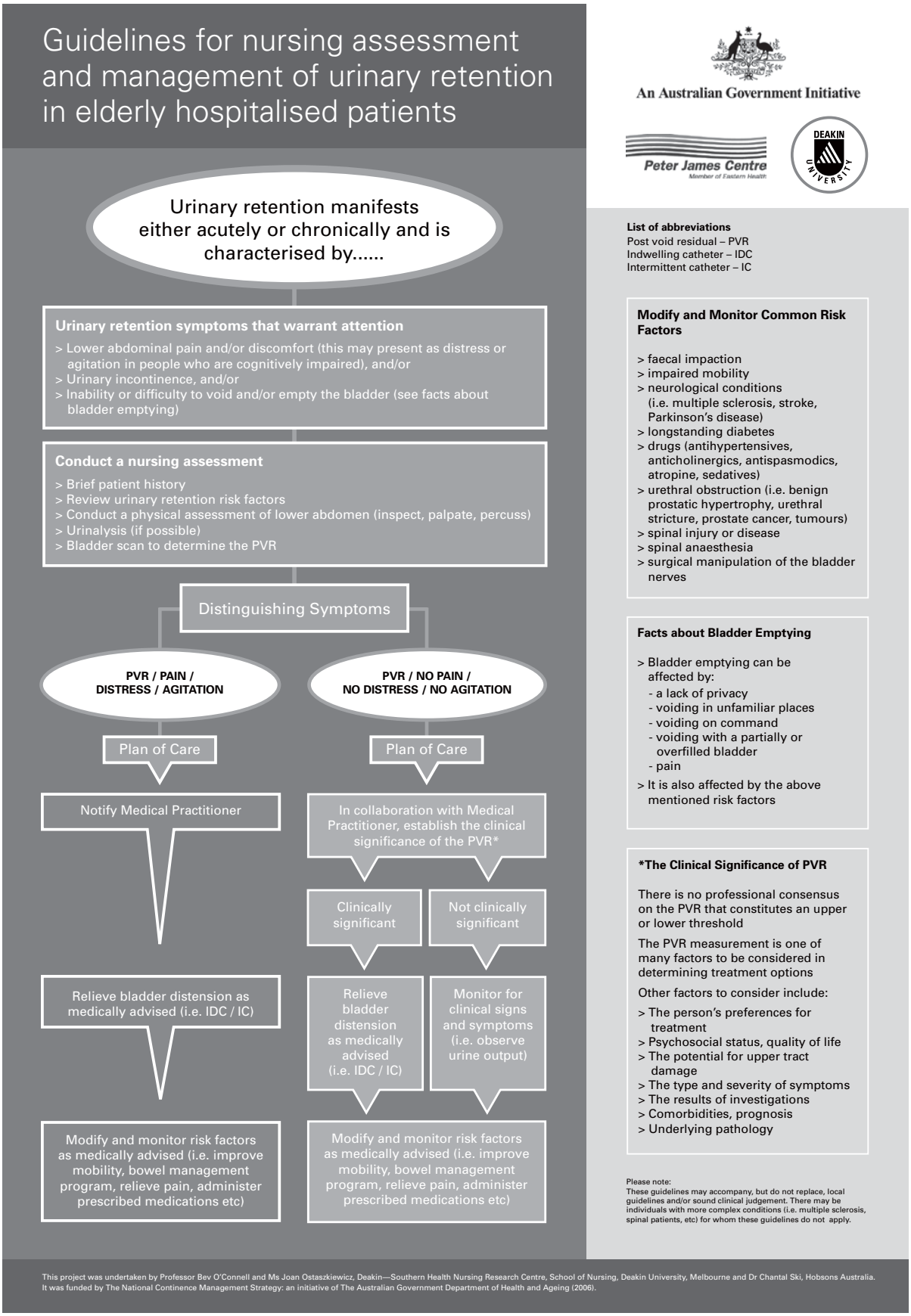

Figure 1. Guidelines for nursing assessment and management of urinary retention in elderly hospitalised patients Ostaskiewicz, O'Connell et al., 2008. Reprinted with permission, Australian and New Zealand Continence Journal

Obstruction of urine in any part of the urinary tract may lead to retention of urine, which can be classified as acute, chronic or acute-on-chronic urinary retention, as described in this section.

Acute urinary retention

Acute urinary retention (AUR) is the most common presentation of urinary retention and is identified by sudden and severe suprapubic pain, lower abdominal 'fullness' and voiding dysfunction. Despite the presence of urine in the bladder and a desire to void, there is an inability to void. Painless AUR requires immediate thorough assessment and management (Gray 2000a). It may be associated with central nervous system disorders, although painless post-operative acute retention can occur in patients who have undergone surgery such as hernia or rectal surgery, and those who have had epidural analgesia. There is a significnat incidence of AUR in post-operative patients (Gosling, 2005).

AUR can present in many clinical environments in both men and women, and may be caused by drug therapy and contributing conditions including constipation, UTI, immobility, recent surgery, and pain (Pellatt, 2007). It is predominately seen in men who have a history of outflow obstruction due to benign prostatic hyperplasia, and may only become evident when the client is unable to pass any urine. In AUR, the catheterised volume drained is usually between 500-800mL. This can be a useful distinction for identifying between acute and acute-on-chronic retention, particularly if the latter is associated with less pain (Choong & Emberton, 2000; Thomas, Chow et al, 2004).

With acute urinary retention, the retention volume is significantly greater than the expected normal bladder capacity. Delayed treatment of AUR can result in longer term bladder dysfunction (Haylen, 2008). While AUR usually presents suddenly and is more likely to be treated promptly due to the associated discomfort and pain, this is not so for chronic urinary retention (Ostaszkiewicz, 2007).

After relief of AUR, a catheter should be kept on free drainage. A catheter valve is not recommended as it mimics urinary retention. A catheter valve is a continence aid and should only be considered after a full clinical assessment has been undertaken, to ensure the client does not have any renal or bladder dysfunction (Sullivan, 2010).

Chronic urinary retention

Chronic urinary retention (CUR) occurs when a client retains a substantial amount of urine in the bladder after each void. The bladder remains palpable or percussible after micturition (Ostaszkiewicz, O'Connell et al., 2008). Over time, symptoms such as abdominal swelling and discomfort, the sensation of wanting to pass urine frequently, difficulty in starting to pass urine, incontinence and voiding in small amounts may be present. The defined PVR for chronic urinary retention can be difficult to establish. Some authors suggest a persistent PVR of between 300-500mL or more as being evidence of CUR (Wareing, 2003/4), while others such as Haylen (2008) indicate that CUR in women can be recognised as a persistent PVR over 200mL.

The development of CUR is not always obvious, as symptoms such as a reduction in urinary flow can gradually progress over a long period of time. If noticed, this is often attributed to the ageing process or outflow obstruction. Some people can retain up to 1000mL in the bladder without experiencing any pain. One of the first signs of CUR may be night-time frequency (nocturia) or incontinence (nocturnal enuresis), because during sleep the urethral pressure relaxes slightly and the higher pressure within the bladder forces urine out (Pellatt, 2007; Wareing, 2003/4).

CUR becomes clinically significant when it causes bothersome voiding dysfunction or when it leads to complications such as acute retention, recurrent urinary tract infection, urinary or bladder calculi, pyelonephritis, hydronephrosis, hydroureter, vesicoureteral reflux or renal insufficiency (Gray, 2000a).

CUR can be further divided into two categories:

- low pressure CUR
- high pressure CUR.

Low pressure chronic urinary retention

In low pressure CUR, the detrusor muscle fails to contract effectively to release urine. The bladder stretches to hold urine while maintaining low pressure within the bladder, but loses its natural smooth shape and size. The bladder may become atonic, which affects its ability to fully empty. This can be associated with conditions such as previously overstretched bladder injury/atonic bladder, obstructive prostate, Multiple Sclerosis and Stroke.

Low pressure CUR may produce voiding dysfunction or may remain asymptomatic. An elevated urinary residual volume can exist, often without producing any apparently harmful effects, and is sometimes discovered during the investigation of another complaint. However, low pressure CUR may present as urinary frequency because the bladder doesn't completely empty, or as recurrent urinary tract infections owing to stasis of urine in the bladder or bladder calculi.

If a client has no symptoms and radiology and pathology tests are normal, treatment may not be necessary. If however, there is a complaint of frequency, nocturia, or recurrent urinary infections, intermittent self catheterisation may be an option to ensure continence and prevent complications (Gosling, 2005).

High pressure chronic urinary retention

High pressure CUR can occur as a result of a long term obstruction. If the detrusor muscle over-exercises, bands of fibrous tissue form and become coarse and thick. The detrusor muscle attempts to contract more strongly in order to overcome obstruction. This leads to thickening of the bladder wall, bladder trabeculation (thick and irregular due to enlargement of the bladder wall muscle bundles), saccule formation (small sac within the bladder), and diverticulum (pouch formed at a weak point) (Gosling, 2005).

Thickening of the bladder wall may lead to occlusion at the end of one or both ureter/s, preventing or diminishing urine drainage from the kidney/s. Progressive back pressure from the bladder

causes the ureter/s to become dilated and tortuous. This inability to adequately propel urine forwards is know as hydroureter. Distension and dilatation of the kidney (hydronephrosis), can cause permanent kidney damage and renal failure. Urinary stasis along any portion of the urinary tract increases the risk of stone formation and infection, and ultimately, upper urinary tract injury.

High pressure CUR is regarded as a urological emergency requiring prompt assessment, treatment and intervention. Left untreated, high pressure CUR can lead to renal failure. Referral should be made immediately to a medical practitioner (Gosling, 2005; Gray, 2000a).

Acute-on-chronic urinary retention

Acute retention of urine may occur at any stage in the disease process and can occur in a client with no former symptoms. While acute retention usually produces severe suprapubic pain from the distended bladder, pain may be minimal in clients with pre-existing chronic retention of urine and a low tone bladder. This is known as acute-on-chronic retention. After intervention, the urine volume drained is often more than 800mL (Wareing, 2003/4).

Management of bladder outflow obstruction (BOO) and urinary retention

The aim of treatment and management of BOO and urinary retention is to remove the obstruction, promote drainage and prevent urinary retention and kidney damage (refer to Figure 1, page 19).

Treatments include:

- Catheter on free drainage
- Not using a catheter valve until assessed
- Elimination of predisposing factors (e.g. constipation, medications, fluid intake)
- Referral to urology services to assess renal function
- Assessment for trial of void
- Trial of void. After removal of a catheter, measuring a minimum of three voids plus PVRs is recommended to ensure there is no increase in the residual urine volume (Sullivan, 2010).

Readings

1. Choong, S. & Emberton, M. 2000, Acute Urinary Retention. *British Journal of Urology.* vol.85, pp. 186-201.
2. Thomas, K., Chow, K. & Kirby, RS. 2003, Acute Urinary Retention; a review of the aetiology and management, *Prostate Cancer and Prostatic Diseases* St George's Hospital, London UK 2004 pp. 32-37.
3. Wareing, M. 2003/4, Urinary Retention: Issues of management and care. *Emergency Nurse*, vol. 11, no 8, pp. 24-27.

Self assessment questions

1. Identify four symptoms of acute urinary retention.

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2. Explain the difference between chronic urinary retention and acute-on-chronic urinary retention.

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3. Explain how high pressure chronic urinary retention affects short term and long term kidney function.

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4. What acute clinical symptoms would be present if a client had 1,000mL in his/her bladder?

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7. Post obstructive diuresis

It is a commonly held misconception that a client with urinary tract obstruction will pass an abnormally small amount of urine (oliguria) or even fail to pass any urine (anuria). Anuria is likely to occur if bilateral urinary tract obstruction is present. A client with a partial (unilateral) obstruction may have urine output that remains within the normal range of output, above one litre per day.

Following relief of urinary tract obstruction, a period of significant polyuria may occur. This is a normal physiologic response and known as post obstructive diuresis. The response is due to the volume expansion and solute accumulation occurring during obstruction. With the return of homeostasis, the period of diuresis ends (Campbell-Walsh, 2007).

The majority of clients do not demonstrate a clinically significant post obstructive diuresis following relief of urinary tract obstruction. However, a pathologic post obstructive diuresis may occur. This is characterised by inappropriate renal handling of water or solutes, or both, and urine outputs of 200 mL/hour or greater may occur. Those who are susceptible to this phenomenon may have signs of fluid overload, oedema, congestive heart failure or hypertension (Campbell-Walsh, 2007). This is considered an acute condition requiring medical management and/or hospitalisation (Sullivan, 2010).

A severe, complete bilateral/unilateral upper urinary tract obstruction can lead to tubular atrophy and eventually to irreversible renal injury. Renal recovery prognosis after relief of urinary tract obstruction is dependent upon severity and duration of the obstruction.

If a kidney has been completely obstructed for up to:

- seven days, full recovery of renal function is expected if the obstruction is relieved within 2 weeks of the obstruction
- fourteen days, there is a permanent reduction to approximately 70% of renal function, with the recovery taking 3-6 months after reversal of the obstruction
- six weeks, there is no renal recovery (Reynard et al 2006).

Readings

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2. Williamson, J. 2005, Management of postoperative urinary retention, *Nursing Times* vol 101, No 29 pp 53-54.

Self assessment questions

1. State the difference between anuria and oliguria.

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2. Explain the term "post-obstructive diuresis".

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3. Explain the potential for renal damage in upper urinary tract obstruction.

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8. Use of a bladder scanner

Prior to the development of the bladder scanner, the options available for assessment and investigation of urine drainage were bladder percussion, catheterisation and radiological investigations. Urinary catheterisation has long been regarded as the gold standard in determining an accurate post void residual (PVR). Although urinary catheterisation is invasive, sometimes uncomfortable, and carries a risk of infection or urethral trauma, it may still be used to determine PVR if a bladder scanner is not available or a client is not suitable for bladder scanning.

Bladder scanning offers advantages over other interventions, such as intermittent catheterisation, for measurement of post void residual volume. It is simple and causes no discomfort to the client. Owing to wide variations in PVR in any one client, at least three consecutive readings are recommended to ensure a correct reading. Bladder scans should not be performed too frequently, ensuring the client does not become anxious. However, inadequate scanning may not detect bladder distension. Individual client circumstances need to be considered to assist determining frequency of scans (Ostaszkiewicz, 2007).

There are a number of different bladder scanners available. It is recommended that health professionals refer to the manufacturer's guidelines for information on use of the equipment. Health professionals who have received training and are deemed competent to perform a bladder scan should ensure that, when a bladder scanner is available, estimation of residual urine or confirmation of effective bladder emptying is a standard component of a continence assessment. The procedure should also be used to assess those at risk of poor bladder emptying, such as clients with chronic retention, even if they have no symptoms (Patraca, 2005).

Reasons for performing bladder scans

The bladder scan provides assessment data, biofeedback in bladder retraining, assessment for catheter malfunction, and aids in assessing urinary retention and renal failure, and the effectiveness of anticholinergic medication on voiding. The bladder scan should be a standard investigation for at-risk groups presenting with bladder problems.

The primary reasons for performing a bladder scan are to:

- collect random bladder scan volume >20 mins since last void
- record residual volume (pre void bladder volume minus volume voided)
- record post void volume 10 - 15 minutes after voiding, for assessment of suspected incomplete bladder emptying or urinary retention
- record pre and post void readings for comparison of bladder volume capability and function
- identify bladder sensation related to bladder volume (first sensation to void)
- conduct a comprehensive clinical assessment (Gilbert, 2005).

Benefits of a bladder scanner

There are many benefits associated with the use of a bladder scanner. They are:

For the clinician:

- high degree of accuracy
- instantaneous results, with decreased assessment time
- able to be performed quickly, faster than catheterisation
- no mathematical calculations required
- print out of recordable volume available
- indicates if there is a need to catheterise
- unlike catheterisation, no risk of introduction of urinary tract infection or trauma
- non-invasive, no contact with mucous membranes
- sterile gloves not required
- no radiation exposure
- with education, the scanner is easy to use and well accepted by staff
- reusable and cost effective over time
- portable
- aids clinical decision making (Gilbert, 2005).

For the client:

- no pain or discomfort
- minimal anxiety
- no exposure of genitals, therefore maintaining privacy and dignity
- improved client care outcomes
- easy and suitable for use with children and adults
- provides instant feedback to the client
- able to be assessed in the home or community setting (Gilbert, 2005).

Clinical indications for use of a bladder scanner

The clinical indicators are:

For the clinician:

- as part of a continence assessment
- to confirm urinary retention
- to identify incomplete bladder emptying
- to assess post void residual urine
- to assess bladder sensation level in relation to bladder volume
- in trial of void, to prevent bladder distension

- to determine if early removal of a catheter has been appropriate
- to assess bladder volume if catheter not draining
- to identify if an indwelling catheter is blocked
- to determine bladder volume in a client with decreased urine output.

For the client:

- to identify any voiding problems prior to an invasive procedure
- to monitor postoperative clients or those who are physically unable to void
- in a bladder retraining program, by determining need to void based on bladder volume and not time
- to assess effectiveness of mechanical bladder emptying
- to identify level of bladder sensation related to bladder volume
- to identify if adverse side effects of urinary retention are present such as with medications e.g. anticholinergics
- as a standard investigation for at-risk groups (e.g. neurological disease, diabetes) when presenting with urinary problems
- annual monitoring of bladder function in those with chronic or progressive diseases e.g. Multiple Sclerosis (Gilbert, 2005).

Bladder scanner limitations

Bladder scanning is a reliable diagnostic tool, which should be used as an adjunct for urinary assessment and not used in isolation from other assessment data. An assessment of bladder function and transient causes of incomplete bladder emptying are important considerations. Integrating information about the client's own experience of their condition, clinical state, and investigation results should be considered, so that clinicians consider the benefits and risks of various management options (Ostaszkiewicz, 2007).

Use of a bladder scanner may not be appropriate in all situations, including:

- if the client has gross or morbid obesity
- if there is severe abdominal scarring
- if abdominal staples or tension sutures are insitu
- if an infectious abdominal wound is present (unless scan head protected with a condom). Check the manufacturer's recommendations
- for pregnant women
- for babies/infants
- for women in early post partum
- identification of true anatomical detail of the bladder.

Inaccurate bladder scan recordings

Inaccurate scanning may occur if:

- part of the bladder extends outside of the scanned region (e.g. if a large hernia or diverticula is present)
- bladder contents have a density other than water e.g. blood clots, mucous, etc.
- there is altered anatomy such as a displaced organ/prolapse
- the wrong type of conduction gel is used
- inadequate amount of gel on the scan head is used
- excessive body hair prevents conduction
- a cracked, broken or unclean scan head is used
- the battery is flat
- the scan head is incorrectly positioned
- there is movement of the scan head while operating the machine
- the wrong gender is identified before scanning
- the operator uses a poor technique
- the client is incorrectly positioned (i.e. not supine)
- the client is obese
- ascites or fluid collection is in the abdominal cavity
- regular service and calibration is not carried out as per manufacturers recommendations (Gilbert, 2005).

Performing a bladder scan

The bladder scanner is a non invasive method of assessing bladder volume using ultrasonography. The client is asked to void and the volume is measured. The probe is then placed externally on the abdomen over the site of the bladder. It has a motorized scanning head with an ultrasonic transducer that transmits sound waves which are reflected from the bladder to the transducer. The data is then transmitted to a computer in the unit which calculates the bladder volume, and may display an image of the bladder. It is important to measure PVR immediately after voiding to ensure accuracy, as there is additional renal output of 1-14mL of urine per minute. The voided volume and PVR should both be recorded.

Documentation

Documentation should be thorough, concise, legible and accountable and should identify:

- the reasons for using the bladder scanner
- client's name, date and time the bladder scan was performed
- results of physical assessment prior to bladder scanning
- volume of void before bladder scanning and time elapsed since voiding

- results of bladder scan (include a printout for client records)
- who was notified of the results of the bladder scan (medical officer/other person)
- further orders/referrals
- client's response to procedure
- follow up plan (Altschuler & Diaz, 2006; Newman, Gaines et al., 2005; Schott-Baer & Reaume, 2001).

Readings

1. Addison, R. 2000a, Bladder ultrasound. *Nursing Times*, September 28, vol. 96, no 39, pp. 49-50.
2. Addison, R. 2000b, A guide to bladder ultrasound. *Nursing Times*, October 5, vol. 96, no. 40, pp. 14-15.

Self assessment questions

1. Explain how a post void residual urine volume is calculated.

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2. List five situations when a bladder scan may not be appropriate.

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3. Identify where to access your employer's policy, procedure and competency for use of a bladder scanner.

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9. Interpreting bladder scanner results

Health professionals who perform a bladder scan play a key role in identifying clients with incomplete bladder emptying, by interpreting the clinical significance of a post void residual urine (PVR) volume, and in determining the most appropriate intervention. One key dilemma when assessing clients is being able to differentiate between those who have clinically significant urinary retention that requires immediate attention, and clinically insignificant incomplete bladder emptying.

There is no consensus regarding normal and abnormal post void residual urine. It is generally considered that a PVR less than 50mL is adequate bladder emptying, while over 200mL is thought to be inadequate (Staskin, Hilton et al., 2005). Ostaszkiewicz et al (2008), citing studies by Bonde (1996) and by Nordling (2002), notes that, in healthy adults, PVR may represent normal ageing. Bonde et al. sampled 140 adults over 75 years, and found the average PVR for women was 45mL and 90mL for men, with a range 0 – 150mL, while Nordling (2002) found that healthy community dwelling adults over 55 years of age showed a significant decline in detrusor contractions, associated with lower urine flow rates and a small increase (</= 50mL) in PVR. If PVR is outside these limits, or if the client has other risk factors, further investigations and interventions should occur to identify the appropriate treatment and management (Staskin, Hilton et al., 2005).

Many clients with chronic urinary retention are not aware that they have a urinary problem. Frequently, chronic retention represents an incidental finding uncovered on routine catheterisation or during a diagnostic study. When discovered incidentally, it is necessary to determine whether the elevated urinary residual is clinically significant. The client's medical history and clinical status must be considered when determining the significance of urinary retention. The threshold for determining the need for referral and further evaluation for adults varies. However, a residual volume of 150 - 200mL or greater indicates the need for further assessment. A residual urine volume of 25% or more of the total bladder capacity (voided volume plus residual volume) justifies similar assessment in children. The amount of residual urine to preclude treatment has not been determined (Gray, 2000b).

Health professionals require good clinical decision making skills to facilitate an accurate review and assessment of their findings. For example, poor bladder emptying may be asymptomatic, and if it remains undiagnosed, the client may not receive appropriate treatment. This in turn may lead to urinary or anatomical complications.

Any interpretation of the clinical significance of PVR should be done in conjunction with other clinical information. Health professionals reviewing results of a bladder scan need to consider the readings in association with other factors, such as:

- significant residual urine found on ultrasound
- any known cause for the residual urine

- any diagnosed or suspected cause of the presenting problem
- if the voiding problem is likely to be curable or incurable
- if the urinary retention is acute or chronic
- the correlation between the presenting symptoms, voiding problems and urine volume recordings
- whether the urinary problem affects the client's quality of life, or general health and well being
- whether the client has incomplete bladder emptying
- the risk of over or under intervention
- if the client has renal failure.

Tips and checks to consider

The following tips and checks will assist to analyse bladder scan results:

- if residual urine volume is over one litre, some scanners may not show the volume but display the recording as >1 litre or 999
- volumes under 100mL may not be recorded accurately (however, as little as 30 mL can be detected)
- an intravesical mass, unusual or irregular bladder shape may affect the bladder scan recording
- a fluid filled cyst in the bladder area (e.g. haematoma) can affect accuracy
- gross or morbid obesity may affect accuracy
- severe constipation may distort the shape of the bladder
- ensure correct calibration and set up of bladder scanner prior to use
- an indwelling urethral catheter may affect accuracy
- lower abdominal scar tissue may affect accuracy
- sutures or staples in situ after surgery can affect ultrasound transmission (Newman, Gaines et al., 2005; Schott-Baer & Reaume, 2001).

Readings

1. Milleman, M. Langenstroer, P. and Guralnick, M. 2004, Post-void residual urine volume in women with overactive bladder symptoms. *The Journal of Urology,* vol. 172, pp.1911-1914.
2. Haylen, BT. 2008, Management of the abnormal post void residual. *Australian and New Zealand Continence Journal*, vol 14 (3), pp 68-69

Self assessment questions

1. List eight reasons for inaccurate bladder scan results.

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2. Identify four reasons why recent abdominal surgery can affect a bladder scan reading.

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3. State the steps you would take if a client's bladder scan reading was 1,000mL.

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10. Professional competence and accountability

Health professionals need to recognise and be accountable for their own practice which includes adherence to legislation, registration board regulations and workplace policies.

In continence assessment and care management, health professionals act on the best evidence available. A bladder scan assists when completing a continence assessment, and in the identification of clients with urinary retention.

Health professionals must ensure their employer has given approval for them to use a bladder scanner and that there is a policy and procedure for bladder scanning.

Before carrying out a bladder scan, health professionals should be able to demonstrate their competence and ensure their employer has accepted bladder scanning as an appropriate clinical activity (Australian Nursing & Midwifery Council, 2005).

Readings

1. Australian Nursing Federation 2004, ANF guidelines - delegation by registered nurses, *Australian Nursing Federation*.
2. Gilbert, R. 2005, Using essence of care benchmarking to develop clinical practice. *Nursing Times,* Supplement, vol. 101, no.2. pp. 54-56.

Self assessment questions

1. Identify your professional responsibilities when undertaking bladder scanning and assessment of acute urinary retention.

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2. Identify two ways you can demonstrate your competence in the use of a bladder scanner.

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3. State the professional skills of an experienced health professional who undertakes a bladder scan.

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11. Conclusion

Congratulations on completing this self directed resource package. You are advised to look at the objectives at the beginning of this package and identify if you have achieved them. Please complete the evaluation at the back of this package and return to the address indicated on the form.

It is essential that you read the manufacturer's information and instruction package provided with each bladder scanner, view any videos or other learning resources, and observe competent colleagues using the bladder scanner.

When you are confident that you understand how to use the bladder scanner, practise using the bladder scanner with another health professional deemed competent in its use. If your employer has a competency based assessment on using the bladder scanner, arrange to have your competency assessed annually.

It is recommended that you inform your employer of your completion of this resource package and, if applicable, advise that you consider yourself competent in bladder scanning. Ensure that you record the date of completion.

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Queensland Government	***HACC/MASS Continence Project*** Evaluation of Urinary Obstruction, Retention and Bladder Scanning: A self directed resource package Please complete and forward this form to the HACC/MASS Continence Project, PO Box 281 Cannon Hill QLD 4170 or fax (07) 3136 3666	hacc home and community care A JOINT COMMONWEALTH AND STATE/TERRITORY PROGRAM PROVIDING FUNDING AND ASSISTANCE FOR AUSTRALIANS IN NEED

For each statement, please tick the box that best reflects your opinion:	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
The package met the stated objectives					
The content was relevant to my practice					
The package was presented in a logical order					
The recommended readings were informative					
The self assessment questions prompted clinical reasoning					
The package has increased my knowledge in this area					
The package has increased my confidence in this area					
I would recommend this package to my colleagues					

How did this package meet your expectations? _____

_____

_____

How could this package be improved? _____

_____

_____

Please comment on the length of the package: _____

_____

_____

How long did you take to complete the package? _____

_____

_____

Additional comments: _____

_____

_____

My profession is: _____

Date completed: _____