Abstract

Urinary retention is a common complication of surgery and anaesthesia. The risk of post-operative urinary retention is increased following certain surgical procedures and anaesthetic modalities, and with patients’ advancing age. Patients at increased risk of post-operative urinary retention should be identified before surgery or the condition should be identified and treated in a timely manner following surgery. If conservative measures do not help the patient to pass urine, the bladder will need to be drained using either an intermittent catheter or an indwelling urethral catheter, which can result in catheter-associated urinary tract infections. This article provides an overview of normal bladder function, risk factors for developing post-operative urinary retention, and treatment options. Guidance drawn from the literature aims to assist nurses in identifying at-risk patients and inform patient care.

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Review

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300mL and 400mL of urine in the bladder (Baldini et al 2009). Normal bladder capacity is between 400mL and 600mL of urine (Lamonerie et al 2004).

Lower urinary tract control is maintained by neural pathways that switch reciprocally between control of the bladder and of the urethral outlet (the bladder neck and the urethra) (Yoshimura and Chancellor 2012). Storage reflexes are organised primarily in the spinal cord and are activated during bladder filling, whereas voiding is mediated by reflex mechanisms (the micturition reflex) that are organised in the pontine micturition centre in the brain (Fowler et al 2008, Clemens 2010). These neural pathways involve afferent nerve fibres from the lower urinary tract that travel via the pelvic, hypogastric and pudendal nerves. These peripheral nerves carry bidirectional (afferent and efferent) information between the end organs, for example the heart, kidneys and brain, and the spinal cord.

Sympathetic efferent nerves exit from the thoracolumbar segment of the spinal cord (T10-L2) and travel via the hypogastric nerve. These nerves modulate contractions of the urethral smooth muscle and bladder base, and relax the bladder body and prevent involuntary bladder emptying (the guarding reflex) simultaneously. Parasympathetic efferent nerves exit the sacral region of the spinal cord at S2-S4 and travel via the pelvic nerve. Parasympathetic postganglionic nerve terminals release acetylcholine, which stimulates various muscarinic receptors in bladder smooth muscles, leading to contraction of the detrusor muscle and relaxation of the bladder outlet, resulting in bladder emptying. Somatic efferent nerves exit from the sacral segment of the spinal cord at S2-S4 and travel via the pudendal nerve to the external urethral sphincter, where they modulate striated (voluntary) sphincter contraction (Fowler et al 2008). Therefore, to empty the bladder, nerve impulses are sent from the bladder to the spinal cord and to the brain. The pons sends parasympathetic signals down the spinal cord to the urinary bladder resulting in contraction of the detrusor muscle and relaxation of the internal and external urethral sphincters (Colbert et al 2012), allowing urine to leave the body.

Risk factors for post-operative urinary retention

In patients undergoing surgery, several risk factors can lead to the development of post-operative urinary retention (Box 1). The main factors appear to be male gender, age (50 years and older), analgesics, spinal anaesthetics and spinal analgesics (such as those administered via the epidural, or intrathecal route), intra-operative infusions and a urinary bladder volume greater than 270mL on return to the clinical area (Keita et al 2005). Approximately 10% of post-operative urinary retention episodes might be attributable to the type of drugs used during surgery (Verhamme 2008). For example, anticholinergics and alpha-adrenergic agonists may block detrusor contractions, whereas opioids can affect detrusor or sphincter control (Choong and Emberton 2000, Baldini et al 2009, Elsamra and Ellsworth 2012). As part of post-operative recovery, nurses should monitor urine output, which should be ≥0.5mL/kg/hr as a minimum, as well as the use of analgesics (Steggall 2007a).

Identifying and preventing urinary retention

The risk of developing post-operative urinary retention appears to be highest in men over 70 years, although this depends on the type of surgery performed (Kuppusamy and Gillatt 2011). Post-operative bladder management is a significant problem following lower-limb orthopaedic surgery (Crew 2007). General anaesthetic agents and opioid analgesics cause bladder atony by interfering with the autonomic

<table>
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<th>BOX 1</th>
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<td>Risk factors for developing post-operative urinary retention</td>
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<tr>
<td><strong>Pre-operative risk factors</strong></td>
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<tr>
<td>▶ Male gender.</td>
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<tr>
<td>▶ Age &gt;50 years.</td>
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<tr>
<td>▶ Abdominal surgery.</td>
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<td>▶ Prostate enlargement.</td>
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<td>▶ Previous pelvic surgery.</td>
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<td>▶ Neurological disease.</td>
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<td>▶ Use of peri-operative medications such as alpha-blockers and beta-blockers.</td>
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<tr>
<td><strong>Intra-operative risk factors</strong></td>
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<tr>
<td>▶ Use of intravenous infusion &gt;750mL.</td>
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<tr>
<td>▶ Prolonged duration of surgery.</td>
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<td>▶ Spinal anaesthesia.</td>
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<td>▶ Epidural anaesthesia.</td>
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<td><strong>Post-operative risk factors</strong></td>
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<td>▶ Bladder volume in excess of 270mL following surgery.</td>
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<tr>
<td>▶ Sedative medication, for example midazolam.</td>
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<td>▶ Post-operative patient-controlled epidural analgesia or continuous epidural infusion.</td>
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(Adapted from Baldini et al 2009)
nervous system – this is more likely to occur in older patients. In the case of spinal analgesics, these can enter the cerebrospinal fluid and travel to the brain, where they also have a central effect on the pontine micturition centre. Many estimates of post-operative urinary retention come from single-centre case series and contain known and unknown biases, therefore incidence varies widely and is reported to be between 0% and 75% (Balderi and Carli 2010). In patients undergoing other forms of general (non-orthopaedic) surgery, the risk of developing post-operative urinary retention is estimated to be 4% (Baldini et al 2009). Independent risk factors for developing urinary retention following general surgery include a diagnosis of diabetes mellitus and administration of various anticholinergic drugs during the intra-operative period (Dreijer et al 2011).

Although some authors recommend routine urethral catheterisation, especially following lower limb orthopaedic surgery and arthroplasty, this may not take into consideration current Enhanced Recovery Partnership Programme recommendations, which do not recommend routine catheterisation of patients undergoing lower limb orthopaedic surgery, because the presence of a urinary catheter represents an impediment to achieving early mobilisation. There is also a perceived risk of complications such as deep wound infection and sepsis (Cumming and Parker 2007, Enhanced Recovery Partnership Programme 2010, Johansson and Christensson 2010). However, Sarasin et al (2006) recommended that elective pre-operative catheterisation should be considered for all male patients aged 70 and older undergoing lower limb orthopaedic surgery under spinal anaesthesia on the basis that these patients are most at risk of developing post-operative urinary retention.

Catheterisation is an invasive procedure with potential complications, including catheter-associated urinary tract infections, urethral trauma, prostatitis, as well as pain and discomfort. A study of patients undergoing knee and hip arthroplasty found that post-operative urinary retention occurred in around 50% of patients (Izard et al 2006). Those most at risk of developing post-operative urinary retention included patients with hypertension and those who received spinal or epidural opiates. Bigsby and Madhusudana (2009) concluded that catheterisation does not significantly increase the risk of joint or urinary tract infections post-operatively, therefore routine pre-operative catheterisation should be considered in patients undergoing hip and knee arthroplasty.

In addition, Izard et al (2006) reported that complications were reduced when bladder management included peri-operative catheterisation, rather than expectant management, suggesting that catheterisation of high-risk patients may decrease the risk of multiple post-operative catheterisations without increasing the rate of urinary tract infections.

Although this literature is drawn from studies in orthopaedics, there are core principles that cross all disciplinary boundaries. Therefore, to minimise post-operative complications, it is recommended that patients with a high risk of developing urinary retention should be identified a priori, monitored appropriately and catheterised only if there is evidence suggestive of retention.

### Nursing assessment

Adult patients should be assessed pre-operatively to determine whether they are at risk of developing post-operative urinary retention (Williamson 2005). Nurses have a role in screening patients who are at risk of developing post-operative urinary retention, thereby reducing the incidence of this surgical complication (Ringdal et al 2003, Steggall 2007b).

Medications used during the peri-operative period, including anaesthetic agents and analgesics, particularly spinal anaesthetics and epidural analgesics, are recognised risk factors for development of post-operative urinary retention (Baldini et al 2009, Elsamra and Ellsworth 2012). Other medications that patients may be taking regularly before surgery, for example, antipsychotic drugs, antidepressants, benzodiazepines, non-steroidal anti-inflammatory drugs and calcium channel antagonists, are also known to contribute to the development of urinary retention (Elsamra and Ellsworth 2012). Withholding these medications during the peri-operative period may be appropriate in some circumstances to mitigate the risks, and nurses should discuss medication requirements with the medical team before surgery.

With appropriate planning and nursing assessment, the relative contribution of environmental factors and practical difficulties such as location of the patient’s bed, proximity to the toilet, access to a call bell, ambient lighting and privacy, can be easily modified, so that appropriate nursing measures aimed at monitoring, detecting and preventing post-operative urinary retention can be put in place. Similarly, assessment of patients’ habits, individual preferences and need for assistance...
with toileting should be documented to inform post-operative care and support the patient to achieve optimum voiding. Therefore, nurses should consider where the patient will need to be cared for, for example near the toilets or ensure that a commode is available for use, so that toileting can be assisted in as near-normal environment as possible. An awareness of other difficulties that the patient may encounter should be considered, including reduced mobility, restriction of movement by infusion devices and other equipment, unfamiliarity with passing urine while lying in bed and lack of privacy in hospital. These factors are likely to make the difficulties in voiding worse and contribute to the development of post-operative urinary retention (Crew 2007). It is also important that nurses update and maintain accurate fluid balance charts regularly, monitoring the volume of fluids administered to a patient peri-operatively, as this most accurately predicts the volume of urine being produced by the kidneys.

Furthermore, nursing staff should ensure that there are appropriate diagnostic tools available, for example a bladder scanner, and that nursing staff are trained in using such equipment. In addition, nurses should ensure that appropriately qualified staff are available who are able to insert a catheter if required. The use of a bladder scanner may reduce the need for catheterisation (Edmond 2006), but to reduce the risk of patients developing urinary tract infection aseptic technique and use of sterile equipment are essential during catheter insertion. Ongoing care of the catheter should be meticulous, and involve daily review and removal at the earliest opportunity.

Presentation

When a patient experiences a sense of fullness and desire to pass urine but urine cannot be passed, the bladder continues to fill, which can result in increased discomfort for the patient and increased pressure in the bladder, potentially leading to irreversible bladder or renal damage (Carrington 2005, Johansson et al 2013). Indications that the patient is experiencing urinary retention include pain and discomfort in the lower part of the abdomen, although these symptoms can be masked by regional anaesthesia, sedation, unconsciousness or comorbidities, for example, spinal cord injury or a cerebrovascular accident. Palpation and percussion of the suprapubic area may indicate urinary retention, although this is not an accurate means of estimating the volume of urine in the bladder. Deep palpation of the bladder should be avoided because this can be painful and elicit vagal reflexes (Baldini et al 2009).

If a patient has not passed urine and/or is in discomfort, an ultrasound of the urinary bladder is required. Ultrasound enables healthcare professionals to assess the volume of urine in the bladder. If the urinary bladder volume is greater than approximately 400-500mL, a catheter will be required (Lamonerie et al 2004, Baldieri et al 2011). Several studies have shown that assessing urinary bladder volume using ultrasound is an important component of post-operative nursing care (Edmond 2006, Luger et al 2008, Baldini et al 2009, Palese et al 2010, Hansen et al 2011).

Nursing management

Patients undergoing surgery may need support in meeting their voiding needs, which includes appropriate assistance in accessing toilets or a commode (Pellatt 2007). Voiding is usually done in private and therefore maintaining privacy and dignity is essential. Johansson et al (2013) stressed that creating a calm voiding situation, preserving maximum patient integrity, is essential to help with ‘normal’ voiding. Women should be offered a comfortable sitting position, with both feet on the floor, which allows the pelvic muscles to relax. Commonly, men stand to void and this assists natural voiding habits. For patients with cognitive impairment, timed voiding, characterised by fixed intervals between toileting, may help with maintaining normal voiding patterns.

If conservative measures have not resulted in the bladder being emptied and the volume of urine identified via bladder ultrasound is more than approximately 400-500mL, a urethral catheter will need to be inserted provided there are no contraindications for doing so, for example urethral trauma or stenosis (Johansson et al 2013). The patient will also require appropriate analgesia, to relieve pain accompanying urinary retention. Regardless of the type of surgery, pain is a frequently under-reported risk factor that is also known to increase sympathetic (neural) activity (Charlton 1997). Pain or ineffective pain management in the post-operative period increases sympathetic tone at the internal urethral sphincter, which increases the risk of developing urinary retention (Charlton 1997). Awareness of this fact underpins the important role of nurses in monitoring patients for signs of pain and highlights the need for adequate post-operative analgesia.

Retention of large urine volumes is a predisposing factor for prolonged voiding difficulties, with the risk of over-distension and permanent detrusor damage, which invariably
results in the need to re-catheterise patients (Keita et al 2005). While undiagnosed bladder distension may result in urinary retention that lasts only between one and two hours, prolonged bladder distension and inability to void may have longer-lasting and harmful consequences such as intramural ischaemia, reduced sensation, neuropraxia (where the nerve is damaged and no longer transmits impulses) and reduced bladder contractility, especially in older patients (Lamonerie et al 2004, Madersbacher et al 2012).

Catheter-associated urinary tract infections are common and can be distressing for the patient, result in delayed discharge from hospital and are more costly to the health provider. Therefore, catheter selection needs to be considered carefully. Schuam and Lam (2008) contended that the short-term use (less than 14 days) of silver alloy indwelling catheters in hospitalised adults reduced the risk of catheter-acquired urinary tract infections. Although these catheters may not be as cost-effective as other types of catheter, they may be preferable because of their role in preventing urinary tract infection. Conversely, Desai et al (2010) reported that silver-alloy catheters do not significantly decrease bacterial adherence or prevent catheter-associated urinary tract infections. Nurses should refer to their local policy for guidance on preventing urinary tract infections.

References


Complications of catheterisation

Urinary catheterisation is an invasive procedure with the potential for significant morbidity and mortality. Urinary tract infections account for at least 35% of all hospital-acquired infections, and 80% of these infections are caused by insertion of a urethral catheter (Gokula et al 2007, Hart 2008, Johansson et al 2013). Other potential complications include tissue trauma, blockage and encrustation (Lowthian 1998).

Despite best nursing care, for each day an indwelling urethral catheter remains in situ the risk of infection increases by 3-10% (Saint et al 2002), with the risk increasing cumulatively the longer the urethral catheter remains in situ (Pratt et al 2007). For patients catheterised for longer than seven to ten days, there may be a 50% increased risk of developing a catheter-associated urinary tract infection. Considering these risks, this invasive procedure should only be undertaken when absolutely necessary, and by appropriately trained and competent nurses and other healthcare practitioners, using sterile equipment and an aseptic technique (Pratt et al 2007).

Conclusion

Post-operative urinary retention is a well-recognised and common complication of surgery and anaesthesia. Although the true incidence is unknown and diagnosis is often arbitrary, it is associated with significant patient morbidity, delayed discharge, and need for additional follow up.

The risk of urinary retention increases with advancing age and is dependent on other factors such as the type of surgery, duration of time under anaesthesia and type of anaesthesia. Pre-operative screening and assessment to identify patients at risk of this complication are essential. Given the adverse outcomes associated with developing urinary retention, recognition of the risk factors that contribute to its development in the surgical patient is vital to ensure prompt and appropriate care and treatment interventions.

References


