A chart audit of patients who had undergone a transurethral resection of the prostate established that 15.4% of 156 patients had post-operative acute urinary retention (AUR). Pre-operative prostate size, clot retention, and pre-operative urinary tract infection distinguished men at risk for post-operative AUR.

Key Words: Acute urinary retention, transurethral resection of prostate, trial of void, voiding trial, urinary retention, predictors of urinary retention.

Objectives

1. Define acute urinary retention (AUR).
2. List the predictive factors of AUR in patients who have undergone transurethral resection of the prostate (TURP).
3. Explain how nurses can assess for and monitor AUR in patients who have undergone TURP.

Acknowledgement: Support by the Division of Surgery at the Princess Alexandra Hospital, Brisbane, Australia, is gratefully acknowledged.

Statement of Disclosure: The authors reported no actual or potential conflict of interest in relation to this continuing nursing education activity.

Note: Objectives and CNE Evaluation Form appear on page 213.
leagues (2008) discuss a study that found 36% of men with BPH and randomized to watchful waiting switched to invasive therapy within five years. Commonly, patients with BPH will present with symptoms of worsening urinary flow rate, increasing prostate volume, and a potential outcome of acute urinary retention (AUR) (Emberton et al., 2008).

Emberton and Fitzpatrick (2008) report on an international survey of the management of AUR. Overall, 83% to 97% of 3785 men have been documented in 0.5% to 11% of patients (Das Bhagia et al., 2008; Fitzpatrick & Emberton, 2000; Nodahl et al., 2007, deep vein thrombosis, and myocardial infarction), various urinary tract complications (such as urinary tract infection [UTI]) (Alhasan, Aji, Mohammed, & Malami, 2008; Wendt-Nodahl et al., 2007), clot retention (Ruszat et al., 2008), and rates of failure to void post-TURP have been documented in 0.5% to 11% of patients (Das Bhagia et al., 2010).

Review of the Literature

There is limited understanding of what factors influence the success or failure of a trial of void (TOV) (or AUR) in patients who undergo TURP. An indwelling catheter is classically placed during the TURP operation to allow continuous irrigation of the bladder and to assist the removal of blood clots and debris. A few days later, the catheter is removed, and patients are observed for AUR, a procedure often referred to as a TOV or voiding trial. Clinical pathways for the care of men after a TURP often include a TOV.

Emberton and Fitzpatrick (2008) do not state specific criteria for failing a TOV when removing the catheter after an episode of urinary retention in the description of their research.

Choong and Emberton (2000) advocate that the criterion for a successful TOV is greater than 150 ml voided at one time, with a residual volume of less than 100 ml. This is further supported by Steggall (2007), who also argues this should occur on three consecutive occasions. Others suggest that patients can also “pass” a TOV with higher, painless residual volumes (Baldini, Bagry, Aprikian, & Carli, 2009). Traditionally, patients have been re-catheterized, whether uncomfortable or not, once their residual reaches 500 ml (Mitchell, 1984; Reynard & Shearer, 1999). Steggall (2007) discusses that the body generally uses its natural mechanisms to initiate voiding at volumes between 200 ml to 400 ml of urine. If more than 500 ml of urine is drained post-catheter insertion, the patient can be diagnosed with AUR.

AUR is generally defined as 500 ml or more of residual urine drained with catheterization (Steggall, 2007), and it can occur after a triggering event, such as surgical procedures with general or local anaesthetic, excessive fluid intake, UTI, and anti-cholinergic drugs (Desgrandchamps, de la Taille, & Doublet, 2006). Choong and Emberton (2000) describe the etiology, pathogenesis, risk factors, and treatment of AUR in their classic review. Several medications, including narcotics, anti-cholinergics, and some anaesthetic agents, can cause AUR (Choong & Emberton, 2000; Fitzpatrick & Kirby, 2006).

Other pre-existing conditions, such as spinal disease, neurological conditions, and urinary tract infections, may result in AUR (Wareing, 2004). Finally, constipation may influence AUR. For example, fecal impaction, if large enough, can result in acute urinary retention due to extrinsic bladder neck compres-
sion (Khan, Gomersall, & Gujral, 2007; Selius & Subedi, 2008).

Research Question

While AUR is recognized as a common complication of TURP, little is known about which specific factors influence it. A commonly held belief regarding this issue is that AUR may be influenced by pre-operative infection (Wareing, 2004), post-operative clot retention (Fitzpatrick & Kirby 2006), and constipation (Selius & Subedi, 2008). This study hypothesized that a combination of factors would influence a post-operative AUR in patients undergoing a TURP. Understanding what influences AUR after TURP surgery may assist nurses in recognizing and responding to this complication.

Methodology

A retrospective chart audit of all patients who had a TURP in 2007 in one Australian hospital was undertaken. Data were extracted from the following forms: operative reports, medication chart, anaesthetic pre-operative work-up, outpatient notes, observation charts, patient care plans, laboratory and radiology results, and previous admission notes. The hospital’s ethics committee approved this study. Because this study was retrospective, patient consent was not required, although the treating physicians provided written support for the study.

Sample

The setting for this study was a large tertiary teaching hospital in Queensland, Australia. This hospital has a 19-bed urology unit and performs approximately 150 TURP surgeries per year. With the help of Health Information Management Services (HIMS), all patients who had been clinically coded as having had a TURP were identified, and their medical records were procured.

Measurement

AUR was defined as present when patients who had undergone a post-operative TURP failed a TOV and subsequently required re-catheterization prior to hospital discharge. A chart audit tool was developed based on current published clinical evidence. It included a) demographic information and b) 20 predictors (8 of which were related to the patient’s history, 2 to the surgery, 5 to clinical factors, and 5 to drugs) (see Table 1). The audit tool used fixed response options, with primarily yes or no options for items such pre-operative UTI. Numeric response options were also used for variables such as prostate weight.

Data Collection

Two experienced urology nurse researchers collected data concomitantly under the guidance of an experienced researcher who has previously used the chart audit methodology. Using the chart audits, each chart was carefully reviewed, focusing on the criterion set out in the audit tool. Any discrepancies were discussed, and a decision was made by consensus and later discussed with the experienced researcher. For consistency, one auditor took primary responsibility for data entry. Data were then electronically transferred to a correlation database using a database management system that was independent of data model and designed to efficiently handle unplanned, ad hoc queries in an analytical system environment.

Data Analysis

Descriptive statistics were used to summarize the number of patients who experienced AUR. Decision Tree analysis using the C5.0 algorithm was then undertaken. This tree architecture automatically eliminates insensitive variables and aids decision-making, proposing factors predictive of AUR (those factors at higher decision levels within the tree). A decision tree can be regarded as a decision support tool that uses a tree-like graph or model of decisions and their possible consequences. The tree is generated by analyzing data with a specialized computer algorithm that finds statistically separable subsets of the data set collected by the health researcher during a trial. These “chunks” of data are then represented in a tree-like structure. Each chunk of data is separated by nodes associated

### Table 1. Potential Predictors of a Post-Operative Acute Urinary Retention

<table>
<thead>
<tr>
<th>Patient History</th>
<th>Surgical Procedure</th>
<th>Clinical Factors</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Pre-operative prostate weight (grams)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of prostate cancer</td>
<td>Resection mass (grams)</td>
<td>Post-operative clot retention</td>
<td>Aperients pre-operatively</td>
</tr>
<tr>
<td>History of AUR</td>
<td>Day of TOV post-op</td>
<td>Day of TOV post-op</td>
<td>Type of anaesthesia</td>
</tr>
<tr>
<td>History of CUR</td>
<td>Residual volume</td>
<td>Bowel discomfort after TOV</td>
<td>Anti-cholinergic in previous 48 hours</td>
</tr>
<tr>
<td>Neurological disorders</td>
<td>Bladder discomfort after TOV</td>
<td>Bowel movement less than or equal</td>
<td>Narcotics in previous 48 hours</td>
</tr>
<tr>
<td>Spinal surgery</td>
<td>Bowel movement</td>
<td>to 48 hours post-operatively</td>
<td>Aperients in previous 48 hours</td>
</tr>
<tr>
<td>Pre-operative UTI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-operative indwelling catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: AUR = acute urinary retention, CUR = chronic urinary retention, UTI = urinary tract infection, TOV = trial of void.

1Choong & Emberton, 2000.
2Reynard & Shearer, 1999.
3Alhasan et al., 2008.
4Fitzpatrick & Kirby, 2006.
with a measure of correlation. In other words, they represent the probability of an outcome at particular “decision points” in the data set.

Ultimately decision trees can be used as a descriptive means for calculating conditional probabilities. A decision tree is a powerful visual representation of the descriptive statistics underlying a data set. Decision trees are commonly applied to medical data to help identify a strategy most likely to reach an outcome – for example, in this article, factors affecting urinary retention post-TURP procedures. After the tree informed risk factor extraction, logistic regression was then undertaken on risk factors to a) validate the tree proposals and b) identify the odds ratios of AUR with 95% confidence intervals (CIs), which were used to identify the predictors most likely to result in AUR. This data-analysis methodology, as compared to logistic regression alone, has been validated to give more information with detail on clinical outcomes if many risk factors together are considered (Camdeviren, Yazici, Akkus, Bugdayci & Sungur, 2007). Making correct selections through constructed tree structures facilitates appropriate explanations of data.

Results

A total of 165 patients were initially identified to have had a TURP in 2007, but only 156 charts were audited. Charts that had incorrect clinical coding (six occasions) and patients who did not have a TOV before their discharge from hospital (three occasions) were excluded from the audit. The average age of patients audited was 67 years, and all were male. A total of 24 (15.4%) of 156 patients had AUR.

Figure 1 demonstrates the most significant predictors of AUR given various conditions from the classification tree analysis. Predictors of AUR in patients where the prostate weighed less than 17.5 grams were different compared with patients whose prostate weighed 17.5 grams or more. The mean prostate weight was 62.5 (± 35.0), with only one patient having a weight of less than 17.5 grams. For the group with a prostate larger than 17.5 grams, the presence or absence of clot retention further influenced predictors of AUR. Decision tree analysis is not “case sensitive;” it
distinguishes groups even when the groups are small, as in the case of the group with a prostate less than 17.5 grams.

Table 2 displays the odds ratios of AUR in order of the decision hierarchy. Prostate weight less than 17.5 grams, clot retention, and pre-operative urinary tract infection were factors that influenced the decision hierarchy the most.

**Discussion**

About 15% of study patients who had a TURP in one Australian hospital experienced an AUR, suggesting it remains a complication associated with the surgery. As a consequence, urologic nurses need to be both aware of AUR and to continue to monitor it post-TURP. The pre-operative prostate size of less than 17.5 grams was the factor that most influenced the decision hierarchy, and this finding is inexplicable. However, the second most important factor, clot retention, is generally addressed by post-operative bladder irrigation. It remains important that nurses continue to assess patients post-operatively for signs, such as urethral bypassing, bladder discomfort, and/or diminished bladder drainage, to allow timely detection of clot retention.

Pre-operative UTI and diagnosed AUR pre-operatively were the third and fourth factors that distinguished AUR the most. There is the potential to identify both conditions pre-operatively. It should be noted that at the study site, patients are ideally seen by both physicians and nurses in a pre-admission setting in the week prior to their surgery. During this visit, a mid-stream urine (MSU) sample is taken and analyzed. If there is evidence of infection, patients are treated with either oral or intravenous antibiotics depending on the microbes’ sensitivities. Patients generally proceed with their procedure as long as they are asymptomatic. Post-operatively, these patients could be considered “at risk” for AUR and should therefore be carefully monitored. Infection in general can be associated with AUR in non-surgical patients (Wareing, 2004); hence, the knowledge of AUR predictors may aid the larger nursing community in assessing their patients.

Nurses’ assessment and monitoring skills remain important. Where possible, nurses can rely on the use of bladder scanners to assess their patients’ urine residuals during a TOV (Steggall, 2007), but these scanners are not available to all nurses. With that in mind, awareness of potential risk factors may add to nurses’ ability to predict AUR and potentially avoid any long-term complications for patients. Further, this information may aid nurses in helping patients and their families understand AUR and TOV (Wareing, 2004).

The supposition that constipation could lead to AUR was not supported by this study’s findings. However, the sample size was relatively small. Other common beliefs, such as the presence of an indwelling catheter pre-operatively or the use of anti-cholinergics, were not statistically significant predictors of AUR.

No statistical significance was found between age and AUR. However, the resulting data tree suggested that if patients were older than 73.5 years of age in conjunction with other contributing factors, such as pre-operative UTI or neurological disorders, AUR is more likely to occur.

This study has several limitations. First, it was conducted at a single site. It is always possible that there are some idiosyncratic issues associated with the treatment of TURP patients at this site. However, it should be noted that this site’s cohort maintains the national averages for length of stay and utilizes clinical pathways developed on evidence-

---

**Table 2. Classification Tree Hierarchy Odds Ratios of Acute Urinary Retention**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio, Exp (B)</th>
<th>95% Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate weight prior to surgery less than 17.5 grams</td>
<td>4.694</td>
<td>1.310</td>
</tr>
<tr>
<td>Clot retention</td>
<td>2.999*10^10</td>
<td>2.999*10^10</td>
</tr>
<tr>
<td>Pre-operative urinary tract infection</td>
<td>4.317</td>
<td>1.250</td>
</tr>
<tr>
<td>Diagnosed acute urinary retention</td>
<td>2.503</td>
<td>0.661</td>
</tr>
<tr>
<td>Age younger than 73.5 years</td>
<td>0.265</td>
<td>0.008</td>
</tr>
<tr>
<td>Neurological disorders</td>
<td>2.269</td>
<td>0.449</td>
</tr>
<tr>
<td>Resection weight less than 35 grams</td>
<td>3.762*10^7</td>
<td>3.762*10^7</td>
</tr>
</tbody>
</table>

* A patient whose prostate weight prior to surgery was less than 17.5 grams was not the same as a patient whose resection weighed less than 35 grams. These were two separate independent variables. Resection weight independently predicted AUR and prostate weight prior to surgery independently predicted AUR in those who had prostate weight less than 17.5 grams.
based practice. The surgeons operating at this site also operate at other facilities utilizing the same clinical guidelines for treatment. Second, the study had a relatively small sample size, which may limit results. Had a larger sample been used, other factors may have emerged as significant predictors of AUR. In particular, the group of patients with a prostate weight of less than 17.5 grams prior to surgery only represented one patient; thus, this finding may not be replicated in other studies. Finally, a retrospective chart audit was used. There was no way to check the accuracy of the chart data; thus, results must be interpreted cautiously. While study findings may not be generalizable to other settings, it provides a foundation upon which further work can be done in the area.

Conclusion

In this study, a decision-tree was statistically constructed to assist nurses in better identifying patients at risk of AUR post-TURP. Approximately 15% of patients who have undergone TURP at the study site have experienced an AUR. Factors, such as prostate weight, clot retention, and both UTI and AUR prior to surgery, influence post-TURP AUR. Awareness of these indicators will allow nurses to be more focused on patients who may be at risk of AUR. While nurses may not be able to prevent AUR, vigilance assessment and timely responses to this condition will likely benefit the patient. Research with a larger sample across a wider community is required to support these single site findings.

References