

POSTOPERATIVE URINARY RETENTION:
AN EXPLORATORY STUDY

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By

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ABSTRACT

Postoperative urinary retention (PUR) is a common problem seen after surgery, particularly after orthopedic surgery. There has been a great deal of research done surrounding the causes of PUR and the optimal treatment for PUR, all with conflicting results. Little research has been done with orthopedic nurses to find out how they actually treat PUR, and on what information they base those treatment decisions. Evidence-based practice has been gaining popularity recently and highlights the need for nurses to make treatment decisions based on sound research, patient preferences, clinical expertise, and taking into consideration health care resources and the clinical setting (DiCenso, Ciliska, & Guyatt, 2005). This study investigated nurses' views on the definition of PUR, how they assessed for PUR, how they treated PUR and what they based their treatment decisions on. Ten nurses who worked on orthopedic units were interviewed using a semi-structured format consisting of four questions. The interviews were recorded and then transcribed verbatim by the student researcher. Qualitative description, as described by Sandelowski (2000), was used to analyze data. All nurses defined PUR fairly similarly. Various contributing factors for PUR were mentioned, some that were studied in the literature, and some that were not. Each nurse had a slightly different way of treating PUR, and 'ward routine' was also described differently. Study results point to a need for more research and education in the area of PUR so that all nurses are treating PUR in the same manner based on the same sound knowledge base.

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CHAPTER 1 INTRODUCTION

Urinary retention is a commonly known postoperative complication and one that surgical nurses deal with on a routine basis. As such, it is important for nurses to know what postoperative urinary retention (PUR) is, what it is caused by, and how to manage it. PUR is particularly common after major orthopedic surgery (Butwick, Carter, & Dolin, 2003); therefore orthopedic nurses need to be especially knowledgeable about PUR.

The researcher has over eight years of clinical experience working on a 34 bed high-acuity orthopedic ward. During this time the researcher cared for numerous patients undergoing hip and knee replacements and revisions who returned from the operating room with indwelling Foley catheters in place. Near the end of the researcher's time working full-time on the ward, it was noted that many patients returning from surgery did not have Foley catheters in place anymore.

After this change was made, the perception on the ward was that there was an increased incidence of urinary retention requiring catheterization. Many nurses working on the ward were frustrated that they had to catheterize the patient on the ward after the patient developed urinary retention. The general consensus was that the majority of patients do develop PUR, and that Foley catheterization in the operating room is the best course of treatment.

As nurses are the ones looking after patients postoperatively, it is important for them to be able to recognize PUR when it occurs. This involves having a complex understanding of the problem including a definition of PUR, knowledge of all the factors that can contribute to PUR, and making judgments as to which ones apply to that particular patient. It also involves performing a proper physical assessment to identify the presence of factors that indicate the

patient does indeed have PUR. Finally, orthopedic nurses must also be familiar with the best course of treatment for PUR.

With the change in practice on the orthopedic ward that the researcher works on, the researcher wondered what nurses' thoughts were regarding PUR, and what they really thought the best course of treatment was for PUR. Do nurses pay attention to the factors that predispose patients to PUR? If so, do they then watch those patients who have those factors more closely for PUR? In general, the writer wanted to know what other nurses' thoughts were on PUR and how they treated it.

The purpose of this study was fourfold. The first was to identify how orthopedic nurses define PUR. There is much controversy and disagreement among healthcare professionals and academics as to how to define PUR. In order to properly treat PUR, it must first have a commonly understood definition. While all of academia might not be able to agree, the healthcare team within a particular health region should all be operating under the same definition in order to maintain consistency. Within a health region, patients are frequently transferred between different hospitals, and orthopedic surgeons are rotated between orthopedic wards at different hospitals.

The second and third reasons were: to identify which factors orthopedic nurses believe have a significant impact on the development of PUR in their patients and which factors would lead to make the decision to catheterize the patient. The literature identifies many different factors that could contribute to/cause PUR, but the studies that have been conducted provide conflicting evidence as to which factors are the most likely to contribute to/cause PUR. This study will not establish the factors, but provide insight into those that the nurses believe cause the problem.

The final reason was to identify how orthopedic nurses treat PUR. Again, as with defining PUR, and its contributing factors, there is controversy over what is the best method to treat PUR (i.e. intermittent catheterization or indwelling catheter insertion). As well, the researcher was interested in finding out if all of the nurses within one orthopedic ward had the same treatment routine for PUR, or if they based their treatment decision upon their own knowledge base.

This study was needed to determine orthopedic nurses' understanding of PUR within a particular health region. Through identification of the factors they consider when making the decision to catheterize, nursing will be able to use this understanding to improve the practices of identification and treatment of PUR. This study was a first step into analyzing PUR, with the ultimate goal of improving how nurses assess and treat it. In addition to improving how it is treated, another future goal is to standardize how it is defined and treated within this particular health region. This improvement in identification and treatment will lead to improved patient care and quality outcomes.

CHAPTER 2 LITERATURE REVIEW

Literature Search

Four major databases were searched for scholarly articles: the Cumulative Index to Nursing and Allied Health Literature (CINAHL Plus with Full Text, 1937-present); OVID Medline (1950-present); Science Direct and Medline with Full Text (1965-present). “Urinary retention” was searched as a major subject heading. “Postoperative urinary retention,” “urinary infection,” and “joint infection” were searched as keywords. Finally, the major subjects of “urinary retention” and “postoperative complications” were combined in a CINAHL search.

The reference lists of all retrieved articles were also checked to identify other relevant papers. Finally, an Internet search using the search engine Google was conducted. The search term phrase used was postoperative urinary retention.

While searching for relevant information, certain articles/subjects were excluded. Articles regarding children/pediatric urinary retention were omitted as the nurses being interviewed in this study only care for adult patients. As well, articles pertaining strictly to urological, gynecological, obstetrical and anorectal surgeries were excluded. These subjects/surgeries have known high rates of retention and deal with areas of the body very close to the urological body system. Non-English articles were excluded. Ambulatory or minor orthopedic surgery (where the patient is not admitted) studies were excluded as the nurses interviewed in this study care for inpatients, the majority of which undergo major orthopedic surgery.

Inclusion criteria included: postoperative urinary retention, acute urinary retention, orthopedic surgery, urinary catheterization articles and urinary infection

articles. Types of articles reviewed included original research papers, systematic reviews, meta-analyses, literature reviews and clinical practice guideline reviews. Limiting results to only randomized controlled studies would have yielded very little information.

Hundreds of articles were looked at during the literature search. Articles were included for review if they dealt with orthopedic patients and postoperative urinary retention (PUR), urinary infection or catheterization. Research studies that dealt with PUR but did not include orthopedic patients in their study were omitted.

When searching urinary retention as a major heading in CINAHL, 499 results were found, and searching for postoperative urinary retention (PUR) as a keyword yielded 33 results. When searching Medline with Full Text, the heading of urinary retention returned 2, 667 articles and PUR as a keyword, 378 results. Inputting PUR as a keyword in Science Direct yielded 13, 301 results. This demonstrates the abundance of information surrounding the topic of urinary retention and PUR in the academic world, and what the researcher had to sort through to compile this literature review.

Urinary Retention

Urinary retention can be divided into two categories: acute and chronic urinary retention (Downey, 2000). Downey defined acute urinary retention as being of “rapid onset, and can occur not only in prostate disease or urethral strictures, but can happen spontaneously in postoperative cases or in situations of severe constipation” (p. 69).

Most authors and clinicians differentiate between acute and chronic urinary retention (Downey, 2000; Dmochowski, 2000), although there is little or no consensus on definitions of acute urinary retention or postoperative urinary retention (PUR). Kaplan, Wein, Staskin, Roehrborn and Steers (2008), conducted a literature review around the

subject of urinary retention in order to “draw attention to the lack of standardized definitions of and criteria for urinary retention” (p. 47). Acute urinary retention includes the subcategory of postoperative urinary retention, which is the focus of this study.

Postoperative Urinary Retention

In the literature various definitions of PUR exist. Some authors define PUR by the amount of urine in the bladder. One study used an amount greater than 300 ml (Olsen & Nielsen, 2007), other researchers used 400 ml (Johansson & Christensson, 2010; Ringdal, Borg & Hellstrom, 2003; Warner, Phillips, Riske, Haubert, & Lash, 2000) and one used 500 ml (Sarasin, Walton, Singh & Clark, 2006). Some studies used the amount of urine in the bladder and attached a time frame to their definition. Feliciano, Montero, McCarthy, and Priester (2008) and Lamonerie, Marret, Deleuze, Lembert, Dupont, and Bonnet (2004) used the amount of 500 ml and attached a 30 minute time frame to their definition. Keita et al. (2005) used the 30 minute time frame, but used 600 ml instead of 500 ml. One study used a time frame of greater than 5 hours as one of their definitions (they defined PUR in 3 different ways)(Ringdal et al.). Zampini, Knott and Glazer (2008) used 8 hours as their time frame, or if the patient had symptomatic bladder distention.

A couple of studies included the post-void residual (PVR) amount in their definitions. Boulis, Mian, Rodriguez, Cho and Hoff (2001) said PUR occurred if the patient’s PVR was greater than 100 ml. Whereas Hebl et al. (2005) used a PVR of greater than 200 ml or more than 500ml of urine in the bladder.

Several studies used patient assessment in their definition. Three studies defined PUR as the patient wanting to void, but being unable to (Kotwal, Hodgson, & Carpenter, 2008; Elkhodair, Parmar, & Vanwaeyenbergh, 2005; Ringdal et al., 2003). Some studies

defined PUR as an inability to void and the patient being catheterized (Joelsson-Alm, Nyman, Lindholm, Ulfvarson, & Svensen, 2009; Fernandes, Costa, & Saraiva, 2007; Lingaraj, Ruben, Chan, & Das De, 2007; Kumar, Mannan, Chowdhury, Kong & Pati, 2006; Macdowell, Robinson, Hill & Villar, 2004; Lau & Lam, 2004; Butwick, Carter & Dolin, 2003; O’Riordan, Hopkins, Ravenscroft, & Stevens, 2000). Finally, some studies simply defined PUR as the patient being catheterized (Shadle, Barbaro, Waxman, Connor, & Von Dollen, 2009; Bigsby & Madhusudana, 2009; Hebl et al., 2008; Campbell, McCormick, McKinlay & Scott, 2008; Dolin & Cashman, 2005; Singelyn, Ferrant, Malisse, & Joris, 2005).

As demonstrated, PUR has been defined in many different ways. The varied definitions of PUR make it difficult to compare results of studies and to form best practice guidelines when there is no agreed upon definition (even though it is most likely because there is no agreed upon definition, that each researcher has chosen their own operational definition of PUR) (Baldini, Bagry, Aprikian, Carli, & Phil, 2009). While a difference of 100 or 200 ml may not seem like a big difference, had all the researchers used the same definition, their PUR rates and contributing factors would have most likely come out very differently. According to Shadle et al. (2009), if they had changed their definition of PUR to a bladder volume >300ml, the rate of PUR would have gone from 5.7% to 36%.

For the purposes of this study, postoperative urinary retention will be defined as “any patient unable to void satisfactorily post-operatively and requiring catheterization” (Izard, Sowery, Jaeger, & Siemens, 2006, p. 3159). According to Dr. Gonor, a urologist from a large urban hospital, urinary retention should not be defined as a certain number

of milliliters in the bladder or by the number of hours a patient has not voided because of the many variations in patient factors (bladder capacity, normal time between voids, etc.) (S.E. Gonor, personal communication, January 23, 2007). He agrees with the above definition and states that urinary retention is simply “the inability to void independently or to void satisfactorily”.

Buckley and Lapitan (2010) (who conducted a review with the Cochrane Collaboration) also provided a more general definition and defined PUR as “the inability to void following surgery despite a full bladder” (p. 2). Such a broad definition has been chosen for this study so as to be more inclusive when discussing the various studies that used differing definitions of PUR. As well, one of the intents of this study was to assess how orthopedic nurses define PUR themselves.

Why is Postoperative Urinary Retention an Issue?

While postoperative urinary retention may not usually be a life-threatening issue, it is something to be concerned about, it does require prompt assessment and treatment, and it is very uncomfortable for the patient (Feliciano et al., 2008). One consequence of urinary retention is bladder distension. According to McConnell (1991), “distension from more than 1,000 ml or more can cause loss of bladder tone-requiring weeks or months for recovery” (p. 86). As well, according to McConnell, this loss of bladder tone could be permanent.

Joelsson-Alm et al. (2009) summarize well what happens when bladder overdistention occurs:

The normal bladder volume is 400-500 ml. The optimum ability to empty the bladder lies at an approximate volume of 300ml, after which voiding becomes more difficult as the volume increases. When bladder volume exceeds 500 ml

there is a clear risk of overdistension of the muscle fibers in the bladder wall, which can result in motility problems with subsequent atonia, postvoiding residual volumes and urinary tract infections. (p. 58)

In Lamonerie, Marret, Deleuze, Lembert, Dupont and Bonnet's (2004) study, 44% of patients undergoing a variety of surgeries (including orthopedic) experienced bladder distention (defined in the study as a bladder amount greater than 500 ml). This points to the frequency of overdistention, and the need to avoid letting it happen to patients in order to avoid its complications.

An increase in bladder residual volumes places patients at a greater risk for urinary tract infections (UTI's) (Balderi & Carli, 2010; Joelsson-Alm et. al. 2009). UTI's can be caused by retention due to urine stasis (Buckley & Lapitan, 2010). As well, if PUR is treated with catheterization, this can also lead to UTI's. UTI's have been linked to deep joint infections in orthopedic patients (Balderi & Carli, 2010). UTI's and deep joint infections can increase hospital stay as well as patient mortality and morbidity and it is well worth healthcare providers time and effort to try and avoid these complications (Baldini, Bagry, Aprikian, Carli, & Phil, 2009; Smith & Albazzaz, 1996). Cronin, Shannon, Bale and Quinlan (2007) also point out that there are risks linked to catheterization (repeated UTI's and urethral strictures) and that urinary retention can cause the patient discomfort and anxiety.

As well as infection, Whytock (2006) pointed out further complications of indwelling catheterization: febrile incidents, kidney stones, bladder stones, chronic kidney inflammation, pyelonephritis and reduced mobility. If PUR could be avoided in

the first place, the patient would not need a catheter and would therefore avoid these potential complications.

According to Buckley and Lapitan (2010), PUR can also lead to detrusor damage, which in some instances can cause “long term bladder dysfunction” which has the “potential to cause hydronephrosis and kidney damage leading to chronic kidney disease (especially in the elderly)” (p. 2). While in many cases PUR is benign, it has the potential to do serious patient harm. Many orthopedic patients are elderly and would be at a higher risk of these complications according to Buckley and Lapitan. Orthopedic nurses must be aware of these consequences and monitor and treat PUR as soon as possible to avoid these sequelae.

Postoperative urinary retention is common after surgery, and is particularly common after total hip and knee arthroplasties (Balderi & Carli, 2010; van den Brand & Castelein, 2001). There are many factors that have been postulated to contribute to the incidence of PUR. These will now be further discussed.

Factors Associated with Postoperative Urinary Retention

There are many and varied reasons postulated for why PUR occurs. As with the definition of PUR, there are differing opinions and study results that support or refute a particular variable’s involvement in the development of urinary retention after surgery. Table 2-1 summarizes research studies where orthopedic/spinal surgeries are included, but are not the sole surgery type studied. Studies that do focus solely on orthopedic and/or spinal surgeries can be found summarized in tables 2-4 and 2-5.

Spinal surgeries are not strictly speaking orthopedic surgeries, but were included in this literature review. The rationale behind this is that one of the orthopedic wards where nurses were interviewed for this study is a trauma orthopedic ward. At this

hospital, the orthopedic surgeons and the neurosurgery physicians alternate taking call for spinal trauma patients. Therefore, the orthopedic nurses on this floor sometimes care for clients who have undergone spinal surgery that was conducted by orthopedic surgeons.

Something to note about summarizing and discussing the various studies, is that due to many differences, they are somewhat difficult to compare accurately. Each study used somewhat different variables in their research, not all studies achieved statistical significance, each study had their own definition of PUR (plus some also included bladder distention and time to void), some studies only included male patients, one study included children and adults, and some studies only included patients undergoing spinal anesthetic. This highlights the difficulty in comparing studies and in making any research-based conclusions on the subject of PUR.

This is a literature review, and as such, that is what has been done: a review of all of the available literature in the orthopedic area relating to PUR. Burns and Grove (2005) stated the purpose of a literature review is to “convey to the reader what is currently known regarding the topic of interest”(p. 93).

While all of the literature is reviewed, that does not mean that all of it is high quality, well-conducted research. With regards to the factors that contribute to PUR, the literature is summarized and somewhat critiqued. Later on in the discussion regarding treatment and guidelines for dealing with PUR, levels of evidence and strength of recommendations will be discussed.

Table 2-1: Non-Orthopedic Focused Postoperative Urinary Retention Studies

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Warner, Phillips, Riske, Haubert, & Lash (2000) Prospective.	To assess utility of Bladderscan BVI 2500 (a portable ultrasound machine) in detecting bladder distention using a revised bladder protocol	“Bladder volumes greater than 400 mL required further action” (p. 22).	-494 men aged 19-96, undergoing a variety of surgeries (otolaryngology, cardio, neurology, ophthalmology, orthopedics, peripheral vascular, plastics, urology)	-19.4% had bladder volumes > 400 ml -11% (54) needed intermittent catheterization	-none (length of surgery, amount of intravenous fluids and age had low correlation with bladder volume)	“With the use of bladder ultrasonography and the new bladder protocol, postoperative bladder distention will be more accurately detected and treated appropriately” (p. 25)
Ringdal, Borg, & Hellstrom (2003) Prospective	“To explore incidence and factors that may influence patients’ first postoperative urination” (p. 342)	-3 reasons for catheterization: 1. patient wants to void and cannot 2. 5 hours passed postoperatively 3. bladder scan > 400 ml	-105 females, 69 males undergoing various minor and major surgeries (including major and minor orthopedic surgery)	-39% not able to urinate on their own	-increasing age -minor orthopedic and breast surgery -longer surgery and anesthesia time - more alpha-adrenergic agents/stimulants and cholinesterase –inhibitors - received opiate analgesics before 1 st urination -received > 1000mL of fluids	- “highlights the importance of nurses’ pharmacological knowledge as a key factor in preventing bladder overdistention”(p. 346) -“clinical practice guidelines on the prevention and management of postoperative voiding problems should be established in the future”(p. 346)

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Lamonerie, Marret, Deleuze, Lembert, Dupont, & Bonnet (2004) Prospective	-to assess incidence of postoperative bladder distention -to determine incidence of PUR and related risk factors	Bladder distention: >500 ml Urinary retention: bladder volume > 500 ml and inability to urinate within 30 minutes while in the recovery room	-177 (124 male, 53 female) undergoing orthopedic, vascular, thoracic, abdominal or ENT ² surgery	-44% bladder distention -23.7% urinary retention after discharge from recovery room	-age > 60 -spinal anesthesia -duration of surgery (> 120 min)	“These results suggest that it is worth checking for postoperative bladder content with ultrasound in the recovery room, especially in older patients and after long operations” (p. 546).
Lau & Lam, 2004 Prospective, randomized	-“to establish the best practice guidelines for the management of postoperative urinary retention”(p. 658)	“The requirement of urinary catheterization, which was performed only if the patient failed to pass urine and was found to have a palpable bladder”(p. 658).	-1448 having elective surgery (included 193 limb and cutaneous surgeries) (765 male, 683 female)	-4.1% (n=60) -a “full urinary bladder” (pg. 659) was found in 46 patients -5.2% of limb/cutaneous surgeries had PUR (n=10)	-old age -type of surgery (anorectal and hernia surgeries) -spinal anesthesia -only independent risk factor was type of surgery	“Voiding dysfunction is therefore a multifactorial consequence, a combination of patient, anaesthetic and surgical factors”(p. 660). -those who develop PUR should have intermittent catheterization because indwelling has no extra benefits

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Keita et al. (2005) Prospective, observational	-to assess factors that will predict PUR in the PACU ³	“an inability to void at bladder volume >600 mL within 30 min.”(p. 593)	-313 (128 female, 185 male) undergoing orthopedic (160 patients), vascular, thoracic, abdominal, urologic surgeries	-16% (53 patients)	Univariate analysis: -age (≥50) -major surgery -duration of surgery (≥60 min) -duration of anesthesia (≥80 min) -amount of intraoperative fluids (≥750 ml) -bladder volume on PACU ³ entry (≥270 ml) Multivariate analysis: -age ≥ 50 -amount of intraoperative fluids ≥750 ml -bladder volume on PACU ³ entry ≥270 ml	“These results suggest the routine evaluation of bladder content in the PACU ³ on entry and before discharge, especially in patients older than 50 years, receiving more than 750 mL intraoperative fluids, or with bladder volume exceeding 270 mL on entry to PACU”(p. 596).

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Dolin & Cashman, 2005 Synthesis review (not a formal systematic review- they included cohort studies, case controlled studies and audit reports)	-looked at side effects (nausea, vomiting, sedation, pruritis and urinary retention) after intramuscular, PCA and epidural analgesia	-does not explicitly define -mentions need for urinary catheterization	-studies of abdominal, pelvic, major orthopedic and thoracic surgeries were included -94 urinary retention studies were examined -12,513 patients represented from combined studies	-23%	-epidural analgesia had highest occurrence	“Given the relatively high rate of urinary retention, it is probably worth inserting a urinary catheter in advance of surgery in certain situations particularly where it is desirable to minimizing bacteraemia”(p. 590).
Olsen & Nielsen (2007) Prospective	-to assess incidence of PUR in recovery room -to look at PUR risk factors to identify those at risk in order to scan their bladder after surgery	“>300 mL urine in the bladder and the inability to void” (p. 92)	-307 patients (abdominal, orthopedic, urologic, otorhinolaryngol ic, plastic, other); demographic data is not provided (other than in relation to PUR rates)	-28.7% on recovery room entry -25.7% on recovery room discharge	-increasing age -regional anesthesia -diabetes mellitus -ephedrine administration -colloid administration (vs. none)	“In order to identify all patients and to prevent PUR in the postoperative phase, all patients, as a minimum, have to be bladder scanned by discharge from recovery” (p. 95)

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Fernandes, Costa, & Saraiva (2007) Prospective, consecutive	“To determine the occurrence of urinary retention in patients using opioid analgesic and to describe the method used for vesical relief”(p. 318)	-not explicitly defined -those who could not void in the “postoperative period” were catheterized after noninvasive techniques tried (i.e. warm compress on the abdomen)	-1216 patients (children & adults) undergoing orthopedic, thoracic and neurologic surgery	-22% (126 orthopedic patients, 2 thoracic patients)	-male gender -type of surgery (orthopedic) -epidural analgesia	“Controlled and randomized studies are needed to evaluate postoperative urinary retention when analgesia with opioids is used, especially in orthopedic surgeries” (p. 322).
Feliciano, Montero, McCarthy, & Priester (2008) Retrospective, descriptive, exploratory.	-the purpose “was to determine whether a significant number of patients would benefit from a new protocol directing early intervention for postoperative bladder distension” (p. 395).	“>500 mL bladder volume and inability to void for greater than 30 minutes” (p. 396).	-102 patients (only spinal anesthetic) undergoing various surgeries (30.4% were orthopedic)	-44.1%	Univariate: -intraoperative fluids >750 ml -bladder volume on PACU entry >500 ml Multivariate: -bladder volume on PACU ³ entry >500 ml	-need to put a protocol in place to diagnose or prevent PUR in the PACU ³

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Shadle, Barbaro, Waxman, Connor, & Von Dollen (2009) Retrospective chart review	-to assess greatest risk factors for PUR	“any patient who was instrumented, whether being straight catheterized or having an indwelling Foley catheter placed, at any time during the patient’s hospitalization” (p. 923).	-176 patients undergoing spinal (42%), laparoscopic cholecystectomy (24%), non-spinal neck surgery (20%), breast (3%) and miscellaneous (10%)	-5.7% (10/176)	-age -bladder volume on recovery room entry -longer length of hospital stay	-recommend a “randomized, controlled trial in high-risk patients to determine whether instrumentation of those with high bladder volumes during their care in the recovery unit would decrease the incidence of urinary retention, urinary tract infection, or shorten hospital stay” (p. 924)
Gehling, & Tryba, 2009 Meta-analysis	-to compare risk ratio of side effects and complications of intrathecal morphine/spinal anesthesia with placebo	-not defined	-total of 223 morphine patients -total 177 placebo patients	-17% among placebo patients	-intrathecal morphine does not increase risk of PUR	-due to low numbers, a beta-type error could have occurred

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Joelsson-Alm, Nyman, Lindholm, Ulfvarson, & Svensen (2009) Prospective, observational.	-to assess incidence of perioperative bladder distention -to delineate factors related to bladder distention	Bladder distention: “bladder volume greater than 500 ml” (p. 59) -if patients could not urinate, they were catheterized	-147 patients undergoing orthopedic (56) and general (91) surgeries	Bladder distention: -after scan I (preoperative PVR ⁵): 7 patients -after scan II (just prior to anesthesia): 3 patients after scan III (upon entry to PACU ³): 14 patients -total of 22% (33 patients) Catheterization: -85% (28/33) of those with distention, could not void on their own	-those having orthopedic surgery were prone to distention	-orthopedic patients are at an increased risk of bladder distension, and more research is needed to determine why and what can be done to prevent the distension in the first place

Author/Year Study Type	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Dal Mago, Helayel, Bianchini, Kozuki, & de Oliveira Filho (2010)	-“to determine the prevalence of postoperative urinary retention and identify independent predictive risk factors”(p. 383)	-a urine volume greater than 600 ml with inability to void within 30 minutes after diagnosis in the PACU	-257 patients undergoing various surgeries (39 patients having upper limb surgery and 114 lower limb)	-7.39% (19 patients)	-in multivariate analysis both lower limb surgery and bladder volume \geq 360 ml on PACU admission were independent predictive factors	-authors suggest “the systematic evaluation of the vesical contents of patients at the time of admission to PACU should be done in those patients who have any risk factor” (p. 386)
Lehmann, Monte, Barach, & Kindler (2010)	-“to evaluate the incidence of perioperative minor adverse events and to analyze patient satisfaction based on potential explanatory variables” (p. 13)	-urinary retention was reported and defined by the patient in the interview	-12,276 surgical patients (4,315 orthopedic patients)	-1.1% (142 patients)	-more frequent in younger patients and men -less common in those having surgery where an indwelling catheter was necessary	-acknowledge rate is low compared to literature, most likely because number is based on patient report -“creating a safe environment to report these minor events, without penalizing the reporters, will offer learning opportunities, improve the quality of anesthetic care, and increase patient satisfaction” (p. 20)

1. PUR: postoperative urinary retention
2. ENT: ear, nose and throat
3. PACU: post-anesthetic care unit
4. BMI: body mass index
5. PVR: post-void residual

Age

Increasing age is a key risk factor for developing PUR (Sarasin et al., 2006; O’Riordan et al., 2000). Kotwal et al. (2008) and Sarasin et al. (2006), both found that increasing age (>70 years old) was a significant risk factor for developing PUR. Lamonerie et al. (2004) found persons over the age of 60 were at an increased risk of PUR, while Keita et al. (2005) identified persons aged 50 or more. Nine other studies found that increasing age was a determinant that increased a patient’s chance of developing PUR, but did not specify above what age (Shadle et al., 2009; Bigsby et al., 2009; Olsen & Nielsen, 2007; Weekes, Quinlan, O’Toole, & O’Byrne, 2006; Izard et al., 2006; Lau & Lam, 2004; Ringdal et al., 2003; Boulis et al., 2001; O’Riordan et al., 2000).

In contrast, some researchers did not find that increasing age was a risk factor (Joelsson-Alm et al., 2009; Feliciano et al., 2008; Lingaraj et al., 2007; Kumar et al., 2006; Butwick et al., 2003; Warner et al., 2000). Many researchers were surprised that age did not come out as a contributing factor but offered no reasons for why they thought this may have occurred.

One study identified younger age as a risk factor for PUR (Zampini et al., 2008). Their results indicated that those patients under the age of 40 were at an increased risk of urinary retention after elective spine surgery. However, later in the same results paragraph they state that age “did not correlate with urinary retention”(p. 178S). Perhaps it was a typographical error. One other issue with the study is that they did not provide the ages of study participants.

A second study also found that younger age was associated with urinary retention (Lehmann, Monte, Barach, & Kindler, 2010). The study included a total of 12,276 patients

(including those undergoing orthopedic surgery). However, the study's urinary retention rates were based on patient report only.

In a short review of orthopedic PUR literature conducted by Edmond (2006), it was found that "there appears to be some confusion within the literature as to whether the age of a patient is a potential risk factor associated within the orthopaedic patient. Even so, the possibilities cannot be ruled out"(p. 69). In two other reviews of PUR (Darrah, Griebing, & Silverstein, 2009; Baldini et al., 2009), they concluded that age did increase one's chances of PUR. Darrah et al. stated that there are age-related changes that modulate urination, which leads in an increased risk of PUR, and Baldini et al. related age risk to "progressive neuronal degeneration leading to bladder dysfunction"(p. 1142). The major problem with Baldini et al.'s review is that they only present studies that found age to be a contributing factor.

Gender

Many studies have identified male gender as being a risk factor for developing urinary retention after surgery (Lehmann, Monte, Barach, & Kindler, 2010; Lingaraj et al., 2007; Fernandes et al., 2007; Sarasin et al., 2006; Butwick et al., 2003; O'Riordan et al., 2000). Lingaraj et al. postulated that male gender came out as a factor due to the rates of benign prostate hypertrophy and urethral stricture in males.

In obstructive urinary retention, the most common reason is benign prostatic hyperplasia (BPH) (Selius & Subedi, 2008). Canadian benign prostatic hyperplasia diagnosis rates in outpatient practice are 1 man in 5 (Nickel et al., 2008). This highlights the prevalence of prostate enlargement and confirms that orthopedic nurses are very likely to encounter the issue as a large number of orthopedic patients are elderly males.

In Lau and Lam's study (2004), a history of benign prostatic hyperplasia was included in their study assessing risk factors for PUR, but it was not found to be a significant predictive factor. They do not discuss why this factor was not found to be significant in their study. However, only three out of the 60 subjects who did have urinary retention had a history of prostatic hyperplasia.

In Dutta's study (2008), all five patients who developed urinary retention after major orthopedic surgery (hip or knee replacement) were male. This study only included 50 patients, with a female to male ratio of 3:2. While the study is somewhat small to draw conclusions from, it does agree with many studies that indicate males have a higher incidence of PUR.

Thirteen studies reviewed found that gender did not predispose patients to PUR (Joelsson-Alm et al., 2009; Shadle et al., 2009; Bigsby et al., 2009; Feliciano et al., 2008; Zampini et al., 2008; Olsen & Nielsen, 2007; Izard et al., 2006; Kumar et al., 2006; Keita et al., 2005; Lamonerie et al., 2004; Lau & Lam, 2004; Ringdal et al., 2003; Boulis et al., 2001). As with age, many researchers were surprised that male gender did not come out in their studies as a predisposing factor, but did not discuss why that may have happened.

As demonstrated by this review, Edmond (2006) also found conflicting research regarding gender and suggested that more research needs to be done in this area. Darrah et al. (2009) found research that also agrees with male gender being a factor, and suggest more clarification for the effect that gender has on PUR in younger patients. Baldini et al. (2009) agree with male gender as a factor, but reviewed a limited number of studies in relation to gender, and once again, present no research that did not find gender to be a factor.

The International Prostate Symptoms Score

The International Prostate Symptoms Score (IPSS) was created by the World Health Organization to identify and classify the degree of urinary tract symptoms in men (Elkhodair et al., 2005). Five recent studies included the IPSS as a potential factor that could predict PUR. Elkhodair et al. and Cronin, Shannon, Bale and Quinlan (2007) found that it was predictive of PUR, whereas Kotwal et al. (2008), Sarasin et al. (2006) and Butwick et al. (2003) did not.

Table 2-2 presents a comparison of the patients who were catheterized in Kotwal et al. (2008), Cronin et al. (2007) and Elkhodair et al.'s studies according to their IPSS. Kotwal et al. and Elkhodair et al. used the same definition of PUR, and had similar numbers of patients in their studies. It is interesting to note that the majority of patients who were catheterized in Kotwal et al.'s study had a mild IPSS, and that only 37.5% of patients with a severe score needed catheterization, whereas 100% of men with a severe score were catheterized in Elkhodair et al.'s study. More research is needed in this area to determine if the IPSS should be used for males to predict PUR.

Table 2-2 IPSS Studies Comparison

IPSS	Elkhodair et al. Catheterized Patients	Cronin et al. Catheterized Patients	Kotwal et al. Catheterized Patients
Mild 0-7	11(17.7%)	23(27.71%)	22(28.5%)
Moderate 8-18	15(55.5%)	18(58.06%) *Cronin used a range of 8-19	6(27.2%)
Severe >18	6(100%)	4(100%) *Cronin used a range of 20-35	3(37.5%)

The number in brackets is the percentage of patients with the same score.
Chart modified from Kotwal et al. (2008).

Urinary symptom questionnaire

Instead of using the IPSS, Weekes et al. (2006) utilized a urinary symptom questionnaire that was scored out of eight points. It included questions about nocturia, voiding frequency, urge incontinence, stress incontinence, hesitancy, and dribbling after voiding. While Weekes et al. did indicate that their questionnaire was easier to use than the IPSS, they do not present any data describing the creation or validity of their questionnaire. Their data found that those men with a score of 4 or more on the questionnaire were at risk for PUR and should have a catheter inserted prior to surgery. It is interesting to note that their study excluded “any patient with any previous urological intervention for obstructive symptoms”(p. 331).

Anesthesia

Studies have been conducted comparing general anesthesia with spinal anesthesia when looking for causes of PUR. Some studies concluded that spinal anesthesia increased the risk of PUR, while other studies concluded that general anesthesia increased it. Finally, some studies found that type of anesthesia was not a factor at all in contributing to urinary retention. Just as in almost every other area of this literature review, there is little consensus, and conflicting research.

Four studies dealing with orthopedic patients identified spinal anesthetic as contributing to PUR: Olsen et al. (2007), Lamonerie et al. (2004), Lau and Lam (2004); and Ringdal et al. (2003). Lau and Lam stated that this occurred because “spinal anesthesia leads to a rapid blockage of the micturition reflex” and that “complete recovery of detrusor muscle function occurs after a few hours” (p. 660). Tammela (1995) also concluded that

spinal anesthesia blocks the micturition reflex and found that when long-acting bupivacaine was used, detrusor strength did not completely return for 7-8 hours after surgery.

It is interesting that spinal anesthesia came out as a factor in the study by Lamonerie et al. (2004) because of the number of spinal versus general anesthesia patients that they had. Out of the 177 patients in their study, 158 received general anesthesia and only 19 had spinal anesthesia.

Only one study with major orthopedic surgery was able to demonstrate that general anesthetic increases a patient's risk of PUR (McLain, Bell, Kalfas, Tetzlaff, & Yoon, 2004). According to Tammela (1995), one of the reasons that general anesthetics might contribute to PUR is that they have a "depressant effect on the bladder" (p. 75).

When some researchers included type of anesthesia as a factor (general versus spinal), it was found that this did not affect the incidence of PUR (Lehmann, et al., 2010; Bigsby et al., 2009; Kotwal et al., 2008; Lingaraj et al., 2007; Kumar et al., 2006; Izard et al., 2006; Keita et al., 2005; O'Riordan et al., 2000; Warner et al., 2000). While Keita et al. did not find type of anesthesia to be a factor, they did admit they did not have enough patients undergoing spinal anesthetic in their study to make a sound conclusion.

The addition of intrathecal morphine during anesthesia has been studied in regards to PUR. Izard et al. (2006) found that the addition of intrathecal morphine increased the risk of PUR. Gehling and Tryba (2009) determined that intrathecal morphine combined with spinal anesthetic versus placebo did not increase the risk of urinary retention. Baldini et al. (2009) conclude that spinal opioids do indeed disrupt bladder function and contribute to PUR.

Epidural anesthesia has also been researched in regards to PUR. Macdowell, Robinson, Hill and Villar (2004) compared patients receiving only general anesthesia with those receiving general, local and opiate epidural anesthesia. Their findings indicated no difference in catheterization rates between the two groups.

As well as type of anesthesia, some studies have looked at the length of anesthesia in relation to PUR (separate from duration of surgery). Ringdal et al. (2003) found an association between a longer average anesthetic time and PUR. Keita et al. (2005) found that an anesthetic time of ≥ 80 minutes was a predisposing factor for PUR in their univariate analysis, but this did not play out in their multivariate analysis. Olsen and Nielsen (2007) identified a PUR rate of 23.5% with an anesthetic time between 0 and 60 minutes, and a 58.6% PUR rate for between 181 and 240 minutes. In contrast, one researcher did not find a correlation between anesthetic time and PUR (Joelsson-Alm et al., 2009).

Duration of surgery

As with other studied factors related to PUR, some researchers found that this factor contributed to PUR, others did not. Increased length of surgery was found to be a factor by: Keita et al. (2005), Lamonerie et al. (2004) and Ringdal et al. (2003). Keita et al. specified a duration of surgery greater than 60 minutes (a factor significant in the univariate analysis, but not the multivariate analysis) and Lamonerie et al. stated a duration greater than 120 minutes contributed to PUR. Increasing duration of surgery has been linked to PUR possibly due to the fact that most patients receive more intravenous fluids and larger amounts of opioids (Darrah et al., 2009; Lamonerie et al., 2004).

Shadle et al. (2009), Lingaraj et al. (2007), Cronin et al. (2007), Izard et al. (2006), Lau and Lam (2004), and Warner et al. (2000) did not find that the length of surgery was a contributing factor to PUR.

As with age, Zampini et al. (2008) found results that seem opposite of many other studies. In their research, they identified a shorter duration of surgery as being a risk factor for PUR. There was no discussion for this finding.

Postoperative analgesia

Postoperative analgesics have been identified as increasing one's risk of developing PUR; both the types of analgesics, and the ways in which those analgesics are delivered to the patient. Morphine is a commonly used narcotic postoperatively. Urinary retention and hesitancy are known side effects of morphine administration (Canadian Pharmacists Association, 2007; Skidmore-Roth, 2007). Tammela (1995) postulated that the reason that morphine (given parenterally or extradurally), contributes to PUR is that it causes "analgesia and inhibition of the voiding reflex" (p. 75), as well as impairing bladder sensation.

Epidural analgesia postoperatively has been commonly implicated as a risk factor for PUR (Campbell et al., 2008; Lingaraj et al., 2007; Fernandes et al., 2007; Dolin et al., 2005; Butwick et al., 2003; Choi et al., 2003). In Darrah et al.'s (2009) review, they found that "the highest rates of opioid-mediated urinary retention have generally been associated with epidural administration"(p. 473).

Two studies compared epidural analgesia with other modes of pain control and found no difference in the rate of PUR. Sarasin et al. (2006) compared epidural analgesia with patient-controlled analgesia (PCA) and found no difference in PUR rates between the

two groups. Singelyn et al. (2005) compared femoral nerve block, PCA and epidural analgesia and also found no significant change in the PUR rates between groups.

Various studies have researched the effect of total dose of opioids on PUR rates. Kumar et al. (2006) found that the mean requirement of morphine after surgery was correlated with PUR. In two studies using a control group and a total joint regional anesthesia (TJRA) protocol, the patients in the TJRA protocol used less opioids, which is why the author's feel that their PUR rates were lower in the TJRA group (Hebl et al., 2008, Hebl et al., 2005). Studies that did not find total dose of opioids a factor include: Olsen et al. (2007), Boulis et al. (2001), and O'Riordan et al. (2000). Olsen et al. did note that there might have been some bias in their study with regards to how the morphine administration was documented.

PCA has also been studied in regards to PUR. O'Riordan et al. (2000) found that PCA use did increase the risk of PUR, whereas Kumar et al. (2006) found that it did not. Keita et al. (2003) compared subcutaneous morphine with PCA morphine in elderly patients and found no difference in PUR rates. However, they think this may have been due to the fact that both groups used the same amount of total morphine. Darrah et al. (2009) point out that PCA may contribute to PUR because it provides a more level plasma concentration of opioids compared to nurse-administered analgesia.

Ringdal et al. (2003) had an interesting result in their study of risk factors for PUR. They found that in those who required catheterization, a large percentage (compared to those who did not need catheterization) had received opioid analgesics prior to their first void. This again points to narcotics as increasing the patient's risk of PUR.

Despite some studies not identifying postoperative narcotics as increasing the incidence of PUR, the majority of studies implicate narcotics in urinary retention, particularly morphine and epidural analgesia. As noted in other areas, there is a lack of replication studies using the same definitions of PUR, thereby making it difficult to compare studies and draw conclusions (Choi et al., 2003).

Other drugs

There have been various non-opioid drugs studied in relation to PUR. Atropine (an anticholinergic), is used during general anesthesia (GA) and “blocks the muscarinic receptors of the urinary bladder paralyzing the detrusor” (Tammela, 1995, p. 75). Therefore, those who undergo GA and receive atropine are at greater risk for developing PUR. However, in the two orthopedic studies that included atropine or atropine-like drugs, it was found not to be a factor (Olsen et al., 2007, Keita et al., 2005).

The contribution of beta-blockers has also been explored as a risk factor with PUR. Boulis et al. (2001) found that preoperative beta-blockers increased the incidence of PUR, but Ringdal et al. (2003) did not. Meigs, Barry, Giovannucci, Rimm, Stampfer and Kawachi (1999) conducted a study looking at contributing factors for acute urinary retention (AUR) among male health professionals. They found hypertension to be a risk factor, but when they adjusted for antihypertensive medications, hypertension became nonsignificant. Those patients on antihypertensives (including beta-blockers) had a 2-3-fold risk increase for AUR. While this study was not conducted with postoperative patients, it points out an area for further investigation.

Ringdal et al. (2003) found that alpha-adrenergic agents or stimulants and cholinesterase inhibitors contributed to the risk of PUR. Olsen et al. (2007) identified ephedrine administration as a PUR risk factor. Kumar et al. (2006) included alpha-blockers

in their study, and this did not result in an increased risk of PUR in their study. Zampini et al. (2008) incorporated the vague factor of “medications” in their study, which did not come out as a factor for PUR.

Boulis et al. (2001) identified two factors that they found *decreased* the risk of PUR: the preoperative administration of narcotics and anti-inflammatories. This is interesting, because most often narcotics are implicated as one of the causes of PUR, not in a decrease in its incidence. According to Darrah et al. (2009), pain after surgery can contribute to PUR by “increasing sympathetic activity, which inhibits detrusor contraction and increases outflow resistance”(p. 472). It would stand to reason that pain before surgery would also cause this effect, and therefore treating with narcotics and anti-inflammatories to control the pain might mitigate some of the risk of developing PUR.

There have been various medications studied within the area of major orthopedic surgery, and no conclusive results. More study is needed to identify exactly which medications play a role with PUR, and to determine what action should be taken based on those results.

Intravenous fluids

Several studies have identified the amount of intravenous (IV) fluids given perioperatively as a risk factor for developing PUR (Feliciano et al., 2008; Keita et al., 2005; Ringdal et al., 2003). Feliciano et al. (in their univariate analysis) and Keita et al. (in their multivariate analysis) found that greater than 750 ml of intraoperative fluids contributed to PUR, whereas Ringdal et al. found the amount to be greater than 1000 ml. According to Darrah et al. (2009), “high fluid volumes are thought to cause retention via overdilatation of the bladder wall”(p. 471).

Some studies that looked at IV fluids did not identify it as a factor (Joelsson-Alm et al., 2009; Shadle et al., 2009; Olsen & Nielsen, 2007; Lau & Lam, 2004; Butwick et al., 2003; Warner et al., 2000). Linares Gil et al. (2009) conducted a study with ambulatory patients and also did not find that IV fluids contributed to PUR. They stated the following: “fluid administration is complex because it requires a design that take into consideration the infusion rate rather than the total amount of fluid infused as well as the pathophysiology of postsurgical micturition and the dynamic function of the bladder”(p. 186).

As with age and duration of surgery, Zampini et al. (2008) had a surprising finding with regards to intravenous fluids. Their study revealed that a lower amount of IV fluids was associated with PUR. Once again, their findings were presented in brief, and this was not discussed further.

As with the research just presented, Edmond (2006) and Darrah et al. (2009) also found conflicting evidence about whether increasing IV fluids contribute to PUR. With regards to this, Olsen et al. (2007) point out that in the studies they reviewed regarding IV fluids, “none of the comparative studies have specified doses of fluid, or whether crystalloid and/or colloid have been used as fluid therapy”(p. 94). Baldini et al. (2009) again provided a one-sided view of the issue and stated that IV fluids *may* play a role in the occurrence of PUR.

As Linares Gil et al. (2009) point out, the issue of fluids is complicated and it is difficult to compare studies to accurately assess if IV fluids do play a role in PUR. While some studies controlled for the amount of IV fluids and based the rate on the weight of the patient, other studies did not. It is also not known in many of the studies if they took into consideration the patient’s level of hydration prior to surgery, as this would affect how

much fluid the patient needs (someone who is dehydrated needs more fluid than someone who is not).

Price, Sear and Venn (for the Cochrane Collaboration)(2008), conducted a review of optimal perioperative fluid volumes after proximal femoral fracture. They point out that a moderate level of hypovolemia might be hard to diagnose solely on clinical assessment, and that there is a trend to underhydrate for fear of putting the patient into congestive heart failure. To compound the problem, they indicate that many elderly people are chronically underhydrated due to diuretics and a lower fluid consumption. This further complicates the issue of IV fluids, orthopedic patients and PUR.

Bladder volume in the recovery room

With the introduction of portable bladder scanners, research surrounding PUR has begun looking at assessment of bladder volumes. Thus, some studies have found that the amount of urine in the bladder, when scanned in the postoperative recovery room, can be a contributing factor to PUR. Shadle et al. (2009) found bladder volume on entry to the recovery room added to the risk of PUR. Feliciano et al. (2008) also found this, but specified a bladder volume greater than 500 ml, Dal Mago, Helayel, Bianchini, Kozuki and de Oliveira Filho (2010) specified greater than or equal to 360 ml and Keita et al. (2005) specified a bladder volume greater than 270 ml. Keita et al. concluded that their findings firmly support scanning the bladders of nearly all patients who come into the post-anesthetic care unit.

Edmond (2006) and Baldini et al. (2009) did not examine bladder scanner research in their reviews. Darrah et al.'s (2009) findings are consistent with this literature review, and they recommend more research in order to conclude whether or not ultrasound bladder monitoring in the recovery room should be more prevalent.

Type of surgery

The literature identifies patients undergoing certain types of surgeries as being at higher risk of PUR (gynecological, urological, anorectal). Major orthopedic surgery, in particular, has been identified as predisposing patients to PUR (Sarasin et al., 2006; Butwick et al., 2003; Johansson, Athlin, Frykholm, Bolinder, & Larsson, 2002; van den Brand, & Castelein, 2001). One of the reasons the orthopedic patient may be at a higher risk of urinary retention is due to immobility. The patient with a fractured hip must remain on bedrest until their surgery and for a short period after their surgery. This causes a problem because, “bladder anatomy is such that in the recumbent position gravity impedes emptying of the bladder, resulting in urinary stasis in the renal pelvis and bladder”(Jagmin, 2002, p. 113).

Balderi and Carli (2010) presented a second reason why orthopedic surgery carries a higher risk. In regards to anesthesia, “the lower level of the sensory and motor block achieved with lumbar epidural analgesia as compared to thoracic epidural analgesia could explain the greater length of time required for the recovery of bladder function after lower joint arthroplasty” (p. 120).

In studies conducted with patients undergoing various types of surgery, orthopedic surgery was identified as a risk factor for PUR in the following studies: Dal Mago et al. (2010), Joelsson-Alm et al. (2009), Fernandes et al. (2007), Ringdal et al. (2003) and Frederickson et al. (2000). Joelsson-Alm et al. draw attention to some of the reasons that orthopedic patients are at higher risk of PUR: if they have a fracture, they have pain that is usually treated with narcotics; being immobile and having to lay supine make it more difficult to void; and they may have had a lengthy wait for an ambulance or in the emergency room when their bladder would have been filling, and they were unable to void.

Within several of the orthopedic-only studies, they compared the PUR rates between those undergoing hip replacements, and those undergoing knee replacements. Kotwal et al. (2008), Sarasin et al. (2006) and Izard et al. (2006) found nearly no difference in PUR rates between the two groups.

These studies once again highlight the importance of accurate and up-to-date knowledge in the area of urinary retention for the orthopedic nurse. PUR is a common occurrence in the orthopedic setting, and it needs prompt and accurate treatment based on best practice.

Some researchers did not find that type of surgery (orthopedic being one type), contributed to PUR (Shadle et al., 2009; Feliciano et al., 2008; Olsen et al., 2007; Keita et al., 2005; Lamonerie et al., 2004; Warner et al., 2000). In addition to studying type of surgery, Feliciano et al. also compared major and minor surgery in regards to PUR, and found that it did not increase the incidence of PUR. Keita et al. compared major and minor surgery as well, and major surgery came out as a factor in their univariate analysis, but not in their multivariate.

History of bladder/prostate problems

A history of bladder and/or prostate problems had been identified as a possible factor for PUR, although the evidence is inconclusive. Kumar et al. (2006) and Ringdal et al. (2003) found a urological history to positively correlate with PUR (although in Kumar et al.'s study it was only a weak predictor). Keita et al. (2005) and O'Riordan et al. (2000) did not find an association between a urological history and PUR.

One of the difficulties with comparisons in this area is that some of the studies were somewhat vague, or used different terminology for a history of urological problems. Keita et al. (2005) stated "history of urinary tract symptoms", Ringdal et al. (2003) used the

phrase “history of previous voiding problems,” Kumar et al. (2006) and O’Riordan et al. (2000) used “history of urinary retention”.

In Edmond’s (2006) review she suggests that the best way to identify potential problems with PUR is to “fully assess all orthopaedic patients before major surgery”(p. 69). Darrah et al. (2009) acknowledges the many past orthopedic studies that have identified a history of urological difficulties as being predictive of PUR, but goes on to say that whether or not patients with voiding difficulties immediately prior to surgery will develop PUR is not clear, but has been demonstrated in a few studies.

History of renal disease

One study by Dutta (2008) looked at history of renal disease and pre-operative creatinine lab results in relation to PUR among orthopedic patients. The study found that those with a history of renal disease and those with elevated creatinine were highly likely to develop PUR. However, as the author notes in his limitations, this was a small sample (50 patients) and the results are difficult to generalize. This does not stop Dutta however, from recommending that those with a history of renal disease or with an elevated creatinine be catheterized preoperatively. Another problem with the study is that Dutta does not define what he considers an elevated creatinine to be, nor does he state why he decided to include these two factors in his data collection when they have been mentioned very infrequently in the literature. Overall, the study lacked clear reasoning and made conclusions that were questionable for use in practice.

Ability to void supine

Similar to the study conducted by Waterhouse, Beaumont, Murray, Staniforth and Stone in 1987, Weekes et al. (2006) looked at a man’s ability to urinate while laying down as a predictive factor for PUR. In contrast to Waterhouse et al.’s study though, Weekes et

al. did not find that an inability to void while lying down was predictive of the need to be catheterized after surgery. They found that 23 of the 31 patients who required a catheter were able to void supine prior to surgery. Weekes et al. do not discuss why this may not have been a factor in their study.

Comorbidities

Studies have identified factors other than a history of prostate/bladder problems as contributing to PUR. Izard et al. (2006) found that there was a trend for patients with a significant history of hypertension to have higher rates of urinary retention, although this was not found to be statistically significant.

Diabetes has also been looked at as a factor related to PUR. Izard et al. (2006) identified a trend (nonsignificant) for diabetics to have a higher rate of urinary tract infections postoperatively. There was no difference in PUR rates among diabetics. Olsen and Nielsen (2007) also studied diabetes and found that it was a risk factor for PUR, with 45% of the diabetics in the study being diagnosed. Darrah et al. (2009) says this in regards to PUR and diabetes: “impaired baseline bladders sensation may augment the contribution that decreased afferent activity secondary to anesthetics, sedative-hypnotics, and analgesics makes to the development of retention”(p. 474-475).

Other researchers have found that patients’ comorbidities in general did not contribute to PUR (Zampini et al., 2008; Kumar et al., 2006; Lau & Lam, 2004). Like IV fluids, past medical history is a bit of a complicated issue. Issues that should be addressed before including this as a factor include: how long has the patient been diagnosed with the condition?, have they sought treatment for the condition?, and are they participating consistently in treatment for the condition?

Baldini et al. (2009) concluded that these concurrent diseases increase the patient's risk of PUR: stroke, poliomyelitis, cerebral palsy, multiple sclerosis, spinal lesions, as well as diabetic and alcoholic neuropathy. Once again, they only present research that supports this conclusion, and nothing contrary.

Cognitive impairment

One recent orthopedic study looked at cognitive impairment in their examination of PUR (Johansson & Christensson, 2010). One of the authors conducted the Mini Mental State Examination 3-5 days after the 48 patients in the study underwent hip surgery. The reason cognitive impairment was included in the study is not made very clear however. The authors stated that this was a fairly common problem and that cognitive impairment may “complicate the situation” (p. 2112) of urinary retention.

Johansson and Christensson also believed that they could not do the test any sooner because “the patients were affected both psychologically and physically by the accident, surgery and pain” (p. 2112). This is perhaps exactly why the exam should be performed earlier. If patients are not cognitively sound, they may have difficulty communicating the need to void or be unaware of the need, leading to bladder distention and urinary retention. More studies are needed that include the assessment of mental status when looking at PUR, especially in the area of orthopedics.

Acute Urinary Retention

Separate from the postoperative urinary retention literature, there is a great deal of literature about acute urinary retention in general and its causes. As some of these causes could also contribute to PUR, they will be reviewed here.

Many authors divide up the causes according to category. Table 2-3 presents possible acute urinary retention causes according to category.

Table 2-3 Acute Urinary Retention Causes by Category

Obstructive	<ul style="list-style-type: none"> -benign prostate enlargement -prostate cancer -urethral stricture -bladder neck stenosis -constipation/fecal impaction -pelvic or gastrointestinal mass -urethral stone -organ prolapse in women -edema
Inflammatory	<ul style="list-style-type: none"> -urinary tract infection -prostatitis -cystitis -periurethral abscess
Neurologic	<ul style="list-style-type: none"> -spinal cord injury/hematoma/abscess -spinal stenosis -Multiple Sclerosis -Parkinson's -pelvic injury/trauma/surgery -diabetes mellitus (diabetic cystopathy) -Guillain-Barre syndrome -Lyme disease -cerebrovascular disease
Pharmacologic	<ul style="list-style-type: none"> -anticholinergics -alcohol -ephedrine, pseudoephedrine -antidepressants -some antiarrhythmics -some antihistamines (diphenhydramine, hydroxyzine, etc.) -antiparkinsonian medications -hormonal medications -some antihypertensives (hydralazine and propranolol) -antimigraine (ergotamine) -antipsychotics
Psychogenic	<ul style="list-style-type: none"> -emotional distress
Other	<ul style="list-style-type: none"> -diuresis with sudden bladder over distention (diuretics, alcohol toxicity, hyperglycemia) -vitamin B12 deficiency

Sources: Curtis, Dolan, & Cespedes, 2001;
 Khan, Gommersall & Gujral, 2007; Selius, & Subedi, 2008; Steggall, 2007; Whytock, 2006.

Orthopedic Postoperative Urinary Retention

Tables 2-4 and 2-5 highlight studies done in the orthopedic area looking at incidence of PUR, and its contributing factors.

Table 2-4 Older Orthopedic PUR Studies

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Walts, Kaufman, Moreland, & Weiskopf (1985) Retrospective chart analysis	To determine “predisposing factors of frequent urinary bladder catheterization after anesthesia and operation” (p. 280).	-not explicitly defined -if the patient was catheterized, retention was said to have occurred	-272 hip arthroplasty patients	Incidence of bladder catheterization was 28%	Use of epidural morphine significantly influenced rate of urinary catheterization.	“This study has clearly confirmed the finding that the use of epidural narcotics increases the incidence of urinary retention. If catheterization is to be avoided, this method of postoperative pain management should not be used” (p. 282)
Redfern, Orth, Machin, Parsons, & Owen (1986) Prospective	-to determine factors that point towards PUR ¹	-not explicit, “painful acute retention that required catheterization” (p. 1437).	-64 low-friction Charnley arthroplasty male patients	21% (14 patients)	-those men with a peak urinary flow rate of less than 7mm per second had increased risk of PUR ¹	-a detailed urological history should be taken preoperatively and a rectal exam done -peak flow rate should be measured, and those with a rate less than 7 mm/second should be referred to urology

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
<p>Waterhouse, Beaumont, Murray, Staniforth, & Stone (1987)</p> <p>Prospective</p>	<p>-to study factors associated with PUR¹</p>	<p>-not explicit: acute retention needed catheterization, “which was by suprapubic route under local anaesthesia” (p. 65).</p>	<p>-103 consecutive male patients undergoing total hip replacement</p>	<p>10.7% (11 patients)</p>	<p>-3 factors found to be significant: the bottle test (preoperatively the male was asked to attempt to void in a urinal while laying down), flow rates showing obstruction and a history or urinary difficulties</p>	<p>“Our study has shown that patients at risk can be identified within orthopaedic departments without the use of facilities for sophisticated urodynamic tests. A patient who is unable to pass urine into a bottle from a supine position, especially if he has a history of urological disease, should be referred for urological assessment with a view to prostatectomy before arthroplasty is undertaken” (p. 66).</p>

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Wynd, Wallace, & Smith (1996) Comparative, descriptive chart review.	-looked at risk factors for PUR ¹	-criteria for PUR: "a palpable bladder, suprapubic discomfort, failure to void within 8 hours postoperatively, and the receipt of large volumes (greater than 2000 cc) of intravenous fluid" (p. 47).	205 (convenience sample) total hip or knee replacement, hip or knee reconstruction patients (111 men, 94 women)	39.5% (81 patients)	-increasing age -greater total amount of intravenous fluids -fentanyl <i>decreased</i> risk of PUR -knee surgery combined with increasing age and bed rest > 24 hours had increased risk of PUR ¹	"Prolonged hospitalization, increased costs, possible infection, and chronic loss of urinary control must be avoided through prevention of urinary retention, or at least, early recognition and intervention to reduce complications" (p. 49).
Smith, & Albazzaz (1996) Prospective study.	-studied females with proximal femoral fractures, looking at PUR, preoperative urinary retention	-a post-voiding residual volume of 300 ml or more (using bladder scanner)	309 women, 65 or older with proximal femoral fractures	-1/3 had retention before surgery -over 1/2 had PUR ¹ within 24 hours -1 in 5 had continuing retention 5-7 days after surgery	-retention more common in older age groups	-some women have retention preoperatively, possibly due to the fall or fracture -surgery further increases incidence of retention -urinary retention is linked to increased fatality in hospital

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Capdevila, Barthelet, Biboulet, Ryckwaert, Rubenovitch, & d'Athis (1999) Prospective, randomized	“Tested the hypothesis that postoperative analgesic techniques influence surgical outcome and the duration of convalescence” (p. 8)	“impossibility to urinate, requiring a urinary catheter to empty the bladder”(p. 10)	56 undergoing total knee replacement or arthrolysis	CEI ² : 53% in PACU CFB ³ : 0% PCA ⁴ : 21% in PACU ⁵	-CFB caused no incidences of PUR	CFB “seems to have all the qualities necessary to become the primary choice for regional anesthesia after major knee surgery” (p. 14)
Singelyn, & Gouverneur (1999) Prospective, nonrandomized	-to compare pain control with 3 different modalities: PCA ⁴ , continuous 3-in1 block and PCEA ⁶	-none provided	1,338 patients having total hip arthroplasty (132 PCA ⁴ , 1142 block, 64 PCEA)	PCA ⁴ : 18.9% Block: 5.9% PCEA ⁶ : 32.8%	-PCEA ⁶	-continuous 3-in1 block is the favorite pain management modality after hip arthroplasty

1. PUR: postoperative urinary retention
2. CEI: continuous epidural infusion
3. CFB: continuous femoral block

4. PCA: patient-controlled analgesia with morphine
5. PACU: post anesthetic care unit
6. PCEA: patient-controlled epidural analgesia

The incidence of postoperative urinary retention (PUR) among studies varied, with the lowest being 10.7% (Waterhouse, Beaumont, Murray, Staniforth, & Stone, 1987), up to 50% (Smith & Albazzaz, 1996) within 24 hours after surgery. While all studies focused on orthopedic PUR, definitions of urinary retention were not consistent. For example, Walts, Kaufman, Moreland, & Weiskopf (1985) regarded PUR as occurring if the patient needed to be catheterized. In contrast, Wynd, Wallace & Smith (1996), defined PUR as the patient being unable to void, plus a time frame of eight hours since surgery and the patient having received more than 2000 ml of intravenous (IV) fluids. As with current studies, there is great difficulty in comparing studies because they all used varying definitions of PUR, so what was deemed PUR in one study, may not have been deemed PUR in another.

Many of the factors identified in contemporary studies were identified in the older ones: epidural morphine, increasing age, larger amounts of IV fluids and a history of urinary difficulties. One interesting test that Waterhouse, Beaumont, Murray, Staniforth & Stone (1987) conducted preoperatively was the bottle test. In this test, the male patient was asked to void in an urinal while lying down; if the gentleman could not void in the urinal, or had a great deal of trouble, the test was positive. A positive bottle test was a factor for the development of PUR in their study.

Something else to consider when attempting to compare studies, is that they all studied different groups of orthopedic patients. Redfern, Orth, Machin, Parsons, and Owen (1986) only studied male patients undergoing low-friction Charnley arthroplasties. Smith and Albazzaz (1996) in contrast, only included female patients with proximal

femoral fractures who were age 65 or older. Again, these differences make it quite difficult to compare the studies and their findings.

Table 2-5 Recent Orthopedic PUR Studies

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
<p>O’Riordan, Hopkins, Ravenscroft, & Stevens (2000)</p> <p>Prospective audit.</p>	<p>-to identify factors possibly linked with PUR¹</p>	<p>-not explicitly stated -if “acute urinary retention requiring catheterization” (p. 432) had taken place, it was documented</p>	<p>-116 (47 men, 69 women) having lower limb joint replacement</p>	<p>-18.1%</p>	<p>-male gender -increasing age -use of PCA²</p>	<p>-“the benefits of PCA² over i.m. opioids must be seriously considered in elderly male patients for lower limb arthroplasty in view of the high risk of developing postoperative urinary retention and the potentially serious complications that may occur” (p. 435)</p>

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Boulis, Mian, Rodriguez, Cho, & Hoff (2001) Retrospective chart review.	-to identify PUR ¹ rate and accompanying risk factors	“defined by a documented PVR ³ of greater than 100 mL, continued intermittent straight catheterization because of a failure to meet criteria for normal voiding (PVR ³ less than 100 mL), or an initial urination more than four hours after a patient’s arrival on the ward” (p. 23).	-503 patients undergoing cervical or lumbar laminectomy or discectomy	-38% (191 patients)	-regression analysis found that preoperative use of anti- inflammatory medication and narcotic analgesics were linked to a decreased risk of PUR ¹ -preoperative use of beta- blockers had an increased risk of PUR, and increasing age -for those with PUR ¹ , indwelling catheterization increased the length of PUR ¹	-increased length of stay and of hospital costs related to PUR ¹

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Butwick, Carter, & Dolin (2003) Prospective, randomized, single-blinded study (pilot study).	-to see if the Queen’s Square bladder stimulator would decrease the PUR ¹ rate of major knee surgery patients	-not explicitly stated, but if signs and symptoms of PUR ¹ occurred, patients were urged to use their stimulator, if patient still could not void, catheterization was performed	-43 patients having elective knee surgery	-41% of bladder stimulator group were catheterized -33% of control group were catheterized	-male gender and the use of an epidural increased the patient’s risk of PUR ¹	-the use of a bladder stimulator did not decrease PUR ¹ rates and the researchers will not be pursuing a larger trial with the stimulator
Choi, Bhandari, Scott, & Douketis (2003) Systematic review	“Is lumbar epidural analgesia more efficacious than systemic analgesia or long- acting spinal analgesia for postoperative pain relief” (p. 1)	-not defined	-13 studies conducted with total hip and/or knee replacement patients	-odds ratio 3.50	-urinary retention more common with epidural than systemic analgesia	“Epidural analgesia may be useful for pain relief after hip or knee replacement surgery; however, the benefits may be limited to the early (four to six hours) postoperative period”(p. 8) -“large, well-designed randomised clinical trials are still needed”(p. 8)

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Keita et al. (2003) Prospective, randomized	-to compare PCA ² with SC ⁴ morphine in elderly patients -to compare times of cognitive function recovery	-not defined	-40 patients having total hip replacements aged 70 and up -patients randomized to receive PCA ² morphine or SC ⁴ morphine (20 in each group)	-20% SC ⁴ group -25% PCA ² -difference not statistically significant	-none in relation to PUR ¹ (same PUR rates for PCA ² and SC ⁴ groups)	-possibly no difference in side effects because each group used the same amount of morphine in total -“the current study indicates that PCA ² does not provide optimal dynamic pain relief after THR ⁵ surgery in elderly patients”(p. 56)
McLain, Bell, Kalfas, Tetzlaff, & Yoon (2004) Case-controlled, comparative study.	-to assess perioperative complications associated with general versus spinal anesthesia	-not given	-400 patients undergoing lumbar laminectomy (200 with spinal anesthesia, 200 with general anesthesia)	-23.6% general anesthesia group -8% spinal anesthesia group	-general anesthesia	-possibly explained that the study did not use subarachnoid opioids during anesthesia and that spinal patients used less opioids postoperatively

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Macdowell, Robinson, Hill, & Villar (2004) Prospective, with retrospective review for validity.	-to study rate of PUR ¹ with general anesthesia, with or without epidural analgesia	-not explicit but, “indication for post-operative catheterization was urinary retention associated with distress” (p. 1115).	177 primary total hip arthroplasty patients -75 had general anesthesia (GA) -98 had general, local and opiate epidural anesthesia	14.7% for GA only group 13.3% for other group no statistical difference	-findings indicate epidural analgesia (a single injection) does not increase PUR ¹	“We conclude that a peri-operative combination of bupivacaine and fentanyl as an epidural anesthetic does not increase the rate of urinary catheterization” (p. 1116).
Singelyn, Ferrant, Malisse, & Joris (2005) Prospective randomized	-to compare femoral nerve block, PCA ² morphine and epidural analgesia -to assess femoral block on hip function	-urinary retention that necessitated catheterization	-45 patients undergoing elective total hip arthroplasty under general anesthesia (15 in each group: PCA ² , femoral nerve block, epidural)	-PCA ² : 27%(n=4) -nerve block: 13%(n=2) -epidural: 40%(n=6) -results not statistically significant	-none in relation to PUR ¹ (no group had a statistically significant increase in PUR)	-all 3 pain modalities give comparable pain control and hip rehabilitation -femoral nerve block has less side effects, and is best choice out of the three; more larger studies needed
Elkhodair, Parmar, & Vanwaeyenbergh, (2005) Prospective, observational	“to find a simple pre-operative test that identified high risk patients and predicted the likelihood of development of acute retention”(p. 64)	“the inability to void spontaneously when the bladder was distended”(p. 64)	-95 males having total hip or knee replacements	-33.68% (n=32)	-IPSS ⁶ did correlate with acute retention	“The IPSS ⁶ is a straightforward and reliable way to predict the chance of a patient developing post- operative retention of urine, with the risk being increased in older patients”(p. 65)

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Hebl et. al. (2005) Pilot study for multimodal analgesic protocol	To examine combined effect of minimally invasive surgery and a multimodal analgesic regimen (TJRA ⁷)	“a bladder volume of > 500 mL necessitating catheterization or a postvoid residual volume of > 200 mL” (p. 69)	20 minimally invasive THA ⁸ 20 minimally invasive TKA ⁹ (matched with 40 controls)	TJRA: PACU ¹⁰ 28% POD ¹¹ 0 45% POD 1 13% POD 2/3 0% Control group: PACU 43 % POD 0 63% POD 2 25% POD 3 8%	-those in the TJRA ⁷ group used almost 50% less opioids than control group	-the decrease in opioid use in the TJRA group may account for the decreased rate of PUR ¹
Kumar, Mannan, Chowdhury, Kong, & Pati (2005) Retrospective case note review	To study rate of PUR ¹ after arthroplasty	-definition not provided	-117 total hip arthroplasty -142 total knee arthroplasty patients	-18.9%	-factors included did not correlate with urinary retention (does not list factors)	-agrees with use of indwelling catheters for total arthroplasty patients with PUR
Kumar, Mannan, Chowdhury, Kong, & Pati (2006) Retrospective case note review	To study the rate of PUR ¹ after total knee arthroplasty	“Patients were catheterised if they could not void postoperatively and were in discomfort or had a palpable bladder” (p. 32)	142 total knee arthroplasty patients	-21.1%	-past medical history of urinary retention (weak predictor) -higher mean requirement of morphine postoperatively (stronger)	-supports the use of indwelling catheters for those developing PUR after knee arthroplasty

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Sarasin, Walton, Singh, & Clark (2006) Prospective audit	To identify if PUR could have been predicted using IPSS ⁶	-doesn't explicitly say, but if patients had > 500 ml of urine upon bladder scanning, an indwelling catheter was inserted	-182 total hip and knee arthroplasty (all had spinal anesthesia)	-51.6%	-males over 70 years of age	-IPSS ⁶ score not a significant predictor of PUR ¹ -males aged 70 and over undergoing hip or knee arthroplasty should have an indwelling catheter put in preoperatively
Weekes, Quinlan, O'Toole, & O'Bryne (2006) Prospective	To identify those at higher risk for PUR using a questionnaire and ability of male to void supine	-not defined -criteria was whether or not patient required a catheter in the 1 st 24 hours after surgery	-164 male primary hip and knee arthroplasty	-33/164 needed a catheter in the 1 st 24 hours (20%)	-a higher mean score on their urinary symptom questionnaire -higher mean age	-patients with a score of 4 or more on the questionnaire should be catheterized prior to surgery
Cronin, Shannon, Bale, & Quinlan (2007) Prospective	To study factors linked with PUR, especially the IPSS ⁶	-not defined -criteria was whether or not patient was catheterized after surgery	-118 males undergoing total hip or knee replacement	-38.14% (45/118)	-higher IPSS score	-the IPSS is easy to use and reliable for predicting PUR

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Lingaraj, Ruben, Chan, & Das De (2007) Retrospective Chart Review	-to assess rates of PUR ¹ after TJA ¹² in Singapore and identify risk factors	“Was deemed to have occurred when there was a failure to void spontaneously and catheterization was performed”(p. 214).	-125 primary, unilateral total knee arthroplasty patients (109 female, 16 male)	-8%	-male gender and epidural analgesia -age, length of surgery, method of anesthesia were not found to be associated in the multivariate analysis	-males should be assessed before surgery “for symptoms and signs of bladder outflow problems, and sent for urological review if these are present (p. 216). -use epidural analgesia with caution to avoid PUR
Hebl et al. (2008) Retrospective review with historical control matches	“to examine the effect of a pre- emptive, multimodal, perioperative analgesic regimen, using peripheral nerve block”(p. 511)	-urinary retention was “absent, or present and requiring catheterization”(p. 512)	-100 patients having primary or revision hip or knee replacements using the TJRA ⁷ Protocol -100 case controls having hip or knee replacements with traditional analgesic techniques	TJRA ⁷ : PACU ¹⁰ : 34 POD ¹¹ 0: 45 POD 1: 40 POD 2: 22 POD 3: 16 Control: PACU: 61 POD 0: 70 POD 1: 70 POD 2: 67 POD 3: 16	-urinary retention significantly reduced in TJRA ⁷ group	-similar to pilot study results (Hebl et al., 2005), TJRA groups used less opioids which authors feel contributed to decreased rates of PUR

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Campbell, McCormick, McKinlay, & Scott (2008) Observer- blinded randomized trial	“compared analgesic efficacy, unwanted side effects and postoperative mobility in patients receiving continuous side-directed epidural analgesia with those receiving analgesia via continuous lumbar plexus infusion”(p.503).	-not defined -recorded if postoperative bladder catheterization occurred	-56 patients undergoing total knee replacements	Side-directed epidural analgesia group: 37.9% (11/29) Continuous lumbar plexus analgesia group: 12.5% (3/24)	-higher rate of catheterization in epidural group	“The lower incidence of bladder catheterization may be seen as a significant benefit since many orthopaedic surgeons are reluctant to catheterize in this group of patients because of concerns regarding joint infection”(p. 506)
Dutta (2008) Prospective chart review	To develop policies regarding preoperative catheterization, anesthesia, and postoperative analgesia in those having total hip and knee surgery.	-not defined	50 total hip and knee replacement patients.	-10%	-history of renal disease. -elevated serum creatinine at time of surgery.	Instituting a protocol of preoperative catheterization in males with history of renal disease or an elevated serum creatinine would decrease rate of PUR ¹ by 80%.

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Kotwal, Hodgson, & Carpenter (2008) Prospective, consecutive.	To determine if the IPSS ⁶ and other factors could predict PUR ¹	“The development of abdominal discomfort with inability to void and with clinical evidence of a distended bladder” (p. 333).	102 orthopedic patients (62 THA ⁸ , 40 TKA ⁹)	-30.4% overall 27.4% THA patients 35% TKA patients	-increasing age only factor found to be a predictor -IPSS, type of operation and type of anesthesia were not found to be reliable predictors	-age greater than 70 is the only “practical” parameter to consider when looking at risk factors for PUR
Zampini, Knott, & Glazer (2008) Retrospective review.	“To evaluate the evidence of and variables contributing to urinary retention following elective spine surgery”(p. 178S)	“The inability to spontaneously void within eight hours after bladder catheter removal, or the complaint of symptomatic bladder distension”(p. 178S)	-103 elective spine surgery patients	13.6% (14/103)	-age <40 -1-2 level lumbar surgery -shorter duration of anesthesia -decreased amount of IV ¹³ fluids	-younger patients with shorter surgery duration are at higher risk for PUR -study provides base for further research into PUR ¹ and spinal surgery

Author/Year Type of Study	Focus of Study	Definition of Urinary Retention	Participants	Rate of urinary retention	Factors identified	Conclusions
Bigby, & Madhusudana (2009) Prospective	-to assess rates of catheterization after surgery in hip/knee arthroplasty patients	-not defined -looked at rates of catheterization	-50 patients having hip or knee arthroplasty	-32% rate of catheterization	-increasing age	-no reliable way to predict postoperative catheterization -no 'good' data to support that catheterization increases risk of UTI ¹⁴ or joint infection -"we suggest that, provided patients do not object, a catheter should be routinely placed pre-operatively"(p. 116)
Johansson, & Christensson (2010) Prospective, descriptive	-6 months after elderly urinary retention program implemented, study done to: "examine the presence of UR in older patients with hip fracture and to describe what actions nurses performed to detect, prevent and treat UR"(p. 2111)	-a bladder scan indicating > 400 ml in the bladder	-48 hip fracture patients age 65 and older	-38% (18 patients)	-no significant differences found between those with UR and those without in regards to: age, sex, bacteriuria, diabetes, senile dementia, or cognitive status -not all nurses were following the program	-even though an evidence based program was put in place, it was not fully followed by nurses -"there is knowledge on how to reduce the presence of UR, but the great challenge is how to implement this knowledge" (p. 2115)

1. PUR: postoperative urinary retention
2. PCA: patient controlled analgesia
3. PVR: post-void residual
4. SC: subcutaneous
5. THR: total hip replacement
6. IPSS: International Prostate Symptom Score
7. TJRA: Total Joint Regional Anesthesia

8. THA: total hip arthroplasty
9. TKA: total knee arthroplasty
10. PACU: post-anesthesia care unit
11. POD: postoperative day
12. TJA: total joint arthroplasty
13. IV: intravenous
14. UTI: urinary tract infection

Summary of Factors Associated with Postoperative Urinary Retention

As demonstrated above, and noted by Izard et al. (2006), it is difficult to predict exactly who will, and who will not develop urinary retention after orthopedic surgery. If we could predict who would develop PUR, we could proactively treat them to prevent complications. As well, if we could predict who would not develop PUR, we could spare them the insertion of an indwelling catheter.

Despite the difficulties in exact prediction of PUR, it is possible to identify those who are at higher risk of developing PUR. If nurses and physicians were equipped with this knowledge, they could be monitoring those patients more closely in the postoperative period and implementing the appropriate treatments (which will be discussed later on in the literature review). And as Koch, Grinberg and Farley (2006) suggested, “multiple preventative measures will be needed to prevent this common complication that can significantly increase patient morbidity” (p. 384).

Assessment of PUR

Assessment of PUR involves collection of both subjective and objective information from the patient. Subjective information includes the patient complaining of pain or discomfort in the lower abdomen or the patient stating they have the urge to void and cannot (Baldini et al., 2009). However, with PUR, the patient may not always be able to feel the discomfort of a full bladder due to the various medications given during and after surgery (Baldini et al.).

Objective data can be obtained by the nurse physically assessing the patient. Bladder palpation and percussion can be performed to assess bladder fullness, but this has been found to be inaccurate in determining PUR (Baldini et al., 2009, Rosseland, Stubhaug, & Breivik, 2002).

The amount of time that has elapsed since the patient's last void should be assessed, as most people void between four and six times in a day (Carrington, 2005). Darrah et al. (2009) recommend watching older patients more closely as "urinary retention can be associated with restlessness, confusion, and potential development of delirium"(p. 466) in this group of patients.

The Bladder Scanner

The amount of urine in the bladder in the post-anesthetic care unit (PACU) has been demonstrated to increase the incidence of PUR (Shadle et al., 2009; Feliciano et al., 2008; Keita et al., 2005). The use of a bladder scanner in general in the postoperative period has also been proven to be a useful assessment tool (Lamonerie et al, 2004; Rosseland et al., 2002; Frederickson et al., 2000; Warner et al., 2000). The bladder scanner allows the nurse to fairly accurately assess the amount of urine in the patient's bladder without relying on clinical assessment and also potentially avoiding unnecessarily catheterizing the patient (Darrah et al., 2009; Rosseland et al., 2002).

Palese, Buchini, Deroma and Barbone (2010) conducted a meta-analysis of the success of bladder scanners in decreasing urinary tract infections. While only three studies met the inclusion criteria (out of 61), they found that "the use of bladder ultrasound reduced the risk of CAUTI [catheter-associated urinary tract infection] by some 73% with respect to intermittent catheterisation" (p. 2976). The authors concluded that using a bladder scanner would decrease catheterizations, which thereby decreases the risk of urinary infection; and it would also decrease cost and length of stay due to urinary infections.

Prevention of PUR

One study has looked at prevention of PUR with naloxone. Gallo, DuRand and Pshon (2008) conducted a study looking at reducing PUR among orthopedic patients with low-dose naloxone. Forty-three patients were assigned to a control group that received only patient-controlled analgesia (PCA) with morphine. Forty-seven patients were assigned to an experimental group that received PCA morphine with the addition of 0.1 mg of intravenous naloxone given every four hours.

Gallo et al. found that “patients who received postoperative intermittent low-dose intravenous naloxone voided more frequently, had lower bladder scan residuals, and were catheterized less often than patients who did not receive naloxone” (p. 114). They go on to suggest that the addition of low-dose naloxone to the postoperative analgesic protocol could prevent urinary retention, which would decrease complications and help the patient move along the road of recovery a little faster.

Treatment of PUR

Before deciding on a treatment of PUR, the patient ought to be assisted to void on his or her own, in a comfortable position. However, this is not always possible after orthopedic surgery. After surgery most patients are unable to get up and go to the bathroom, and therefore must use the bedpan or urinal. According to Tammela (1995), one-third of patients cannot void in the prone position. This poses a significant problem for orthopedic patients, especially after hip surgery.

The most common treatment for PUR is urinary catheterization. Before going to this treatment, one study looked at methods to help the patient void. In Gonullu, Gonullu, Utkan, Dulger, Gokgoz and Karsli’s (1993) research, 85 out of the 111 patients who developed urinary retention were able to void after a warm pack was applied to their

suprapubic area and they were mobilized. However, as mentioned above, early mobilization may not be feasible for orthopedic patients.

As discussed previously, catheterization is the most common treatment for PUR. An issue that has been frequently researched is which is better: intermittent catheterization or indwelling catheterization. Tables 2-6 and 2-7 present studies that address this issue.

Table 2-6 Older Orthopedic PUR Treatment Studies

Author/Year	Focus of Study	Study Population	Definition of PUR	PUR Rate	Treatment Protocol	Results	Conclusions
Hozack, Carpinello, & Booth (1988)	-tested hypothesis that early bladder decompression can reduce rates of infection, retention and catheterization	-54 female total arthroplasty (hip or knee) patients (only spinal anesthetic)	-not stated	-13% required indwelling catheterization (does not give reason why) -61% needed intermittent catheterizations after leaving recovery room	Group A: had intermittent catheterization in the recovery room (31 patients) Group B: no catheterization in recovery room (23 patients)	-13% overall had positive urine culture postoperatively	“The effect of straight catheterization in the recovery room was not beneficial but merely increased by one the number of catheterizations needed in the immediate postoperative period” (p. 82).
Carpiniello, Cendron, Altman, Malloy, & Booth (1988)	-tested whether early bladder decompression reduced UTI, PUR and number of catheterization rates	-77 female patients having total arthroplasty (hip or knee) (spinal only)	-not stated	-13% in A and B needed Foley postoperatively -61% in A and B need intermittent catheterization -C: 1 patient needed straight catheterization	Group A: 31 catheterized in recovery room Group B: 23 not catheterized Group C: had Foley inserted preoperatively, left in 24 hours postoperatively	-10% in A and B had positive urine cultures postoperatively -C: 1 patient had positive urine culture	“Perioperative twenty-four-hour bladder drainage is recommended in light of the decreased incidence of urinary tract infections and urinary retention with this regimen”(p. 188)

Author/Year	Focus of Study	Study Population	Definition of PUR	PUR Rate	Treatment Protocol	Results	Conclusions
Ritter, Faris, & Keating (1989)	-to evaluate a catheterization protocol	601 total joint arthroplasty patients	-not stated	Group 1: 64% needed one catheterization at a minimum Group 2: 31% needed only intermittent, remainder needed indwelling catheters Group 3: 10 patients needed intermittent catheterization after removal of indwelling	Group 1: (165 patients) intermittent catheterization as needed Group 2: (295 patients) intermittent catheterization based on index episode, indwelling inserted if 2 nd episode occurred Group 3: (140 patients) indwelling catheter inserted in operating room just prior to surgery	Group 1: 1 patient had UTI ¹ Group 2: 2 patients had UTI Group 3: 0 UTI's -differences in infection rates not significant	-recommend group 3 treatment: catheter inserted under sterile conditions, less trauma for the patient, large obstruction can be detected before crisis, able to monitor output, fast return to normal voiding post-removal

Author/Year	Focus of Study	Study Population	Definition of PUR	PUR Rate	Treatment Protocol	Results	Conclusions
Petersen, Collins, Selakovich, & Finkbeiner (1991)	-to assess if prazosin could decrease PUR	60 male patients having total hip or knee arthroplasty	Defined as “the inability to spontaneously void when the bladder became distended” (p. 103).	Group 1: 21.4% Group 2: 59.4%	Group 1: (28 patients) had initial test dose of 1 mg prazosin, if tolerated, were given 2 mg by mouth every 12 hours Group 2: (32 patients) no prazosin or alpha-adrenergic blocker	-no difference between groups in terms of urinary tract infection rates -in those that developed PUR, there was significant increase in UTI	“The perioperative use of prazosin resulted in no significant side effects and a decreased incidence of retention. Prazosin can be an effective adjunct for the prophylaxis of postoperative urinary tract infections and for the reduction of the potential risk of total joint sepsis (p. 106).

Author/Year	Focus of Study	Study Population	Definition of PUR	PUR Rate	Treatment Protocol	Results	Conclusions
Skelly, Guyatt, Kalbfleisch, Singer, & Winter (1992)	-to compare intermittent and indwelling catheters for treatment of PUR	67 patients undergoing surgical hip repair for fracture (55 women, 12 men), aged 60 or more, all had general anesthesia	-not explicit, but if patients could not void after 8 hours, intermittent catheterization was done	82% preoperatively (55 patients) 18% more developed postoperatively (6 in each group) 8 hours after surgery	If patient could not void after 8 hours, intermittent catheterization was done, if residual was more than 150 ml, random assignment occurred: group 1 got indwelling catheter (left in for 48 hours), group 2 got intermittent catheterization	-in and out catheterization in group 2 had a sooner return to voiding than the indwelling group -31% of group 1 and 38% of group 2 developed UTI ¹ by postoperative day 5	“Overdistension must be avoided. Second, intermittent catheterization to achieve this goal will result in an earlier return to normal voiding and perhaps earlier mobilization and discharge of patients” (p. 1189)

Author/Year	Focus of Study	Study Population	Definition of PUR	PUR Rate	Treatment Protocol	Results	Conclusions
Oishi, Williams, Hanson, Schneider, Colwell, & Walker (1995)	“Determine the efficacy of a straight catheterization protocol in comparison with an indwelling catheter protocol in preventing urinary retention, bladder distention, and infection” (p. 732).	95 primary THA ² patients undergoing general anesthesia	PUR: “an inability to void requiring catheterization” Bladder distention: “a urine volume greater than 500 ml at catheterization” (p. 733)	PUR: 84% group 1, 7% group 2 Bladder distention: 41% group 1, 7% group 2	Group 1: initial 49 consecutive patients had as needed intermittent catheterization protocol. Group 2: remaining 46 consecutive patients had indwelling catheter protocol.	Group 1: no infection Group 2: 25 developed bacteriuria, 2% UTI ¹ with no symptoms	“Data from this study support the use of an indwelling bladder catheter protocol for optimal THA ² perioperative care” (p. 735). Indwelling catheterization time should not exceed 48 hours.
Knight, & Pellegrini (1996)	-to compare indwelling catheters and intermittent catheters with UTI ¹ rates	119 primary THA ² and TKA ³ patients	-not defined	-35% in group 2 required intermittent catheterization after 48 hours -19% in group 1 required intermittent catheterization after indwelling removal	Randomized: 1. indwelling catheter in OR ⁴ just prior to surgery for 48 hours (n=62) 2. intermittently catheterized every 6 hours if not voiding or urinating 50 ml or less (n=57)	-12 UTI ¹ 's (overall infection rate of 10%) -group 1 infection rate 8% -group 2 infection rate 12%	“For total joint arthroplasty, management by indwelling catheter is a cost-effective strategy to facilitate postoperative return of normal bladder function”(p. 882).

Author/Year	Focus of Study	Study Population	Definition of PUR	PUR Rate	Treatment Protocol	Results	Conclusions
Wiley, & Tran (1999) Prospective trial	“to determine the safety of routine usage of indwelling urinary catheter (IDC) in patients undergoing total hip or knee arthroplasty”(p. 158)	-68 patients having primary or revision arthroplasty of the hip or knee (33 men, 35 women)	-not discussed as all patients had a catheter inserted in the operating room	-not applicable -after removal of the IDC (typically on 3 rd day after surgery), no patient needed to be catheterized again	-all patients had combined epidural/general anesthesia -primary surgery patients had antibiotic prophylaxis for 24 hours, and revision patients for 48 hours after surgery -all patients had epidural analgesia for 48 hours	-urinary tract infection rate of 4.4% -no joint infections after a minimum 6 month follow-up	-“the short term use of an IDC is safe after total hip or knee arthroplasty”(p. 159)

Author/Year	Focus of Study	Study Population	Definition of PUR	PUR Rate	Treatment Protocol	Results	Conclusions
Slappendel, & Weber (1999)	To study effect of the introduction of a bladder scanner on number of catheterizations and UTI ¹ rates	1 st group: 1920 patients having spine/orthopedic procedures 2 nd group: 2196 patients (same types of surgeries)	·After bladder scanner introduced: “no spontaneous diuresis 8h after surgery combined with a bladder volume estimated at more than 800 ml”(p. 504).	·Prior to bladder scanner introduction: 31.4% of patients catheterized After: 15.9% patients catheterized	4 month period: patients catheterized if had not voided 8 hours after surgery Next 4 months, bladder scanner introduced and patients only catheterized if bladder volume >800 ml 8 hours postoperatively	1 st group: 18 patients had UTI 2 nd group: 5 patients had UTI	-bladder scanner reduced number of catheterizations done, which saved money and eased nursing workload and decreased UTI rates

1. UTI: urinary tract infection
2. THA: total hip arthroplasty
3. TKA: total knee arthroplasty
4. OR: operating room

The above studies all focused on some type of treatment or test protocol for treatment of PUR. Some studies focused just on a certain type of protocol, and others also looked at urinary infection rates. Five out of the six studies that compared intermittent and indwelling catheterization recommended indwelling catheterization as an effective and safe treatment for PUR. Only one study by Skelly, Guyatt, Kalbfleisch, & Winter (1992), recommended intermittent catheterization as the optimal protocol. Skelly et al. recommended intermittent because they felt that with this method, normal urinating would return faster and the patient would mobilize more quickly. They were not recommending this method due to infection rates (their study found no significant difference in infection rates between groups).

As with the studies looking at the incidence of PUR, all of these studies used varying definitions of PUR (if they even provided a definition), and used different treatment protocols with different patient populations (some had just female patients, others just male patients). To draw comparisons is difficult, again because of the many variations in each study.

Table 2-7: Recent Orthopedic PUR Treatment Studies

Study Author/Year	Focus of Study	Participants	Definition of PUR/PUR Rate	Treatment Protocol	Results	Conclusions
<p>Frederickson, Neitzel, Miller, Reuter, Graner, & Heller (2000)</p> <p>Descriptive for general surgery. Quasi-experimental for orthopedic wards.</p>	<p>“To determine the effect of ultrasound assessment of bladder volume on patient and cost outcomes for patients needing postoperative catheterization” (p. 79)</p>	<p>-132 (50 urologic, colon, gynecologic; 82 total joint replacement or spine) (only orthopedic group results will be discussed)</p>	<p>-in intervention group, 2 protocols -due to void protocol: after ultrasound, if >400 ml or >300ml and patient uncomfortable, catheterize; if volume <400ml, ultrasound in 1 hour, if <300 ml, assess patient hydration -void with residual protocol: after ultrasound, if PVR¹ >150ml, catheterize; if PVR <150ml, ultrasound after each void x3 and if each PVR <150ml, no more ultrasound; if PVR >150ml x3, consult with doctor</p>	<p>-used 3 orthopedic wards: 2 served as control treated with standard protocol (timed, intermittent catheterization) -intervention orthopedic ward had bladder volume assessment with scanner prior to catheterization</p>	<p>-advancing age and hip/knee repair were linked to increase in number of catheterizations in orthopedic group -20% fewer catheterizations in intervention group, but not statistically significant -no statistically significant difference in UTI² rates between control and intervention group</p>	<p>“Ultrasound assessment of bladder volume promotes databased practice that will guide the practitioner in decisions to order invasive urinary catheterizations” (p. 86). -cost data supports purchase of bladder ultrasound machines</p>

Study Author/Year	Focus of Study	Participants	Definition of PUR/PUR Rate	Treatment Protocol	Results	Conclusions
Iorio, Healy, Patch, & Appleby (2000)	-to assess which method has less complications and is more cost effective: preoperative insertion of indwelling catheters or catheterizing after surgery as needed	652 unilateral total knee arthroplasty patients	·not defined ·67% of group 2 patients had catheters as necessary (88.6% indwelling, 11.4% intermittent, no reason given for catheter choice)	Patients randomized into 2 groups: 1. (306 patients) had indwelling catheter inserted preoperatively for 24 hours 2. (346 patients) had catheter inserted as needed for symptoms of urinary retention	-based on urinary tract infections, no difference was found between the 2 groups	-recommend intermittent catheterizations for PUR to avoid urinary tract infections -more cost effective to catheterize as needed, rather than preoperative catheterization
van den Brand, & Castelein (2001)	Studied postoperative bacteriuria after TJA ³ with use of indwelling or intermittent catheterization.	99 (27 men, 72 women) primary total hip or knee arthroplasty patients	·not explicit, but see group 2 protocol ·38 of 53 group 2 patients needed 1 or more intermittent catheterizations	Randomized into 2 groups: 1. (46 patients) indwelling catheterization done in operating room just before surgery, left in 48 hours 2. (53 patients) intermittently catheterized every 6 hours, or sooner if had urge to go but could not, until voiding on own	-14% with postoperative bacteriuria (overall) -24% bacteriuria rate in group 1 (higher for males), 6% in group 2 -results were statistically significant	-recommend intermittent catheterization for treatment of PUR

Study Author/Year	Focus of Study	Participants	Definition of PUR/PUR Rate	Treatment Protocol	Results	Conclusions
Johansson, Athlin, Frykholm, Bolinder, & Larsson (2002)	-to note UTI ² rates, to assess whether decision to do intermittent or indwelling catheters was used and look at length of hospital stay for those with UTI	144 (105 female, 39 male) traumatic hip fracture patients	-not discussed -recommendation of quality improvement process was that intermittent catheterization was to be performed if catheterization deemed necessary -no PUR rate given	-none -71% of those without UTI on admission, had intermittent catheterizations (instead of indwelling), which were the hospital's recommendations; other 29% received indwelling catheters (against recommendations)	-38% of group has positive preoperative urine cultures -32% of intermittent group developed UTI -61% of indwelling group developed positive urine culture	-UTI associated with longer hospital stay -avoid use of indwelling catheters to decrease UTI rates -nursing and medical documentation needs development
Butwick, Carter, & Dolin (2003)	-to compare a bladder stimulator and placebo in the treatment of PUR	43 elective knee surgery patients	·not defined ·Group 1: 41% needed catheterization Group 2: 33% needed catheterization	Group 1: (22 patients) bladder stimulator group Group 2: (21 patients) placebo non-functioning bladder stimulator	-data indicated that the stimulator does not decrease PUR rates	-there was not even a small indicator pointing towards effectiveness, therefore the researcher's did not continue on with a larger study

Study Author/Year	Focus of Study	Participants	Definition of PUR/PUR Rate	Treatment Protocol	Results	Conclusions
Iorio, Whang, Healy, Patch, Najibi, & Appleby (2005)	-to assess which method has less complications and is more cost effective: preoperative insertion of indwelling catheters or catheterizing after surgery as needed	719 primary total hip arthroplasty patients	·not given ·77.8% of group 2 were catheterized as needed	Group 1: 379 patients had a catheter as necessary Group 2: 340 patients preoperative insertion of indwelling catheter for 24 hours (non-randomized)	-no significant difference in UTI ² between groups -being female was independent risk factor for UTI	-recommend intermittent catheterization of PUR -more cost effective to catheterize as necessary postoperatively
Izard, Sowery, Jaeger, & Siemens (2006)	“To update the risk of urological complications after a contemporary series of lower limb joint replacements, and to define parameters affecting this risk” (p. 3159)	221 undergoing hip or knee replacement (including partial or revision surgeries)	·“Any patient unable to void satisfactorily post-operatively and requiring catheterization” (pg. 3159) ·35% PUR rate ·47% overall urological complication rate	Compared those who peri-operative urinary catheterization (< 48 hours postoperatively) with those managed “expectantly”.	-no difference in infection rates between the 2 groups	“In high-risk patients, the practice of utilizing a catheter peri-operatively may decrease the risk of multiple post-operative catheterizations without increasing the rate of infections”(p. 3158)

Study Author/Year	Focus of Study	Participants	Definition of PUR/PUR Rate	Treatment Protocol	Results	Conclusions
Beaupre et al. (2006)	-to compare effectiveness of evidence based clinical pathway (CP) in hip fracture patients with control group	-control group: 678 patients -clinical pathway group: 663	-PUR definition nor rate studied	-CP group: indwelling catheter inserted in emergency room, catheter care given BID after; discontinue catheter POD 3 or 4; if unable to void 12 hours after removal, reinsert indwelling and reassess daily -unsure about control group	-incidence rates (/1000 persons) of UTI ² did not differ between groups (control: 212.4, CP group: 180.0) -median days catheter was in: control-5, CP group-4	“An evidence based standardized CP led to reduced postoperative morbidity but in-hospital mortality was unchanged”(p. 378).
Gallo, DuRand, & Pshon (2008)	-compared PUR in orthopedic patients with a naloxone treatment	97 elective shoulder, hip, knee patients with PCA ⁴ with morphine, aged 65 or younger	·not explicitly defined: “patients unable to void or those experiencing urinary distension were straight catheterized under standing physician orders” (p. 112) ·11.5 % experimental group needed catheterization 24.4% of control group	Random assignment: 1. (52 patients) experimental group received 0.1 mg IV ⁵ naloxone every 4 hours with PCA ⁴ morphine 2. (45 patients) control group: received morphine PCA ⁴ and no naloxone -those requiring indwelling catheters were taken out of the study	-number of voids was significantly higher in group 1, also lower average bladder scan amount -experimental group was also catheterized less often	-study results suggest that low-dose naloxone can “assist in prevention of bladder retention” (p. 115)

Study Author/Year	Focus of Study	Participants	Definition of PUR/PUR Rate	Treatment Protocol	Results	Conclusions
Pedersen et al. (2008)	“to compare the rate of in-hospital postoperative complications including mortality before and after introduction of a comprehensive multidisciplinary fast-track treatment and care program”(p. 1832).	-control group: 357 patients -intervention group: 178 patients -both groups patients were admitted for non-pathological low-energy hip fracture	-control: urinary retention resulted in catheterization -intervention: bladder volume greater than 300 ml resulted in catheterization -control group: ~2% -intervention group: ~5%	-control: “urinary retention resulted in intermittent catheterizations, repeated every 4 hours until spontaneous urination -intervention group: bladder scanner was used, “the first instance of retention greater than 300 mL resulted in a single catheterization; in the second instance a catheter was inserted for 1 to 2 days”(p. 1833)	-UTI ² more common in control group	“The optimized hip fracture program reduced the rate of postoperative complications and mortality, but randomized clinical trials are needed”(p. 1837).

- 1.PVR: post-void residual
- 2.UTI: urinary tract infection
3. TJA: total joint arthroplasty
4. PCA: patient-controlled analgesia
5. IV: intravenous

Intermittent versus Indwelling Catheterization and Infection in Orthopedic Patients

Regardless of the definition of PUR, at some point if the patient cannot void, they will need to be catheterized. There are two main issues with catheterization and the orthopedic patient: urinary infections and deep joint infections.

The first issue with catheterization treatment for PUR is catheter associated urinary tract infections (CAUTIs). As nurses, it is undesirable for our patients to develop infections due to the use of a urinary catheter. According to Tambyah (2004), “the best way of preventing a CAUTI is to remove the catheter or to avoid its use” (p. S46). This then raises the question, of how best to achieve this- intermittent catheterization or indwelling Foley with early removal?

In terms of best practice research, a few studies have looked at what should be the preferred routine for bladder management after orthopedic surgery. However, there is little agreement on a “preferred bladder management” routine (Izard, Sowery, Jaeger, & Siemens, 2006, p. 3158). Many of the studies looking at the treatment of PUR differ on their recommendations regarding intermittent catheterization (IC) versus having an indwelling Foley catheter (IFC).

Iorio, Whang, Healy, Patch, Najibi, & Appleby (2005), Johansson, Athlin, Frykholm, Bolinder, & Larsson (2002), van den Brand, & Castelein (2001), Iorio, Healy, Patch, & Appleby (2000) all recommended intermittent catheterization instead of indwelling. Some studies specifically found that there were decreased urinary tract infection rates (Johansson et al.; van den Brand et al.; & Iorio et al., 2000) and that intermittent catheterization was more cost effective (Iorio et al., 2005; Iorio et al., 2000). This is in contrast to many of the older studies that recommended indwelling catheterization (see

Table 2-6). Izard et al. (2006) and Bigsby and Madhusudana (2009) are the only recent orthopedic studies that recommended indwelling catheterization.

Bigsby et al. (2009) conducted a small study looking at rates of catheterization among patients undergoing knee or hip arthroplasties. In total, 50 patients were included in the study, and there was a 32% rate of catheterization postoperatively. Based on the results of their limited study and the results of their small literature review (they only reviewed nine studies), they recommend, “a catheter should be routinely placed pre-operatively” (p. 116).

It is interesting to note however, that in addition to a small sample size and literature review; they do not state the reasons that patients were catheterized. They also go on to claim that “there is no good evidence that catheterisation increases the risk of joint or urinary infection” (p. 116). There are a great many sources, many of which are included in this literature review, which would disagree with that statement.

Deep Joint Infections

The second issue with catheterization of the orthopedic patient is that of deep joint infection or sepsis. The problem can occur when infection travels from another source (i.e. a urine infection) via the bloodstream to the joint, thereby infecting it. This is called hematogenous seeding (Lucas, 2008). Joint infection is a very serious issue for the orthopedic patient that can necessitate long-term antibiotic therapy and single or multiple surgeries to cure the infection (Best, 2005).

Wroblewski and Del Sel (1980) conducted a classic study looking at urinary retention and deep joint infection. Their study included 195 male patients having the Charnley low friction arthroplasty procedure who had urinary retention, which

necessitated catheterization. Their results found a deep joint sepsis rate of 6.2% (12 patients).

While the study could not establish causal relationships between urinary retention and deep joint infection, they did recommend that retention should be screened for prior to surgery and dealt with appropriately. The problem with this study is that it was a retrospective study and therefore some tests were not performed on some participants (i.e. some patients did not have urine or wound cultures done). Due to the missing data, and the fact that further testing of the organism that caused the urine and wound infections was not done, the authors were only able to assume a link between urinary infection and deep joint infection of the hip arthroplasty.

Table 2-8 provides a summary of the orthopedic studies that looked specifically at infection rates (deep wound and/or urinary infections) in the orthopedic patient. To the best of the researcher's knowledge, there is no study that has *conclusively* found that urinary infection causes deep wound infection.

In a recent study by Koulouvaris, Sculco, Finerty, Sculco, & Sharrock (2009), they concluded that urinary tract infection presents a very small risk of joint infections in the orthopedic patient. This was a fairly large-scale study (19,375 patients) with strict infection definition criteria. Perhaps the risk of deep joint infection is not as great as it once was, but the potential for hematogenous seeding is still there and the risks should be minimized whenever possible. If nurses were made aware of the possible link of extended catheterization and hip infection, the length of time patients were catheterized may decrease.

Table 2-8 Infection and the Orthopedic Patient

Author/Year	Focus of Study	Participants	Definition of infection	Infection rate	Factors that predisposed to infection	Conclusions
Wroblewski, & Del Sel (1980)	-to assess the link between urinary retention and deep hip infection	-195 male hip arthroplasty patients with urinary retention	Deep sepsis: - radiographic and/or bacterial confirmation in the prosthesis	-6.2% (12/195) deep sepsis rate	-link between urinary catheterization and deep sepsis can be assumed only	-recommended that males with urinary symptoms should be assessed and treated if needed prior to hip surgery
Herruzo-Cabrera, Lopez-Gimenez, Cordero, & Munuera (2001)	“To analyse the current incidence of UTI ¹ , to further investigate the risk factors and to suggest ways of reducing urinary infections in orthopedic patients” (p. 55).	5320 orthopedic patients over 10 years of age, with a stay length over 2 days (1617 fracture osteosynthesis, 1388 hip arthroplasty, 596 knee arthroplasty, 340 joint arthodeses and 1379 other patients)	Urinary infection: > 100,000 units/ml are cultured	1.39% urinary infection rate (74 patients)	·Bivariate analysis: -inadequate antibiotic prophylaxis, urinary catheterization, central venous catheter -length of preoperative hospitalization and urinary catheterization ·Multivariate analysis: -preoperative hospitalization > 4 days and urinary catheterization	-recommended decreasing postoperative stay, complete antibiotic prophylaxis and reducing length of urinary catheterization

Author/Year	Focus of Study	Participants	Definition of infection	Infection rate	Factors that predisposed to infection	Conclusions
Krijnen, Kaandorp, Steyerberg, van Schaardenburg, Moens, & Habbema (2001)	“To assess cost effectiveness of antibiotic prophylaxis for haematogenous bacterial arthritis in patients with joint disease”(p. 259).	-4907 patients with joint disease	-define bacterial arthritis by modified criteria from Newman (but do not say what that is)	-37/4907 with bacterial arthritis -2/37 had UTI ¹	-those more prone to bacterial arthritis: having a hip/knee prosthesis, rheumatoid arthritis, comorbidity and aged 80 and up	-antibiotic prophylaxis recommended for those with urinary infections who are more prone to bacterial arthritis
Peersman, Laskin, Davis, & Peterson (2001)	-to identify risk factors for wound infection after knee replacement	-6120 patients undergoing primary or revision knee replacement -knee infection patients (n=113) were matched 1:2 with case controls (n=236)	-not defined	-113/6120 -0.39% of primary knee replacement patients -0.97% of revision knee surgery patients -overall infection rate of 0.43% -8 patients had a UTI prior to knee infection	-factors that predisposed to knee infection: increasing number of comorbidities, weight, diagnosis other than osteoarthritis, increased surgical time, revision surgery	-in the operating room, using body and exhaust suits and vertical laminar flow, has resulted in a nominal infection rate -could not analyze UTI ¹ information because this determinant was not present in the control group

Author/Year	Focus of Study	Participants	Definition of infection	Infection rate	Factors that predisposed to infection	Conclusions
Kumar, Mannan, Chowdhury, Kong, & Pati (2006)	“to assess the impact of urinary retention and catheterization on joint sepsis”(p. 31-32)	-142 TKA ² patients	-did not provide definitions for urinary infection or deep joint sepsis	-3 patients had positive urinalysis but were asymptomatic -deep joint sepsis: 2.1% (3/142)	-“no case of deep joint sepsis had urinary retention or had symptomatic urinary tract infection”(p. 34)	-with prophylactic antibiotics and ensuring a short length of catheterization, they did not find a greater incidence of deep joint sepsis; they do not recommend <i>against</i> short-term indwelling catheters
Cumming, & Parker (2007)	To explore the link between deep wound infections and urinary catheterizations.	-3180 hip fracture patients.	Deep wound infection: “clinical evidence of infection below the deep fascia with or without microbiological confirmation” (p. 484).	-26 cases of deep wound infection.	-average control group catheterization time: 3.5 days; 6.9 days for deep sepsis group -number of long-term catheters (> 21 days) was also higher in deep sepsis group	-difficult to prove cause or association of deep wound infection and catheterization

Author/Year	Focus of Study	Participants	Definition of infection	Infection rate	Factors that predisposed to infection	Conclusions
Koulouvaris, Sculco, Finerty, Sculco, & Sharrock (2009)	-to assess if treated UTI's ¹ or asymptomatic bacteriuria raise the chance of joint infections -to identify if UTI organism is same as the joint infection organism	-19,375 joint arthroplasty patients; joint infection patients identified and then matched 1:1 with control subjects	Deep incisional: 1. infection in 30 days if no implant, 1year if implant in, 2. purulent drainage from deep incision, fever, pain, tenderness or evidence of abscess, surgeon diagnosis Joint space: 1. same as above, 2. purulent drainage from a drain, organisms cultured from joint/synovial fluid, evidence of abscess, surgeon diagnosis	-0.29% (n=58, 42 deep incisional, 16 joint space) -7 patients with joint infection also had a UTI -only one patient had same bacteria cultured from their wound and urine	-no association was found between total UTI rates and wound infection rates, preoperative UTI and wound infection, and postoperative UTI and wound infection	-their results suggest a UTI that is treated poses little risk for joint wound infections after surgery (the authors do acknowledge that because of their low wound infection rate, they did not have enough power. To achieve 80% power, they would have needed to have 260 patients wound infections)

Author/Year	Focus of Study	Participants	Definition of infection	Infection rate	Factors that predisposed to infection	Conclusions
			UTI: at minimum one of: fever, urgency, frequency, dysuria, suprapubic tenderness; positive urine culture; physician diagnosis			

1. UTI: urinary tract infection

2. TKA: total knee arthroplasty

Treatment Guidelines

The question then, how best to proceed when PUR is present, has not really been answered yet. Nor, as is evident, is there much agreement in the literature. In Baldini et al.'s (2009) PUR literature review, they make specific mention of PUR in relation to lower limb joint surgery. After their review of the data, their recommendations are as follows: “bladder catheterization is not required in low-risk patients receiving neuraxial lipophilic opioids, whereas bladder catheterization is recommended in high-risk patients for 24 h under adequate antibiotic prophylaxis. Subsequent in-out catheterization should be guided by ultrasound” (p. 1153-1154).

The Scottish Intercollegiate Guidelines Network (SIGN) released a national guideline for the management of hip fractures in elderly people (SIGN, 2009b). SIGN develops “evidence based clinical practice guidelines, . . . derived from a systematic review of the scientific literature”(SIGN, 2009a, p.1). Their guideline development group was unable to find any high quality evidence for catheterization in patients with hip fracture. According to SIGN (2009b) high quality evidence includes meta-analyses, systematic reviews, randomized controlled trials, etc.

The SIGN (2009b) guideline recommended abstaining from catheterization except in these instances: “in the presence of urinary incontinence, on a long journey, where there is concern about urinary retention, and when monitoring renal/cardiac function” (SIGN, 2009b, p. 24). If the patient already has a catheter, they highlight the need for good pain control, ensuring the patient is hydrated and providing prophylactic antibiotics for the duration of catheterization. These recommendations were based on the clinical expertise of the group that developed the guidelines (due to absence of high-quality evidence).

The Joanna Briggs Institute (JBI)(2000) published an information sheet regarding short term indwelling catheters and their management. In their review of the literature on indwelling catheterization compared with intermittent catheterization, they only found one randomized controlled trial to review. Based on the paucity of solid research, they stressed the need for further investigations to be conducted. What they were willing to recommend was that “catheters should be removed from post operative patients as soon as possible. Indwelling catheterization is preferable to intermittent catheterization for some groups of post operative patients in the reduction of complications”(p. 6).

In 2004, Lockwood, Page, Conroy-Hiller and Florence updated the JBI review for management of short-term catheters. At the time of the update, more high-quality evidence was still not found with regards to intermittent versus indwelling catheterization. They point out the immediate requirement for replication studies in order to form more solid and evidence based solutions.

Niel-Weise and van den Broek (2005), with the Cochrane Collaboration, conducted a review of urinary catheter policies for short-term use (less than 14 days). They compared three things: a) indwelling versus suprapubic catheterization, b) indwelling versus intermittent and c) suprapubic versus intermittent. In their study of intermittent versus indwelling, they deemed two studies used in this literature review (Knight & Pellegrini, 1996; van den Brand & Castelein, 2001) adequate for review. They concluded the evidence suggested that intermittent catheterization was better than indwelling catheterization to decrease bacteriuria, but this “was not sufficient to draw conclusions for practice”(p. 8). In agreement with SIGN and JBI, Niel-Weise et al. conclude that there is not enough good-quality evidence in this area to make firm conclusions and a plan for practice.

Booth and Clarkson (2007) presented a catheterization algorithm used by community nurses in North Lancashire (how the algorithm was developed and on what evidence is not discussed). Before using the algorithm, the authors outlined some steps to be followed and considered. Step one involves assessing the need for which catheterization is a choice. Secondly, establish other choices: “referral to a continence advisor, proper toileting regimens and bladder retraining”(p. 152). Thirdly, if catheterization is the only option, start using the algorithm. Step four and five are interesting, and something that some nurses might not do. Step four involves consultation with the client for what will happen, and step five is involving other caregivers. Too often in healthcare the patient is not consulted with about what will be happening to their bodies.

In the algorithm, once acute retention has been established, a bladder scan is suggested after voiding, and then action is taken based on the amount (>300/400 ml, 100/300 ml, <100 ml). The algorithm presents the choice of short term, long term or intermittent catheterization, but does not present decision making support for which option to choose. Booth et al. (2007) relate using an algorithm to supporting evidence based practice and state that using algorithms or guidelines is “not designed to take away the nurses clinical decision-making processes but to support them with evidence that will stand up should they ever find their practice questioned”(p. 152).

An interdisciplinary group of healthcare professionals at Newcastle General Hospital created two pathways for dealing with catheterization issues and orthopedic patients (Rees & Mawson, 2007). The first pathway is for treating urinary retention in femur fracture patients. Assessments are made (including fluid intake and output) and if the patient has not voided within six hours, if voiding is less than 200 ml at < 2 hour time periods, or is dribbling urine, a bladder

scan is done. If urinary volume is >500 ml, an indwelling catheter is inserted. If the volume is <500 ml, but >200 ml, intermittent catheterization is considered in conjunction with medical staff.

The second pathway is for the management of catheterization in preoperative orthopedic hip surgery patients. The pathway calls for the insertion of a catheter in the operating room on induction if: the patient is incontinent and has cognitive deterioration, presence of voiding troubles, pressure areas as a result of incontinence, or comorbidities like heart or renal failure where fluid balance needs strict monitoring. Both pathways call for daily assessment if an indwelling catheter is present, and removal as soon as possible.

O'Connell, Ostaszkievicz and Ski (2006) headed a research team that developed a clinical guideline for dealing with urinary retention in acute/sub-acute settings with older adults. While not specific to postoperative urinary retention or orthopedic patients, the guideline will be briefly reviewed as it was applied to hospitalized patients. After nurses conducted an assessment, which was to include a patient bladder scan, the guideline branches off in two different directions. The first branch is for if the patient is experiencing pain, distress or agitation and has a post-void residual (PVR), the second branch is for if the patient is not experiencing pain, distress or agitation and has a PVR. The next step in both branches involves consulting with the medical practitioner to determine the next action (indwelling catheter, intermittent catheterization or monitoring for further clinical signs and symptoms).

To develop the clinical guideline, a literature review was conducted, a survey of present practice was done and finally the Delphi technique was employed. While conducting their literature review, the researchers encountered the same difficulties as found with the current study: a lack of consistent terminology surrounding urinary retention and a lack of high quality

evidence on which to base practice. Different techniques were used to incorporate the guideline with staff (workshops, posters, availability of a clinical nurse consultant), but when the guideline was evaluated, findings indicated that nearly half of the nurses did not know about the guideline (patient outcomes were not investigated). Guidelines are only effective if they are known about, and are being followed.

Johansson and Christensson (2010) conducted a study six months after an evidence-based hip fracture program for dealing with urinary retention was put in place. The program to be implemented was as follows:

Ultrasound bladder scan was to be performed within the first hour after the patient arrived at the hospital, and repeated controls were to be performed at 4-6 hour intervals until the risk of UR [urinary retention] had been eliminated. If the urine volume measured using ultrasound bladder scan was more than 400 ml and the patient was unable to pass urine, the prescribed treatment was to be catheterisation (IC [intermittent catheterisation] or IUC [indwelling urethral catheter]). When IUC was used, the catheter was to be removed within 24 hours postoperatively, and the patient was to subsequently be managed with scheduled IC if catheterisation was necessary. (p. 2111)

Findings from the study indicated that many nurses were not following the program. Out of the 48 patients in the study, only 12 received a bladder scan within one hour of being admitted. On the patient's surgery day, 28 patients had an indwelling catheter inserted with no documentation as to the reason. To implement the program, staff was given a two hour education session. The authors did not discuss why they think nurses were not following the program, but do mention in their limitations that their data came from patient charts, and not all

pertinent information may have been recorded. As these authors demonstrated, even when guidelines are in place, they are not always followed.

Regardless of the absence of high-quality studies, many studies and authors recommend the same things: catheterize only when absolutely necessary, remove the catheter as soon as possible, and practice infection control techniques (i.e. handwashing, meatal care, etc.) at all times. Until more large-scale, randomized studies are conducted, each hospital will have to develop their own guidelines based on the available evidence and the clientele they serve.

What have Nurses been Asked?

All of the information presented thus far has been studies of patients, patient factors, and treatments or protocols. What research has been conducted with nurses surrounding urinary retention and catheterization? Four studies will now be discussed.

Dumont and Wakeman (2010) conducted a journal and online survey about catheter-associated urinary tract infections (CAUTIs). Their survey included registered nurses, licensed practical nurses and students, and in total they had 178 respondents. The mean score for correct answers was 64% and in terms of work place, education or license type, there were no score differences. As well, the study found that “most nurses chose the correct response for the most important questions and at least a partially correct response for many others” (p. 25). The authors concluded that nursing has great control over CAUTI rates and that “nurses should be leading as well as participating in ongoing efforts to attain zero CAUTI” (p. 30).

Rees and Mawson (2007) completed a project that involved nursing staff and an anonymous questionnaire. The questionnaire was an audit of the nurses’ knowledge base. Questions asked included: if staff felt competent to pick the right type and size of catheter (<20% could name correct catheter type for their patient), what conditions would lead to patient catheterization, and if they felt competent using the unit’s bladder scanner (90% felt confident

and would use scanner prior to catheterization for possible retention). Three responses to the reason for catheterization were: urinary retention, recording urine output and incontinence for which there was tissue damage risk (each respondent typically only gave one of these reasons).

Williams, Taylor, Bates, Tincello and Richmond (2003) surveyed midwives, nurses and medical staff regarding female bladder anatomy and care (40 nurses and 48 midwives completed the survey). The survey consisted of eight simple questions ranging from the length of the female urethra, to the length a long term catheter can remain in before being changed. Their study highlighted some knowledge gaps and they encouraged health professional teachers to reinforce bladder physiology and catheter care to help ensure that retention does not go undiagnosed and lead to bladder injury.

Bridger (1997) interviewed twelve RN's in the United Kingdom about their views on preventing hospital-acquired urinary tract infections (UTI). The study highlighted that nurses were aware of infection control practices (handwashing, using gloves), but that these were not routinely done. The study also revealed the themes of: lack of time to implement standards of care, powerlessness to change care practices and inconsistency in: catheter management, infection prophylaxis and different standards of care between staff. This is a somewhat outdated study, but points out key themes that are still applicable today: lack of time and inconsistencies surrounding standards of care.

Each study highlighted knowledge gaps or areas for improvement within nursing surrounding urinary retention and catheterization. To the best of the researcher's knowledge, no one has asked nurses how they define PUR, or what they think contributes to it.

Summary

As demonstrated in the review of literature, there is little agreement on the subject of postoperative urinary retention (PUR). The research does not agree on how to define it, which

factors contribute most to it, or what is the method of treating it. The area with the least amount of controversy is assessment of the patient with PUR. However, even within this area there is variation, as not every ward has an ultrasound bladder scanner. Therefore their assessments for PUR cannot all follow the same procedures. More research, dialogue and consensus are needed in this area.

CHAPTER 3 METHODS AND PROCEDURES

Theoretical Perspective

Evidence-based practice, or evidence-based nursing (EBN) is an area that has gained momentum in the last decade or so and has its roots in medicine (Schmidt & Brown, 2009). Ingersoll (2000) defined EBN as “the conscientious, explicit and judicious use of theory-derived, research-based information in making decisions about care delivery to individuals or groups of patients and in consideration of individual needs and preferences” (p. 152).

Some authors also use the term “evidence-informed nursing”(EIN) (McSherry, Simmons, & Pearce, 2002; Hodson & Cooke, 2004; Petch, 2006). McSherry et al. feel this term is more appropriate because it recognizes that “nurses are critical practitioners”(p. 1) and that using evidence in practice requires thought and judgment. Epstein (2009) further supports the substitution of the word based for informed, “because it implies that practice knowledge and intervention decisions might be *enriched* by prior research but not *limited* to it”(p. 224).

EIN is important for nurses because it challenges routine thinking, and stimulates nurses to ask, “why are we doing this” and, “is there good evidence to back up what we’re doing”? Nurses need to be able to support their actions to clients, so that when clients ask why they do the things they do, nurses can answer with a sound, and research-based rationale (Booth & Clarkson, 2007; Edmond, 2006; McSherry, Simmons, & Pearce, 2002).

The Canadian Nurses Association (2002) supports EIN and believes that individual nurses need to “evaluate, use and promote evidence-based nursing practice” and “position themselves to provide optimal care by acquiring competencies for evidence-based nursing practice” (p. 2). Orthopedic nurses then, must be knowledgeable about what causes PUR, what the best practice is for treating PUR, and not rely on their own opinions (Edmond, 2006).

DiCenso, Ciliska, and Guyatt (2005) discussed five elements central to EBN and evidence-based decision making. The four base elements are: clinical state, setting and circumstances; patient preferences and actions; best research evidence; and health care resources. The fifth element is clinical expertise, which is integrated within the other four elements. This study looked directly and indirectly at all five elements. Orthopedic nurses were asked about how PUR is treated where they work, and what they base their PUR treatment decisions on, which encompasses information about all five elements.

Clinical state, setting and circumstances in this study refer to the orthopedic wards the nurses work on and in which they care for patients. The clinical setting and circumstances have the possibility to affect how the nurses think about and treat PUR. For instance, nurses at one hospital might treat PUR differently than nurses at another hospital.

Patient preferences and actions, while not always visible as a tenet of evidence-based decision making, are pivotal to the process according to DiCenso, Ciliska and Guyatt (2005). Patients may have no preferences at all, or very set preferences on their treatment choices in hospital (Haynes, Devereaux, & Guyatt, 2002). This has implications for orthopedic nurses in terms of potentially offering patients choices when looking at preventing and/or treating postoperative urinary retention.

Incorporating best research evidence into evidence-based decision making involves using “sound, clinically relevant research about the effectiveness and safety of nursing interventions” (DiCenso, Ciliska, & Guyatt, 2005, p. 4). It also takes into account issues like cost-effectiveness and patient experiences. The evidence surrounding PUR has been researched in the literature review, and some studies examined the cost of certain nursing interventions surrounding the treatment of PUR, such as the cost of intermittent catheters and nursing time when performing

intermittent catheterizations. Orthopedic nurses should be using the best available evidence to make decisions about the treatment of PUR.

Finite health care resources must be managed appropriately and using the best available evidence while incorporating patient preference and clinical expertise (DiCenso, Cullum, & Ciliska, 1998). Resources also play a large role in the diagnosis and treatment of PUR. Bladder scanners have been studied in terms of accuracy and their role in identifying and treating PUR; therefore orthopedic nurses should be utilizing bladder scanners when assessing for PUR.

The fifth element, clinical expertise, is superimposed over the first four elements. This element “refers to our ability to use clinical skills and past experience to identify the health state of patients or populations, their risks, their preferences and actions, and the potential benefits of interventions” (DiCenso, Ciliska, & Guyatt, 2005, p. 5). Nurses with more orthopedic or nursing experience in general might identify different contributing factors to PUR, or they might treat PUR differently than a less experienced nurse.

Ciliska, Pinelli, DiCenso, and Cullum (2001) summarized six steps involved with EBN practice:

- 1) formulation of an answerable question to address a specific patient problem or situation;
- 2) systematic searching for the research evidence that could be used to answer the question;
- 3) appraisal of the validity, relevance, and applicability of the research evidence;
- 4) decision making regarding the change in practice;
- 5) implementation of the evidence-based practice decision; and finally,
- 6) evaluation of the decision outcome. (p. 521)

Orthopedic nurses need to be asking themselves if they are making assessments and decisions based on sound research evidence, available health care resources, patient preferences and clinical expertise.

As demonstrated in the literature review, many studies have been conducted to identify what causes PUR, and how to best treat it. Little consensus has been reached on nearly every issue surrounding PUR. To the best of the researcher's knowledge, no one has ever asked orthopedic nurses what they think contributes to PUR, how they treat PUR, and what their PUR treatment decisions are based on. Therefore it is important to have a study that asks orthopedic nurses what they think about PUR. This provides a starting point for further research into finding/developing guidelines for managing PUR in the orthopedic population.

Design

This study examined orthopedic nurses' views on PUR, its contributing factors, assessment techniques and how nurses treated this surgical phenomenon. The research conducted was exploratory and descriptive in nature. The study followed a fundamental qualitative description design as described by Sandelowski (2000). This design is indicated when "straight descriptions of phenomena are desired"(p. 339), which is consistent the intent of this research study. Qualitative description "entails the presentation of the facts of the case in everyday language (p. 336), the intent is not to conceptualize everything, but to describe and perform a basic interpretation of the data.

A semi-structured interview format was used. Burns and Grove (2005) believe interviewing is a flexible technique that "allows the researcher to explore greater depth of meaning than can be obtained with other techniques" (p. 397). They also state that interviews have a higher response rate when compared to questionnaires, which will increase sample size.

Wood and Ross-Kerr (2006) assert, “many people who would ignore a questionnaire are willing to talk with an interviewer who is obviously interested in what they have to say” (p. 180).

There is a lack of research looking at orthopedic nurses’ views on PUR, which is why a descriptive qualitative, interview format was chosen. The intent of this study was to explore the phenomena of PUR from the orthopedic nurses’ viewpoint. The best method to accomplish this was to interview orthopedic nurses to find out their views, knowledge base and practices surrounding PUR.

Starting with a qualitative study in this area is consistent with the intent of this type of research, which is to “find the issue of concern in its everyday context, and by means of interviews and/or observations and/or accessing text, hear the voices of those closely involved”(Smythe & Giddings, 2007, p. 37). This study gives voice to orthopedic nurses on the issue of PUR, which helps lay the foundation for further research into the area of PUR and its treatment by healthcare professionals.

Setting

The interviews were conducted with nurses who worked in a large urban setting acute care hospital. These acute care hospitals conduct major orthopedic surgery (total hip replacements, total knee replacements, etc.) on a regular basis.

The Participant Group

The participants for this study were obtained using convenience sampling. In a convenience sample, “subjects are included in the study because they happened to be in the right place at the right at the right time” (Burns & Grove, 2005, p.350). The intent of this study was not to generalize to all orthopedic nurses, but to gain some preliminary understanding of nursing knowledge and experience in relation to postoperative urinary retention among orthopedic

patients. The invitation letter to participate in the study can be found in Appendix A, and the research poster placed on the ward in Appendix B.

Inclusion criteria

Participants were included in the study if they had the designation of either Registered Nurse (RN) or Licensed Practical Nurse (LPN) and worked on an orthopedic ward. Full-time, part-time and casual staff were invited to participate. Those who met these criteria and provided written, informed consent were included.

Exclusion criteria

Senior assists, special care aides, and support staff (unit aides, clerks, etc.) at each of the orthopedic wards were excluded.

Participant group size

All orthopedic nurses who agreed to participate were interviewed. At minimum, six to eight participants were needed, as this is the number suggested by Kuzel when doing research with a homogenous group (as cited in Holloway and Wheeler, 2002).

Six to eight participants was the minimum recruitment goal for this study. While this was the minimum needed, it was hoped that the researcher would be able to recruit between eight and 12 participants. The final participant total for the study was ten participants.

Sample description

A total of ten nurses participated in this study. All of the nurses worked on an orthopedic unit within the designated large urban setting, and all were employed full-time. Only one male nurse was interviewed. As well, only one Licensed Practical Nurse (LPN) participated. Of the nine Registered Nurses who participated, two had their diplomas and the other seven had their Bachelor of Science in Nursing.

Years of nursing experience varied widely among participants. The participant with the least experience had been nursing for only one year, and the participant with the most experience had been nursing for 27 years. Six nurses had between 1 and 6 years of nursing experience, one had 13 years, and 3 had 15 years or more. The mean number of years of nursing experience was 9.3 years, and the median was 5.

The number of years of orthopedic nursing experience also varied greatly. The participant with the least amount of orthopedic nursing had one year's experience, and the participant with the most orthopedic experience had 23 years of orthopedic nursing. Seven nurses had between 1 and 6 years of orthopedic experience, one nurse had 9 years, another had 10 years, and the nurse with the most had 23 years of orthopedic experience. The mean years of orthopedic nursing experience was 6.6 years, the median 4.5 and the mode was 4.

Ethical Considerations

Ethical approval for this study was obtained from the University of Saskatchewan's Behavioural Research Ethics Board (Beh-REB) on February 21, 2008. Beh-REB is responsible for review of research that "involves experimentation using behavioural methods, as well as observation, surveys, questionnaires, interviews, and focus groups" (University of Saskatchewan, 2005, p.1).

This research study also followed the regulations set out in the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada, 1998). By following these guidelines, it ensured that the research was conducted according to the "highest ethical standards" (p. i.2), which was one of the goals of this research study.

Approval to conduct this study was also obtained from the local health region in which the study was conducted. The researcher obtained the region's Operational Approval to conduct the study on April 14, 2008. As part of that approval, consent was obtained from each of the two managers of nursing on each orthopedic ward.

As well as ethical approval, informed consent was obtained from each participant. A copy of the consent form can be found in Appendix C. Free and informed consent complies with Tri-Council guidelines (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada, 1998) and was obtained in writing.

The informed consent form that participants signed clearly indicated that the participants had the right to withdraw from the study, at any time, and without penalty. The form also explained that their participation was completely voluntary, and that they could refuse to answer specific questions within the interview if they so chose. The document also stated that the data from the study would be stored for a minimum of five years with the research supervisor, Dr. Glenn Donnelly.

As well as written information explaining participant rights, the researcher also verbalized with the participants that they could end the interview anytime and that they could choose not to answer any question they did not want to without penalty.

The consent form also clearly detailed how to contact those involved with the research study. Contact information was given for the student researcher, the thesis supervisor, and the University of Saskatchewan's Behavioural Research Ethics Board.

Consent was also obtained from each participant for using specific quotes in the manuscript. A copy of the data/transcript release form can be found in Appendix D.

Instrument: The Semi-Structured Interview

The interview itself consisted of four open-ended questions. The questions were as follows:

1. How would you describe postoperative urinary retention?
2. What patient factors do you feel contribute most to postoperative urinary retention?
3. When you decide a patient has postoperative urinary retention, what do you base this decision on?
4. How do you decide how to treat the patient's postoperative urinary retention? (I.e. Is your decision based on ward routine, your knowledge of urinary retention, etc.?)

The questions were designed by the researcher and the thesis supervisor to get orthopedic nurses to share their knowledge and understanding of PUR, specifically around the issues of contributing factors and the decision to treat PUR. As this was a descriptive, exploratory study, the questions were chosen because they were very simple and would reveal basic knowledge and routine of orthopedic nurses when dealing with PUR. The questions were meant as a guide only to direct the participant in the interview. The participant was free to offer any other information they had that was relevant to the topic.

Procedure

Nurses at each of the two hospitals were made aware of the study through two methods. Firstly, information posters were placed around the ward (a copy can be found in Appendix B) to inform nurses about the study. Secondly, a letter of invitation was placed in each nurse's mailbox, informing them of the study and inviting them to participate (a copy can be found in Appendix A).

Once nurses agreed to participate, the researcher contacted the nurse and set up a time and place for the interview that was convenient for that nurse. Nurses most often chose to meet on a non-work day.

Most interviews took no longer than 30 minutes, in total, to complete. The researcher explained briefly again what the study entailed and then read over the information letter (found in Appendix E) and consent form (found in Appendix C). The participant was then given the opportunity to ask questions, and then if they agreed to participate, they signed the consent form.

Once completed, the consent form was placed in a sealed envelope marked with a number. The envelopes were consecutively marked with numbers, as nurses participated in the study. The demographic form was also be marked with the same number. Once signed, the consent forms were sealed and not looked at again. The purpose of the number was to ensure that there is a consent form signed for each participant.

After the consent form was signed and sealed in an envelope, the participant filled out a short demographic form. Demographic data were collected to compare how different groups of nurses view PUR. For example, were there differences between how RN's and LPN's define PUR?

After completion of the demographic form, the actual interview began. Each interview was tape-recorded. The interviewer asked the participant the first open-ended question and then allowed them to answer the question. If further explanation of the question was needed, the interviewer provided it. This continued until all the research questions had been asked and then the interview concluded. Sometimes participants requested to come back to a question at the end of the interview. This request was of course accommodated, to allow the participant to think things through and not feel pressured to answer quickly.

Interviews were recorded onto separate mini-discs. The one exception to this was when the researcher attempted to put two interviews on the same mini-disc. When recording the second interview on the mini-disc, the researcher accidentally recorded over the first interview that was on that disc. The participant's interview that was deleted was contacted to see if they would be willing to re-do the interview. The researcher explained that this was entirely voluntary, and that there was absolutely no expectation that they re-do the interview. The participant readily, and willingly agreed to record the interview again.

After the interviews were completed, the researcher transcribed them verbatim. Holloway and Wheeler (2002) recommend that students "transcribe their own tapes because this way they immerse themselves in the data and become sensitive to the issues of importance" (p. 236). They also point out that this saves money for the researcher.

About six weeks after the first invitation letters were sent out, reminder cards (found in Appendix F) were placed in all of the nurses' mailboxes at the hospitals. These yielded three more participants in addition to the seven who had been interviewed prior to the reminder card.

The last interview was completed on November 27th, 2008. Following the completion of data collection, the health region was notified and the study was closed.

Data Analysis and Interpretation

Data for this research study has been analyzed using qualitative content analysis (Sandelowski, 2000). This type of analysis involved looking at the data, counting the responses in each category and then describing the trends that have been found. According to Sandelowski, this differs from quantitative analysis in that the analysis goes beyond the counting and seeks to understand the "latent content of the data"(p. 338). This also differs from other qualitative analysis approaches in that "there is no mandate to re-present the data in any other terms but their own"(p. 338).

The analysis has been arranged by question, with discussion and description about the participants' responses in comparison with the research presented in the literature review. This is consistent with qualitative description because it is a "straight descriptive summary of the informational contents of data organized in a way that best fits the data"(Sandelowski, 2000, p. 338-339).

Researcher Standpoint

The researcher herself is an orthopedic nurse, currently employed on a casual basis at one of the wards where participants were drawn from. The researcher has over eight years of combined full-time and casual orthopedic nursing experience. The researcher knows nearly all of the staff at the orthopedic ward in which she works. This could have both helped or hindered the study participation rate and the information the participants were willing to share.

The researcher working on the orthopedic ward at which the study was conducted could have helped the study in that because the researcher was known to some of the potential participants, they may have been more likely to contact the researcher to participate in the study. As well, they may have been more comfortable with the researcher during the taped interview, answering questions more honestly and freely.

While some participants may have been more comfortable discussing things with the researcher, others may have been more uncomfortable. The participants may have felt pressure to give the researcher "the right answers", in order to "help me out."

While the researcher may have entered the study with some preconceptions about how PUR was treated, as well as her own knowledge of how she was taught to treat PUR, these ideas were suspended during the interviews. The researcher went into each interview with intent of finding out what that participant had learned, thought and practiced with regards to PUR and its treatment.

CHAPTER 4 RESULTS AND DISCUSSION

Participant responses to the four questions asked during each interview will now be described and discussed. The answers participants gave will be summarized and compared with the orthopedic research literature, as well as evidence-based decision making. In addition, limitations of the study will be illustrated.

Definition of Postoperative Urinary Retention

All ten participants gave a general definition of an inability to void postoperatively. One participant mentioned that in addition to being unable to void, the patient might be unable to initiate the void or empty their bladder completely. Two participants included that the patient may only be voiding small amounts after surgery, which would indicate postoperative urinary retention (PUR).

Seven out of ten participants attached a time frame to their definition of PUR. Two participants gave a time frame of six to eight hours postoperatively, and five participants stated about eight hours. Few studies in the orthopedic literature attached a time frame to their definitions of PUR. Only one study by Zampini et al. (2008) used a time frame of eight hours after surgery in their PUR definition.

Four participants included patient assessment factors in their definitions. Two participants assess if the patient is uncomfortable or has a feeling of fullness. Two participants included in their definition that the patient states they are unable to void. This is consistent with three studies in the orthopedic literature that also used the patient wanting to, but being unable to void, in their definition (Kotwal et al, 2008; Elkhodair et al., 2005; & Ringdal et al., 2003).

Participant two indicated that if they had catheterized the patient for greater than 250 ml of urine, this would also be considered PUR. The amount of 250 ml is somewhat low compared

to the literature. Olsen and Nielsen (2007) used 300 ml, other researchers used 400 ml, others 500 ml and some 600 ml. As highlighted in the literature, there is no one set amount at which one can say if this volume of urine is in your bladder, postoperative urinary retention is present. It is agreed upon that a normal adult bladder volume is between 400 and 600 ml (Baldini et al., 2009). This is a range however, which reflects normal variation among patients, making it difficult to set one number at which one could say that everyone has postoperative urinary retention.

There is also no agreed upon bladder volume after which one can say damage is likely. Joelsson-Alm et al. (2009) stated there is a risk of damage after 500 ml. In contrast, Pavlin, Pavlin, Gunn, Taraday, and Koerschgen (1999) found that temporary bladder distention of 500-1000 ml has no adverse effects if found and managed in one to two hours. Baldini et al. (2009) pointed out the need for more research into “safe bladder volume ranges to avoid bladder overdistention and persistent bladder dysfunction” (p. 1151).

Two participants made mention of the etiology of PUR in their definitions. One participant believed that there are factors related to the surgical procedure that cause PUR. Another participant believed that it is the anesthetic that causes the PUR. Factors contributing to PUR will be discussed next.

Factors Participants Felt Contributed to Postoperative Urinary Retention

The participants listed a variety of factors that they thought contributed to PUR. The most common factor mentioned was prostate problems in men. Seven of the ten participants listed this factor as contributing to PUR. Some simply stated prostate problems, some said an enlarged prostate and some said specifically benign prostatic hypertrophy (BPH).

The perception of the participants that male gender was a risk factor for PUR due to prostate problems is consistent with some of the research in the orthopedic literature. Prostate

problems are likely one of the biggest issues that put men at a greater risk for PUR, and prostate issues are prevalent in Canadian men (Nickel et al, 2008).

There is also the issue of undiagnosed prostate problems that may only surface after a male patient has had surgery. A few studies have looked at the International Prostate Symptoms Score (IPSS) as a way to identify and predict those males at increased risk. As in most of the literature conducted about PUR, there were conflicting results about whether or not the IPSS was a useful tool and more research is needed. Furthermore, none of the participants mentioned the IPSS.

Separate from prostate problems, four participants listed male gender as a predisposing factor to PUR. In addition to prostate problems as being the reason for increased PUR rates among males, Lingaraj et al. (2007) also suggested that males have a higher rate of urethral stricture that increases their PUR risk. Joseph (2006) also points out that standing while voiding straightens the urethra, which decreases the force needed to void. Orthopedic patients are often not able to stand right after surgery, and must attempt voiding in the recumbent position.

Five participants felt that spinal anesthetic contributed to PUR, whereas two participants felt that general anesthetic contributed to PUR. Once again, the literature presents conflicting study results with some studies reporting spinal anesthetic to increase the risk of PUR, some general anesthesia, and finally others reported that anesthetic did not factor in at all. More research is needed in this area as well.

One participant mentioned epidural anesthesia as increasing the risk of PUR. Izard et al. (2006) found that intrathecal morphine did increase the risk of PUR, but Macdowell et al. (2004) found that epidural anesthesia did not contribute to PUR in comparison to general anesthesia.

More research is needed for orthopedic patients undergoing major orthopedic surgery in regards to intraoperative epidural medications and epidural anesthesia.

Five participants stated increasing age as a contributing factor. As with other factors studied, there is conflicting research. Despite this, more studies have found increasing age to be a factor than not. Orthopedic nurses see a large number of elderly clients who fall and break a bone or who are scheduled for joint replacement. Therefore orthopedic nurses might see a higher incidence of PUR with their postoperative elderly patients. The age of the client also factored into how some orthopedic nurses treated PUR, and this will be discussed further on.

Four participants mentioned morphine as a contributing factor to PUR and narcotics in general were mentioned by three participants. Pain control is an important facet of orthopedic nursing care and postoperatively good pain control is crucial in order to ensure early mobilization. Orthopedic patients often receive analgesic frequently in the early postoperative period, therefore consideration of the amount of narcotic, and its delivery method is important when assessing a patient for PUR. Morphine is known to decrease the “sensation of bladder fullness”(Steggall, 2007, p.44), and therefore the patient may be unaware of the need to void, which can lead to PUR.

Route of narcotic administration is also an important factor to consider. One participant stated that epidural drugs are a PUR risk factor. Some studies found that epidural analgesia was a contributing factor, while other studies did not. However, in regards to opioids, Darrah et al. (2009) found that the epidural route had the highest rates of PUR.

Another route for postoperative pain control is patient-controlled analgesia (PCA). Two participants mentioned this as a contributing factor for PUR. In the literature there are conflicting research results, but Darrah et al. (2009) state that PUR may add to the risk of PUR

more in comparison to other methods of analgesic delivery because of the steady plasma opioid concentration levels in the patient. While not all postoperative orthopedic patients will receive a PCA, for those that do, ongoing urinary assessment is an important element.

Participant two mentioned that they could not remember caring for a postoperative orthopedic patient with a PCA that did not have a Foley catheter already inserted. This would suggest that it was anticipated that those receiving PCA would develop PUR. However, there is not enough data to support this.

Other than narcotics, the only other medication class listed by a participant was antidepressants, mentioned by participant ten. Retention of urine is a recognized side effect of antidepressants from the selective serotonin reuptake inhibitors group (Lam, 2008; Verhamme, Sturkenboom, Stricker & Bosch, 2008) and tri-cyclic antidepressants (Verhamme et al., 2008), but has not been mentioned in the PUR literature surrounding major orthopedic surgery.

Five participants mentioned mobility issues and/or voiding position. Jagmin (2002) states with the patient lying flat, the bladder has difficulty emptying due to gravity, which leads to stasis of urine. Participant ten mentioned that if patients have a lot of pain postoperatively, this would impair their mobility, which will then affect their ability to void.

Participant eight specifically mentioned that women have difficulty using a bedpan, and that men have trouble voiding lying down. In Waterhouse et al.'s (1987) study, they assessed whether or not a male could void in a urinal lying down. Those that could not were found to be at an increased risk of PUR postoperatively. More current studies are needed to assess how voiding position affects the development of PUR.

Participant ten stated “some people just have trouble going on a bedpan, they just can’t, they need to get up to the toilet.” Jagmin (2002) also stated the following regarding the ability to void and patient position:

The reclining position can also make it difficult for persons to achieve relaxation of the perineal muscles and external sphincter, thus inhibiting the detrusor muscle reflex and eliminating normal contraction and bladder emptying. If the sensation to void is not heeded, the bladder further distends, causing extensive stretch of the detrusor muscle and inhibiting the sensation to void. (p. 113)

Nurses who mentioned patient position and voiding ability are cognizant of bladder function and understand that this will contribute to why the patient cannot void. While some patients are able to void in the recumbent position, others are not.

Participant eight has had personal experience with bedpans, and discussed the mental aspect of female patients using a bedpan. She stated, “like with women, having had to use a bedpan myself, I know it feels like you’re trying to pee yourself, and having been taught for how many years prior that that is a no-no, its, its really hard to get over that mentality.” While not all women will have difficulty voiding on a bedpan, it is again something to consider when assessing for PUR.

Participant two discussed the issue of cognitive impairment contributing to PUR. They felt that the cognitive impairment led to communication issues and the patient would not void in bed, but if the patient were mobilized to the bathroom, they would void. Participant nine mentioned confusion as a factor relating to PUR and participant four stated elderly women with dementia. This would be similar to cognitive impairment, as the patient might not be able to articulate that they have to void due to their confusion/dementia. Yarnold (1999) states that

cognitively impaired clients have an increased chance of developing a urinary tract infection because they cannot verbalize the need to void. This is a problem orthopedic nurses see frequently because as many as 42% of elderly patients develop postoperative confusion after hip fracture surgery (Bjorkelund, Hommel, Thomgren, Lundberg, & Larsson, 2009).

The issue of confusion and cognitive impairment has not been taken into consideration by many orthopedic PUR studies. In fact many studies do not delve into how the decision that the patient has PUR is made, they simply look at whether or not the patient was catheterized. In some cases then, the patient may have been catheterized not because they were experiencing urinary retention, but merely because they could not verbalize the need to void.

Participant ten discussed the issue of level of consciousness and postoperative urinary retention. This participant stated that sedation contributes to PUR and that if the patient is drowsy from the anesthetic, this can also affect voiding. Similar to the cognition issue, if the patient is too drowsy or sedated, they may not be able to communicate the need to void. Also, if the patient is too drowsy, they will not be able to mobilize to a commode or to the bathroom.

Three participants listed a history of urinary difficulties as relating to PUR. Participant six stated bladder surgery for women and multiple children, participant nine stated “preexisting problems with voiding” and participant ten stated “bladder troubles in the past or surgeries.” As with other possible contributing factors, there is conflicting research on whether or not a history of bladder difficulties contributes to the risk of developing PUR. Regardless however, nurses should be assessing the patient holistically and taking into account their full medical and surgical history.

Participant nine discussed level of hydration in regards to urinary retention. This nurse felt that if the patient had too much intravenous fluids, their bladder would be over-distended.

Conversely, this nurse would also assess for dehydration. If the patient was dehydrated, then they were not experiencing urinary retention. They simply did not have to void. In the orthopedic literature surrounding intravenous (IV) fluids, there are conflicting results. In addition, there are many discrepancies and unknown factors when IV fluids were included in studies (Linares Gil et al., 2009), but this participant's reasoning is still sound and level of hydration should be assessed.

Two participants mentioned type of surgery as a contributing factor. Participant four indicated that spinal surgery and pelvic surgery carry a higher risk of PUR. Participant ten thought bladder surgery carried a higher PUR risk. In the one study reviewed that included spinal surgery, it was not found that this type of surgery carried a higher incidence of PUR (Shadle et al, 2009). No studies reviewed in the literature review included pelvic surgeries and it is well known that urologic surgeries carry a higher risk of retention (Souter & Pavlin, 2005), which is why urologic surgery studies were excluded from the literature review.

Some of the participants had not given much conscious thought to what factors contributed to PUR. Participant one indicated that they had never really given causative factors much thought. Participant two had not really considered which type of anesthetic was associated with more retention, nor had participant ten. Participant five "never really looked at why, who, who really, all I know is like if they do do it [have urinary retention] then I fix it." When asked about gender, participant nine "hadn't really thought about it." Years of experience did not seem to correlate with having given factors related to PUR great thought as two of the participants had more than twenty years of experience, and the other three had between two and five years of experience.

Even though PUR is something that orthopedic nurses deal with on a regular basis, half of the participants had not critically looked at one or more factors that would place patients at a higher risk for PUR. It is unknown why these participants have not critically thought about these factors. Is it a lack of time? Is it a lack of knowledge or education? Is it a lack of interest? It is important for nurses to think about and assess for these factors in order to identify those patients at higher risk for PUR and to monitor those patients more closely.

Factors Considered when Deciding on PUR

Subjective Patient Assessment

When describing how they come to the conclusion that their patients' have PUR, the participants' most common response was that the patient states they cannot void, or that they have the urge to void and cannot. Six out of ten participants discussed this when answering the question. In contrast, one participant stated that if it has been a while since surgery and the patient has *not* expressed an urge to void, they would consider PUR. Four participants also indicated that the patient stated they were uncomfortable.

Subjective questioning is important when performing patient assessments. One symptom of PUR is that the patient states they cannot void (Baldini et al., 2009), as six of the participants in this study have identified. Conversely, the nurse must keep in mind that PUR may present asymptotically for the patient due to anesthesia and medications, and the nurse must use other assessment factors to make an accurate diagnosis (Baldini et al., 2009), as one participant has acknowledged.

Nurses must include subjective questioning in all of their client interactions. If nurses are not, this needs further investigation. Is it a lack of time, lack of knowledge/education, or lack of interest? Patients are receiving sub-optimal care if their nurses are not asking the right questions

in order to identify issues such as PUR after surgery. All of the participants in this study mentioned some form of patient questioning when determining PUR, which indicates that they value patient input and see its importance in determining problems such as PUR.

Physical Assessment

The next most common factor identified was a distended bladder, with five participants stating this factor. Two participants also mentioned specifically the palpation of a distended bladder. A sixth participant did mention palpating the bladder, but not to look for distention. This participant palpated the bladder to assess for sensation (i.e. can the patient feel like they have to void when their bladder is palpated?). One participant also mentioned that the patient might experience bladder pain or a feeling of fullness.

Palpation of the bladder for discomfort and distention can help to identify PUR, but again, it is not completely accurate all of the time. In Weatherall and Harwood's (2002) study comparing physical exam by junior physicians and assessment with a bladder scanner, physical assessment by the physicians was found to be inaccurate in healthy volunteers. While this study was done with physicians and not nurses, it does point out that physical assessment cannot be relied upon solely when attempting to determine PUR. No participants in this study relied solely on physical assessment to determine PUR, a few different factors were always considered.

Other Factors

Time

Two participants based their diagnosis of PUR on the fact that the patient has not voided for six to eight hours (one participant stated specifically since they last voided, or since their catheter was removed). Two other participants also mentioned that they consider the time since the patient last voided, but they did not give a time frame. Participant four was even more specific and decided on PUR based on the time since last void based on age. This participant

gave the elderly eight hours to void before deciding it was PUR, and gave younger patients ten hours to void.

As discussed above when defining PUR, few orthopedic studies attached a time frame when describing PUR. Participant nine talked about how they do not use a set time frame after surgery, but that they base their PUR diagnosis on specific patient factors. This participant has also had discussions with a urologist regarding how long to wait after surgery before considering PUR.

“I base it on the patient because preop, if someone would void 300 mls in 12 hours, then do we really need to worry until at least twelve hours postop? I think a lot of people use eight hours as a rough rule, but I tend to extend it. I remember talking once to one of the urologists and they said, “you leave them for 24 hours,” and I thought, oh, I couldn’t do that, but especially people who wouldn’t, because of confusion or anything, wouldn’t be able to tell you if they were uncomfortable or, if it would be hard to palpate their bladder, but I think, based on what their normal output might be and how much fluid they received.”

This participant has sought out clinical expertise from another source, and has integrated that with their own clinical expertise (this nurse has 24 years of nursing experience). Part of evidence-based decision making is integrating one’s clinical expertise with other factors used in decision making, such as: research evidence, clinical circumstances, patient preferences and resources (DiCenso, et al., 2005).

The most important issue with PUR, and its potential complications, is not so much time to void after surgery, but amount of urine in the bladder. If it has been 8 hours since surgery, and the patient only has 200 ml of urine in their bladder, there is not much risk of bladder damage

(Joelsson-Alm et al., 2009). However, the problem with one of the orthopedic wards is that they do not have a bladder scanner with which to make this assessment.

Intravenous fluids

Intravenous (IV) fluids as a factor was mentioned by two participants. One participant stated that just the fact that the patient was receiving IV fluids contributed to their diagnosis of PUR. Participant eight was more specific and looked at how much IV fluids the patient has had, how much IV fluid is currently infusing and how much IV fluid they have received in the operating room (OR). As well, if the patient received more than three litres of IV fluids, the participant felt that they had to have some urine in their bladder, “I base it on how much fluid we’ve thrown at them, so I mean if they’ve got more than three litres on board, then they’ve gotta have something in there [their bladder].”

As mentioned earlier, the issue of IV fluids is complex, and the research reviewed presents conflicting results. Some studies found that it did contribute to PUR, and others did not. Once again, more consistent and thorough research is needed in this area. The patient’s level of hydration before, during and after surgery definitely plays a part in PUR and its development.

Urine output

While some participants looked at patient intake, others looked at patient output. Participant three decided a patient had PUR if they could not void, could not use the bedpan, had got up to use the commode, with water running (to urge them to void), and after all this still could not empty their bladder. Participant six looked at if the patient was drinking well and still could not void. Another participant simply looked at whether or not the patient could empty their bladder. Finally, participant ten looked at the patient’s urine output prior to surgery (to see how much they had been voiding), and looked at if the patient had any output in the recovery

room. This participant would also frequently check the benefit (diaper) of the incontinent patient after surgery to see if they had voided yet.

Urine output prior to surgery is an important factor missing from many research studies. This data provides a baseline from which to assess urinary output postoperatively. Without this information, it is difficult to make an accurate assessment of PUR. Participants who take this kind of information into account when contemplating PUR, have a more accurate base from which to make the diagnosis.

Participant five discussed consideration of PUR if the patient was only voiding small amounts, “they might have peed a little, but just like small amounts that are not enough.” Voiding only small amounts is one symptom of PUR as identified by Yarnold (1999).

While some participants only mentioned input and others only output, participant seven mentioned both. This participant assessed the patient’s intake and output, both prior to their last void, and currently what their intake and output was when considering PUR. Again, assessment of the patient’s fluid volume status is an important factor to think about when deciding on PUR.

Bladder scanner

Three participants discussed the use of a bladder scanner in the diagnosis of PUR. Participant three mentioned that their old workplace had a bladder scanner, and that it was extremely useful (the participant’s current workplace does not have a bladder scanner). Participant seven indicated that when assessing for PUR, if there was a bladder scanner available, they would use it.

Participant eight does have a bladder scanner at their workplace and finds it extremely useful. This participant was very specific in terms of the bladder scan when deciding on PUR and the subsequent action to take. If the patient had less than 250 ml in their bladder, nothing was done; if there was more than 400 ml, a catheter was considered or the patient needed to void

soon; and finally if there was more than 999 ml, a Foley catheter was inserted. As discussed earlier, more research is needed into what is a safe bladder volume and what is not.

Participant eight went on to discuss how normally they have to borrow a bladder scanner from another ward. Recently, the participant's ward purchased a bladder scanner due to the high usage rate, "we've been the popular borrower which is why we, we got our own one."

Something of interest to note is that another participant that works on this same ward did not mention the bladder scanner once in their interview.

Within evidence-based decision making, consideration of health care resources is one of the five basic elements (DiCenso et al., 2005). Nurses on one of the orthopedic wards have access to a very useful tool in the accurate and timely diagnosis of PUR, an ultrasound bladder scanner. Resources for health care are in high demand (DiCenso, Cullum, & Ciliska, 1998), and management at this hospital has obviously decided that the benefits of having a bladder scanner outweigh the cost of it. Perhaps the other orthopedic ward could benefit from obtaining a bladder scanner as well.

Vital signs

Vital signs were mentioned by two participants when deciding upon PUR. Two participants included an increased blood pressure (BP) as a sign that a patient may have PUR. As well, one of the participants also mentioned that if the patient had a high heart rate, this could be one factor that would indicate PUR. An enlarged bladder can cause pain, which would in turn increase the patient's blood pressure (Osborne & Held-Warmkessel, 2000) and heart rate. Once again, comprehensive patient assessment is important and nurses who do not do this are missing 'pieces of the PUR puzzle', which could delay the diagnosis and allow the patient to have a distended bladder for longer than is safe.

Patient cognition/communication

With confused patients, it is sometimes difficult to make a diagnosis of PUR, and two nurses discussed this further. One participant described a confused patient as being restless and starting to climb out of bed. This was a clue to the participant that the patient may have to void and could not verbalize the need to do so.

Participant ten discussed that with a cognitively impaired patient, one attempts to put them on the bedpan or toilet, and then considers PUR if they cannot void. If they have not voided within about eight hours, this participant does an intermittent catheterization to assess for urinary retention. This participant also makes mention of communication as being an issue with diagnosing PUR. The participant considers if the patient can tell them whether or not they have to void.

Participant three referred to intuition when diagnosing PUR in patients with communication issues, “now you can tell, like a lot of times they’re, it seems like their blood pressure will go up and they just get uncomfortable, unsettled, a lot of them start climbing out of bed, and like, if they can’t tell you, you just know something’s not right.” This participant has 13 years of nursing experience, and a developed intuition has been linked to experience (Smith, 2009). With the varied presentation of PUR, a keen sense of intuition can aid in diagnosis. Intuition should not be ignored, and is “a valuable source of knowledge that should be recognized in the provision of nursing care”(Smith, p. 35).

Participant ten considered the patient’s level of sedation when assessing for PUR. Similar to cognitive impairment, if the patient was too drowsy, they may not voice the urge to void, in which case the bladder would continue to fill and develop PUR.

Nurses who do not take into consideration their patient’s communication abilities/sedation level, may be hindering patient care. There are potential problems both if the

patient is catheterized unnecessarily or if they are not catheterized when needed. If the nurses who did not mention cognition/sedation do not assess for this, there is a potential lack of knowledge and need for education. As well, if the ward without a bladder scanner were to receive one, it could help eliminate unnecessary catheterization and prevent overly distended bladders.

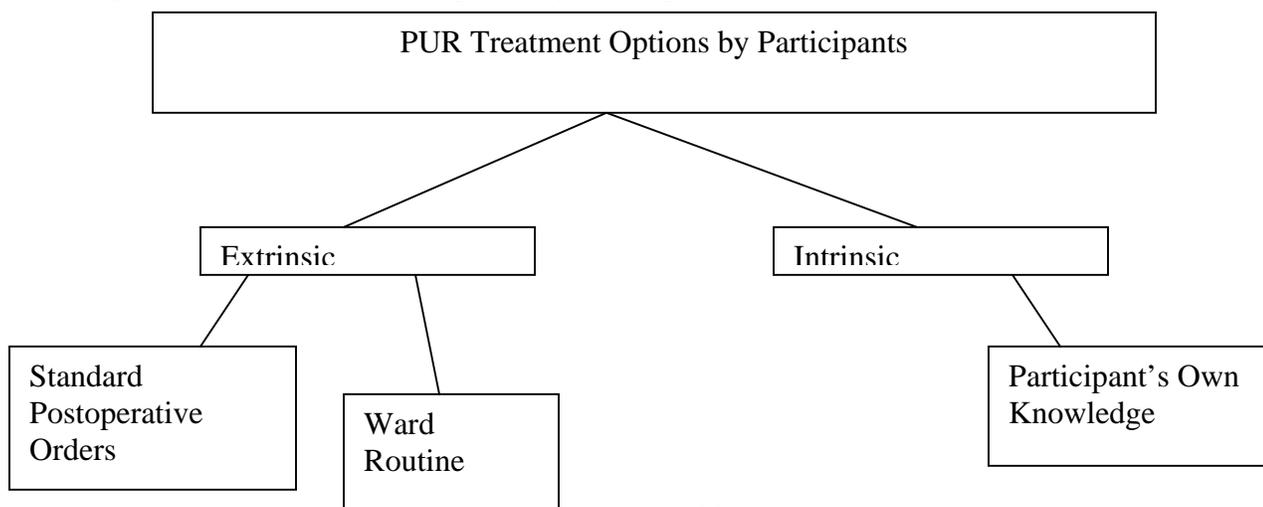
Patient history

When contemplating PUR, participant ten listed a few factors that they did not think of when asked question number two. A history of prostate enlargement, a prior history of bladder trouble or surgery and a history of frequency or urgency are all factored in by this participant when making a diagnosis of PUR. As mentioned in the literature review, the research is inconclusive as to whether or not these factors contribute to PUR. Nonetheless, the patient's history should be considered as it could provide clues as to the patient's risk of PUR.

Basis for PUR Treatment Decisions

Responses varied among the participants as to how PUR was dealt with on their wards. Three main factors emerged: standard postoperative orders, ward routine (extrinsic factors) and participant's own knowledge (intrinsic factor) (see Figure 4-1). Some participants only mentioned one factor, while others used a combination of two or more of these factors.

Figure 4-1 PUR Treatment Options by Participants



Ward Routine

Only one participant, number seven, indicated that PUR treatment was solely based on ward routine. Ward routine as described by this participant was consulting with the doctor and then performing intermittent catheterizations if the patient was unable to void within eight hours after surgery. They added that they think all patients should return from surgery with a Foley catheter if the patient has had a general anesthetic. The participant also stated that “it would be more prudent, you’d have a better uh, you could follow their ins and outs more accurately”[if all patients returned from the operating room with a catheter].

As the literature has demonstrated, there are risks associated with catheterization, and not every patient returning from surgery requires a catheter. The risk of urinary tract infection and deep joint infection sometimes outweighs the benefit of being able to monitor the patient’s urinary output. This nurse’s rationale for every patient having a catheter is not sound or based on best available evidence.

Participant’s Own Knowledge

Participant two stated that their treatment decision was based on their knowledge alone. They indicated that there is a ward routine, which is to insert a Foley catheter if needed, but that they perform intermittent catheterizations instead (unless the patient has patient-controlled analgesia [PCA]). If the patient still had not voided on their own eight hours after the intermittent catheterization, the participant would insert an indwelling catheter and phone the physician. The participant did not explain why they choose to do an intermittent catheterization instead of inserting a Foley catheter.

Ward Routine and Participant’s Own Knowledge

Three participants discussed that their PUR treatment decision was based on a combination of ward routine and their own knowledge. None of these participants mentioned

standard postoperative orders regarding how to treat PUR, and participant one stated, “its definitely not a standing order post, like in the postop orders or whatever, and usually it’s a nursing judgment.” This is interesting to note because there are standard postoperative physician orders for certain orthopedic surgeries on the ward this participant works on.

Postoperative Orders and Participant’s Own Knowledge

Participant three stated that their decision to treat PUR was based on a combination of the physician postoperative orders and their own knowledge. The orders indicated intermittent catheterization could be done as necessary. Whether or not the participant does intermittent catheterization or inserts an indwelling catheter is based on their own knowledge, it’s “just what I figured out after a few years of ortho.” This participant has 13 years of nursing experience, and four years of orthopedic nursing experience.

Postoperative Orders and Ward Routine

Participant eight based their PUR treatment decision on a combination of physician postoperative orders and their ward’s routine. They indicated that there was no policy for treating PUR, but that there are postoperative orders indicating a Foley was to be inserted if the patient experiences urinary retention. Interestingly, they also indicated that they were aware of a change in the postoperative orders that was to be implemented soon: instead of a Foley catheter, the orders would now call for an intermittent catheterization to be done.

This participant also went on to describe ward routine. They stated that six hours after surgery they attempt to get the patient to void. If the patient is unable to void, they complete a bladder scan. Their next action depends on how much urine is in the patient’s bladder. If the patient has 500-600 ml’s of urine in their bladder, this nurse gives the patient the option of a Foley catheter or doing an intermittent catheterization. When asked which option the patients’

usually take, they replied that the Foley is often picked because it is often late in the day and the patient just wants the issue dealt with.

Ward Routine, Postoperative Orders and Participant's Own Knowledge

Three participants discussed that their treatment decisions were based on a combination of their ward's routine, physician orders and their own knowledge base. Participants four and nine indicated physician orders were to insert a catheter for PUR and participant ten could not remember if the orders stated to insert an indwelling catheter, or perform intermittent catheterizations.

Ward Routine is Not 'Routine'

It appears that what is ward routine, is slightly different in each participant's eyes, even though most of them work on the same orthopedic ward. The results of question four suggest that everyone is doing something slightly different, and that more education and guidelines are needed so that all nurses are treating PUR in the same way, based on the best available evidence.

The fact that almost all participants who mentioned ward routine as helping to determine their PUR treatment described ward routine differently raises many questions. Firstly, why do participants' view what is 'routine' so differently? The participants who indicated that their PUR treatment was based on routine and their own knowledge, would appear to have tempered what they learned to be ward routine, with their own clinical experience. It is unknown however, if they had a solid evidence base from which to make those changes.

Secondly, who is teaching nurses 'ward routine'? Does each person have a different view of ward routine because someone different taught them each what that ward routine was? Perhaps those nurses who developed their own way to treat PUR, passed those ways on to new staff that they mentored as being 'ward routine.'

Finally, why did some participants not mention ward routine or not follow ward routine? Were they taught ward routine and made the decision not to follow it? Or did someone never teach them what ward routine was? The ways in which participants answered this question has raised many issues about staff education and ward routine.

Indwelling Foley Catheter versus Intermittent Catheterization

When discussing what they based their PUR treatment decision on, many participants had various criteria for how they chose between putting in an indwelling catheter or performing intermittent catheterization. These criteria will now be discussed.

Decision based on cardiac/renal function

Participant nine stated that they would put in an indwelling catheter if a patient had a history of congestive heart failure (CHF) or renal failure to monitor their fluid balance. Normally the Scottish Intercollegiate Guidelines Network (SIGN) discourages catheterization, with a few exceptions. One of the exceptions is when the patient requires renal or cardiac function monitoring (SIGN, 2009b). This participant is in line with SIGN recommendations.

Decision based on age

Three participants based their choice of intermittent versus indwelling catheterization on the patient's age. If the patient were young, an intermittent catheterization would be performed, and if older an indwelling catheter was inserted. Participant one stated young was about age 40 and under, participant three stated under the age of 70 and participant four did not specify an age, but indicated the patient was "young and healthy." All three participants felt that all younger patients needed sometimes was an intermittent catheter once or twice, and then they were able to void on their own.

This may have some merit in that there are age related bladder changes that may make it more difficult for the older client to urinate on their own (Baldini et al., 2009; Darrah et al.,

2009). In Izard et al.'s (2006) study, there was a significant increase in the average age of patients among those who needed extended catheterization. Studies to assess whether or not younger patients only require a few intermittent catheterizations to 'get them going', versus older clients who might need indwelling catheterization would be valuable and worthwhile.

Decision based on mobility

Mobilization factored into the decision between an intermittent and indwelling catheterization with four participants. All participants who discussed mobility stated that if the patient was not, or was not expected to be, mobilizing well, they would insert an indwelling catheter. This brings up two issues. Firstly, for those patients who are not, or are not expected to, be mobilizing well, indwelling catheterization is easier on the patient. Orthopedic patients in the immediate postoperative period often have a significant amount of pain, and indwelling catheterization is less obtrusive and less painful for the patient.

Secondly, indwelling catheters can be both a help, and a hindrance. Study participants implied that performing intermittent catheterizations would be easier for those patients who were mobilizing because they would not have to carry around a catheter bag. Conversely, Gallo et al. (2008) point out that intermittent catheterization can impair an orthopedic patient's recovery: "therapy times can be missed when urinary catheters need placement and monitoring, and the patient who should be focusing on his or her mobility hence becomes obsessed with the inability to void"(p. 115).

Decision based on workload

Some participants discussed how workload factored into either their own decisions to use intermittent versus indwelling catheterizations, or that of their colleagues. Participant four stated, "it also goes to your workload, cause if they're really big, don't turn, well it's not feasible to get them on a bedpan you know as much."

Participant nine discussed how some nurses, once the indwelling catheter was in, did not want to take it out, “a lot of people are reluctant to take them out, because it is easier to care for them, rather than getting them up and down, or toileting them.” Participant ten also mentioned practice on the ward and stated, “I think often, Foley’s just get inserted because it seems like the easier route to go, you put it in, and then you can just monitor and empty it.”

Catheterization should never be done because it is the ‘easier’ thing to do. However, sometimes this is the case and catheters get inserted, not because they are needed, but because it makes patient care easier (Holroyd-Leduc, Sands, Counsell, Palmer, Kresevic, & Landefeld, 2005). Nurses must carefully consider the whole patient picture before deciding to catheterize. This decision must be based on solid patient assessments and sound evidence. If decisions are based solely on workload, nurses could be exposing their patients to unnecessary urinary tract infections.

Length of catheterization

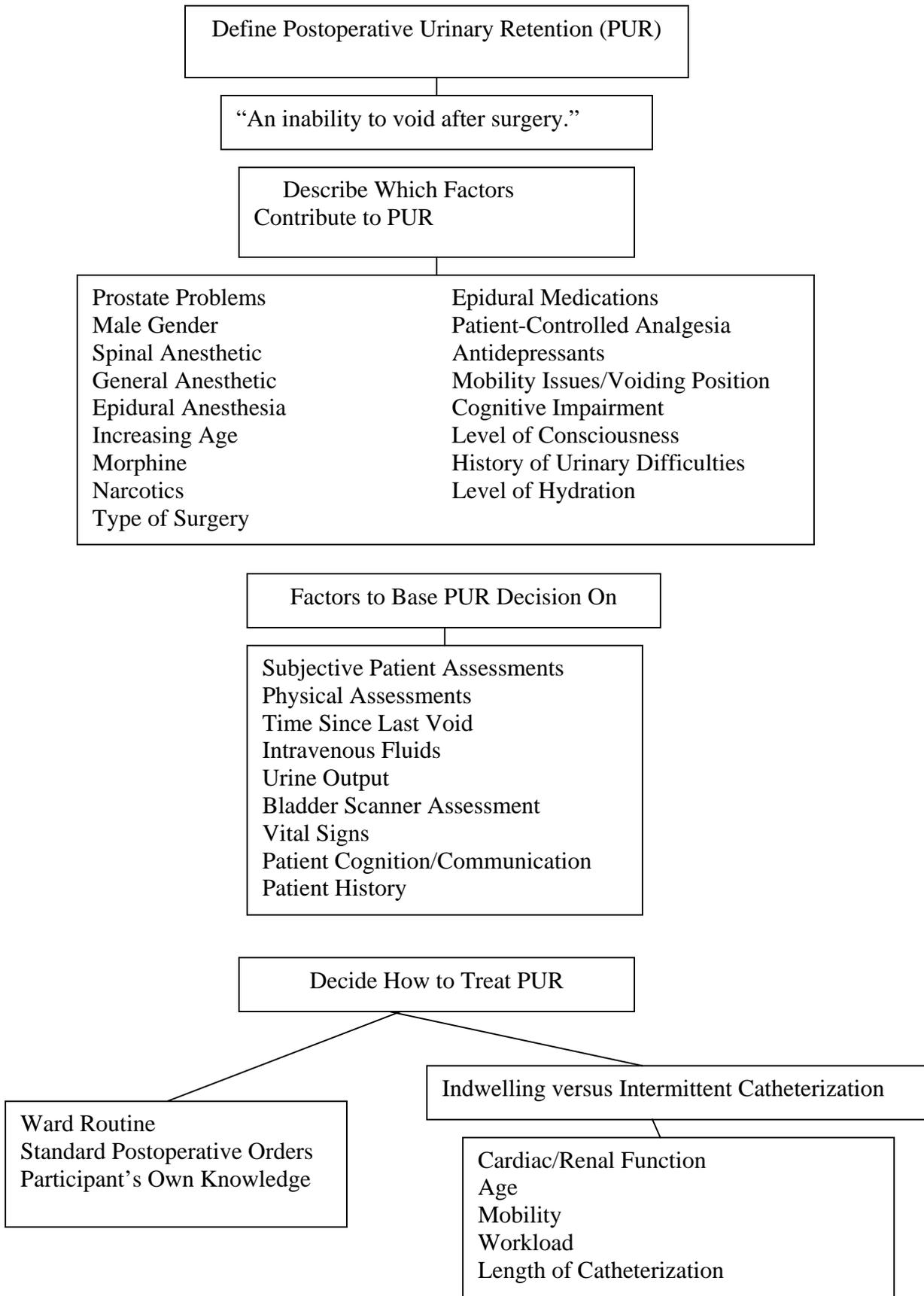
Two participants mentioned length of catheterization when discussing PUR treatment. Participant five stated, “I would look at like, they never came in with a tube, so why keep the tube in longer for more risk for infection so, I try not to leave catheters in.” This is consistent with some of the research literature that indicates the longer a catheter is left in, the greater the chance of infection (Izard et al., 2006).

Participant six stated it “seems the longer the catheter is left in, the more problems they have once that catheter comes out.” The participant did not describe what they meant by ‘problems.’ One might extrapolate that they meant the patient would have continued difficulties with urinary retention and have difficulty voiding on their own. Or, they could have been referring to the risk of urinary tract infections. Either way, length of catheterization is an important factor when dealing with hospitalized patients, but is not the focus of this study.

Summary of Participant Responses

Figure 4-2 summarizes the participant responses from the interviews. Overall participants appeared to give honest representations of their knowledge and beliefs surrounding PUR among orthopedic patients. Some participants viewed the issue of PUR more comprehensively than others. Some nurses considered many assessment factors when deciding on PUR, and others only considered a few. The participant responses will now be discussed in light of evidence-based decision making.

Figure 4-2 Participant Responses Summary



Evidence-Based Decision Making

The variety of responses for dealing with PUR point to a need for more research, as well as guidelines for all orthopedic patients when treating PUR. In evidence-based decision making, a combination of clinical expertise, clinical circumstances, patient preferences, best available evidence and health care resources should be evident in the treatment decisions for PUR. Table 4-1 provides a summary of participant quotes in relation to the elements of evidence-based decision making.

Table 4-1: Themes with Participant Quotes

Themes	Participant Quotes
Clinical Expertise	<p>In regards to assessing a cognitively impaired patient for PUR: “you just know something’s not right”(Participant 3).</p> <p>In terms of how they treat PUR, it’s “just what I figured out after a few years of ortho”(Participant 3).</p> <p>When asked about what their PUR treatment decision is based on, “just my own, myself, my own practice”(Participant 5).</p> <p>“I didn’t study” (Participant 6).</p> <p>When discussing type of anesthetic risk and PUR participant thought general anesthetic was higher risk but stated: “whether that’s true or not, I don’t know” (Participant 9).</p>
Clinical State, Setting and Circumstances	<p>“I think in our orders we have we have uh, that we can do a in and out catheter, uh a PRN”(Participant 3).</p> <p>“It’s actually in the postop orders, if unable to void insert catheter” (Participant 4).</p> <p>“It also goes to your workload, cause if they’re really big, don’t turn, well it’s not feasible to get them on a bedpan you know as much”(Participant 4).</p> <p>“Postop orders are to do a Foley, the new one that’s going to be coming out next month, is to, is for in and out catheter, not the Foley”(Participant 8).</p> <p>“Standing orders are may insert Foley if unable to void”(Participant 9).</p>

Themes	Participant Quotes
	<p>“A lot of people are reluctant to take them out, because it is easier to care for them, rather than getting them up and down, or toileting them”(Participant 9).</p> <p>“But I think often, Foley’s just get inserted because it seems like the easier route to go”(Participant 10).</p>
Patient Preferences	<p>“If they’re young and healthy, and usually they don’t want the catheter, . . they want to wait longer, they don’t want that catheter unless they absolutely have to have it” (Participant 4).</p> <p>In terms of catheterization: “I give the patient the option”(Participant 8).</p> <p>In terms of patient attitude towards catheterization: “there’s some that do not want a catheter no matter what” (Participant 9).</p>
Health Care Resources	<p>“Well, where I used to work we had a bladder scanner, which was wonderful because we could see you know, if they hadn’t gone postop, we could scan them to see how much was actually in there” “the bladder scanner is a wonderful invention”(Participant 3).</p> <p>“If there was some way you could ultrasound the bladder then you could do that”(Participant 7).</p> <p>In terms of bladder scanner use from another ward: “we’ve been they popular borrower which is why we, we got our own one”(Participant 8).</p>

Clinical Expertise

According to DiCenso et al. (2005), clinical expertise is the “ability to use clinical skills and past experience to identify the health state of patients or populations, their risks, their preferences and action, and the potential benefits of interventions” (p. 5). Eight out of ten participants used their own knowledge base, or a combination thereof, when determining how to treat PUR. These eight participants had levels of nursing experience ranging from 1.5 to 27 years of nursing experience.

However, clinical expertise cannot be based on years of experience alone. Clinical expertise is derived from skills and experiences with patients, which does not necessarily require many years of nursing to acquire. For example, one participant was very aware of the standard postoperative orders on their ward and regularly used a bladder scanner in patient assessments, whereas another participant from that ward did not appear to be aware of or use either. The former participant has been nursing a very short while, and the latter participant has many years of experience.

Within evidence-based decision making, clinical expertise is the overall ‘umbrella’ factor that ties in the other four elements (clinical state, patient preferences, research evidence and health care resources) and tempers the final decision that the nurse makes (DiCenso et al., 2005). As nurses progress through their careers they see certain patterns emerge with their patient care and adjust that care accordingly. As participant three stated, it’s “just what I figured out after a few years of ortho.”

There are times though, that nurses may perceive a pattern in patient trends but be unsure of its accuracy. When discussing type of anesthetic and PUR risk, participant nine thought general anesthetic carried a higher risk but stated, “whether that’s true or not, I don’t know.” In the area of PUR, much of what nurses have to rely on is their own clinical expertise and observations because the literature is so inconclusive. So even if orthopedic nurses were reviewing the research, they would find conflicting results making it very difficult to make an informed decision.

Clinical State, Setting and Circumstances

All participants interviewed worked on orthopedic wards on which standard postoperative physician orders were available for certain surgeries (i.e. hip replacement or knee replacement surgery). Only five out of ten participants identified that these orders were

considered when treating PUR. Participant eight was very knowledgeable and up-to-date with what those orders stated in regards to PUR, and to what they were changing to. An awareness of what is happening in the clinical area is an important part of being an effective nurse.

Following postoperative orders is also an important part of nursing, and if these orders are not being followed, the reasons need to be identified and dealt with. While critical thinking in nursing is greatly valued and needed, routine deviation from policy (i.e. standard postoperative orders), needs to be addressed. If the deviation from policy is based on solid clinical expertise and sound evidence, then perhaps the policy needs to be modified or re-evaluated. If the deviation is not based on expertise or evidence, then more staff education is needed so that all nurses are treating PUR in relatively the same fashion, based on the same evidence or algorithm.

Patient Preferences

Patient preferences are very important in evidence-based decision making. Haynes et al. (2002) stated that “patients may have no views or unshakable views on their treatment options, depending on their condition, personal values and experiences, degree of aversion to risk”(p. 384) and so forth. Patients are not always included in decision making, but three participants in this study allowed patients a choice when deciding how to treat PUR.

Participant eight gave their patient a choice after a bladder scan revealed 500-600 ml’s of urine in the bladder, “we’ll give them the option at that point to do the Foley or, or do the in and out.” They continued the discussion further and delineated how they explain to the patient first thing after surgery that retention is a possibility and how it would be treated. The participant does this up front, and then finds the patient “to be much more receptive to having a catheter at that point, if should we feel that they need it.”

Patient preference is considered by participant nine when deciding between an indwelling catheter and intermittent catheterization. They stated patient attitude would factor in, “there’s

some that do not want a catheter no matter what, so on those I would be, especially if there was obvious distension, and it had been a long time, I would just do an intermittent catheter, rather than leaving an indwelling in.”

Participant four allows some patient preference for treatment of PUR based on age. They stated, “depends on their age, if they’re young and healthy, and usually they don’t want the catheter and usually they say, OK, you know, I’ll let you, I’ll give you a couple more hours to try.” If the younger patient does not void on their own, then catheterization is done. However, with older patients, this participant will simply put in a catheter after 8 hours.

Patient preferences should factor into decision making with competent patients. Nurses have a duty to present the risks and benefits, and then let the patient decide what they want; this includes how to treat postoperative urinary retention. As DiCenso et al., (1998) pointed out, “although the patient’s role in clinical decisions is usually not formalized and is sometimes ignored by care providers, it is an important component of most clinical decisions”(p. 39).

DiCenso et al. (1998) indicated that the ideal in terms of patient preferences is that patients participate fully in their healthcare decisions after a comprehensive assessment has been carried out and their current situation clearly explained to them. Participating in decision making can empower patients and give them a sense of purpose. It can also improve the nurse-patient relationship and foster a sense of trust and respect. Some barriers to this might be the ‘nurse knows best’ attitude and time constraints in terms of taking the time to clearly explain things to the patient. As in almost every other area, more education and research is needed.

Best Available Evidence

The available evidence in orthopedic studies has been discussed in the literature review. According to DiCenso et al. (2005), this evidence should be “methodologically sound, clinically relevant research about the effectiveness and safety of nursing interventions, the accuracy and

precision of nursing assessment measures, the power of prognostic markers, the strength of causal relationships, the cost-effectiveness of nursing interventions and the meaning of illness”(p. 4). The issue with orthopedic PUR is that the studies were not conducted in the same manner, and that there are many conflicting results. This makes it extremely difficult to make any decisions based on the available evidence.

None of the participants mentioned that they had reviewed any of the research evidence in regards to PUR) (however, nor were they directly asked). Billings and Kowalski (2006) have indicated that there is still a disparity between theory and practice, and that this leads to “failure or excessive lag time in incorporating or deleting clinical practices based on current evidence” (p. 248). More current evidence is needed in Saskatchewan, and that evidence then needs to be translated into guidelines for treatment of orthopedic PUR.

There was some evidence that guidelines were being updated by the participant who mentioned that the standard orders were changing. This would indicate that those who create and update the standard postoperative orders are basing their decisions on more up-to-date resources and changing their practice accordingly.

While the participants were asked what they based their PUR treatment decisions on, further information should have been gathered on where the participants’ knowledge base came from. According to Estabrooks, Chong, Brigidear and Profetto-McGrath (2005), “understanding the types and variety of knowledge resources used by nurses is critical to our understanding of research utilization and decision-making processes in clinical settings” (p. 119).

Estabrooks et al. conducted a study looking at the preferred knowledge sources of Canadian nurses. The two most identified sources of knowledge were individual information learned from patients and personal experience gained from nursing. Nursing journals and

nursing research journals ranked among the least often used sources of knowledge for nurses. More research is needed in Saskatchewan to determine what sources of knowledge orthopedic nurses are using to make treatment decisions in order to institute solutions to the research-practice gap (Estabrooks et al., 2005).

Health Care Resources

The main health care resource discussed by three participants was the bladder scanner. Participant three used to have a bladder scanner at their workplace, and now does not. They felt that “the bladder scanner is a wonderful invention” and that the ward “should do some fundraising” for some money to purchase a bladder scanner. A potential follow-up of this study could be a needs analysis to see if this orthopedic ward could indeed benefit from a bladder scanner.

Participant nine mentioned a personal nursing practice in relation to health care resources. This participant uses a Tieman’s catheter (a specially designed catheter to ease insertion for men with large prostates) with male patients over the age of 60. This participant indicated they use this type of catheter with this specific population for comfort as many of these men have prostate issues. More research is needed to determine if it is necessary to use this type of catheter for men over a certain age and what the associated costs are.

Limitations

One limitation was the lack of demographic variety; the study participants were a fairly homogeneous group. All participants in this study worked full-time. It is unknown if part-time and casual staff would have had differing answers from full-time staff. There was also only one male nurse, and only one Licensed Practical Nurse. Due to their under-representation in the study population, it would be very difficult to extrapolate or make any conclusions related to those two factors when discussing the answers those participants gave.

The researcher working on the ward leads into another potential limitation, researcher as colleague. McEvoy (2001) discussed some of the pitfalls of being researcher and colleague with participants. One of them is that the participant is often much more exposed than the researcher, “these feelings of exposure may be exacerbated with a colleague and therefore an interview with an anonymous stranger may sometimes be less threatening to the interviewee”(p. 54). This was somewhat evident with one participant who was a bit nervous during the interview and jokingly said that they had not studied for the interview.

A final limitation was the questions asked. In hindsight, more questions should have been asked about how the participant developed their own knowledge base for treating PUR, and if they had sought additional resources (i.e. research, best practice guidelines) to inform their practice. As well, after the participant listed the factors they thought contributed to PUR, they should have been asked why they thought those factors were relevant. Due to the brevity of the answers provided by the participants, there was a limited ability of the researcher to draw more in-depth conclusions.

Summary

Participants in general all had the same basic definition of PUR. They listed a variety of factors that they thought contributed to PUR, almost all of which have been studied in the literature, with conflicting results. When assessing patients for PUR, some participants considered a more comprehensive list of assessments than others. As well, the evidence points towards a bladder scanner as being a very useful tool that some participants would like to have on their ward.

In terms of treatment options, participants considered a variety of factors including their own knowledge base, ward routine and postoperative orders. Clinical expertise, clinical state, patient preferences, research evidence and health care resources are all very important factors in

evidence-based decision making (DiCenso et al., 2005). In terms of clinical state and setting, the results indicate that even though both wards have standard postoperative orders for some surgeries, these are not always being followed. This has implications for patient safety. With regard to clinical expertise, nurses are adjusting the orders based on their own experience and knowledge, which again has implications for patient safety.

The other major issue is that what has been described as ward routine by each participant is somewhat different, so nurses are all treating PUR somewhat differently. In terms of best available research, no participant directly indicated that they had reviewed any evidence about PUR and its treatment. Even if some participants would go to the research, they would find conflicting results and little high quality evidence to guide them. More high quality evidence is needed so that sound, evidence-based guidelines can be developed for nurses to follow when dealing with PUR.

Many interesting and concerning points have come to light in this study, such as some participants not following standard postoperative orders. Information given by participants has indicated a need for both research and education in nearly all facets of PUR identification and treatment.

CHAPTER 5 STUDY IMPLICATIONS AND FUTURE DIRECTIONS

As orthopedic surgery continues, so too does the problem of postoperative urinary retention (PUR) among those orthopedic patients. Therefore it is important that all orthopedic nurses have sound knowledge regarding PUR and its optimal treatment avenues. This study has highlighted many gaps in the knowledge and research, as well as gaps in nursing knowledge. Implications for future practice, education and research will now be discussed.

Implications for Practice and Education

This study has demonstrated that while orthopedic nurses define postoperative urinary retention (PUR) fairly similarly, they view contributing factors and how to assess for PUR differently. It has also illustrated that there is little consistency in the way orthopedic nurses treat PUR.

The fact that some participants felt there was a ward routine, while others did not, suggests that staff have been educated and mentored to the ward differently. As well, among those who did indicate there was a ward routine, it was described differently by each participant. Therefore, there really is not a common ‘ward routine.’

PUR identification and treatment needs to be evidence-based, and treated using a common pathway. This is important so that all patients are getting the best care possible. If each nurse is doing something different, not necessarily based on sound evidence, patient safety is potentially compromised. Preventing infection should always be a priority, and as Dumont and Wakeman (2010) stated, nurses have the power to reduce urinary infection rates and they should be leading the movement to do so.

More education is needed for orthopedic nurses, both on contributing factors of PUR, and of the proper treatment for PUR. However, as discussed earlier, evidence-based decision making

includes consideration of patient preferences; therefore PUR would not always be treated in exactly the same way, depending on what the patient desired. Nurses need to include the patient in the decision-making process, and consider their preferences.

Additional education is also needed for each orthopedic ward as to what truly is ‘ward routine’ and what are the best treatment options for orthopedic patients with PUR. More education is needed for nurses on the standard postoperative orders and the rationale behind those orders, so that all staff are following the same protocol. Staff who do not follow, or are unaware of, physician postoperative orders, are putting patient safety at risk. Perhaps if there were physician/nursing collaboration on PUR treatment guidelines, patients would receive more consistent treatment and PUR would be identified early and treated appropriately to minimize infection and other complications of PUR and catheterization.

Catheter-associated urinary tract infections (CAUTIs) have been described as “ ‘never events’ because they’re preventable and should ‘never’ happen” (Dumont & Wakeman, 2010, p. 25). Nurses have a responsibility to provide the best, and safest patient care possible. More education and vigilance is needed by nurses to prevent CAUTIs, because they should not be happening in the first place. Some nurses might be inserting a catheter when it is unnecessary, potentially leading to a urinary infection.

As discussed earlier, resources are an important part of evidence-based decision making and one orthopedic ward does not have the same resource as another. More investigation is needed to identify if the ward without a bladder scanner would be able to purchase one. Research has already demonstrated that scanners are accurate, useful, decrease unnecessary catheterizations and can help decrease urinary infection rates (Palese, Buchini, Deroma & Barbone, 2010).

As one participant identified, they formerly worked on a ward where there was a bladder scanner, and the ward they currently work on does not have a scanner. What is not known is how many other nurses feel the same way. A part of nursing is leadership, these nurses could take the lead and advocate for a bladder scanner for their ward. Again, as Dumont and Wakeman (2010) pointed out, nurses need to lead the way towards a rate of zero catheter-associated urinary tract infections. Obtaining and using a bladder scanner is one way to help achieve that goal.

Implications for Research

The literature review and study results present a myriad of future research directions in the area of PUR. Firstly, as Chapple (2009) calls for, the terminology surrounding the issue of acute retention, and specifically that of PUR, needs to be standardized. Once the terminology has been decided upon, further research studies around PUR can be conducted, all using the same definitions. This will greatly help to compare research studies and findings, when the definitions used in the studies are all consistent.

Another area for research is what factors contribute to orthopedic PUR. More prospective and controlled studies are needed. Replication studies, looking at the same factors as previous studies are needed to possibly be able to identify accurately who is at high risk for PUR, and who is at a lower PUR risk (Edmond, 2006). Once those at greatest risk are identified, they can be preemptively catheterized, or monitored more closely for PUR.

Some of the study participants have discussed how they based their decision of intermittent catheterization versus indwelling catheterization on the patient's age. More research is needed in this area to determine if this is an accurate assumption: that 'younger' patients often only require intermittent catheterization, whereas 'older' patients would require indwelling

catheterization. If this were found to be true through research, then it would have practice applications for physicians and nurses.

More research is also needed in the area of what sources of knowledge orthopedic nurses are using to treat PUR. If reviewing the evidence is not part of their treatment decision, then research and education are also needed to determine the reasons why nurses are not using the evidence. What are the barriers to using evidence in practice- is it: lack of skill to assess the evidence, lack of confidence, lack of resources, lack of organizational support, and/or lack of authority/autonomy (DiCenso, 2003)?

Rogers (1995) presented a theory of diffusion of innovation, which described how new ideas or ways of doing things were adopted. Diffusion is defined as “the process by which an innovation is communicated through certain channels over time among the members of a social system” (p. 35). Evidence based practice (EBP) could be considered an innovation, and the principles of diffusion of innovation used to study why or why not EBP has been adopted by orthopedic nurses in general nursing practice, as well as when dealing with PUR.

In Johansson and Christensson’s (2010) study after an evidence-based program for treating urinary retention was implemented, it was found that nurses were not following the protocol. It was not described in the article how the program was developed or if the staff nurses had any input into the program. To implement it, nurses were given a two hour education session and the protocol was put on the local website. Perhaps one of the reasons nurses were not following the program was because there was not enough education, support and input from them about the protocol. This is something to keep in mind as healthcare moves forward and we continue to deal with PUR. If evidence-based guidelines are to be developed and followed, there has to be nursing input into the process.

In regards to the new standard postoperative orders on one of the orthopedic wards, there are opportunities for more research as well. The change from indwelling catheter insertion to intermittent catheterization on the standard postoperative form is an example of an authority innovation-decision (Rogers, 1995). More transparency is needed with nursing staff when changes like this occur. What research was used to make this decision? Who were the people involved in making the decision? Was there education done with the staff when the change was made? Have the staff adopted the change, are they following protocol? There are many opportunities for research in this area.

Conclusion

This study has highlighted the great amount of research, most of it conflicting, which has been conducted with regards to the definition, contributing factors and treatment options of postoperative urinary retention (PUR). It has demonstrated that most nurses define PUR similarly, but consider different contributing factors and treat it differently based on different sources (i.e. participant knowledge, ward routine, etc.). Further well-conducted studies and consensus among healthcare providers is needed on the issue of PUR.

Increasingly health care is being called upon to be evidence-based, and orthopedic nurses are not exempt from this. This study has demonstrated that some nurses use facets of evidence-based decision making such as clinical expertise, health care resources and patient preferences. More education and research is needed to increase our knowledge of, and inform our treatment decisions of PUR.

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APPENDIX A
INVITATION LETTER

Dear Orthopedic Nurse,

You are invited to participate in a study entitled – Postoperative Urinary Retention: A Qualitative Study.

My name is Amanda Betker. I am a Registered Nurse completing my Master of Nursing Degree at the College of Nursing, University of Saskatchewan. I am an orthopedic nurse interested in how other orthopedic nurses define, assess and treat postoperative urinary retention for their orthopedic patients. The results of this research study will be used for my master's thesis. I will also use the information from this study to publish articles in journals and for presentations at conferences.

Participation in this study is not part of your regular nursing duties; it is completely optional. The study involves only one phase, completion of a face-to-face interview. The interview involves questions about how you define postoperative urinary retention (PUR), what factors you think contribute to PUR, and how you treat PUR. A small amount of demographic data will also be collected. The interview should take about 30-60 minutes to complete. All information collected in this study will be kept confidential.

Should you wish to participate in this study, please contact your manager of nursing, leaving your name and stating your intent to participate in the study. I will then contact you and arrange a time and place to conduct the interview. The interview will be tape-recorded. Or, if you wish, you can contact me directly at the number below and we will arrange a time to meet.

Thank-you in advance for your consideration to participate in this research study.

If you are interested in learning more about this study, please contact Amanda Betker or Professor Glenn Donnelly and more details will be provided.

Student Researcher:
Amanda Betker
College of Nursing
University of Saskatchewan
Phone number: (306) 978-2622
E-mail: amn958@mail.usask.ca

Research Supervisor:
Dr. Glenn Donnelly
Associate Professor, College of Nursing
University of Saskatchewan
Phone number: (306) 798-1083
E-mail: glenn.donnelly@usask.ca

This study has been approved by the Behavioural Research Ethics Board of the University of Saskatchewan on February 21, 2008. Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (966-2084). Out of town participants may call collect.

APPENDIX B
RESEARCH POSTER



You're invited to participate in the study entitled:
Postoperative Urinary Retention: A Qualitative Study.

What: A nursing study looking at how nurses define, assess and treat postoperative urinary retention among orthopedic patients.

Who may participate? All Registered Nurses and Licensed Practical Nurses working on an orthopedic ward in are invited to participate.

When: The study will be conducted from April to June, 2008.

What do I have to do? The study will consist of one 30-60 minute face-to-face interview with the researcher. The time and place will be arranged by you and the researcher.

How do I participate? If you wish to participate you may leave your name and contact information with your manager and the researcher will contact you, or you may contact the researcher directly at the number/e-mail address provided below.

Thank-you for your consideration.

Contact information:

Student Researcher:
Amanda Betker
College of Nursing
University of Saskatchewan
Phone number: (306) 978-2622
E-mail: amn958@mail.usask.ca

Thesis Supervisor:
Professor Glenn Donnelly
College of Nursing
University of Saskatchewan
Phone number: (306) 798-1083

This study has been approved by the Behavioural Research Ethics Board of the University of Saskatchewan on February 22, 2008. Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (966-2084). Out of town participants may call collect.

APPENDIX C CONSENT FORM

You are invited to participate in a study entitled: Postoperative Urinary Retention: A Qualitative Study. Please read this form carefully, and feel free to ask any questions you might have.

Researcher: Amanda Betker, Masters of Nursing student, College of Nursing,
University of Saskatchewan. Contact number: (306) 978-2622.

Supervisor: Professor Glenn Donnelly, College of Nursing, University of Saskatchewan.
Contact number: (306) 798-1083.

The purpose of this study is to identify the knowledge and decision-making processes of orthopedic nurses when dealing with postoperative urinary retention. The study consists of a face-to-face interview that will take approximately 30-60 minutes. The interview will be tape-recorded and then transcribed by the student researcher.

There is minimal risk associated with this study. The transcriptions will be kept strictly confidential. All identifying information will be removed before analysis of the data will be undertaken. Research findings will be reported in aggregate form by hospital. Depending upon the data, some direct quotes will be used anonymously in the researcher's thesis, however, in a small nursing community there is a remote chance that someone might attribute a quote to you. The results of this study can be accessed by contacting the student researcher at the number listed above.

Your participation is voluntary, and you may withdraw from the study for any reason, at any time, without penalty of any sort. You also have the right to refuse to answer individual questions within the interview without penalty. Participation or non-participation in this study has no effect on your position as a nurse and is not required of you by your employer. If you withdraw from the study at any time, any data that you have contributed will be destroyed at your request. The research supervisor, Dr. Glenn Donnelly, will store all data associated with this study for a minimum of 5 years following the completion of the study.

If you have any questions concerning the study, please feel free to ask at any point; you are also free to contact the researcher or the researcher's supervisor at the numbers provided above if you have questions at a later time. The University of Saskatchewan Behavioural Research Ethics Board has approved this study on ethical grounds on February 21, 2008. Any questions regarding your rights as a participant may be addressed to that committee through the Ethics Office (966-2084). Out of town participants may call collect.

I have read and understood the description provided above; I have been provided with an opportunity to ask questions and my questions have been answered satisfactorily. I consent to participate in the study described above, understanding that I may withdraw this consent at any time. A copy of this consent form has been given to me for my records.

(Name of Participant)

(Date)

(Signature of Participant)

(Signature of Researcher)

APPENDIX D
DATA/TRANSCRIPT RELEASE FORM

Postoperative Urinary Retention: A Qualitative Study

Data Release Form

I, _____, have reviewed the direct quotations of my personal interview in this study, and have been provided with the opportunity to add, alter, and delete information from the quotation(s) as appropriate. I acknowledge that the quotation(s) accurately reflect what I said in my personal interview with Amanda Betker. I hereby authorize the release of this quotation(s) to Amanda Betker to be used in the manner described in the Consent Form. I have received a copy of this Data Release Form for my own records.

Name of Participant

Date

Signature of Participant

Signature of researcher

APPENDIX E
INFORMATION LETTER

Dear Orthopedic Nurse,

You are invited to participate in a study entitled – Postoperative Urinary Retention: A Qualitative Study.

My name is Amanda Betker. I am a Registered Nurse completing my Master of Nursing Degree at the College of Nursing, University of Saskatchewan. I am an orthopedic nurse interested in how other orthopedic nurses define, assess and treat postoperative urinary retention for their orthopedic patients. The results of this study will be used for my master's thesis. I will also use the information from this study to publish articles in journals and for presentations at conferences.

Participation in this study is not part of your regular nursing duties; it is completely optional. The study involves only one phase, completion of a 30-60 minute interview. The interview will be tape-recorded. Questions will be asked about how you define postoperative urinary retention (PUR), what factors you think contribute to PUR, and your decision-making regarding the treatment of PUR. A small amount of demographic data will also be collected. All information collected in this study will be kept confidential.

The tapes, transcripts and written notes will be available only to myself, and members of my masters committee. My supervisor, Dr. Glenn Donnelly, will keep all tapes, transcripts and notes in a locked cabinet following the study for five years. Everything will then be destroyed. Your name and any other identifying information will not be attached to the information you give. Your name will never be used in any presentations or publications of the study results. All of the information will be kept confidential, except when professional codes of ethics require me to release them (i.e. if you reveal actions that contravene the CNA Code of Ethics).

Thank-you, in advance, for considering participation in this study. Should you decide to participate, please read and sign the attached consent form. Keep one consent form for your records and return the other copy to the researcher, where it will be sealed in an envelope coded only with a number. Thank-you in advance for your consideration.

Sincerely,

Amanda Betker, RN, B.S.N.

Graduate Student
College of Nursing
University of Saskatchewan

Dr. Glenn Donnelly, Ph.D.

Associate Professor
College of Nursing
University of Saskatchewan

APPENDIX F
REMINDER CARD

Just a Reminder, . . .

If you would still like to participate in the study: Postoperative Urinary Retention: A Qualitative Study, you may still do so. Please give me a call to let me know of your interest in participating.

Thank-you again for your consideration, and participation. If you have any questions or concerns, please feel free to contact me at (306) 978-2622, or e-mail me at amn958@mail.usask.ca

Note: I will be away from June 21, 2008 until July 14, 2008; so feel free to contact me before or after these dates.

Amanda Betker

