CE

Prevention of Catheter-Associated Urinary Tract Infections in Patients With Hip Fractures Through Education of Nurses to Specific Catheter Protocols

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The majority of patients who experience hip fractures are elderly, and complications in these patients increase length of hospital stays, medical costs, and mortality rates. Catheter-associated urinary tract infections (CAUTI) are one of the common complications in this patient population. Studies have demonstrated that the use of specific indwelling urinary catheter protocols will decrease the catheter use and prevent CAUTI. The purpose of this evidence-based practice change project was to demonstrate that education of nurses on specific catheter protocols decreases the incidence of urinary tract infections in the population with hip fracture. The effectiveness of the education was measured by pre- and posttests given to the nurses. The actual number of CAUTI was also tracked and the outcomes suggest that the education and implementation of specific protocols decreased the overall incidence of CAUTI in these patients.

Introduction

Inappropriate use of indwelling urinary catheters in the population with hip fractures is a significant problem that can lead to increased incidence of urinary tract infections (UTI; Kamdar, Yahya, & Thangaraj, 2009). Other potential problems include patient safety, financial issues, and ethical concerns. Reducing the risk of healthcare-acquired infections is one of the 2010 Joint Commission National Patient Safety Goals. Research studies have demonstrated that the incidence of UTI can be significantly decreased when specific urinary retention and catheter protocols are used (Pedersen et al., 2008). Many times indwelling urinary catheter use is unwarranted and contributes to the development of catheter-associated urinary tract infection (CAUTI). If indwelling urinary catheters are necessary, they should be removed as soon as possible to prevent infections. Duration of the catheter use is one of the most significant predictors of CAUTI (Blodgett, 2009). The main purpose of this evidence-based practice change project was to review specific urinary catheter protocols for patients admitted with hip fractures, revise the protocols to include both insertion and removal criteria, and educate nurses regarding the proper use of these protocols. Education about the specific protocols provides nurses with an important tool to implement urinary catheters judiciously and remove them as soon as possible to ensure that their patients have the best possible outcomes.

Overview of Problem of Interest

Even with the best care, complications from hip fractures are high and almost one third of patients who experience hip fractures die within the first year of the injury (Barsoum, Helfand, Krebs, & Whinney, 2006). Patients who develop complications also experience decreased functional capacity, and substantial resources are needed to care for them. In patients who have experienced hip fractures, CAUTI can contribute to longer hospital stays, increased costs, and increased mortality rates (Barsoum et al., 2006; Nazarko, 2008). Catheter-associated urinary tract infection is a significant complication for patients with hip fractures and is related to the inappropriate use of indwelling urinary catheters (Kamdar et al., 2009). This complication can be reduced by the development of specific catheter protocols and education of staff in the use of these protocols (Robinson et al., 2007). Protocols include specific insertion guidelines, using alternatives such as intermittent or condom catheters instead of indwelling catheters, and removing catheters as soon as possible, ideally within 24–48 hr. One of the key components in prevention of CAUTI is prompt removal of urinary catheters (Wenger, 2010).

The increased incidence of CAUTI is not only an individual patient safety issue, but a financial concern for hospitals as well. Urinary tract infections are the most common cause of hospital-acquired infections and 80% of these UTIs are associated with the catheter use (Nazarko, 2008). The Centers of Medicare & Medicaid

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Services no longer reimburses hospitals for additional care costs associated with several types of hospital-acquired infections, including CAUTI. These conditions are considered preventable through the use of evidence-based guidelines, and hospitals will be held accountable for any of these infections that occur while patients are in their care. A single CAUTI can add several thousand dollars to the direct cost of hospitalization (Wenger, 2010). The annual cost of treating CAUTI is about $424 million (Blodgett, 2009). Hospitals will have to absorb these additional costs. This becomes a broader problem as increased costs multiply and the entire healthcare system is burdened because of preventable conditions.

There is also an ethical side to this issue. Healthcare providers are bound by the ethical principle of nonmaleficence or "do no harm." Careless and unwarranted use of urinary catheters can cause problems for patients. If these infections are preventable with careful adherence to specific evidence-based protocols, then it is an ethical responsibility to find ways to reduce the incidence of UTIs and protect patients. Through the redevelopment of protocols and education of nurses, a goal of this project was to protect patients from preventable infections, decrease mortality rates from complications, and save valuable healthcare dollars.

The Johns Hopkins Model for Evidence-Based Practice was used for the project (Newhouse, Dearholt, Poe, Pugh, & White, 2007). This systematic approach provides nurses with a format that is easily taught and applied to practice. After identifying a specific practice question, a thorough search of the current evidence was done through a review of the literature. Once the evidence was analyzed, an action plan was formulated and translated to the practice setting.

Evidence-Based Practice Process

Practice Question, Evidence, and Translation

(Newhouse, et al., 2007)

Review of Literature

There is evidence to support the use of specific urinary catheter practice protocols. Review of the related literature supports the fact that indwelling urinary catheters increase the incidence of CAUTI and that the use of standardized protocols will decrease inappropriate catheter use subsequently reducing complications (Harris, 2010; Kalsi et al., 2003; Newman, 2009). Multiple studies support nurse-driven catheter protocols and have demonstrated a relationship between these and reduced incidence of CAUTI (Blodgett, 2009).

Another more recent term for specific protocols is "bundling." Care bundles are a collection of scientifically guided elements that are necessary for safe and effective patient care (The Joint Commission, 2006). An indwelling urinary catheter bundle contains the most fundamental of protocols. These consist of using standard infection control principles to reduce CAUTI including maintaining a closed system by minimizing disconnection of catheter junctions, keeping the drainage bag lower than the level of the bladder, and ensuring that staff are trained appropriately in insertion, maintenance, and discontinuation of catheters (Lowry, 2010). Basic control practices are extremely important to increase safety and reduce costs when attempting to control UTIs in catheterized patients (Harris, 2010).

Johansson et al. (2002) reported that urinary catheters are not always appropriate in patients with hip fractures. Their research demonstrated that 29% of these patients had urinary catheters inserted without an appropriate documented reason. Kamdar et al. (2009) confirmed that there is a higher incidence of catheter insertion in patients with femoral neck fractures as compared to the general hospital population. A review by the Cochrane Collaboration (2009) concluded that the first step to reducing CAUTI is to avoid unnecessary catheterizations. Specific insertion/removal protocols would reduce the number of inappropriate indwelling urinary catheters. Bacteria are introduced into the bladder with any passage of a catheter so one of the most effective strategies to prevent CAUTI is to avoid unnecessary catheterization (Fekete, 2009). Evidence-based indicators for insertion of indwelling urinary catheters include neurogenic bladder, bladder outlet obstruction, monitoring output in critically ill patients, stage III/IV skin breakdown, crush injury/pelvic fracture, uncleared spinal injuries, chemical paralysis/sedation, and hospice or comfort care (Harris, 2010; Reilly et al., 2006).

The following practices decrease CAUTI: inserting indwelling urinary catheters only when necessary, removing catheters as soon as possible, using proper insertion techniques, using intermittent catheterization or condom catheters instead of indwelling catheters, using reminder systems for staff, and using ultrasound scanning to check bladder volumes (Beaupre et al., 2005; Newman, 2009). Saint et al. (2006) used a randomized, controlled trial to review the use of condom catheters versus indwelling catheters in hospitalized men aged 40 years and older who required a urinary collection device. Condom catheter use reduced adverse outcomes and patients who had an indwelling catheter were five times more likely to develop bacteruria (Saint et al.). In their study, Johansson et al. (2002) conducted a comparison of indwelling and intermittent catheters, and demonstrated significantly longer hospital stays in patients who had indwelling catheters in place longer than 24 hours. Sixty-one percent of the patients with hip fractures whose catheters were left in place longer than 24 hours developed UTIs. Two previous studies completed on orthopaedic patients (Knight & Pellegrini, 1996; Oishi, et al., 1995) reported no statistical difference for infection rates between indwelling and intermittent catheterization as long as the indwelling catheters were in place less than 48 hr. This was supported by a more recent study of catheterized surgical patients; the incidence of CAUTI was doubled when catheters were left in place longer than 2 days (Fekete, 2009). For each day that an indwelling catheter is in place, patients develop bacteruria at a rate of 3%–10% per day (Parker et al., 2009). In a meta-analysis of studies that reviewed the catheter use, seven

trials supported the early removal of catheters and fewer UTIs were present when the catheter was removed at 1 day versus 3 days (Fekete). Loeb et al. (2008) studied the effect of using standardized stop orders to reduce unnecessary urinary catheterizations in hospitalized patients and keep indwelling catheter insertion time to a minimum. They found fewer days of inappropriate and total urinary catheter usage, using standardized protocols. One of the best practices is to develop removal protocols that are nurse-driven, which allow nurses to discontinue catheters using established guidelines without a specific physician's order (Newman, 2009). Wenger (2010) discovered a significant reduction in CAUTI rates after initiation of nurse-driven urinary catheter protocols. This is also supported by the 2009 Prevention of CAUTI guidelines from the Healthcare Infection Control Practices Advisory Committee, which is based on the best available evidence.

Practice Change Design

Practice change is possible when interventions are well-designed and based on evidence (Newhouse et al., 2007). Implementing an evidence-based practice change project requires collaboration, organization, and perseverance. For the project to be successful, the problem must be identified early, the literature needs to be reviewed thoroughly, and the implementation plan/timeline formulated carefully. It is also important to remain flexible in the plan in case unexpected modifications have to be made during the implementation phase.

The main focus of this practice change project was the education of nurses on specific indwelling catheter protocols to prevent the complication of UTI in the patient population with hip fractures. The design plan was initiated to improve compliance of nurses in the use of indwelling urinary catheter protocols. The setting for implementation of the project was a 55-bed acute care hospital unit with a population of orthopaedic, neuroscience, and trauma patients. The goal of this practice change was to ultimately decrease the number of catheter days and the incidence of CAUTI in patients with hip fractures through the education of nurses. Basic infection control practices and aseptic catheter insertion techniques were reviewed with staff nurses before the implementation of the project. This ensured that all nurses who work on the unit started with the same baseline education before the presentation and education of revised protocols took place. Prior to implementation, the revised protocols were presented and reviewed with the orthopaedic doctors who admit patients with hip fractures, the nurse manager, and the unit practice council.

Initially, a needs assessment was completed and one of the problems that were identified as a significant issue was that nurses needed to be educated as to the importance of using urinary catheter protocols, careful documentation of the reasons for catheter insertion, and being diligent with the removal of indwelling catheters as quickly as possible. These specific educational needs were identified by chart reviews that were completed with the assistance of the unit performance improvement committee on the acute inpatient orthopaedic/neurosurgical unit where the project was done. On review, it was discovered that nurses were not documenting the use of the indwelling catheter removal protocols already in place (see Figure 1). As a follow-up to this audit, a brief survey was conducted to assess the reasons for noncompliance. Almost 50% of the registered nurses on the staff were queried. Nurses were asked whether they knew about the removal protocols and whether they were able to show where on the computerized patient record to document the criteria for indwelling catheter removal. Seventy percent of those surveyed stated that they did not know how to find the removal assessment tool screen on the electronic chart and that they were not using it to assess patients who had indwelling catheters. Of the registered nurses who said that they knew about the removal protocols, half of this group stated that they were unaware that these should be used for all patients with an indwelling catheter. Only 20% of the nurses surveyed were able to identify interventions related to the catheter "bundle" that includes basic information about indwelling urinary catheters and was part of the urinary catheter protocols that were already in place.

On the basis of the results of the audits and surveys, it was determined that the most important part of the project was the planning and implementation of education of nurses on the insertion, removal, and management of indwelling catheters. Because learning style preferences influence learning outcomes, the education plan did include a variety of teaching strategies, including Microsoft PowerPoint presentations, demonstration/return demonstration, e-mail messages, bulletin boards, and unit in-services. The cost of the time spent on education of the nurses was justified by the increase in correct use of urinary catheter protocols and the potential decreased incidence of CAUTI and the cost savings associated with this change.

To minimize the risk that nurses may be hesitant to use catheters for patients who meet the criteria for an indwelling catheter because of the risk of infection, thorough education that included reasons for catheterization as well as criteria for removal was implemented. A decision tree algorithm was created to assist nurses to quickly assess the need for indwelling urinary catheters (see Figure 2). The standing order set for all patients admitted with hip fractures included an order to insert an indwelling catheter preoperatively. Because the hospital was in the middle of implementing computerized order entry, the current order sets could not be immediately changed. Nurses were encouraged to use the algorithm before inserting an indwelling catheter on these patients and notify the physician if catheterization was not indicated. The physicians also supported the algorithm protocol.

The actual implementation of the project took place over a 10-week period. The first week was spent meeting with the orthopaedic practice group, the nurse manager, musculoskeletal director, and the unit performance improvement, education, and practice councils to review the final implementation plan and answer any questions or concerns. It is important to note that interprofessional collaboration is critical to any project that involves actual patients and possible changes in care delivery. Educational posters were displayed on the unit to remind nurses of the revised protocols and the schedules

WELLSPAN: Indwelling Urinary Catheter Removal Nursing Protocol Tool

Patient Label

Instructions: Score daily. When score reaches 5 or > STOP: Urinary catheter is indicated.

Excludes Urology and Genitourinary Trauma patients.

Total scores for all parameters. Use the following guidelines:
5 or > = Keep catheter in
3-4 = Consider alternative methods (straight catheterization, condom catheterization, urinal, bladder scanning)
2 or < = Remove catheter.

SCORING TOOL

Indicators for Maintenance of Catheters	0	1	2	5
Hemodynamics				In order to obtain accurate intake & output in critically ill patients
Incontinence				Patient at risk for local wound contamination or on comfort care measures
Urologic Requirements				Urologic surgery, mechanical obstruction, or chronic indwelling catheter
Mental Status	Alert & oriented	Responds to verbal stimuli	Responds only to painful stimuli	Unresponsive (Obtunded patient either due to injury, illness, chemical induction)
Mobility	Mobile	Partially immobile	Immobile	Uncleared spine, T & L spine new fracture
Skin Assessment	No breakdown	Stage I/II breakdown	Stage I/II breakdown of back/sacrum	Stage III/IV breakdown

DAILY ASSESSMENT GUIDE

Date							
Total Score							
Nurse's Initials							
Foley Catheter removed: (Yes or No)							
Total Score 2 or < and catheter not removed because: 1. Patient going to OR within 24 hrs. 2. Cord patient going to Rehab 3. Physician order with justification							

FIGURE 1. Catheter removal scoring tool – Adapted from UTI Reduction Project (Phillips, 2000).

of the education inservices. In addition to the posters, reminder e-mails were sent to all unit nurses. The project designer was responsible to review the presentations to make sure that all the information was correct and that the copies of the pre-/posttests and handouts were organized.

During weeks 2–4, the actual education was implemented. The education of the nurses was done at various times and repeated in multiple sessions to ensure that nurses from all of the different shifts had an opportunity to attend the inservices. A complete list of the nursing staff was maintained so that it could be determined that all nurses received the education. Each nurse had to attend only one inservice as the information that was presented was identical in each session and presented by the same person, the project coordinator. The initial plan was to use Microsoft PowerPoint presentations with handouts during half-hour sessions done in the unit conference room. However, the plan was modified to include the use of flip charts and individual education sessions taken to the nurses because it was difficult for groups of nurses to attend the inservices because of staffing challenges on the unit. Handouts were given to all nurses to reinforce the information that included the following: review of both insertion and removal protocols with the date of implementation, review of basic care of indwelling catheters, review of importance of aseptic insertion technique, and how/where to document the use of the protocols. In addition to the formal education,

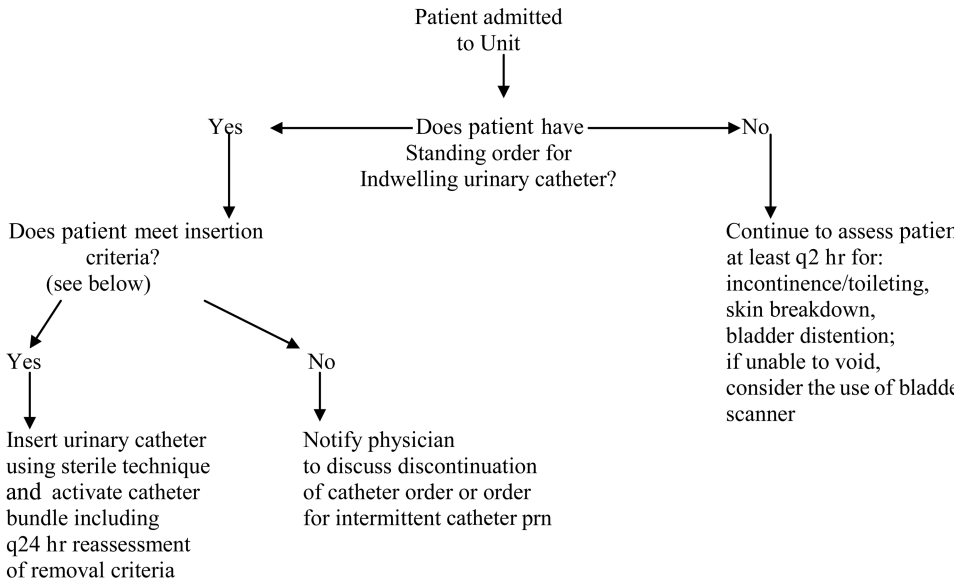

FIGURE 2. Indwelling catheter decision algorithm.

the project coordinator spent additional time out on the unit talking to nurses and assessing their understanding of the protocol education.

Actual implementation of the reviewed protocols was initiated after all of the education was completed. Reminder e-mails were sent to all staff involved in the project. During the time that the revised protocols were initiated, the project coordinator continued to be readily available to the unit staff to answer any questions and to make assessments as to whether the nurses were correctly using the protocols. Chart reviews were also started during this time period. These reviews assessed two parts of the project. First, the reviews verified that the nurses were documenting the use of the urinary catheter protocols and that the documentation was being done properly. Correct documentation on the charts supported the fact that the nurses were using the protocols. Second, the chart reviews determined the incidences of CAUTI in the population with hip fractures to ascertain whether there was a decrease since the protocols went into effect. After the chart reviews had been conducted for 4 weeks, the evaluation of the data took place. The hospital research center was utilized for assistance in evaluating the data from the project. Approval from the institutional review board was obtained before the implementation of the project to minimize delay in collecting and evaluating data. At the end of the implementation period, acknowledgments and thank-you notes were sent to anyone who assisted with the project. Results of the education were shared with the unit staff members, nurse manager, and the orthopaedic physicians group by the creation of a written report with graphs.

Project Evaluation

This project was evaluated to determine the effectiveness of the practice change education. The main part of the evaluation used a single-group pre-/posttest design. Each nurse who received the education completed seven identical pre- and posttest questions to evaluate the success of the education session. A total of 70 out of 80 nurses received the protocol education and 96% of these also completed the pre-/posttests. These tests validated the nurses' knowledge about the urinary catheter protocols, including insertion, removal, and care of indwelling catheters. Matched *t* tests compared the scores from the first group (pretest) and the scores of the second group (posttest). The pretest total score mean was 3.35 and the posttest total score mean was 6.72 (see Table 1). This was a significant improvement in the ability of the nurses to correctly answer the test questions after they received the education. The *p* value for the paired samples tabulation was less than .001, demonstrating that the change was statistically significant because it is less

Table 1. Paired Samples Statistics

Pair 1	Mean	*N*	*SD*
Pre total	3.35	68	1.207
Post total	6.72	68	0.484

than .05 value, which researchers generally accept as statistically significant.

Chart reviews were performed to determine the number of indwelling catheter insertions and the incidence of CAUTI that occurred in the population with hip fractures before and after the implementation of catheter insertion/removal protocols. In the 30 days before the education, there were two documented cases of UTI in the 14 patients admitted for hip fractures who had urinary catheters. After the education and implementation of the protocols, the chart reviews completed over the same time period did not show any CAUTI in the 10 patients admitted for hip fractures. The number of patients was too small to draw any statistically significant conclusions. It would be helpful to do chart reviews over an extended period of time to validate these results.

Nurses were surveyed by e-mail after the project to ask whether they were using the protocols and whether they had made a practice change on the basis of the education that was provided. Although the response rate for the survey was low, all who replied wrote that the education was very helpful. Three nurses stated that they had used the decision tree when considering catheter insertion and two of these had decided against catheterization based on the protocols.

One of the limitations of this project was the small number of patients. It is hypothesized that the implementation of urinary catheter protocols on a larger patient population, preceded by the successful education of nurses to the protocols, will also decrease the incidence of CAUTI in the patient population with hip fractures. Tracking the number of catheter days would have been helpful to the evaluation of this project. However, this information was not available for the specific hip-fractured population before the implementation of the protocols so no comparison could be made. Future education should include nurses in the emergency department because many patients with hip fractures are admitted through this department and indwelling catheters are also inserted during this time. Further exploration of future changes to the standardized order set with possible removal of the automatic catheter insertion order is also recommended.

Summary/Conclusion

Complications in the hip-fractured population can lead to prolonged recovery time, unnecessary costs, and increased mortality rates. Urinary tract infections from indwelling urinary catheters are a frequent complication. Education of nurses about specific urinary catheter protocols improves patient outcomes by significantly reducing the incidence of catheter infections. The purpose of this project was to educate nurses on an acute orthopaedic, neurosurgical unit about specific urinary catheter protocols including insertion, removal, and care of catheters.

After conducting a thorough literature search, a practice change plan was formulated. During the implementation of this project, a variety of teaching methods were used to review the insertion, removal, and catheter care protocols with all unit nurses. A test administered at the beginning and end of each education session assessed the knowledge level of the nurses. A review of charts also determined the number of CAUTI and the documentation of the use of the protocols. With assistance from the research department, statistical tests confirmed the positive results of the education phase of this project.

Nurses have a major role in implementing evidence-based practice. Practice change can be challenging and success depends on a process that is well-organized. Clear communication is necessary especially when working with a multidisciplinary team of staff members. The most important benefit from this project was improved patient outcomes and improved satisfaction of nurses who gain the ability to control these outcomes through evidence-based practice changes. The positive results of this project can benefit patients beyond the hip-fractured population as the complications of CAUTI are seen in other types of patients. Similar protocols could be implemented for all patients who may need indwelling urinary catheters. The information gained from this evidence-based project has the potential to change practice at the bedside to save healthcare dollars, increase nurse satisfaction, and increase the incidence of positive patient outcomes.

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