INSTITUTING A QUALITY IMPROVEMENT PROGRAM AT A COMMUNITY MEDICAL CENTER DESIGNED TO REDUCE URINARY CATHETER DAYS AND THE INCIDENCE OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

by

Minnie L. Davis

JO ANN RUNEWICZ, EdD, Faculty Mentor and Chair

BRIDGET ROBERTS, DNP, Committee Member

JOSEPH J. HERMAN, M.D., Preceptor

Patrick Robinson, PhD, Dean, School of Nursing and Health Sciences

A DNP Project Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Nursing Practice

For submission to *The American Journal of Nursing*

Capella University

June, 2016

Abstract

Background: In the United States (US) it has been reported that approximately 40% of all healthcare-associated infections (HAIs) are indwelling urinary catheter associated. These infections give rise to increased morbidity, mortality, and result in increased healthcare costs (Nicolle, 2012). A northwest community hospital has identified a higher number of infections related to urinary catheter use and an excessive number of urinary catheter days as compared to the state average.

Purpose: In an attempt to reduce the rate of catheter-associated urinary tract infections (CAUTIs) a quality improvement project involving the development of an evidence-based nurse-driven urinary catheter protocol (UCP) as well as ongoing educational efforts was instituted.

Method: Nursing staff reviewed catheter use daily and contacted physicians to discontinue urinary catheters based on the protocol. Education of nursing staff and patients in alternatives to catheter use and post catheter care were emphasized. All patients with urinary catheters were included in the quantitative analysis. Urinary tract infections were monitored by Infection Prevention through the review of all positive urine cultures and all physician diagnoses of urinary tract infection. Urinary catheter days were collected by nursing staff.

Results: Urinary catheter days were reduced from a three-month average of 2844 in the year before the intervention to 2361 in the three months after the intervention. The incidence of CAUTI was reduced by 67% with a resulting

decrease in CAUTI rate from 3.79 to 1.30 infections/100 catheter days although the results were not statically significant (*P*=0.48).

Conclusion: The present study was limited due to time constraints and lacked statistical power but did appear to indicate that the use of a nurse-driven urinary catheter protocol may decrease the rate of hospital acquired CAUTI and warrants further ongoing study.

Keywords: *Quality Improvement*, *Urinary Catheter Protocol, Catheter-Associated Urinary Tract Infection (CAUTI), Infection Prevention, Standard Infection Ratio (SIR), and Healthcare-Associated Infections (HAIs)*

Instituting a Quality Improvement Program at a Community Medical Center Designed to Reduce Urinary Catheter Days and the Incidence of Catheter-Associated Urinary Tract Infections

In the US, it has been estimated that roughly 40% of all preventable hospital acquired infections are urinary catheter related (Lo, Nicolle, Coffin, Gould, Maragakis et al., 2014). Three to seven percent of patients contract urinary tract infections (UTIs) on a daily basis during their hospital stay (Nicolle, 2012). Catheter-associated urinary tract infections not only increase mortality and morbidity of patients, but also results in a loss in revenue for the hospital and a decrease in insurance reimbursement. In an attempt to reduce urinary catheter use in health care by 50%, catheter-associated urinary tract infections (CAUTI) will no longer be a reimbursable service under Medicare if a HAI is documented. Therefore, it has become vital for nurses, practitioners, and physicians to establish prevention strategies for catheter-associated urinary tract infections (McDonald, 2014; Nicolle, 2012).

Gap in Practice

Review of CAUTI rates by the Infection Prevention Department at this northwest community hospital (an approximately 300 bed community hospital) has revealed that their patients experienced a higher number of CAUTI as compared to the state average. The standardized infection ratio (SIR) for CAUTI was 1.8 over the last year. The state average was 1.3 with an expected rate, by

definition, of 1.0 and a goal of zero (McDonald, 2014). A review of CAUTI cases revealed that one of the factors leading to CAUTI was a prolonged duration of urinary catheter placement. Infection preventionists determined that the average duration of urinary catheter placement was significantly higher than the state average (McDonald, 2014). For this reason, this hospital has become concerned about patient outcomes and decreased reimbursement related to these infections. A gap in practice at this organization, the prolonged and unnecessary use of urinary catheters leading to an increased rate of urinary tract infections was identified.

PICOT Question

In hospitalized patients with urinary catheters, can a multidisciplinary approach designed to remove catheters, result in decreased catheter days and associated urinary tract infections, compared to current rates over a three-month period?

Purpose

The main purpose of this Doctor of Nursing Practice (DNP) project was determining whether an evidence-based nurse-driven urinary catheter protocol that encourages prompt catheter removal and education on the proper use of indwelling urinary catheters decreases the incidence of CAUTI in the hospital setting. By implementing a quality improvement program, we hoped to decrease

urinary catheter days to below the state average and reduce the SIR for CAUTI to below 1.0.

Intervention

A hospital-wide change in practice was initiated which required nursing staff to review the use of urinary catheters on their patients in order to prompt attending physicians to discontinue urinary catheter use in patients in which urinary catheters are no longer needed. To elucidate the criteria for proper use of urinary catheters, a multidisciplinary team composed of urologists, infection disease physicians, infection preventionist, and nursing staff was formed. This team reviewed published research and clinical data regarding the indications for the use of catheters. An evidence-based set of criteria for the use and discontinuation of catheters was developed, and these criteria were presented to medical and nursing staff. A policy was implemented that enabled nurses to initiate discontinuation of urinary catheters based on the specified criteria. By implementing this nursing policy change as part of a quality improvement project, this northwest community hospital hoped to address the problem with high CAUTI rates and promote a positive change for patients by reducing their use of urinary catheters. This hospital sought to benefit financially by reducing healthcare costs associated with excessive infections as well as improving reimbursement. Most important was the goal of reducing morbidity and mortality among patients (CDC, 2014).

It has been projected that 1.7 million HAIs result in 99,000 deaths yearly in the US, even though these infections are preventable (CDC, 2014). Given these clinical implications as well as the financial ramifications of CAUTI detailed above, the need to reduce CAUTI rates is apparent giving rise to implementation of this project. After this project was initiated, CAUTI rates continued to be reviewed quarterly and presented to the Infection Prevention Committee with further intervention or change based on the results.

This DNP project aligns with an essential area of doctorate education as defined by the American Association of Colleges of Nursing (2014), which includes a Systems Leadership for Quality Improvement. By establishing a leadership role in this project an improvement in patient care outcomes was sought by demonstrating a reduction in the incidence of catheter-associated urinary tract infections (American Association of Colleges of Nursing, 2014).

This project uses evidence-based practice to describe actions and an advanced strategy to enhance healthcare delivery, evaluate outcomes, and develop new practice approaches based on nursing theories. These are essential elements of a DNP program as outlined by The American Association of Colleges of Nursing (2014). This project uses skills needed to develop, direct, communicate, and analyze a quality improvement process within a community hospital.

Outcomes Measured

Outcomes measured included total urinary catheter days, average duration of urinary catheter per patient, and CAUTI rates. Catheter-associated urinary tract infection rates and urinary catheter days after the intervention were compared to CAUTI rates and urinary catheter days at the community hospital during the prior year to determine if the practice change affected urinary catheter days and CAUTI rates. This data was collected by nursing staff and the Infection Prevention Department. Data calculated in the project, included the number of CAUTIs per 1000 patient days, using utilization ratio: (urinary catheter days/patient days) x one hundred (Lo et al., 2014).

The setting selected for this study is a northwest community hospital operated by a large national healthcare organization comprised of several hospitals in different states. The community hospital determined that catheter-associated urinary tract infection (CAUTI) rates were higher than established national norms. The standardized infection ratio (SIR) for CAUTI at this hospital was 1.8 over the last year (McDonald, 2014). According to McDonald (2014) the state average was 1.3 for CAUTI infection with an expected rate, by definition, of 1.0 and a goal of zero.

Review of Literature

Catheter-Associated Urinary Tract Infections

An extensive review of the literature with regard to CAUTI and its prevention was undertaken as well as the level of evidence of the literature. The databases searched were The Cochrane Library, Cumulative Index to Nursing and Allied Health (CINAHL), Medline (PubMed), Elton B Stephens Company (EBSCO), ProQuest, Capella Library, Centers for Disease Control website (CDC), and Medscape. Keywords searched included *infection, healthcare-associated infections, catheter-associated urinary tract infections,* and *hospital infection rates*. The search results returned 83 articles that were then analyzed for validity, clinical merit, level of evidence, methods, and outcomes. Articles not felt to be clinically relevant, were written in a foreign language, more than five-years-old, or contained duplicate data were excluded, leaving a total of 42 articles reviewed.

The definition of (HAI) has been debated but includes infections acquired at any inpatient or outpatient healthcare related facility. Infections acquired at long term care facilities are now recognized as healthcare-associated infections. A variety of pathogens, including viruses, bacteria, and fungi, may result in a healthcare-associated infection. The incidence of hospital-associated infections in the United States is 1 in 25, resulting in 99,000 deaths occurring in approximately 1.7 million patients (CDC, 2014; Nicolle, 2014).

Foreign bodies, of which urinary catheters are a significant contributor, are a major risk factor for healthcare-associated infections (CDC, 2015). There are several mechanisms involved in the pathogenesis of catheter-associated urinary tract infections including the loss of skin integrity during insertion with the ascension of pathogens into the bladder and upper urinary tract as well as through urethral damage. Not surprisingly, there is a strong correlation between duration of catheter placement and the incidence of catheter-associated urinary tract infection (CDC, 2015). Alternatives to the placement of indwelling catheters as suggested by the CDC (2014) include external and intermittent catheterization in appropriately selected patients. Of course diapers provide a cost-effective and safe alternative to indwelling catheters (Davis, 2015).

As noted previously there is now a strong financial incentive for hospitals to eliminate catheter-associated urinary tract infections. The Center for Medicare & Medicaid Services will no longer provide reimbursement to the health care facility for cases in which there is a hospital-acquired catheter-associated infection (Palmer, Lee, Dutta-Linn, Wroe, & Hartmann, 2013). In addition, hospitals must now publicize certain performance data, including CAUTI rates, making this information public and providing further incentive to lower CAUTI rates from a business standpoint.

Preventing CAUTI

A two-pronged method to CAUTI prevention that includes clinical practice and culture change within the organization has been efficacious in attaining and sustaining reductions in hospital acquired infections. Fully incorporating these best practices into standard procedures of operation can be problematic and beset with intricacies without a change in the culture of care. Instituting a quality improvement program designed to reduce urinary catheter days and the incidence of CAUTI necessitate a caring and supportive environment that is conducive to organizational change (American Hospital Association, 2013).

Clinical Comprehensive Unit-based Safety Program (CUSP)

The health care system has a positive impact on patient care outcomes by instigating an organizational culture of safety. This organizational culture should be entrenched in evidence-based technical interventions. A safety-oriented organizational culture decreases errors and improves the level of communication amid hospital personnel, workers, and patients (including their families). The Comprehensive Unit-based Safety Program (CUSP) model (*On the CUSP: Stop CAUTI,* 2012) generates the groundwork for the interdisciplinary health care team and subsidiary divisions to function and operate together (Agency for Healthcare Research and Quality, 2011). Context for fighting CAUTI would consist of the following as a unit management viewpoint:

1. Bringing the team together

Each unit-based team focused on the improvement of safety should have an acknowledged team leader, members of different points of view, and a majority of members with direct patient contact.

2. Involving the Senior Executive

The function of the senior leader is to talk about issue(s) dealing with safety that have been acknowledged by the unit teams and caregivers; this should focus on eliminating obstacles to enhancement.

3. Comprehending the aspect of safety

The delivery of care is done through intricate systems and structures; collaboration with the primary caregivers is imperative to identify system safety flaws.

4. Detect and learn from shortcomings

This encompasses specific examples concerning what has happened within and around the unit that was deemed to be erroneous, or not 'best practice', and that would not be desired to occur repetitively. More so, it covers primary causes of CAUTI (and other issues) that can be taken into consideration to ensure safer care

5. Executing teamwork and tools for communication

Hands-on and everyday models for teamwork and tools for communication can be employed to take into account the issues that might hinder dangers to safety.

Aspects to Consider Prior to Inserting the Catheter

Prior to the insertion of an indwelling catheter, it is imperative to take into consideration whether other alternatives would be more suitable. A bladder scanner can be used to evaluate and provide confirmation of urinary retention prior to inserting the catheter in order to release urine (Chenoweth & Saints, 2013). Bedside garments such as those used in assisting continence and provision of urinals with the purpose of managing incontinence can be utilized. A straight catheter for one-time use can be employed for irregular or protracted emptying needs. Additionally, external catheters suitable for obliging men devoid of any urinary retention or any form of impediment are also available (Chenoweth & Saints, 2013).

Technical Interventions for CAUTI Prevention

Evidence that is obtained clinically is employed to offer guidance for CAUTI prevention. The following are major steps which hospitals should concentrate on:

A. Suitable use of urinary catheter placement intervention

1. The insertion of urinary catheters should only be for suitable indications. The evidence-based Healthcare Infection Control Practice Advisory Committee/CDC Policy stipulates appropriate suggestions for urinary catheter insertion and use.
2. Take into consideration the different alternatives to indwelling urinary catheters; these include using bladder scanners to detect and supervise urinary retention, external catheters, and approaches to measuring output of urine that are non-invasive.

B. Components of catheter insertion and maintenance

1. Making sure that only well trained personnel, who are certain of the appropriate method of sterile catheter insertion, as well as catheter maintenance, are handed these duties.
2. Catheters should be inserted through use of hygienic methods and equipment that is sterile.
3. Maintenance of a disinfected drainage system that is always closed.
4. Ensure that the urinary drainage system is not disconnected to the catheter unless the latter needs to be irrigated physically due to hindrance and impediment.

C. Timely removal of the catheter

There should be daily monitoring and supervision of any patients using catheters. If a suitable indication for catheter use is nonexistent, then there should be timely removal of the catheter. It is important for doctors and nurses to be aware of the indications for the use of urinary catheters; these medical professionals should repeatedly monitor and supervise patient need for a catheter. Doctors should quickly withdraw catheters that are not indicated or needed any longer; nurses assessing catheters and discovering no indication should communicate with the doctor to quickly discontinue or withdraw the catheter. One common reason for the inappropriate use of catheters is simply the lack of awareness and alertness amongst clinicians using catheters (Lo et al., 2014).

D. Training of Personnel

This would ensure that only well-trained personnel, who are well informed about the proper method of sterilized catheter insertion, and its maintenance, are given the duty and accountability for placement or insertion of the urethral catheters. Materials which are required for inserting urethral catheters include, sterile gloves, under pads that are water absorbent, aseptic drape, forceps, swabs for preparation, antiseptic solution, catheter, tubing, collecting bag, aseptic water for inflating the balloon, and lubricating jelly. Supplies are often prepackaged as kits.

All urethral catheters have to be placed under aseptic conditions at all times and while wearing gloves that are sterile. If a catheterization kit is being

used, it has to be removed from its external packaging, and thereafter the paper wrapping inside opened to create an aseptic field. In order to ensure that the gloves are not contaminated, the absorbent pad should be retrieved in a careful manner from the top of the kit with cleansed hands and thereafter placed underneath the buttocks of the patient with the plastic being side down. The gloves should then be put on and the greater pubic area and the abdomen of the patient covered with the drape. The content of the tray should be placed on an area that is sterile and on a bedside table that can be easily reached and the tray should be well organized. There are varying methods for the catheterization of female and male patients (Lo et al., 2014).

Quality Improvement

A culture of safety is employed by several nationwide quality improvement schemes focused on health care delivery in order to enhance patient safety. These projects make use of a robust and resilient safety culture with clinical or practical interventions that have already been proven to bring down the rate of health care associated infections. The *On the Comprehensive Unit-based Safety Program (CUSP): Stop CAUTI* (2012) project is an example of a nationwide endeavor to eliminate CAUTI. The quality improvement process can be presented as a practice that is a self-governing or self-supervision improvement program, or as an evaluation undertaken by an external party (College of Family Physicians of Canada [CFPC], 2009). It is important to develop an official quality

improvement approach for guidance during the transformation process as the healthcare organization strives to become a patient-centered medical facility (Fontaine et al., 2015; Spenceley et al., 2013; Wagner et al., 2012; Wagner, Gupta, & Coleman, 2014).

Several characteristics are necessary for an effective quality improvement approach, such as a solid and involved leadership with proficiency in change management that can make use of rapid-cycle methods of change to assess innovations and plans for change. Quality improvement is reliant on unchanging performance measurements to pinpoint or ascertain prospects for improvement. Personnel must be engaged in the process of development and implementation and one must routinely attain and make use of patient experience information and data to notify improvement endeavors. The engagement of personnel in these activities offers a well-accepted and understood perspective on the prevailing processes and notions for change, and might make the changes more acceptable (Wagner, Gupta, & Coleman, 2014). Involving patients and their families in current quality improvement endeavors by petitioning consistent reactions and responses through surveys and collecting additional information on patient standpoints through the creation of patient/family consultative assemblies can help make patients and their families more receptive to the project (Fontaine et al., 2015; Spenceley et al., 2013; Wagner et al., 2012; Wagner, Gupta, & Coleman, 2014).

Cultural Interventions for CAUTI Prevention

Attaining and maintaining conditions that are conducive to reducing CAUTI necessitate an environment that supports honest and clear communication, shared responsibility, and constant development. Development and improvement, in the long run, necessitates a culture that makes sure that the practical work will be done effectively. One challenge that comes with these quality improvement practices is project fatigue. Health care systems have ascertained that the CUSP model compliments other change models, including the Institute for Healthcare Improvement and the Kotter leading change model (American Hospital Association, 2013).

Effective Practice

The nationwide project dubbed *On the CUSP: Stop CAUTI* (2012) offers comprehensive tutoring and important data-gathering support to unit teams constantly working to reduce catheter-associated urinary tract infections. By means of this support and mentoring, the involved hospitals have pinpointed numerous key lessons to positively decrease and prevent rates of catheter-associated urinary tract infections. These include:

1. Exhibit senior leadership dedication
2. Amass an active diverse multidisciplinary unit based team
3. Authorize diverse multidisciplinary team personnel
4. Ensure data collection procedures and documentation are recognized

5. Offer committed resources to the endeavor
6. Involve personnel with patient experiences
7. Share ongoing achievements in the project
8. Create and supervise metrics to assess routine improvement determinations and results. Also make sure all personnel members have an understanding of the metrics for success
9. Make the most of health information technology that offers support to critical functions; for instance, performance measurement, alerts to providers, and constant reminders, computerized order entry (COE), and population management.
10. For the quality improvement strategy to be effective, it is important that clinically significant and actionable metrics that are suitable to each exercise and public setting be carefully chosen (CFPC, 2009; Coleman et al., 2014).

Several studies have documented a reduction in urinary catheter days and CAUTI by using a nurse-driven urinary catheter protocol. Magers (2013) demonstrated a 33% reduction in CAUTI rates and a 13.12-day reduction in mean number of catheter days in a 25 bed long term acute care hospital setting. Chen et al. (2013) documented a 22% reduction in catheter utilization rates and a 48% reduction in CAUTI in two respiratory care intensive care units. Mori (2014)

reduced urinary catheter usage from 37.6% to 27.7% and cut CAUTI rates by over 50 percent.

Reimbursement

Owing to the extent of this issue and since these infections can often be prevented, the Centers for Medicare & Medicaid Services (CMS) has added CAUTI in a listing of hospital-acquired illnesses that the institution will no longer reimburse. According to Kennedy, Hallum and Montag (2013), cases with CAUTI brought about an additional cost of about $1,300 to $1,600 for every patient during a single year of study. Therefore, the prevention and the reduction of CAUTIs will assist hospitals and health care systems in preventing needless and excessive costs. At the onset of 2014, it was declared that Medicare will no longer reimburse for CAUTIs; this prompted health care institutions to substantially reduce their rates of infection (Kennedy, Hallum, & Montag, 2013).

Framework

It is important to limit the use of urinary catheters in order to reduce healthcare-associated infections and urinary tract infections. This can be achieved by implementing transformational change using the Iowa model (Meddings, Krein, Fakih, Olmsted, Saint, 2013). The Iowa model is chosen because it is a source of guidance for nurses and clinicians when making decisions that have an impact on patient outcomes. This model infuses research into practice by using a

multidisciplinary team approach to address a number of topics that are clinically important (Fineout-Overholt & Melnyk, 2011).

The Iowa model contains key components for the clinician to follow and utilize in order to problem solve using evidence-based research which allows the initial question to be generated based on the research findings or problem (Doody & Doody, 2011). In this case the problem identified is the recognition of an elevated rate of CAUTI at a northwest community hospital. After reviewing the evidence, a pilot practice is conducted, allowing for gathering of more evidence through research with the use of the model. Catheter-associated urinary tract infection rates are a problem of high priority at this northwest community hospital. Healthcare-associated infections such as CAUTI have resulted in increased morbidity and mortality for its patient population as well as a significant financial loss as a result of the Medicare reimbursement mandate (Nicolle, 2012).

Method

Project design

A hospital-wide change in practice was initiated which required nursing staff to review urinary catheter use on their patients in order to prompt attending physicians to discontinue urinary catheter use in patients in which urinary catheters are no longer needed. The setting selected for the proposed study is a 260 bed community hospital operated by a national healthcare organization

comprised of several hospitals in different states. The patient population analyzed in this setting were all hospitalized patients with urinary catheters.

Development of Urinary Catheter Protocol

1. In order to elucidate criteria for the proper use of urinary catheters a multidisciplinary team involving urologists, infection disease physicians, infection preventionist, and nursing staff was formed.
2. This team reviewed published research and clinical data regarding the indications for the use of catheters.
3. An evidence-based set of criteria for the use and discontinuation of catheters was developed and presented to medical and nursing staff.
4. A policy enabled nurses to initiate discontinuation of urinary catheters based on the above criteria was implemented (see Figures 1-4).

Institution of Urinary Catheter Protocol

1. Nurses assessed all patients with urinary catheters based on the protocol. If the catheter was not felt to be necessary based on the protocol the nurse contacted the physician and requested discontinuation.

2. Post urinary catheter nursing care was also emphasized, to include teaching patients the importance of drinking plenty of fluids and completely emptying the bladder during urinating. Alternatives to urinary catheterization as detailed above were implemented as clinically indicated.
3. Nursing and medical staff continued to be educated regarding appropriate indications for urinary catheters throughout the project.

Collection and Analysis of Data

1. Outcomes measured included urinary catheter days and CAUTI rates through the hospital. Nursing staff and the Infection Prevention Department collected this data.
2. Catheter-associated urinary tract infections rates and urinary catheter days after the intervention were compared to CAUTI rates and urinary catheter days during the prior year to determine if the policy change could affect urinary catheter days and CAUTI rates.
3. The statistical data used in the study included the number of CAUTIs per 1000 patient days, using utilization ratio: (urinary catheter days/patient days) x one hundred (Lo et

al., 2014). The SIR value for the previous year will be compared to the SIR value for the 3-month interval beginning after initiation of the intervention when this becomes available through the National Healthcare Safety Network.

Policy Change

1. Data obtained in this project will be presented to the Infection Prevention Committee and if approved, will then be submitted to the Executive and Quality Committees in an attempt to implement this change as long term policy for the community hospital.
2. The main potential limitation considered at the beginning of this project was a small sample size as it is unclear whether enough patients would be involved to reach statistical significance.

Sample

The focus of this project is the reduction of CAUTI rates through the reduction in urinary catheter days at the northwest community hospital in adult patients. The sample analyzed included all hospitalized patients with urinary catheters, a total of 472 patients (N=472). There were very few hospitalized pediatric patients at this community hospital and they were excluded. There were

no other exclusion criteria. As only data on the number of urinary catheter days and CAUTI rates were analyzed, no data collected included any identifiable information of the participants.

Results

Results obtained are displayed in the following (see Tables 1, 2, & 3 and Figure 4). Data was collected over a three-month period and compared to data from the previous year. Overall urinary catheter days (using a three-month average for the previous year) were reduced by 17.0% (from 2844 to 2361). There was an overall reduction of 67% in CAUTIs (from 18.25 to 6) translating into a rate reduction from 3.79 to 1.30 infections per 1000 catheter days using the utilization ratio formula: (urinary catheter days/patient days) x one hundred (Lo et al., 2014). This is a risk reduction from the prior year of 2.49 infections per 1,000 catheter days.

Although the project conclusions were not statistically significant (z= -0.71, p=0.48) (see Tables 1, 2, & 3), the trend was very encouraging with a substantial decline in catheter-associated urinary tract infections. The intervention was therefore felt to be clinically significant. Once a larger number of patients have been evaluated, a statistical difference might be seen.

Conclusion

Catheter-associated UTIs are a common problem in hospitals in the United States resulting in substantial morbidity, mortality, and increased healthcare costs.

There are also strong financial incentives for hospitals to reduce the incidence of these infections as they now result in decreased reimbursements from Medicare (Nicolle, 2012). A northwest community hospital has recently become concerned about the rate of CAUTIs at their hospital and has sought mechanisms to decrease the rate of these infections at their institution.

This quality improvement project involved the development of an evidence-based urinary catheter protocol along with ongoing staff education in the proper use of urinary catheters in an attempt to reduce the rate of CAUTI at this hospital. The project was successful in lowering the CAUTI rate from 3.79 to 1.30 infections/1000 catheter days but did not achieve statistical significance. The study was limited due to time constraints and a lack of statistical power likely related to the small numbers involved. Despite the lack of statistical significance, the results are encouraging and may warrant ongoing implementation. For this reason, the data will be presented to the Infection Prevention Committee with the goal of movement to the Quality Committee for continuation of the interventions.

Funding

There was no funding and no conflict of interest for this project.

References

Agency for Healthcare Research and Quality (2011). Strategies to put patients at the center of primary care. Rockville, MD: *Agency for Healthcare Research and Quality*. Retrieved January 2, 2016 from http://pcmh.ahrq.gov/sites/default/files/attachments/Strategies to Put Patients at the Center of Primary Care.pdf

American Association of Colleges of Nursing. (2014). Building a framework for the future: Advancing higher education in nursing. *Annual Report.* Retrieved December 3, 2015 from http://www.aacn.nche.edu/aacn-publications/annual

American Hospital Association (2013). *Workforce roles in a redesigned primary care model.* Retrieved January 3, 2016 from http://www.aha.org/content/13/13-0110-wf-primary-care.pdf

Centers for Disease Control and Prevention (CDC). (2014, September). *The Centers for Disease Control Prevention NHSN e-News, 9*(3), 1-23. Retrieved January 3, 2016 from http://www.cdc.gov/nhsn/PDFs/Newsletters/vol9-3-eNL-Sept-2014.pdf

Centers for Disease Control and Prevention (CDC). (2015). Catheter-associated urinary tract infections (CAUTI). *Centers for Disease Control and Prevention.* Retrieved January 3, 2016 from http://www.cdc.gov/

Chen, Y. Y., Chi, M. M., Chen, Y.C., Chan, Y. J., Chou, S. S., & Wan, F. D. (2013). Using a criteria-based reminder to reduce use of indwelling urinary catheters and decrease urinary tract infections. *American Journal of Critical Care, 22*(2), 105-114. Retrieved December 3, 2015 from doi:10.4037/ajcc2013464

Chenoweth, C., & Saints, S. (2013). Preventing catheter-associated urinary tract infections in the intensive care unit. *Critical Care Clinics, 29*(1), 19-32. Retrieved December 3, 2015 from doi:10.1016/j.ccc.2012.10.005

Coleman, K. et al. (2014). Unlocking the black box: Supporting practices to become patient-centered medical homes. *Medical Care*, *52*(11 Suppl. 4), S11-7. Retrieved January 3, 2016 from http://www.commonwealthfund.org/publications/in-brief/2014/oct/supporting-practices-to-become-medical-homes

College of Family Physicians of Canada (CFPC). (2009). *Patient-centred primary care in Canada: Bring It On Home*. Retrieved January 3, 2016 from http://patientsmedicalhome.ca/files/uploads/PMH_Bring_it_on_home.pdf

Davis, M. L. (2015, May 24). *Simple strategy of limiting the use of Foley catheter to reduce the rate of health care associated infections* (HAIs). Unpublished manuscript, Capella University.

Doody, C. M., & Doody, O. (2011). Introducing evidence into nursing practice: Using the Iowa model [Abstract]. *University of Limerick Institutional*

Repository. Retrieved January 3, 2016 from https://ulir.ul.ie/handle/10344/1801

Fineout-Overholt, E. & Melnyk, B. (2011). *Evidence-Based practice in nursing & a Healthcare: A guide to best practice* (2nd ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Fontaine, P., Solberg, L.I., Tillema, J., Smithson, A., & Crabtree, B.F. (2015). Minnesota's early experience with medical home implementation: Viewpoints from the front lines. *Journal of General Internal Medicine*, *30*(7), 899-906. Retrieved January 3, 2016 from https://www.docphin.com/research/article-detail/16293975/PubMedID 25500785/Minnesota's-Early-Experience-with-Medical-Home-Implementation-Viewpoints-from-the-Front-Lines

Kennedy, E., Hallum J., & Montag, D. (2013). CAUTI cost calculator. Retrieved January 3, 2016 from http://cauti.umms.med.umich.edu/PHP/CAUTI_input.php

Lo, E. et al. (2014). Strategies to prevent catheter-associated urinary tract infections in acute care hospitals. *Infection Control and Hospital Epidemiology, 35*(5), 464-479. Retrieved January 4, 2016 from doi:10.1086/67518

Magers, T. L. (2013). Using evidence-based practice to reduce catheter-associated urinary tract infections. *The American Journal of Nursing, 113*(6), 34-42. Retrieved December 4, 2016 doi:10.1097/01NAJ.0000430923.a7

McDonald, C. (2014). A northwest community hospital infection prevention department. *Infection Dashboard.*

Meddings, J. Krein, S.L. Fakih, M.G. Olmsted, R. N. Saint, S. (2013). Making health care safer II: An updated critical analysis of the evidence for patient safety practices. *Evidence.* Retrieved January 3, 2016 from http://www.Ncbi.Nlm.nih.gov/books/NBK133363/pdf/

Mori, C. (2014). A-voiding catastrophe: implement a nurse-driven protocol. *Medsurg Nursing, 23*(1), 15-21, 28. Retrieved January 3, 2016 from http://www.nbci.nlm.nih.gov/pubmed/24707664

Nicolle, L. E. (2012). Urinary catheter associated infections. *Infectious Disease Clinic of North America, 26*(1), 13-27. doi:10.1016/j.idc2011.09.009

Nicolle, L. E. (2014). Catheter associated urinary tract infections. *Antimicrobial Resistance Infection Control 3*(23). doi:10.1186/2047-2994-3-23

On the CUSP: Stop CAUTI, implementation guide (2012). Retrieved January 3, 2016 from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1518541/

Palmer, J. A., Lee, G. M., Dutta-Linn, M. M., Wroe, P., & Hartmann, C. W. (2013). Including catheter-associated urinary tract infections in the 2008 CMS payment policy: a qualitative analysis. *Urologic nursing, 33*(1), 15.

Retrieved January 3, 2016 from http://www.suna.org/resources/journal/article331Epubl.pdf

Spenceley, S.M., Andres C., Lapins J., Wedel R., Gelber T., & Halma L.M. (2013). Accountability by design: Moving primary care reform ahead in Alberta. Calgary: *University of Calgary School of Public Policy*. Retrieved January 3, 2016 from http://policyschool.ucalgary.ca/sites/default/files/research/sspenceley-care-reform.pdf

Wagner, E.H., Coleman, K., Reid, R.J., Phillips, K., Abrams, M.K., & Sugarman, J.R. (2012). The changes involved in patient-centered medical home transformation. *Primary Care*, *9*(2), 241-59. doi:10.1016l/j.pop.2012.03.002

Wagner, E.H., Gupta, R., & Coleman, K. (2014). Practice transformation in the safety net medical home initiative: A qualitative look. *Medical Care, 52*(11 supp l4)*,* S18-22. doi:10.1097/mLR.000000000000019

Figure 1. Nurse Driven Surgical Indwelling Urinary Catheter Removal Protocol

Figure 1. Protocol for instructing healthcare staff on removal of surgical urinary catheters in order to prevent urinary catheter associated infections. EMR = Electronic Medical Record. Permission granted by Infection Prevention Department at the northwest community hospital.

Figure 2. Nurse-driven non-surgical indwelling urinary catheter removal protocol.

INSTRUCTIONS

☐	**For non-surgical patients,** Nursing to assess patient daily to determine if urinary catheter is still necessary (*document in EMR*). Obtain an order to remove the urinary catheter unless one or more removal exclusion criteria apply. Supra-pubic catheters are NOT included in this protocol.
☐	Catheter removal will be performed ideally between 0600 and 1000 to allow a sufficient period of observation and sufficient staffing to ensure patient safety.
☐	No urinalysis (U/A) or culture required upon removal
☐	**For surgical patients only**, follow the Nurse-driven Surgical Indwelling Urinary Catheter Removal Protocol for Post-Operative Patients.

REMOVAL EXCLUSION CRITERIA	
If any of the following criteria are present, DO NOT remove the urinary catheter	
☐	Urinary retention or obstruction or patient had difficult insertion per physician (*e.g. coudé catheter*)
☐	Patient had difficult insertion by Urologist or the 'Difficult Cath Team' (*identified by red band*)
☐	Continuous bladder irrigation
☐	Critically ill patient requiring strict measurement of urinary output or patient on diuretics or Inotropes
☐	Urinary incontinence with stage III or IV pressure ulcer
☐	Hospice/Comfort Care/Palliative Care
☐	Peri-operative use for the following selected surgical procedures (with planned removal as soon as possible): • Patients undergoing urologic surgery or other surgery on contiguous structures of the genitourinary tract • Anticipated prolonged duration of surgery (catheters inserted for this reason should ideally be removed in PACU) • Patients anticipated to receive large-volume infusions or diuretics during surgery • Operative patients with urinary incontinence
☐	Prolonged immobilization due to fractures of the pelvic region, and unstable thoracic or lumbar spine
☐	Physician order to remain inserted, including reason for maintaining catheter

Figure 2. Protocol for instructing healthcare staff on removal of non-surgical urinary catheters in order to prevent urinary catheter associated infections. EMR = Electronic Medical Record; PACU = Post Anesthesia Care Unit. Permission granted by Infection Prevention Department at the northwest community hospital.

Figure 3. Post Removal Monitoring and Re-insertion Algorithm

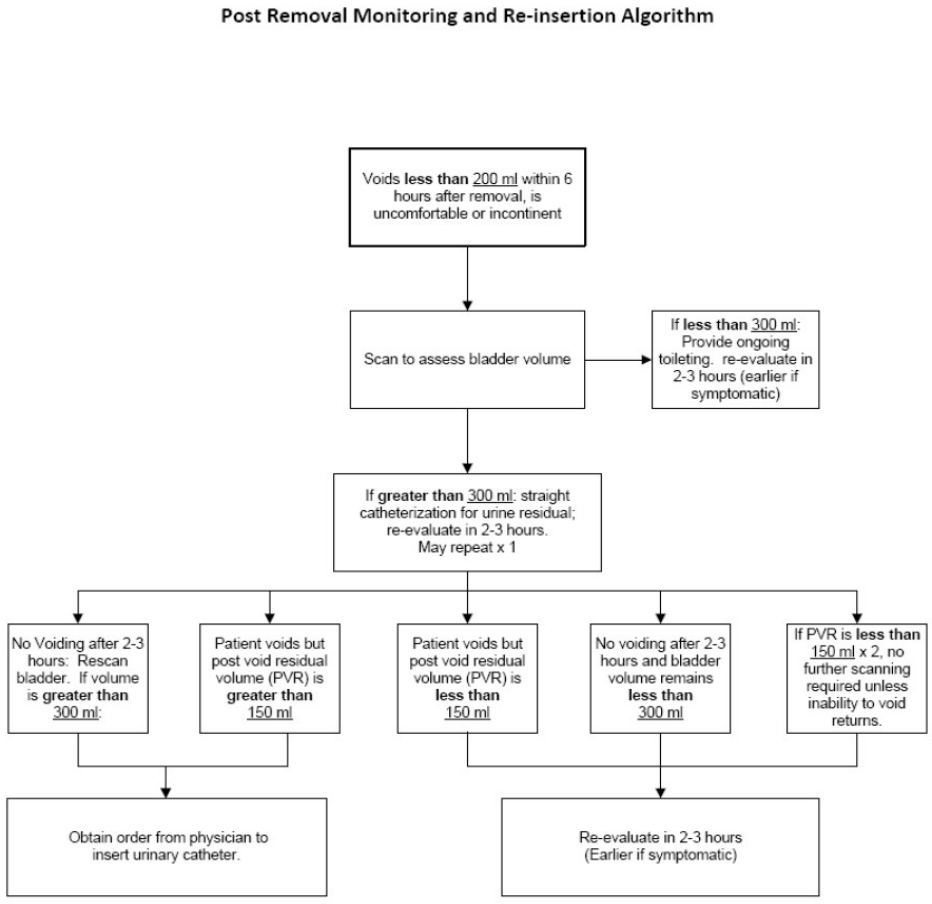

Figure 3. *Algorithm depicting decision tree directing health care staff when to insert or remove a urinary catheter. PVR= Post Void Residual. Permission granted by Infection Prevention Department at the northwest community hospital.*

Figure 4. Number of Hospital Acquired CAUTI

Figure 4. *Comparison of CAUTI's before and after catheter removal protocol implementation. UTI=Urinary Tract Infection. Figure approved by Infection Prevention Department at the northwest community hospital.*

Table 1

Pre-protocol implementation

	Patient Days	Catheter Days	Number of CAUTIs	CAUTI Rate
12 Months Prior	19,278	11,376	73	3.79

Note. Summary of CAUTI rates in 12 months prior to implementation of CAUTI reduction protocol. CAUTI = Catheter-Associated Urinary Tract Infection.

Table 2.
Post-protocol implementation

	Patient Days	Catheter Days	Number of CAUTIs	CAUTI Rate
Month 1	1487	678	3	2.02
Month 2	1590	834	1	0.63
Month 3	1522	849	2	1.31
Total	4599	2361	6	1.30

Note. Summary of CAUTI rates in 3 months following implementation of CAUTI reduction protocol. CAUTI = Catheter-Associated Urinary Tract Infection.

Table 3.

CAUTI Rate Summary Statistics

Rate before the protocol	Rate after the protocol	Absolute Risk Reduction	z Value	p Value
3.79	1.30	2.49	-0.71	0.48

Note. Comparison of CAUTI rates 12 months prior and in three months following implementation of CAUTI reduction protocol. CAUTI = Catheter-Associated Urinary Tract Infection.