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Original article

An intervention to improve the catheter associated urinary tract infection rate in a medical intensive care unit: Direct observation of catheter insertion procedure

Janet M. Galiczewski[a,b,*], Kathleen M. Shurpin[a]

[a] Stony Brook University School of Nursing, United States
[b] Long Island Jewish Medical Center, United States

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ABSTRACT

Background: Healthcare associated infections from indwelling urinary catheters lead to increased patient morbidity and mortality.
Aim: The purpose of this study was to determine if direct observation of the urinary catheter insertion procedure, as compared to the standard process, decreased catheter utilization and urinary tract infection rates.
Methods: This case control study was conducted in a medical intensive care unit. During phase I, a retrospective data review was conducted on utilsiation and urinary catheter infection rates when practitioners followed the institution's standard insertion algorithm. During phase II, an intervention of direct observation was added to the standard insertion procedure.
Results: The results demonstrated no change in utilization rates, however, CAUTI rates decreased from 2.24 to 0 per 1000 catheter days.
Conclusion: The findings from this study may promote changes in clinical practice guidelines leading to a reduction in urinary catheter utilization and infection rates and improved patient outcomes.

Introduction

Catheter associated urinary tract infections (CAUTI) account for 40% of all healthcare associated infections (HAI) in the United States (Fuchs et al., 2011). Internationally, CAUTI rates can increase up to 5% higher depending on the socioeconomic status and resources of the country (Rosenthal et al., 2012). Urinary tract infections (UTI) caused by an indwelling catheter lead to a significant increase in patient morbidity and mortality and generate a financial burden on health care systems (Leone et al., 2003).

Background and significance

Thei ncidence of CAUTI in the United States has reached almost two million cases and has raised healthcare costs to over 400 million dollars per year (Gray, 2010; Vacca and Angelos, 2013). As a result, government funded reimbursement is being limited to encourage hospitals to implement protocols aimed at reducing this HAI (Vacca and Angelos, 2013). The National Healthcare Safety Network (NHSN) survey conducted on patients in intensive care units (ICU) revealed that UTIs were the most common HAI found in this vulnerable population (Richards et al., 2000).

In January 2015, the Center for Disease Control and Prevention (CDC) issued changes in the CAUTI definition that may have an impact on urinary catheter infection and utilization rates. The new definition will impact how CAUTI is reported to the NHSN. The significant changes included: (1) bacteria only acceptable causative agent of UTIs, (2) urine culture threshold criteria increased to 1,000,000 CFU/ml, and (3) same pathogen list used for symptomatic UTIs and asymptomatic bacteriuria UTIs (CDC, 2015). The exclusion of yeast, mold, fungi and parasite related UTIs will decrease the often overinflated CAUTI rates (CDC, 2015). Studies are needed post implementation of the updated CAUTI surveillance definition to examine the impact on urinary catheter infection and utilization rates.

* Corresponding author at: Stony Brook University, School of Nursing HSC Level 2- 204 Stony Brook, New York 11794-8240, United States.
E-mail address: Janet.Galiczewski@stonybrook.edu (J.M. Galiczewski).

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Implications for Clinical Practice

- Decreasing the incidents of CAUTI not only improves patient outcomes by reducing patient morbidity and mortality but can also decrease medical costs.
- Protocol based algorithms for urinary catheter placement must include interventions that focus on adherence to general infection control principles.
- Evidence supports the intervention of direct observation being added to the catheter placement algorithm to ensure adherence to protocol.
- An invaluable benefit of direct observation is the ability to provide immediate constructive feedback that may improve practice.

Preventative measures for CAUTI such as catheter avoidance strategies, hand hygiene, perineal care, and daily necessity review to limit catheter days have been associated with decreased CAUTI rates in ICUs (Chenoweth and Saint, 2013). Many institutions bundle these interventions into protocol-based guidelines for catheter insertion to standardize care based on the scientific evidence to improve patient outcomes (Clearinghouse, 2014). Globally, CAUTI prevention efforts continue and nurses lead the effort to identify interventions with the greatest impact on CAUTI rates. The purpose of this quality improvement study is to determine if direct observation of the urinary catheter insertion procedure, as compared to the standard process, decreases urinary tract infection and utilization rates.

Review of literature

Protocol -based care

Protocol-based care is used to implement evidence-based interventions which improve patient outcomes and the overall quality of care (Topal et al., 2005). The use of protocol-based care provides the nurse with increasing autonomy and positively affects delivery of care (Ilott et al., 2006; Rycroft-Malone et al., 2008). Clinical protocols are developed by healthcare teams and are based on systematic review of the scientific evidence (Harbour and Miller, 2001). The strength of the evidence is graded and agencies developing protocol-based care policies must assess the applicability, consistency and clinical impact of the evidence (Hadorn et al., 1996; Harbour and Miller, 2001).

Ilott et al. (2006) defined protocol-based care as "*the standardization of the processes of clinical care in documents, such as protocols, pathways, algorithms or guidelines*" (p. 548). In 1997, the Agency for Healthcare Research and Quality (AHRQ) created the National Guideline Clearinghouse (NGC) to represent protocol development that was in harmony with the Institution of Medicine (IOM) (Clearinghouse, 2014). In 2014, the definition of protocol-based care was revised and defined as the standardization of care based on the scientific evidence to optimize patient outcomes (Clearinghouse, 2014). The CDC developed guidelines for CAUTI and hospitals that adopted the guidelines and implemented protocol-based care have decreased CAUTI rates (Gray, 2010).

Implementation of protocol-based care bundles to prevent CAUTI

Evidence based research has identified interventions to combat urinary catheter infection and utilization rates and these interventions have been incorporated into protocol-based insertion bundles (Flodgren et al., 2013; Gray, 2010). A multi-phase study conducted in an ICU and two step down units (SDUs) in a Brazilian hospital that implemented CDC recommended protocols and the Institute for Healthcare Improvement's (IHI) bladder bundle (Marra et al., 2011). The results were statistically significant with a reduction in the CAUTI rate in the ICU from 7.6 to 5 per 1000 catheter days and in the SDUs from 15.3 to 12.9 per 1000 catheter days (Marra et al., 2011). This study was conducted in a single hospital and did not collect continuous data on the units prior to the implementation of the bundle intervention (Marra et al., 2011).

Studies conducted in ICUs of hospitals that are members of the International Nosocomial Infection Control Consortium (INICC) were done to assess the impact of a multidimensional infection control strategy on CAUTI rates (Kanj et al., 2013; Leblebicioglu et al., 2013; Navoa-Ng et al., 2013; Rosenthal et al., 2012). This international study included 15 developing countrieswith a total sample size of 56, 429 patients in 57 ICUs (Rosenthal et al., 2012). Rosenthal et al. (2012) conducted a meta-analysis of the multiple studies involved in the INICC to evaluate the impact of the bundle intervention strategy on CAUTI rates as a whole. The interventions included in the bundle were: (1) proper hand hygiene, (2) to maintain collection bag lower than the level of the bladder, (3) to maintain unobstructed urine flow, (4) to empty collection bag at regular intervals and avoid allowing the draining spigot to touch the collection container, and (5) to monitor CAUTIs using standardized criteria (Rosenthal et al., 2012). The results of the combined studies were statistically significant with 253,122 urinary catheter days recorded). The CAUTI rate decreased from 7.68 to 4.95 per 1000 catheter days after implementation of the bundle intervention (Rosenthal et al., 2012). The strength of these combined studies were that they took place in multiple institutions, in different types of adult ICU setting, in different countries and had large sample sizes. Limitations included a lack of resources to collect more data on process surveillance and compliance with all interventions in the bundle (Kanj et al., 2013; Leblebicioglu et al., 2013; Navoa-Ng et al., 2013; Rosenthal et al., 2012).

Inappropriate use of urinary catheters, improper insertion technique and poor management of the catheter once inserted have been identified as major factors that lead to unnecessary infections (Tatham et al., 2015; Tsai et al., 2015). A study by Tsai et al. (2015) implemented a UTI care bundle that included a staff education session and an insertion and daily care checklist. The insertion and daily checklist included hand hygiene, perineum washing, care of the urine container, keeping a closed system and daily review of catheter necessity. The CAUTI rate decreased significantly after implementation of the care bundle from 6.10% in 2013 to 3.47% in 2014 (Tsai et al., 2015). Another quality improvement study that implemented insertion and maintenance care bundles based on national guidelines had similar success in decreasing CAUTI rates and also identified the need to engage staff by conducting education sessions and providing frequent feedback on patient outcomes (Tatham et al., 2015).

Measuring effectiveness of protocol-based care

Measuring protocol-based care is a challenge. Often, patient outcomes, reduced length of stay (LOS) and improved documentation are used to determine the effectiveness of standardization of care (Rycroft-Malone et al., 2004). A study conducted by Rycroft-Malone et al. (2008) used a multifaceted approach to measure protocol-based care which included: (1) direct observation of activ-

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