An Innovative Educational Approach to Reducing Catheter-Associated Urinary Tract Infections: A Case Study

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abstract

Best practices for urinary catheter insertion and care are well documented in the literature. However, the development of educational methods to address best practice standards has been relatively stagnant. A novel educational approach to teach practicing providers proper catheter insertion and care was developed under a blended learning model with online videos and hands-on simulations. The education was custom created for each participant role. This education also highlighted the providers’ own hospitals’ catheter-associated urinary tract infections (CAUTI) rates, the negative patient outcomes that have occurred as a result of CAUTIs, and the financial burdens caused by CAUTIs. Results showed a significant inverse relationship between whether the education was occurring and the number of monthly CAUTIs. The results provided evidence that engaging frontline workers in blended learning catheter care simulation education was significantly associated with a lower number of monthly CAUTIs. Other institutions can design similar educational interventions to reduce their CAUTI rates.


Indwelling urinary catheters are useful tools in the care of patients with specific medical needs. However, if the catheters are not cared for in an appropriate manner or are not removed promptly, significant complications may arise, such as physical pain or catheter-associated urinary tract infections (CAUTIs). A CAUTI is defined by the Centers for Disease Control and Prevention (2013) as an infection caused by the insertion of an indwelling urinary catheter for more than 2 calendar days on the day of event where placement of the device is considered to be day one. CAUTIs are one of the leading causes of hospital-acquired infections in health care. Urinary tract infections account for 35% of all hospital-acquired infections, and CAUTIs increase the cost of care for each patient by $2,800 and increase the lengths of stay by 2 to 4 days (Burnett et al., 2010). Although some urinary infections can be minor, others may lead to sepsis or death in patients who are in a compromised state of health.

Hospitals must reduce these hospital-acquired infections, including CAUTIs, to improve the quality of care by enhancing patient safety leading to positive health care outcomes. Furthermore, as another driving force to reduce CAUTIs, the Center for Medicare and Medicaid Services will no longer reimburse a hospital for the additional cost of treating an infection that resulted from a Foley catheter placed within that institution (Revello &

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Gallo, 2013). Hence, it is imperative that hospitals modify Foley catheter protocols to ensure that best practices in insertion and care are routinely followed.

Although the basic principles for appropriate use and maintenance of indwelling Foley catheters are well documented in the literature, hospitals need to be proactive in ensuring that the frontline staff receives the needed education and skills competencies to safely and efficiently care for these patients. Therefore, the authors developed a fresh, dynamic approach to teach interprofessional health care team members, including nurses, nursing assistants, and transporters, catheter care and CAUTI prevention education using a blended learning model. A blended learning model refers to education where part of the curriculum is administered over a form of electronic media. The catheter care education in this project consisted of a self-paced review of indwelling Foley catheter insertion and maintenance policy and procedures, an online module, and hands-on simulations. Nurses were expected to be knowledgeable and skilled in proper catheter insertion and care after completion of this education. It was also expected that participants would have a renewed awareness of the dangers of improper catheter care and the negative patient and institutional effects of CAUTIs. In turn, these outcomes were expected to result in a decrease in CAUTI rates.

**CASE STUDY**

The CAUTI prevention education was based on a blended learning model that included online videos and hands-on simulations. This educational model was selected to provide participants with the most efficient and effective means to learning, while also satisfying the learning styles and preferences of adults. The course content included theoretical material of the current best practices of catheter care and the four best practices of CAUTI prevention, including the following (Wong & Hooton, 2005):
- Preventing unnecessary urinary catheter insertions.
- Proper insertion of urinary catheters.
- Early removal of urinary catheters.
- Accurate documentation.

Learners navigated a slide presentation and online videos, custom designed for their unique roles as nurses, nursing assistants, or transporters at their own convenience and at their own pace. For example, nursing assistants and transporters did not insert catheters at this time, and so their education excluded insertion best practices and instead was focused on catheter care. Their education consisted of three main topics: daily cleaning, proper positioning, and emptying the bag for transport or ambulation. Nonetheless, all online modules emphasized the importance of catheter care and CAUTI prevention by including statistics on the staff member’s own hospital’s CAUTI rates, descriptions of the negative outcomes patients experienced due to increase in length of stay caused by CAUTIs, and the dollar amounts of how much reimbursement money was missed. The module concludes with a short examination that the learner must pass before moving on to the second component of the education. Again, three examination versions were used to align with each role. The examinations consisted of five multiple choice questions that were created by the director of interprofessional education based on protocol and best practice standards for insertion. The participants were required to correctly answer four questions (80%). If they missed more than one item, the participant met with the nurse educator on their unit for a review of the hospital policy and then had to watch the video again and retake the examination until they earned a passing score.

After participants completed the online module, they applied that knowledge by practicing their skills via hands-on, in situ simulations. The use of simulation with Nursing Anne manikins allowed participants to polish and perfect their skills through repeated practice in a safe environment, which is in stark contrast to the traditional approach of “see one, do one, teach one,” which does not permit any opportunity to practice the technique. Each nurse participant was required to insert a Foley catheter using the sterile technique on both male and female patients following hospital policy and under the supervision of a nurse educator. The nurse assistants and transporters were required to demonstrate proper Foley catheter care only. These simulations were self-directed, had immediate relevance to their jobs, and were problem centered, thus satisfying preferences of adult learners as stated in Knowles’ (1984) theory of adult learning.

Participants were deemed competent if they properly completed each step of the insertion process, from introduction of the procedure to the documentation of a successful catheter placement. The simulation facilitator used a 34-item checklist to ensure that all steps of nurses’ catheter insertions were successfully completed. If they were deemed incompetent, the participant had to watch the online video again, review the procedure one-to-one with the nurse educator, and then redo the simulation.

This CAUTI education was administered to a convenience sample of 680 nurses, nursing assistants, and transporters from a 350-bed acute care hospital in western Pennsylvania. This hospital is a level II trauma center, a certified stroke center, and an accredited chest pain center, and it has a nationally recognized cardiovascular surgery center. It houses 10 inpatient nursing units that
includes an 18-bed intensive care unit, a 12-bed coronary care unit, a mental health unit, and a level II nursery. This hospital typically receives 15,000 inpatient admissions annually.

RESULTS

The number of CAUTIs that this hospital experienced 15 months prior to the education and during the 15 months of education were tracked. During the educational months, the educators completed daily audits to track the CAUTI rates. This project only tracked CAUTI rates from patients who received their catheter in this hospital, not rates originating from patients who were admitted to this hospital with a catheter already in place. SPSS version 22.0 software was used to conduct descriptive and inferential analyses of the data. During the 15 months prior to education, there were 33 reported CAUTIs. In contrast, during the 15 months as the education was rolled out to the hospital, the number of CAUTIs dropped by more than half to 14. Indeed, there was a significant inverse relationship between whether education was administered and the monthly number of CAUTIs, with a point-biserial correlation of $r = -0.45, p = .01$.

In addition, all three measures of central tendency provide evidence that the frequency distribution of CAUTI infections during the education shifted from the frequency distribution before the education. During the 15 months prior to the education, the mode (i.e., most frequent) number of monthly CAUTIs was three, whereas during the training the mode number of monthly CAUTIs was zero. The median number of monthly CAUTIs was two before the education and only one during the education. Likewise, the mean number of monthly CAUTIs decreased from 2.2 before the education to 0.9 during the education. Even the range of the number of CAUTIs was shortened during the educational months. The maximum number of monthly CAUTIs experienced in one month before the education was five, whereas during the education roll-out, the highest number of monthly CAUTIs was two.

DISCUSSION

The results provided evidence that engaging nurses, nursing assistants, and transporters in an innovative blended learning education with simulation on catheter care was significantly associated with a lower number of monthly CAUTIs, improving the quality of care provided to the patients. The reduced number of CAUTIs also brought some financial advantages to the hospital, as the associated costs of infections also decreased. Without additional CAUTI complications, expenditures would be reduced and patient stays would likely be shorter.

This educational approach was novel because the learners interacted with the material in several formats, through online videos, slideshows, and high-fidelity, hands-on simulations. Learners were also assessed in multiple ways to ensure competence, through an online examination and performance assessments. The standardized education and various learning checkpoints empowered the educators to ensure that all nurses, nursing assistants, and transporters were adequately knowledgeable or skilled at each portion of the training, both theoretically and clinically. This multiple modality education satisfied the various learning styles that the health care providers may have had with auditory, visual, and hands-on stimulation. This education was also novel in the way in which it remediated participants who were deemed incompetent, with immediate remediation on site one-to-one with the educator. Education leaders continue to monitor the CAUTI rates of this hospital. Weekly review of real-time data from quality scorecards has shown a sustained reduction in CAUTI rates, although educators still provide the one-to-one, just-in-time education if and when needed. Furthermore, this education is included as an annual competency and also as a part of nursing orientation.

CONCLUSION

Although this educational model etched a path for others to follow, further research needs to be done to ensure its effectiveness and applicability. This education needs to be offered to a broader population, as this project was limited to a convenience sample at one hospital. The online quiz needs to include additional items to ensure its reliability and more evidence needs to be procured to validate it. Future researchers need to gather the demographics of the participants and their units to further investigate and understand the relationships among the education, the health care providers, and the CAUTI rates. Other possible confounding variables need to be considered and investigated. Future researchers may also apply this educational model and design to other problematic procedures as well, instead of just catheter insertion.

CAUTIs have serious consequences for both patients and hospitals, and this project provided evidence that a novel, blended learning, proactive educational intervention had positive results in decreasing the number of monthly CAUTIs. Other institutions can design similar educational interventions to reduce their CAUTI rates.
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