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Major article

Sustainability of a program for continuous reduction of catheter-associated urinary tract infection

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Key Words:
Catheter-associated urinary tract infection
health care–associated infection prevention
urinary catheter

Background: Urinary tract infections account for 8%-21% of health care–associated infections; of these, 80% are associated with the use of a urinary catheter.
Methods: A quasi-experimental study was conducted in 2 medical-surgical intensive care units (ICUs) with 48 beds and 3 step-down units (SDUs) with 95 beds in a private tertiary care hospital in Sao Paulo, Brazil. The study had 3 phases over a 9-year period to determine the sustainability of a program for continuous reduction of catheter-associated urinary tract infection (CAUTI).
Results: Over the 3 phases of the study, rates of CAUTI in the ICUs fell from 7.0 to 3.5 to 0.9 infections per 1,000 catheter days. In the SDUs, CAUTI rates decreased from 14.9 to 6.6 to 1.0 per 1,000 catheter days. Comparisons of CAUTI rates in the 3 study phases, both in the ICUs and SDUs, showed significant reductions both between the 3 periods and in all possible combinations of analysis phases (all $P < .001$).
Conclusions: These results suggest that it is possible to reduce CAUTI rates to near zero and sustain these rates, but it requires a multidisciplinary team with different strategies that require continuous monitoring.

Catheter-associated urinary tract infection (CAUTI) remains a common adverse event in hospitalized patients.[1] Of the health care–associated infections that occur in intensive care unit (ICU) patients, 8%-21% are urinary tract infections (UTIs)[2]; of these, 80% are associated with urinary catheters (UCs).[3] This device is considered the major risk factor for the development of nosocomial UTI.[1,4]

The search for solutions to this problem has gained more attention since 2008, when the U.S. Centers for Medicare and Medicaid Services began a new policy limiting reimbursement for hospitalizations associated with health care–associated infections.[5] Although this policy does not influence Brazilian hospitals, our hospital is actively engaged in preventing CAUTI. CAUTI is considered a quality of care metric that affects the annual bonus received by our institution's employees.

In 2011, our team published a study[6] of 2 phases showing a series of measures and interventions carried out between June 2005 and July 2010 that led to a statistically significant reduction in the rate of CAUTI in the ICU, from 7.6 per 1,000 catheter days (95% confidence interval [CI], 6.6-8.6) before the intervention to 5.0 per 1,000 catheter days (95% CI, 4.2-5.8; $P = .001$) after the intervention. We also found a statistically significant reduction in the rate of CAUTI in the step-down units (SDUs), from 15.3 per 1,000 catheter days (95% CI, 13.9-16.6) before the intervention to 12.9 per 1,000 catheter days (95% CI, 11.6-14.2) after the intervention ($P = .014$).

Our current study aims to demonstrate that new interventions implemented in these units further reduced these rates and also analyzes the microorganisms involved in CAUTI over the different phases of the study.

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METHODS

Setting and study design

This quasi-experimental study was conducted in 2 medical-surgical ICUs with 48 beds and 3 SDUs (general, neurologic, and coronary care units; 95 beds), all with the same physical layout in a private tertiary care hospital in Sao Paulo, Brazil from June 2005-August 2014. The ICU has an open staffing model and admits approximately 2,200 patients annually. In our open staffing model ICU, a patient's primary physician is responsible for all medical care decisions. In many open ICUs the primary physician works together with intensivists. All rooms in the ICUs and SDUs are single-bed rooms. The ICU receives patients from the SDUs, various wards, and the emergency department. The SDU patients are transferred from the medical-surgical ICU, various wards, and the emergency department. This study was approved by the institutional review board of our hospital.

In the previous study,[6] the interventions were divided into 2 phases. In phase 1 (June 2005-December 2007), ICU nurses or physicians (primarily urologists) inserted UCs using an aseptic technique with a 2% chlorhexidine preparation for skin antisepsis. Catheter insertion and maintenance were in accordance with the Centers for Disease Control and Prevention (CDC) guidelines.[7] The decision to remove a UC was made solely by the patient's physician, with catheters kept in place until it was no longer needed or until an adverse event necessitated its removal (eg, obstruction of the catheter, catheter causing discomfort to the patient). Each year, in a convenience sample of patients, UC insertion was directly observed by assigned nurses, who provided feedback on compliance with appropriate practices to the ICU team via e-mail.

In phase 2 (January 2008-July 2010), after the hospital's chief executive officer articulated a policy of zero tolerance for CAUTIs, we continued the processes we started in phase 1, but we audited these process measures once monthly at random intervals in a small sample of patients undergoing UC insertion. In January 2008, we implemented the bladder bundle. The bundle components included the creation of a UC insertion cart, hand hygiene, chlorhexidine skin and meatal antisepsis, sterile field and sterile gloves, only 1 attempt at insertion allowed for each catheter (ie, a new catheter was used for each attempt), adequate UC balloon inflation, and daily review of the need for a UC with prompt removal if no longer needed. The bundle was used for all ICU and SDU patients requiring a UC. Nurses intervened in this process at the same time that performance monitoring was occurring at the bedside if noncompliance with an element of the bundle (eg, hand hygiene was not performed) was detected during UC insertion.[6]

Phase 3 (July 2013-August 2014) began after an increase in the number of CAUTIs prompted a number of new interventions, starting with the hiring of a senior nurse to exclusively coordinate the actions for prevention for UTIs in the ICUs and SDUs. The bladder catheter insertion technique and maintenance care were kept unchanged. Some interventions from phase 1 and 2 were adjusted, including the intensification of audits on UC insertion and maintenance and the training model of nursing staff involved in the project (Fig 1). In July 2013, a UC insertion team composed of nurses and nursing technicians was created. The idea was that only members of this team would insert catheters after receiving didactic and simulation training. The urologists were allowed to insert catheters, but they were monitored and followed the same rules as the catheter insertion team for CAUTI prevention.

Taking into account the number of UCs inserted daily in each unit per shift, it was estimated that training of 30% of all nursing staff would be required. During the month of July 2013, approximately 150 members of the nursing staff of the ICUs and SDUs were trained to perform UC insertion on a mannequin precepted by the senior nurse and 4 nurses previously trained to be trainers.

All of the rest of the nursing staff, or staff members who did not make up the team, were approached by the trainer nurses with lectures where they could review the insertion and maintenance of UCs. Beginning in July 2013, only team members were permitted to insert UCs in the ICU. All procedures were audited by the nurse on duty using a standardized checklist (Fig 2). The trainer nurse intervened if any noncompliance was observed. The criteria for removal of UCs based on the CDC's criteria[8] were implemented, and daily audits to stimulate the removal of inappropriate UCs were performed by 5 nurses in a systematic manner guided by the senior nurse. The catheter team began to receive monthly emails on UTI rates, and update classes on subjects related to bladder catheterization were scheduled. The classes were taught by the senior nurse and designed to answer questions and assist in solving perceived difficulties.

A group of 12 nurses who were members of the insertion team also received training in the use of ultrasound in order to assess bladder volume and more accurately monitor cases of urinary retention. This new tool allowed choosing the best approach for each patient with possible urinary retention after removal of the bladder catheter. Data were collected to assess the need for program

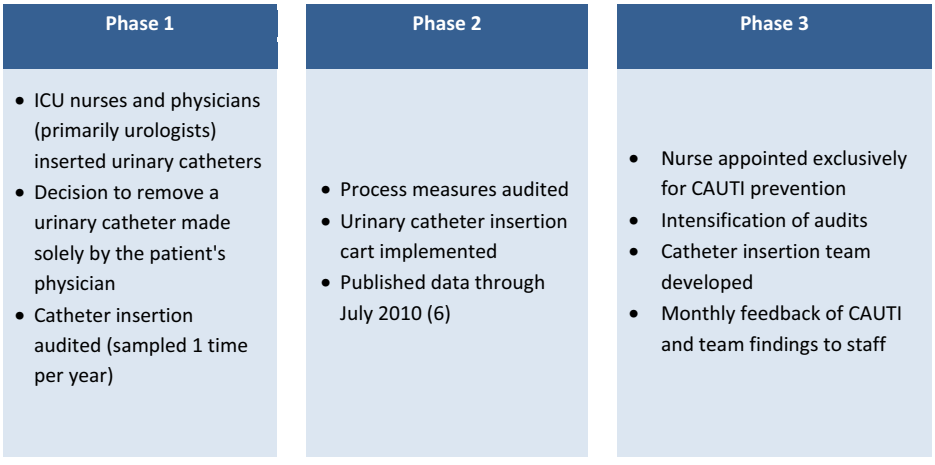

Fig 1. Study design. Phase 1 (June 2005-December 2007) was described in our previous publication.[6] We extended data collection in the present article from January 2008-June 2013 in phase 2 and from July 2013-August 2014 in phase 3. *CAUTI*, catheter-associated urinary tract infection; *ICU*, intensive care unit.