National Incidence and Impact of Noninfectious Urethral Catheter Related Complications on the Surgical Care Improvement Project

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Abbreviations and Acronyms

CABG = coronary artery bypass graft

CMS = Centers for Medicare and Medicaid Services

LOS = length of stay

NIS = National Inpatient Sample

SCIP = Surgical Care Improvement Project

UTI = urinary tract infection

Submitted for publication September 9, 2010.
Nothing to disclose.

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Editor's Note: This article is the fourth of 5 published in this issue for which category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 1998 and 1999.

Purpose: We defined the incidence and health outcomes related impact of noninfectious urethral catheter related complications for the 7 surgical procedures monitored by the Joint Commission as part of the Surgical Care Improvement Project.

Materials and Methods: We performed a cross-sectional analysis of the 2007 National Inpatient Sample (a 20% stratified sampling of nonfederal United States hospitals) using ICD-9-CM procedure and diagnostic codes to identify the incidence of catheter related complications for coronary artery bypass graft, and noncoronary artery bypass graft cardiac surgery, hysterectomy, colon, hip, knee and major vascular surgery. Univariate and multivariate analysis (with a significance level of less than 0.05) was performed to determine if these complications were associated with length of stay, urinary tract infections and/or deaths.

Results: A total of 1,420 cases of catheter related complications were identified nationally. The incidence of catheter related complications varied by surgical procedure (average 1 in 528 men and 1 in 5,217 women for all procedures). Univariate analysis revealed that in the presence of catheter related complications, mean length of stay (6 of 7 procedures, range 1.5 to 3.0 days, $p < 0.05$) and urinary tract infection (5 of 7 procedures, absolute range 6.9% to 11.8%, $p < 0.05$) were statistically increased for most procedures. Multivariate analysis demonstrated a significant association between catheter related complications, and increased length of stay (range 1.5 to 3.5 days, $p < 0.05$) and urinary tract infection (OR 2.4–6.8, $p < 0.05$) for 5 and 6 of 7 procedure types, respectively, but not mortality rate (0 of 7 procedures).

Conclusions: Catheter related complications are reported rarely, but are associated with increased length of stay and urinary tract infection rates for patients in the Surgical Care Improvement Project.

Key Words: catheters, urethra, postoperative complications, safety

NONINFECTIOUS urethral catheter related complications, referred to as catheter related complications, are a patient safety issue that has received little national attention, although they are well documented in the medical literature.[1–4] Catheter related complications comprise a slew of accidental urethral injuries experienced by patients at the hand of the medical practitioner or the patients themselves. For the most part these events may be prevented, not unlike venous line infections or patient falls, by heeding to protocols through training. Kashefi et al found the rate of catheter related complications at their institution to be 0.3% for male

0022-5347/11/1855-1756/0
THE JOURNAL OF UROLOGY®

Vol. 185, 1756-1760, May 2011
Printed in U.S.A.
DOI:10.1016/j.juro.2010.12.041

ward patients.[3] This number decreased (but did not disappear) to 0.07% after an educational intervention directed at nurses. However, unlike most other specialized medical/surgical devices, urethral catheters are placed by virtually all health professionals (eg ward and operating room nurses, medical students, residents and attendings) whose medical training and experience can vary substantially, making intensive training more difficult.

In addition, accidental dislodgement of an inflated urethral catheter from the bladder, another type of catheter related complication, is estimated to occur in 5% of the intensive care unit population who are more likely to have altered mental status.[5] While these rates seem small, when one considers that the prevalence of urethral catheterization is greater than 8 million people annually, or approximately 12% to 25% of all patients admitted to a United States hospital, the number of patients potentially affected is actually quite large.[6]

As members of a consulting urology service based in a tertiary care urban hospital, we are aware of the ongoing incidence and deleterious effects of catheter related complications. A concerted effort to reduce the number of such events will require, at a minimum, an estimation of the baseline incidence rate, for which data are lacking. Furthermore, to motivate regulatory agencies to track this problem, which has not been done to our knowledge at any institution, it is useful to be able to describe the impact of such events on the health care system. One such regulatory body is the Joint Commission, which monitors the quality of care for 7 surgical inpatient procedures through the SCIP (major vascular surgeries, CABG and nonCABG cardiac surgeries, hysterectomy, colon, hip and knee surgeries). Therefore, we assessed whether catheter related complications significantly impacted LOS, urinary tract infection and/or inpatient mortality in the SCIP.

MATERIALS AND METHODS

Data and Sample

We performed a cross-sectional study of United States patients identified through the 2007 NIS undergoing 1 of the 7 surgical procedures currently monitored through the Joint Commission's SCIP. The NIS is a database of inpatient discharge abstracts collected via federal-state partnerships as part of the Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project.[7] The 2007 NIS contains records of discharges from United States, nonfederal hospitals located in 40 states. This approximates a nationally representative 20% stratified sample of United States nonfederal hospitals (representing a total number of 39,541,948 discharges).

The NIS data include patient discharge records, including the data elements for LOS, diagnosis codes and death. From the NIS, data for inpatient urethral catheter related trauma were extracted from patients undergoing surgical procedures for which SCIP performance is specifically reported, including coronary artery bypass grafting, major vascular surgery (aneurysm repair, thromboendarterectomy, vein bypass), hip and knee arthroplasty, hysterectomy, other cardiac surgery and colon surgery. Although no variable exists in the NIS to confirm that a urethral catheter was placed, all of these procedure types are highly likely to involve urethral catheterization at surgery. We identified cases using ICD-9-CM codes listed under the primary procedure for each hospital admission via a method defined by the Joint Commission.[8] Patients younger than 18 years old (3,458) were excluded from study since they are not included in SCIP performance measures. Patients were also excluded from study if outcomes data were not available (no length of stay for 3 patients).

Noninfectious urethral catheter related complications were identified through ICD-9-CM diagnostic codes for urethral false passage (599.4), mechanical injury due to indwelling catheter (996.31), other mechanical complication due to genitourinary device (996.39), other complications due to genitourinary device, implant and graft (996.76), and surgical misadventure as a result of urethral catheterization (E879.6). Specific ICD-9-CM diagnostic codes exist for infectious urethral catheter related complications but were not the focus of this study.

Analysis and Statistics

We used weighted hospital discharge rates to calculate the national incidence of noninfectious urethral catheter related complications during each surgical procedure. We then used the Student t test to examine whether a binary variable (noninfectious urethral catheter related event) and a continuous variable (LOS) had any relationship. A chi-square analysis was used to determine if catheter related complications had an association with UTI, inpatient death, gender or the nature of the surgical procedure being performed (elective vs emergency).

Multivariate analysis was then performed with linear and logistic regression, respectively, to consider patient variables such as age categorized by decade, gender, comorbidities and type of admission (emergency vs elective) in the determination of whether confounding explained the results of our univariate analysis. Comorbidities were defined in the severity file by the Elixhauser classification, which is a well cited system used in calculating risk adjusted mortality rates.[9]

A 2-sided significance level of 0.05 was used for all hypotheses tests with a 95% CI. Size effect was reported and all analyses were performed using Stata/SE® version 10.0 software. This study was exempt from institutional review board review as no patient identifiers are listed in the NIS.

RESULTS

Incidence and Characteristics

A total of 416,389 cases (representing 2,036,816 cases nationally) were performed in the 2007 NIS for all of the 7 surgical procedures examined. There were 288 cases (representing 1,420 cases nationally)