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Errors in bladder catheterization: are residents ready for complex scenarios?



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ABSTRACT

Background: The aim of this study was to investigate whether junior surgical residents had successfully mastered bladder catheterization. Our hypothesis was that surgical residents would be overly confident in their abilities and underestimate the potential for case complexity.

Materials and methods: PGY 2-4 surgery residents ($n = 44$) were given 15 min. to complete three of four bladder catheterization simulations. Participants reported their mastery by rating confidence using a 5-point Likert scale. Multiple linear regression analysis was used to test predictors of procedure performance.

Results: Participants made a total of 228 errors with an average of 5.1 errors (standard deviation = 2.6) per participant. The most common errors included not maintaining the sterile field (52.0%), failure to get urine return (20.3%), and inflating the catheter balloon before urine return (8.4%). Some residents committed the same error more than once. Presimulation confidence ratings ranged from "1" being not confident to "5" being extremely confident. Average presimulation confidence was 4.42 (range 1-5, standard deviation = 0.85). Sixteen (36%) residents ranked their presimulation confidence in problem-solving abilities as "moderately confident" or below, whereas 28 (64%) were "very confident" or above. The lower the resident's presimulation confidence in problem-solving, the more errors they committed during the simulation ($\beta = -0.33$, $t = -2.15$, $P = 0.04$).
Conclusions: The residents did not perform as well as they anticipated when presented with more complicated bladder catheterization scenarios. Simulation can be used to identify and expose potential errors that may occur during complex presentations of basic procedures. This type of training and assessment may facilitate mastery.

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Introduction

Catheter-associated urinary tract infections (CAUTI) are currently the number one hospital-acquired infection in the United States. The CDC estimates that CAUTI attributes to 13,000 deaths and at least \$400 million in additional cost per year nationally. The detrimental effects of CAUTI have caused

the CDC to define a set of Core Prevention strategies with high-level evidence for prevention. Proper training of personnel and maintaining sterile insertion technique are included in the Core Prevention strategies as defined by the Centers for Disease Control and Prevention.¹⁻³ Although nurses perform a majority of urinary bladder catheterizations in the hospital, physicians are often called on for more complex placements.

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The Association for Healthcare Research and Quality has released a safety program dedicated to the prevention of device-associated infections. The safety program focuses on training resident physicians to be CAUTI-prevention experts, as they are often the first physicians to see the patient.⁴

The current body of literature indicates that simulation training can enhance residents' confidence and performance in performing surgical and bedside procedures.⁵⁻⁷ However, simulation programs can vary widely among medical schools and residency training programs and do not always include complex presentations of procedures for training and assessment.^{8,9} In 2007, the ACS/APDS Surgical Resident Skills Curriculum was developed in an attempt to standardize training of surgical residents. According to the ACS/APDS curriculum, urethral catheterization should be mastered during the PGY1 and 2 y.¹⁰

The aim of this study was to investigate whether surgical residents had successfully mastered bladder catheterization. We intended to determine the level of mastery of this basic procedure by presenting more complex and well-known clinical scenarios. Our hypothesis was that surgical residents would be overly confident in their abilities and underestimate the potential for case complexity.

Materials and methods

Setting and participants

General surgery residents (PGY 2-4, $n = 44$, 55.6% female, 44.4% male) from seven Midwest training programs participated in this study. Surgical residents in their dedicated research years made up 60% of the participants. Study participants were given 15 min to complete three bladder catheterization simulations. Data were captured using motion-tracking software and video and audio recording. Participants were double gloved using their normal size surgical gloves. Motion-tracking wires were secured on their hands between the two gloves. Participants were given no feedback on their performance after completion of the simulation. This study was approved by the University of Wisconsin-Madison Social and Behavioral Sciences Institutional Review Board.

Bladder catheterization simulations

Study participants completed three of four randomized bladder catheterization simulations as part of a larger study. The simulations represented well-known clinical scenarios: a female trauma patient, a female preoperative patient, a preoperative male with a full urethral blockage, and a male with urinary retention due to benign prostatic hypertrophy (Table 1). This study used modified Limbs & Things and Nasco bladder catheterization models. The female trauma patient was a standard model that returned bloody urine to indicate prior trauma. The female preoperative patient simulation was created by adding sutures to the inside of labia to simulate a labial stricture. The penile urethra was completely tied off inside the model to simulate a male with complete urethral blockage. Finally, the penile urethra in male with partial

Table 1 – Description of the four simulated bladder catheterization procedures.

Description	Clinical scenario	Unknown pathology
Female trauma	Motor vehicle accident, pelvic fracture	Bladder injury
Preoperative female	None	Labial constriction
Preoperative male	Rectal cancer, preoperative lower anterior resection	Complete obstruction
Male, retention	Benign prostatic hypertrophy	None

urethral structure was partially obstructed using a polyethylene tube.

Participants were given a short description of the clinical scenario that corresponded with each simulation. Participants were provided with a simulated catheterization kit including sterile water, lubricant, and a choice of five different catheter sizes. The residents were told to assume that the field was sterile, and the patient had been prepped. In addition, participants were given the option to place a urology consult at any point in the simulation.

Participant data

One investigator reviewed video and audio data from each participant and evaluated procedure performance. Errors were defined using the ACS/APDS Technical Skills Curriculum.¹⁰ Investigators used a standard rubric from the ACS/APDS Technical Skills Curriculum to evaluate errors. Error definitions are shown in Figure 3. The residents were asked to complete a survey both before and after simulation. They rated the perceived procedure difficulty and their personal confidence level using a 5-point Likert scale for three categories: identifying relevant anatomy, problem-solving, and completing the entire surgical task (Fig. 1). They also rated the amount of skill reduction they expected as a function of their dedicated time in laboratory research.

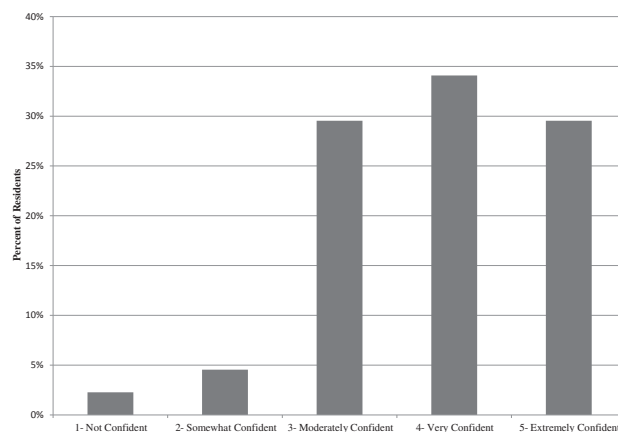


Fig. 1 – Resident presimulation confidence in problem-solving ability for urinary catheterization.

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