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A Simulation-based, cognitive assessment of resident decision making during complex urinary catheterization scenarios



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ABSTRACT

Background: This study explores general surgery residents' decision making skills in uncommon, complex urinary catheter scenarios.

Methods: 40 residents were presented with two scenarios. Scenario A was a male with traumatic urethral injury and scenario B was a male with complete urinary blockage. Residents verbalized whether they would catheterize the patient and described the workup and management of suspected pathologies. Residents' decision paths were documented and analyzed.

Results: In scenario A, 45% of participants chose to immediately consult Urology. 47.5% named five diagnostic tests to decide if catheterization was safe. In scenario B, 27% chose to catheterize with a 16 French Coude. When faced with catheterization failure, participants randomly upsized or downsized catheters. Chi-square analysis revealed no measurable consensus amongst participants.

Conclusions: Residents need more training in complex decision making for urinary catheterization. The decision trees generated in this study provide a useful blueprint of residents' learning needs.

Summary: Exploration of general surgery residents' decision making skills in uncommon, complex urinary catheter scenarios revealed major deficiencies. The resulting decision trees reveal residents' learning needs.

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1. Introduction

This study explores how simulation can be used to objectively assess decision making abilities of general surgery residents. While urinary catheterization responsibilities have shifted predominantly to nursing staff, house staff are typically responsible for complex scenarios. Competency in such scenarios, however, requires excellent psychomotor and decision-making skills. Recently, surgical educators have placed greater emphasis on evaluating clinical decision making throughout the continuum of training.¹ Decision-making is considered an aspect of the hidden curriculum and could benefit greatly from explicit training and assessment.² Prior work related to clinical decision making focused on analyzing procedural outcomes rather than examining the factors that may affect decisions before or during a procedure.^{3–5} In addition,

feedback on decision making commonly occurs in an unstructured environment that is known to be limited in breadth and subject to instructor bias.⁶

An example of formative assessment of clinical decision making and judgment is the mock oral examinations. These assessments may be administered to senior level residents multiple times a year.⁷ Experts recognize, however, that mock oral exams cannot capture all of the facets of real-life clinical decision making and may fail to capture whether residents can competently avoid risks based on complex clinical presentations.⁷ Additionally, performance on traditional verbal assessments (on rounds, clinic, etc) is not an adequate representation of actual clinical decision making skills as it may be affected by format familiarity and topic predictability.⁷

The introduction of simulation significantly changes the way that assessment occurs in surgical training. Many training programs have adopted simulation and have curricula that support structured, objective assessment of trainee performance.^{8–14} However, many of the assessment methods that employ hands-on simulation focus on technical skills performance and include procedure-specific and general rating scales, final product analysis,

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or critical procedure errors.^{15,16} As such, there is still a need to better understand and incorporate assessments of surgical and procedural decision making in simulation based evaluations. In our prior work, we have developed and evaluated the utility of combining decision focused assessments with technical skills assessments and providing feedback.^{6,17} We have found that simulation can improve upon the process of assessment by incorporating decision making into a comprehensive, structured, and objective evaluation and feedback.

While competency in urinary catheterization is expected, it remains unclear whether residents have the skill and knowledge to address complex scenarios.¹⁸ The first aim of our study is to see how simulation can be used to objectively assess decision making abilities of general surgery residents. Our second aim is to assess the surgical trainee's ability to navigate the work up and subsequent decision making in complex clinical scenarios involving the urinary tract. We hypothesize that residents will make inconsistent decisions for clinical scenarios where they suspect pathological conditions.

2. Materials and methods

2.1. Setting and participants

This study was a part of a longitudinal skills decay study primarily interested in skill attrition secondary to nonuse of medical and surgical knowledge. As such, surgical residents in their first year of dedicated research were the primary focus for recruitment for this study. Residents in their second year of research and clinical residents who showed interest were allowed to participate. Recruitment took place primarily by telephone or electronic correspondence to individuals in charge of resident education. All programs that were within reasonable driving distance from the home institution were contacted. The final group included seven Midwest general surgery training programs.¹⁹ Data was collected in the summer of 2014 and participation was completed voluntary. The University of Wisconsin Hospitals and Clinics (UWHC) Institutional Review Board gave approval for this study.

2.2. Research protocol

Study participants completed a demographic survey. Following the survey, participants were directed to the urinary catheter station. Residents were first asked to perform sterile, urinary catheterization on three, anatomically different simulation models. After completion of the catheterization task, a researcher presented individual participants with cognitive scenarios regarding complex urinary pathologies. Their verbal responses were audio-recorded. Residents were allowed a total of 15 min to complete this station. Those who did not complete the station were asked to stop and move on to other portions of the longitudinal study.

Participants were given two cognitive scenarios. Scenario A is a 40 year old male presenting as a trauma with blood at the urethral meatus and a non-palpable prostate. Scenario B is a 75 year old male with an enlarged prostate presenting with septic shock secondary to pneumonia, requiring urinary catheterization for monitoring of resuscitation. Participants were asked to verbalize potential difficulties associated with the pathologies and whether or not they would place a catheter in the patient based on those difficulties. The participants who vocalized that they would catheterize were asked to further elaborate on catheter sizes and types. The participants that chose to not place a catheter were asked what steps they would take to address the suspected pathology. Participant's responses to the cognitive scenarios were recorded and transcribed using Transana.²⁰

2.3. Data analysis

Using techniques described originally by decision analysis research, decision trees were developed from participant responses after they were coded and graphed.²¹ Serial and sequential decisions were arranged vertically along branches. Red stop signs indicate decisions to consult Urology. Chi-Square analyses tested the probability of equal frequency of decision type for the first two levels of the decision tree. Only the first two levels of the decision tree were analyzed as the majority of residents were unable to provide third or fourth level decisions on the tree. Comparative analysis was performed at the group level and the post-graduate year (PGY) level to explore potential difference in response. A power analysis was performed to ensure that the study had an adequate number of participants for the given analyses. All analyses were performed using SPSS 23.²²

3. Results

Forty general surgery residents (55% female) between their second and fourth post-graduate year (M = 2.74, SD = 0.92) participated in the decision making exercise. Residents were at various stages in their training: 14.3% were in their first research year, 65.7% in their second research year, 2.9% were in their third year of research and 12.5% were in their clinical year. Per self-report, none of the residents had recent rotations on a Urologic service within one year prior to participating in this study. 100% of residents (N = 40) completed the cognitive scenario of the male trauma and 75% (N = 30) completed the geriatric male scenario. With power set at 0.8 and alpha 0.05, power analysis determined that our sample size was adequate to detect statistical significance at $p < 0.05$.

There was no group or PGY level consensus amongst participants for the male trauma scenario. Analysis revealed that 55% (N = 22) chose to proceed with catheterization, whereas 45% of participants (N = 18) chose to place a Urology consult immediately ($\chi^2 = 0.40$, $p = 0.527$). For the group that consulted Urology, 4 participants vocalized that they would also place a suprapubic catheter if the bladder was full ($\chi^2 = 5.56$, $p = 0.018$). For those who chose to catheterize, 47.5% (N = 19) vocalized the decision to gather more information by running a diagnostic test. The majority of those who chose to run diagnostic tests vocalized the need for a retrograde urethrogram (32.5%, N = 13, $\chi^2 = 36.55$, $p < 0.001$). The remaining tests included a cystogram (N = 2, 2.5%), a pyelogram (N = 1, 2.5%), a retrograde urethrocytogram (N = 2, 5%) and a bladder scan (N = 1, 2.5%). Only 7.5% (N = 3) of participants chose to place a catheter without first ordering an ancillary test.

If an injury was indicated by a retrograde urethrogram, participants provided very different next steps including, ordering a pyelogram (N = 1, 2.5%), placing a suprapubic catheter (N = 1, 2.5%), placing a urology consult (N = 1, 2.5%) or placing both a urology consult and then a suprapubic catheter. A complete decision tree including all participant responses is represented in Fig. 1.

When evaluating the results for Scenario B (geriatric male), again, there was no consensus amongst the residents at the group or PGY level after the first decision. After reading the clinical scenario 86.7% chose to catheterize the patient. The other 13.3% (N = 4) chose to place a Urology consult ($\chi^2 = 17.07$, $p < 0.001$). For those who chose to catheterize, the 16 French (Fr) Coude was chosen most often (36.7%, N = 11). Additional catheter choices included: 12 or 14 Fr Foley catheter (30%, N = 9), 12 or 14 Fr Coude (13.3%, N = 4), or 16 Fr Foley (6.7%, N = 2) ($\chi^2 = 14.30$, $p = 0.006$). One participant reported that they would first order a cystogram followed by placing a 12/14 Fr Coude catheter.

In the case of initial catheter failure, participants randomly chose to upsize or downsize catheters or consult Urology. No

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