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# *Proposal to decrease incidence, morbidity, and associated healthcare costs regarding difficult and traumatic urethral catheterization – a protocol for DMC hospitals: A pilot study*

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SARVER J, FARLEY R, DAUGHERTY S, BILBREW J, PALKA J. Proposal to decrease incidence, morbidity, and associated healthcare costs regarding difficult and traumatic urethral catheterization – a protocol for DMC hospitals: A pilot study. *Can J Urol* 2023;23(4): 11624-11628.

**Introduction:** *Difficult and traumatic urethral catheterization is a common reason for urologic consult. Catheter insertion and management is common for patients who are managed in the hospital setting.*

**Materials and methods:** *A four-question survey was distributed across three hospitals at a single-institution.*

**Results:** *A total of 41 nursing staff responses were recorded. Forty-four percent of the nursing staff reported prior participation in a traumatic catheter insertion. Ninety percent of total responders reported a prior involvement with a difficulty catheter.*

**Conclusion:** *Patient morbidity and healthcare costs regarding traumatic and difficult catheterization is significant. Utility of protocols and education could potentially reduce these burdens and enhance patient care.*

**Key Words:** traumatic catheterization, foley, urethral stricture, protocol

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## Introduction

Difficult and traumatic urethral catheterization is a common reason for urologic consult. Approximately 10%-25% of hospitalized patients undergo urethral

catheterization,<sup>1</sup> 3.2-6.7/1000 of which are traumatic.<sup>2</sup> Urologists are usually consulted in the setting of failed catheter attempts. Difficulty requiring consultation can arise with changes in anatomy prior to admission (i.e. urethral stricture, obstructing prostate, etc.) and are termed difficulty urethral catheterization (DUC). Likewise, changes in anatomy during admission (i.e. injury to urethra from multiple failed catheter attempts) can be seen in cases of traumatic urethral catheterization (TUC). Short term complications arising from DUC or TUC include acute urinary retention, urosepsis, bleeding, or acute kidney

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Accepted for publication July 2023

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injury (AKI).<sup>3</sup> Similarly, long term complications exist and include urethral strictures.<sup>3</sup> Although the incidence may vary across institutions, one study quotes an incidence of 78% of patients developing strictures, which were managed by clean intermittent catheterization (CIC) in most (48%) with others requiring surgical correction (38%).<sup>3</sup> Reduction in DUC and TUC rates will help manage patient morbidities associated with these issues.

Complications from DUC/TUC represent a significant burden to the healthcare system. The incidence of TUC in hospitalized patients is 13.4 per 1000 catheter attempts.<sup>3</sup> This number translates to the additional cost of managing iatrogenic urethral injuries to be around \$371,790 per patient.<sup>2</sup> In order to decrease the incidence of DUC/TUC and long term complications in the community, several attempts have been made to institute possible solutions. Prior studies have shown the need for protocols to reduce injuries and costs.<sup>3</sup> This can be accomplished through identifying patient risk factors and consulting the urology service earlier in the treatment plan<sup>4</sup> or establishing advanced training and educational workshops for nurses and healthcare workers.<sup>5</sup> Given patient morbidity and healthcare costs, it is important for institutions to establish protocols around catheter insertion<sup>5</sup>.

The nursing staff are usually the first to evaluate and attempt placement of the urethral catheters. Increased conversation and creation of protocols around proper catheter placement can help to prevent trauma and subsequent complications. Studies have examined protocol-based efforts to decrease TUC in hospital settings with improvement in TUC incidence.<sup>6</sup> This allows nursing staff to trouble-shoot TUC and improve patient outcomes. Likewise, studies report the need for improvement in catheter training protocols to avoid iatrogenic complications.<sup>5</sup> This study examines nursing involvement in DUC/TUC at our institution with the goal to reduce incidence of catheter complications by instituting a nursing-driven protocol.

## Materials and methods

A four-question survey was distributed to nurses willing to answer and participate across three hospitals at a single-institution. As this is a quality improvement project and did not include patient descriptors, IRB approval was not required by our institution. All questions were answered by “yes” or “no” by responders and collected for analysis. Nurses were separated by department in which they work, including

the emergency department, intensive care unit (ICU) and floor units at a Detroit Medical Center (DMC) Hospital. Survey included four questions regarding experiences with traumatic catheterization, difficult placement and if a protocol and Urology in-service would be helpful with reducing adverse outcomes. The first two questions dealt with the demographic representation of the medical staff involvement in DUC/TUC. Question 1 stated, “Have you ever been involved in placement of a TUC?” Question 2 stated, “Has there ever been a urethral catheter you were unable to place?” The last two questions focused on the implementation of a solution to these complicated Foley catheter attempts. Question 3 asked, “Would a DUC/TUC protocol be helpful?” Lastly, Question 4 asked nurses, “Would a urology in-service directed toward TUC and DUC placement be helpful?”, Figure 1. The data collected was reported as a descriptive representation of the group (n, mean % of total).

The primary goal of this study is to better understand nursing experiences with DUC/TUC and receptiveness of a protocol. Descriptive statistics, including mean, median, standard deviation, minimum and maximum (for continuous variables) or frequency and percentage (for binary or categorical variables), were used to describe numerical data.

**Nursing TUC and DUC Placement Survey**

- 1. Have you ever been involved in placement of a TUC?**
- 2. Has there ever been a urethral catheter you were unable to place?**
- 3. Would a TUC and DUC protocol be helpful?**
- 4. Would a Urology in-service directed toward TUC and DUC placement be useful?**

\*TUC (Traumatic Urethral Catheterization); DUC (Difficult Urethral Catheterization)

**Figure 1.** Survey that was distributed by the urology service to the participating nursing staff.

1. ED-----	60% Yes	
SICU/MICU-----	33% Yes	
Floor-----	42% Yes	Total = 44% Yes
2. ED-----	90% Yes	
SICU/MICU-----	92% Yes	
Floor-----	89% Yes	Total = 90% Yes
3. ED-----	100% Yes	
SICU/MICU-----	92% Yes	
Floor-----	84% Yes	Total = 90% Yes
4. ED-----	100% Yes	
SICU/MICU-----	92% Yes	
Floor-----	95% Yes	Total = 95% Yes
*41 SGH Nurses surveyed; Average overall years of Nursing was 16.5 years		

**Figure 2.** Response data from each individual question asked by nursing staff regarding study aim.

## Results

A total of 41 nursing staff responses were recorded. The mean overall years of nursing experience was 16.5 years for responders. Of these participants, most (19, 46.3%) worked on a medical/surgical floor, with additional participants from the ED (10, 24.4%), and the ICU (12, 29.3%). In total, 44% of the nursing staff reported prior participation in a traumatic catheter insertion. Likewise, for question 2, 90% of total responders reported a prior involvement with a difficulty catheter. Additionally, for question 3, 90% of total participants reported interest in a formal Foley catheter protocol creation. Lastly, 95% of all participants supported the institution of a urology-based nursing in-service regarding catheter placement, Figure 2.

A subgroup analysis was completed based on nursing department assignment. Nurses working in the ED (6, 60%) had the highest reported involvement of traumatic catheters compared to those working in the ICU (4, 33%) and the floor (8, 42%). More of the nursing staff working in intensive care settings (9, 92%) reported being involved with having difficulty placing a catheter compared to ED (11, 90%) and floor (17, 89%). We received the most positive response rates (100%, 100%) from the emergency department regarding questions 3 and 4, respectively, compared to the responses of the ICU (92%, 92%) and floor (84%, 95%), which were still in favor of these protocols, Figure 2.

## Discussion

Our study reported a 44% involvement of nursing staff in a TUC and 90% of responders reported involvement with a DUC. The examination of nurses across

different floors in the hospital helped with including a diverse sample size for evaluation. A recent study from 2020 highlights the importance of conversation between healthcare providers regarding catheter care.<sup>7</sup> In this study, Manojlovich et al identified several types of communication barriers to discuss proper indwelling urethral catheter care and insertion.<sup>7</sup> Similar to our study, this example highlights the high number of healthcare providers, especially nurses, that are involved with complex catheter care.<sup>7</sup> Our high rate of responses in involvement with DUC and TUC implies the need for further group discussion regarding catheter care.

This study shows a high need and desire for a protocol and education regarding traumatic and difficult catheterization at our institution. In this study, 90% of all nursing participants reported interest in a formal Foley catheter protocol. Likewise, 95% of all participants supported a urology-taught in-service about catheter placement in difficult and traumatic situations. Bhatt et al surveyed 90 healthcare workers asking about their involvement in traumatic catheters.<sup>8</sup> Overall, the majority of participants (90%) felt Foley catheterization should be a formal training component to their line of work.<sup>8</sup> Half of the participants (51%) reported that they felt the need for further education on catheterization.<sup>8</sup> Of those responders, the majority (37%) requested ongoing education regarding difficult/traumatic catheters as the form of continued training.<sup>8</sup> This study and ours highlight the importance and desire for continuing education for nursing and hospital staff. With the goal of implementing a protocol for difficult and traumatic catheters, we aim to implement a yearly in-service training session for the nursing staff surrounding difficult and traumatic catheters. In addition to education, studies have shown progress in electronic medical record-based prevention of difficult catheterization.<sup>4</sup> Lee et al from University of Michigan studied difficult catheterization in men who are at risk for iatrogenic urethral injuries.<sup>4</sup> Of their cohort, 78.5% of patients with iatrogenic urethral injury were found to have at least one risk factor for difficult catheterization.<sup>4</sup> The authors implemented a computer-based detection method for the use of a Coude-tip catheter in at-risk men.<sup>4</sup> Although their intervention did not provide statistically significant changes to the rate of urethral injury, the authors comment on the need to create plans for catheter awareness and training to prevent future complications.<sup>4</sup> A study from Hackett et al highlights a proficiency pathway for the insertion of Foley catheters that were perceived as difficult.<sup>9</sup> Nurse practitioners received a 2-step training program to better trouble shoot the difficult catheters.<sup>9</sup> This program

reduced catheter-related complications and length of stay for patients and recommended a consultation-based difficult catheter service as a potential solution.<sup>9</sup> Similar to our study, this is an example of possible future directions for catheter care in order to decrease catheter complications and associated patient costs. Our future research plan is to provide nursing staff and hospital staff alike a step-wise trouble-shooting method in difficult catheters to decrease the risk of iatrogenic injury and the subsequent effects of this issue.

Decreasing the incidence of traumatic and troubleshooting difficult catheterization are goals that our institution hopes to achieve. With these goals met, we will likely see a decrease in healthcare costs and increases in patient satisfaction. Similar studies have examined successful pathways in order to troubleshoot catheters and meet similar endpoints to our study. Willette et al examined a difficult catheter algorithm in an emergency department setting for nursing staff.<sup>10</sup> This study concluded that these treatment algorithms can prospectively be studied in order to better troubleshoot difficult catheters and the utility of a urological consult.<sup>10</sup> The creation of an algorithm, equipped with nursing education, can help tackle this highly expensive and occasionally morbid consultation. For example, Bhatt et al completed a prospective study calculating the changes in incidence and morbidity of iatrogenic urethral catheter injuries after an educational workshop was conducted.<sup>5</sup> Six months after the educational session was conducted, the incidence of iatrogenic urethral catheter injuries was reduced from 4.3/1000 to 3.8/1000 cases.<sup>5</sup> However, the morbidity and cost of managing the catheters increased.<sup>5</sup> This study highlights the need for more involved and improved training for hospital staff around urethral catheters. At our institution we hope to propose a protocol in which nursing staff and non-urologic clinicians will utilize a troubleshooting checklist, with algorithm, if difficult urinary catheter or traumatic catheter are encountered. If Urology is consulted for difficult urinary catheter, or traumatic catheterization, documentation on measures used to place catheter will be completed. Prospectively, traumatic or difficult urethral catheters consults will be tracked at two DMC hospitals for 3 months before initiating protocol. A newly designed protocol will then be implemented at these hospitals to evaluate for reduction in difficult urethral catheter. Future directions also include exploring the prevalence of traumatic removal of catheters by patients and ways to prevent and manage these issues by addressing them in a nursing in-service at our institution. Prevention of self-extraction of catheters is another topic of high prevalence in our institution, and others, alike.<sup>11</sup>

Limitations to this study include the cross-sectional nature of the survey. The nursing evaluation only studied those working at one institution at a set interval of time. However, the diverse types of nurses including ER, ICU, and floor help with the generalizability of the findings. Likewise, the single-institution nature of this study challenges the incidence of catheter complications in other hospital settings. Searching the literature, there are few multi-institutional studies studying the incidence and nursing experience with DUC/TUC. Although our study is at a single institution, there is still concepts of catheter education, protocol creation, and better spending of healthcare resources that can be applied to other settings.

## Conclusion

Patient morbidity and healthcare costs regarding traumatic and difficult catheterization is significant. Utility of protocols and education could potentially reduce these burdens within the DMC healthcare system and enhance patient care. Survey of a single DMC hospital show that traumatic catheterization and inability to place a urethral catheter among nursing staff is common, with 44% and 90% experiencing these adverse events respectively. The survey also showed a high need and desire for a protocol and education regarding traumatic and difficult catheterizations with 90% favoring a protocol and 95% favoring a Urology in-service. Further data including nursing survey at other DMC hospitals and longitudinal data comparing patient outcomes and healthcare costs after implementation of this proposal are needed to further evaluate benefit. □

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## Proposal to decrease incidence, morbidity, and associated healthcare costs regarding difficult and traumatic urethral catheterization – a protocol for DMC hospitals: A pilot study

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