Implementation of instructional videos improves nursing comfort with commonly encountered urinary catheter care scenarios

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Introduction: *Placement of coudé catheters, manual irrigation of urinary catheters, and management of continuous bladder irrigation (CBI) are routine interventions for which nurses often receive little or no formal education. In this study, our aim was to determine factors associated with higher comfort levels for these catheter-care techniques and to assess whether online instructional videos could be used to improve nursing comfort.*

Materials and methods: *Three 5-minute videos were created to demonstrate proper technique for coudé catheter placement, manual irrigation of a catheter, and management of CBI. An online module with pre- and post-video surveys was created and administered to all nursing staff at MedStar Georgetown University Hospital.*

Results: *A total of 821 nurses participated in this study and completed the online module with both pre-- and post-video surveys. Using a 10-point Likert scale, pre-video median comfort levels for coudé catheter placement, manual irrigation of a catheter, and management of CBI were 5, 6, and 5, respectively. Post-video median comfort levels increased significantly to 9, 8, and 8, respectively ($p < 0.001$). In the linear regression models, prior formal training was significantly associated with higher baseline comfort levels for all three techniques ($p < 0.001$).*

Conclusions: *Prior formal training as well as baseline nursing comfort levels for common catheter related techniques tend to be low and the implementation of simple instructional videos via an online platform may be a useful strategy for improving nursing comfort. This study demonstrates a reproducible strategy for disseminating catheter education for nurses on a larger scale.*

Key Words: nurse education, bladder irrigation, coudé catheter, continuous bladder irrigation

Introduction

The use of indwelling urinary catheters in the hospital setting is common with an estimated 25% of inpatients undergoing indwelling urinary catheter placement during their hospitalization.[1] Despite their utility to the hospitalized patient, catheters are associated with complications including infection, urethral trauma, and hematuria that may require intervention.[2] Management strategies for these adverse outcomes include exchanging catheters, placing coudé catheters, manually irrigating catheters, and utilizing continuous bladder irrigation (CBI), all of which fall within the scope of routine nursing skills. However, in many

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institutions, nurses receive little or no education on how to perform basic procedures pertaining to catheter care and, consequently, nursing comfort levels regarding these techniques tend to be low.[3,4]

Previous studies utilizing nursing education protocols regarding catheter care have been shown to be effective.[5] Still, there is a paucity of data regarding comfort levels and outcomes after these interventions, and focus has traditionally been on reducing rates of catheter-associated urinary tract infections (CAUTI). Furthermore, previous investigators have relied on labor-intensive teaching sessions to educate nursing staff which can be difficult to implement consistently on a system-wide scale.[5-7]

At our institution there is no standardized nursing education for the placement of coudé catheters, irrigation of urethral catheters, or management of CBI. Consequently, at our institution and others these tasks are frequently performed by the urology service, leading to overuse of inpatient urologic specialty consultation. In a recent study, 69% of inpatient urology consults either required no intervention or were managed with catheter placement alone,[8] suggesting there is room for improved urologic education among other healthcare staff. In the present study, our aim was to develop a series of instructional videos that we hypothesized would improve nursing education and comfort levels with frequently encountered catheter care scenarios. Additionally, we sought to identify factors associated with higher comfort levels in performing these catheter care techniques. We anticipate that these standardized instructional videos will serve as a pilot for ongoing nursing education to improve catheter care skills and catheter-related outcomes.

Materials and methods

Three 5-minute instructional videos were created by the urology department at MedStar Georgetown University Hospital explaining the indications and proper technique for placing a coudé catheter, manually irrigating a catheter, and managing CBI. After obtaining Institutional Review Board approval for the study, these videos were incorporated into an online module along with a pre- and post-video surveys. The module was assigned to all adult nursing staff at MedStar Georgetown University Hospital and completed between February 2020 and March 2020. The module in total took an estimated 20 minutes to complete. Data was collected in an anonymous fashion and stored in a secure institutional database.

Module survey items included basic demographic data, prior formal training with these catheter tasks, nursing experience with each of these catheter care skills, and associated comfort levels with these skills assessed on a Likert scale from 1-10. Additionally, nurses were asked to rate the usefulness of the educational videos using a five-point Likert scale. All survey items were reviewed and approved by an independent nurse practice council at MedStar Georgetown University Hospital.

Statistical analysis was performed using STATA. Mean and standard deviations were calculated for continuous data, and median and interquartile ranges were calculated for non-parametric and ordinal data. Wilcoxon signed-rank test was utilized to compare pre- and post-video comfort levels of coudé catheter placement, manual irrigation of a catheter, and management of CBI. Linear regression models were created to identify demographic factors associated with higher nursing comfort levels for each catheter care task based on the pre-video survey. Statistical significance was defined using $\alpha = 0.05$.

Results

A total of 821 nurses participated in this study and completed the online module. Participant demographics as well as survey responses are displayed in Table 1. Mean age for nursing staff was 33.5 years ± 11.7, and mean years of nursing experience was 8.8 years ± 10.4. The majority of participants were female (90.5%, n = 743) and Caucasian (62.9%, n = 516). Nurses in this study were employed in a variety of clinical settings, including intensive care units (22.3%), intermediate care units (21.9%), internal medicine units (20.7%), surgical units (20.2%), perioperative care units (12.9%), and the emergency department (5.4%).

Nurses were asked if they had received any prior formal training for these three catheter-related tasks. Only 20.2% (n = 166), 42.8% (n = 351), and 39.5% (n = 324) reported prior formal training for placement of a coudé catheter, manual irrigation of a catheter, or management of CBI, respectively.

In the preceding 3 months prior to completing the proctored viewing session, nurses reported few attempts at coudé catheter placement, manual irrigation of a catheter, or management of CBI (mode = 0 for each). In our sample, 17.7% (n=145) of nurses had attempted placement of a coudé catheter, 28.0% (n = 230) had manually irrigated a catheter, and 19.5% (n = 160) had managed CBI at least once. Pre-video median comfort levels for coudé catheter placement, manual irrigation of a catheter, and management of CBI were 5, 6, and 5, respectively (range = 1-10 for each). After completion of the online module, post-

TABLE 1. **Nursing staff respondent survey data**

N	**821**
Age, mean (± SD), years	33.5 (11.7)
Gender	
Male, n (%)	74 (9.0)
Female, n (%)	743 (90.5)
Other, n (%)	4 (0.5)
Ethnicity	
Asian/Pacific Islander, n (%)	123 (15.0)
Black of African American, n (%)	116 (14.1)
Hispanic, n (%)	25 (3.0)
White/Caucasian, n (%)	516 (62.9)
Other, n (%)	41 (5.0)
Years worked as nurse, mean (± SD)	8.8 (10.4)
Current clinical setting	
Surgical unit, n (%)	166 (20.2)
Medical unit, n (%)	170 (20.7)
Emergency Department, n (%)	44 (5.4)
ICU, n (%)	180 (21.9)
Intermediate Care Unit, n (%)	155 (18.9)
Perioperative, n (%)	106 (12.9)
Prior formal coudé training	
Yes, n (%)	166 (20.2)
No, n (%)	655 (79.8)
Coudé catheter attempts (prior 3 months)	
0, n (%)	639 (77.8)
1-2, n (%)	145 (17.7)
3-5, n (%)	22 (2.7)
6-10, n (%)	8 (1.0)
> 10, n (%)	7 (0.9)
Pre-video coudé catheter comfort level (Scale 1-10), median, IQR	5 (1-7)
Post-video coudé catheter comfort level (Scale 1-10), median, IQR	9 (7-10)
Prior formal CBI training	
Yes, n (%)	324 (39.5)
No, n (%)	497 (60.5)
Managing CBI (prior 3 months)	
0, n (%)	583 (71.0)
1-2, n (%)	160 (19.5)
3-5, n (%)	46 (5.6)
6-10, n (%)	17 (2.1)
> 10, n (%)	15 (1.8)
Pre-video CBI comfort level (Scale 1-10), median, IQR	5 (2-8)
Post-video CBI comfort level (Scale 1-10), median, IQR	8 (6-10)
Prior formal irrigation training	
Yes, n (%)	351 (42.8)
No, n (%)	470 (57.2)
Foley catheter irrigation attempts (prior 3 months)	
0, n (%)	511 (62.2)
1-2, n (%)	230 (28.0)
3-5, n (%)	61 (7.4)
6-10, n (%)	10 (1.2)
> 10, n (%)	9 (1.1)
Pre-video Foley catheter irrigation comfort level (Scale 1-10), median, IQR	6 (2-9)
Post-video Foley catheter irrigation comfort level (Scale 1-10), median, IQR	8 (6-10)

video median comfort levels increased significantly to 9 (IQR 7-10), 8 (IQR 6-10), and 8 (IQR 6-10), respectively ($p < 0.001$ for each), which is shown in Figure 1.

In the regression model for comfort with coudé catheter placement, Table 2, male sex ($p = 0.01$), practicing in the emergency department ($p = 0.001$), and prior formal training in coudé catheter placement ($p < 0.0001$) were associated with higher baseline comfort levels. In the model for comfort levels with catheter irrigation, Table 3, male age ($p = 0.003$), years of nursing experience ($p = 0.04$), practicing in an ICU ($p = 0.002$) or surgical setting ($p = 0.02$), and prior formal training with catheter irrigation ($p < 0.001$) were associated with higher baseline comfort levels with catheter irrigation. In the model for comfort with CBI management, Table 4, male sex ($p < 0.001$), age ($p = 0.04$), nursing experience ($p = 0.005$), practicing

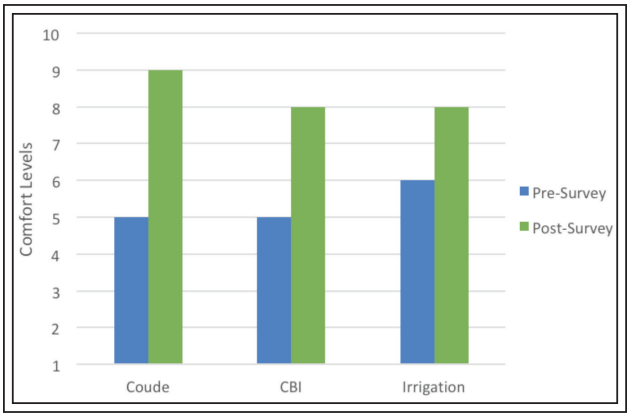

Figure 1. Pre- and post-video nursing staff comfort levels.

TABLE 2. **Linear regression model to determine factors associated with higher baseline comfort levels for coudé catheter placement**

Coudé	Coefficient	Standard error	t	p > |t|
Age	0.03	0.02	1.72	0.0852
Race				
Black	-0.62	0.30	-2.10	0.0359
Asian	-0.41	0.29	-1.42	0.1570
Hispanic	-0.27	0.56	-0.48	0.6285
Other	0.19	0.46	0.42	0.6749
Sex				
Male	0.88	0.34	2.57	0.0103
Other	-2.22	1.42	-1.56	0.1184
Years as nurse	0.03	0.02	1.56	0.1187
Career setting				
Emergency Dept	1.54	0.47	3.27	0.0011
ICU	0.39	0.30	1.29	0.1957
IMC	0.26	0.31	0.83	0.4054
Perioperative	0.54	0.35	1.54	0.1246
Surgical	0.49	0.30	1.63	0.1036
Prior formal training				
Yes	3.23	0.25	13.12	< 0.0001

IMC = intermediate care unit

TABLE 3. **Linear regression model to determine factors associated with higher baseline comfort levels for catheter irrigation**

Irrigation	Coefficient	Standard error	t	p > |t|
Age	0.04	0.01	2.97	0.0031
Race				
Black	0.15	0.28	0.54	0.5882
Asian	0.53	0.28	1.92	0.0558
Hispanic	-0.12	0.54	-0.23	0.8186
Other	0.48	0.44	1.09	0.2756
Sex				
Male	0.59	0.33	1.80	0.0715
Other	-2.53	1.36	-1.86	0.0631
Years as nurse	0.03	0.02	2.05	0.0408
Career setting				
Emergency Dept	0.08	0.45	0.17	0.8614
ICU	0.90	0.29	3.17	0.0016
IMC	0.08	0.30	0.27	0.7867
Perioperative	-0.33	0.33	-1.00	0.3155
Surgical	0.69	0.29	2.39	0.0172
Prior formal training				
Yes	2.75	0.19	14.23	< 0.0001

IMC = intermediate care unit

TABLE 4. **Linear regression model to determine factors associated with higher baseline comfort levels for CBI management**

CBI	Coefficient	Standard error	t	p > |t|
Age	0.03	0.01	2.00	0.0463
Race				
Black	0.37	0.27	1.36	0.1727
Asian	0.43	0.27	1.60	0.1092
Hispanic	0.18	0.52	0.35	0.7281
Other	0.75	0.42	1.78	0.0754
Sex				
Male	1.11	0.31	3.56	0.0004
Other	-2.38	1.31	-1.82	0.0696
Years as nurse	0.04	0.02	2.82	0.0050
Career setting				
Emergency Dept	-0.71	0.43	-1.63	0.1030
ICU	-0.54	0.27	-1.97	0.0486
IMC	-0.89	0.29	-3.10	0.0020
Perioperative	0.30	0.32	0.93	0.3520
Surgical	0.72	0.28	2.58	0.0102
Prior formal training				
Yes	3.11	0.19	16.36	< 0.0001

IMC = intermediate care unit

in a surgical unit (p = 0.01), and prior formal training with CBI management (p < 0.001) were associated with higher baseline comfort levels. Practicing in an ICU (p = 0.05) or IMC setting (p = 0.002) were associated with lower baseline comfort levels with CBI management.

Finally, using a five-point Likert scale from "1 = not at all useful" to "5 = extremely useful" on the post-video survey, nurses were asked to rate the usefulness of the instructional videos for educating nurses on catheter care techniques. Overall, 86.6% (n = 711) of nurses rated the instructional videos as ≥ 4, or at least "very useful."

Discussion

At our institution, nurses are trained to place standard urinary catheters (i.e. 16Fr Foley catheters) in patients when clinically indicated. However, they receive no formal training on how to perform other common urinary catheter care skills that fall within the scope of nursing practice, such as coudé catheter placement, manual irrigation of catheters, or CBI management. Interestingly, when nurses were asked if they had received any prior formal training with these techniques, a low percentage (< 50%) indicated that they had. It is therefore not surprising that nurses in this study reported low baseline comfort levels with these techniques as assessed on our pre-video survey. These findings echo those reported by Dungerwalla et al, wherein only 35% of nurses at their institution received education on manual irrigation of a catheter as nursing students.[3] In that study, nurse confidence levels regarding the proper indications and techniques for manual catheter irrigation were also low. Similarly, Ng et al demonstrated that baseline knowledge pertaining to assessment of a blocked catheter in the setting of CBI were lower among nurses on general inpatient wards relative to nurses on postoperative urologic surgery wards.[9] Consequently, though we do not know the prevalence of adequate catheter care education among nurses in the United States, it is likely that many institutions could benefit from implementing standardized education programs.

In this study, we demonstrated that concise instructional videos can be effective for teaching nurses and improving their comfort with three routine catheter care skills. Coudé catheter placement was included based on American Urological Association recommendations for managing difficult urethral catheters (DUC) and studies demonstrating that coudé catheters are the most frequently utilized catheters for DUC among urology residents.[10-12] Irrigation of catheters and management of CBI were included because these

skills, when employed expeditiously by nursing staff, can avert significant patient discomfort and morbidity. Despite nurses in our cohort having on average more than 8 years of experience, nurses performed these three skills infrequently. However, after viewing the videos, nurses reported significant improvements in comfort levels for all three skills. Additionally, the majority of nurses rated the videos as "very" to "extremely" useful, underscoring the potential need for these instructional tools at our institution.

A review of our regression analyses reveals several important associations that might help guide future efforts to improve nursing comfort levels and skills regarding catheter-related techniques. As expected, prior formal catheter training was associated with higher baseline comfort levels across all three techniques, again highlighting the importance of formal training sessions. Nursing experience in general also seems to play a role, as greater years of nursing experience translated to higher comfort levels with both catheter irrigation and CBI management. Furthermore, clinical practice setting may also play an integral role in nursing comfort. Nurses in the emergency department, for instance, reported more comfort with coudé catheter placement. This may be the result of nurses in the emergency department having more experience placing catheters, or perhaps be due to a culture of being more procedural and autonomous in the emergency department. Similarly, practice in a surgical unit was associated with higher baseline comfort levels with both CBI management and catheter irrigation, which may be a reflection of the fact that urology patients, who often require CBI management and catheter irrigation, are most often assigned to surgical units postoperatively. By determining the variables most strongly associated with nursing comfort, future educational interventions may be targeted to practice settings and nursing staff reporting the lowest comfort levels.

Of note, the present study is not the first to evaluate the impact of nursing education initiatives on urinary catheter care. Prior studies have, in smaller samples, shown that training programs can improve nurse comfort levels with coudé catheter placement, decrease rates of CAUTIs, and lower indwelling catheter duration.[5,13,14] Still, these studies almost universally employed time-consuming methodologies, making it unclear what the optimal strategy is for training nurses on a broad scale when time and resources are limited. Shaver et al, for instance, showed that a CAUTI education initiative involving two hands-on training sessions and additional one-on-one teaching sessions was successful in improving nurses' knowledge about CAUTIs, yet it did not significantly change nurse attitudes or perceptions regarding CAUTI prevention.[4] In a study by Dave et al, an initiative to reduce iatrogenic catheter-associated urethral trauma ultimately proved successful, but at the expense of numerous didactic presentations, hands-on teaching sessions with urology residents, implementation of a DUC algorithm, and finally, creation of a specialized skilled nursing team to address DUCs.[6] We contend that, in order to have pervasive institutional success, nursing education programs should be effective, easily reproducible, and avoid excessive investments in time and resources.

To the best of our knowledge, this study employed the largest nurse cohort to date examining the impact of a nurse education initiative on comfort levels. In this respect, a principal strength of our study is the utilization of standardized instructional videos that can be distributed easily to large groups of people via an online platform. Given that videos can be shared and viewed repeatedly, we anticipate that future initiatives utilizing video instruction will have more durable impacts on nursing skills over time relative to initiatives that employ single in-person training sessions. Furthermore, in contrast to studies focusing on a single skill, this study demonstrates that instructional videos can be used to improve nurse comfort levels for several catheter care skills in a single brief viewing session. Additional strengths of this study include its prospective design and generalizability across nurses from a variety of clinical settings within the hospital.

There are, however, study limitations to consider as well. Firstly, our primary outcome—nurse comfort level—was assessed using subjective survey responses rather than objective measures. The improved subjective comfort levels were noted immediately after viewing the technique videos, and it is unclear if this improved comfort is durable long term. Furthermore, we have yet to demonstrate whether increases in comfort translate to improved capability in performing these catheter-related techniques, which must be investigated. Lastly, there was no objective assessment of nursing comprehension or the impact of these educational videos on outcomes such as iatrogenic catheter-associated urethral injuries, CAUTIs, urology consultations, or healthcare costs. In the study by Wooller et al, for example, an intensive nursing education protocol was successful in reducing unnecessary catheter rates, but had no impact on CAUTI rates, which had been the authors' intent.[7] Future studies will need to address these issues to better understand the utility of these instructional programs.

Conclusions

In conclusion, nurses often receive no formal training on various catheter care skills, which represents an important opportunity to establish standardized education protocols and ultimately improve patient care. This pilot study demonstrates a feasible and reproducible strategy for improving nursing comfort levels for common catheter care skills on a broader scale. In the future, we plan to assess if improvement in subjective self-rated comfort levels is long-lasting and more importantly leads to improved competency in performing the techniques, and to document the impact that instructional videos may have on associated relevant long-term catheter care outcomes. □

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