Catheter burden following urogynecologic surgery

Check for updates

Alexis A. Dieter, MD; Jennifer M. Wu, MD, MPH; Jessica L. Gage, BA; Katherine M. Feliciano, BA; Marcella G. Willis-Gray, MD

BACKGROUND: Data on the experience that women who undergo urogynecologic surgery have with postoperative catheterization are severely limited. As the importance of our patients' perioperative experience becomes more valued, assessment of the burden of postoperative catheterization, which has not yet been performed, is increasingly needed.

OBJECTIVE: The aim of this study was to compare catheter burden in women who self-selected use of an indwelling Foley catheter vs clean intermittent self-catheterization for voiding dysfunction after reconstructive pelvic surgery.

STUDY DESIGN: This is a nested study within a nonblinded randomized controlled trial of 2 different voiding trial protocols that was conducted from March to October 2017. Women who underwent pelvic organ prolapse and/or stress urinary incontinence surgery who were English speaking and ≥18 years old with a preoperative postvoid residual <100 mL were included. Participants who did not pass their voiding trial were discharged with an indwelling Foley catheter or self-catheterization per participant preference. Our primary outcome was catheter burden at 1 week after surgery assessed by the Short-Term Catheter Burden Questionnaire, which is a validated 6-item survey comprised of 2 subscales: difficulty of use and embarrassment. Scores range from 3−15 with higher scores indicating greater difficulty and/or embarrassment, and the sum of the 2 subscale scores measures total catheter burden with a higher score indicating greater burden. Secondary outcomes included the rate of urinary tract infection, the number of postoperative clinic visits, and the number of postoperative phone calls.

RESULTS: Of 150 participants, 77 women (51%) did not pass their voiding trial; of those, 47 women (61%) were discharged home with an indwelling catheter and 30 women (39%) with self-catheterization. Baseline demographics were similar, except that women who chose an indwelling Foley catheter were older (62±11 vs 55±11 years; $P<.01$). There were no significant differences between indwelling Foley catheter and self-catheterization in total catheter burden score (18±5 vs 18±6; $P=.77$), difficulty of use subscale score (8±3 vs 9±3; $P=.20$), or embarrassment subscale score (10±4 vs 9±4; $P=.12$). For secondary outcomes, there were no significant differences in rate of urinary tract infection (23% indwelling vs 30% self-catheterization; $P=.60$). Consistent with study protocol, women who were discharged with an indwelling Foley catheter did have more postoperative clinic visits (2±1 vs 1±1 visits; $P<.01$), and those women who were discharged with self-catheterization had more postoperative phone calls (2±3 vs 5±3 phone calls; $P<.01$). Otherwise there was no significant difference in nonvoiding-related clinic visits (1±1 visits for indwelling and self-catheterization; $P=.15$) or postoperative phone calls (1±2 indwelling vs 2±3 self-catheterization calls; $P=.31$).

CONCLUSION: In women who used either an indwelling Foley catheter or clean intermittent self-catheterization for management of postoperative voiding dysfunction after pelvic reconstructive surgery, there were no differences in difficulty of use, embarrassment, or overall catheter burden. There were also no differences in nonvoiding-related postoperative phone calls or clinic visits, with similar rates of urinary tract infection between the 2 groups.

Key words: indwelling Foley catheter, intermittent self-catheterization, pelvic organ prolapse, voiding dysfunction

Postoperative catheterization for the management of acute voiding dysfunction after urogynecologic surgery occurs frequently.[1−7] Although considered a routine occurrence by surgeons, the need to use a catheter postoperatively after urogynecologic surgery represents a significant source of anxiety for patients. After reconstructive pelvic surgery, Elkadry et al[8] found that 15% of patients reported that catheterization was the worst aspect of their surgical experience and that 9% considered undergoing postoperative catheterization to be a surgical complication.

Because the importance of our patients' perioperative experiences is increasingly acknowledged and valued, the burden of and experience surrounding postoperative catheterization takes on even greater importance. At this time, there are few data on the experience that women who undergo urogynecologic surgery have with postoperative catheterization. In 2016, Carpenter et al[9] created and validated the Short-Term Catheter Burden Questionnaire (STCBQ) to assess the burden related to short-term catheterization after reconstructive pelvic surgery. A study that has assessed catheter burden after urogynecologic surgery using the STCBQ has not yet been performed and is greatly needed.

The objective of our study was to use the STCBQ to assess the perceived burden of catheterization in women who use either an indwelling transurethral Foley catheter (IFC) or clean intermittent self-catheterization (CISC) for the management of acute postoperative voiding dysfunction after reconstructive pelvic surgery. We specifically aimed to determine whether there is a significant difference in catheter burden when comparing IFC with CISC.

Materials and Methods

This was a nested study within a randomized controlled trial that compared a traditional backfill-assisted voiding trial (traditional VT) to a postvoid residual (PVR) free VT (PVR-free VT) in women who underwent pelvic organ prolapse (POP) and/or stress urinary incontinence surgery. The study was conducted from March 2017 to October 2017 by the Division of Urogynecology and Reconstructive Pelvic Surgery at the University of North Carolina at Chapel Hill after institutional review board

AJOG at a Glance

Why was this study conducted?

This study was conducted to determine whether there was a difference in catheter burden in women who self-selected use of an indwelling Foley catheter vs clean intermittent self-catheterization for voiding dysfunction after pelvic reconstructive surgery.

Key findings

There were no significant differences between indwelling Foley catheter and clean intermittent self-catheterization in catheter burden, difficulty of use, or embarrassment.

What does this add to what is known?

In women with postoperative voiding dysfunction after urogynecologic surgery, we found that, when we compared indwelling Foley catheter and clean intermittent self-catheterization, there were no differences in catheter burden, difficulty of use, or embarrassment as assessed by the validated Short-Term Catheter Burden Questionnaire.

approval was obtained. The randomized controlled trial was registered at ClinicalTrials.gov (ID: NCT03009968).

We approached all patients who underwent surgery for pelvic organ prolapse and/or stress urinary incontinence who had a documented preoperative PVR of <100 mL in the electronic medical record. Patients were excluded if they underwent surgery for fistula repair, sacral neuromodulation surgery, urethral diverticulum/vaginal mass excision, or mesh revision surgery. Patients were also excluded if they were younger than 18 years old, non-English speaking, pregnant, or dependent on catheterization to void preoperatively. Additionally, participants who sustained an intraoperative injury to the urinary tract that required postoperative catheterization were excluded from the study before randomization. From a review of the electronic medical record, we collected baseline demographics that included age, race, body mass index, smoking status, parity, preoperative postvoid residual volume, menopausal status, and variables that are included in the Charlson Comorbidity Index.[10]

On postoperative day 0, immediately after surgery was completed, randomization was performed to either traditional VT or PVR-free VT protocol. Balanced randomization was achieved

with the use of computer-generated assignments via REDCap software (Research Electronic Data Capture, Vanderbilt University, Nashville, TN) to generate random permuted blocks, with block sizes varying between 4, 6, and 8. Allocation concealment was achieved with the use of REDCap software. After the allocation was revealed to the surgical team, the type of void trial protocol to be used was written explicitly in the postoperative orders for the nursing staff to follow.

All participants completed their VT before discharge from the hospital. Both VT protocols consisted of the following instructions: the bladder was backfilled with up to 300 mL (less if patient could not tolerate 300 mL); the IFC was removed; the participant was given 15 minutes to void, and the voided volume was measured. In the traditional VT group, a PVR was measured after voiding (or attempt to void), and the participant was considered to have passed the traditional VT if she had a PVR of <100 mL or less than one-half the voided volume if she voided >200 mL. In the PVR-free VT group, a PVR was not measured, and the participant was considered to have passed the VT if she voided more than one-half the instilled volume.

For this study, we focused on only the participants who did not pass the VT.

For either protocol, if the participant did not pass the VT, she was discharged to home with an IFC or with CISC per the participant's preference. Participants with an IFC returned to clinic within 1—3 days after discharge for a repeat VT per routine clinic protocol with the use of their same randomized VT protocol. If the participant was discharged on CISC, she was instructed to record her voided volumes and PVRs while at home. Our nursing staff then called every 1—3 days to determine when she could stop CISC; participants were instructed to stop CISC when they had 2 consecutive PVRs less than <100 mL. Our nurses documented all phone calls and included the aforementioned information in a standardized template in the electronic medical record per routine clinic protocol.

Our primary outcome was catheter burden at 1 week after surgery that was assessed with the STCBQ (Table 1).[9] The STCBQ is a validated 6-item survey that assesses short-term catheter burden after pelvic reconstructive surgery and is comprised of 2 subscales: difficulty of use and embarrassment. Subscale scores range from 3—15; a higher score indicates greater difficulty of use and/or embarrassment. The sum of the 2 subscale scores is the total catheter burden score; a higher total score indicates greater burden. All participants who were discharged to home using postoperative catheterization (either IFC or CISC) were called approximately 1 week after surgery to complete the STCBQ. The 1-week time point was chosen because this optimizes patient recollection while also limiting bias from initial postoperative pain.[11] Secondary outcomes included the number of days that catheterization was required, treatment for urinary tract infection (UTI), the number of postoperative clinic visits, and the number of postoperative phone calls. The number of postoperative clinic visits and postoperative phone calls included all visits and calls from the day of surgery through the 6-week postoperative visit. We categorized all postoperative clinic visits and phone calls into voiding related (eg, phone call for CISC follow up or clinic visit for void

TABLE 1
Short-Term Catheter Burden Questionnaire

	Response				
Query	Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
My catheter sometimes makes me feel embarrassed.[a]	1	2	3	4	5
My need to use a catheter stops me from visiting friends and family as often as I would like.[a]	1	2	3	4	5
I find it easy to use my catheter when I am away from home.[b]	1	2	3	4	5
It is easy to prepare to use my catheter when I am away from home.[b]	1	2	3	4	5
I can use my catheter discretely.[b]	1	2	3	4	5
I would feel embarrassed if people saw my catheter.[a]	1	2	3	4	5

[a] Embarrassment subscale question; [b] Difficulty of use subscale question.

Dieter et al. Catheter burden after urogynecologic surgery. Am J Obstet Gynecol 2019.

trial) or nonvoiding related (eg, phone call for constipation or clinic visit for pain evaluation).

Continuous variables were analyzed with the use of the Student t tests; categoric variables were analyzed with the use of the χ^2 or Fisher's exact test. Days of catheterization was compared with the use of the Mann-Whitney U test for difference in medians. A probability value of <.05 defined statistical significance. Statistical analysis was by intention to treat. All data were analyzed with the use of SPSS software (version 24; IBM Corp, Armonk, NY).

Results
Of 150 participants, 80 women (53%) did not pass their assigned VT, and a total of 77 women were discharged using either IFC or CISC. The remaining 3 participants experienced VT protocol deviations that allowed them additional opportunities to void, and they all subsequently passed their VT and were discharged to home voiding spontaneously. Of the 77 who did not pass the VT and were discharged to home needing to catheterize, 47 women (61%) were discharged home with an IFC and 30 women (39%) were discharged with

CISC. There was no significant difference in VT group allocation (traditional vs PVR free) between those electing IFC vs CISC. In the women randomly assigned to the traditional VT, 19 women (40%) were discharged with IFC vs 19 women (63%) with CISC (P=.07); whereas in the PVR-free group, 28 women (60%) were discharged with IFC and 11 women (37%) were discharged with CISC (P=.07).

When examining baseline demographics between the IFC and CISC groups, we found that, when compared with those discharged using CISC, women who used IFC were older and had a higher Charlson Comorbidity Index that indicated poorer health (Table 2). Otherwise, there were no significant differences in baseline demographics between the IFC and CISC groups. No significant differences were seen in type of anesthesia, route of surgery, apical suspension approach, anterior/posterior repair, midurethral sling placement, bladder injury, operative time, or estimated blood loss.

For our primary outcome, there were no significant differences between IFC and CISC in the STCBQ total catheter burden score (18±5 vs 18±6; P=.77), difficulty of use subscale score (8±3 vs

9±3; P=.20), or embarrassment subscale score (10±4 vs 9±4; P=.12; Table 3). For secondary outcomes, there were no significant differences in rate of UTI treatment (23% IFC vs 30% CISC; P=.60) or days of catheterization (median, 3 [interquartile range, 3,4] IFC vs 4 [2,7] CISC; P=.24) when this postoperative management protocol was used (Table 4). Women who were discharged with IFC had more postoperative clinic visits (2±1 IFC vs 1±1 CISC; P<.01); those women who were discharged with CISC had more postoperative phone calls (2±3 IFC vs 5±3 CISC; P<.01).

Comment
In women who required postoperative catheterization for voiding dysfunction status after reconstructive pelvic surgery who self-selected the use of IFC or CISC, we did not find a significant difference between IFC and CISC in the STCBQ total score, the difficulty of use subscale score, or the embarrassment subscale score. Women who were sent home with IFC were older, had a higher Charlson Comorbidity Index score, and had more postoperative clinic visits; women with CISC had more postoperative phone calls. When comparing IFC and CISC, we did not find a significant difference in total

TABLE 2
Characteristics of participants who chose indwelling Foley catheter vs clean intermittent self-catheterization

Characteristic	Indwelling Foley catheter (n= 47)	Clean intermittent self-catheterization (n=30)	Pvalue[a]
Preoperative data			
Age, y	62±11	55±11	.01[b]
White race, n (%)	36 (77)	25 (83)	.48
Body mass index, kg/m[2c]	28±5	28±5	.91[b]
Postmenopausal, n (%)	39 (83)	18 (60)	.03
Charlson Comorbidity Index score[c]	2±2	1±1	<.01[b]
Pelvic organ prolapse quantification stage ≥3, n (%)	24 (51)	14 (47)	.71
Preoperative postvoid residual, mL[c]	25±19	25±18	.94[a]
Operative data			
General Anesthesia, n (%)	44 (94)	30 (100)	.16
Hysterectomy, n (%)			
Vaginal	21 (45)	19 (63)	.11
Laparoscopic	4 (9)	2 (7)	.77
Abdominal	2 (4)	0	.52
Sacrocolpopexy, n (%)			
Laparoscopic	7 (15)	2 (7)	.31
Abdominal	1 (2)	0	1.0
Vault suspension, n (%)			
Uterosacral ligament suspension	21 (45)	19 (63)	.11
Sacrospinous ligament fixation	6 (13)	4 (13)	1.0
Anterior repair, n (%)	27 (57)	20 (67)	.42
Posterior repair, n (%)	25 (53)	18 (60)	.56
Midurethral sling, n (%)	35 (75)	26 (87)	.20
Bladder injury, n (%)	3 (6)	3 (10)	.67
Operative time, min[c]	196±95	85±16	.93[b]
Estimated blood loss, mL[c]	128±151	121±115	.83[b]

[a] All values are from Pearson chi-square test, unless otherwise specified; [b] Student *t* test; [c] Data are presented as mean±standard deviation.

Dieter et al. Catheter burden after urogynecologic surgery. Am J Obstet Gynecol 2019.

process that included information normalizing and explaining postoperative catheterization, Kenton et al[12] found that 6% of patients still considered going home with a catheter to be a postoperative complication, 11% felt unprepared to cope with a catheter in the hospital, and 14% felt unprepared to cope with a catheter at home. In this same study, Kenton et al showed that women who feel prepared before reconstructive surgery had greater postoperative satisfaction and greater symptomatic and quality-of-life improvement. In a 2015 study, Tunitsky-Bitton et al[4] found that, in women who undergo outpatient midurethral sling surgery, more patients gave a "greatly important" rating to being discharged home with a catheter (72%) than good pain control (50%), which shows that postoperative catheterization continues to be a significant concern for our patients.

Our study is the first to use the validated STCBQ to assess catheter burden during the acute postoperative period. Our findings revealed a significant catheter burden, with a mean STCBQ total score of 18 of a maximum of 30 points in both IFC and CISC groups. This finding of a high catheter burden score is consistent with our knowledge that a significant percentage of patients consider having a catheter postoperatively to be a surgical complication, even when instructed preoperatively that catheterization after surgery is normal and that they should expect to need a catheter postoperatively.[8,12] As more researchers use the STCBQ, the significance of a score of 18 of 30 will become clearer. At this time, the need for postoperative catheterization, despite setting expectations preoperatively, appears to consistently represent a significant patient burden that has potential to negatively influence perceived symptomatic improvement and quality-of-life changes after surgery.

Similar to previous studies, we found a significant risk of UTI after surgery, with 23% and 30% of participants receiving UTI treatment in IFC and CISC groups, respectively.[13−16]

days of catheterization or rate of UTI treatment within the first 6 weeks after surgery.

Postoperative voiding dysfunction is an important issue for patients, and the burden of catheterization during the postoperative period must be acknowledged and investigated further. As Elkadry et al[8] revealed in their 2003 study, a significant number of patients perceive postoperative catheterization to be worse than the preexisting problem for which they underwent surgery. In a follow-up study that assessed the effect of a standardized informed consent

Regarding duration of catheterization, we did not find a significant difference between the 2 groups. This duration of catheterization finding is in line with the previous findings of Jannelli et al[17] who found an average duration of catheterization to be 5 days after reconstructive pelvic surgery with CISC. Haarkvort et al[18] found a shorter average duration of catheterization of 1 day in clean intermittent catheterization vs 3 days in IFC in a recent trial that compared these 2 approaches to manage voiding dysfunction after pelvic organ prolapse surgery. In the Haarkvort trial, the authors used a cut off of 150-mL PVR to discontinue catheterization, and the catheterization was performed by nursing staff, which may explain the difference in duration of catheterization.

Our finding that patients with CISC had more postoperative phone calls and that patients with IFC had more postoperative clinic visits was not surprising. In our study, participants who were discharged with CISC had 2 additional postoperative phone calls, and participants who were discharged with IFC had 1 additional postoperative clinic visit. These differences are explained by how our clinical practice manages patients postoperatively. In our practice, patients with CISC are routinely followed by phone with nurses calling every 1—3 days postoperatively to assess when a patient can stop performing CISC; patients with IFC are scheduled routinely for a nurse visit to come in to the clinic for a formal VT. The cost-effectiveness of these 2 strategies is unclear, and many of our patients have specific reasons to choose IFC or CISC that include transportation limitations or inability to perform CISC.

We found that, of those patients who needed postoperative catheterization, more patients elected for IFC than CISC. This finding differs from a study by Haarkvort et al[19] who found that a majority of patients elected for clean intermittent catheterization when asked preoperatively about their preferred method of catheterization. Their study population included patients who planned pelvic organ prolapse surgery who had never been catheterized before and specifically excluded those with previous catheterization experience. We did not exclude based on or assess previous experience with catheterization; thus, some of our patients who elected IFC may have had IFC before and felt more comfortable with this option as a result. When comparing IFC with CISC with suprapubic catheter, McDermott et al[11] found that more patients preferred IFC than CISC, with suprapubic catheter being the most preferred. In our clinic, all surgical patients have the option for IFC or CISC. At their preoperative visit, patients are offered the option of CISC teaching; if interested, patients are taught CISC by our nursing staff that day. From our experience, some patients do then change their mind on the day of surgery and subsequently go home with IFC.

The fact that our participants were able to choose their preferred method of postoperative catheterization is a unique

TABLE 3
Short-term Catheter Burden Questionnaire results

Variable	Indwelling Foley catheter (n= 38/47)[a]	Clean intermittent self-catheterization (n= 29/30)[a]	P value[b]
Postoperative day questionnaire completed	7±1	7±1	.71
Total catheter burden	18±5	18±6	.77
Difficulty of use subscale	8±3	9±3	.20
Embarrassment subscale	10±4	9±4	.12

[a] Data are presented as mean±standard deviation; [b] Student t test.

Dieter et al. Catheter burden after urogynecologic surgery. Am J Obstet Gynecol 2019.

TABLE 4
Secondary outcomes for participants who were discharged with indwelling Foley catheter vs clean intermittent self-catheterization

Outcome	Indwelling Foley catheter (n= 47)	Clean intermittent self-catheterization (n= 30)	P value[a]
Days of catheterization[b]	3 (3, 4)	4 (2, 7)	.24[c]
Urinary tract infection treatment, n (%)	11 (23)	9 (30)	.60[d]
Postoperative phone calls[e]			
Total	2±3	5±3	<.01
Voiding related only	1±1	3±2	.01
Nonvoiding related	1±2	2±3	.31
Postoperative clinic visits[e]			
Total	2±1	1±1	<.01
Voiding related only	1±1	0±0	<.01
Nonvoiding related	1±1	1±1	.15

[a] All values are from Student t test, unless otherwise specified; [b] Data are presented as median (interquartile range [25%, 75%]); [c] Mann-Whitney U test; [d] Pearson chi-square test; [e] Data are presented as mean±standard deviation.

Dieter et al. Catheter burden after urogynecologic surgery. Am J Obstet Gynecol 2019.

strength of our study because many other studies that have assessed post-operative catheterization satisfaction dictated the type of postoperative catheter based on surgeon preference or study design.[17,18,20] Our study is also strengthened by the use of a well-characterized study population who underwent a variety of urogynecologic surgeries, which included abdominal and vaginal prolapse repairs with and without concomitant midurethral sling surgery, and we had a balanced distribution of women who chose IFC or CISC. Because this study was nested within a larger randomized controlled trial, we had close follow up of participants, which resulted in a high rate of STCBQ completion at 1 week postoperatively.

Limitations of our study include that it was not powered to detect a predefined difference in catheter burden. The assessment of the STCBQ scores was a planned secondary outcome that was assessed within the larger randomized controlled trial. However, given that both the IFC and CISC groups had the same mean catheter burden score, it is unlikely that powering the study for this outcome would have changed our results in a clinically significant way. Observation bias is a limitation that could influence the actual perceived catheter burden, and it is possible that having patients choose their method of catheterization altered their responses to the STCBQ because they may feel some responsibility for their catheterization experience.

In conclusion, we found that, in women who require postoperative catheterization for acute urinary retention after reconstructive pelvic surgery, there is a significant burden to catheter use, regardless of type of catheterization (ie, IFC or CISC). Previous discussions regarding how to best assess and manage postoperative voiding function have focused traditionally on weighing the balance between the risk of UTI and the risk of voiding dysfunction. Our findings highlight the patient experience and reveal the significant burden that postoperative catheterization poses to patients who are recovering from reconstructive pelvic surgery. When examining the harms vs benefits of postoperative catheterization to manage postoperative voiding dysfunction, future studies should take into consideration the significant patient burden that catheterization poses to better optimize postoperative outcomes for our patients. ■

Acknowledgments

References

1. Book NM, Novi B, Novi JM, Pulvino JQ. Postoperative voiding dysfunction following posterior colporrhaphy. Female Pelvic Med Reconstr Surg 2012;18:32–4.
2. Geller EJ, Hankins KJ, Parnell BA, Robinson BL, Dunivan GC. Diagnostic accuracy of retrograde and spontaneous voiding trials for postoperative voiding dysfunction: a randomized controlled trial. Obstet Gynecol 2011;118:637–42.
3. Myers EM, Matthews CA, Crane AK, Connolly A, Wu JM, Geller EJ. Two techniques for assessing postoperative voiding function, a randomized trial. Int Urogynecol J 2017;28: 1567–72.
4. Tunitsky-Bitton E, Murphy A, Barber MD, Goldman HB, Vasavada S, Jelovsek JE. Assessment of voiding after sling: a randomized trial of 2 methods of postoperative catheter management after midurethral sling surgery for stress urinary incontinence in women. Am J Obstet Gynecol 2015;212:597. e1–9.
5. Turner LC, Kantartzis K, Shepherd JP. Predictors of postoperative acute urinary retention in women undergoing minimally invasive sacral colpopexy. Female Pelvic Med Reconstr Surg 2015;21:39–42.
6. Williams KS, Pilkinton ML, Shalom DF, Winkler HA. A randomized controlled trial comparing two voiding trials after midurethral sling with or without colporrhaphy. Int Urogynecol J 2018. https://doi.org/10.1007/s00192-018-3783-3 [Epub ahead of print].
7. Yune JJ, Cheng JW, Wagner H, Kim J, Hardesty JS, Siddighi S. Postoperative urinary retention after pelvic organ prolapse repair: vaginal versus robotic transabdominal approach. Neurourol Urodyn 2018;37: 1794–800.
8. Elkadry EA, Kenton KS, FitzGerald MP, Shott S, Brubaker L. Patient-selected goals: a new perspective on surgical outcome. Am J Obstet Gynecol 2003;189:1551–8.
9. Carpenter JS, Heit M, Rand KL. Development and psychometric properties of a measure of catheter burden with bladder drainage after pelvic reconstructive surgery. Neurourol Urodyn 2017;36: 1140–6.
10. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis 1987;40:373–83.
11. McDermott CD, Ryan V, Pulver A, Boutet M. Postoperative voiding dysfunction: the preferred method for catheterization. Female Pelvic Med Reconstr Surg 2019;25: 56–62.
12. Kenton K, Pham T, Mueller E, Brubaker L. Patient preparedness: an important predictor of surgical outcome. Am J Obstet Gynecol 2007;197:654.e1–6.
13. Dieter AA, Amundsen CL, Edenfield AL, et al. Oral antibiotics to prevent postoperative urinary tract infection: a randomized controlled trial. Obstet Gynecol 2014;123:96–103.
14. Chung CP, Kuehl TJ, Harris SK, et al. Incidence and risk factors of postoperative urinary tract infection after uterosacral ligament suspension. Int Urogynecol J 2012;23: 947–50.
15. Dieter AA, Amundsen CL, Visco AG, Siddiqui NY. Treatment for urinary tract infection after midurethral sling: a retrospective study comparing patients who receive short-term postoperative catheterization and patients who pass a void trial on the day of surgery. Female Pelvic Med Reconstr Surg 2012;18:175–8.
16. Rogers RG, Kammerer-Doak D, Olsen A, et al. A randomized, double-blind, placebo-controlled comparison of the effect of nitrofurantoin monohydrate macrocrystals on the development of urinary tract infections after surgery for pelvic organ prolapse and/or stress urinary incontinence with suprapubic catheterization. Am J Obstet Gynecol 2004;191:182–7.
17. Jannelli ML, Wu JM, Plunkett LW, Williams KS, Visco AG. A randomized controlled trial of clean intermittent self-catheterization versus suprapubic catheterization after urogynecologic surgery. Am J Obstet Gynecol 2007;197:72.e1–4.
18. Hakvoort RA, Thijs SD, Bouwmeester FW, et al. Comparing clean intermittent catheterisation and transurethral indwelling catheterisation for incomplete voiding after vaginal

prolapse surgery: a multicentre randomised trial. BJOG 2011;118:1055–60.

19. Hakvoort RA, Nieuwkerk PT, Burger MP, Emanuel MH, Roovers JP. Patient preferences for clean intermittent catheterisation and transurethral indwelling catheterisation for treatment of abnormal post-void residual bladder volume after vaginal prolapse surgery. BJOG 2011;118: 1324–8.

20. Takase-Sanchez MM, Thompson JC, Hale DS, Heit MH. Suprapubic versus tran-surethral bladder drainage following reconstructive pelvic surgery: a comparison of patient satisfaction and quality of life. Int Urogynecol J 2017;28:721–8.

Author and article information

From the Division of Urogynecology and Reconstructive Pelvic Surgery, The University of North Carolina at Chapel Hill, Chapel Hill, NC.

Corresponding author: Alexis Dieter, MD. alexis_dieter@med.unc.edu