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Research Paper

Urinary catheterization management after vaginal prolapse surgery: A national survey among Chinese urogynecologists and nurses

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ABSTRACT

Background: Urinary catheterization after vaginal prolapse surgery can cause inconvenience for patients, elevate the risk of urinary tract infections, and potentially prolong the hospitalization. In China, there is no consensus on the optimal time to remove the urinary catheter after vaginal prolapse surgery. Thus, it will be valuable to gain insight into the nationwide catheterization management after the vaginal prolapse surgery.

Methods: From March to May 2020, an online questionnaire was shared and purposive non-probabilistic sampling was used to recruit the participants. The urogynecologists currently performing vaginal prolapse surgery and involved nurses were included in this study.

Results: 1363 urogynecologists and 436 nurses responded and 99.5% of them reported using transurethral indwelling catheters (TIC) for post-operative bladder drainage in their practices. The duration of initial catheterization after vaginal prolapse surgery was generally 1–7 days, with a median duration of 3 days for anterior colporrhaphy (AC) and anterior & posterior colporrhaphy (APC), and 2 days for other procedures. For the same type of surgery, the median duration of catheterization varied by region. For AC, it was shorter by 1 day in West China and South China ($P < 0.001$); for PC, it was 2 days in most regions, while 1 day in East China ($P < 0.05$); and for APC, it was 3 days in most regions, while 4 days in Northeast China ($P < 0.05$). No statistically significant difference was found in duration of catheterization in hospital levels.

Conclusions: The findings suggested that duration of catheterization after prolapse surgery varied greatly in China, potentially resulting in unnecessary prolonging of catheterization. Well-designed studies are urgently needed to optimize catheterization management after vaginal prolapse surgery in China.

1. Introduction

Pelvic organ prolapse (POP) occurs in 40% of menopausal women[1] according to the vaginal examination results. The lifetime risk for women undergoing surgery to address POP is 18.7% in Denmark[2] and 20.5% in the United State.[3] After vaginal prolapse surgery, there is an elevated risk of transient urinary retention ranging from 2.5% to 29%.[4,5] And it is a common practice to place a transurethral indwelling catheterization (TIC) to avoid postoperative bladder overdistension,[5,6] and to give the repairs time to heal. However, urinary catheterization may be accompanied by an increased risk of urinary tract infections,[7–9] inconvenience for patients, higher costs, and prolonged hospitalization.[10] Accordingly, it is important to apply the catheterization judiciously.

A survey of related literature suggests that it is still unclear when is the best time to remove the urinary catheter after vaginal prolapse surgery. Several studies have demonstrated that indwelling Foley catheter for 1 day may safely be employed after vaginal prolapse surgery.[10–14] Others indicate that compared to TIC, clean intermittent catheterization

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(CIC) leads to faster resolution of postoperative urinary retention,[15] and suprapubic catheterization (SPC) is associated with higher patient satisfaction[16] and less asymptomatic bacteriuria.[17,18]

For our facility, the routine catheterization period ranges from 3 days to over 5 days. This prolonged catheterization protocol is prompted by the presence of a post-operative vaginal gauze, because pain, anesthesia-related procedures, and paraurethral edema or innervation trauma can prevent optimal emptying of the bladder. As such, a randomized controlled trial (RCT) was conducted in our hospital to compare the 24-h TIC and the 72-h TIC after vaginal prolapse surgery (Chinese Clinical Trial Registry: ChiCTR2000031066).

While results of the trial were compiled, it would be valuable to get insight into the nationwide catheterization management after vaginal prolapse surgery. In the United Kingdom, Hilton and colleagues evaluated the catheterization strategies among gynecologists and reported that the duration of initial catheterization varied from 1 to 7 days after anterior colporrhaphy.[19] In 2009, Hakvoort et al.[20] published a nationwide survey in *The Netherlands* regarding catheterization regimes after vaginal prolapse surgery and demonstrated a high practice variation among hospitals due to insufficient evidence. A separate survey evaluating the anterior colporrhaphy points out that urinary catheter is generally removed on day 2 after surgery and on day 1 after vaginal pack.[21] Nurses make their judgment according to related studies, as they are closely involved in postoperative care. Awareness of national policies as well as the attitude of urogynecologists and nurses is valuable to promote wide application of a new policy.[22]

To date, there are no reported studies presenting an overview of catheterization management after vaginal prolapse surgery throughout the mainland China. To help bridge this gap, a nationwide survey was made in this study to investigate the views, experiences, and practices of gynecologists and urologists currently performing surgery for vaginal prolapse as well as nurse specialists in perioperative care for prolapse patients.

2. Methods

2.1. Study design and participants

This study employed a nationwide questionnaire-based survey among Chinese urogynecologists and nurses; a purposive nonprobability sampling approach was used to select the participants under investigation. In March 2020, the survey invitation and online questionnaire address link were sent to 54 leading gynecologists, urogynecologists, and gynecological nurse specialists of each province in the mainland China. The link was then sent to directors and head nurses of gynecology wards in the hospitals, hoping their clinical urogynecologists and nurses could complete the questionnaire using mobile phones anonymously. Some basic requirements for participation were designed as the first section in the survey to select appropriate respondents. Urogynecologists were eligible to participate if they were specialized in female pelvic floor medicine and reconstructive surgery, and they were currently performing vaginal surgery for prolapse. Nurses who managed perioperative care of prolapse women were also invited to participate in the survey.

2.2. Ethics approval and consent to participate

Ethical approval was obtained from the Clinical Research Ethics Committee of the Peking University People's Hospital. There was a separate question before the questionnaire: “Do you agree to participate in this survey?”. When respondents answered “yes”, they could participate in the survey; otherwise, the questionnaire would be closed and the survey had to be stopped. All survey responses were anonymous, with consent to participate implied by completion of the questionnaire. Survey questions were not compulsory, thus participants had discretion over what they answered. No incentive to participate was provided.

2.3. Questionnaire

Development of the questionnaire took several iterations until consensus among the research teams was reached. One researcher (YL) developed the questions and sequence of questioning; one (XL) reviewed the questions, types, sequence, and relevance; and another (XS) edited and provided the final decision on areas of contention. The final questionnaire consisted of 24 questions, covering the following four sections: 1) a general information sheet with basic demographic characteristics and information about the hospitals, in anonymity; 2) standard protocols related to post-operative initial catheter, including the standard type and duration of initial catheter, whether vaginal gauze was routinely placed post-operatively, and whether antibiotics were routinely administered after surgery; 3) viewpoints concerning duration of initial catheterization after different types of vaginal surgery; 4) management after removal of initial catheter, such as the definition of abnormal postvoid residual (cut-off point of acceptable residual bladder volume), the technique to measure postvoid residual, and type of bladder drainage. An English version of the questionnaire was given in Supplementary file 1.

2.4. Statistical analyses

A database was automatically formed on the website platform, and it was downloaded and input into SPSS 17.0. Incomplete data was automatically identified and eliminated. Descriptive statistics were used to examine the distribution and to summarize the data (mean ± standard deviation, frequency, and constituent ratio). The duration of catheterization after surgery is summarized by median and interquartile range, and compared between groups using the Mann-Whitney *U* test. *P* value < 0.05 meant the difference was statistically significant.

3. Results

During March to April 2020, 1363 (75.8%) urogynecologists and 436 (24.2%) nurses from 31 provinces in mainland China participated in this survey; 69.6% of them had 10+ years of working experience as a urogynecologist or nurse specializing in (uro)gynecology. Among the 1799 respondents, 36.2% had a master's or doctor's degree, and 26.8% were chief physician or chief nurse, which were senior professional titles in the Chinese medical field. Participants' socio-demographics, practice characteristics, and general information about their practicing hospitals were showed in Table 1. The raw data was presented in Supplementary file 2.

As shown in Table 2, almost all of the respondents (99.5%) reported using a TIC for post-operative bladder drainage in their practice. Nearly 73% of participants declared a routine of inserting vaginal gauze and half of them removed the gauze later than 24 h after surgery. 92.6% of participants routinely administered antibiotics, and over half of whom applied antibiotics for patients through an intravenous drip for over two days. After removal of initial catheter, the cut-off value for an abnormal postvoid residual varied from 50 to 300 mL with a median value of 100 mL. The residual volume was measured primarily (75.5%) using an ultrasonic scanning device. When urinary retention occurred, nearly 80% reinserted a transurethral catheter for 2–3 days.

As for initial TIC, 1305 (72.5%) respondents believed duration of catheterization depended on the type of vaginal prolapse surgery, as outlined in Table 3. The median duration of initial catheterization after AC or APC was three days, and was two days for PC, Le Fort colpocleisis, sacrospinous ligament fixation (SSLF), or other uterus suspension techniques.

For the procedures of AC and APC, the median duration of catheterization arranged by nurses was statistically significantly shorter by 1 day than that of the urogynecologists; while for PC and Le Fort colpocleisis, the median duration of catheterization was shorter by 1 day from the views of urogynecologists than that of the nurses ($P < 0.05$). For hospitals with different levels, the median duration of initial catheterization after APC/SSLF/Lefort was the same, but it was generally 1 day longer in level 3

Table 1
Baseline characteristics of Respondents (N = 1799).

Items	Category	Number (%)
Hospital level	Level 3	1493 (83.0)
	Level 2	297 (16.5)
	Level 1	9 (0.5)
Hospital type	Comprehensive	1316 (73.2)
	(Uro)Gynecology specialized	430 (23.9)
	Traditional Chinese medicine	46 (2.6)
	Others	7 (0.4)
Hospital composition	Public	1727 (96.0)
	Private	36 (2.0)
	Military	13 (0.7)
	Others	23 (1.3)
Hospital location	East China	503 (28.0)
	South China	147 (8.2)
	Central China	157 (8.7)
	North China	311 (17.3)
	Northwest China	338 (18.8)
	Southwest China	171 (9.5)
	Northeast China	172 (9.6)
Gender	Male	200 (11.1)
	Female	1599 (88.9)
Age (years old)	18–25	81 (4.5)
	26–30	261 (14.5)
	31–40	579 (32.2)
	41–50	502 (27.9)
	51–60	358 (19.9)
	>60	18 (1.0)
Education level	Associate degree	85 (4.7)
	Bachelor degree	1062 (59.0)
	Master's degree	493 (27.4)
	Doctor's degree	159 (8.8)
Work experiences (years)	<5	286 (15.9)
	5–9	261 (14.5)
	10–19	500 (27.8)
	≥20	752 (41.8)
Position title	Chief physician	479 (26.6)
	Associate chief physician	386 (21.5)
	Attending doctor	285 (15.8)
	Resident doctor	213 (11.8)
	chief of nursing	4 (0.2)
	Associate professor of nursing	37 (2.1)
	Nurse in charge	118 (6.6)
	Nurse practitioner	201 (11.2)
	Nurse	76 (4.2)
Number of Vaginal prolapse surgery performed	1-9 weekly	1564 (86.9)
	10-19 weekly	173 (9.6)
	20-29 weekly	38 (2.1)
	30-39 weekly	13 (0.7)
	≥40 weekly	11 (0.6)
Prolapse surgery performed (only for urogynecologists)	1-4 weekly	1217 (67.6)
	5-9 weekly	110 (6.1)
	10-14 weekly	11 (0.6)
	15-19 weekly	8 (0.4)
	≥20 weekly	17 (0.9)

Hospital level: the higher the level, the greater the scale and the higher quality of hospital. Level 1 represents the primary health care center and level 3 represents the medical center with comprehensive medical, teaching, and scientific research capabilities.
East China includes 7 provinces: Shandong & Jiangsu & Anhui & Zhejiang & Fujian & Shanghai & Jiangxi; *South China* includes 3 provinces: Guangdong & Guangxi & Hainan; *Central China* includes 3 provinces: Hunan & Hubei & Henan; *North China* includes 5 provinces: Beijing & Tianjin & Hebei & Shanxi & Inner Mongolia; *Northwest China* includes 5 provinces: Ningxia & Xinjiang & Qinghai & Shanxi & Gansu; *Southwest China* includes 5 provinces: Sichuan & Yunnan & Guizhou & Xizang & Chongqing; *Northeast China* includes 3 provinces: Liaoning & Jilin & Heilongjiang.

hospitals after AC/PC, with no statistically significant differences. For the procedures of AC/PC and APC, hospitals all over the China showed great variation. For AC surgery, the median duration of initial catheterization was 1 day longer in East China, Central China, North China, and Northeast China than that in West China and South China ($P < 0.001$). For PC surgery, it was generally shorter within 2 days, and even 1 day in East China

Table 2
Protocols related to post-operative initial catheter (N = 1799).

Items	Number (%)
Type of catheterization	
Indwelling transurethral	1790 (99.5)
Clean intermittent	8 (0.4)
Suprapubic	1 (0.1)
Routine insertion of a vaginal gauze post-operatively	
No	494 (27.5)
Yes	1305 (72.5)
For 24 h or less	656 (36.5)
for 25 h–48 h	565 (31.4)
for 49 h–72 h	82 (4.6)
for over 72 h	2 (0.1)
Routine administration of antibiotics post-operatively	
No	134 (7.4)
Yes	1665 (92.6)
by infusion	1617 (89.9)
by oral administration	27 (1.5)
by other ways	21 (1.2)
for 1 day	302 (16.8)
for 2 days	550 (30.6)
for 3 days	643 (35.7)
for over 3 days	170 (9.4)
Technique of measurement of residual volume	
Ultrasonic scanning	1359 (75.5)
Catheterization	397 (22.1)
Others	43 (2.4)
Cut-off point for urinary retention(mL)	
50	444 (24.7)
100	1111 (61.8)
150	117 (6.5)
200	98 (5.4)
250	25 (1.4)
300	4 (0.2)
Type of bladder drainage after diagnosis of urinary retention	
Suprapubic	1 (0.1)
Indwelling transurethral	1593 (88.5)
for 24 h or less	137 (7.6)
for 25–48 h	531 (29.5)
for 49–72 h	364 (20.2)
for 73–96 h	198 (11.0)
For 96 h or longer	228 (12.7)
Clean intermittent	205 (11.4)
every 2 h	34 (1.9)
every 4 h	57 (3.2)
every 6 h	7 (0.4)
every 8 h	5 (0.3)
when necessary	102 (5.7)

($P < 0.05$). For APC surgery, it was 3 days in most regions and 4 days in Northeast China. Respondents with longer work experience reported a shorter duration of initial catheterization after PC and a longer duration after AC ($P < 0.05$). Urogynecologists' opinions on duration of catheterization after different prolapse surgeries were generally similar, regardless of numbers of procedures performed.

4. Discussion

In this survey, it investigated urinary catheterization management after vaginal prolapse surgery among Chinese urogynecologists and nurses. Nearly all respondents (99.5%) reported a use of TIC for patients after vaginal prolapse surgery. The median duration of initial catheterization was three days after AC and APC, and two days after PC, Le Fort colpocleisis, SSLF, or other uterus suspension techniques.

Firstly, the practice variation regarding type of catheterization after vaginal prolapse surgery was minimal in China. Research abroad reports varying utilization rates of different types of catheterizations for post-operative bladder management in urogynecology. A national survey among 99 hospitals in Netherlands[20] found that 77% performed TIC, 12% adopted SPC, and 11% used CIC. Another electronic survey in the United States[23] found that 53% of the respondents determined TIC as the best catheterization option, compared with 42% for CIC and 4% for SPC

Table 3
Duration of initial catheter after different vaginal prolapse surgeries [N = 1305, M(Q1,Q3)].

Category	Surgical procedures				
	AC	PC	APC	SSLF or other uterus suspension techniques*	Le Fort
All respondents	3 (2,4)	2 (1,2)	3 (2,5)	2 (1,3)	2 (1,3)
Different occupations					
Urogynecologists (n = 1038)	3 (2,5)	1 (1,2)	3 (2,5)	2 (1,2)	2 (1,3)
Nurse (n = 267)	2 (1,3)	2 (1,3)	2 (1,3)	2 (1,3)	3 (1,4)
P*	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Different hospital levels					
Level 3 (n = 1083)	3 (2,4)	2 (1,2)	3 (2,5)	2 (1,3)	2 (1,3)
Level 2&1 (n = 222)	2 (2,4)	1 (1,2)	3 (2,5)	2 (1,3)	2 (1,3)
P*	0.459	0.333	0.594	0.776	0.448
Different locations					
East China (n = 371)	3 (2,4)	1 (1,2)	3 (2,5)	2 (1,2)	2 (1,3)
South China (n = 120)	2 (2,3)	2 (1,2)	3 (2,5)	2 (1,2)	2 (1,3)
Central China (n = 107)	3 (2,3)	2 (1,3)	3 (2,5)	2 (1,3)	2 (1,3)
North China (n = 217)	3 (2,5)	2 (1,3)	3 (2,5)	2 (1,3)	2 (1,3)
Northwest China (n = 242)	2 (1,3)	2 (1.3)	3 (2,5)	2 (1,3)	2 (1,3)
Southwest China (n = 124)	2 (1,3)	2 (1,3)	3 (2,5)	1 (1,3)	2 (1,3)
Northeast China (n = 124)	3 (2,5)	2 (1,3)	4 (2,6)	2 (1,3)	2 (1,3)
P*	**<0.001**	**0.017**	**0.022**	0.387	0.542
Different working years					
<10 (n = 339)	2 (1,3)	2 (1,3)	3 (2,5)	2 (1,3)	2 (1,3)
≥10 (n = 966)	3 (2,4)	1 (1,2)	3 (2,5)	2 (1,2)	2 (1,3)
P*	**<0.001**	**<0.001**	0.345	**0.001**	**<0.001**
Different numbers of procedures performed by urogynecologists					
<5 (n = 919)	3 (2,5)	1 (1,2)	3 (2,5)	2 (1,2)	2 (1,3)
≥5 (n = 119)	3 (2,4)	1 (1,2)	3 (2,5)	1 (1,2)	2 (1,3)
P*	0.253	**0.037**	**0.030**	0.083	0.568

AC: anterior colporrhaphy (with or without mesh); PC: posterior colporrhaphy (with or without mesh); APC: anterior and posterior colporrhaphy (with or without mesh); SSLF: sacrospinous ligament fixation.; * with or without vaginal hysterectomy.
Hospital level: the higher the level, the greater the scale and the higher quality of hospital. Level 1 represents the primary health care center and level 3 represents the medical center with comprehensive medical, teaching, and scientific research capabilities.
East China includes 7 provinces: Shandong & Jiangsu & Anhui &Zhejiang & Fujian & Shanghai & Jiangxi; *South China* includes 3 provinces: Guangdong & Guangxi & Hainan; Central China includes 3 provinces: Hunan & Hubei & Henan; North China includes 5 provinces: Beijing & Tianjin & Hebei & Shanxi & Inner Mongolia; Northwest China includes 5 provinces: Ningxia & Xinjiang & Qinghai & Shanxi & Gansu; Southwest China includes 5 provinces: Sichuan & Yunnan & Guizhou & Xizang & Chongqing; Northeast China includes 3 provinces: Liaoning & Jilin & Heilongjiang.
*P**: Mann-Whitney *U* test; *P < 0.05 is indicated in bold.*

($P < 0.0001$). These two investigations demonstrate a larger proportion of using CIC and SPC in bladder drainage in prolapse surgery patients than in China. In fact, despite its higher risk of bacteriuria, TIC is considered easier to use for patients as well as medical staff.[23] Because it is free from manipulating catheter through the urethra when compared to CIC, and is less invasive than SPC, which is associated with a higher rate of severe complications.[24] The popularity of TIC is reflected in the fact that the majority of respondents choose it.

Secondly, it was found that the duration of initial catheterization after various types of vaginal prolapse surgeries were generally longer than that reported in the research abroad. Hakvoort et al.[11] indicated that the disadvantages of prolonged catheterization outweighed the advantages, and removal should be performed the first day after surgery. This is in accordance with the recommendations of Schiotz and Tanbo[25] who summarized the six studies they conducted among gynecologic patients in the 1990s. Recently, several studies have even explored the safety and feasibility of removing the catheter on the day after prolapse surgery. However, according to our survey, TIC was normally kept for at least two days and even longer after prolapse surgery in China.

Prolonged catheterization may be partly related to the routine insertion of a vaginal pack (72.5%) and the routine infusion-administered antibiotics (92.6%). It has been a traditional practice to place a vaginal pack after vaginal surgery to prevent reactionary hemorrhage, which hinders normal urinary voiding. The bladder is catheterized to facilitate urinary drainage after surgery, but it is accompanied by an increased risk of urinary infection. Subsequently, antibiotics are administered to lower the incidence of infection. As a result, intravenous infusion and the vaginal pack can interfere with the out-of-bed mobilization of patients and may cover up the symptoms of urinary infection, so as to delay removal of urinary catheter. However, keeping catheter and pack for prolonged duration after surgery has evolved, as it has become evident that prolonging the duration brings no additional benefit. Glavind et al.[26] reported vaginal bleeding was heavier than a menstrual bleeding in 2.9% of women whose vaginal pack was removed after 24 h and none among women whose pack was removed after 3 h. Rajan et al.[27] found that keeping the urinary catheter and vaginal pack for 24 h after vaginal surgery did not offer any additional benefit against removing them after 3 h, with respect to vaginal bleeding (1% and 0, $P = 1.0$), urinary retention (4% and 9%, $P = 0.15$), febrile morbidity (4% and 7%, $P = 0.35$), and urinary infection (26% and 26%, $P = 1.0$).

In addition, age may also play a role in influencing the longer duration of domestic patients. Epidemiological studies have shown that the majority of Chinese patients with moderate to severe POP are older women over 60 years old.[28] The aging process may increase urethral stiffness, decreases the contractility of detrusor muscles, and lead to progressive neuronal degeneration, making it more likely to occur urinary retention.[29,30] Therefore, it may increase the duration of catheterization. Furthermore, some elderly patients have difficulty in self-care before surgery, and early postoperative removal of urinary catheter does not allow them to move around on their own, which can also influence the urogynecologists' consideration on duration of urinary catheter.

Conversely, Urogynecology and Reconstruction of Pelvic Surgery (URPS) develops slowly in China. Apart from several large municipal hospitals, many local hospitals' perioperative management measures for prolapse patients are still relatively traditional and conservative. Since many community hospitals in China have no subspecialty and local hospitals are supplied with limited medical resources, many prolapse patients have to seek treatment in larger hospitals. Patients can only be

discharged after complete recovery in the hospital, and the hospital stay is generally 3–7 days. Both medical staff and the patients are reluctant to remove the urinary catheters early. These may be related to the prolonged initially TIC and a great variation in postoperative catheterization management in different parts of China. The different levels of expertise and the various conditions of patients may also explain the regional differences in the duration of initial catheterization. However, with the application of Enhanced Recovery After Surgery (ERAS) and the development of pelvic floor surgery technologies, the notion of early removal of urinary catheter has been accepted by more and more medical staff and patients. Hospital stays are expected to be shortened by 1–3 days.

Thirdly, it was found that the median duration of catheterization for different procedures of prolapse surgery was similar in the nurses group, which was 2 days. In the urogynecologists group, the median duration of catheterization was longer by 1 day for AC/APC, and shorter by 1 day for PC/SSLF/Le Fort colpocleisis than those in the nurses group ($P < 0.05$). Regardless of the number of procedures performed, urogynecologists' opinions on duration of catheterization after different prolapse surgeries were generally similar. Assessing nurses' opinions was valuable: while they do not decide when to remove the urinary catheter, they do closely monitor patients in the postoperative period, so they have as much clinical experience on this topic. Possible explanations for different opinions between urogynecologists and nurses could be the fact that nurses have limited knowledge about the specific procedures of pelvic floor reconstruction surgery. From their long-term postoperative care, they think that two days for TIC use is sufficient for patients to return to normal urination function. In addition, the potentially increased workload associated with the earlier removal of catheterization seems to influence their opinions. However, urogynecologists concerned more on the effect of surgical operation on postoperative urination of patients, believing that anterior pelvic surgery involves the handling of urethra, which may lead to edema of urethra surrounding tissues. In addition, they consider the long-term effect of AC, requiring a longer TIC to assist bladder drainage. These findings should be taken into consideration when the catheter removal policies are implemented in the future.

Limitations of this study were identified as follows. The convenience of online survey should be balanced with the challenge of possible low response rates. The sample size was not calculated in advance, aiming to invite as many eligible participants as possible. To overcome these limitations, 54 leading gynecologists, urogynecologists, and gynecological nursing specialists of all the 31 provinces in mainland China were invited for data collection. In addition, the additional filter questions were not designed in this study, so that the reliability of the collected data could be judged better. When a submitted questionnaire showed no missing content in the event that the respondent chose not to answer the question, it was still considered to be reliable.

5. Conclusions

In conclusion, the vast majority of urogynecologists and nurses surveyed in our study reported the use of transurethral indwelling catheters after vaginal prolapse surgery in their practice. Duration of catheterization varied greatly due to different vaginal prolapse surgeries; and such practice variation may result in unnecessary prolongation of catheterization. Although randomized trials were necessary to determine optimal catheterization management, our findings were conducive to implementing a new urinary catheter policy.

Author contribution

CY and LYcollected and analyzed the data,and drafted the article; LX: reviewed and revised the preliminary draft and provided support and guidance for this study, SX: provided support for this study, WJ: provided support for this study. All authors read and approved the final manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.gocm.2022.04.006.

References

1. Handa VL, Garrett E, Hendrix S, et al. Progression and remission of pelvic organ prolapse: a longitudinal study of menopausal women. *Am J Obstet Gynecol.* 2004;190(1):27–32.
2. Løwenstein E, Ottesen B, Gimbel H. Incidence and lifetime risk of pelvic organ prolapse surgery in Denmark from 1977 to 2009. *Int Urogynecol J.* 2015;26(1):49–55.
3. Wilkins MF, Wu JM. Lifetime risk of surgery for stress urinary incontinence or pelvic organ prolapse. *Minerva Ginecol.* 2017;69(2):171–177.
4. Hakvoort RA, Dijkgraaf MG, Burger MP, et al. Predicting short-term urinary retention after vaginal prolapse surgery. *Neurourol Urodyn.* 2009;28(3):225–228.
5. Geller EJ. Prevention and management of postoperative urinary retention after urogynecologic surgery. *Int J Womens Health.* 2014;(6):829–838.
6. Madersbacher H, Cardozo L, Chapple C, et al. What are the causes and consequences of bladder overdistension? ICI-RS 2011. *Neurourol Urodyn.* 2012;31(3):317–321.
7. Tambyah PA, Maki DG. Catheter-associated urinary tract infection is rarely symptomatic: a prospective study of 1,497 catheterized patients. *Arch Intern Med.* 2000;160(5):678–682.
8. Kringel U, Reimer T, Tomczak S, et al. Postoperative infections due to bladder catheters after anterior colporrhaphy: a prospective, randomized three-arm study. *Int Urogynecol J.* 2010;21(12):1499–1504.
9. Thomas-White KJ, Gao X, Lin H, et al. Urinary microbes and postoperative urinary tract infection risk in urogynecologic surgical patients. *Int Urogynecol J.* 2018;29(12):1797–1805.
10. Kamilya G, Seal SL, Mukherji J, et al. A randomized controlled trial comparing short versus long-term catheterization after uncomplicated vaginal prolapse surgery. *J Obstet Gynaecol Res.* 2010;36(1):154–158.
11. Hakvoort RA, Elberink R, Vollebregt A, et al. How long should urinary bladder catheterisation be continued after vaginal prolapse surgery? A randomised controlled trial comparing short term versus long term catheterisation after vaginal prolapse surgery. *BJOG.* 2004;111(8):828–830.
12. Schiotz HA. Comparison of 1 and 3 days' transurethral Foley catheterization after retropubic incontinence surgery. *Int UrogynEcol J Pelvic Floor Dysfunct.* 1996;7(2):98–101.
13. Fernandez-Gonzalez S, Martinez Franco E, Martínez-Cumplido R, et al. Reducing postoperative catheterisation after anterior colporrhaphy from 48 to 24 h: a randomised controlled trial. *Int Urogynecol J.* 2019;30(11):1897–1902.
14. Bray R, Cartwright R, Digesu A, et al. A randomised controlled trial comparing immediate versus delayed catheter removal following vaginal prolapse surgery. *Eur J Obstet Gynecol Reprod Biol.* 2017;210:314–318.
15. 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(9):1055–1060.
16. Takase-Sanchez MM, Thompson JC, Hale DS, et al. Suprapubic versus transurethral bladder drainage following reconstructive pelvic surgery: a comparison of patient satisfaction and quality of life. *Int Urogynecol J.* 2017;28(5):721–728.
17. Kidd EA, Stewart F, Kassis NC, et al. Urethral (indwelling or intermittent) or suprapubic routes for short-term catheterisation in hospitalised adults. *Cochrane Database Syst Rev.* 2015;12, CD004203.
18. Healy DA, Walsh CA, Walsh SR. Suprapubic versus transurethral bladder catheterization following pelvic surgery. *Curr Opin Obstet Gynecol.* 2013;25(5):410–413.
19. Hilton P. Bladder drainage: a survey of practices among gynaecologists in the British Isles. *Br J Obstet Gynaecol.* 1988;95(11):1178–1189.
20. Hakvoort RA, Burger MP, Emanuel MH, et al. A nationwide survey to measure practice variation of catheterisation management in patients undergoing vaginal prolapse surgery. *Int Urogynecol J.* 2009;20(7):813–818.
21. Lensen EJM, Stoutjesdijk JA, Withagen MIJ, et al. Technique of anterior colporrhaphy: a Dutch evaluation. *Int Urogynecol J.* 2011;22(5):557–561.
22. Sandberg EM, Leinweber FS, Herbschleb PJ, et al. Urinary catheterisation management after laparoscopic hysterectomy: a national overview and a nurse preference survey. *J Obstet Gynaecol.* 2018;38(8):1115–1120.
23. Kulkarni A, McDermott CD. The preferred catheter type after prolapse surgery. *Female Pelvic Med Reconstr Surg.* 2021;27(1):34–38.

24. Stekkinger E, van der Linden PJQ. A comparison of suprapubic and transurethral catheterization on postoperative urinary retention after vaginal prolapse repair: a randomized controlled trial. *Gynecol Obstet Invest*. 2011;72(2):109–116.
25. Schiøtz HA, Tanbo TG. Postoperative voiding, bacteriuria and urinary tract infection with Foley catheterization after gynecological surgery. *Acta Obstet Gynecol Scand*. 2006;85(4):476–481.
26. Glavind K, Mørup L, Madsen H, et al. A prospective, randomised, controlled trial comparing 3 hour and 24 hour postoperative removal of bladder catheter and vaginal pack following vaginal prolapse surgery. *Acta Obstet Gynecol Scand*. 2007;86(9):1122–1125.
27. Rajan P, Soundara RS, Sharma D. Study comparing 3 hour and 24 hour post-operative removal of bladder catheter and vaginal pack following vaginal surgery: a randomised controlled trial. *BMC Wom Health*. 2017;17(1):78.
28. Zhiyi LI. *An Epidemiological Study of Pelvic Organ Prolapse in Chinese Adult Women*. Peking Union Medical College; 2019.
29. Alas A, Hidalgo R, Espaillat L, et al. Does spinal anesthesia lead to postoperative urinary retention in same-day urogynecology surgery? A retrospective review. *Int Urogynecol J*. 2019;30(8):1283–1289.
30. Cao TT, Sun HX, Sun XL, et al. The efficacy of transcutaneous electrical stimulation on urinary retention in women with pelvic reconstructive surgery. *Chin J Clin Obstet Gynecol*. 2019;20(2):104–107.