

Postpartum urinary retention: an expert review



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Postpartum urinary retention is a relatively common condition that can have a marked impact on women in the immediate days following childbirth. If left untreated, postpartum urinary retention can lead to repetitive overdistention injury that may damage the detrusor muscle and the parasympathetic nerve fibers within the bladder wall. In rare circumstances, postpartum urinary retention may even lead to bladder rupture, which is a potentially life-threatening yet entirely preventable complication. Early diagnosis and timely intervention are necessary to decrease long-term consequences. There are 3 types of postpartum urinary retention: overt, covert, and persistent. Overt retention is associated with an inability to void, whereas covert retention is associated with incomplete bladder emptying. Persistent urinary retention continues beyond the third postpartum day and can persist for several weeks in rare cases. Recognition of risk factors and prompt diagnosis are important for proper management and prevention of negative sequelae. However, lack of knowledge by providers and patients alike creates barriers to accessing and receiving evidence-based care, and may further delay diagnosis for patients, especially those who experience covert postpartum urinary retention. Nationally accepted definitions and management algorithms for postpartum urinary retention are lacking, and development of such guidelines is essential for both patient care and research design. We propose intrapartum recommendations and a standardized postpartum bladder management protocol that will improve patient outcomes and contribute to the growing body of evidence-based practice in this field.

Key words: bladder protocol, female pelvic medicine and reconstructive surgery, indwelling urethral catheter, intermittent self-catheterization, intrapartum bladder management, patient education, peripartum, postpartum bladder management, urogynecology

Introduction

Postpartum urinary retention (PUR) is an underrecognized phenomenon that can occur in the immediate postpartum period. Estimates of PUR incidence vary

widely from 1.5% to 17.9%, with undiagnosed cases making the true incidence difficult to determine.^{1–3} Although international guidelines for PUR exist, the lack of standardized screening and

treatment protocols for PUR in the United States has created discrepancies in clinical practice that may result in undertreatment.^{4,5} Although the potential long-term consequences of untreated PUR remain unclear, in the short term untreated PUR can be an unanticipated stressor and lead to repetitive overdistention injury that may damage the detrusor muscle and the parasympathetic nerve fibers within the bladder wall. Prompt management is necessary because longer periods of untreated acute retention are more likely to transform the detrusor muscle into noncontractile fibrosis.^{6,7} In rare circumstances, PUR may lead to bladder rupture,^{4,8–10} a potentially life-threatening yet entirely preventable complication.

Prompt recognition is essential for PUR management; however, this is hindered by knowledge deficits among physicians and patients. A survey of obstetrics and gynecology residents revealed that only 17.1% of respondents received formal didactics on PUR management.¹¹ Formal PUR education increased the likelihood that residents could successfully recognize scenarios concerning PUR, and implementation of a management protocol was associated with increased comfort in managing PUR.¹¹ Identifying this educational gap highlights an important opportunity to improve resident training. Unfortunately, only approximately 30% of U.S. institutions have a standardized policy for PUR evaluation and management.¹¹ These are often based on local expert opinion because no national consensus exists.¹² Institutional PUR protocols are important because patients may not be aware that attention to timing and adequacy of bladder emptying is necessary. Therefore, healthcare providers must be vigilant in the identification and prompt management of PUR.

The aims of this expert opinion are to define subtypes of PUR, identify risk factors, and examine the pathophysiology

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and long-term implications of untreated PUR. We highlight the importance of early PUR identification and offer management recommendations. With appropriate guidance and resources, the diagnosis and management of PUR can be improved.

Definitions

The lack of consensus in defining PUR has created a major challenge in performing research and providing evidence-based care. Research suggests that normal postpartum voiding includes micturition within 6 hours after vaginal delivery or 6 hours after catheter removal following cesarean delivery. A postvoid residual (PVR) volume of <150 mL is typically considered appropriate for normal bladder emptying.^{2,3,13} Deviation from these parameters results in PUR diagnosis.

Clinical findings of PUR include inadequate urinary output and/or signs of urinary retention, such as suprapubic fullness, a palpable distended bladder, displaced uterine fundal height, bladder discomfort, sensation of bladder fullness or pain, dysuria, urinary frequency, passing small amounts of urine, hesitancy to void, and a sensation of incomplete bladder emptying. Increased vaginal bleeding may also be a sign of PUR because bladder distention may impair the myometrial contraction needed to compress the vascular interface previously supplying the placenta.

Overt, covert, and persistent PUR are defined according to the currently available literature (Box 1). Overt PUR is the inability to void ≥ 6 hours after vaginal delivery or catheter removal following cesarean delivery.² Covert PUR is most commonly defined as a PVR bladder volume of ≥ 150 mL after a spontaneous void, as measured by ultrasound or catheterization.² Because covert PUR requires an intervention to assess bladder emptying and a standardized definition of an abnormal PVR, it is more likely to go undiagnosed compared with overt PUR. Persistent PUR, also known as protracted, prolonged, or chronic PUR, is urinary retention lasting beyond 3 days postpartum and requiring either an indwelling urethral catheter or intermittent self-catheterization (ISC).^{6,14} The

Box 1

Postpartum urinary retention definitions

Overt PUR: inability to void six hours after a vaginal delivery or, alternatively, inability to void six hours after catheter removal following a cesarean delivery.

Covert PUR: urinary symptoms or a PVR volume of greater than or equal to 150 mL after a spontaneous void, as measured by ultrasound or catheterization.

Persistent PUR: urinary retention lasting longer than three days postpartum and requiring catheterization.

These definitions are used for the diagnosis and management of the various types of PUR.

PUR, postpartum urinary retention; PVR, postvoid residual.

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definitions outlined above are used for the diagnosis and management recommendations in this review.

Pathophysiology

The pathophysiology of PUR is not well-understood; however, several hypotheses exist regarding physiological, neurologic, and mechanical factors related to pregnancy and the immediate postpartum period. The bladder is a hormone-responsive organ.¹⁵ Pregnancy-related changes, including increased progesterone,¹⁶ reduced bladder muscle tone, increased capacity,¹⁷ increased urethral length, and increased maximal urethral closure pressure¹⁸ may contribute to PUR development. During pregnancy and immediately postpartum, increased progesterone levels inhibit smooth muscle tone and may contribute to detrusor inhibition.¹⁵ Impaired detrusor contractility combined with a lack of urethral relaxation may explain a component of the urinary retention mechanism.¹⁹ One study of the rabbit bladder contractile response demonstrated that pregnancy induced a 50% decrease in bladder muscarinic receptor density, which correlated with a 50% decrease in the contractile response to bethanechol.²⁰

Another PUR mechanism involves injury to the pelvic, hypogastric, and pudendal nerves during delivery.¹⁵ Neurologic consequences vary depending on the complex interactions of partial or complete injuries with the parasympathetic, sympathetic, and somatic nervous systems.^{15,21} Sympathetic nerve injuries result in decreased bladder compliance and high storage pressures because of

beta-adrenergic denervation, whereas parasympathetic nerve injuries produce a hypocontractile bladder with decreased sensation.¹⁵ These nerve injuries, which are typically transient in nature and resolve within 3 months postpartum, have been demonstrated through electrophysiological research.^{15,22} During a vaginal delivery, ischemic nerve injury can occur from a prolonged second stage of labor, and direct partial or complete nerve transection can result from either spontaneous or operative birth trauma. Denervation can occur during a cesarean delivery in cases complicated by substantial hemorrhage or in those requiring a cesarean hysterectomy. Regional analgesia acts as a potential iatrogenic contributor to PUR, directly affecting bladder sensitivity and contractility. It also temporarily disrupts afferent input arising from bladder stretch receptors, which may be damaged by overdistention intrapartum.²³

Periurethral and vulvar edema can lead to mechanical urethral obstruction and impaired voiding.¹⁹ Pain associated with obstetrical lacerations may preclude relaxation of pelvic floor muscles, which is the first step in initiating a spontaneous void. Furthermore, patient discomfort with voiding in unfamiliar locations and lack of privacy are possible contributors to PUR.¹⁵

Risk factors

Independent risk factors for PUR vary and are often limited by confounding factors. Frequently proposed risk factors include epidural anesthesia, operative vaginal delivery, prolonged labor

duration, episiotomy, newborn macrosomia, nulliparity, and obstetric anal sphincter injury. A systematic review of PUR risk factors found that operative vaginal delivery was the only clinical factor with a consistently strong association with PUR.²⁴ Operative vaginal delivery may result in direct pelvic floor and bladder trauma, edema that results in mechanical outlet obstruction, or impaired reflex and voluntary relaxation of the sphincter urethrae, periurethral muscles, and pelvic floor.²³ It is unclear whether operative vaginal delivery is an individual risk factor, or if it is confounded by other concurrent risk factors such as epidural, episiotomy, prolonged labor, and parity.²⁴ In a multivariate analysis, labor duration >700 minutes was the only factor that predicted PUR.²⁵ Ultimately, multiple risk factors likely act synergistically to impair normal postpartum micturition processes.

Prevention

Intrapartum prevention

Prevention of PUR requires avoiding bladder overdistention during labor. In patients with regional analgesia, we recommend simultaneous placement of an indwelling urethral catheter. If the patient prefers intermittent bladder drainage and staffing is available, this can be a reasonable alternative. When performing intermittent bladder drainage, we recommend an intrapartum frequency of at least every 4 hours with a goal of <500 mL of drained urine per catheterization. However, to avoid distention injuries, personalized bladder drainage intervals are critical because laboring patients differ considerably in their fluid status and urine output. Shorter bladder drainage intervals are necessary if the volume catheterized exceeds 500 mL. We recommend patient education and shared decision-making on intrapartum bladder management and strong consideration of an indwelling urethral catheter at any point where clinical concern exists.

Postpartum prevention and management

We support the American College of Obstetricians and Gynecologists

recommendation that all women be assessed for bladder emptying in the first 24 hours postdelivery to avoid PUR.²⁶ As previously described, covert PUR may go unrecognized if a woman is not assessed for an elevated PVR. Normal urine output is defined as 0.5 to 1.5 mL/kg/h.²⁷ We suggest inadequate urinary output be defined as <30 mL/h, which is roughly 0.5 mL/kg/h for a 70-kg individual.²⁸ Many patients may be fluid-depleted following delivery because of intrapartum fluid restriction and slow return to normal oral intake postpartum. Alternatively, some women experience fluid overload because of multiple intrapartum fluid boluses coupled with postpartum fluid shifts. Women should have a bladder ultrasound after any void when concern of inadequate emptying and/or PUR signs or symptoms exist. In a study investigating the validity of bladder volume measurements by ultrasound postpartum, both portable (BioCon-700; Mcube Technology Co, Ltd, Seoul, Republic of Korea) and trans-abdominal ultrasounds underestimated total bladder volume.²⁹ The portable BioCon-700 had a positive predictive value of 66.7% and negative predictive value of 100% in detecting a PVR >150 mL.²⁹ Either modality can be used to screen for an elevated PVR; however, precise bladder volumes should not be expected.²⁹ For volumes \geq 150 mL, a catheter should be used to accurately assess the PVR.

Figure 1 illustrates our postpartum bladder management protocol, developed by group consensus with incorporation of a variety of protocols currently used nationally and internationally.^{5,30} The algorithm begins with identifying overt or covert PUR, followed by step-by-step guidance for management and discharge disposition.

Postpartum evaluation of postpartum urinary retention

Patients should spontaneously void within 6 hours after the last bladder drainage or catheter removal (Figure 1):

- All patients: the first 2 voids should be measured,³¹ and an ultrasound should be performed to assess PVR if the patient's initial attempts are

unsuccessful, urine output is inadequate (<30 mL/h), or if clinical signs or symptoms of PUR are present. If bladder volume is \geq 150 mL on the scan, the patient should enter the PUR management algorithm (Figure 1).

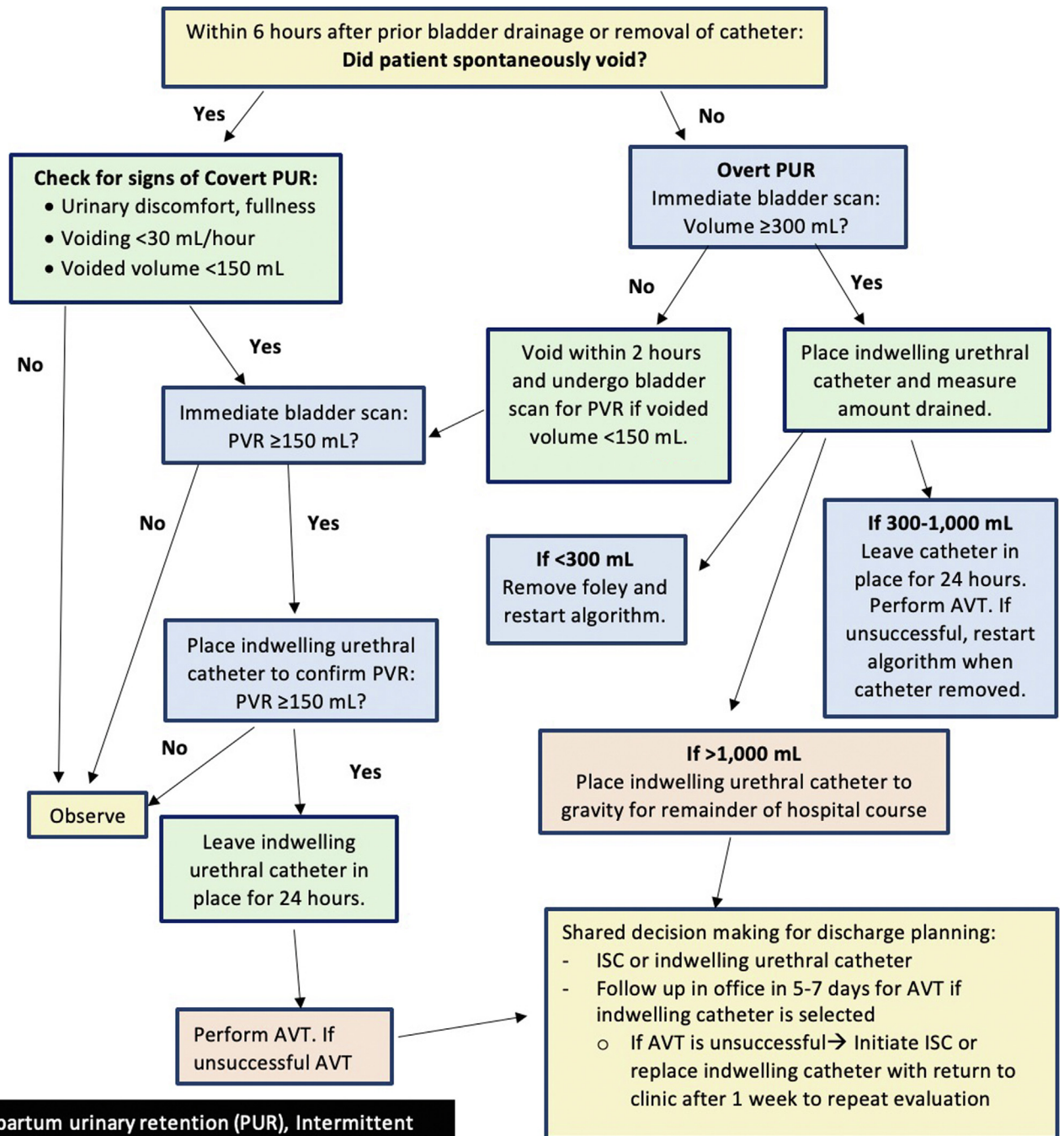
- Assessment of bladder urine volume: this can be performed with a bladder scan to determine the urine volume followed by catheter placement for more accurate measurement.
- Active voiding trial (AVT): perform after 24 hours of indwelling urethral catheter. We recommend an AVT because it provides a controlled, efficient approach to evaluate the adequacy of bladder emptying and reduces urinary tract injury (UTI) risk.³² Drain the bladder completely into the urine collection bag. Disconnect the catheter from the urine collection bag and back-fill the bladder with 300 mL of sterile water or saline. If the patient has no sensation to void, volumes up to 500 mL can be instilled. For patients with increased bladder sensation or decreased capacity, volumes as low as 200 mL can be instilled. The patient must void at least two-thirds of the instilled volume within 30 minutes of instillation.³³

Hospital discharge and outpatient management

When PUR is persistent, management with ISC or indwelling urethral catheter is indicated regardless of whether the patient is symptomatic. This prevents further bladder injury by keeping the bladder decompressed while awaiting return of normal bladder function. Advantages of indwelling urethral catheter placement include complete bladder rest and lack of need for ISC teaching. Disadvantages include increased infection risk, need for in-office voiding trials, and inability to monitor ongoing progress.

Advantages of ISC include ongoing monitoring of bladder sensation, voided volumes, and PVRs, as well as decreased risk of UTI. Disadvantages include the need for resources to teach ISC and office tracking of voiding diaries, and potential patient difficulty and discomfort

FIGURE 1
Postpartum bladder management protocol



The flow diagram depicts a suggested postpartum bladder management protocol developed by group consensus with incorporation of both national and international protocols.⁵

AVT, active void trial; ISC, intermittent self-catheterization; PUR, postpartum urinary retention.

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with performing ISC. In addition, there are challenges to manipulating swollen and tender vulvar tissues and maintaining a self-catheterization routine while caring for a newborn. High fluid intake in mothers expressing milk coupled with postpartum diuresis and diminished bladder sensation may make it challenging to perform frequent self-catheterization and avoid overdistention. To balance these challenges, we strongly recommend using an indwelling catheter for the first 5 to 7 days followed by ISC, if needed.

Whether to manage persistent PUR with ISC or with an indwelling urethral catheter is not well-studied and no guidelines exist.^{23,30,34,35} Thus, we recommend shared decision-making with the patient, weighing the advantages and disadvantages of each option. Providing education on the importance of bladder emptying for recovery and discussing the patient's preferred approach is imperative. Establishing a trusting relationship and agreement with the plan, providing reassurance and encouragement, and determining a feasible check-in schedule will help avoid additional overdistention injury, patient frustration, and a protracted recovery. To minimize patient travel burden, electronic medical record patient portals and telehealth visits can be used to evaluate voiding diaries and to screen for postpartum mood disorders in this high-risk patient population.

If ISC is chosen, we recommend initially performing ISC after each void and recording voided volume and PVR to monitor progress. [Figure 2](#) demonstrates a sample PVR log. In cases of no bladder sensation, ISC should be performed at least every 4 hours to avoid bladder overdistention. Patients should be educated on bladder distention symptoms that should prompt an attempt to void and to perform ISC. If an indwelling urethral catheter is selected, we recommend AVT after 5 to 7 days to allow time for bladder rest and recovery. In a study of 119 women with covert PUR, 92% were able to empty their bladder completely by postpartum day 4,¹⁴ whereas a high PVR at 72 hours was associated with increased risk of late

recovery.⁶ If the patient fails their AVT, we recommend initiation of ISC or continuation of the indwelling urethral catheter for additional 5 to 7 days followed by office assessment and AVT. We strongly discourage clamping the catheter before presentation for a passive voiding trial because this may lead to bladder overdistention, resulting in possible reinjury to the detrusor muscle and parasympathetic nerve fibers, and possible recurrence of PUR hours after the voiding trial in the office.

In some centers, urogynecology or female urology referral is placed when PUR is diagnosed or persists.^{6,36} When these services are available, we recommend referral at the time of hospital discharge for women with unresolved PUR. These providers have AVT supplies, staff with expertise in teaching ISC, and the ability to perform additional testing. However, it is important to note, urodynamic testing and imaging studies are not routinely indicated for women with PUR and should be reserved only for women with atypical symptoms, a concerning history, or considerably prolonged PUR.⁷

Acupuncture has been studied for PUR treatment at the time of diagnosis in the immediate postpartum period. In a randomized trial of 55 women with PUR, 92% in the acupuncture group achieved spontaneous micturition within 1 hour following treatment.³⁷ Although acupuncture is an accepted treatment option for PUR in some parts of the world,³⁷ limited access to experienced licensed acupuncturists coupled with U.S. hesitancy toward acupuncture pose challenges to offering this management option.

Regarding medication options, both bethanechol and tamsulosin have been discussed in the literature. Bethanechol chloride is a U.S. Food and Drug Administration–approved cholinergic medication for the treatment of acute postpartum nonobstructive urinary retention.³⁸ Dosing begins at 5 to 10 mg, 3 times per day with dose escalation as needed. However, studies evaluating bethanechol for urinary retention treatment have failed to demonstrate efficacy.¹⁵ In a randomized, double-blind,

placebo-controlled trial, oral bethanechol was not shown to improve residual volume, voided volume, or mean flow rate.³⁹ Side effects of bethanechol include flushing, tachycardia, diarrhea, vomiting, and urinary urgency.⁴⁰ It is unknown whether bethanechol is secreted in human milk. Thus, caution should be used when treating women who are breastfeeding or expressing milk for infant ingestion.

Tamsulosin, an alpha-adrenergic receptor antagonist acting at the level of the bladder neck and urethra, has been shown to be efficacious in preventing postoperative urinary retention in a urogynecologic population⁴¹; however, no data exist regarding PUR treatment. It is unknown whether tamsulosin is secreted in breast milk. As such, bethanechol and tamsulosin are not routinely recommended for treatment of PUR. Maneuvers such as Valsalva, Credé, double voiding, and position changes may promote bladder emptying; however, evidence to support these practices is lacking.

Patient counseling

What to expect for bladder recovery

Discharge home with an indwelling urethral catheter can be emotionally and physically overwhelming for a new mother, especially given that a previous study of urogynecologic patient perceptions found postoperative discharge with an indwelling catheter to be deemed by patients as a moderate to severe complication.⁴² Thus, patient counseling and anticipatory guidance are key. Because PUR is not well-understood, its progression is difficult to predict. However, women can be reassured that PUR lasting beyond 72 hours is rare.^{9,43} In the case of persistent PUR, predicting time to resolution is difficult because it is influenced by risk factors, timing of recognition, degree of overdistention, and adequacy of early management. However, even when prolonged, PUR is generally transient and will resolve with proper management.^{6,14}

The best way to improve recovery time is to avoid overdistention injury. In a study by Zussman et al,³⁶ 27 cases of persistent PUR were managed with

FIGURE 2 Sample postvoid residual voiding log and guidelines

Guidelines to Frequency of ISC⁴⁶

There will be variations to these guidelines

RESIDUAL.....	FREQUENCY
>400mls	4-6 times a day
400-300mls	3 times a day
300-200mls	Twice a day
200-100mls	Daily

Or as often as your doctor or nurse instructs.

ISC Record

Instructions:

- Drink at least 8 cups of fluid every 24 hours
- Measure each void of urine prior to catheterization and record pre-catheter (voided) and drained catheter volume
- ISC as frequently as your doctor or nurse instructs

Date & Time	Void	Catheter output	Comments	Date & Time	Void	Catheter output	Comments

A sample postvoid residual log that can be used by patients performing ISC. Adapted from the International Urogynecology Association Patient Information Leaflet from <https://www.yourpelvicfloor.org/media/Intermittent-Self-Catheterization.png>.

ISC, intermittent self-catheterization.

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an indwelling urethral catheter and weekly voiding trials. Among actively managed patients, mean residual volume at the time of diagnosis was 1083 mL (range, 250–1900 mL), and mean time to return to normal voiding was 20.5±9.4 days.³⁶

In contrast, Tiberon et al³⁰ showed that delayed recognition and management of PUR can lead to repetitive overdistention injury and prolonged recovery time. Women with an initial catheterization of >1020 mL were at risk for PUR beyond 72 hours compared with those with an initial catheterization of 715 mL ($P<.05$).³⁰ Eight of 15 women used ISC for 7 to 15 days, 4 for at least 1 month, and 3 for 6 to 8 weeks.³⁰ All cases resolved within 2 months.³⁰ The key takeaways are the importance of early recognition, avoiding bladder volumes >1000 mL, and avoiding repetitive overdistention injury to reduce the time to recovery.

Long-term impact of postpartum urinary retention

Data on the impact of acute and chronic urinary retention on long-term urinary and renal dysfunction in women are limited and inconclusive. Existing studies have largely been in male populations.⁴¹ Potential long-term sequelae of urinary retention include detrusor dysfunction, hydronephrosis, impaired tubular function, and renal failure.^{44–46}

Several case reports described bladder rupture after vaginal delivery, believed to be the result of severe PUR.^{4,8–10} This represents a potentially life-threatening, yet entirely preventable complication of unmanaged PUR.

Although PUR can cause irreversible damage to the detrusor muscle and parasympathetic nerve fibers within the bladder wall,³ limited studies addressed long-term urinary dysfunction and renal function in women who experienced PUR. In a study of 48 women with

persistent PUR, 5 (10.4%) had stress urinary incontinence, 4 (8.3%) had overactive bladder symptoms, and 3 (6.3%) had subjective voiding difficulties during the 39-month study period.⁶ However, given the high incidence of urinary incontinence in the peripartum population, it is unclear whether these symptoms can be attributed to PUR.

In contrast, a prospective study of 119 women who had a PVR ≥150 mL and 105 who had a PVR <150 mL after their first spontaneous void postpartum, surveyed at 1, 6, and 12 months postpartum, showed no significant differences (P value of <.05) in urinary symptoms. However, management strategies used in the elevated-PVR group were not described, thereby limiting the ability to draw clinical conclusions. Further subgroup analysis of PVR <250 mL vs ≥250 mL and PVR <500 mL vs ≥500 mL showed no differences in urinary symptoms.¹⁴ Other studies with

Box 2**Resources on intermittent self-catheterization**

1. American Urogynecologic Society (English and Spanish): <https://www.augs.org/assets/2/6/ISC.pdf>
2. International Urogynecologic Association (multiple languages available): <https://www.yourpelvicfloor.org/conditions/intermittent-self-catheterization/>
https://www.yourpelvicfloor.org/media/Intermittent_Self_Catheterization.pdf
3. Society of Gynecologic Surgeons
<https://www.sgsonline.org/a-guide-to-female-clean-intermittent-self-catheterization>

Patient educational materials related to intermittent self-catheterization are available at the listed websites.

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long-term evaluation did not show differences in urinary symptoms between women with a history of PUR and the general population.^{47–49}

Patient education resources

Patient educational materials on PUR are not available through reputable websites.

However, resources are available on ISC (Box 2). We recommend patients be provided with written and verbal instructions to achieve the most successful results. In addition, we recommend national organizations develop patient educational materials on postpartum voiding issues. This would provide a dual benefit: increasing providers' awareness of the condition and providing educational materials for patients.

Limitations and future directions

Developing a peripartum bladder management consensus statement and patient care protocol will be challenging. Thus, we have provided expert opinion and a summation of the currently available literature. The long-term effects of PUR are still being established. We hope that more robust research will be conducted following establishment of standardized nomenclature and management algorithms. Universal definitions and standardized management protocols for PUR are necessary to assess risk factors independently contributing to PUR, evaluate the clinical impact of standardized PUR management, evolve clinical protocols, and elucidate the long-term effects of untreated PUR. In addition, implementation of a clinical protocol will require education

and acceptance from numerous stakeholders, including patients. Although this will initially involve increased effort by the healthcare team, we believe that avoiding the detrimental effects of PUR is an essential component of providing safe, comprehensive care to this, and potentially other, high-risk patient populations.

Conclusion

PUR has the potential to substantially affect women both emotionally and physically in the days following childbirth. Recognizing PUR is the first step in providing appropriate and comprehensive care. Development of nationally accepted definitions and a management algorithm for PUR are essential for future research and patient care. The proposed peripartum bladder management protocols will contribute to the growing body of evidence-based practice in this field and improve patient outcomes. ■

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