WHITE PAPER

Management of Patients after Suprapubic Catheter Insertion

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Abstract

Nursing care recommendations after placing a suprapubic catheter remain inconsistent, partly because many resources do not differentiate between indwelling urinary catheters and indwelling suprapubic catheters. This is further complicated by a lack of standardized training and variations in the nationwide guidance offered by nurse practice acts. This white paper provides recommendations based on expert opinion and the scarce evidence relative to suprapubic catheter care after the initial post-insertion change.

Key Words

Urinary catheterization, patient satisfaction, cystostomy, urologists, drainage, catheters, indwelling, urethra.

Identification of the Topic

There are multiple medical conditions where placement of an indwelling urinary catheter for permanent bladder drainage is an option. The majority of guidelines that discuss the use of indwelling catheters do not distinguish between suprapubic catheters (SPCs) and urinary catheters, limiting evidence-based literature on which to base SPC care or 'best practice' recommendations. With the expansion of long-term care facilities, home care, and the aging U.S. population, it becomes vitally important to develop recommendations for best practices (Sweeney, 2022). However, there is a paucity of high-level evidence that describes best practices for the care of patients after SPC insertion.

Background

Suprapubic catheterization, also referred to as a 'suprapubic tube,' involves inserting a urinary catheter directly into the bladder through the lower abdominal wall via a surgically created tract (cystostomy). Urine drains from the catheter into a urinary drainage bag. Insertion may be performed at the bedside, in a procedure room or in the operating room, and placement may be guided by cystoscopy or ultrasound. The purpose of SPC insertion is to provide temporary or continuous urinary drainage in a variety of well-defined circumstances when intermittent or urethral catheterization is not tolerated or presents clinical challenges:

- Anticipation of long-term bladder drainage, such as with a diagnosis of neurogenic bladder.
- After urethral reconstruction, if a transurethral indwelling catheter might increase breakdown of the reconstruction.
- Known or suspected urethral injury or after pelvic trauma.
- Improvement of patient comfort, satisfaction, or sexually active patients.
- Physical or functional characteristics that make catheterization difficult.
- Anatomical obstruction of the urethra.
- After urogynecological or other genitourinary surgeries requiring postoperative urethral healing.
- Quality-of-life considerations.

Several sources describe indications for placement (Dixon et al., 2010; Kidd et al., 2015; Kowalik & Plante, 2016; Lavelle et al., 2016). These catheters also provide an emergency option for patients with urinary retention who may be far from traditional medical care, such as in wilderness survival or natural disaster circumstances (Cook et al., 2021).

Relative contraindications for SPC placement include previous lower abdominal surgery, abdominal ascites, the presence of prosthetic devices in the lower abdomen (such as hernia mesh or vascular grafts), inability to visualize a distended bladder on bedside ultrasonography (relative), and conditions that affect the anatomy or tissue integrity in the area of insertion, as well as anything that may increase the risk of bowel adherence to the bladder or anterior abdominal wall. Absolute contraindications include bladder cancer, uncorrected coagulopathy, and abdominal sepsis (Lachance & Grobelna, 2019; Oberai & Kirby, 2017).

Intermittent catheterization is recommended as the preferred method for management of neurogenic bladder in patients with spinal cord injury (SCI) based on

Note: Biographical information of SUNA SPC White Paper Task Force members appears on next page.

limited high-quality data. However, this may not be feasible or available to all patient circumstances. Other alternative options include condom catheter drainage or indwelling catheters, such as urethral catheters or suprapubic tubes, reflex voiding, and bladder expression with Valsalva. Non-invasive medical therapies are key to improving incontinence, urodynamic parameters, and quality of life in many patients with a neurogenic bladder (Romo et al., 2018).

Misuse, or inappropriate recommendations for indwelling urinary catheters (including SPC), has been well-described in the literature. Such misuse puts patients at increased risk of urinary tract infections, increasing morbidity, mortality, and costs. The most common reasons for misuse include using urinary catheters longer than necessary, in the management of urinary incontinence, and when there is no established guideline-based use (Lachance & Grobelna, 2019).

Abbreviations

APP	Advanced practice provider
ASB	Asymptomatic bacteriuria
BAUS	British Association of Urological Surgeons
CDC	Centers for Disease Control and Prevention
ISDA	Infectious Disease Society of America
NPA	Nurse Practice Act
RN	Registered nurse
SCI	Spinal cord injury
SPC	Suprapubic catheter
SUNA	Society of Urologic Nurses and Associates
UTI	Urinary tract infection

Nursing Management

Nursing management of SPCs in the acute phase after initial placement remains inconsistent and without consensus among guidelines. There are no evidence-based guidelines and little research on care for patients with acute, emergent, or initial insertion of SPCs for urinary retention. The evidence base for education and training of the health care team member exchanging the SPC remains absent from contemporary literature, as do the mechanics of this initial SPC exchange. In addition, there is no consensus on what level of licensure is best suited for the first SPC change, the timing of the first change, and the mechanics of the first exchange, such as whether to use an aseptic/sterile or clean technique.

This white paper is not intended to provide a step-by-step process for changing SPC, as this will be governed by individual facility policy. The SUNA SPC White Paper Task Force reviewed literature limited to

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short-term SPC care, defined for this paper as care in the weeks and months after the initial catheter change post-insertion. This white paper offers a general overview of the care problems, highlighting gaps in evidence-based care, to guide the development of further evidence-based practices related to patients needing suprapubic catheters.

Literature Search Methodology

Comprehensive search strategies were developed and implemented by a health sciences librarian using keywords and subject headings related to various aspects of suprapubic catheter management (Appendix A). The initial literature search was conducted in September 2021 in the following databases and resources: CINAHL, ClinicalTrials.gov, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, ECRI Guidelines Trust, Embase, MEDLINE (EBSCOhost interface), ProQuest Theses and Dissertations, Sigma Repository, and Web of Science Core Collection. An updated search using the same keywords and subject headings was conducted in October 2022 to cover the period from September 2021-October 2022 in the aforementioned databases and resources.

Following the initial search conducted in September 2021, a total of 3,789 records were identified. Records were exported into EndNote bibliographic management software, and duplicates were removed. Reviewers screened titles and abstracts of 2,560 records against pre-determined inclusion criteria (U.S. research studies, guidelines, or review articles; published since 2010; and addressing nursing management of SPCs in the acute phase of initial placement and exchange), and 2,397 records were excluded. Of the 163 articles remaining for full-text review, reviewers identified none as meeting the inclusion criteria. The updated search conducted in October 2022 yielded 282 new records. Following duplicate removal, titles and abstracts of 120 records were screened for eligibility and excluded. Overall, both searches conducted in September 2021 and October 2022 resulted in no articles being eligible for inclusion in an evidence synthesis (Figure 1).

Literature Background

Although there were no articles for direct inclusion in an evidence synthesis, the Task Force noted that the extant literature describes indications, contraindications, complications, and types of genitourinary and urogynecology surgeries in which SPC is used short-term. There is a paucity of U.S. literature aimed at nursing assessment of important aspects of care with patients in the acute phase of SPC placement and first exchange. Complications are rare but include catheter misplacement, bowel injury, bleeding, pain, urethral incontinence, and infection (Hall et al., 2020; Verma et al., 2020). Contraindications are also represented in the literature and include carcinoma of the bladder, abdominal sepsis, and the presence of subcutaneous vascular graft in the suprapubic area (Demtchouk et al., 2017; Dixon et al., 2010; Ejikeme, 2019; Ferrell & Connor, 2020; Hall et al., 2020; Kowalik & Plante, 2016). However, nurse-specific assessment for and identification of indications, complications, and patient population-specific factors, is limited (Tompkins et al., 2014). This lack of information related to assessment skills after SPC placement is a major safety concern and suggests the need for additional research (Lamont et al., 2011). The education and training of those caring for patients who have undergone the initial insertion of the SPC and the educational level of personnel who perform the first exchange are limited at best.

Evaluation of qualifications for the first SPC exchange was determined by practitioner opinion, with some literature stating that only the urologist or advanced practice provider (APP) perform the first exchange, while others stating that trained nurses or aides could perform the first exchange under the direction of a urologist or APP (Bratt et al., 2020; Bullman, 2011; Ejikeme, 2019). The most extensive evidence available was published by the British Association of Urological Surgeons (BAUS) SPC practice guidelines available from the United Kingdom (Hall et al., 2019; Hall et al., 2020). However, these guidelines do not address who was qualified to perform the first exchange, nor was there any evidence-based research or guidelines on how those qualifications should be determined or evaluated.

Another area of concern is the timing of the first SPC exchange post-insertion. There is little consensus on when this first catheter exchange occurs. By anecdotal report, the first exchange is done by the individual urologist's custom; time intervals identified in the literature and practice are vague. When time intervals for the first exchange are suggested, no research is cited, but only defined as when the tract has matured at or around 6 weeks post-insertion (Hall et al., 2020; Harrison et al., 2011). Most concerning is there is no nursing research evaluating nursing observations, assessments, patient characteristics, or other factors influencing healing that would be important for timing the first SPC exchange.

The mechanics of performing the first exchange, sometimes called rapid change to indicate a minimal amount of time the catheter is absent from the stoma, focus mainly on tasks such as ensuring the balloon is deflated prior to removal and the presence of urine after the exchange. However, there are no research papers, guidelines, or expert consensus on the efficacy of the sterile versus clean technique for a first SPC exchange.

Urinary tract infection is the most common complication resulting from any urinary catheters, including SPC. Most research addresses catheter-associated bacteriuria or catheter-acquired urinary tract infections in those at initial insertion of short-term indwelling catheterization versus short-term SPC, and participants had SPC placed using sterile technique (Bonkat et al., 2013; Kidd et al., 2015). The only article that addressed

nursing mechanics of the initial insertion was based on clinical experience, and the procedure was considered a clean technique (Bullman, 2011).

Practice procedures describe the types of catheters used for specific conditions (Haider & Annamaraju, 2022). For example, a 14-Fr or 16-Fr catheter is usually used in adults with no history of urologic problems; a larger bore catheter may be needed to drain hematuria or blood clots.

Initial Placement

Urinary retention of all causes requires different types of urinary devices inserted into the bladder to relieve symptoms and prevent obstructive complications. The initial insertion method differs slightly depending on the type of catheter used, but indications remain the same. Several types of SPCs and kits are commercially available. Regardless of the catheter or technique used, the patient must have a palpable bladder or a distended bladder visible on ultrasound before attempting to insert the tube. Several methods have been described for this initial placement, but the discussion of these is beyond the scope of this white paper.

The SPC is a urinary catheter placed just above the symphysis pubis directly into the bladder using a minimally invasive surgical procedure. Initial SPC placement is performed by a provider and may be performed in a procedure room, in the operating room, or during a cystoscopy. A small incision is made prior to placement of a catheter into the bladder, approximately 3 cm above the mid-line symphysis of the pubic bone. While there is no universal consensus related to the time for the tract to heal, some suggest the catheter be kept in place for 4 to 6 weeks before the first catheter change to allow the tract to heal. In both the acute care and long-term care settings, catheter replacement may be performed by a licensed individual in accordance with the regulatory scope of practice for the state and the organization's practice parameters. The provider should be notified if the catheter is dislodged prior to 4 weeks.

Suprapubic catheter changes are performed per the provider's order. Although the provider may order routine SPC changes, especially for patients who experience obstruction due to catheter encrustation, there is no evidence that changing catheters at set intervals reduces urinary tract infections (Centers for Disease Control and Prevention [CDC] 2009, updated 2017). SPC changes should be performed based on clinical signs of infection, obstruction, compromise of the closed-drainage system, or per the manufacturer's instructions for use in accordance with the regulatory scope of practice and organizational guidelines. Asymptomatic bacteriuria (ASB) will develop in patients with long-term indwelling catheters; however, present recommendations are against screening for or treating ASB, and there is no recommendation for treating ASB when the catheter is removed (CDC 2009, updated 2017).

Nursing Impressions

When caring for patients in the hospital after pelvic organ prolapse surgery, 160 nurses completed the survey (Kulkarni & McDermott, 2021), representing a 45% response rate. More than half (63.1%, $n = 101$) of respondents stated a preference for transurethral indwelling catheters, 23.1% ($n = 37$) preferred suprapubic tubes, and 10.6% ($n = 17$) preferred intermittent catheterization. Nurses ranked transurethral indwelling catheters as the best catheter type for ease of use and pain/discomfort for patients. Nurses ranked intermittent catheterization as the best for the lowest malfunction rates and return of bladder function. Nurses ranked suprapubic tubes as best for the lowest infection rates (Kulkarni & McDermott, 2021), although the rate of infection when compared with indwelling catheters is similar. SPCs are associated with a low incidence of urethral injury and stricture, but have similar rates of upper tract damage, vesicoureteral reflux, kidney or bladder calculi, and symptomatic urinary tract infections compared to urethral catheters (Hunter et al., 2013). Suprapubic catheterization is not superior to urethral catheters in reducing catheter-associated bacteriuria (Bonkat et al., 2013).

Current Practice

Assessment by Licensed Personnel

When assessing a suprapubic catheter either immediately after placement or before performing the first change of the SPC, clinicians must be familiar with symptoms and exam findings that constitute normal findings and complications. Potential complications that can occur immediately after initial placement of an SPC were described earlier in this white paper, including but not limited to urinary tract infection, catheter blockage, and bowel injury (Hall et al., 2020; Verma et al., 2020). These potential complications are consistent with potential complications of future routine SPC changes. Current literature identifying unique complications of acute management of SPCs are viewed as similar to complications of chronic management of SPCs, making comparisons difficult.

For health care staff who care for patients after the initial placement of an SPC, it is important to assess for persistent discomfort that seems to radiate from the new SPC site, minimal or no urinary output, or generalized worsening or persistent lower abdominal pain because these could be signs of a possible bowel injury from the SPC placement, and the provider should be promptly alerted (Ghaffary et al., 2013). Significant urinary leakage around the SPC, significant bleeding around the SPC, and/or persistent gross hematuria that does not resolve independently should also be assessed in the immediate hours to days after initial SPC placement (Ghaffary et al., 2013). Additionally, a licensed professional caring for a patient with an SPC should assess for these warning symptoms and signs of complications after any subsequent routine SPC change.

When considering the first change of an SPC, detailed steps for changing an SPC can be found in the literature (Bullman, 2011; Firnhaber & Wilson, 2021), but there is a lack of evidence-based guidance detailing unique differences in the patient assessment for the first SPC change. As noted previously in this white paper, the clinician should assess the maturity of the SPC tract prior to performing a routine first SPC change (Bullman, 2011; Firnhaber & Wilson, 2021) by inspecting for the appearance of a well-healed stoma. This assessment includes inspecting the skin around the SPC tract for signs of skin breakdown, erythema, discharge, hyper granulation of tissue, or signs of infection/cellulitis (Bullman, 2011; Firnhaber & Wilson, 2021).

Prior to performing any clinical procedure, it is essential for clinicians to not only assess the patient but also assess the environment to ensure the procedure can be performed safely and competently. This includes not only immediate surroundings and supplies necessary for the procedure, but also familiarity with the policies and procedures of the facility where the procedure is being performed. Specific to SPC management, facilities must have a written protocol for SPC changes that clearly delineates the clinical personnel qualified to change SPCs in their institution and the training/proctoring necessary to be qualified to change SPCs. As roles and protocols may vary between institutions and jurisdictions, clinical staff involved in the care of SPCs must be aware of their facility's policies, and these policies must be made easily accessible in writing, either in print or electronically.

Timing of the First SPC Exchange

Limited data are available for addressing the initial suprapubic tube exchange time frame. The suprapubic tract is considered mature within 4 to 6 weeks, and most articles discuss the initial exchange time being between 4 to 6 weeks (Hall et al., 2020; James & Palleschi, 2020). A recent survey conducted by Quallich and colleagues (2023) of urology specialists noted slightly over half of respondents reported that the timing of the first SPC change in their practice is 4 weeks after initial placement, with slightly less than one-third of respondents reporting the first SPC change takes place at 6 weeks after initial placement. However, other authors suggest the initial change should be delayed for 6 to 12 weeks (Harrison et al., 2011). These differences highlight the lack of contemporary standardization concerning SPC care in general and the lack of research about unique patient characteristics that influence healing times, such as in patients with diabetes mellitus, obesity, or other immunocompromised states (Nazzal et al., 2019).

Clean vs. Aseptic/Sterile Technique

Clean versus aseptic/sterile technique for SPC changes remains an area lacking consensus and evidence-based practice. CDC (2009, updated 2017) definitions and guidelines recommend health care providers use an aseptic technique for catheterization in the acute setting to avoid introducing and transferring contaminants and germs, but do not specifically address SPC care. Clean technique, however, involves strategies to prevent or reduce the transmission of microorganisms from one place to another. The existing evidence-based expert opinion, the CDC, and the Infectious Disease Society of America (ISDA) (CDC, 2009, updated 2017; Hooton et al., 2010) do not mention SPC in their guidelines.

When inserting urinary catheters in the acute care hospital setting, the CDC (2009, updated 2017) recommends using an aseptic technique and sterile equipment. However, in the non-acute care setting, recommendations from the CDC include clean technique for intermittent catheterization for patients who require chronic intermittent catheterization. No recommendations were found for SPC replacement (Gould et al., 2015). The facility or environments where the suprapubic catheter is being replaced will most likely determine how the procedure will be performed and the healthcare personnel responsible for changing the SPC. Health care personnel should be familiar with policies and procedures for their facility or unit.

There are no society recommendations for how the SPC should be exchanged or replaced for outpatient urology offices. A literature review specifically relevant to neurogenic bladder patients found the aseptic technique was associated with 277% higher costs than the clean technique (Campeau et al., 2020). None of these studies significantly differed in urinary tract infections with clean or aseptic techniques (Campeau et al., 2020). A recent survey of active SUNA members demonstrated that most inpatient changes and outpatient changes of SPC in the work environment of respondents were performed by sterile technique (Quallich et al., 2023).

Procedure for Changing SPC

The goal of this white paper is not to suggest specific steps in the process for SPC changes. Some procedural steps were identified as common across several resources, although these are not evidence-based. These steps have been aggregated from available procedure manuals because no evidence-based or research literature specifying procedural steps exists. There is also variability among institution policies when discussing inpatient, clinic-based, and changes that occur in the home or community setting.

Educational Level of Personnel Who Perform the First SPC Exchange

The scope of practice guiding the initial SPC change and subsequent changes will vary from state to state, dependent upon each state's Nurse Practice Act (Appendix B). Facilities and individuals are advised to refer to the state Board of Nursing because this can also change based on legislation from year to year. Based on examples in Appendix B, there is a demonstrated lack of consistency in the standard of care.

Suprapubic Catheter Tube Complications

The most common problems are catheter blockages, infections, and bladder stones. These will occur with a similar incidence with either an SPC or a urethral catheter. Urethral complications, such as strictures, scrotal infection, and erosion, are less common with suprapubic catheterization. However, the benefit of having an SPC needs to be balanced against the risks involved in inserting the SPC. Patient-reported symptoms show that an SPC is more comfortable and better tolerated than a urethral catheter (English, 2017).

Suprapubic catheters are associated with a low incidence of urethral injury and stricture. Still, they have similar rates of upper tract damage, vesicoureteral reflux, kidney or bladder calculi, and symptomatic urinary tract infections compared to urethral catheters (Hunter et al., 2013). Suprapubic catheterization is not superior to urethral catheters in reducing catheter-associated bacteriuria (Bonkat et al., 2013).

Solution/Recommendations

Shared decision-making should be utilized for aspects of care related to SPCs. This white paper aims to inform practice professionals about the state of the evidence regarding immediate care of these patients during this crucial time after SPC insertion and provide recommendations based upon the best evidence. In the absence of high-level evidence to recommend specific techniques or policies for SPC changes, it became clear that any recommendations would be based on extrapolation from the existing literature related to indwelling catheterization and the combined opinions of this panel.

This white paper offers the following SUNA SPC White Paper Task Force consensus recommendations.

Education

1. Registered nurse staff in the acute care setting and long-term care facilities should be trained to change an SPC.
2. Clinical personnel may be trained to change SPC based on state practice acts and facility guidelines.
3. Facilities should institute and maintain competencies and training for all staff involved with patients requiring SPCs, and this should include instruction on lower urinary tract anatomy and physiology.
4. Ensuring the catheter is in the proper position/placement is the most important step when changing the SPC.

Technique

1. Hand hygiene is vital when changing the suprapubic catheter.
2. Comply with universal protocol: Perform a time-out to verify the correct patient, correct site, and correct procedure when changing the SPC.
3. Recommend that all SPC changes in the acute care hospital setting use the aseptic/sterile technique.
4. In the non-acute care setting (home or community), there are no evidence-based recommendations for aseptic/sterile versus clean technique for indwelling urinary catheter changes.

Supporting Basic Care Principles

1. Provide developmentally and culturally appropriate patient education based on the desire for knowledge, readiness to learn, manual dexterity, and overall neurologic and psychosocial state.
2. Reinforce the rationale for the use of an SPC using verbal, written, and visual modalities per adult learning theories.
3. Instruct the patient (and family or caregiver) on the basics of catheter and urinary stoma care.
4. Arrange for the appropriate environment, health care team members, and equipment to assist with SPC changes, as necessary.
5. Latex catheters should not be used for SPC drainage due to the risk of allergic reactions.

Conclusions

This white paper clarifies and offers an expert opinion regarding practice recommendations for the management of patients after initial SPC change. Future research should also focus on the patient/caregiver learning new catheter management skills and developing culturally appropriate patient education. Evidence-based practice should include evaluation of practice guidelines for initial SPC insertion, quality-of-life impact for those living with long-term SPC, standardization of protocol across facilities, and evaluation of any additional costs associated with health care services related to SPC. Future nursing research studies are also needed to inform understanding of complications; causes of emotional and physical distress of patients, families, and caregivers of those individuals living with an SPC; and the impact of the SPC on daily activities or social roles. ◉

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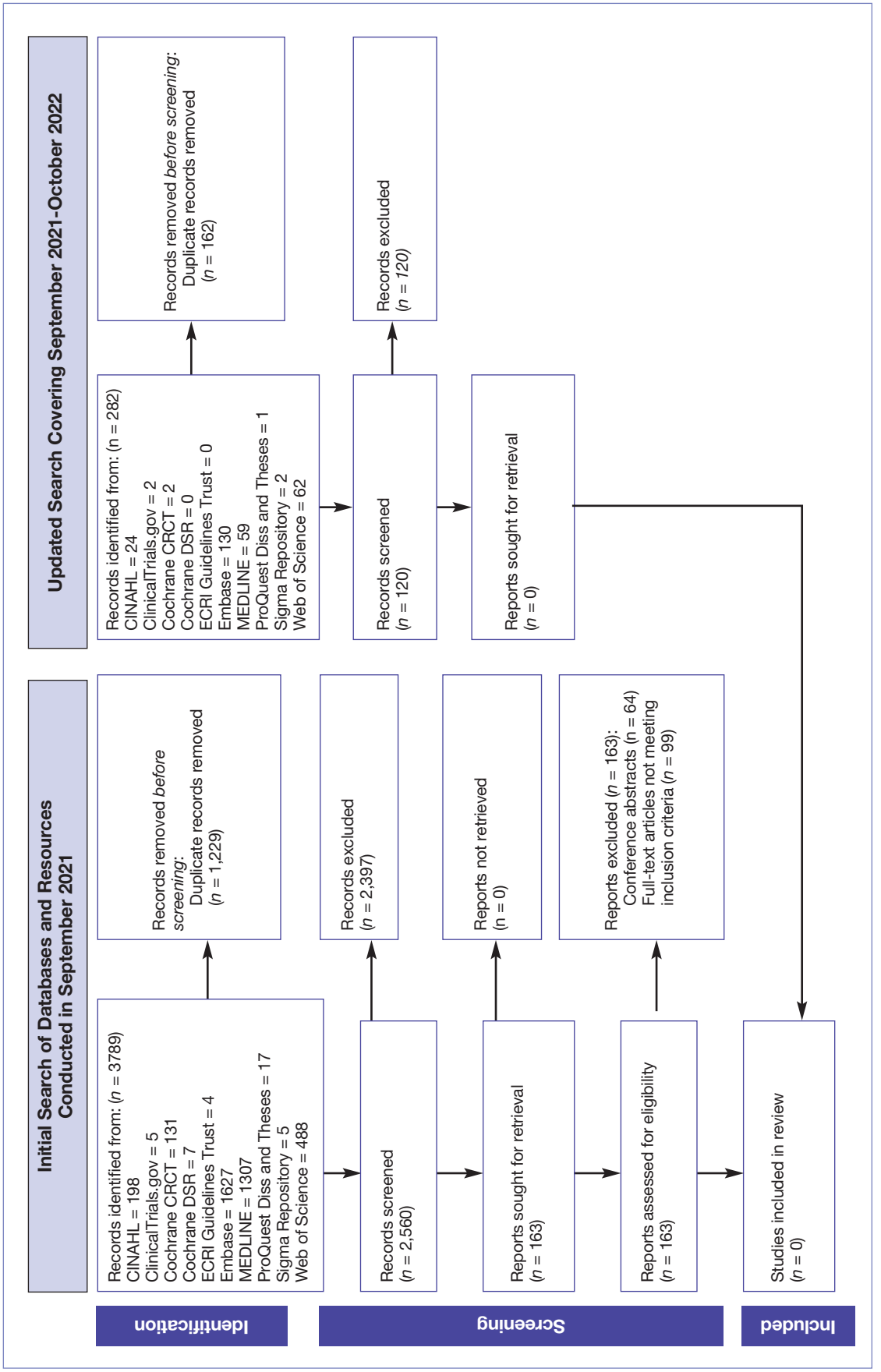
Figure 1.
PRISMA Flow Diagram for Review of the Literature



Source: Adapted from Page et al., 2020. For more information, visit: http://www.prisma-statement.org/

Appendix A.
Literature Search Strategies by Database/Resource

Cumulative Index to Nursing and Allied Health Literature (CINAHL)	Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Trials	Embase	MEDLINE (EBSCOhost interface)	Web of Science Core Collection	Grey Literature Resources
1. suprapubic* 2. catheter* OR cystostom* OR tube* 3. #1 AND #2 4. anti-septic OR "anti septic" OR antiseptic OR aseptic OR care OR caring OR clean* OR hygien* OR maintain* OR maintenance OR manag* OR safe* OR steril* 5. ("adverse effect*" OR "adverse event*" OR complication* OR infect* OR injur*) AND (control* OR prevent*) 6. #4 OR #5 7. chang* OR exchang* OR insert* OR placement OR post-insertion OR "post insertion" OR postinsertion OR pre-insertion OR "pre insertion" OR preinsertion OR remov* OR replac* 8. #3 AND #6 AND #7 (Keywords) 9. Suprapubic Catheters OR Catheter Care, Suprapubic (CINAHL Subject Headings) 10. #8 OR #9 (this search combines the keyword and CINAHL Subject Heading searches with OR)	1. (suprapubic*):ti,ab,kw (Word variations have been searched) 2. (catheter* OR cystostom* OR tube*):ti,ab,kw (Word variations have been searched) 3. #1 AND #2 4. (anti-septic OR "anti septic" OR antiseptic OR aseptic OR care OR caring OR clean* OR hygien* OR maintain* OR maintenance OR manag* OR safe* OR sterile*):ti,ab,kw (Word variations have been searched) 5. ((("adverse effect*" OR "adverse event*" OR complication* OR infect* OR injur*) AND (control* OR prevent*)):ti,ab,kw (Word variations have been searched) 6. #4 OR #5 7. (chang* OR exchang* OR insert* OR placement OR post-insertion OR "post insertion" OR postinsertion OR pre-insertion OR "pre insertion" OR preinsertion OR remov* ORreplacec*):ti,ab,kw (Word variations have been searched) 8. #3 AND #6 AND #7 9. MeSH descriptor: [Catheters, Indwelling] this term only 10. MeSH descriptor: [Cystostomy] this term only 11. MeSH descriptor: [Urinary Bladder] this term only	1. suprapubic* 2. catheter* OR cystostom* OR tube* 3. #1 AND #2 4. anti-septic OR "anti septic" OR antiseptic OR aseptic OR care OR caring OR clean* OR hygien* OR maintain* OR maintenance OR manag* OR safe* OR sterile* 5. ("adverse effect*" OR "adverse event* OR complication* OR infect* OR injur*) AND (control* OR prevent*) 6. #4 OR #5 7. chang* OR exchang* OR insert* OR placement OR post-insertion OR "post insertion" OR postinsertion OR pre-insertion OR "pre insertion" OR preinsertion OR remov* OR replace* 8. #3 AND #6 AND #7 9. Suprapubic catheter (Emtree term/not exploded) 10. Asepsis(exp) OR Catheter Care OR Catheter Complication (exp)/prevention OR Hygiene OR Infection Control OR Infection (exp)/prevention OR Patient Safety OR Perioperative Period(exp) OR Postoperative Care OR Preoperative Care OR Postoperative Complication (exp)/prevention 11. #9 AND #10 12. Suprapubic catheter/adverse device effect	1. suprapubic* 2. catheter* OR cystostom* OR tube* 3. #1 AND #2 4. anti-septic OR "anti septic" OR antiseptic OR aseptic OR care OR caring OR clean* OR hygien* OR maintain* OR maintenance OR manage OR safe* OR steril* 5. ("adverse effect*" OR "adverse event*" OR complication* OR infect* OR injur*) AND (control* OR prevent*) 6. #4 OR #5 7. chang* OR exchang* OR insert* OR placement OR post-insertion OR "post insertion" OR postinsertion OR pre-insertion OR "pre insertion" OR preinsertion OR remov* OR replac* 8. #3 AND #6 AND #7 9. (Catheters, Indwelling OR Cystostomy OR Urinary Bladder OR Urinary Catheterization [exp]) [MeSH terms] 10. #1 AND #9 11. Catheter-Related Infections/nursing OR Catheter-Related Infections/prevention and control OR Hygiene (exploded) OR Infection Control (exploded) OR Infections (exploded)/nursing OR Patient Care Management (exploded) OR Patient Safety OR	1. suprapubic* 2. catheter* OR cystostom* OR tube* 3. #1 AND #2 4. anti-septic OR "anti septic" OR antiseptic OR aseptic OR care OR caring OR clean* OR hygien* OR maintain* OR maintenance OR manag* OR safe* OR sterile* 5. ("adverse effect*" OR "adverse event*" OR complication* OR infect* OR injur*) AND (control* OR prevent*) 6. #4 OR #5 7. chang* OR exchang* OR insert* OR placement OR post-insertion OR "post insertion" OR postinsertion OR pre-insertion OR "pre insertion" OR preinsertion OR remov* OR replac* 8. #3 AND #6 AND #7	***ClinicalTrials.gov*** suprapubic AND (catheter OR catheters OR catheterization OR tube OR tubes OR cystostomy OR cystostomies) Limited to Completed Studies, Studies With Results ***ECRI Guidelines Trust*** suprapubic* AND (catheter* OR tube* OR cystostom*) ***ProQuest Dissertations & Theses*** suprapubic* AND (catheter* OR tube* OR cystostom*) ***Sigma Repository*** suprapubic AND (catheter OR catheters OR catheterization OR tube OR tubes OR cystostomy OR cystostomies)

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Appendix A. (continued)
Literature Search Strategies by Database/Resource

Cumulative Index to Nursing and Allied Health Literature (CINAHL)	Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Trials	Embase	MEDLINE (EBSCOhost interface)	Web of Science Core Collection	Grey Literature Resources
	12. MeSH descriptor: [Urinary Catheterization] explode all trees 13. #9 OR #10 OR #11 OR #12 14. #1 AND #13 15. MeSH descriptor: [Catheter-Related Infections] this term only and with qualifier(s): [nursing - NU, prevention & control - PC] 16. MeSH descriptor: [Hygiene] explode all trees 17. MeSH descriptor: [Infection Control] explode all trees 18. MeSH descriptor: [Infections] explode all trees and with qualifier(s): [nursing - NU] 19. MeSH descriptor: [Patient Care Management] explode all trees 20. MeSH descriptor: [Patient Safety] this term only 21. MeSH descriptor: [Perioperative Care] explode all trees 22. MeSH descriptor: [Postoperative Care] explode all trees 23. MeSH descriptor: [Preoperative Care] explode all trees 24. MeSH descriptor: [Postoperative Complications] explode all trees and with qualifier(s): [nursing - NU, prevention & control - PC]	13. #8 OR #11 OR #12 (this search combines the keyword and Emtree searches with OR)	11. Perioperative Care (exploded) OR Postoperative Care OR Preoperative Care (exploded) OR Postoperative Complications/nursing OR Postoperative Complications/prevention and control (exp) [MeSH terms] 12. #10 AND #11 13. (Catheters, Indwelling/adverse effects OR Cystostomy/adverse effects OR Cystostomy/methods OR Cystostomy/nursing OR Urinary Bladder/surgery OR Urinary Catheterization (exp)/adverse effects OR Urinary Catheterization (exp)/methods OR Urinary Catheterization (exp)/nursing) [MeSH terms] 14. #1 AND #13 15. #8 OR #12 OR #14 [this search combines the keyword and MeSH searches with OR]		

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Appendix A. (continued)
Literature Search Strategies by Database/Resource

Cumulative Index to Nursing and Allied Health Literature (CINAHL)	Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Trials	Embase	MEDLINE (EBSCOhost interface)	Web of Science Core Collection	Grey Literature Resources
	25. #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 26. #14 AND #25 27. MeSH descriptor: [Catheters, Indwelling] explode all trees and with qualifier(s): [adverse effects - AE] 28. MeSH descriptor: [Cystostomy] explode all trees and with qualifier(s): [adverse effects - AE, methods - MT, nursing - NU] 29. MeSH descriptor: [Urinary Bladder] explode all trees and with qualifier(s): [surgery - SU] 30. MeSH descriptor: [Urinary Catheterization] explode all trees and with qualifier(s): [adverse effects - AE, methods - MT, nursing - NU] 31. #27 OR #28 OR #29 OR #30 32. #1 AND #31 33. #8 OR #26 OR #32				

Appendix B.
Examples of State Nurse Practice Acts as of January 2023

State	Nurse Practice Act Specifics	Reference
Arizona	Allows licensed practical nurses to change suprapubic catheters. • LPNs must adhere to their employer's/agency's written policy and procedures. Allows for certified nursing assistant (CNA) and licensed nursing assistant (LNA) to care for patients with catheters. • Detailed as providing care for patients or residents with drains and tubes, including catheters and feeding tubes.	Arizona Board of Nursing. (June 2020). *Arizona Board of Nursing Scope of Practice Questions & Answers SCOPE OF PRACTICE – Licensed Practical Nurse (LPN).* https://www.azbn.gov/sites/default/files/2020-11/FAQ%20Final%20Questions%20LPN%206-1-20%20%281%29.pdf Arizona Board of Nursing. (June 2020). *Arizona Board of Nursing Scope of Practice Questions & Answers SCOPE OF PRACTICE Certified Nursing Assistant (CNA) & Licensed Nursing Assistant (LNA).* https://www.azbn.gov/sites/default/files/2020-11/FAQ%20Final%20Questions%20CNALNA%206.1.20%20%282%29%20%281%29.pdf
California	Does not allow unlicensed assistive personal to insert catheters. Includes all health care facilities. Section 1250 of the Health and Safety Code shall not assign unlicensed personnel to perform nursing functions in lieu of a registered nurse and may not allow unlicensed personnel to perform functions under the direct clinical supervision of a registered nurse that require a substantial amount of scientific knowledge and technical skills. • Includes "Educating patients and their families concerning the patient's health care problems, including post discharge care."	State of California Department of Consumer Affairs. (November 2010). *Unlicensed Assistive Personal.* https://www.rn.ca.gov/pdfs/regulations/npr-b-16.pdf State of California Department of Consumer Affairs. (January 2013). *Scope of Regulation Excerpt from Business and Professions Code Division 2, Chapter 6. Article 2.* https://www.rn.ca.gov/pdfs/regulations/npr-i-15.pdf
Michigan	Does not have a stand-alone act called the Nurse Practice Act. Instead, Michigan has an act that regulates the practice of nursing along with 25 other health occupations, is formally titled the Occupational Regulation Sections of the Michigan Public Health Code, PA 368 of 1978. Michigan State Board of Nursing allows safe delegation of nursing tasks to unlicensed persons; authorizes the RN to delegate nursing activities and requires that the RN teach and supervise less skilled personnel in the performance of delegated nursing activities.	State of Michigan. (2014). *Michigan Department of Licensing and Regulatory Affairs Bureau of Health Care Services.* https://www.michigan.gov/lara/-/media/Project/Websites/lara/healthsystemslicensing/Folder1/mdch_na_train_curr_model.pdf Michigan School Health: Delegation. (2021). *Considerations for Practice.* https://www.michigan.gov/-/media/Project/Websites/mde/2021/12/09/ADA_Delegation_final_6-29-21pdf.pdf
Minnesota	Does not specifically detail nursing tasks or procedures, such as suprapubic catheter changes. Defines a registered nurse delegating to a licensed practical nurse or unlicensed assistive personal (Subd. 24). Unlicensed assistive personal is defined as an unlicensed person to whom nursing tasks or activities may be delegated or assigned, as approved by the board.	Minnesota Board of Nursing. (ND). *Scope of Practice.* https://mn.gov/boards/nursing/practice/nursing-practice-topics/scope-of-practice.jsp Minnesota Board of Nursing. (ND). *Minnesota Board of Nursing Nurse Practice Act – Minnesota Statute Section 148.171.* https://mn.gov/boards/assets/NPA_2013_Combined_Def_12-2020_tcm21-37252.pdf Office of the Register of Statutes. (n.d.). *2022 Minnesota Statutes.* https://www.revisor.mn.gov/statutes/
Nevada	Nevada Nurse Practice Act has adopted a protocol on suprapubic catheters from the Society of Urologic Nurses and Associates for licensed practical nurses called "Practice Decision LPN Scope of Practice Regarding Suprapubic Catheter Replacement." The licensed practical nurse who is educationally prepared and properly trained per NAC 632.232 and NAC 632.242 to replace a suprapubic catheter.	Nevada State Board of Nursing. (2019). *Practice Decision LPN Scope of Practice Regarding Suprapubic Catheter Replacement.* https://nevadanursingboard.org/wp-content/uploads/2020/02/Suprapubic-Post-NPAC-REVIEW-003.pdf

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Appendix B. (continued)
Examples of State Nurse Practice Acts as of January 2023

State	Nurse Practice Act Specifics	Reference
Ohio	Licensed nurse shall include all of the following when teaching an unlicensed person to perform a nursing task: • Presentation of information on infection control and universal precautions; • Presentation of information and directions on the concepts underlying the nursing task; • Presentation of information and direction on how to correctly perform the specific nursing task according to current standards of practice following step-by-step directions readily available to the unlicensed person; • Demonstration of the nursing task; and • Observation and documentation of a satisfactory return demonstration by the unlicensed person of the nursing task. "Unlicensed person" means an individual, not currently licensed by the board as a registered nurse or licensed practical nurse, or an individual who does not hold a current valid certificate to practice as a dialysis technician or administer medications as a medication aide. Does not have any specific rules on suprapubic catheters. "Delegation" means the transfer of responsibility for the performance of a selected nursing task from a licensed nurse authorized to perform the task to an individual who does not otherwise have the authority to perform the task.	Ohio Law and Administrative Codes. (October 2021). *Rule 4723-13-01 | Definitions.* https://codes.ohio.gov/ohio-administrative-code/rule-4723-13-01 Ohio Law and Administrative Codes. (October 2021). *Rule 4723-13-06 | Minimum curriculum requirements for teaching a nursing task*. https://codes.ohio.gov/ohio-administrative-code/rule-4723-13-06
Pennsylvania	Allows registered nurses to change suprapubic catheters but does not specify on timing after initial insertion. Allows licensed practical nurses to care for suprapubic catheters. In section 21.414. Interpretations regarding the functions of Licensed Practical Nurses (LPN)—statement of policy, (b) The following nursing practices fall within the scope of LPN practice under § 21.145(b): (1) Changing cystostomy tubes after the stoma heals.	Pennsylvania Code. (ND). *Chapter 21. State Board of Nursing.* Https://www.pacodeandbulletin.gov/Display/pacode?file=/secure/pacode/data/049/chapter21/chap21toc.html&d=reduce