Securing the Indwelling Catheter

Overview: Each year, millions of Americans are catheterized to ensure adequate bladder drainage. But despite the high rate of catheterization in acute care facilities, clinicians often pay little attention to the decision to insert an indwelling catheter, its optimal management, or especially its timely removal. A physician or NP typically orders the insertion of a urinary catheter, but a nurse often performs the catheterization and is responsible for its management. Reimbursement policy changes recently mandated by the Centers for Medicare and Medicaid Services—including one stipulating that Medicare will no longer cover the cost of treating catheter-associated urinary tract infections—have resulted in increased scrutiny of indwelling catheter management. This article explores one aspect of catheter management, the use of securement devices, and analyzes the standard practices, expert opinion, and clinical evidence concerning this intervention.

Optimal catheter management includes the correct use of securement devices.

Two thousand years ago the Roman encyclopedist Celsus, in his treatise *De Medicina,* described bronze tubes inserted into the urethra to drain urine, and modern archeologists discovered hollow, S-shaped bronze instruments among medical devices in the ruins of Pompeii.[1] But use of a self-retaining, or *indwelling,* catheter for ongoing urine drainage did not become widespread until 1936, when a U.S. manufacturer, Davol Rubber Company, introduced a soft rubber tube with an inflatable balloon that was based on a design by Frederick Foley.[2] An indwelling urinary catheter, still commonly referred to as a Foley catheter, is inserted into the bladder by way of the urethra or through a small suprapubic cystostomy to continuously drain urine from the lower urinary tract.

Current prevalence data on the use of indwelling catheters in the United States aren't available, but since the early 1980s various sources have estimated that approximately 4 million Americans undergo indwelling urinary catheterization each year. About 25% of patients in acute care facilities receive indwelling urinary catheters,[3] as do about 5% of those who've been in a long-term care facility for at least one year.[4] Most patients have indwelling catheters in place for short periods (14 days or less),[5] but long-term catheterization, sometimes lasting months or years, is sometimes required.

Proper management of indwelling catheters has been given increased attention since Medicare stopped covering the cost of treating catheter-associated urinary tract infections (for more on this topic, see "New Medicare Payment Rules: Danger or Opportunity for Nursing?" June). And although a physician or NP usually makes the decision to place an

Courtesy of Historical Collections and Services, Claude Moore Health Sciences Library, University of Virginia

A male catheter like this reproduction, 11.375 in. long, was excavated from the House of the Surgeon at Pompeii and is an example of the surgical instruments available in the first century BCE (the Italian city of Pompeii was buried in the eruption of Mt. Vesuvius in 79 CE). According to the Historical Collections and Services of the Claude Moore Health Sciences Library at the University of Virginia at Charlottesville, which houses a collection of reproductions of the surgical artifacts, "there was relatively little innovation in surgery and surgical tools [between] the time of Hippocrates (fifth century BCE) and Galen (second century CE)"; the artifacts found at Pompeii, therefore, are "typical of surgical practice for nearly a millennium."

indwelling catheter, nurses are responsible for its ongoing management. Optimal management of an indwelling catheter includes securing the catheter to the thigh or abdomen in a way that prevents the catheter or its retention balloon from exerting excessive force on the bladder neck or urethra.[6]

Although a review of the literature reveals insufficient evidence to define routine securement of an indwelling catheter as an evidence-based intervention, clinical experience and expert opinion suggest that the practice is based on more than mere tradition. Routine securement is recommended by the Society of Urologic Nurses and Associates and the Centers for Disease Control and Prevention.[6, 7] It's also discussed in guidelines on the use of indwelling catheters issued by the Centers for Medicare and Medicaid Services.[8] Therefore, it's reasonable to recommend and implement routine catheter securement in patients who have short- or long-term indwelling catheters.

Making this intervention part of routine practice should begin with evaluating the institution's current procedures and educating nurses and other providers about the rationale for the revised protocol. Policies should be established on such matters as how the decision to apply a catheter securement device is arrived at (for example, by institutional policy or by physician or NP order) and what type of device will be routinely used. Nurses and other care providers who apply and maintain securement straps should be educated in their use, and home care instructions for patients and their families should be revised if necessary to provide explicit and easily understood information about their purpose and ongoing maintenance. Table 1 (see page 49) reviews current knowledge about securing indwelling catheters and gives a simplified ranking of evidence that provides a basis for individual and institutional decision making regarding securement devices.

INDICATIONS

There are three primary reasons to secure a catheter:

- to control postoperative bleeding with pressure (tamponade)
- to protect a surgical anastomosis
- to prevent urethral trauma or erosion, as well as inadvertent catheter removal

Other benefits of securement have been suggested, including increased comfort and reduced risk of urinary tract infection, but evidence for these is lacking.

Control of postoperative bleeding. The indwelling catheter was originally developed as a means of controlling bleeding while still ensuring unobstructed urinary drainage after urologic surgery.[2] This practice was recommended in the first edition of *Young's Practice of Urology* and is still recommended in current urologic textbooks.[9, 10] Securing the catheter helps control bleeding and subsequent clot formation in two ways: it limits movement of the catheter within the urethra, allowing it to act as a more effective

tamponade device, and, in patients who have undergone open or transurethral resection of the prostate, it allows a 30-mL retention balloon to be placed in the prostatic bed under gentle traction. After surgery of the prostate, urologists often insert a large indwelling catheter (16 to 24 F) and place gentle traction against the bladder outlet to stop urethral bleeding while allowing passage of urine and clots from the bladder.

Protection of surgical anastomosis. Regardless of the surgical technique used, radical prostatectomy involves separating the prostate from the urethra and removing the prostate, prostatic urethra, and seminal vesicles. The lower urinary tract is then restored by anastomosing the membranous urethra to the bladder neck.[11] An indwelling catheter is left in place until the urethra heals, which typically takes two weeks. Inadvertent traction of the retention balloon against this delicate anastomosis can cause pain, compromise wound healing, and increase the risk of scarring and anastomotic stricture. Therefore, urologists recommend securing the catheter in a manner that prevents inadvertent traction or pulling against the anastomosis.[12] Securement with tape or a suture can also protect other delicate surgical sites, such as urethrovesical anastomoses.[13]

Urethral protection during indwelling catheterization. Indwelling catheterization, by definition, involves placing a foreign object in the bladder, typically via the urethra. Although advances in catheter materials have reduced the irritation of and damage to the mucosa of the urethra and bladder neck, the risk of urethral erosion hasn't been eliminated.[14] Over time, mucosal damage and the resulting loss of a watertight seal between the catheter wall and urethral mucosa may result in *catheter bypassing,* the leakage of urine around the catheter.

Limited evidence suggests that the incidence of urethral erosion resulting in catheter bypassing may be high, especially in women undergoing long-term catheterization. For example, in 1995 Bennett and colleagues reported on urologic outcomes in a group of 70 women with spinal cord injuries, including 22 who'd had indwelling catheters for an average of 16.7 years.[15] Nine of the 22 women (41%) experienced urethral erosion resulting in daily urinary leakage. In 1982 Kennedy and Brocklehurst surveyed 107 patients with indwelling catheters in a hospital or home care setting and found that 40% experienced catheter bypassing.[16] Although their survey did not differentiate between bypassing caused by detrusor overactivity (bladder spasm) and that caused by urethral erosion, it's interesting to note the two studies' similar rates of bypassing.

Long-term urethral catheterization of men occasionally results in urethral erosion and a hypospadias-like defect beginning at the ventral aspect of the urethra. The defect tends to extend proximally (toward the scrotum) and may in some cases involve the entire penile shaft. Secrest and colleagues reported on a group of 18 patients with spinal cord injuries who required surgical reconstruction of urethral defects.[17] Urethral erosion with a severe ventral defect occurred in four subjects, all of whom had long-term indwelling urinary catheters.

Considerable force is needed to remove a catheter whose retention balloon is inflated with 5 to 30 mL of saline or sterile water, posing a significant risk of bleeding and trauma to the urethral sphincter mechanism. Clinical experience suggests that the risk of inadvertent removal is highest in patients who are critically ill, cognitively impaired, or sedated. In addition, those with impaired or absent perineal sensation will be unable to alert providers when unintended traction against the catheter causes traumatic removal.

Many experts recommend applying a securement device to the upper thigh in women and to the abdomen in men.

A review of the MEDLINE and CINAHL databases from January 1966 to August 2008 revealed only two studies that focused on the incidence of accidental catheter dislodgment in critical care settings. Lorente and colleagues evaluated accidental removal of vascular (central venous and arterial) catheters, surgical drainage tubes, endotracheal tubes, intraventricular brain drainage tubes, nasogastric tubes, and indwelling urinary catheters in 988 patients in a university-based medical–surgical ICU.[18] The incidence of accidental removal of indwelling urinary catheters was 2% per 100 catheter days. Garcia and colleagues reported that the incidence of "accidental disconnection" of urinary catheters they observed on the critical care units they studied fell within reference standards taken "from the literature," but didn't specify the incidence or prevalence rates of accidental catheter dislodgment.[19]

Use of a catheter securement device such as a tether helps to protect the urethra by preventing direct force from being applied to the retention balloon and bladder outflow tract if the distal catheter or distal tubing is inadvertently pulled or becomes entangled in other equipment.

Prevention of catheter-associated urinary tract infection. It has been suggested that use of a catheter securement device may reduce the risk of catheter-associated urinary tract infection. Possible

mechanisms include the minimization of urethral trauma and movement of the catheter within the urethra and the prevention of accidental dislodgment with associated urethral trauma. However, a systematic review of literature published between January 1966 and November 2003 that focused on techniques for preventing catheter-associated urinary tract infection found no evidence that catheter securement affected infection rates.[20] A search of more recent literature revealed a single prospective, multicenter, randomized clinical trial of 118 subjects that compared the outcomes seen with a specific catheter securement device (StatLock, then manufactured by Venetec International, which was acquired in 2006 by C. R. Bard) with those achieved with a variety of methods (the control group), including tape and other adhesive and nonadhesive (Velcro strap) devices, as well as no securement device.[21] No statistically significant differences were found in the rates of symptomatic urinary tract infection in the groups.

Courtesy of Mikel Gray

Figure 1. The catheter is placed in a nonadhesive securement device just above the bifurcation. There is no one "correct" spot to place the securement device; some clinicians prefer to place it at the most rigid part of the catheter—just below the bifurcation—if it can be accommodated there. Otherwise, it must be placed above the bifurcation.

NURSING MANAGEMENT

Management of a catheter securement device varies depending on the reason for its placement, its type, and the care setting. In acute care facilities patients may return from urologic surgery with a catheter securement device in place.

In my 30 years of caring for patients who have had urologic surgery, I've observed the use of a variety of devices. The choice of device usually depends on the surgeon's preference and knowledge of the devices available. The catheter may be secured to the abdomen or upper thigh, and as discussed above, gentle traction may be intentionally applied. In this case, it's important to ensure that the securement device remains in place and the traction is maintained until a medical order is given to remove the catheter or alter the securement device. A physician should be notified if the securement device is disturbed. If the patient has undergone radical prostatectomy requiring urethral reanastomosis, special care should be taken to ensure that no traction is placed on the catheter until securement is restored. Alternatively, if the catheter was secured under gentle traction, the patient should be closely observed for hematuria by monitoring the catheter bag for blood clots. In close consultation with the physician, nurses may temporarily place gentle traction if bright red blood or a clot is observed.

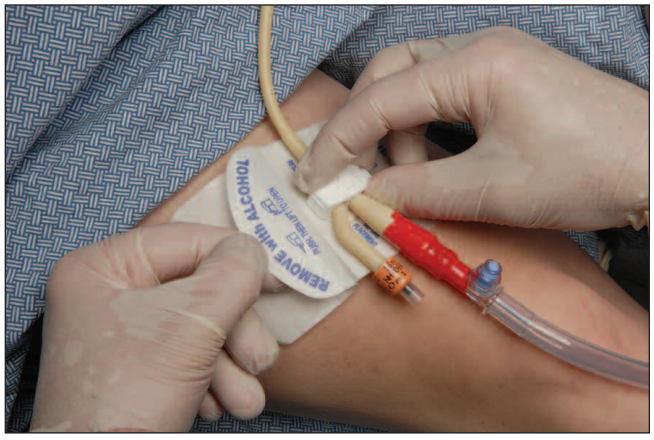
Even though research shows that nurses agree that catheter securement is a necessary part of patient care, better nurse education and institutional policies will be necessary to ensure that it becomes routine practice in both acute and long-term care settings. For example, Siegel surveyed 82 medical–surgical and critical care RNs and found that 98% supported routine securement of indwelling urinary catheters, even though a prevalence study conducted at the same facility prior to the survey found that only three of 68 patients (4%) had stabilized indwelling catheters.[22] The large discrepancy between nurses' perceptions and their daily practice must be addressed to ensure that the intervention becomes routine.

Types of securement devices. A number of catheter securement devices for short- and long-term indwelling catheters are available, and they can be divided into three categories:

- improvised devices that make use of adhesive tape, safety pins, or sutures
- manufactured devices with an adhesive backing and a mechanism for attaching the catheter
- nonadhesive devices that incorporate Velcro and straps to secure the catheter to the upper thigh

Improvised devices are usually made with adhesive tape applied to the abdomen or upper thigh. For example, a piece of tape can be applied to the skin and the catheter placed over it and secured with a second piece of tape that's attached to the first. Additional tape may be used to encircle and secure the distal portion of the catheter, usually just below the bifurcation. Alternatively, the catheter may be sutured in place by the surgeon, but this approach is used primarily to secure transient drainage tubes after complex urologic surgery.[13]

Adhesive-backed devices include the Horizontal Tube Attachment Device (Hollister) and the StatLock device. These can be applied to the upper thigh or abdomen. However, Pomfret cautions that direct contact between the adhesive and a latex-coated catheter might damage the catheter's core.[23]



Courtesy of C. R. Bard, Inc.

Figure 2. The StatLock is an example of an adhesive-backed securement device.

Nonadhesive devices combine a wide stretch leg band with a Velcro locking system to hold the catheter in place (see Figure 1, page 47). Examples include the Foley Catheter Holder (Dale Medical Products), the Catheter Leg Strap (C. R. Bard), and the Catheter Tube Holder Strap (Posey Company).

Searches of the MEDLINE and CINAHL databases from January 1, 1996, to December 31, 2006, revealed only two studies comparing manufactured to improvised securement devices. In a study conducted in New Zealand, Tracy compared manufactured catheter securement devices (brand not specified) with improvised devices using tape and a safety pin in two nonrandomized groups of 20 men each.[24] Both the improvised and manufactured devices were applied to the upper thigh; the study found that the improvised devices were more likely to remain in place. There were no statistically significant differences between the groups when subjects were asked about comfort and ease of application of the respective devices, but because the catheters were placed for four or fewer days after a variety of urologic surgeries, the potential irritation caused by prolonged and repeated use of adhesive tape in long-term catheter use was not addressed. Also, the study didn't specify whether the manufactured device used an adhesive or nonadhesive method of attachment. Finally, the study didn't evaluate the catheters used with the improvised securement system to determine whether the adhesive had come into contact with the catheter and, if it had, whether the catheter's integrity or patency was compromised as a result.

Blaylock and colleagues compared improvised securement using surgical tape with a manufactured device that used an adhesive backing, a hydrocolloid wafer, and resealable adhesive tape (Flexi-Trak Anchoring Device, ConvaTec).[25] This multisite, randomized clinical trial analyzed data on 59 patients whose treatment involved the use of a variety of tubes, including indwelling urinary catheters. In contrast to Tracy's findings, in this study clinicians ranked the manufactured device as easier to apply and remove and as more effective than surgical tape in preventing tension on the tube. They found no difference in device security, but reported that the manufactured device remained in place an average of two days longer than the surgical tape, a statistically significant and clinically relevant difference.

Based on my clinical experience, I initially select a nonadhesive device when managing a patient with an indwelling urinary catheter that's expected to remain in place for two weeks or longer. I've found that patients usually prefer this type of device because it's less irritating than adhesive devices, it's simple to apply, and it can be used for a longer period of time. Some of the Velcro-strap devices can be laundered and reused, reducing the cost of purchasing a new device every time it needs to be changed. In addition, the nonadhesive straps are made of stretch material, minimizing the risk of skin irritation and deep vein occlusion.[26] Nevertheless, venous compression remains a theoretical concern and Velcro-strap devices should be used with caution in patients with severe peripheral vascular disease affecting the lower extremities. I tend to select an adhesive device for patients with severe peripheral vascular disease or when applying the securement device to the abdomen (manufactured devices don't include straps for securing to the abdomen).

As mentioned, a catheter securement device can be applied to the abdomen or the upper thigh. Many clinical experts recommend applying a securement device to the upper thigh in women and to the abdomen in men to maximize the efficiency of urine drainage from the bladder.[27-29] However, we have achieved excellent results by applying a strap to the upper thigh in men as well as women. Further, Blaylock reported catheter tension in three of 64 patients using a securement device for a variety of drainage tubes (including indwelling urinary catheters); in every case the tube was attached to the abdomen.[25] If a nonadhesive device is applied, the strap should be placed on the upper thigh so the smaller catheter-securing strap is easily visible to the patient and care providers and sufficiently close to the urethra to allow a relatively straight course from the male urethra and to prevent tension on the urethra in both sexes. The patient should be instructed to inform care providers if the strap causes pain or numbness of the ipsilateral lower leg or foot, in which case the strap should be removed. If an adhesive device is used, the underlying skin should be carefully monitored for irritation or dermatitis. The skin may be shaved prior to placement to minimize irritation when the device is removed, and a skin barrier may be applied to protect the skin and promote adhesion. Rotating placement of the device from one side to the other also may reduce the risk of skin irritation.

The catheter is typically secured just below the

Table 1. Summary of Clinical Evidence for Catheter Securement

Clinical Action and Rationale	Level of Evidence*
Indwelling urinary catheters should be routinely secured to reduce the risk of urethral erosion or accidental dislodgment.[1-4]	C
Catheter securement with gentle traction may be used to reduce bleeding after transurethral resection of the prostate or open prostatectomy.[4, 5]	C
Catheter securement may be used to protect the surgical anastomosis following radical prostatectomy.[6-8]	C
Manufactured securement devices may be easier to secure, easier to remove, and less likely to create tension against the tube than improvised devices constructed of adhesive tape and safety pins.[3, 9]	B
Catheter securement does not reduce the risk for catheter-associated urinary tract infection.[10, 11]	B
Adhesive that is part of a securement device should not directly contact a latex-coated catheter because it could damage it.[12]	C
Catheter securement devices may be placed on the abdomen or thigh.[1-4, 8, 9, 13]	B
The catheter should be attached to the securement device at the catheter's stiffest point, which usually is just below the bifurcation where the retention balloon is inflated, to prevent occlusion of the catheter lumen.[2]	C

*** Level of Evidence**

A: Statement is supported by a metaanalysis or more than one well-designed randomized clinical trial.
B: Statement is supported by one or several randomized clinical trials or multiple quasi-experimental trials.
C: Statement is supported by expert opinion or clinical practice guidelines based on pooled clinical opinion.

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bifurcation of the tube, where the catheter is stiffest, if it can be accommodated there. But there is no one "correct" spot to place the securement device. Care should be taken to avoid occluding the catheter. The mechanisms used to secure the catheter differ by product, and nurses should consult the manufacturer's directions for the specific product to be used. ▼

Mikel L. Gray is an NP and professor in the Department of Urology at the University of Virginia in Charlottesville. Contact author: mg5k@virginia.edu.

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GENERAL PURPOSE: To explore for registered professional nurses one particular aspect of indwelling urinary catheter management, the use of securement devices, while also analyzing standard practices, expert opinion, and clinical evidence associated with this intervention.

LEARNING OBJECTIVES: After reading this article and taking the test on the next page, you will be able to
- review the background information helpful for understanding the issues involved in securing a urinary catheter.
- summarize the research presented here as it relates to securing a urinary catheter.
- plan the appropriate interventions for securing a urinary catheter.

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