Adaptive Equipment to Assist With One-Handed Intermittent Self-Catheterization: A Case Study of a Patient With Multiple Brain Injuries

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KEY WORDS
• activities of daily living
• brain injuries
• self care
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• urinary catheterization

Intermittent self-catheterization is common for patients who have neurogenic bladder associated with traumatic brain injury (TBI). Intermittent self-catheterization is considered the gold standard for bladder drainage because of the significantly decreased incidence of urinary tract infection in comparison with other catheterization methods. Occupational therapists educate patients in how to complete intermittent self-catheterization and assist them with adaptive equipment so that they may catheterize themselves independently. This case study describes adaptive equipment fabricated to allow a male patient with TBI who was independent with intermittent self-catheterization to continue independent intermittent self-catheterization after a second injury resulting in hemiplegia. Without the use of his left hand, the patient could not complete self-catheterization; therefore, a trough-shaped prop was fabricated to maintain the penis in an upright, lengthened position.


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Occupational therapists in physical rehabilitation settings frequently encounter clients with urinary incontinence requiring catheterization. In the general population, the prevalence of urinary incontinence ranges from 6.6% to 8.9% (Hamid, Arya, Khastgir, Patel, & Shah, 2003). The incidence of urinary incontinence after traumatic brain injury (TBI) and other neurologic injuries is high: 81% of people with spinal cord injury report neurogenic bladder (Moore & Neville, 2006), and 62% of patients in acute rehabilitation after TBI experience urinary incontinence (Chua, Chuo, & Kong, 2003). Occupational therapists can help patients with TBI resulting in neurogenic bladder learn to complete intermittent self-catheterization.

Although multiple products are available for urinary incontinence management, such as indwelling catheters, external catheters, absorbent products, and occlusive devices, studies have shown that intermittent catheterization is the gold standard of bladder drainage for patients with urinary retention secondary to neurogenic bladder (Newman, Fader, & Bliss, 2004). A study by Biering-Sørensen (2002) found that clean intermittent catheterization may induce lower rates of bacteriuria and fewer long-term urethral complications. In a study of 128 patients, the incidence rate of urinary tract infection decreased from 2.72 episodes per 100 person-days for men with indwelling catheters to 0.41 episodes per 100 person-days for men completing clean intermittent catheterization (Biering-Sørensen, 2002). In addition to the low risk of complications, intermittent self-catheterization can provide freedom from urinary collection systems and allow patients to catheterize at times that are convenient to their social activities (Promfret, 2007). Occupational therapists should assist patients in finding the safest method of urinary drainage.
possible; therefore, if an adaptive device allows the patient to complete intermittent self-catheterization, the procedure should be attempted. This article describes the fabrication and use of adaptive equipment to allow a male patient with TBI who was independent with intermittent self-catheterization to continue independent intermittent self-catheterization after a second injury resulting in hemiplegia.

Preparation for self-catheterization begins with washing the top of the penis with soap and water or an antiseptic. The end of the catheter is positioned so that urine can flow into a collection container or toilet. A lubricant is placed on 2 in. of the tip of the catheter. At this point, the patient is ready to complete intermittent self-catheterization. If he is not circumcised, he would pull back the foreskin and keep it back during the procedure. The penis is held straight out in front of the patient, so that its head is pointing away from the body, or erect, so that it is pointing upward. The catheter is then gently inserted into the urethra, the opening in the penis, until urine begins to flow, and then inserted approximately 2 in. farther into the penis. The catheter is removed when the urine stops flowing by gently pulling the catheter tube away from the body (Nettina, 2005).

People with one injury sometimes develop a second illness or injury that affects their ability to continue performing self-catheterization independently, creating a need for adaptive equipment that can be used to assist patients in regaining the capacity to self-catheterize. The current adaptive equipment for self-catheterization includes external catheters that use a condom attached over the penis to collect urine instead of a catheter inserted into the penis (Newman et al., 2004) and rubber bands to increase the grip of the weakened digits (Pham, Noble, & Hentz, 1988). According to Klinger and Spaulding (2001), adaptive equipment is defined as any item, equipment, or system that increases, maintains, or improves the functional abilities of people with disabilities. Adaptive equipment helps patients overcome impairments and increase functional independence in activities of daily living (ADLs; Chiu & Man, 2004). The occupational therapist’s role is to enhance each patient’s function and maintain his or her quality of life. In the population of patients with neurogenic bladder, the occupational therapist’s role is also to fabricate adaptive equipment to increase independence in intermittent self-catheterization (Klinger & Spaulding, 2001). If independence with self-catheterization through occupational therapy interventions cannot be accomplished, other methods of catheterization or urinary drainage can be considered; however, every effort should be made to maintain the patient’s prior level of function while concurrently optimizing the long-term health of the patient’s urinary tract.

**Literature Review**

We completed an extensive literature search of PubMed and Ovid to find adaptive equipment adequate to assist with intermittent self-catheterization; we used the terms intermittent catheterization, adaptive technology, urinary incontinence, assistive devices, and urinary catheterization in combination and individually. The search resulted in studies describing general use of assistive technology, which lacked specificity; most studies described adaptive equipment as only bathing and toileting devices (Chiu & Man, 2004; Klinger & Spaulding, 2001). Multiple research studies have focused on or described treatment of incontinence through exercise and electrical stimulators (Moore & Neville, 2006), behavior modification (Chua et al., 2003), injections (Hamid et al., 2003), and surgical procedures (Birch, 2005; Lewis & Cheng, 2007). Other studies have described effectiveness and selection methods to choose the best type of catheterization system (Hadfield-Law, 2001; Newman et al., 2004; Promfret, 2007). We found no studies examining the specific adaptive equipment available for assisting patients with adapted intermittent self-catheterization.

**Case Study**

A 57-year-old man was admitted to the intensive rehabilitation unit after medical stabilization of a right frontal lobe bleed after falling from his porch. The patient had a neurogenic bladder from a TBI that occurred at age 32. Before his fall, he had been living with his stepfather and had been independent in bathing, dressing, and self-catheterizing. On initial evaluation by the occupational therapist, the patient identified his most important goal as returning to independence with self-catheterization, because he did not want his stepfather to assist with this self-care activity. Manual muscle testing was completed. The patient’s left upper-extremity strength was 2/5 at the shoulder; 1/5 at the elbow, forearm, and wrist; and 0/5 at the digits. His right upper-extremity muscle strength remained at 5/5 throughout. As rated by staff on the Functional Independence Measure™ (Hawley, Taylor, Hellawell, & Pentland, 1999), the patient’s memory and problem-solving skills were 3/7, indicating that he required moderate assistance in those areas. At initial evaluation, the lack of functional movement in the patient’s left upper extremity caused him to be dependent in intermittent catheterization. The patient’s decreased memory and problem-solving skills, compounded by the second head injury, diminished his ability to learn complicated tasks.

Both physical and mental abilities are necessary to complete intermittent self-catheterization, which requires the
patient to pass a catheter into his or her bladder through the urethra (Promfret, 2007). The physical abilities required to complete self-catheterization include bilateral hand dexterity and strength. One hand is necessary to maintain penile position, and the other hand is needed to insert the catheter. The mental abilities required for catheterization include the ability to remember the steps, or the ability to read the steps if provided, and the ability to maintain a catheterization schedule.

Through the occupational therapy evaluation and ongoing assessment process, we determined that adaptive equipment to allow independent intermittent self-catheterization would be necessary. All attempts to complete catheterization without adaptive equipment were unsuccessful, despite administering interventions designed to improve muscle strength and control of the left upper extremity. The patient’s left upper extremity was no longer strong enough to allow him to maintain position of the penis so that he could insert the catheter with his right upper extremity.

As described earlier, we completed a literature search to find adaptive equipment for this patient adequate to maintain the position of the penis in an upright, lengthened position. We determined that the adaptive equipment necessary to meet the patient’s needs for one-handed self-catheterization did not exist; therefore, a penile prop would have to be fabricated. A penile prop was constructed that was curved to fit the shape of the penis for stabilization, angled to point the end of the penis upward for access to the urethra, and equipped with supporting legs to maintain equipment position. It was fabricated of low-temperature thermoplastic material of 1/8-in. thickness. This material was chosen because of its excellent draping, molding, and conforming qualities. Also, its polymorphic ability allows for any needed adjustments to the size and shape of the prop once it has been fabricated. Because the insertion of a catheter is associated with a significant danger of acquiring a urinary tract infection (Hadfield-Law, 2001), no padding was added to prevent the collection of bacteria near the catheter insertion site.

The thermoplastic material was heated in hot water until it was pliable. It was then draped over a small stacking cone, starting at the small end and ending halfway up the cone, to form the trough. As the thermoplastic material hardened, the trough edges were folded down so that they were the same height as the base of the trough at the wider end and 3 in. longer than the base of the trough at the narrower end. Creating the supporting legs this way increased the angle of the trough. The legs were winged outward to increase the base of support at the front of the penile prop, and the edges were rounded and rolled to protect the delicate skin. The completed penile prop was shaped like an M with a rounded center (Figure 1).

The patient was capable of using his right hand to place the penile prop between his thighs, with the shorter end toward his scrotum and the taller end at the head of the penis, and to then place his penis inside the trough of the penile prop. Once the penis was in place in the prop, with the trough firmly pressed against the upper thighs, the right hand was used to insert the catheter into the urethra. The shape of the trough allowed the penis to maintain the upright, lengthened position necessary for one-handed self-catheterization.

The treatment sessions after the production of the penile prop were scheduled around the patient’s catheterization times. He was provided verbal cues and assistance with placement of the penile prop during the first treatment session. During the second treatment session, he was provided only verbal cues while using the penile prop to complete self-catheterization. By the third session, the patient completed self-catheterization independently using the penile prop. The patient accomplished his goal of independent intermittent self-catheterization.

Conclusion
Occupational therapists enable patients to maximize their ability to function and participate in everyday activities by prescribing adaptive equipment. Provision of adaptive equip-

Figure 1. Completed penile prop, from left to right: front view, top view, and with a stacking cone inserted.
ment requires not only patient education and facilitation of services but also the possible manufacture or production of the equipment (Klinger & Spaulding, 2001). To be most effective, the equipment must satisfy the patient’s goals and needs (Chang, 2001). The occupational therapist’s role is to identify the patient’s goals, develop a plan of care, and provide the resources necessary to meet these goals.

Adaptive equipment to meet the needs of patients with urinary incontinence can decrease patient care needs, increase the effectiveness of vocational rehabilitation, and decrease the isolation that is often felt by patients with urinary incontinence (Moiyadi, Devi, & Nair, 2007). In this case, creating new adaptive equipment was necessary and effective in meeting the patient’s goals and in decreasing the occurrence of urinary incontinence. The penile prop was simple to fabricate and can be used to address any condition in which a patient may have difficulty maintaining penis position for self-catheterization.

References