Bladder and Bowel Dysfunction in Patients with Spinal Cord Injury – Nursing Intervention

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ABSTRACT

Spinal cord injury (SCI) has severe consequences on patients' mobility and body organ function. In particular, its effects on bladder and bowel have been thoroughly studied since, in addition to their adverse effect on patients' quality of life, they are also associated with increased mortality.

The aim of this study is to review therapeutic interventions for the management of bladder and bowel disorders in SCI patients, focusing on the nursing role, as a member of the rehabilitation team in the acute and chronic phase of injury. This is a narrative literature review using the Pubmed internet database. Papers were searched with the use of the following keywords: ("neurogenic bladder" OR "neurogenic bowel") AND "spinal cord injury". Among the 214 publications evaluated, 124 were rejected, leaving 90 studies for the present review.

Treatment modalities in SCI patients with neurogenic bladder include clean intermittent catheterization, indwelling catheters, bladder function training and assisted bladder emptying. Neurogenic bowel may be treated with adequate and appropriate intake of food and fluids, use of dietary supplements and oral medications, selection of appropriate methods to aid defecation and emptying and colostomy surgery. The role of nursing care is of vital importance as it can prevent further injury and contribute to improvement of patients' quality of life.

Key Words: "neurogenic bladder", "neurogenic bowel", "spinal cord injury".

Introduction

Spinal cord injury (SCI) has severe consequences not only for patients' mobility and sensation but also for the function of body organs. In particular, its effects on bladder and bowel have been thoroughly studied since, in addition to their adverse effect on patients' quality of life, they are also associated with increased mortality. Chronic kidney disease is the leading cause of death in SCI patients.

Loss of normal bladder function is one of the most important consequences for SCI patients. Inadequate management of bladder function may lead to complications such as urinary tract infections, urinary retention, incontinence, kidney stones and urinary reflux as well as life-threatening conditions, such as renal failure. Dysfunction of the urinary system following traumatic SCI is determined by bladder dysfunction. The type of subsequent neurogenic bladder depends on the level of SCI, the nature of the lesion (complete or incomplete SCI), as well as

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the time elapsed from injury [2]. During spinal shock phase, the bladder loses its reflexes, the detrusor is acontractile and the sphincters are contracted, leading to acute urinary retention and overflow incontinence. Neuroplasticity progressively alters the properties of bladder afferences and spinal circuitry. A few weeks after injury, areas of spinal cord that were not damaged begin to gradually regain function. During storage phase, the bladder spontaneously contracts (neurogenic detrusor overactivity) leading to decreased bladder capacity, urinary incontinence and vesico-ureteral reflux. During micturition, coordination between detrusor contraction and sphincter relaxation fails (detrusor sphincter dyssynergia), resulting in high detrusor pressure and dysuria. Patients are at the same time incontinent and suffer from chronic urinary retention due to the functional obstruction by dyssynergia. Voluntary bladder control is abolished, while the amount of urine retained in the bladder is large (but not as much as the remaining amount of urine in the immediate post-traumatic phase). Neurogenic detrusor overactivity can trigger autonomic dysreflexia and can impair quality of life [3-4]. As the absence of spinal reflexes subsides, two main types of bladder condition develop: hyperactive (spastic) bladder and inactive (loose) bladder.

Another serious condition in SCI patients is the neurogenic bowel, which is responsible for a large number of gastrointestinal problems, such as decreased motility of the bowel, prolonged passage of contents, chronic constipation, abdominal distension and fecal incontinence. Patients with neurogenic bowel are constantly alert, due to possible incontinence, which negatively contributes to patients' return to previous activities. If not treated appropriately, neurogenic bowel dysfunction results in complications such as irregular bowel evacuation, hemorrhoids, constipation, nausea, pain, ileus, and autonomic dysreflexia [5].

The aim of this study is to review the therapeutic interventions for the management of bladder and bowel disorders in SCI patients with focus on the role of the nurse as a member of the rehabilitation team, in the acute and chronic phase of the injury.

A literature review was conducted using the Pubmed internet database. Papers were searched with the use of the following keywords: ("neurogenic bladder" OR "neurogenic bowel") AND "spinal cord injury". The search was limited to papers published in the last 5 years (2017–2022). Studies in non-English language, case reports, study protocols, pilot studies, animal studies and not nurse – related studies were excluded.

Discussion

The search retrieved a total of 366 papers (Figure 1). After screening of titles and abstracts, 152 articles were rejected as they were not related with the study. Among the 214 publications evaluated, 124 were rejected, leaving 90 studies for the present review.

Neurogenic Bladder - Diagnostic Approach

Normal function of the lower urinary tract is based on a complex interaction between sensory and motor nervous systems. The type of dysfunction should always be identified. A complete medical history, physical examination and an urination diary are required before any other diagnostic tests. The results of the initial evaluation are used to assess long-term treatment [6]. Evaluating patients' present and expected quality of life is important to evaluate the treatment effectiveness. The type of bladder management has been shown to affect health-related quality in SCI patients [7-9].

In addition to patient's detailed history, special attention should be paid to physical and mental disabilities. Patients with high SCIs can cause a significant drop in blood pressure when moved to a sitting or standing position. The sensation and reflexes of the urogenital system must be checked. In addition, the rectal sphincter and pelvic floor function should be checked [7-8].

For the members of the rehabilitation team, ultrasonography is the preferred method for the surveillance of the upper urinary tract dysfunction. Urodynamic evaluation, along with multichannel urodynamics, voiding cystourethrography combined with urodynamics and video-urodynamics are the applied methods that can objectively assess the function of the lower urinary tract [8,10-11].

Principles of Neurogenic Bladder Treatment

Treatment of neurogenic bladder in SCI patients includes new strategies for neurogenic detrusor overactivity, new surgical techniques, prevention of recurrent urinary tract infections [12]. The primary

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goals for the treatment of neurogenic bladder are: protection of the upper urinary system, achieving (or maintaining) restraint of urination, restoration of the operation of the lower urinary tract and improving patients' quality of life [9,13]. In SCI patients, non-invasive medical management is important to improve urodynamic parameters of bladder capacity, decrease detrusor pressure and improve quality of life outcomes with neurogenic bladder management [6,14-15]. Co-existing neurogenic bowel and spasticity are factors associated with neurogenic bladder [16,17]. Management of neurogenic bladder in SCI patients includes the following approaches: (a) intermittent bladder catheterization, (b) indwelling catheters, (c) condom catheter drainage, (d) assisted bladder emptying, (e) oral drug therapy, botulinum toxin injections, surgical treatment and (f) neuro-urological rehabilitation

Clean intermittent catheterization: For neuro-urological SCI patients who are unable to empty their bladder effectively, clean intermittent self-catheterisation is the gold standard of treatment. Intermittent catheterization involves the placement of a catheter to drain baldder's urine and its immediate removal after completion. This is repeated at regular intervals throughout the day and is performed with either a disposable or a reusable catheter [15,18-19]. Intermittent catheterization is performed by the patient or his caregiver in the rehabilitation center or home environment using a clean technique. According to the latest guidelines, nurses should use their clinical judgment to determine the technique and type of catheter, always according to the needs and particularities of each patient [20]. Sterile intermittent catheterization as originally proposed by Gutmann and Frankel significantly reduces the risk of urinary tract infection and bacteriuria, compared to the clean intermittent catheterization proposed by Lapides et al [21]. However, it has not yet been documented whether the occurrence of urinary tract infections, or patient satisfaction are associated with sterile or clean techniques or by any other factor. The sterile technique cannot be considered a routine procedure. The clean intermittent catheterization technique is an alternative to the sterile technique.

The use of intermittent catheterization, possibly the aseptic technique, is recommended for patients with urinary retention. Reusable catheters are mainly used in developing countries and are considered more risky in terms of hygiene. They have high availability, high sustainability, low cost and little impact on environment [22-23]. On the other hand, single use catheters are safer, more easy to use but are expensive, difficult to be stored and harmful for the environment [22-25]. A study by Welk et al showed that hydrophilic catheters may be cost effective in comparison with uncoated catheters [26].

The average frequency of catheterizations per day is 4-6 times and the most commonly used catheter size is between 12-16 Fr. Ideally, the volume of the bladder during catheterization should generally not exceed 400-500ml. The technique can even be applied in SCI patients up to C6-level lesions [12,18,27-30].

Long intervals between catheterizations, makes bladder store excess urine, leading to excessive filling, reduction of bladder blood flow and detrusor myogenic damage, further increasing the risk of reflux. When the intervals are short, frequent catheterizations increases the risk of urinary tract infections and affect the bladder ability to obtain effective systolic and diastolic training [14,29]. Therefore, frequency of catheterizations depends on the residual urine volume and maximum urine output [14,31].

This method of the intermittent catheterization has an advantage over permanent catheterization, as it reduces the frequency of long-term complications, such as hydronephrosis, kidney stone growth and bladder. SCI patients who use intermittent catheterization suffer fewer lower urinary tract symptoms, enjoy better sleep and improve physical activities, resulting in a better quality of life. Sterile technique is used in hospitalized patients, but aseptic technique is widely used in clinical practice [20,27,32-36].

Intermittent catheterization is contraindicated for patients who do not have upper extremity functionality to perform the procedure themselves, patients who do not have someone willing or suitable to help them in this process, when there is poor cognitive function, inability or reluctance to meet the catheterization schedule or fluid intake pattern, and when there is an adverse reaction, from the continuous insertion of the catheter into the genital area [27,37-40]. According to

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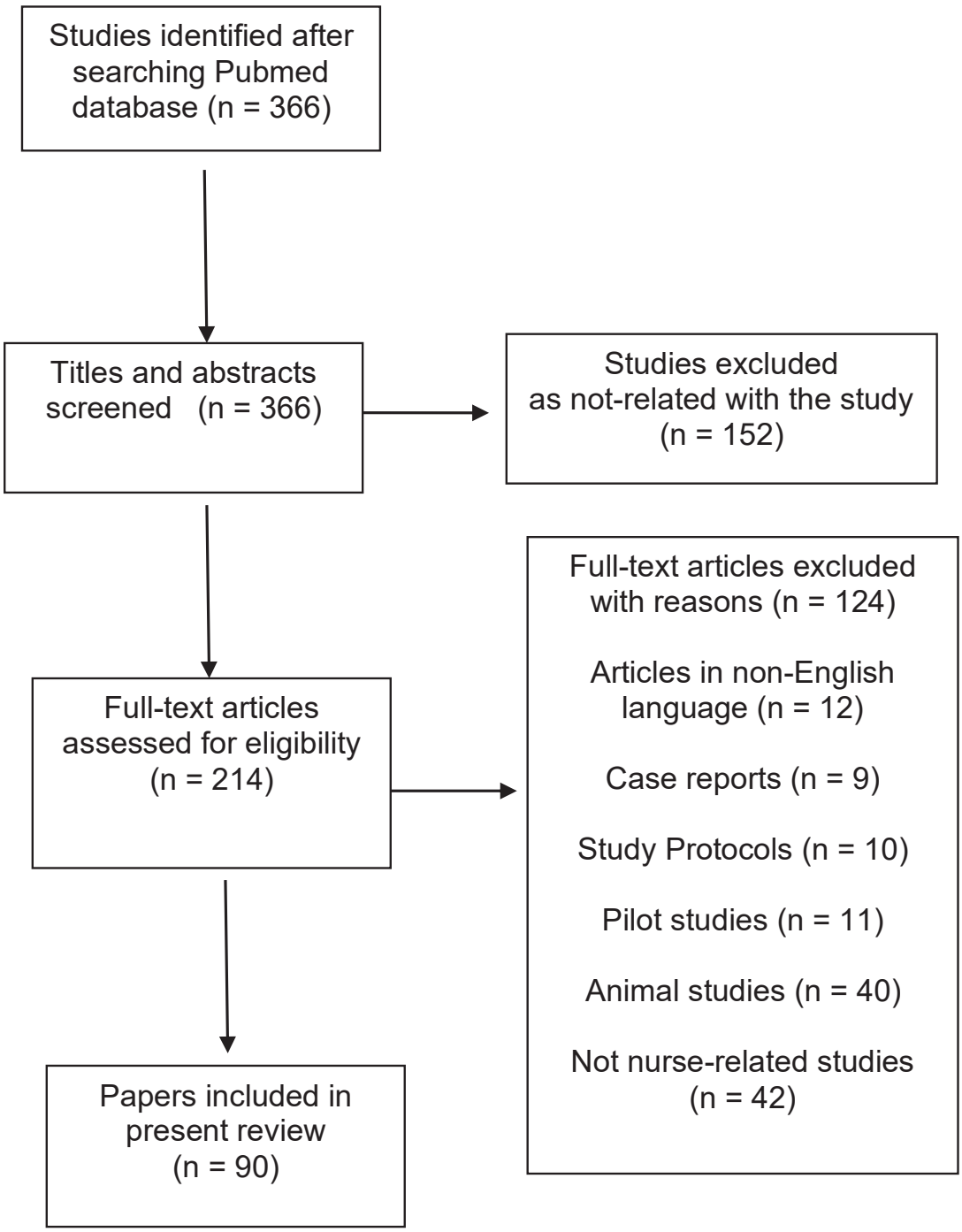
Figure 1



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Crescenze et al, female gender, earlier injury, recurrent urinary tract infections and severe bowel dysfunction were associated with dissatisfaction for clean intermittent catheterization of SCI patients [41,42].

Indwelling catheters: The use of an indwelling catheter involves inserting a catheter into the bladder for a short or long period of time. The two types of Indwelling catheter are the transurethral catheter and the suprapubic catheter. Permanent transurethral catheterization, and to a lesser extent suprapubic cystostomy are associated with a wide range of complications as well as an increased risk of urinary tract infections [43,44]. SCI patients with indwelling catheters were almost twice as likely to report more severe bowel symptoms as those performing clean intermittent catheterization [45]. In this way, both prior techniques should be avoided whenever possible. Silicone catheters are preferred as they are less prone to sediment deposition and the high probability of latex allergy in neuro-urological patients.

Condom catheter drainage: Social restraint can be achieved by collecting urine with various devices such as incontinence diapers. Condom catheters with a urine collection device are a practical method for men. Patients should be closely monitored for the risk of urinary tract infections. The penile pressure-closure device is completely contraindicated in patients with extrinsic hyperactivity or low-dilation bladder because there is a risk of developing high intravesical pressures and wounding or necrosis due to reduced or absent sensation [15].

Assisted bladder emptying: Bladder emptying without catheters is the top priority for restoring bladder function [46]. Incomplete emptying of the bladder is a serious risk factor for urinary tract infection, development of high intravesical pressure and incontinence. Therefore, various methods can be applied to improve the emptying process. Downward movement of the lower abdomen with suprapubic compression (Credé) or increased intra-abdominal pressure (Valsalva) leads to an increase in intra-cystic pressure, but can usually also cause reflex contraction of the sphincter [10,15]. The latter can increase the outflow resistance of the bladder and lead to inefficient emptying. The high pressures that develop during these procedures are dangerous for the urinary system. Therefore, their application should be discouraged, unless urodynamic testing shows that the intracystic pressure remains within safe limits. Long-term complications are inevitable for both of these emptying methods. Already insufficient pelvic floor function may worsen further, causing or exacerbating pre-existing urinary incontinence [14].

The risk of high pressure urination is real and interventions to reduce peripheral resistance may be necessary. This stimulation can also cause autonomic dysreflexia, especially in patients with high SCI (at or above the T6 level). All assisted bladder emptying techniques require low peripheral (urethral) resistances. Even then, high extruder pressures can develop. Therefore, patients need careful training and close urodynamic and urological monitoring [6].

Gradual training and prevention of urinary tract infections can be performed. Bladder training absorbs much of a patient's time, which can be discouraging. But perseverance is necessary, because the bladder will gradually train. The same training is done for both sexes, but it is absolutely necessary for women, as there is no satisfactory catheter in the market. Incontinence diapers are the only protection in case of leaks between discharges or catheters. When bladder training is ineffective, the patient learns self-catheterization with an intermittent but not always regular schedule [6]. Continuous nursing care intervention can improve patients' compliance and psychological aspects and reduce urinary complications [47-48].

Oral drug therapy, botulinum toxin injections, surgical treatment: A single, optimal, medical treatment for neuro-urological symptoms is not yet available. Usually, a combination of different treatments (eg intermittent catheterization and antimuscarinic drugs) is recommended to prevent urinary tract damage and improve long-term results, especially in patients with suprasacral SCIs [49]. Antimuscarinics are the first line of treatment [12]. The administration of probiotics may be useful for the prevention of urinary tract infections in these patients [50]. Botulinum toxin injections for urinary incontinence are associated with about 50% patients' satisfaction [15,51-53]. Addition of gabapentin can be considered as an alternative, before Botulinum toxin injection, for SCI patients with neurogenic overactive detrusor who did not respond

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to the combination of anticholinergics and mirabegron [54]. Augmentation cystoplasty is a well described surgical method aiming to control incontinence risk factors and long-term complications [12,55-57].

Neuro-urological rehabilitation: The term bladder rehabilitation summarizes the treatment options aimed at restoring bladder function in SCI patients with neuro-urological symptoms. Strong contraction of the urethral and / or pelvic floor sphincter, as well as anal dilation, manipulation of the genital area, and physical activity inhibit urination through a reflex arc. Relevant methods include temporary peripheral electric stimulation, peripheral electric stimulation combined with pelvic floor muscles training, intracystic electric stimulation and repeated transcranial magnetic stimulation [14,58-64]. Sacral neuromodulation has shown conflicting results with a favourable outcome ranging from 29% to 40% in the testing phase and 58% to 80% in the permanent phase [1]. Electrical stimulation of the genital nerves (GNS) is a tolerable method that acutely inhibits reflex neurogenic detrusor overactivity and bladder contractions and may increase bladder capacity [65-66].

Principles of Neurogenic Bowel Treatment

Treatment of bowel dysfunction in SCI patients is of vital importance, as it is associated with a negative impact in quality of life [4]. Prevention of fecal incontinence is the top priority for restoring bowel function [46]. Proper bowel care reduces the risk of autonomic dysreflexia [45,67]. Fecal incontinence was associated with urinary incontinence and impaired satisfaction with life [68]. The rate of fecal incontinence increases significantly with increasing age, myelomeningocele as etiology of injury, completeness of SCI, and permanent use of wheelchair [68-69]. Education to nurses, rehabilitation team and patients is important to facilitate a neurogenic bowel program in the acute care trauma setting [5].

The role of the nursing team is significant and proper skills and education are needed [70]. An appropriate and consistent bowel care routine implemented by properly educated nursing team enables SCI patients to experience wellness and quality in their everyday lives [71]. It is proved that nursing intervention contributes to recovery of bowel function and improvement of SCI patients' quality of life and satisfaction [72]. Todd et al observed that, nurses providing bowel care to SCI patients, accepted unpleasantly their duty for bowel care, and often saw it as low priority displaying avoidance tactics. Provision of care in these patients may facilitated by the standardization of bowel care training. More properly educated nurses are needed to improve the level of treatment [73].

In the first management phase of the neurogenic bowel, proper nutrition, satisfactory fluid intake and bowel emptying program are necessary for SCI patients. The training of the SCI patient for the operation of the rectum is necessary to be carried out immediately after the installation of the lesion and regardless of the level of the SCI [74]. According to Attabib et al, in patients with traumatic cauda equina injury, shorter time from injury to initiation of rehabilitation was a significant predictor for bowel function. Patients with traumatic cauda equina injury have a reasonable chance of recovery in bowel and bladder function [75].

For bowel care, the right training program starts as soon as the patient is on a complete diet. The goal is to transfer bowel contents to the rectum and remove it with reflex defecation when the patient is prepared [76]. Proper evaluation and the creation of a personalized program, combined with patient monitoring and education, are important parameters of the process. Individual MR-defecography findings in complete SCI patients may help to determine specific therapeutical options for patients suffering from severe bowel dysfunction [77]. The development of an effective bowel function program may include measures such as [78]: (a) adequate and appropriate intake of food and fluids, (b) use of dietary supplements and oral medications when necessary, (c) selection of appropriate methods to aid defecation and emptying and (d) colostomy surgery.

Adequate and appropriate intake of food and fluids: The Mediterranean diet, combined with exercise and dietary supplements, has been proposed in SCI patients. However, chronic SCI patients consume fruits, vegetables and whole grains in less quantity than the recommended guidelines. This can be explained by the fact that symptoms of bowel dysfunction may be increased after high fiber consumption. Low fiber

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consumption triggers dysbiosis, which is associated with both endotoxemia and inflammation [79-80]. Approximate daily consumption of 15 gr dietary fibers has been shown to be beneficial in the management of neurogenic bowel in SCI patients [81].

Use of oral medications: Conservative, pharmacological management of neurogenic bowel dysfunction is successful in 67% of the SCI patients [82]. Opioids have a significant constipation effect [83].

Selection of appropriate methods to aid defecation and emptying: Selection of appropriate methods to aid defecation and emptying, such as natural techniques (manual emptying, rectal and anal canal irritation with appropriate body positioning) and defecation stimulants such as suppositories, enemas and laxatives [76,84]. The neurogenic bowel is best treated when the rectum is emptied at a specific time, the same hours that the person maintained and before the injury. Laxatives are administered 6-8 hours before the specified time of rectal emptying. Bowel management typically includes mechanical distension of the distal colon to evoke a recto-colic reflex and induce bowel emptying. The induction of true emptying can be achieved by administering a glycerol suppository, thus stimulating the defecation reflexes, causing gas and chemical irritation of the mucosa [85]. Evacuation takes place either in bed or in the toilet. For most patients, this procedure is done with help [76]. Colonic stimulation may have the potential to improve colonic motility for individuals with neurogenic bowel dysfunction [86]. However, it has been found that 1/3 of the SCI patients has no information about transanal irrigation [87]. Electric stimulation may be beneficial for neurogenic bowel in SCI patients [64,88].

Colostomy surgery: Colostomy surgery to achieve bowel emptying is a safe and effective method when performed early after SCI. Colostomy may help newly injured patients to gain independence and make bowel care easier and more acceptable [89]. Most SCI patients experience improvement in quality of life after colostomy procedures [90].

Other methods: Transdermal administration of neostigmine / glycopyrrolate by iontophoresis has been suggested as an easy, safe, and effective method to promote bowel evacuation in SCI patients [91].

Conclusions

Neurogenic bladder and neurogenic bowel are a major challenge for SCI patients in the long term. Treatment modalities in SCI patients with neurogenic bladder include clean intermittent catheterization, indwelling catheters, bladder function training and assisted bladder emptying. Neurogenic bowel may be treated with adequate and appropriate intake of food and fluids, use of dietary supplements and oral medications, selection of appropriate methods to aid defecation and emptying and colostomy surgery. The role of nursing care is of vital importance as it can prevent further injury and contribute to improvement of patients' quality of life.

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