



2011

Occupational Therapy Intervention for Patients with Spinal Cord Injury

Cheryl A. Nickerson
University of North Dakota

Follow this and additional works at: <https://commons.und.edu/ot-grad>

 Part of the [Occupational Therapy Commons](#)

Recommended Citation

Nickerson, Cheryl A., "Occupational Therapy Intervention for Patients with Spinal Cord Injury" (2011). *Occupational Therapy Capstones*. 281.
<https://commons.und.edu/ot-grad/281>

This Scholarly Project is brought to you for free and open access by the Department of Occupational Therapy at UND Scholarly Commons. It has been accepted for inclusion in Occupational Therapy Capstones by an authorized administrator of UND Scholarly Commons. For more information, please contact zeinebyousif@library.und.edu.

OCCUPATIONAL THERAPY INTERVENTION FOR PATIENTS
WITH SPINAL CORD INJURY

By

Cheryl A. Nickerson, OTR/L

Advisor: Janet Jedlicka Ph.D, OTR/L

A Scholarly Project

Submitted to the Occupational Therapy Department
of the

University of North Dakota

In partial fulfillment of the requirements
for the degree of

Master's of Occupational Therapy

Grand Forks, North Dakota

May 1, 2011



This Scholarly Project Paper, submitted by Cheryl A. Nickerson in partial fulfillment of the requirement for the Degree of Master's of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.



Faculty Advisor

5-2-11

Date

PERMISSION

Title OCCUPATIONAL THERAPY INTERVENTIONS FOR
PATIENTS WITH SPINAL CORD INJURY

Department Occupational Therapy

Degree Master's of Occupational Therapy

In presenting this Scholarly Project in partial fulfillment of the requirements for a graduate degree from the University of North Dakota, I agree that the Department of Occupational Therapy shall make it freely available for inspection. I further agree that permission for extensive copying for scholarly purposes may be granted by the professor who supervised our work or in her absence, by the Chairperson of the Department. It is understood that any copying or publication or other use of this Scholarly Project or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and the University of North Dakota in any scholarly use which may be made of any material in our Scholarly Project.

Signature *Cheryl Jackson OTR/L* Date 4/28/11

ACKNOWLEDGMENTS

I am very grateful to all the people in my life who shared my vision of obtaining this advanced degree. My friends and family had continuous encouragement and inspiration to keep me focused on the end in sight.

I would like to express my gratitude to Janet Jedlicka, PhD, OTR/L for her generous patience and guidance throughout this project. It has been a great learning process with a remarkable mentor at the helm.

It is also important to say thanks to my special friend, Beth, and my sister-in-law, Debbie, who spent countless hours editing my writing and giving encouragement when I needed it the most.

Special acknowledgment to my loving and patient husband, Dave, who has been supportive with all my endeavors over the past thirty years. Gratitude for my beautiful daughter, Laura, who dropped everything to give advice and be my technical advisor. For all your precious time, I sincerely thank you.

TABLE OF CONTENTS

| | |
|------------------------------------|-----|
| ABSTRACT | vii |
| CHAPTER | |
| I. INTRODUCTION | 1 |
| II. REVIEW OF THE LITERATURE | 4 |
| Overview of Treatment | 6 |
| Medical Complications | 6 |
| Interdisciplinary Team | 7 |
| ASIA Assessment | 8 |
| Role of Occupational Therapy | 9 |
| Common Complications | 10 |
| Autonomic Dysreflexia | 10 |
| Orthostatic Hypotension | 11 |
| Pressure Ulcers | 13 |
| Treatment Approaches | 15 |
| Bowel Management | 15 |
| Bladder Management | 17 |

| | |
|--------------------|----|
| Exercise | 18 |
| Self-Care | 20 |
| Conclusion | 22 |
| III. METHODOLOGY | 23 |
| IV. PRODUCT | 27 |
| Purpose | 27 |
| Description | 28 |
| Frame of Reference | 30 |
| Conclusion | 31 |
| V. SUMMARY | 33 |
| REFERENCES | 37 |
| APPENDIX | 43 |

ABSTRACT

Spinal cord injuries are complex and debilitating, affecting every aspect of a patient's life. This causes a general reduction in personal independence and social participation (Pillastrini et al., 2008). In order to provide effective and appropriate care, the interdisciplinary team must have extensive knowledge of the diagnosis and potential problems that the spinal cord patient may encounter. The purpose of this study was to identify successful interventions for an effective occupational therapy approach and to develop an education manual for use in the rehabilitation setting in order for entry-level therapists to develop competency.

Based on information found in the literature review, previous continuing educational courses, and expertise of the author, a training/educational manual was developed. This resource addresses major areas of spinal cord care commonly treated by occupational therapy in a rehabilitation setting. The manual consists of major areas of spinal cord care, with each topic divided into applicable areas of treatment. Each section contains an overview of the topic, objectives for learning, precautions and contraindications, applicable treatment and possible use of adaptive equipment. This educational resource will be presented to the spinal cord development team for approval and suggestions and then to the occupational therapy team for implementation. Continued training and education for staff will provide a true collaborative effort for inpatient care and potentially increase functional independence of the patient at time of discharge (Pillastrini et al., 2008).

CHAPTER I

INTRODUCTION

Spinal cord injuries (SCI) are complex and debilitating, affecting every aspect of an individual's life regardless of severity (Pillastrini et al., 2008). The magnitude of the injury depends on the level of damage to the spinal cord and results in deficits in motor control, sensation or both. The loss of movement and coordination of limbs translates into decreased ability to dress, groom, toilet, ambulate, transfer from surface to surface, and perform home management tasks. This loss of function affects not only the independence of the injured person but everyone associated with the individual including family, friends and co-workers. There is often a substantial physical and financial burden placed on family who are forced to compensate for the significant loss of function (Post, Bloemen, & deWitte, 2005). In addition, there is a tremendous emotional toll on the patient following this life-changing event due to his/her inability to fulfill established roles as child, sibling, parent and worker.

Patients with SCI are often transferred to a rehabilitation facility to work on maximizing his/her independence in all activities of daily living (ADL's) including self-care, functional mobility, home management, and community re-entry. Due to the extensive nature of these injuries, it is beneficial for these patients to experience early rehabilitation with therapists and other health professionals to regain or

compensate for their needs and to promote a healthy psychological attitude (Kirschblum et al., 2007). In order to provide effective and appropriate care, the treatment facility must employ a multidisciplinary team with extensive knowledge of the diagnosis and potential problems each patient may encounter (Sinclair, Lingard, & Mohabeer, 2009).

Treatment provided by occupational therapists on a rehabilitation unit is beneficial to the patient by providing client-centered, individualized therapy (Pillastrini et al., 2008). Occupational therapy implemented through purposeful activities addresses the motor and sensory deficits, as well as social and cognitive aspects of the patient's injury. Organizing such a complex and detailed plan of care can be a difficult task for staff unfamiliar with the complexities of a SCI (Anderson, 2004). Care of an individual with a spinal cord injury requires advanced competency of the therapists and continuous collaboration among the interdisciplinary team (Sinclair, et al., 2009). Entry-level therapists or inexperienced professionals unfamiliar with SCI in the rehabilitation setting need advanced education and training to develop a complex plan of care. A high job turnover rate for the therapy profession affects both SCI patients on the rehabilitation unit and the profession as a whole. There is a decrease in effectiveness among the staff and a decline in patient care while new staff is being trained (Harkson, Unterreiner, & Shepard, 1982).

Due to the complex and demanding nature of SCI therapy and the turnover rate of therapists in the rehabilitation setting, a strong need exists for educational materials that provide ongoing education and training for entry-level therapists or inexperienced staff. The purpose of this scholarly project is to develop an educational manual based on the Occupational Adaptation framework for occupational therapists and certified

occupational therapy assistants involved in the SCI patient's care while on the rehabilitation unit. The goal of the manual is to increase independence and responsibility of the therapist working in SCI intervention and lessen the anxiety associated with treating this challenging diagnosis.

Chapter II of this document provides an in-depth review of the pertinent literature defining SCI and current methods for treatment. It describes the benefits of a rehabilitation unit and the role of occupational therapists within the interdisciplinary team. The scholarly project provides a resource for continued education and competency in SCI rehabilitation. Chapter III is a description of the methodology used to develop the educational manual for use by occupational therapists working with SCI patients. Chapter IV summarizes the educational manual. The complete manual is located in the appendix. Chapter V describes recommendations for implementation of the training program.

CHAPTER II

A REVIEW OF THE LITERATURE

This literature review covers many of the complications and problems patients endure after a spinal cord injury (SCI). It details the current demographics and various types of injuries including recent trends in the occurrence of injuries. With the significant change the injury places on this population, including loss of pertinent roles, decreased income, and decreased self-esteem; the burden of care increases, thus placing an enormous strain on family and friends. In addition, this chapter discusses the role of occupational therapy and the latest research on intervention.

According to the University of Alabama National Spinal Cord Injury Statistical Center (NSCISC), the incidence of spinal cord injuries is approximately 12,000 new occurrences per year (“Spinal Cord Injury Facts,” 2010). NSCISC estimates that there are currently 231,000 to 311,000 persons living with SCI in the U.S.A, the majority being young adults. Statistically, more injuries occur in males than females, although recently this number has slightly declined from 81.8% to 80.8%. Since 2005, the greatest percentage of SCI occurs due to motor vehicle accidents (41.3%) followed by falls (27.3%), violence (15%), sports (7.9%) and other/unknown factors (8.5%). The other/unknown category includes non-traumatic injuries such as tumors and infections (e.g., Transverse Myelitis and Guillain Barre), genetic disorders (e.g., Spina Bifida), and cord compression due to intervertebral disc ruptures or abnormalities. As life expectancy

increases in the senior population, there is a consistent upward trend of spinal cord injuries over the age of sixty (Jackson, Dijkers, DeVivo, & Poczatek, 2004). These injuries are the result of decreased balance and safety awareness in the older population placing them at a higher risk for falls.

For patients who have experienced a SCI, their life roles are diminished or significantly changed while the burden of care for family and friends increases tremendously (Post et al., 2005). These life roles include sibling, parent, child, worker, and friend. Craig Hospital in Denver, CO., a model system rehabilitation facility for SCI, reports more than half of their patients with acquired SCI are employed at the time of the injury (“Spinal Cord Injury Facts,” 2010). Following up with the same people one year post injury indicates that only 11% of the people have employment. The patient’s inability to continue in his/her role as a worker and provider leads to a strain on finances, as well as decreased self-esteem. The loss of the ability to be productive and a wage earner becomes even more problematic for people who have a poor support system or are single (“Spinal Cord Injury Facts,” 2010).

The University of Alabama NSCISC reports the economic burden of a spinal cord injury and the subsequent cost of rehabilitation vary greatly and are dependent upon the severity and level of the injury (“Costs of Living,” 2010). The amount of financial and physical support the person has available upon discharge is also an individual factor for cost expenditures (French et al., 2007). The first year of medical and rehabilitation costs for a C5-C8 tetraplegic is over \$500,000 and approximately \$56,000 each subsequent year. For a paraplegic, the annual costs are approximately \$282,388 with approximately \$30,000 for each subsequent year. Discharge settings vary although 87.9% of all spinal

cord injured patients return home to private settings. Unfortunately, 5.6% of all SCI patients are discharged to a nursing home setting (“Costs of Living,” 2010) due to poor support or lack of appropriate housing, while the remaining are discharged to acute care, group homes or other unknown settings.

Overview of Treatment

Spinal cord injuries affect every aspect of a person’s life including motor, cognition and psychosocial areas, causing a general reduction of independence with everyday tasks. These injuries can be complex and extremely debilitating, affecting cardio respiratory, gastrointestinal and genitourinary systems in addition to other motor and sensory deficits (Walker, 2009). The initial length of acute care is approximately fifteen days and thirty-six days in a rehabilitation unit (“Costs of Living,” 2010). In order to provide effective and appropriate care, the treatment facility must have a multidisciplinary team with extensive knowledge of the diagnosis and potential problems these specific patients may encounter. Understanding these issues can facilitate the team in preventing complications and recognizing the specific and necessary treatment for each issue (Walker, 2009).

Medical Complications

Early spinal stabilization and subsequent treatment will determine the severity of the trauma and determine the length of stay within the hospital setting (Schinkel & Anastasiadis, 2008). One important intervention is maintenance of the airway from nursing staff and getting sufficient air into the lungs. High-level injuries affect the

respiratory muscles and therefore put the patient at risk for pneumonia and other ailments (Weaver et al., 2006).

The lack of physical movement has serious consequences to the health of SCI patients. Deep vein thrombosis (DVT) is caused by immobilization and presents a significant health risk resulting in a thromboembolism or death (Waring & Karunas, 1991). This health setback can delay rehabilitation progress, prolong hospital stays, and drive up the cost of healthcare. As part of the protocol to prevent further injury from immobilization, sequential pumps are used on the legs to keep fluids moving and daily passive stretching of all affected limbs initiated by a qualified therapist or a trained family member. Using Podus boots while in bed to float the heels, along with a strict turning schedule helps to prevent breakdown on the heels and other vulnerable areas of the body. Other consequences of immobility are skin breakdown from prolonged sitting or lying and contractures from nonuse of joints. Staff members are trained to be proactive and attentive to full-body skin care, watching for the initial stages of skin breakdown. As therapy progresses and the patient is accepting of self-care tasks, then patient education is initiated on proper skin inspection. Therapists begin a joint range of motion (ROM) protocol to prevent muscle wasting and contractures at joints as well as maintaining available strength in non-affected muscles.

Interdisciplinary Team

As the patient transitions from an inpatient acute care unit to a lesser level of care rehabilitation, it is essential that a patient-driven plan of care be initiated to ensure motivation from the patient. The plan of care is typically completed by the

interdisciplinary team within twenty-four hours upon admission to the rehabilitation unit. This specialized team consists of a physical therapist, occupational therapist, nurse, personal care technician (pct), case manager, director of nursing, and a facility liaison. The main objective of the team is to provide consistent care with each new spinal cord admission. A specialized setting is optimal for success of SCI patients, with early initiation to increase independence and decrease length of stay on the rehabilitation unit (Kirshblum et al., 2007). It is important to present uniform care and quality communication between the members of the interdisciplinary team to follow and update the established plan of care throughout the rehabilitation stay (Sinclair et al., 2009). Recognizing that not all patients will recover at the same rate or with the same results, the team utilizes the ASIA assessment and the associated predicted outcomes to help determine the patient's ability to return to their community environment with the greatest independence and safety with all self-care and functional mobility (Kirshblum et al., 2007).

Asia Assessment

In determining the extent of the spinal cord injury, the American Spinal Cord Injury Association (ASIA) has developed a classification system; International Standards for Neurological Classification of Spinal cord Injury (ISNCSCI). This is the recommended assessment for grading the impairment of spinal cord injuries for patients in clinical settings (Marino, Jones, Kirshblum, Tal, & Dasgupta, 2008). This neurological assessment is best used with formal, standardized training to reduce errors and maintain consistency when administering the assessment (Chafetz, Vogel, Betz, Gaughan, & Mulcahey, 2008) while accentuating the proper guidelines and problem solving

procedure for use by clinicians. With training and accurate use of the ASIA, the healthcare worker is able to determine accurate motor and sensory deficits (Marino et al., 2008). This reliable assessment relates to whether a patient has a complete or incomplete spinal cord injury (Hall & Perkins, 2009). This determination is important to establish the classification of the injury for several reasons: 1) to provide consistent communication between the healthcare providers, and 2) to have accurate prognostic information for future planning by the healthcare team and the family. Establishing the level of the injury can be difficult in the initial days of injury due to spinal shock. Spinal shock causes edema of the cord at the site of injury decreasing blood flow, oxygen, and ultimately decreasing blood pressure (Krassioukov, Furlan, & Fehlings, 2003). During this initial twenty-four hour period, the spinal cord ceases to function below the level of the injury and may last as long as twenty-four hours up to four weeks. Occupational therapists or physical therapists determine the level of injury by using the ASIA form starting with the initial assessment within the first forty-eight hours after the injury. If the patient has an incomplete injury, the ASIA assessment usually is completed weekly to mark changes or stability of sensory and motor deficits.

Role of Occupational Therapy

The Occupational therapists work closely with the interdisciplinary team to provide interventions based on current evidence based research for achieving the best possible outcomes (Kirschblum et al., 2007). With use of the predicted outcomes developed from the ASIA assessment, the occupational therapists build their plan of care using a holistic approach, which gives the profession a strong voice on the interdisciplinary team. Occupational therapy starts from time of admission with

collaboration of the team from initiating a bowel and bladder program, to discharge by introducing relevant resources in the community and individualized home modifications.

Common Complications

After a spinal cord injury there are many complications, which can arise during the initial days of the accident, to lifelong complications that must be monitored and dealt with to prevent further barriers to an independent life. The following sections detail numerous complications that are common among patients with this injury.

Autonomic Dysreflexia

Autonomic dysreflexia (AD) is a life threatening complication for spinal cord injury patients above T6. It is the inability of the body to control blood pressure, characterized by rapid onset of hypertension. AD is most likely to occur in patients during the post-acute phase of SCI. However, clinicians need to remain vigilant regarding the potential for this devastating complication in the acute phase of recovery, especially in high-level cervical injuries (Krassioukov et al., 2003).

Autonomic dysreflexia originates from painful or noxious stimuli existing below the level of the injury. Etiology of noxious stimuli can be a distended bladder, distended bowel, pressure sores, ingrown toenails, tight or wrinkled clothing or bedding, change in temperature, urinary tract infections or severe spasticity (Hall & Perkins, 2009). Any of these stimuli may cause an exaggerated response from the autonomic system. Due to the cord injury, the message of a noxious stimulus being present is prevented from traveling to the brain, causing instead an exaggerated response from the autonomic nervous system to release neurotransmitters. These neurotransmitters cause vasoconstriction of blood

vessels above the level of the injury. This, in turn, increases blood pressure, resulting in uncontrolled hypertension (Essat, 2003).

Possible symptoms of AD include increased spasticity, red blotchy skin above the level of injury, nasal stuffiness, piloerection, severe headache, increased blood pressure by 20 points, reflex bradycardia, profuse sweating above the injury, and blurred vision. Due to the seriousness of this complication, it is important the patient, treatment team, and family understand the symptoms and course of action for this medical emergency. Untreated AD can lead to seizures, subarachnoid bleeding, stroke, or even death if not treated immediately (Hall & Perkins, 2009). As soon as AD is suspected, the patient should be sat upright and legs lowered. A thorough check for the source of irritation should be completed and the cause eliminated. If the source of the AD cannot be found, the physician should be notified immediately for medication to decrease the blood pressure or order a possible admit to the emergency room for management.

Orthostatic Hypotension

Orthostatic (postural) hypotension is an autonomic dysfunction experienced by SCI patients, typically when the injury is above the T6 level. It is most severe in high-level cervical lesions (Hammell, 1995) and with patients that have been confined to bed rest or immobile for a long period of time. It is identified by an excessive drop in blood pressure, usually >20mm Hg systolic, when transferring from a supine to sitting position (Illman, Stiller, & Williams, 2000). The lack of active muscle movement in the lower extremities causes blood to pool in the legs and abdomen, which instigates a drop in

blood pressure. For a patient who has been on bed rest for an extended amount of time, orthostatic hypotension is initially a significant barrier to rehabilitation.

Symptoms of orthostatic hypotension include dizziness, blurred vision, weakness, and possible fainting. Because many of the symptoms are similar to autonomic dysreflexia, determining the problem and choosing the correct course of action is critical. Unlike autonomic dysreflexia, the immediate course of action is to place the patient in a reclined position as quickly as possible with legs raised to prevent fainting (Hall & Perkins, 2009).

Common treatment of orthostatic hypotension is to restart movement slowly. It is advisable to acclimate the patient from a horizontal to vertical position by raising the head of the bed a few degrees at a time until they are able to tolerate the new position (Illman et al., 2000). If the patient is up, a reclining wheelchair is optimal for placing the back into a reclined position and elevating the feet on the footrests. Using abdominal binders prior to transferring from supine to sitting will aid in reducing pooling of blood in the abdomen (Smit et al., 2004). The therapist can also assist by pressing firmly on the abdomen for similar results. The binder is tightly wrapped below the rib cage, between the waist and gluteal fold for optimal usage. To decrease pooling of blood in the lower extremities, pressure gradient stockings or ace wraps should be applied to the legs prior to getting out of bed to move the flow of blood upward. The patient will eventually acclimate to the change in position, but until they are able to transfer without significant symptoms, it is important to educate staff, patient, and family of the possible problem and the resolution.

Pressure Ulcers

Pressure ulcers are a wound or lesion resulting from unrelieved compressive forces between internal bony prominences and external hard surfaces (Harvey, 2008). This unrelieved pressure causes decreased blood flow resulting in the breakdown of underlying tissues first, followed by subsequent breakdown to the outer layers of tissue. Common areas of breakdown are the sacrum, heels, coccyx, and ischial tuberosities. Pressure sores can lead to increased pain causing AD, osteomyelitis, sepsis, possible flap surgery, and even death.

According to Gelis et al. (2009), pressure ulcers are the most common medical complication of SCI. Because of this injury, patients with SCI are at higher risk for acquiring a pressure ulcer due to the loss of sensation, loss of movement, and impaired circulation (Hammell, 1995). Acquiring a pressure ulcer(s) adversely affects the quality of life and individual roles of these patients, as well as lengthens the rehabilitation stay. This potentially serious complication is a major cause of rehospitalizations, increased medical costs, and loss of work and leisure due to significant secondary problems and healing time of the sores (Cardenas, Hoffman, Kirshblum, & McKinley, 2004). Pressure ulcer management continues to be a medical challenge for healthcare today. Medical care costs escalate after developing a pressure sore in terms of increased burden of care, provision of specialty items such as beds, mattresses, and cushions, wound care supplies, and even surgery (Makhsous et al., 2009). Care and prevention begins with the initial admission in the acute setting and remains constant throughout the hospital stay. Length of stay in the acute setting has shown to place patients at higher risk for contracting pressure sores (Hammell, 1995; Verschuerrren et al., 2010).

Strategies to minimize pressure on underlying tissue are as follows: initiate a two-hour turning schedule, educate staff on proper bed positioning, provide proper seating position and cushion, pressure relief every fifteen to twenty minutes; provide meticulous peri-care after bowel and bladder incontinence; perform daily skin inspection, and provide education on good nutrition (McKinley et al., 2002). Other causes of pressure ulcers include shearing forces from sliding across surfaces, bowel or bladder incontinence, decreased circulation, and previous scarring. Therapists educate patients and staff on proper transfers with use of a slide board for decreased friction and shearing force (Guihan, Hastings, & Garber, 2009).

Pressure ulcers are difficult to treat and may reduce the amount of time dedicated to quality rehabilitation of the SCI patient. Pressure sores limit the time patients with SCI can remain upright in their wheelchairs. This results in decreased therapy services and slower improvement with independence of all self-care and mobility (Guihan et al., 2009). Pressure relief, along with increasing blood flow are critical factors in reducing and healing a pressure ulcer. Patients must be educated on the importance of pressure relief and the techniques used to provide the necessary break, typically armchair pushups. Initially, staff needs to facilitate pressure relief for the patient until the patient is able to complete this task independently.

Having the proper wheelchair cushion in place is important to preventing and healing pressure sores. A study conducted by Makhsous et al. (2009), demonstrated the benefits of wheelchairs equipped with an automatic cyclic pressure relief seating system. Although all patients in the study demonstrated healing over time, the automatic seating system accelerated the healing of the pressure sores. There is additional cost associated

with this seating system, which may be prohibitive to many patients and families. Therapy staff is instrumental in providing a comprehensive assessment for a seating system that suits each patient individually and fits within his or her budget or insurance specifications. Specialized seating clinics are also available in many areas of the country to assist with individual seating systems (Coggrave & Rose, 2003). It is the role of the therapists to advocate for patients to obtain the necessary equipment from third party payers based on safety and health findings.

Treatment Approaches

During the course of SCI intervention, there are areas of self-care that require immediate and consistent strategies. To prevent complications and promote best possible outcomes the following treatment approaches are recommended.

Bowel Management

Chronic constipation is the number one gastrointestinal complaint affecting independence of SCI patients. It may add further complications and possibly increased morbidity for people with spinal cord injury (Badiali et al., 1997). Bowel care is one of the more challenging aspects of SCI, yet one of the most critical tasks due to its influence on the patient's daily life. Sixty-three percent of people with a spinal cord injury have impaired bowel function one year post-injury (Harvey, 2008).

The level of injury is an important factor in determining the appropriate bowel program. Bowel function depends on communication between the sympathetic and

parasympathetic system and skeletal muscle control by S2-S4 nerve roots. Injuries above the conus medullaris (upper motor neuron lesion), results in spastic paralysis of the bowel as well as retained sacral reflexes. Injuries below the conus medullaris (lower motor neuron lesion), results in flaccid paralysis of skeletal muscles associated with bowel function and loss of sacral reflexes.

Bowel care is difficult for the patient to cope with due to the level of intimacy and lack of privacy associated with managing this issue. However, if the program is not initiated or managed properly, the patient will likely have accidents throughout the day, regardless of time or situation. This leads to decreased involvement in an active social life for fear of embarrassing accidents (Hicken, Putzke, & Richards, 2001). A consistent bowel program needs to be in place to decrease constipation and to optimize normal voiding time each day. This will not only prevent accidents, but also maintain a healthy colon by decreasing complications (Badiali et al., 1997). A study by Eng et al., (2001) established the health benefits of patients who used a standing frame for prolonged standing, which among other benefits assisted with bowel motility.

A bowel program should be implemented as soon as the initial period of spinal shock has been resolved. It should consist of strategies which include good nutrition, physical or pharmacological stimulation, scheduled voiding times, and increased exercise or standing upright with assistance of equipment. Although there are different interventions for managing a bowel program, research indicates that use of a water-based soluble suppository facilitates peristalsis and empties the colon (Steins, Luttrell, & Binard, 1998). Regular daily scheduled voiding times in conjunction with a suppository in place for fifteen minutes, followed by digital stimulation along the rectum wall increases peristalsis

and complete emptying. It is important for the patient to be sitting upright on a padded toilet to allow gravity to assist with the emptying of the bowel. If a bowel program is consistently followed, the patient will eventually empty with less intrusive assistance and ultimately have increased independence with bowel function. It is important to determine the time of voiding for each patient with regards to prior habits and lifestyle for client centered care and increased compliance after discharge (Harvey, 2008).

Bladder Management

Patients with SCI run an increased risk of urinary tract infections, which can contribute to kidney failure later in life (Harvey, 2008). Determining the manageability of the bladder is also determined by the level of the injury. An upper motor neuron lesion (UMNL) results in spastic bladder and a lower motor neuron lesion (LMNL) results in a flaccid bladder, both of which cause a neurogenic bladder. A spastic bladder is more difficult to manage and includes the increased risk of kidney damage (Hall & Perkins, 2009). Hammell (1995) describes four expectations when managing a dependable voiding program: 1) determining a program that is socially acceptable and congruous with the patient's lifestyle; 2) preventing over-distention of the bladder; 3) voiding completely, and 4) preventing or managing infection.

Managing bladder function is initially completed with an indwelling catheter for both males and females until the spinal shock period has passed. Management is then dependent upon hand function or incontinence issues. For patients with poor hand function (tetraplegia or frail elderly) it may be too difficult to handle self-catheterization as an option for bladder management. A long-term indwelling catheter may be used for

incontinence issues as well as for decreased hand function, although the option is tied to increased urinary tract infections (UTI) (Giannantoni et al., 1998). Giannantoni's study showed that the safest way to void is intermittent catheterization. Another option of a urethral catheter in both men and women is a suprapubic catheter surgically placed through the abdominal wall above the pubic bone directly into the bladder. Men frequently use a condom catheter for external drainage. These are similar to condoms that cover the penis and attach to a leg bag. Unfortunately, women have fewer options for incontinence other than an indwelling catheter or the use of continence pads to keep outer clothing dry.

Incontinence has a detrimental effect on skin tissue, causing subsequent breakdown due to increased moisture on the skin. Determining a prompt, reliable voiding program allows patients improved independence with bowel function. However, improved effectiveness when using one method of voiding over another has not been proven for catheter management (Jamison, Maguire, & McCann, 2009). Patients who gain independence with their bladder program report greater satisfaction with their life and perceive themselves as having a decreased overall handicap (Hicken, Putzke, & Richards, 2001).

Exercise

Exercise is an important a component of daily life for patients with SCI. Once the patient is able to tolerate an exercise program, the therapist will determine the level and ability of the patient before initiating an individualized program. Burnham et al. (1997) found that the change in the muscle of a patient with SCI occurs quickly; therefore,

intervention requires a quick response to suspend any change or damage to the muscle structure. Following a SCI, the skeletal muscles below the level of injury in an upper motor neuron lesion quickly atrophy and fatigue easier than those above the injury. Understanding the undesirable changes these muscles undergo helps the therapist guide the timing of intervention, which possibly prevents any muscle damage (Burnham et al., 1997). The goal of any exercise program is to increase strength in innervated muscles, build endurance, maintain muscle tone, improve respiratory efficiency and improve overall functioning with activities of daily living (Hall & Perkins, 2009). Additional benefits of a regular exercise program include increased self-esteem, decreased anxiety, pain, depression, and overall general wellbeing of the patient (Harvey, 2008), promoting social integration and satisfaction with life.

Determining the type of exercise program and when to initiate is primarily the role of the therapist. Active range of motion of innervated muscles should start immediately to prevent atrophy from disuse of the muscles. As soon as the patient is able to tolerate sitting up in a wheelchair, an individualized program should be initiated utilizing all innervated muscles with careful observation and monitoring for compensation of stronger muscles. Self-propelling the wheelchair is an important start of a program along with resistive exercises. As the patient's tolerance continues to increase, daily use of a tilt table or standing frame is initiated. Weight bearing through the long bones of the body while being in a full upright position in the standing frame benefits the patient immensely. It decreases the risk of osteoporosis, decreases the chance of hip contractures, facilitates digestion and bowel motility, and decreases spasticity. It also provides a valuable boost to self-esteem by being eye level with peers (Hall & Perkins,

2009). Because of prolonged standing, patients perceive a better quality of life due to health improvements with bowel and bladder function (Eng et al., 2001). Although the benefits of the standing frame are documented, the frame can be costly and not always covered by insurance; therefore, home use may be cost prohibitive.

After discharge home, continuing with a home exercise program is essential to maintaining muscle integrity and bone strength. Hicks et al. (2003) established that a twice-weekly program of progressive exercise training effectively increases upper body strength, arm ergometry performance, and decrease pain, stress, and depression. This home exercise program will continue to improve quality of life and psychological well-being.

Self-Care

Occupational therapy intervention focuses on improving function to participate in all self-care activities. Limitations or barriers are identified with assessments such as the Functional Independence Measure (FIM) or Spinal Cord Independence Measure (SCIM) (Catz & Itzkovich, 2007). The FIM assesses activity limitations through a series of 18 domains; self-care, sphincter control, transfers, locomotion, communication, and social cognition. The SCIM is developed especially for patients with SCI and covers 16 domains including self-care, respiration, sphincter management, and mobility (Harvey, 2008). Identifying physical limitations with the use of assessment tools provides the basis for writing functional goals focusing on independence with ADL's. The amount of function with self-care will depend upon the level of injury and subsequently the amount of hand function the patient has available (Beekhuizen, 2005). The loss of upper

extremity function is one of the most devastating aspects for a patient with SCI because of the importance of hand and arm function for all tasks including self-care (Snoek, IJzerman, Hermens, Maxwell & Biering-Sorensen, 2004).

For patients with an injury at C4 and above, caregivers will work on preventing contractures with static splinting and prolonged stretch in the upper extremities as soon as possible after injury (Krajnick & Bridle, 1992). C5 injuries will not have hand function but will continue to have bicep movement. The patient will use bilateral wrists for picking up items or use his/her hands in supination with wrists supported to bring items to the mouth. C6-7 patients will utilize the tenodesis grip for hand function or get assistance with palmar bands to hold utensils. The tenodesis grip is a method to grasp smaller items by actively extending the wrist and passively flexing the fingers. Compromising the tenodesis grip by overstretching the finger flexors limits the functionality of the hand and grip. Therefore, it is imperative that the therapist train staff and family on the proper way to stretch the hands. Injury at the C8 level will allow for significantly more hand movement but with the absence of intrinsic finger and thumb muscles.

Teaching the patient with SCI how to manage clothing and utensils is challenging and dependent upon the level of injury. Once the involved muscles are determined, the therapist can determine what assistive devices can be used for increased independence with all self-care. Equipment can range from hand splints for prolonged stretching, wrist and hand orthotic to assist with function, to specialized tools to make the task easier such as plate guards or bent utensils. If hand function is enhanced through practice training or

the tenodesis grasp is strengthened, then adaptive equipment may be discontinued (Beekhuizen, 2005).

Exercise and strengthening programs play an important role in gaining independence with all self-care. Trunk control, rolling side-to-side, strength for transfers, strengthened tenodesis grasp for picking items up are all important for dressing, grooming, and other self-care tasks.

CONCLUSION

Based on the findings of the literature review, patients with SCI require specialized and consistent care from the initial days in acute care carried through to discharge home and back into the community. In order to remain constant with the standards of care for this population, the interdisciplinary team must maintain competency and knowledge with the most current plan of care. In order to maintain the integrity of the occupational therapy team there is a need for an educational manual to address each area of need for SCI patients. The developed manual is a resource for entry-level occupational therapists or existing staff that requires assistance with learning the necessary treatment protocols. It outlines four main divisions: 1) description of the individual section, 2) application to occupational therapists in the rehabilitation setting with relevant equipment and materials, 3) contraindications, 4) references.

Chapter III details the methodology used in developing this resource. An initial literature review was conducted to assemble current facts and information regarding spinal cord care and protocols. Additional information was gathered through sources

received from continuing educational seminars and classes, as well as from skilled co-workers and personal experience.

CHAPTER III

METHODOLOGY

The incidence of spinal cord injuries is approximately 12,000 new occurrences each year (“Spinal Cord Facts,” 2010); this includes traumatic and non-traumatic injuries. Depending on the level and extent of the injury, the individual’s quality of life is altered significantly due to decreased independence in all activities of daily living. This is a devastating event. It changes how the patient manages all his/her prior occupations and adversely affects everyone involved with the patient. Unfortunately, SCI is a long-term health issue for the patient and his/her family.

In order to regain function from basic activities of daily living (ADL) to instrumental activities of daily living (IADL) such as home management tasks, patients benefit from a period of rehabilitation in a facility that offers holistic, individual care. Improving the quality of life for these patients is the goal of occupational therapists and specialized teams in any rehabilitation facility. Understanding the importance of utilizing established SCI protocols and building on the patient’s existing level of function is the major focus of intervention. The occupational therapy team provides specialized treatment focusing on self-care activities, functional mobility, strengthening, home management tasks, and community re-entry to promote independence and a lifetime of wellness.

The purpose of this scholarly project is to develop an educational manual for use as a reference or learning module for occupational therapists to deliver the level of specialized services needed for patients with SCI. It is organized in a manner to allow the occupational therapist the opportunity to refresh skills to carry out an effective intervention plan or to use it as a learning tool for inexperienced staff. Due to turnover in staff or the hiring of new graduates who have little or no experience with SCI care, it offers the means to new learning and building competency within the occupational therapy team by providing an evidence-based educational manual. The manual provides detailed information regarding major areas of care for the patient with SCI. It will guide the treating occupational therapist in successful intervention planning for the patient while in the rehabilitation facility. Although the focus of the project is to educate the occupational therapist in SCI care, the ultimate goal is to provide skilled and consistent services for improved quality of life.

A literature review was completed to assemble current facts and information in regards to spinal cord care and protocols. Much of the literature review was located through the University of North Dakota's library, Harley E. French Library of the Health Sciences, with use of PUBMED, Cochrane, CINAHL (Cumulative Index to Nursing and Allied Health Literature) and Google Scholar. The American Occupational Therapy Association was another resource for current information on SCI. Several SCI books and applicable SCI workbooks from continuing education classes were used for assisting in development of the protocols. Useful websites such as The Christopher Reeve Organization (www.christopherreeve.org/site), The National Spinal Cord Injury Statistical Center in Birmingham, Alabama (www.nscisc.uab.edu), and the Paralyzed

Veterans Association (www.pva.org) provided information and related facts and figures for current SCI research.

The author has over ten years experience as an occupational therapist and has worked with individuals with SCI for the past five years in the rehabilitation setting. She has extensive clinical expertise and has participated in numerous continuing education courses related to SCI. These courses were utilized to collect information on daily care protocols and other health issues associated with patients with SCI. Much of the literature reviewed related to health issues patients often encounter that negatively impact their quality of life. Other information concerned self-care protocols for gaining independence or training caregivers to perform needed tasks successfully. The information was assembled into a concise, easy-to-read manual for use on the rehabilitation unit by occupational therapists.

The educational manual was created using key principles of adult learning theory format beneficial to adult learning (Aldridge, 2004). The goal was to make the material easy to read by consistently using a 12-point type with the exception of headings which were typed with 14-point. Bold face lettering emphasized important elements and key points. Shorter sentences and bulleted format helped to keep the material uncluttered and easy to follow. The addition of pictures taken by the author assisted with illustrating the tools discussed in the individual protocols. Aldridge (2004) states that well-designed, appropriately written material increases the likelihood of the educational information being used for the intended purpose.

Chapter 4 provides a summary of the education manual. The complete manual is located in the appendix.

CHAPTER IV

THE PRODUCT

Purpose

The purpose of this scholarly project is to provide the treating occupational therapist in a rehabilitation setting with the tools to collaboratively build and implement an effective SCI intervention plan to achieve the patient's identified goals. The educational manual establishes the role of the occupational therapist in the process of recovery within the rehabilitation facility. It assists with creating an intervention plan that focuses on increasing performance skills through use of occupation-based activities and remediation or adaptation of the task as needed. The manual provides concise information that will prepare the therapist in basic knowledge of major areas of SCI care.

Occupational therapists work within the AOTA practice framework to promote the health of patients and provide interventions based on engagement in occupations that result in positive discharge outcomes (AJOT, 2008). Self-care, mobility, and community reintegration is significantly affected in patients with SCI creating a major change in their lives. The assigned interdisciplinary team initiates a patient-driven plan of care based on best evidence-based practice. This patient-driven intervention is motivating to the client as he/she has a voice in the decision making process of building an individualized plan of

care, utilized while in the rehabilitation facility (Pillastrini et al., 2007). Because of the holistic approach to treatment, occupational therapists are an important member of the interdisciplinary team with this complex diagnosis. They work to make a difference in the lives of these patients by being competent, effective, managers of care at every level and at each stage of recovery. Early occupational therapy intervention promotes a positive influence on the outcome and ultimate functional capability in SCI patients and decreases their rehabilitation stay (Kirshblum et al., 2007).

Description

As patients are referred to the rehabilitation facility, a case review is done by a team consisting of an occupational therapist, physical therapist, director of nursing, case manager, and physician. At completion of the case review, the patient's level of injury and subsequent level of care is determined. This assists the team in making the appropriate decision of whether the facility is prepared in terms of necessary equipment and staff to provide quality care for the SCI patient. If the patient is accepted, then an interdisciplinary team is established according to experience and availability of occupational therapists. Due to the complexities of a SCI and the complicated course of intervention, experience and competency with this diagnosis is optimal for treatment.

Product

Due to the variance of census and diagnoses from day to day in a rehabilitation unit, it is not always possible to have consistent therapists for each admission of a SCI patient. Another variable is staff turnover on the therapy team. For this reason, an educational reference manual was developed by the author to be used as a resource or learning tool for basic SCI care in the rehabilitation setting. The intent is to educate staff occupational therapists on the complex intervention of SCI, provide a guide as to the occupational therapists' role on the interdisciplinary team, and to decrease the anxiety of treating this individual with this complex diagnosis. The manual will be used as a reference guide only and is not intended as a comprehensive intervention plan detailing every aspect of spinal cord care. Its concise format is appropriate for the therapist as a quick overview of major issues associated with spinal cord care and the application for treatment pertaining to a rehabilitation unit. References are included to aid the therapist in identifying possible resources to further his/her knowledge base.

The format of the educational manual is bulleted and written for easy examination of details by the therapist for a quick review or for learning the basics of spinal cord care on a rehabilitation unit. The expectation is for the manual to be an ongoing informational process. As evidence-based interventions evolve with this complicated diagnosis and as supplementary information is added to existing information, the manual will be updated. References are provided for occupational therapists to seek further information.

The current presentation of the manual is separated into autonomic dysreflexia, orthostatic hypotension, pressure ulcers, bladder, bowel, self-care and exercise. Each

section is further divided into major sections detailing areas of performance, causes of dysfunction, precautions, and application of treatment for the SCI patient. Within each section, introduction of the problem and a brief description provides a quick overview to the pertinent issue. An objectives section offers the therapist an outline of learning expectations. Examination of the cause for each problem precedes signs and symptoms, presented in a bulleted format for easy referral. The treatment or application section refers to treatment that is applicable to occupational therapists specifically on the rehabilitation unit, although it may be appropriate in other settings as well. An important section of the manual is the list of precautions and possible contraindications, again written in a bulleted format for quick examination. The final portion provides recommendations of treatment including safe and effective interventions to increase independence with self-care and functional mobility of the SCI patient.

Frame of Reference

The frame of reference chosen for this scholarly project is the Occupational Adaptation (OA) frame of reference. OA is based on internal adaptation toward outward challenges and the press for mastery of a skill as a direct result of an occupational challenge (Schkade & McClung, 2001). Within this frame of reference, the framework assumes three constant factors: 1) the therapist has a desire to be skillful at his job and is willing to make the changes necessary to be competent, 2) the environment in which the therapist is working demands mastery of the therapist, and 3) the combination of desire to be skillful and environmental demands produce the press for mastery from the therapist.

The occupational therapists' desire to learn about the complexities of SCI and to provide optimal intervention fits well with this frame of reference.

According to the OA framework, occupations or roles include three properties; 1) the person is actively involved in the occupation, 2) the occupation is meaningful to the person, 3) the occupation involves a process with a product (Schkade & McClung, 2001). In terms of this project, the challenge is for the therapist to reflect upon his occupation or role as an occupational therapist and determine whether he is competent to develop and implement an effective intervention plan for the SCI patient. Second, understanding and promoting skilled intervention in this role is important to a competent therapist, therefore, the therapist will take steps to learn about SCI care. Third, the product provides skills to a patient with SCI in order to increase independence in all self-care and mobility for a successful discharge. Applying the OA framework to this product is effective because of the internal adaptation therapist's use for building and implementing an intervention plan for SCI patients. It continues to be an ongoing process for the therapist as new challenges arise.

Conclusion

The purpose of this product is to promote personal and professional competency to increase skills of occupational therapists working with patients with SCI. Having a skilled and competent interdisciplinary team assigned to a SCI case is important for communication and building rapport with the patient. It is important to make a first good impression on the patient; building a level of trust and confidence maintains a good

patient-therapist relationship. The life of a patient with SCI is eternally changed with the event of this life altering injury. Many times at onset of injury, the patient is left with only a voice to communicate. All other tasks are managed by staff, leaving the patient vulnerable and scared by the ultimate loss of control. An inexperienced therapist initiating care but unable to convey confidence exasperates this vulnerability. The educational manual is designed to provide the therapist with basic knowledge and lessen the anxiety of both the therapist and the patient resulting in a positive working relationship.

Chapter V is a summarization of the purpose of the project. It includes suggestions and recommendations for implementation of the manual in the rehabilitation facility.

CHAPTER V

SUMMARY

The SCI manual is intended as an educational tool for occupational therapists facing the challenge of treating a patient with this injury. It is designed for entry-level therapists or therapists with little or no experience in spinal cord intervention, but who are faced with treating this challenging diagnosis in a rehabilitation setting. Occupational therapists focus on building a patient-centered plan of care that concentrates on promoting good health while increasing independence with all ADL's and IADL's. This includes evaluation of performance with self-care and all functional mobility, as well as discharge planning and community reintegration. This manual is specifically designed for a rehabilitation facility located in the Western region of the United States. It is a forty-bed inpatient facility with a census of various diagnoses including brain injury, spinal cord injury, strokes, and orthopedic conditions. The rehabilitation unit typically has one or two traumatic or non-traumatic SCI patients in-house at any given time. The facility currently employs three full-time occupational therapists, one half-time occupational therapist and two occupational therapy assistants.

The manual provides general information on major areas of spinal cord care and specific guidelines as to the role of the OT within the interdisciplinary team. It is

compiled from evidence-based research combined with the clinical experience of staff therapists and is presented in a precise, concrete format. The manual is divided into major areas of spinal cord care. Within each section, critical information is provided including objectives, cause of barriers, treatment ideas and applicable tools, precautions and contraindications, and recommendations for intervention.

This educational tool is designed to assist the occupational therapist in developing an intervention plan that focuses on independence with all ADL's and IADL's. The ultimate goal is to provide skilled services to the patient to increase self-esteem and promote a healthy psychological attitude towards a new lifestyle. This allows for generalization of skills to life outside the rehabilitation facility. The manual can be used for any therapist needing to build skill and competency with this diagnosis or a review of specific information on the major aspects of spinal cord care.

The manual is limited as it presents merely an overview of spinal cord care and touches only on the major areas. It is not a comprehensive manual, but instead focuses on common complications and basic self-care of the patient. Within the document, references are listed so the therapist is able to easily locate applicable research articles for further reading. With any SCI, there are numerous presentations depending on the level and type of injury. For this reason, the therapist needs to fully understand the importance of determining both the strengths and limitations of each individual patient in order to build the intervention plan accordingly.

The plan for implementation of this project is to present the manual to the spinal cord development team for approval. The manual will then be offered to the occupational therapy team in the rehabilitation facility with supplemental ideas on how to best use the

manual and a determination of where it will be best located for ease of access. Feedback and suggestions from the therapists will be taken into consideration for improving the manual.

The purpose of this project was to build a more cohesive team and to ensure that occupational therapy intervention was skillful and consistent. By providing an evidence-based manual, both goals can potentially be met. Therapists will gain skills by referring to the manual and replicating suggested treatment and recommendations, allowing for a more consistent plan of care with each new SCI admission. The plan for measuring the outcomes include the satisfaction score received from each patient as he or she is being discharged from the facility and whether each new admission has a smooth and consistent transition to the rehabilitation unit. The spinal cord development team consists of the CEO, hospital liaison, director of nursing, two physical therapists, two occupational therapists, case management, and a rehabilitation technician. The team meets monthly to review the care and service provided for the first week of each spinal cord patient. The team uses a standardized form to evaluate services provided in the first week. Adjustments are made to the admission process and follow-up care as determined by the team. As therapists become comfortable with his/her role on the interdisciplinary team and with SCI intervention, they will become more confident developing an effective plan of care with the patient and team.

The manual contains current information and intervention protocols, to be updated continuously as evidence-based information becomes available. Additional information will also be added based on feedback from users for a more comprehensive overview of spinal cord care. As Sinclair (2009) reports, a skilled clinician is only part of

the total picture. Having cohesive, interprofessional collaboration (IPC) builds an effective team, which provides quality care for patients admitted to a rehabilitation facility. As patients become more independent with self-care and functional tasks through hard work and quality intervention, they become more engaged in their valued occupations.

REFERENCES

- Aldridge, M. (2004). Writing and designing readable patient education materials. *Nephrology Nursing Journal*, 31, 373-377.
- American Occupational Therapy Association (2008). Occupational therapy practice framework: Domain and process (2nd ed). *American Journal of Occupational Therapy*, 62, 625-683.
- Anderson, K. (2004). Targeting recovery: Priorities of the spinal cord-injured population. *Journal of Neurotrauma*, 21, 1371-1383.
- Badiali, D., Bracci, F., Castellano, V., Corazziari, E., Fuoco, U., Habib, F., & Scivoletto, G. (1997). Sequential treatment of chronic constipation in paraplegic subjects. *Spinal Cord*, 35, 116-120.
- Beekhuizen, K. (2005). New perspectives on improving upper extremity function after spinal cord injury. *Journal of Neurological Physical Therapy*, 29, 157-162.
- Burnham, R., Martin, T., Stein, R., Bell, G., McClean, I., & Steadward, R. (1997). Skeletal muscle fibre type transformation following spinal cord injury. *Spinal Cord*, 35, 86-91.
- Cardenas, D., Hoffman, J., Kirshblum, S., & McKinley, W. (2004). Etiology and incidence of rehospitalization after traumatic spinal cord injury: A multicenter analysis. *Archives of Physical Medicine and Rehabilitation*, 85, 1757-1763.
- Catz, A. & Itzkovich, M. (2007). Spinal cord independence measure: Comprehensive ability rating scale for the spinal cord lesion patient. *Journal of Rehabilitation Research & Development*, 44, 65-68.

- Chafetz, R., Vogel, L., Betz, R., Gaughan, J., & Mulcahey, M. (2008). International standards for neurological classification of spinal cord injury: Training effect on accurate classification. *The Journal of Spinal Cord Medicine, 31*, 538-542.
- Coggrave, M., & Rose L. (2003). A specialist seating assessment clinic: Changing pressure relief practice. *Spinal Cord, 41*, 692-695.
- Cost of Living with Spinal Cord Injury. Retrieved July 10, 2010 from <http://www.christopherreeve.org/site>.
- Eng, J., Levins, S., Townson, A., Mah-Jones, D., Bremner, J., & Huston, G. (2001). Use of prolonged standing for individuals with spinal cord injuries. *Physical Therapy, 81*, 1392-1399.
- Essat, Z. (2003). Management of autonomic dysreflexia. *Nursing Standard, 17*, 42-44.
- French, D., Campbell, R., Sabharwal, S., Nelson, A., Palacios, P., & Gavin-Dreschnack, D. (2007). Health care costs for patients with chronic spinal cord injury in the veteran's health administration. *Journal of Spinal Cord Medicine, 30*, 477-481.
- Gelis, A., Dupeyron, A., Legros, P., Benaim, C., Pelissier, J., & Fattal, C. (2009). Pressure ulcer risk factors in persons with spinal cord injury Part 2: The chronic stage. *Spinal Cord, 47*, 651-661.
- Giannantoni, A., Scivoletto, G., Di Stasi, S., Silecchia, A., Finazzi-Agro, E., Micali, I., & Castellano, V. (1998). Clean intermittent catheterization and prevention of renal disease in spinal cord injury patients. *Spinal Cord, 36*, 29-32.

- Guihan, M., Hastings, J., & Garber, S. (2009). Therapists' roles in pressure ulcer management in persons with spinal cord injury. *The Journal of Spinal Cord Medicine, 32*, 560-567.
- Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.
- Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.
- Harkson, D., Unterreiner, A., & Shepard, K. (1982). Factors related to job turnover in physical therapy. *Physical Therapy, 62*, 1465-1470.
- Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.
- Hicks, A., Martin, K., Ditor, D., Latimer, A., Craven, C., Bugaresti, J., & McCartney, N. (2003). Long-term exercise training in persons with spinal cord injury: Effects on strength, arm ergometry performance and psychological well-being. *Spinal Cord, 41*, 34-43.
- Hicken, B., Putzke, J., & Richards, J. (2001). Bladder management and quality of life after spinal cord injury. *American Journal of Physical Medicine & Rehabilitation, 80*, 916-922.
- Illman, A, Stiller, K. & Williams, M. (2000). The prevalence of orthostatic hypotension during physiotherapy treatment in patients with an acute spinal cord injury. *Spinal Cord, 38*, 741-747.

- Jackson, A., Dijkers, M., DeVivo, M., & Poczatek, R. (2004). A demographic profile of new traumatic spinal cord injuries: Change and stability over 30 years. *Archives of Physical Medicine and Rehabilitation*, 85, 1740-1748.
- Jamison, J., Maguire, S., & McCann, J. (2009). Catheter policies for management of long term voiding problems in adults with neurogenic bladder disorders. *The Cochrane Collaboration*. John Wiley & Sons, Ltd.
- Kirshblum, S., Priebe, M., Ho, C., Seelza, W., Chiodo, A., & Wuermsler, L. (2007). Spinal cord injury medicine 3. Rehabilitation phase after acute spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, 88, 562-570.
- Krajnick, S., & Bridle, M. (1992). Hand splinting in quadriplegia: Current practice. *American Journal of Occupational Therapy*, 46, 149-156.
- Krassioukov, A., Furlan, J., & Fehlings, M. (2003). Autonomic dysreflexia in acute spinal cord injury: An under-recognized clinical entity. *Journal of Neurotrauma*, 20, 707-714.
- Makhsous, M., Lin, F., Knaus, E., Zeigler, M., Rowles, D., Gittler, M., Bankard, J., & Chen, D. (2009). Promote pressure ulcer healing in individuals with spinal cord injury using an individualized cyclic pressure-relief protocol. *Advanced Skin Wound Care*, 22, 514-521.
- Marino, R., Jones, L., Kirshblum, S., Tal, J., & Dasgupta, A. (2008). Reliability and repeatability of the motor and sensory examination of the international standards for neurological classification of spinal cord injury. *Journal of Spinal Cord Medicine*, 31, 166-170.

- McKinley, W., Gittler, M., Kirschblum, Steins, S., & Groah, S. (2002). Spinal cord injury medicine. 2. medical complications after spinal cord injury: Identification and management. *Archives of Physical Medicine Rehabilitation*, 83, 58-64.
- Morgan, S. (2010, October). *Advances in Spinal Cord Injury*. Advanced course presented in Hershey, PA.
- Pillastrini, P., Mugnai, R., Bonfiglioli, R., Curti, S., Mattioli, S., Majoli, M., Bazzocchi, G., Menarini, M., Vannini, R. (2008). Evaluation of an occupational therapy program for patients with spinal cord injury. *Spinal Cord*, 46, 78-81.
- Post, M., Bloemen, J., & deWitte, L. (2005). Burden of support for partners of persons with spinal cord injuries. *Spinal Cord*, 43, 311-319.
- Schinkel, C. & Anastasiadis, A. (2008). The timing of spinal stabilization in polytrauma and in patients with spinal cord injury. *Current Opinion in Critical Care*, 14, 685-689.
- Schkade, J. & McClung, M. (2001). *Occupational adaptation in practice*. Thorofare, NJ: SLACK Incorporated.
- Sinclair, L., Lingard, L., Mohabeer, R. (2009). What's so great about rehabilitation teams? An ethnographic study of interprofessional collaboration in a rehabilitation unit. *Archives of Physical Medicine and Rehabilitation*, 90, 1196-1201.
- Smit, A., Wieling, W., Fujimura, J., Denq, J., Opfer-Gehrking, T., Akarriou, M., Karemaker, J., & Low, P. (2004). Use of lower abdominal compression to combat orthostatic hypotension in patients with autonomic dysfunction. *Clinical Autonomic Research*, 14, 167-175.

- Snoek, G., IJzerman, M., Hermens, H., Maxwell, D., & Biering-Sorensen, F. (2004). Survey of the needs of patients with spinal cord injury: Impact and priority for improvement in hand function in tetraplegics. *Spinal Cord* (42), 526-532
- Stiens, S., Luttrell, W., & Binard, J. (1998). Polyethylene glycol versus vegetable oil based bisacodyl suppositories to initiate side-lying bowel care: A clinical trial in persons with spinal cord injury. *Spinal Cord*, 36, 777-781.
- Spinal Cord Injury Facts and Figures at a Glance. Retrieved September 15, 2010 from <https://www.nscisc.uab.edu>.
- Verschueren, J., Post, M., deGroot, S., van der Woude, L., van Asbeck, F., & Rol, M. (2010). Occurrence and predictors of pressure ulcers during primary in-patient spinal cord injury rehabilitation. *Spinal Cord*, 1-7.
- Walker, J. (2009). Spinal cord injuries: Acute care management and rehabilitation. *Nursing Standard*, 23, 47-56.
- Waring, W. & Karunas, R. (1991). Acute spinal cord injuries and the incidence of clinically occurring thromboembolic disease. *Paraplegia*, 29, 8-16.
- Weaver, F., Smith, B., Evans, C., Kurichi, J., Patel, N., Kapur, V. & Burns, S. (2006). Outcomes of outpatient visits for acute respiratory illness in veterans with spinal cord injuries and disorders. *American Journal of Physical Medicine Rehabilitation*, 85, 718-726.

APPENDIX

ELKHORN VALLEY REHABILITATION HOSPITAL

Occupational Therapy Intervention for Patients with Spinal Cord Injury



Educational Reference Manual

Cheryl Nickerson, MOTR/L
4/27/2011

TABLE OF CONTENTS

| | |
|-------------------------------|----|
| AUTONOMIC DYSREFLEXIA----- | 3 |
| ORTHOSTATIC HYPOTENSION ----- | 6 |
| BOWEL PROGRAM ----- | 9 |
| BLADDER PROGRAM ----- | 13 |
| PRESSURE ULCERS ----- | 17 |
| SELF- CARE ----- | 21 |
| EXERCISE ----- | 26 |
| REFERENCES ----- | 30 |

AUTONOMIC DYSREFLEXIA

Autonomic dysreflexia (AD) is defined as a life threatening complication for spinal cord injury patients above T6. It is the body's inability to control blood pressure, characterized by rapid onset of hypertension due to a noxious stimulus (Essat, 2003). AD is most likely to occur in patients during the post-acute phase of SCI. However, clinicians need to remain vigilant regarding the potential for this devastating complication in the acute phase of recovery, especially in high-level cervical injuries (Krassioukov et al., 2003). Untreated AD can cause a cerebrovascular accident (CVA) or even death.

Objectives - At the conclusion of this tutorial, the occupational therapist will be able to:

- Identify the causes of AD
- Identify the signs and symptoms of AD
- Describe the treatment protocol
- Develop an intervention plan for the patient

Causes of AD - Etiology of AD involves any noxious stimuli to the patient below the level of injury. The response to noxious stimuli can occur rapidly (within minutes) or over an extended period of time.

- Urinary - One of the most common causes is increased pressure in the bladder due to distended bladder or use of a catheter; urinary tract infection.
- Bowel - Rectal distention due to constipation; rectal stimulation from use of digital stimulation or enema.
- Pain – Any stimuli below the level of injury that could cause pain including pressure sores, ingrown toenails, or burns.

- Other Causes – tight clothing or shoes, excessive temperature change, ejaculation, menstrual cramps.

Signs & Symptoms –

- Increased blood pressure over 20 mm Hg of established “normal”
- Pounding headache and blurred vision
- Profuse sweating; flushed in the face and neck
- Clammy skin below the lesion
- Nausea
- Increased anxiety
- Increased spasticity

Treatment for AD – As soon as AD is suspected, sit *the patient up* and lower the legs.

Identify the source of irritation by checking the most likely causes first. Check the bladder by looking for a blocked Foley catheter or catheterize to empty the bladder.

Loosen any clothing that might be binding or wrinkled including ace wraps or ace binder.

Change position of the patient for relief of skin pressure. If the source of the AD cannot be found, the physician should be notified immediately for medication use to decrease the blood pressure or possibly readmit to the emergency room for management. If the source of irritation is found, the blood pressure will begin to drop immediately and symptoms will become less profuse.

Precautions –

Due to sudden increased intracerebral blood pressure, the patient is a high risk for CVA or death if immediate action is not taken.

Recommendations -

- Educate staff, patient and family on signs, symptoms, and treatment of AD.
- Hang a poster with identifying information regarding AD in the patient's room for quick reference
- Identify the patient's normal blood pressure and keep it posted in the patient's room for quick reference.
- Educate patient and family on the importance of immediate treatment and assist the family with securing a "medical alert" card to carry when away from the home.

References –

Essat, Z. (2003). Management of autonomic dysreflexia. *Nursing Standard*, 17, 42-44.

Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.

Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.

Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.

Krassioukov, A., Furlan, J., & Fehlings, M. (2003). Autonomic dysreflexia in acute spinal cord injury: An under-recognized clinical entity. *Journal of Neurotrauma*, 20, 707-714.

ORTHOSTATIC HYPOTENSION

Orthostatic (postural) hypotension is an autonomic dysfunction experienced by SCI patients, typically when the injury is above the T6 level. It is most severe in high-level cervical lesions (Hammell, 1995) and with patients that have been confined to bed rest or are immobile for a long period of time. It is identified by an excessive drop in blood pressure, usually >20mm Hg systolic, when transferring from a supine to sitting position.

Objectives - At the conclusion of this tutorial, the occupational therapist will be able to:

- Identify the cause of orthostatic hypotension
- Recognize the signs and symptoms of orthostatic hypotension
- Identify methods to prevent orthostatic hypotension
- Describe the protocol for treatment of orthostatic hypotension
- Develop an intervention plan for the patient

Causes of Orthostatic Hypotension - The cause of orthostatic hypotension is a change in blood pressure due to decreased cerebral blood flow secondary to the lack of muscles pumping blood upward, as well as loss of sympathetic vasoconstriction tone. Without muscles contracting below the level of the lesion, blood tends to pool in the legs and abdomen.

Signs and Symptoms of Orthostatic Hypotension –

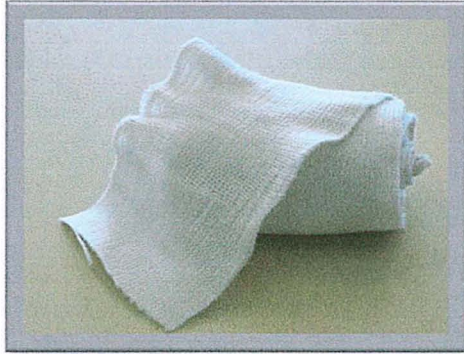
- Dizziness
- Weakness
- Blurred vision
- Fainting or blacking out

Treatment - The goal for treating orthostatic hypotension is primarily to prevent it from occurring. Following are recommendations for prevention and treatment:

- Use of ace wraps to reduce pooling of blood in the lower extremities
- Use of an abdominal binder to reduce pooling of blood in the abdomen
- Gradually introduce progression from supine to vertical position to allow for acclimation of change in position
- As symptoms occur, lay patient down and elevate feet to increase blood pressure
- Medication as a last resort to manage blood pressure
- Assist with decreased pooling of blood by firmly pressing abdomen during course of dropped pressure

Precautions – The therapist must recognize the difference between orthostatic hypotension and autonomic dysreflexia since they could initially have similar symptoms but different treatment protocols.

Recommendations - The therapist will need to educate staff on introducing mobilization gradually. This includes elevating the head of the bed slowly with an increase in degrees each day until the patient is tolerating sitting at 90 °. The occupational therapist will also wrap both legs each morning as needed and educate the staff on use of the abdominal binder and the proper way to use the ace wraps. The ace wraps are placed on the legs in a figure-eight fashion starting at the foot and working up the leg to the groin. It will be important to train the staff, patient, and family on the signs and symptoms along with the appropriate protocol for orthostatic hypotension. Noting the normal blood pressure on the white board in the room will assist in determining whether the current blood pressure is above or below the typical pressure for the patient.



Ace Wraps for Bilateral Lower Extremities



Abdominal Binder

References -

Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.

Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY

Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.

BOWEL PROGRAM

Chronic constipation is the number one gastrointestinal complaint of a spinal cord patient affecting independence. It may add further complications and possibly increased morbidity for people with SCI (Badiali et al., 1997). Bowel care is one of the more challenging aspects of SCI, yet one of the most essential tasks due to its influence on the patient's daily life. If a bowel program is not initiated early or managed properly, the patient will likely have accidents throughout the day regardless of time or situation.

Objectives - At the conclusion of this tutorial, the occupational therapist will be able to:

- Identify the cause of bowel dysfunction in the SCI patient.
- Describe the treatment protocol for an effective bowel program.
- Develop an intervention plan for the SCI patient.

Cause of Bowel Dysfunction - Bowel function depends on communication between the sympathetic system, parasympathetic system and skeletal muscle control by S2-S4 nerve roots. During the period of spinal shock, all patients will demonstrate a flaccid bowel and therefore, need to be monitored weekly for bowel program changes.

- Injuries above the conus medullaris (upper motor neuron lesion) result in spastic paralysis of the bowel and bladder as well as retained sacral reflexes.
- Injuries below the conus medullaris (lower motor neuron lesion) result in flaccid paralysis of skeletal muscles associated with bowel and bladder function and loss of sacral reflexes.

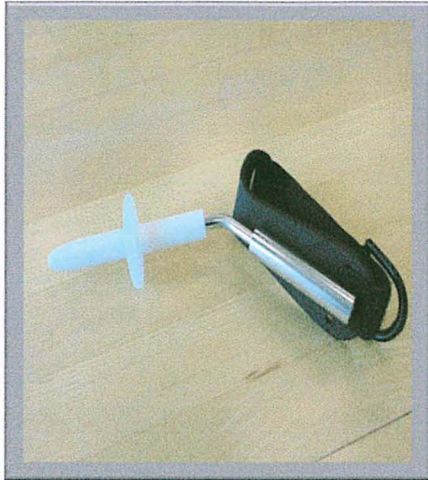
Treatment for Bowel Dysfunction –

Upper motor lesion (hyper-reflexic bowel/rectum) – The sphincter will tighten around the examiner's finger.

1. Polyethylene glycol based suppository (Magic Bullet) is inserted past the sphincter and placed against the bowel wall while the patient is laying on the left side 10-20 minutes prior to digital stimulation.
2. Patient should be transferred to a bedside commode for gravity assist with evacuation of bowel if they can tolerate sitting up.
3. Staff to complete digital stimulation to trigger the reflex by circling the wall of the rectum three times with use of the Dill Stick.

Lower motor lesion (areflexic bowel): Usually T12 and below; the sphincter will feel loose around the examiner's finger.

1. Suppository – same as above
2. Transfer to bedside commode
3. Manual evacuation (digital stimulation unnecessary)
4. Use of Valsalva maneuver for elimination (holding the breath and straining)



Digital Stimulation Tool (Dill Stick)



Toilet/shower chair on wheels

Precautions –

- Prolonged contact with moist skin causes breakdown, which may lead to pressure sores or ulcers.
- Rectal distention, digital stimulation, and enemas may cause autonomic dysreflexia, which requires immediate attention.

Recommendations –

- The occupational therapist works with the nursing staff and the patient to establish the morning or evening bowel routine. Monitor daily to ensure complete follow through with evacuation steps. For the first five to seven days, therapy will work with the nursing staff to complete safe transfers to the commode.
- Base the program on prior bowel habits. Perform program thirty minutes after breakfast or coffee for best results.
- Educate staff on use of the Magic Bullet for a successful bowel program (Steins, Luttrell & Binard, 1998).

- Educate staff, patient, and family on importance of a daily schedule bowel program protocol for successful long-term bowel evacuation.
- Educate patient on the importance of good nutrition, high fiber, and increased fluid intake for successful bowel evacuation.
- Provide adaptive equipment for independent suppository insertion and digital stimulation as appropriate.
- Initiate discharge planning as soon as possible to include obtaining bathroom measurements of the home to determine adaptive equipment needs. This could include a bedside commode with wheels so the patient can wheel himself over the toilet for bowel program (also used for shower task).

References –

- Badiali, D., Bracci, F., Castellano, V., Corazziari, E., Fuoco, U., Habib, F., & Scivoletto, G. (1997). Sequential treatment of chronic constipation in paraplegic subjects. *Spinal Cord*, 35, 116-120.
- Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.
- Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.
- Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.
- Stiens, S., Luttrell, W., & Binard, J. (1998). Polyethylene glycol versus vegetable oil based bisacodyl suppositories to initiate side-lying bowel care: A clinical trial in persons with spinal cord injury. *Spinal Cord*, 36, 777-781.

BLADDER PROGRAM

Voiding is a spinal reflex controlled by the central nervous system consisting of the brain and spinal cord, which coordinates the function of the bladder and urethra (emedicine, 2009). The sacral spinal cord is the terminal portion of the spinal cord and is responsible for bladder contractions. Normal voiding is dependent upon an intact spinal cord to allow for communication back and forth from the brain to the bladder. It is important to understand the exact site of the spinal cord lesion to determine the course of action with bladder management. Hammell (1995) describes four expectations when managing a dependable bladder program: 1) determining a program that is socially acceptable and congruous with the patient's lifestyle; 2) preventing of over-distention of the bladder; 3) voiding completely and 4) preventing or managing infection.

Objectives - At the conclusion of this tutorial, the occupational therapist will be able to:

- Identify the cause of bladder dysfunction in the SCI patient.
- Describe the treatment protocol for a bladder program.
- Develop an intervention plan for the SCI patient.

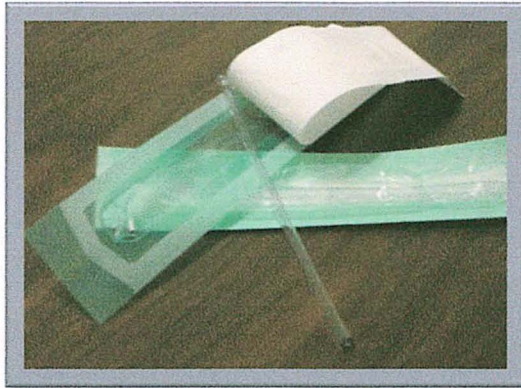
Cause of Bladder Dysfunction – Uncoordinated activity between the sympathetic and unsympathetic nervous systems and muscle control at the S2-S4 nerve roots.

- Below the conus: flaccid paralysis of the skeletal muscles; loss of parasympathetic spinal cord-mediated reflexes

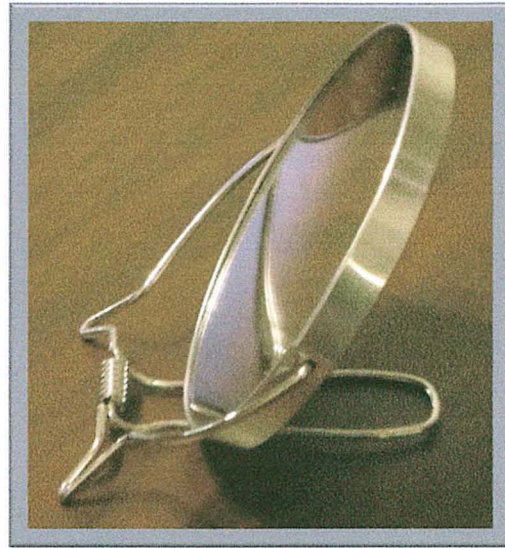
- Above the conus: spastic paralysis of the skeletal muscles; retention of sacral reflexes

Treatment of Bladder Management – Depending on the cause of the dysfunction, the treatment team will identify the proper protocol for voiding. Initially, the patient will have an indwelling urethral catheter inserted until they are able to sit and are ready for intermittent catheterization. This will include the use of a leg bag during the day for privacy and ease of transfer. If the patient has efficient hand function, he will be taught to remove the catheter tubing of the urine bag used through the night and set it aside. Next, the tubing of the leg bag is attached to the neck of the indwelling catheter. The leg bag has two straps that are placed below the knee for greater drainage.

The patient will need to be shown how to empty the urinary bag into the toilet from his wheelchair. As the patient feels comfortable and confident in his care, instruction on self-catheterization will be implemented. For females, this initially will be done while in bed with use of a small standing hand mirror between the legs for proper placement of a small urinary catheter into the urethra. The urine will flow into a container to be emptied into the toilet when completed. If incontinence is an issue, females typically use an incontinence pad. Males can complete self-catheterization while sitting upright and emptied in the same manner as above. Use of an external drainage sheath known as a condom catheter is available for incontinence issues. Intermittent catheterization for males or females will provide for improved personal hygiene and can be used long term.



Self-Catheter Supplies



Standing Hand Mirror

Precautions –

- Over distention of the bladder is the number one cause of autonomic dysreflexia.
- Long-term indwelling catheter use is a significant cause of urinary tract infections.
- To avoid overstretching of the bladder, it should be emptied regularly and not allowed to exceed 400-500L.
- Prolonged contact of urine with skin causes skin breakdown, which may lead to pressure sores or ulcers.
- Untreated urinary tract infections may lead to urosepsis and death.

Recommendations -

- Educate staff, patient and family on the importance of bladder management and clean, healthy skin.

- Work with nursing staff to determine which discipline will introduce the self-catheterization or educate the caregiver on clean catheterization to prevent urinary tract infections (Giannantoni et al., 1998).
- Have family purchase a small standing hand mirror.
- Prior to discharge, treatment should also include catheterization while in the wheelchair in a public bathroom for community re-entry purposes. Patient will have to carry supplies in a bag on his/her wheelchair.

References –

- Giannantoni, A., Scivoletto, G., Di Stasi, S., Silecchia, A., Finazzi-Agro, E., Micali, I., & Castellano, V. (1998). Clean intermittent catheterization and prevention of renal disease in spinal cord injury patients. *Spinal Cord*, 36, 29-32.
- Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.
- Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.
- Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.

PRESSURE ULCERS

Pressure ulcers are wounds or lesions resulting from unrelieved compressive forces between internal bony prominences and external hard surfaces (Harvey, 2008). This unrelieved pressure causes decreased blood flow resulting in the breakdown of underlying tissues initially, followed by subsequent breakdown in the outer layers of tissue.

Objectives - At the conclusion of this tutorial, the occupational therapist will be able to:

- Identify the causes and stages of pressure ulcers.
- Identify methods to prevent pressure ulcers.
- Describe the protocol for treatment of pressure ulcers.
- Develop an intervention plan for the patient.

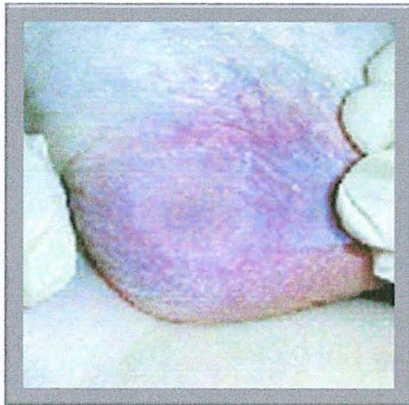
Causes of Pressure Ulcers – Pressure ulcers are a result of necrosis of soft tissues, which occurs when the blood supply is compromised by compression of arteries and capillaries between bony prominences and external hard surfaces (Harvey, 2008). Other causes of pressure ulcers include shearing forces from sliding across surfaces, moist skin from bowel or bladder incontinence, decreased circulation, and previous scarring.

Stages of Pressure Ulcers – There are four stages to pressure ulcer formation as follows:

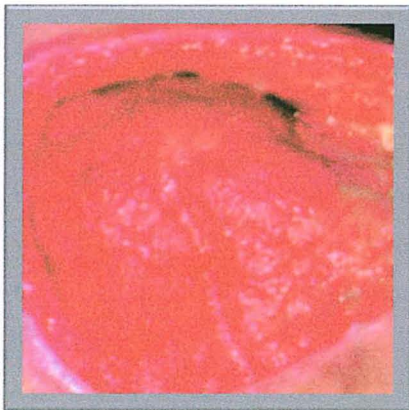
1. Stage One - Non-blanchable area of skin; redness; skin intact
2. Stage Two - Partial thickness skin loss involving dermis such as an abrasion or blister

3. Stage Three - Full thickness skin loss extending into muscle; presents like a crater in the skin
4. Stage Four - Ulcer extending into the bone

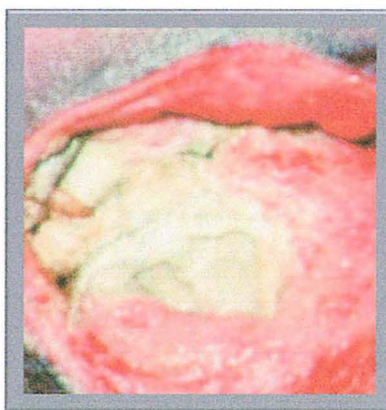
Stage One Wound



Stage Two Wound



Stage Three Wound



Stage Four Wound

Treatment of Pressure Ulcers – The most effective treatment for ulcers is to minimize the amount of time spent on the affected area. This might mean staying out of the wheelchair and increasing time spent in bed. A turning schedule should be implemented to relieve pressure on bony prominences while in bed and a special mattress or wheelchair cushion should be considered to relieve pressure.



RoHo Pressure Relief Cushion

Precautions – After sustaining a severe pressure ulcer, the skin is forever compromised and susceptible to subsequent breakdown in the future. Patients may have to be hospitalized and surgery performed to attach a flap for improved healing of the pressure ulcer.

Recommendations –

- Initiate a two-hour turning schedule immediately upon admit to prevent an ulcer or treat an existing ulcer.
- Determine the need for specialized equipment such as a special mattress or wheelchair cushion.
- Educate staff, patient and family on the initial signs of pressure ulcers to be proactive with treatment.
- Educate and train the patient and staff on daily skin inspection.
- Educate and train the patient and staff on pressure relief while sitting in the wheelchair.
- Provide a timer to remind the patient to perform pressure relief.

References -

Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.

Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.

Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.

SELF-CARE

The loss of upper extremity function is one of the most devastating aspects for a patient with SCI because of the importance of hand and arm function for all tasks including self-care (Snoek, IJzerman, Hermens, Maxwell & Biering-Sorensen, 2004). Occupational therapy intervention focuses on improving hand and arm function, as well as trunk stability, to participate in all self-care activities and functional mobility. Limitations or barriers are identified with assessments such as the Functional Independence Measure (FIM) or Spinal Cord Independence Measure (SCIM). Identifying the physical limitations with use of assessment tools provides the basis for writing functional goals focusing on improving independence with ADL's and IADL's.

Teaching the SCI patient how to complete ADL's such as managing clothing or utensils is challenging and dependent upon the level of injury. Once the muscles and sensation are determined through the ASIA assessment, the occupational therapist can determine what function is available and what assistive devices are needed for increased independence with self-care.

Objectives – At the conclusion of this tutorial, the occupational therapist will be able to:

- Identify the available function of the upper extremities and determine what tools are needed to assist with independence of ADL's.
- Identify any precautions associated with self-care tasks.
- Describe the treatment protocol within the interdisciplinary team.
- Develop an intervention plan for the SCI patient.

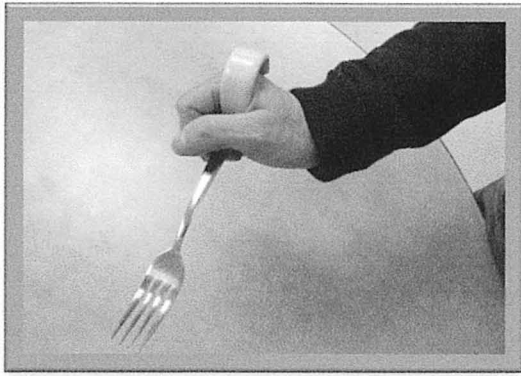
Intervention for self-care tasks – Determining the level of injury and the available muscle function is important to establish the plan of care and intervention strategies. Use of the ASIA assessment tool will determine the level of injury and whether it is a complete or incomplete injury. Along with the ASIA, the therapist should determine functional ability with use of the Functional Instrumental Measure (FIM), which is the standard tool used in the rehabilitation facility.

Once the available muscles have been determined, the therapist will introduce adaptive equipment for self-feeding and grooming if needed. At the same time, it will be necessary to begin working on trunk control and mobility to develop strategies for dressing. The patient will need to be able to log roll side-to-side to pull a shirt down the back or to pull up or down pants while in a supine position. Supine position is where dressing begins and progresses to upright as the patient builds trunk control and confidence. As the patient is able medically, he/she is taught how to roll to the side and come up onto an elbow, eventually working his/her way up to long sitting. In this position, the patient will be able to reach both feet or pull the legs up into hip and knee flexion to don pants, socks, and shoes. Controlling the trunk either by muscle control or arm support is important for all functional transfers. Once the patient is able to control the trunk, he/she is introduced to the Dill Stick (see the bowel program section) for independence with the bowel program while on the commode.

The patient with limited hand function may use a tenodesis grip, which is the passive flexion of fingers through active extension of the wrist due to the paralysis of finger and thumb flexors. This grip is important to maintain and strengthen for eventual independence with self-care tasks without adaptive equipment. Flexion of the fingers

should only be done with the wrist in extension. Likewise, extension of the fingers should only be done in flexion to prevent overstretching the tendons. For optimal use, one hand should have a tight tenodesis grip for lateral pinch and the other hand somewhat looser for a palmar grasp to pick up larger items such as a cup. Depending on what the task is, adaptive equipment can be supplied as needed to facilitate independence with eating, toileting, dressing, and grooming.

Adaptive equipment can range from resting hand splints for prolonged stretching at night, wrist and hand orthosis to assist with hand function for eating and grooming, to specialized tools to make tasks easier and completed more independently. A palmar band or universal cuff with wrist extension can be applied to the patient's dominant hand and the appropriate tool for each individual task can be attached to the orthosis for self-feeding, grooming, computer use and writing. The Dill Stick is built with a palmar band to fit onto the palm with the stimulator attached for independence with toileting. A plate guard, bent forks and spoons, or built-up utensils can also be provided for success with self-feeding. A note to remember with adaptive equipment: a patient will need to be independent with donning or doffing the equipment and will also need to be able to carry it with him/her for use. Therefore, it is better to utilize existing ability of the patient to complete tasks instead of providing adaptive equipment. However, a SCI patient needs to recognize that he/she will be able to be independent with tasks. As they demonstrate independence with tasks the better they are psychologically, therefore, providing equipment early for independence and weaning later is optimal.



Universal Cuff (Palmar Band) for Holding Utensils

Precautions –

- Prevent contractures early by proper splinting for prolonged stretch.
- Do not compromise the tenodesis grip by excessive extensibility of the finger flexor muscles. Flexion of the fingers should only be done with the wrist in extension and likewise, extension of the fingers should only be done in flexion to prevent overstretching. If the tenodesis grip is lost due to overstretching, the patient will have decreased functional use of the hand.
- A tenodesis grip should not be promoted in patients with incomplete injuries unless it is determined they will not regain active finger flexor movement.

Recommendations –

- Maintain or strengthen shoulder muscles for proximal stability and distal mobility.
- Always end the session with success if possible. These patients need to know they can function independently or believe they will be able to at some point.

- Work daily on building strength in the available muscles without producing pain; tease out the weaker muscles and strengthen as able.

References –

Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*.

London: Churchill Livingstone Elsevier.

Hall, S. & Perkins, B. (2009). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.

Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.

Snoek, G., IJzerman, M., Hermens, H., Maxwell, D., & Biering-Sorensen, F. (2004).

Survey of the needs of patients with spinal cord injury: Impact and priority for improvement in hand function in tetraplegics. *Spinal Cord* (42), 526-532.

EXERCISE

Exercise is as important a component of daily life for patients with SCI. Burnham et al. (1997) found that changes in the muscles of patients with SCI occurs quickly, therefore, intervention requires a quick response to suspend any change or damage to the muscle structure. Due to inefficient movement patterns in the early stages of SCI, the patient has added physical stress with all activity, as well as, decreased cardiovascular fitness due to bed rest in the acute stages of injury. Initiating an exercise program early prevents muscle wasting, strengthens all available muscles, improves the cardiovascular system, and builds confidence with improved mobility and functional tasks.

Objectives - At the conclusion of this tutorial, the occupational therapist will be able to:

- Identify the importance of a daily exercise program for the SCI patient
- Describe the treatment protocol for an effective exercise program
- Develop an intervention plan for the SCI patient

Goal – The goal of exercising is to increase strength, endurance and muscle tone to increase independence with all functional tasks and mobility. It is important to identify the innervated muscles and continue to strengthen them with an exercise program. Along with the innervated muscles, the therapist must continue to “tease” out the next available muscles to begin strengthening them as well (Morgan, 2010). Core muscles must be part of the exercise routine to build proximal stability for distal mobility. Key factors for any exercise program are frequency, intensity, and duration. Use of a standing frame places the patient in a full upright position for important weight bearing through the long bones

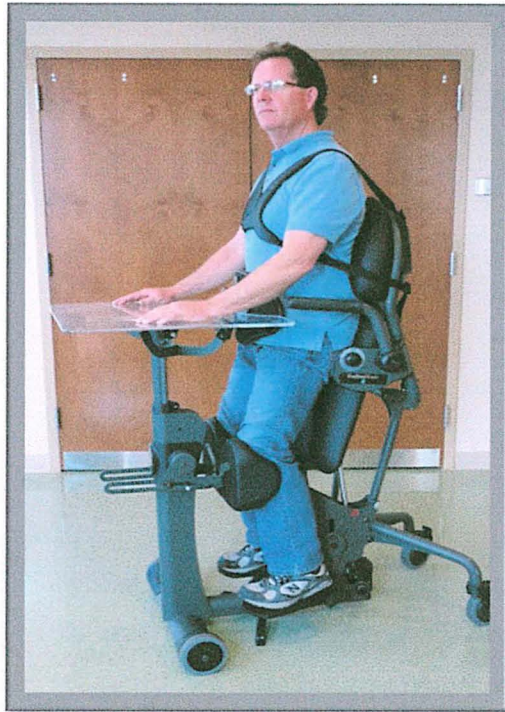
for decreased osteoporosis. It also provides a valuable boost to self-esteem by being eye level with peers (Hall & Perkins, 2009).

Types of Exercise –

- Arm ergometers to improve exercise capacity
- Wheel chair propulsion on a flat plane initially for building exercise endurance
- Strengthening programs with use of free weights, circuits with use of equipment, standing frame, and the rickshaw machine
- Use of the hand mitt to hold onto the equipment as needed during exercise



Rickshaw Exercise Machine



Standing Frame



Hand Mitt for Securing Grip

References -

Burnham, R., Martin, T., Stein, R., Bell, G., McClean, I., & Steadward, R. (1997).

Skeletal muscle fibre type transformation following spinal cord injury. *Spinal Cord*, 35, 86-91.

Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.

Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.

Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.

Morgan, S. (2010, October). *Advances in Spinal Cord Injury*. Advanced course presented in Hershey, PA.

REFERENCES

- Badiali, D., Bracci, F., Castellano, V., Corazziari, E., Fuoco, U., Habib, F., & Scivoletto, G. (1997). Sequential treatment of chronic constipation in paraplegic subjects. *Spinal Cord*, 35, 116-120.
- Burnham, R., Martin, T., Stein, R., Bell, G., McClean, I., & Steadward, R. (1997). Skeletal muscle fibre type transformation following spinal cord injury. *Spinal Cord*, 35, 86-91.
- Essat, Z. (2003). Management of autonomic dysreflexia. *Nursing Standard*, 17, 42-44.
- Giannantoni, A., Scivoletto, G., Di Stasi, S., Silecchia, A., Finazzi-Agro, E., Micali, I., & Castellano, V. (1998). Clean intermittent catheterization and prevention of renal disease in spinal cord injury patients. *Spinal Cord*, 36, 29-32.
- Hall, S. & Perkins, B. (2009, April). *Spinal cord injury: Just the facts*. Spinal cord injury course presented to Elkhorn Valley Rehabilitation Hospital in Casper, WY.
- Harvey, L. (2008). *Management of spinal cord injuries; A guide for physiotherapists*. London: Churchill Livingstone Elsevier.
- Hammel, K. (1995). *Spinal cord injury rehabilitation*. London: Chapman & Hall.
- Krassioukov, A., Furlan, J., & Fehlings, M. (2003). Autonomic dysreflexia in acute spinal cord injury: An under-recognized clinical entity. *Journal of Neurotrauma*, 20, 707-714.
- Morgan, S. (2010, October). *Advances in Spinal Cord Injury*. Advanced course presented in Hershey, PA.

Snoek, G., IJzerman, M., Hermens, H., Maxwell, D., & Biering-Sorensen, F. (2004).

Survey of the needs of patients with spinal cord injury: Impact and priority for improvement in hand function in tetraplegics. *Spinal Cord* (42), 526-532.

Stiens, S., Luttrell, W., & Binard, J. (1998). Polyethylene glycol versus vegetable oil based bisacodyl suppositories to initiate side-lying bowel care: A clinical trial in persons with spinal cord injury. *Spinal Cord* (36), 777-781.

PERMISSION FOR ILLUSTRATIONS

FROM: Mardell.Williams@Hillenbrand.com
SENT: March 21, 2011
TO: Cheryl Nickerson (dnick3380@bresnan.net)
SUBJECT: Wound Stage photos

Cheryl -

Please sign the release form and email or fax back to me. Once I receive the signed form, I will send you the images.

Thanks!

MarDell Williams
Design Services Supervisor
812.934.7100 office
812.934.8264 fax

FROM: Cheryl Nickerson
SENT: March 21, 2011
TO: MarDell Williams
SUBJECT: Wound Stage Photos

Question or Comments: I am seeking approval to use your wound stage photos in my scholarly project for graduate school. The project will be used in our facility as a teaching tool for occupational therapists, as well as, kept on file at the University of North Dakota library.

I appreciate your consideration with this matter.

Cheryl Nickerson, OTR/L
Team Lead, Occupational Therapy
Elkhorn Valley Rehabilitation Hospital
Casper, WY
(307) 262-7474