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The Uncommon
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**Spinal Cord
Injury: From
Emergency Care
To Home**



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Spinal Cord Injury: From Emergency Care To Home

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Spinal cord injury remains one of the most devastating injuries nurses will witness across the continuum of care. The National Spinal Cord Injury Association estimates that there are 7,800 new injuries in the USA per year and anywhere from 250,000 to 400,000 individuals are living with spinal cord injury or dysfunction. Some 82% of them are male with the median age of 19 years. The most common causes are motor vehicle accidents, acts of violence, falls, and sports. After age 45, falls are the leading cause of spinal cord injury. Some 45% of these injuries are complete with slightly more than half resulting in quadriplegia.¹

The average length of hospital stay for a quadriplegic patient in 1992 was 95 days with an average cost of \$118,900.² The majority of patients are discharged home from either the acute care or rehabilitation setting. Until now, since the chance of recovery has been miniscule, treatment has been directed at preventing and treating potentially life-threatening complications. As more of these patients not only survive, but go on to even

longer life expectancies, the need for nurses in the home-care setting has increased dramatically.

Pathophysiology and mechanism of injury

It is important first to look at the spinal cord and review its function. The spinal cord is about 18 inches long and runs from the base of the brain to below the waist. The nerves that lie within the spinal cord are called upper motor neurons. They carry messages back and forth from the brain to the spinal nerves. These spinal nerves branch out from the vertebrae to the other parts of the body and are called lower motor neurons. They have both sensory and motor branches. The spinal cord is the highway connecting the central nervous system to the peripheral nerves.

Most injuries occur because of a severe indirect force to the vertebral column. Such force may result in sudden flexion, hyperextension, vertebral compression, or rotation of the spinal column. Direct injury can also occur as from a stab or gunshot wound. The mechanism of injury is important to know, as it provides insight into the stability of the spinal injury and therefore the extent of damage to the spinal cord.³

In the early stages after acute injury, the cord is soft, swollen, and mushy with hemorrhages and exudates. This exudate consists of red cells, polymorphs, lymphocytes, and plasma cells. These changes are found several segments above and below the level of injury. This period is known as spinal shock. This edema subsides after several weeks, and the hemorrhages are absorbed. The exudate is replaced by macrophages, and this reparative stage may take up to two years resulting in cavitation and fibrosis.⁴

Injury to the cord can be described as complete or incomplete. Most cervical spine injuries are complete lesions, whereas more lumbar spine injuries are incomplete. If there is chronic and complete transection of the cord after the period of spinal shock, this will result in permanent motor, sensory, and autonomic paralysis below the level of the injury. Incomplete injury results in many different clinical pictures, depending on the pathways involved.

The level of injury will determine the functional level of the individual. Classification of injury is usually made at the vertebral level involved. A patient with an injury above C4 will require lifelong ventilatory assistance, probably with a tracheostomy tube. A patient with an injury at C7-8 will be able to be independent with some transfers and feeding and will be able to drive with hand controls. An injury at T12 may result in the ability for short-term ambulation with long leg orthoses and crutches.

Emergency care

Immobilization of the neck and spine are critical and must be maintained at all times. Because 50% of all patients with spinal cord injuries also present with other, sometimes more serious, injuries, these must be attended to. A good example is the coexistence of a

traumatic brain injury, blunt abdominal trauma, or chest injuries, especially when the cause is a motor vehicle accident. Attention must be paid to the ABCs, as in any emergency situation. The administration of oxygen will reduce the likelihood of edema. Mechanical ventilation may be needed, depending on respiratory effort. Spinal shock is often accompanied by hypotension and bradycardia, and IV fluids and vasoconstrictor agents may be required.⁵

Diagnosis of a spinal cord injury is usually made first by clinical presentation. It is critical to obtain a complete history from witnesses about the cause of the injury. A complete set of radiographs is usually done, though care must be taken not to manipulate the spine while taking lateral and oblique views. CT and CT myelograms are often done, though the manipulation of the patient for the flow of contrast material can also be a risk. MRI has been found to be the best method and allows differentiation between swelling from edema (spinal shock) versus ischemia.⁶

Current research suggests that a high dose of methylprednisone given within eight hours of injury can have beneficial effects in reducing the degree of paralysis. The dosage is 30mg/kg IV followed by a 45-minute pause, then a 5.4 mg/kg continuous infusion for 23 hours. As clinical trials have been so promising, research continues and methylprednisone has become the standard of care. It is important to note that even in the group that this medication has helped, however, there was still chronic loss of function.⁷

Treatment

Once the patient is hemodynamically stable, attention will then turn to maintaining spinal alignment and, if indicated, surgical decompression. In the case of cervical fracture, an external traction device, such as Halo fixation or Crutchfield tongs, will be applied. In the case of thoracolumbar injury, however, surgical decompression and stabilization with devices, such as Harrington rods, may be tried. Research has shown that there is little effect on the neurological outcome post surgery, but this operation may be essential if spinal cord compression is imminent or there has been a progressive loss of function.

There are two new drugs under investigation at present. One is another steroid called Tirilizade. The other is Sygen or GM-1 Ganglioside. In a small study, Sygen was given within 72 hours of injury and was continued for up to 32 days with an one year improvement in functional recovery. Sygen is still awaiting FDA approval.⁸

Post acute care

Most of these patients are transferred as soon as they are medically stable to an acute rehabilitation unit equipped to provide comprehensive therapy for spinal cord injury.

The rehabilitation setting is crucial in caring for and teaching the patient to care for themselves. This is where an intermittent catheterization program will begin as well as a

bowel program. This is also where the patient will learn to be as functionally independent as possible and where equipment will be selected for the patient to use at home.

Discharge planning

Before the patient goes home, the therapy team usually makes a home visit to assess for modifications that will be needed, such as widened doorways, as well as to making decisions about what equipment will be sent home. Power versus manual wheelchair decisions are based on level of injury and functional abilities. Prior to discharge, the patient usually has spent time in the Independent Living Unit at rehab with their family or has had a home pass to make sure they understand and are able to actively demonstrate all the teaching they have received.

Home care issues - how to deal with complications

According to the National Spinal Cord Injury Association, 92% of these patients are discharged to home. As rehabilitation length of stays decrease due to prospective payment-systems issues, the home-care team will become a more integral part of the rehabilitation process. It is essential that the home-care nurse is able to prevent, recognize, and treat the most common complications associated with this injury.



The first is infection. Urinary tract infections used to be the leading cause of death, but this has now been surpassed by respiratory infections. Most alert patients with spinal cord injury will be on an intermittent catheterization program rather than have an indwelling foley catheter. When an indwelling foley catheter is in place, a legband foley catheter holder with a velcro-type closure made of soft material can be used for added skin comfort. These holders are available with a velcro[®] locking system to prevent foley movement, thereby reducing the chance of meatal irritation with intermittent catheterization. It is essential that the patient self catheterize at least every 3 to 4 hours to prevent retention and urinary reflux. The nurse must be alert to signs and symptoms of urinary tract infection such as chills, fever, low-back pain, cloudy urine, burning and increased spasticity. The nurse should report these signs and symptoms immediately and be prepared to collect a urine culture. The home-care nurse should instruct the patient to increase decaffeinated fluids, in the importance of proper leg and catheter bag technique, and in the purpose and timing of medications, such as urinary tract agents and antibiotics.

Questions to ask when choosing a Spinal Cord Injury Program

Are they CARF (Commission

ation of Rehabilitation

Racilities) accredited?
Have they been designated as a Model Spinal Injury Center by the National Institute of Disability Research and Rehabilitation?
Will there be a case manager to help with financial matters and to coordinate communication among the team members?
will therapy be at least three hours a day?
Will the patient have access to a physiatrist as well as specialists in internal medicine, neurology, othropedics, and urology as needed?
Is there psychological support for the patient and family?

Respiratory infection is also an issue, especially with the higher level injuries due to ineffective use of the accessory muscles of breathing. The home-care nurse must do a thorough respiratory assessment and teach the use of incentive spirometry and coughing and deep breathing for airway clearance. The abdominal binder (Figure 1) may be used in conjunction with an incentive spirometer to encourage the patient to deep breathe and cough productively.

Autonomic dysreflexia is a true medical emergency and home-care personnel as well as patient and family must be prepared to handle this. It is caused by a sudden increase in blood pressure due to uncontrolled sympathetic nervous system discharge. This occurs with these patients as they have no parasympathetic mechanism to counter this surge. Signs and symptoms are hypertension (200/100 mmhg or greater at times), pounding headache, flushed face, redness above the level of injury and clamminess below, nausea, bradycardia, and sweating above the level of injury and goosebumps below. The most common cause is an overstretched bladder, caused by a blocked catheter, urinary tract infection, or urinary retention. Overdistension of the bowel or overstimulation during the bowel program can also precipitate this, as can any irritant, such as tight clothing. The key is to first remove the cause. If the urine bag is kinked, straighten it. If the patient is distended, disimpact (carefully). If this does not bring the blood pressure down, the patient should receive medical attention immediately and may need antihypertensive medication to prevent a brain attack or myocardial infarction.

Pressure sores are one of the most serious complications and are eminently preventable. The home-care nurse is in a good position to teach the proper use of air mattresses, pressure cushions (never donut shaped), positioning, and skin inspection. If a decubitus ulcer develops, a wound care specialist (ET nurse) should be consulted immediately to ensure the use of appropriate agents. Attention to nutrition is also crucial and a dietician should be consulted as needed in the home-care setting, as caloric needs increase post injury.

Another complication is spasticity, which can interfere with transfers and cause falls. Some spasticity is good, as it can aid muscle tone, however, too much can interfere with self help goals and increase the likelihood of skin breakdown. Medications like Baclofen

have become increasingly standard. It is also important to teach the importance of lying prone as directed by the rehabilitation team.

Other complications that the home-care nurse must be aware of are deep venous thrombosis and orthostatic hypotension. An abdominal binder has been demonstrated to reduce the incidence of orthostatic hypotension. TED stockings can prevent both of these complications. It is also important to pay attention to safety concerns when transferring these patients and to be sure to allow time between positional changes. Spinal cord injury patients may be discharged on low molecular weight heparin (Lovenox) or Coumadin.

Psychosocial issues, such as sexuality and vocational issues, must be addressed for a return to productive life. It is essential for the home-care nurse to be able to make the appropriate referrals and to maintain communication with the rehabilitation team, so that these issues can be addressed by the appropriate team members. Other concerns, such as pain management and heterotopic ossification also may require referral to the appropriate medical professionals. The patient should maintain a relationship with the rehabilitation center so that follow-up can be maintained. He/she should see the psychiatrist at least every 3-6 months and should also see urologist on a regular basis. The home care nurse is in a position to ensure that this continuum is maintained. If financial and reimbursement concerns surface, there should be a referral early in the case to medical social work.

Conclusion

Spinal cord injuries continue to be a common cause of disability in this country. New treatment techniques and outcomes- oriented rehabilitation systems have offered new hope for a productive life.

Nurses across the continuum of care play a vital role in caring for these patients and in teaching patients and their families how to develop regimes that will prevent complications and improve the quality of life.

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Valerie Parisi RN, CRRN, CCM is currently a rehabilitation nurse consultant and a medical case manager. She specializes in managing medical aspects of disability for a range of traumatic injuries. Ms. Parisi consults extensively on determining appropriate home care and facility-based options for catastrophic injuries. She also does medical-legal case review and is a board member of the American Association of Legal Nurse Consultants (Philadelphia).