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Critical Rehabilitation of the Patient With Spinal Cord Injury

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Most healthcare practitioners have worked with patients with spinal cord injury at some point in their career, for some it is a specialty. The critical care area usually only has patient with spinal cord injury for a brief time before they are transferred. More recently, there are longer intensive care unit stays due to multiple trauma and lack of insurance. Nurses must be cognizant of indications, contraindications, and best practice interventions to contribute positively to patient's long-term outcomes. As part of the multispecialty team, nurses can be pivotal in preventing secondary complications, especially pressure ulcers. Rehabilitation team members can be consulted early to provide expertise in managing this complex diagnostic group. **Key words:** *early referral*, *occupational therapy*, *positioning*, *pressure relief*, *spinal cord injury*

THIS article will discuss the advantages of critical rehabilitation of the patient with spinal cord injury (SCI). According to the SCI Network, a resource provided by the National Spinal Cord Injury Association (NSCIA), the incidence of SCI is 40 cases per million population in the United States; however, there have been no studies regarding incidence since the 1970s. Most new SCI cases (40.9%) are caused by motor vehicle crashes, followed by falls (22.4%) and violence (21.6%). While it is hoped that the presence of air bags in cars will decrease the incidence of SCI, this would not impact the number of violent acts or falls causing SCI.[1]

The yearly lifetime costs for healthcare and living expenses per year for higher-level injuries (C1-C4) are $626, 588 for the first year and $112, 237 for each subsequent year.[1] Although sums are lower for incomplete SCIs, the expense combined with lost earnings and productivity create a multimillion-dollar effect on the US economy. Mortality rates are highest during the first year after injury than in subsequent years,[1] and complications or secondary injuries can lead to long critical care stays. Another contributing factor is whether the patient was insured at the time of injury. The absence of insurance coverage could extend the critical care and acute hospital stay as much as 3 months. Therefore, nursing staff needs to familiarize themselves with best practice methods for the patient with SCI.[1]

In an effort to minimize the costs related to SCI, healthcare practitioners must strive to prevent secondary complications from SCI, including decubitus ulcers, pulmonary emboli, and joint contracture. The absence of normal sensation, combined with the absence or weakness of normal motor ability, creates a very high risk for the development of pressure ulcers. Prolonged bed rest and abnormal respiratory function can lead to pulmonary emboli. Finally, abnormal muscle tone and absence of active range of motion (AROM) can produce joint contractures. All of these complications can increase length of stay, add more expense, and limit the patient's ability to participate in acute rehabilitation after discharge. The involvement of the acute rehabilitation team is essential in minimizing these risks.[2,3]

Once a patient has been diagnosed with an SCI, the first priority is to protect the skin.

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This should be a concern whether the spine has been stabilized or not. Commonly, healthcare practitioners are fearful of moving patients who have not yet undergone stabilization surgery. There are many times, however, that surgery is delayed because of sepsis or other life-threatening issues, but diligent position changes and proper equipment must be utilized. Staff can physically stabilize the spine during position changes by keeping the spine in anatomical alignment: zero rotation. This will require the aid of at least 3 staff members with no lifting restrictions. One person must stabilize the neck while the other 2 turn the patient's trunk slowly and carefully. Flexing the hips, knees, and ankles and holding the feet flat on the bed surface will allow for better control of the lower body. A staff member can control the knees toward the direction of the turn (which will lead the torso in the same direction) while the third staff member controls the shoulder girdle. Care must be taken to prevent spine rotation when using this technique. Changes in position must occur every 2 hours at a minimum whether or not stabilization has been completed.[2–4]

Foam wedges, pillows, or air-filled rolls are useful in maintaining alignment once the desired position has been achieved. Care should be taken to protect all bony prominences. One of the most common areas for a decubitus ulcer is the sacral spine. This is caused from the natural curvature of the back applying pressure against a flat surface. A patient with normal sensation will make tiny postural adjustments to relieve pressure where a patient with SCI will be unable to feel the pressure or move to relieve it. This area is also in the center of the mattress where air is less likely to provide for evaporation of sweat and skin quickly becomes moist or macerated. When sheets are used to lift the patient toward the head of the bed shearing occurs directly over the sacrum. Once the skin is damaged, the prevention of an ulcer is even more difficult and unlikely.

Another common area for pressure in SCI is the posterior thigh, which is caused from pressure through the ischial tuberosities. This happens when patients are in bed on their back and the bed is inclined, or when they are sitting upright in a wheelchair (for a prolonged period of time without pressure relief and an adequate cushion). The weight of the upper-body rests on the upper thigh and pushes the ischial tuberosities posteriorly toward the thigh. These ulcers are of great concern because they commonly develop outward from the inside, with little evidence on the skin. It is not uncommon for these ulcers to require debridement down to the bone.

Heels are also a high-risk area for pressure ulcers. The bony protrusion of the calcaneous, also with a natural curvature, rests against a flat bed surface. The bone pushes toward the skin. Circulation is compromised and the dermis begins to necros. Sometimes, blisters will form or skin will break open into a circular pattern. Heels should be protected from the first day after admission. Boots can be used to keep heels suspended by providing support to the lower leg and foot. These orthotics are typically lined with sheepskin material, which adds comfort and allows for evaporation of perspiration.

In addition to orthotics, many different types of beds are available that reduce pressure via rotation. These are used mostly to benefit respiratory function, but are also very effective in reducing the pressure over bony prominences. The Roto-Rest® bed is often used for patients who have not yet undergone stabilization. This system can keep the spine aligned with antirotation segments for the head. The Roto-Rest should never be used to apply cervical traction but it can maintain neutral spine position (zero rotation) while rotating the body up to 62° on each side (total arc of 124°).[5] This bed has pressure reduction foam and gel-packed surfaces to help minimize the risk for skin breakdown over the sacrum. It is imperative that critical care staff are trained in the proper operation of these beds since the foam padding is firm (to provide enough support to immobilize) and will cause pressure if not continually rotating.

There are several other specialty mattresses designed for pressure relief. The Triadyne® and Kinair® systems have air-filled nylon sections that relieve pressure and decrease

shearing. The Triadyne bed has a proning option and rotation of the upper-body portion to improve respiratory functioning.[6,7] These features are effective in reducing the risk for pressure ulcers but the rotation can only be utilized after stabilization of the spine has been completed. Often, these systems come with air-filled positioning devices that can improve alignment of the spine and extremities. Despite the effectiveness of these mattresses in pressure relief, they are unable to prevent pressure and position changes must be completed every 2 hours. Healthcare practitioners should be cautioned not to assume the mattress is addressing the issue of pressure relief.

When specialty beds are not available, the patient should have some type of mattress overlay. There are gel overlays, compressor air-filled overlays, and air mattress overlays as well. At the very minimum, a patient with SCI should be provided with an air mattress and regular repositioning when resources are lacking. The most important rule of pressure relief is that a change in position is the best position. Healthcare practitioners must support the spine and turn the patient every 2 hours, regardless of the surface. This can be challenging and time-consuming but should be prioritized because once a pressure ulcer is present, the length of stay, cost, and psychosocial effect will increase exponentially.[2–4,8] If diligent repositioning can prevent a decubitus, the patient can rapidly progress and participate fully in an active rehabilitation program.

Once the patient with SCI has been referred to rehabilitation service, including occupational and physical therapy, he or she will undergo a comprehensive initial evaluation. A baseline level will be documented, including motor ability and sensory awareness. The patient and therapist will identify client-centered goals on which therapeutic interventions will be based. Interventions include remediation of performance components as well as adaptation for those components that are not likely to improve.[9] In an effort to encourage active patient participation, he or she will be instructed by the rehabilitation staff to guide his or her own care as much as possible.[2] Since early motor function is limited because of spinal shock and edema, patients may only be able to contribute to the team by directing their care. Patients may gain control over certain issues by taking responsibility for daily tasks. They can direct position changes by reminding staff when it's time to be turned and can be given choices about how and when bathing and hygiene tasks will be completed. It is necessary to have a clearly defined method of communication to maximize the patient's level of autonomy.

It may be necessary to provide the patient with an adapted call system to ensure his or her needs are known. These adaptive devices should be based on current motor function and allow the patient to operate the call system with little effort. Some adaptive switches are low-pressure (less than 2 oz of pressure), use voice control, use a sip-and-puff straw like switch, or use chin movement to control the call system. The type of device prescribed by the therapist will be dependent on how much motor function is present. High-level cervical SCIs often cause patients to limit volitional movement to the head and neck. Lever-type toggle switches can be positioned under the chin and opening the mouth will depress the lever, which will in turn activate the switch and control (turn on or off) the device to which it is attached. Since the position of the head will change every 2 hours, these devices can be difficult to keep within reach of the patient.

Another option is the sip-and-puff switch. This is also designed for a one-way (on/off) toggle switch and is operated by a sip (sucking through a straw) and puff (blowing through the straw). The straws can be placed at the edge of the mouth to allow the patient easy access to the switch. Sip-and-puff switches can also be challenging to continually reposition.

The low-pressure switch has many different sizes and shapes. Often, they are round and flat and contain wire that can be utilized within the existing call system with an adaptive plug. These switches take less than 2 oz of pressure to activate. They can be operated by turning the head, shrugging the shoulder, or any other slight motion the patient may possess. They are easier to position since they are

simply placed within the range of the patient's available motion.

Finally, there are voice-activated switches that utilize infrared technology. These can operate any device that accepts infrared signals, such as TV, VCR, and similar electronic devices. Most hospital call systems are "hard wired" and cannot be used with infrared technology as yet. Eventually, devices similar to these will allow the patient to control almost all electronic devices in the home. They may also be used to operate an electric wheelchair.

The rehabilitation team can assist healthcare practitioners in turning patients and provide proper positioning protocols.[9] Not only must the patient be rolled into alternating positions, but these positions should also maximize range of motion and assist in preventing joint contracture. A patient with a complete SCI at or above C4 will have no upper-extremity AROM; however, compensatory movements of the upper trapezious muscles can provide the patient with an ability to support himself or herself in a sitting position. This can only be achieved with external rotation beyond normal ranges. One way to accomplish this is to position patients with their shoulders abducted to 90°, elbows flexed to 90°, and shoulders fully externally rotated. The forearms and hands will be next to the patient's head on either side. It is optimal to have a pillow under the head but not under the forearms since this will facilitate more external rotation at the shoulder and can only be done while the patient is supine. The head of the bed must be as low as tolerated (measured by pulmonary function) to increase the surface area of the body and prevent pressure over the ischial tuberosities. Patients with injuries at or above C4 may complain that they feel they are unable to breathe because of the weight of the denervated chest and abdominal musculature upon their trunk. It should be explained that these positions are crucial in preventing skin ulcers and that the feeling will subside, or that they will acclimate after a few hours.

When side lying, the patient should have most of the upper-body weight over the scapula that rests on the bed. The hips and knees should be flexed, which will allow the patient to remain on his or her side without much support. Pillows or foam cushions should be placed between the knees and behind the back to maintain accurate positioning. Shoulders can be flexed to 90°, or at the side (neutral), but elbows should be extended (0° elbow flexion). This will allow for alternating flexion and extension of the elbows and shoulders when supine versus side lying. Again, the head of the bed should be as low as possible to increase surface area and decrease pressure over bony prominences. In the process of turning, all staff should be cognizant of the spine and should always avoid rotation in any area.

Hand positioning will vary depending on the level of injury. In higher-level SCI, C6 and above, the hands should be kept flexed at all times. Rehabilitation staff will provide "tenodesis stretches." These stretches are careful passive range of motion (PROM) of the wrist and hand keeping the fingers flexed during wrist extension to end range, and allowing the fingers to extend with wrist flexion to end range. This will lead to intentional shortening of the soft tissue of the forearm and create a "grasp" type position of the hand. If this occurs, the patient may eventually have gross grasp and release and perhaps allow for a higher level of independence.[9] Ankle position should always be maintained in neutral. Heel boots should be provided within a few days of admission to ensure that this is attained. Many different types of boots are available from the rehabilitation department or an Orthotics and Prothestics Vendor. The therapy staff will often provide on/off schedules for the boots to allow for hygiene and skin checks and to ensure additional pressure is not added to the skin by the boot itself.

Range of motion should also begin early and continue throughout the patient's length of stay. The motor impairments caused by SCI limit AROM and when combined with abnormal muscle tone, the potential for joint contracture is high. Joint range of motion may also assist in preventing the development of

heterotrophic ossifications, which limit ROM and are difficult to remove once present. Therapists will provide PROM through the full availability of the joint. Hips and shoulders must be flexed and extended to the very ends of the arc to allow adapted sitting positions once the patient has reached full rehabilitation potential.

In the case of incomplete SCI, therapists will also utilize active assisted range of motion to facilitate the return of normal muscle function and AROM. It is critical that rehabilitation staff provide ROM with an awareness of the soft tissue and bony structures of each joint they move. For instance, a patient in a hospital bed in a supine position will tend to have abducted scapulas. This is due to the weight of the upper body on the bed and the mobility of the scapula. The therapist completing ROM must palpate the scapula to ensure the bone is moving with the rhythm of the shoulder girdle. This will ensure that all soft tissue structures remain intact and uninjured. If the scapula was not mobilized with the shoulder, the potential for a torn tendon or impinged nerve is high. Family members may be educated on how to provide ROM if they feel comfortable and demonstrate proper techniques.

Family members can be involved early in the rehabilitation of their loved one. Rehabilitation staff can instruct family member in ROM techniques and provide education on the common rehabilitation continuum of care. Resources about support groups, inpatient rehabilitation facilities, and the nature of SCI may be beneficial to family members. Often, family members are concerned about the appearance of the patient but do not feel comfortable or know what questions to ask. Once the aspects of SCI are described, they may feel more at ease. Much of the progress in SCI occurs after the acute stay when the swelling around the spinal cord is relieved and true outcomes can be measured. There have been many occasions when patients have improved well beyond all medical expectations. It may be helpful to have other people with SCI of the same level to visit the patient and family to provide support and answer questions.

When patients are stabilized, hopefully within the first week of admission, more active rehabilitation can occur. There is evidence that suggests early surgical mobilization can improve functional outcomes and patients can begin the rehabilitation process sooner.[10] This has benefits on the physical functioning as well as respiratory and circulatory systems alike. There is less risk of secondary complications like deep vein thrombosis (DVT), pulmonary embolus, and pneumonia. While it may be necessary for the patient to remain on many medications or a ventilator, once surgical stabilization has occurred, activity levels should be increased.

Stabilization can occur surgically without the need for additional braces or in conjunction with orthotic devices. The most cumbersome of all devices is the Halo Vest. While it has clear advantages in ensuring cervical spine immobilization, it imparts many limitations on patient independence. The metal components are screwed into the skull and attached via rods to a sheepskin-lined plastic vest secured on the torso. Many patients report they feel their head is floating and never truly supported (especially enough to sleep well).[11] There are many precautions, which include not using soap on the skin under the vest[12] (to prevent irritation of the skin) and not placing pillows behind the posterior support bars. This can add force to the pins sites and cause misalignment of the halo. Some patients report increased comfort when a small towel or pillowcase is rolled up behind the neck to take space and reduce the sensation of "floating." Extra sheepskin vests are normally issued to ensure that a clean vest is always available but they should not be replaced without the assistance of an orthotic technician. The vests can be washed with mild soap, well rinsed, and air-dried.

The Minerva Brace provides the patient with cervical and thoracic immobilization with a brace made of plastic and metal. There are 2 padded sections around the cervical area, one that supports the chin and another that supports the back of the head. Each of these supports is attached to the thoracic

section via flat metal rods. These are riveted on top of the thoracic section but can be adjusted for length with the proper tools. The thoracic section has several Velcro straps: 2 connecting the front and back, and one over each shoulder, and chinstraps connect the chin support to the posterior head supports. The anterior metal supports allow for endotracheal tube access to the neck. These devices can be removed while the patient is in bed and are less cumbersome, but also less immobilizing than the Halo vest.

When a lesser degree of cervical immobilization is indicated, surgeons may prescribe cervical collars. At times, they may have a thoracic component as well. The vest section is similar to the Halo vest but attaches to the cervical collar with plastic tabs. These are much less restrictive and can usually be removed for bathing and dressing. Sometimes, the patient may be issued and cervical collar independently of attachments. The Aspen® and Miami J® cervical collars come in sizes relative to neck length and width. They also come with extra pads to allow for cleaning. Philadelphia® cervical collars are light orange foam and come in only one size. They are effective for mobile patients but may cause pressure ulcers on the posterior head when used with patients on bed rest.

When fractures are more inferior, or lower in the spine, it may be necessary to use a thoraco-lumbar-sacral orthosis (TLSO). These can be large and bulky because they must immobilize a large section of the spine. Often, they are made of a white plastic material (Kydex) and have 2 sections (anterior and posterior) that meet on the sides of the patient and are fastened with 6 Velcro straps across the front. The patient must be custom measured for this orthosis (while they are supine) by an orthotic technician and delivery takes at least 24 hours depending on the vendor.

They can be donned while supine in bed or sometimes the surgeon will allow the patient to sit and donn the brace. Donning the brace in supine can be challenging since patients will always need help to place the rear section (placing it without help would rotate the spine). Fitting the TLSO properly is dependent on the placement of the curved lower portion over the pelvis and the flattened upper portion on the sternum. It should fit snugly enough to prevent flexion, hyperextension, or rotation of the spine. Patients may report feeling pressure under the top or bottom but it may be necessary to ensure immobilization of the vertebra.

When only lumbar-sacral immobilization or support is indicated, there are many types of braces available. Aspen makes a lumbar-sacral orthosis (LSO) that can be adjusted for size and has 3 Velcro straps in the front that many patients are able to adjust independently. Another orthotic called the chair back brace has hard plastic components attached to a corset-type fabric section. These are secured with metal clips but also have laces that provide for custom sizing. Hard plastic LSOs are also available when custom fitting and increased immobilization is desired. These are fabricated out of the same plastic as the Kydex TLSO but do not extend up to the sternum. Once the brace has been identified and provided (by the Orthotics Vendor), the rehabilitation staff can assist the patient and/or train the family in the correct procedure for donning and doffing the device.

Once the spine has been stabilized, immobilized, and supported as determined by the surgeon, rehabilitation staff can begin to mobilize the patient out of bed. Considerations for mobilization are dependent on the level of injury. Levels are based on the most caudal segment with normal function and are measured by the "Standard Neurological Classification of Spinal Cord Injury."[10] This scale evaluates the motor and sensory function at each spinal level. Sensory function is tested by applying light touch or pinprick to each dermatome from C2 through S4-5 bilaterally and scoring as absent, impaired, or present. Each myotome muscle groups from C5-T1 and L1-S1 are tested for muscle response and graded from 0 to 5, 0 is no contraction and 5 is normal AROM against gravity. The area between T1-L1 is tested for sensation only because there is no

way to accurately complete a muscle test on postural muscles.[10]

Therapists anticipate what functional level the patient can achieve based on the findings of the initial evaluation. Those with high lesions (C3 and above) will likely require mechanical ventilation. Therefore, these patients will always need physical assistance from others to live in the community. Despite this fact, many people with high-level injuries can use an electric wheelchair, control most of their environment with specialized adaptive control units, and direct the care that is provided to them. There is no limit to the technology now available to patients with very little motor function.

The lower down the spinal cord, the more functions a patient will have. Patients with C3-4 injuries will have some neck motion and scapular function. They may not need mechanical ventilation but will be a full-time wheelchair user. These patients will require full-time assistance from another. When the lesion is in the C5 area, the patient will have shoulder movements and can achieve independence with upper-body self-care skills including self-feeding, oral hygiene, shaving, and handwriting with adaptive devices and set-up. When the lesion is near the C6 level, patient will have some forearm and wrist movement, increasing the complexity of tasks and decreasing the need for adaptive equipment or assistance.[9]

People with SCI at the C7-8 level may achieve fully independent living. They will be able to transfer to all surfaces using their upper extremities. They can drive an adapted vehicle, and can return to the workforce if proper retraining has been provided. Each of the lower segments provides the patient with more motor ability and sensation and a higher-level of independence. Some patients with initial paraplegia may gain full gait ability later in their course of treatment. In addition, it is not uncommon for patients to demonstrate differences in motor ability on one side versus the other. For example, a patient with a C5-6 SCI may have wrist extensors in the right upper extremity (RUE) but only elbow flexion in the left upper extremity (LUE). This would allow the patients to develop a grasp-and-release ability with one arm. Therefore, they will be able to feed themselves, dress themselves, and go to the toilet themselves with little or no help from another person.[9]

Since patients with high-level injuries can become high functioning after an acute rehabilitation program, it is imperative to begin active rehabilitation as soon as possible. The first step in an active rehabilitation process is mobilization. Mobilization begins with moving in bed, rolling side-to-side, transitioning from side lying to sitting, or supine to sitting, and finally sitting at the edge of the bed. Even patients with high-level injuries (C4) can learn to sit by "locking" the elbows into extension and balancing the upper extremities and trunk with a biomechanical technique. Therefore, one of the first interventions includes teaching patients and their family members how to move properly in bed. It is crucial to keep correct spinal alignment, with no rotation. Rotation on the spine can cause torque, which can in turn cause further soft-tissue damage, edema, or additional spinal cord trauma. The shoulders, spine, and pelvis create a basic "H" shape and this should be maintained throughout the roll from supine to one side. Initially, the patient will need assistance but should be able to roll correctly without assistance after training.

Mobilization for higher-level injuries will include dependent transfers to a wheelchair. Some hospitals have "Medi-Chairs," which recline to a completely flat position, and then incline to upright sitting. These are helpful when grading the task of sitting from fully supine to fully upright since these chairs can stop at any point in between. Patients with SCI will require lower extremity compression (with compression stockings, sequential compression devices, or ace wraps) and an abdominal binder to prevent orhtostatic hypotension. When orhtostatic hypotension occurs, the chair can remain partially reclined until vital signs return to normal and then incrementally inclined. Usually, orhtostatic hypotension

will diminish with ongoing sitting activities when time is taken to slowly incline and recline the chair and avoid sudden changes in posture.

Once the patient can tolerate sitting in a chair, a proper cushion must be issued. There are many wheelchair cushions available and some are specially designed for use with SCI. The Roho® cushion has been found to be effective in reducing the risk for pressure ulcer, and recurrence when used as a wheelchair cushion and as a mattress section.[13,14] Cushions must be of the correct size for the patient and the chair in which they are seated. If the lateral thighs are sliding off the cushion, there will not be adequate pressure relief over the ischial tuberosities and increased pressure on the trochanter. In addition, if the cushion is too large for the chair, it will push upward onto the patient's thighs and or the patient will not be properly centered on the cushion. Despite the presence of a cushion, pressure relief techniques must be completed every 15 minutes and for at least 15 seconds.[2–4] The patient should be instructed to monitor the time and remind staff to assist in this effort. With higher-level injuries the staff may have to recline the chair for the patient whereas patients with lower-level injuries will be able to move themselves enough to relieve pressure for the required time.

Ideally, an electric wheelchair with a "tilt in space" option, alternative operating devices (joystick, chin lever, or sip-and-puff) and a pressure-relieving cushion would benefit a majority of the patients with SCI. The "tilt in space" allows for the entire seat back and seat bottom to recline while keeping the patient's trunk and lower extremities supported. There is little concern for shearing effects on the skin because the entire chair reclines rather than only the seat back. With adaptive controls, as above, the patient can control his or her pressure relief without assistance from staff. Many hospitals do not have the resources to purchase chairs such as these and alternative equipment may be necessary. The rehabilitation department may have relationships with vendors in the community that will loan equipment to patients until long-term needs have been identified.

When patients are independent in bed mobility, they may begin to work on the transition from side lying to sitting. This normally involves the use of the upper extremities to push the shoulder girdle over the pelvis and into a sitting position. Patients with lower-level lesions will be able to use the elbow extension, and stabilization of the shoulder complex, to assist. Higher-level injuries will require manual assist to assume a seated position (usually with a recliner chair). It is necessary to train the patient with these techniques from both sides whenever capable since each environment is unique and the patient may have to get up from either side of the bed. Sitting balance and sitting tolerance are the next steps in demonstrating improvement. This process may take several weeks to attain but offers the patient great benefit. They will enjoy a vertical world in which they can interact with others, participate in activities of daily living (ADLs), and continue to strengthen postural muscle groups.

Patients that can sit with fair balance may be taught to use a slide board to transfer to a chair or wheelchair. Eventually they may develop the strength and skill to transfer without using the slide board. A patient with paraplegia should be independent with wheelchair mobility at the end of the rehabilitation stay and may begin to work toward ambulation with assistive devices (long leg braces) if additional motor function has returned.

Patients with SCI have many issues that must be closely monitored and carefully managed to ensure a minimum of secondary problems and complications. It is rare that an SCI occurs without other injuries. More common is SCI combined with fractures, which adds to immobilization of extremities and often leads to joint contractures. Commonly, there are wounds that limit positioning alternatives and add to the risk for pressure ulcers over other bony prominences. Head injuries are frequently found in patients with an SCI,[15] and add cognitive deficits including memory loss, poor insight, and poor judgment, making

it difficult for the patient to recall and adhere to the many precautions for an SCI. When all of these impairments are combined there are many other issues to consider in addition to the SCI.

Tremendous effort must be put forth to prevent secondary complication such as decubitus ulcers. This can be accomplished with the provision of adequate equipment as well as a multispecialty team.[16] Literature suggests that early surgical stabilization and early transfer to the rehabilitation setting can improve long-term outcomes. It is the goal of all rehabilitation professionals to facilitate the patient's return to their previous environment (home), occupation (job), and leisure interests. It is our responsibility to ensure that this process occurs swiftly and without incident, while fostering the highest possible level of independence.

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