CHAPTER-II
REVIEW OF LITERATURE

2.1 INTRODUCTION:--

Review of literature is an important aspect of any research and project from the beginning to the end. It gives insight to the problem, helps in selecting methodology, developing tool and analyzing data.

"The Keys to the vast store-house of published literature may open doors to source of significant problems and explanatory hypothesis and provide helpful orientation for definition of the problem, background for selection of procedure and comparative data for interpretation of results. In order to be truly creative and original, one must read extensively and critically as a stimulus to thinking". It helps the research worker to develop a thorough understanding and insight into previous works and trends that have emerged. The review can also help in reaching a number of important specific goals.

It is necessary for any research worker to study the past work done in the area in which he/she is prepared to work. Review work of research literature is essential for the researcher to develop an insight into the problem as it helps him/her to frame an appropriate design for the problem on hand.

Abdella and Livine (1979) stated that review of literature provides a basis for further investigations, justifies the need for replication, throws light on the feasibility of the study, indicates constraints of data collection and helps to relate findings from one study to another.¹

Polite and Hungler (1999) stated that review of literature refers to activities involved in identifying the search for information on a topic and developing an understanding of the state of the art on research problem. Both the research and the write-up are important in the research process.

The investigator did an extensive review of the research and non-research literature related to the present study and an attempt was made through MEDLAR and INTERNATE search. This contributed to a deeper insight into problem area, methodology, construction of tool and analysis of data.
The literature review for the present study has been organized under the following headings:
1) Literature related to traumatic spinal cord injuries
2) Literature related to rehabilitation therapy
3) Literature related to effectiveness of physical rehabilitation therapy of the traumatic paraplegic patient.
4) Literature related to effectiveness of social rehabilitation therapy of the traumatic paraplegic patient.
5) Literature related to effectiveness of psychological rehabilitation therapy of the traumatic paraplegic patient.
6) Literature related to effectiveness of sexual rehabilitation therapy of the traumatic paraplegic patient.
7) Literature related to effectiveness of occupational and vocational rehabilitation therapy of the traumatic paraplegic patient.

2.2 LITERATURE RELATED TO TRAUMATIC SPINAL CORD INJURIES
Overview of Anatomy & Physiology of Spinal Cord Injury

Anatomy
The spinal cord is the largest nerve in the body, and it is comprised of the nerves which act as the communication system for the body. The nerve fibers within the spinal cord carry messages to and from the brain to other parts of the body. Thus, the spinal cord can be compared to a telephone cable which connects the central office (brain) to the individual homes. Because of its important role in the nervous system, the spinal cord is surrounded by protective bone segments, called the vertebral column. The vertebral column is comprised of seven cervical vertebrae, twelve thoracic vertebrae, 5 lumbar vertebrae and five sacral vertebrae. As the body grows, the vertebral column grows more in length than the spinal cord, causing a discrepancy between the location of the spinal cord segments and the vertebral column segments, particularly in the lower part of the spinal system. For this reason, there is often a discrepancy between the level of vertebral fracture and the level of spinal cord injury.
The term spinal cord injury refers to any injury of the neural elements within the spinal canal. Spinal cord injury can occur from either trauma or disease to the vertebral column or the spinal cord itself. Most spinal cord injuries are the result of trauma to the vertebral column causing a fracture of the bone, or tearing of the ligaments with displacement of the bony column producing a pinching of the spinal cord. The majority of broken necks and broken backs, or vertebral fractures, do not cause any spinal cord damage; however, in 10-14% of the cases where a vertebral trauma has occurred, the damage is of such severity it results in damage to the spinal cord.

Spinal cord injury can occur at any level of the spinal cord or at multiple levels; however, the most common area of injury is at the lower part of the neck at the C-4, C-5 and C-6 levels. The second most common area of injury is at the bottom of the rib cage at T-12. Approximately 90% of all spinal fractures occur in the thoracic and lumbar spines. In fact, the majority of thoracic and lumbar injuries occur within the region between T11 and L1, commonly referred to as the thoracolumbar junction. A variety of factors can explain this increased susceptibility. The thoracolumbar
junction is a transition zone between the relatively stiff thoracic spine, stabilized by the costovertebral articulations, and more mobile lumbar spine. This area also exhibits significant alterations in flexion-extension and rotational degrees of freedom, as well as morphological and biomechanical changes in intervertebral disc architecture. Neurologic deficit reportedly occurs in approximately 15% to 20% of thoracolumbar fractures and dislocations; this is an injury combination that affects about 1 in every 20,000 people in the US. C-7 is the third most common area of spinal cord injury. An injury to the bone at the C-1 and C-2 level may not damage the spinal cord, but if the injury is very severe it will lead to immediate death because the high level of injury interferes with breathing. Therefore, at this level medical professionals only see patients with an incomplete injury or those who have a complete injury and receive mouth to mouth resuscitation until other assistive ventilation is possible. All of these areas are particularly vulnerable injury points because a more fixed part of the skeleton is attached to a more movable part and at the moment of trauma the movable part is injured at the place of fixation.\textsuperscript{17,93}

**Pathophysiology of Spinal Cord Injury**

There are four general types of spinal cord injury:

1) Cord maceration, in which the morphology of the cord is severely distorted

2) Cord lacerations (gun shot or knife wounds)

3) Contusion injury, which leads to a central hematomyelia that may evolve to syringomyelia; and

4) Solid cord injury, in which there is no central focus of necrosis as in contusion injury.

In the first two injuries, the surface of the cord is lacerated and a prominent connective tissue response is invoked, whereas in the latter two the spinal cord surface is not breached and the connective tissue component is minimal. Of these four injury types, the contusion injury represents from 25 to 40% of the cases and is a progressive injury that enlarges over time. The most commonly used animal model in SCI research is patterned after the contusion injury within these four injury types, degree of completeness must be considered, as incomplete lesions will benefit more dramatically from experimental interventions than complete lesions in terms of degree
of recovery that can be obtained. It is important to note that the clinical presentation of SCI is most often characterized as an anatomically incomplete lesion, irrespective of initial neurological presentation.

There are three phases of SCI response that occur after injury: the acute, secondary, and chronic injury processes. In the acute phase, which encompasses the moment of injury and extends for the first few days, a variety of parallel pathophysiological processes begins. Upon initial impact or injury, there is immediate mechanical damage to neural and other soft tissue, including endothelial cells of the vasculature. Thus necrosis, or cell death, results from these mechanical and ischemic insults, is instantaneous, and, in a contusion injury, appears to be more predominant in the grey matter of the spinal cord than in the white matter, resulting in a ring of preserved white matter at the contusion site. After the insult, over the next few minutes, the injured nerve cells respond with an injury-induced barrage of action potentials. Accompanying this are significant electrolytic shifts, principally involving the monovalent and divalent cations Na\(^+\) (intracellular concentrations increase), K\(^+\) (extracellular concentrations increase), and Ca\(^{2+}\) (intracellular concentrations increase to toxic levels), that contribute to a failure in normal neural function and spinal shock, which lasts for about 24 hours and represents a generalized failure of circuitry in the spinal neural network. Hemorrhage occurs, with localized edema, loss of microcirculation by thrombosis, vasospasm and mechanical damage, and loss of vasculature autoregulation, all of which further exacerbate the neural injury. Furthermore, compression of the spinal cord occurs as a result of vertebral displacement followed by edema and later by fibrotic responses, contributing further to the neural injury. Because in the best circumstances the time to admission after spinal cord injury is about three hours, the immediate acute injury processes do not offer a clinically useful target for therapeutic intervention unless the Emergency Medical Service can adapt an easy-to-administer intervention, and/or the population adopts a preventative stance, such as taking aspirin once a day to prevent cardiac death after an episode of cardiac ischemia as recommended by the American Heart Association. In contrast, the secondary and chronic injury processes, because these occur within minutes to weeks after injury, are strategically better for therapeutic targets.\(^{110}\)
Classification

The ASIA Impairment Scale

A spinal cord injury is classified according to the American Spinal Injury Association’s (ASIA) International Standards for Neurological and Functional Classification of Spinal Cord Injury (revised 1996):

- An injury is a class “A” complete injury if no motor or sensory function is preserved in the sacral segments S4-S5.
- An injury is a class “B” incomplete injury if sensory but no motor function is preserved below the neurological level and includes the sacral segments S4-S5.
- A class “C” incomplete injury is given to an injury where sacral sensation is present and motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than “3” (less than active movement against gravity).
- A class “D” incomplete injury is given where sacral sensation is present and motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade of “3” or more.

Finally, normal motor and sensory function is classified an “E” normal. Trends over time indicate an increasing proportion of persons with incomplete paraplegia and a decreasing proportion of persons with complete tetraplegia.3,113
### The Frankel scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>Complete neurological injury - no motor or sensory function clinically detected below the level of the injury.</td>
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<tr>
<td>B</td>
<td>Preserved sensation only - no motor function clinically detected below the level of the injury; sensory function remains below the level of the injury but may include only partial function (sacral sparing qualifies as preserved sensation).</td>
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<tr>
<td>C</td>
<td>Preserved motor non-functional - some motor function observed below the level of the injury, but is of no practical use to the patient.</td>
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<tr>
<td>D</td>
<td>Preserved motor function - useful motor function below the level of the injury; patient can move lower limbs and walk with or without aid, but does not have a normal gait or strength in all motor groups.</td>
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<tr>
<td>E</td>
<td>Normal motor - no clinically detected abnormality in motor or sensory function with normal sphincter function; abnormal reflexes and subjective sensory abnormalities may be present.</td>
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The ASIA Impairment Scale follows the Frankel scale but differs from the older scale in several important respects. First, instead of no function below the injury level, ASIA A is defined as a person with no motor or sensory function preserved in the sacral segments S4-S5. This definition is clear and unambiguous. ASIA B is essentially identical to Frankel B but adds the requirement of preserved sacral S4-S5 function. It should be noted that ASIA A and B classification depend entirely on a single observation, i.e. the preservation of motor and sensory function of S4-S5.

The ASIA scale also added quantitative criteria for C and D. The original Frankel scale asked clinicians to evaluate the usefulness of lower limb function. This not only introduced a subjective element to the scale but ignored arm and hand function in patients with cervical spinal cord injury. To get around this problem, ASIA stipulated that a patient would be an ASIA C if more than half of the muscles evaluated had a grade of less than 3/5. If not, the person was assigned to ASIA D.

ASIA E is of interest because it implies that somebody can have spinal cord injury without having any neurological deficits at least detectable on a neurological
examination of this type. Also, the ASIA motor and sensory scoring may not be sensitive to subtle weakness, presence of spasticity, pain, and certain forms of dyesthesia that could be a result of spinal cord injury. Note that such a person would be categorized as an ASIA E.

These changes in the ASIA scale significantly improved the reliability and consistency of the classification. Although it was more logical, the new definition of "complete" injury does not necessarily mean that it better reflects injury severity. For example, is there any situation where a person could be an ASIA B and better off the ASIA C or even ASIA D?

The new ASIA A categorization turns out to be more predictive of prognosis than the previous definition where the presence of function several segments below the injury site but the absence of function below a given level could be interpreted as an "incomplete" spinal cord injury.

The ASIA committee also classified incomplete spinal cord injuries into five types. A central cord syndrome is associated with greater loss of upper limb function compared to the lower limbs. The Brown-Sequard syndrome results from a hemisection lesion of the spinal cord. Anterior cord syndrome occurs when the injury affects the anterior spinal tracts, including the vestibulospinal tract. Conusmedullaris and cauda equine syndromes occur with damage to the conus or spinal roots of the cord.

Spinal cord injuries must also be distinguished as to whether the injury is within the spinal cord proper or whether it has occurred in the cauda equine which is below the lower tip of the spinal cord.

- The spinal cord itself ends between the L-1 and L-2 vertebrae. The level of injury will also affect the type of paralysis.
- A person with preservation of normal spinal cord segments below the level of injury usually has an upper motor neuron type of injury, or spastic paralysis.
- However, a person with a conusmedullaris injury without preservation of normal spinal cord segments below the lesion or a caudaequine injury, will have a lower motor neuron injury, or flaccid paralysis.46,49,123,112
Neurologic Assessment

A good neurologic examination, including a sensory examination and motor examination, is required to classify the level of injury. The classification standards endorsed by the ASIA is recommended for determining the level of injury. The neurologic level of injury is defined as “the most caudal segment of the spinal cord with normal sensory and motor function on both sides of the body.” The injury is further classified as complete or incomplete and by the Anatomical Syndromes. The Anatomical Syndromes include the Central Cord Syndrome, the Brown-Sequard Syndrome, Anterior Cord Syndrome, Conus Medullaris Syndrome, Cauda Equina Syndrome or unclassified Syndrome.

![Cervical Spine Injury: Incomplete Spinal Cord Syndromes](image-url)

- **Central cord syndrome**: Central cord hemorrhage and edema. Parts of 3 main tracts involved on both sides. Upper limbs more affected than lower limbs.
- **Anterior spinal artery syndrome**: Artery damaged by bone or cartilage spicules (shaded area affected). Bilateral loss of motor function and pain sensation below injured segment; position sense preserved.
- **Brown-Sequard’s syndrome**: One side of cord affected. Loss of motor function and position sense on same side and of pain sensation on opposite side.
- **Posterior column syndrome** (uncommon): Position sense lost below lesion; motor function and pain sensation preserved.

The Central Cord Syndrome
It is the most common type of incomplete injury. Trauma to the spinal cord initially causes hemorrhage, hypoxia and edema in the central gray matter, gradually increasing over several hours and extending peripherally from the center of the cord, and is dependent on the extent of the injury. The damage may stop with peripheral cord sparing or may extend to completely destroy the spinal cord at the level of injury. Because the corticospinal tracks are laminated with the cervical segments more central and the sacral segments more peripheral, there is a disassociation in the degree of motor weakness; lower limbs remain stronger than upper limbs along with sacral sensory sparing, giving the picture of a Central Cord Syndrome. In addition, the sensory and motor levels need to be determined for both the right and left sides. When there is a discrepancy between the lowest normal sensory level and the lowest normal motor level, this should be described, as it is not unusual to have a sensory level which is only normal down to C-4, but with a motor level that may be normal through C-5 or C-6.²,³,³³,⁷⁰

**Anterior Cord Syndrome**

It is frequently related to flexion injuries of cervical region with resultant damage to the anterior portion of cord and/or its vascular supply from anterior spinal artery. This syndrome is characterized by loss of motor function and loss of the sense of pain and temperature below the level of lesion. Proprioception, kinesthesia, and vibratory sense are generally preserved.

**Brown-Sequard syndrome**

It occurs from the hemisection of the spinal cord. It is typically caused by stab wounds. Partial lesion occurs more frequently; true hemisections are rare. The clinical features are asymmetrical. On the ipsilateral side of the lesion, there is loss of sensation in the dermatome segment corresponding to the level of lesion. Owing to the lateral column damage, there are decreased reflexes, lack of superficial reflexes, clonus, positive Babinski’s sign. As a result of dorsal column damage, there is loss of proprioception, kinesthesia and vibratory sense. On the side contralateral to the lesion, damage to the spinothalamic tracts, results in loss of sensation of pain and temperature. This loss begins several dermatome segments below the level of injury. This discrepancy in levels occurs because the lateral spinothalamic tracts ascend two or four segments on the same side before crossing.³⁵
Posterior Cord Syndrome

It is very rare, resulting from compression by tumor or infarction of the posterior spinal artery. Clinically proprioception, stereognosis, two point discrimination and vibratory sense are lost below the level of lesion. A wide base step gait pattern is typical.

Cauda Equina Syndrome.

Damage to the cauda equina occurs with injuries at the L1 vertebral level and below, resulting in a lower motor neuron lesion, which is usually an incomplete lesion. This lesion results in flaccid paralysis. No spinal reflex activity is present.

Sacral Sparing

It refers to an incomplete lesion in which the most centrally located sacral tracts are spared. Varying levels of innervations from sacral segments remain intact. Clinical sign include perianal sensation.34

Conus Medullaris Syndrome

Injury to the sacral cord or lumbar nerve roots within neural canal results in a clinical picture of lower extremity motor and sensory loss and areflexic bladder and bowel.51

Recovery

An accurate and complete examination is vital in determining the neurologic level, and therefore, establishing realistic rehabilitation goals. In persons with a complete injury, goals can usually be established on the day of the initial examination, since only about three percent of these patients later have recovery to an incomplete injury with minimal sparing. In persons with an incomplete injury, recovery is often much more difficult to predict. The person with any preserved motor movement often has fairly good prognosis. It is important that every patient have an examination of the sacral areas for sensation, since preservation of sensation may be the only evidence of an incomplete injury and this can change the outlook for recovery. In the patient with sensory sparing only, some rather dramatic recovery may take place about 1-2 months after injury, or very little recovery may occur.
Recovery from spinal cord injury is, therefore, fairly predictable. Persons with a complete injury by neurologic examination generally are not expected to make any significant recovery except some improvement in motor strength in the zone of injury. Recovery for persons with an incomplete injury is less predictable and most recovery occurs within the first six months; however, some additional neurologic recovery may take place up to 18 months after injury. In a patient with a caudaequina injury, some recovery is possible through regeneration for up to three years following spinal cord injury since it is a peripheral nerve type of injury.
MUSCLE GRADING
0  total paralysis
1  palpable or visible contraction
2  active movement, full range of motion, gravity eliminated
3  active movement, full range of motion, against gravity
4  active movement, full range of motion, against gravity and provides some resistance
5  active movement, full range of motion, against gravity and provides normal resistance
5* muscle able to exert, in examiner’s judgement, sufficient resistance to be considered normal if identifiable inhibiting factors were not present
NI not testable. Patient unable to reliably exert effort or muscle unavailable for testing due to factors such as immobilization, pain on effort or contracture.

ASIA IMPAIRMENT SCALE
☐ A = Complete: No motor or sensory function is preserved in the sacral segments S4-S5.
☐ B = Incomplete: Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5.
☐ C = Incomplete: Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3.
☐ D = Incomplete: Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a muscle grade of 3 or more.
☐ E = Normal: Motor and sensory function are normal.

CLINICAL SYNDROMES (OPTIONAL)
☐ Central Cord
☐ Brown-Séquard
☐ Anterior Cord
☐ Conus Medullaris
☐ Cauda Equina

STEPS IN CLASSIFICATION
The following order is recommended in determining the classification of individuals with SCI
1. Determine sensory levels for right and left sides.
2. Determine motor levels for right and left sides. Note: In regions where there is no myotome to test, the motor level is presumed to be the same as the sensory level.
3. Determine the single neurological level. This is the lowest segment where motor and sensory function is normal on both sides, and is the most cephalad of the sensory and motor levels determined in steps 1 and 2.
4. Determine whether the injury is Complete or Incomplete (sensory sparing).
   If voluntary anal contraction = No AND all S4-5 sensory scores = 0 AND any anal sensation = No, then injury is COMPLETE. Otherwise injury is incomplete.
5. Determine ASIA Impairment Scale (AIS) Grade:
   Is injury Complete? If YES, AIS=A Record /PV
   Is injury motor incomplete? If NO, AIS=B
   Are at least half of the key muscles below the (single) neurological level graded 3 or better?
   YES AIS=C
   NO AIS=D

If sensation and motor function is normal in all segments, AIS=E
Note: AIS E is used in follow up testing when an individual with a documented SCI has recovered normal function. If at initial testing no deficits are found, the individual is neurologically intact; the ASIA Impairment Scale does not apply.
Clinical manifestation:

Spinal shock:
Immediately following SCI there is a period of areflexia called spinal shock. It is believed to result from the very abrupt withdrawal connections between higher centers and spinal cord. It is characterized by absence of all reflex activity, flaccidity, and loss of sensation and motor function below the level of lesion. It may last from several days to several weeks. One of the first predictors that spinal shock is the presence of a positive bulbocavernous reflex.

Motor and sensory impairments:
Following SCI there will be either complete or partial loss of muscle function below the level of lesion. Disruption of the ascending sensory fibers results in impaired or absent sensation below the level of the lesion.

The clinical presentation depend on the neurological level, the completeness of the lesion, and the symmetry of the lesion.

Impaired temperature control
After damage to the spinal cord, the hypothalamus can no longer control cutaneous blood flow or level of sweating. This results in loss of internal thermoregulatory responses. This problem is more frequent with cervical lesions than with thoracic or lumbar involvement.

Respiratory impairments:
Respiratory functions varies depending on the level of lesion. All patients with tetraplegia and those with high level paraplegia demonstrate some compromise in respiratory function. The level of respiratory impairment is directly related to the level of lesion, residual respiratory muscles friction, and additional trauma sustained at time of injury, as well as pre morbid respiratory status. Pulmonary complications are responsible for a high mortality during the early stages of tetraplegia.
Spasticity:
Spasticity results from release of intact reflex arcs from central nervous system control and is characterized by hyper tonicity. Hyperactive stretch reflexes and clonus. It occurs below the level of lesion after spinal shock subsides. It is increased by multiple internal and external stimuli like positional changes, cutaneous stimuli, tight clothing, bladder or kidney stone, catheter blockage etc. strong spasticity interferes with many aspects of rehabilitation.  

Bladder and bowel dysfunction:
During the stage of spinal shock, the urinary bladder is flaccid. All muscles tone and bladder reflexes are absent. Following spinal shock, one of the two types of bladder and lesion of the conus medullaris or cauda equine develop flaccid or non reflex bladder. Bowel dysfunction occurs in similar way as with bladder dysfunction.

Sexual dysfunction:
Sexual information is as vital and as normal a part of rehabilitation process is providing other information to enable the patient to better understand and adapt to his medical condition. Goals include (1) Direct patient care including assessment, prognosis, treatment, and counseling (2) Education of patient and his or her partner; and (3) preparation of staff members to deal with sexual concerns.
The male response: Sexual response is directly related to level and completeness of injury. Sexual capabilities are broadly divided between upper motor neuron lesions and lower motor neuron lesions.

Erectile capacity:

Higgins presented two consistent findings:

a) Erectile capacity is greater in UMN lesions than in LMN lesions

b) Erectile capacity is greater in incomplete lesion than in complete lesions

There are two types of erections: reflexogenic and Psychogenic. Reflexogenic erections occur in response to external physical stimulation of the genitals or perineum. Psychogenic erections occur through cognitive activity such as erotic fantasy.
**Ejaculation:**
There is a higher incidence of ejaculation with (1) LMN lesions than UMN lesions, (2) lower level versus higher level cord lesions and (3) incomplete as compared with complete lesions.

Relatively little information is available related to the effects of SCI on orgasm.

The female response: It also follows a pattern related to location of lesion. In patient with UMN lesions, the reflex arc is intact. Therefore, components of sexual arousal will occur through reflexogenic stimulation, but Psychogenic response will be lost. With LMN lesions, psychogenic responses will be preserved and reflex responses is lost.

**Menstruation**
The menstruation cycle typically is interrupted for a period of 1 to 3 months following injury. After this time normal menses return.

**Fertility and pregnancy:**
The potential for conception remains unimpaired. Pregnancy is possible under close supervision.73

**Complications**
Patients with SCI are at great risk for secondary complications during acute hospitalization and rehabilitation. The NSCISC reported that only 18.3% of patients did not experience a secondary medical complication. Three most common complications are pneumonia (34.3%), pressure ulcers (33.5%), and deep vein thrombosis (15%). Other complications are contracture, pain, heterotrophic ossification, osteoporosis, renal calculi, Urinary tract infection etc.

**Pressure sore:**
Pressure sore are ulceration of soft tissue caused by unrelieved pressure and shearing forces. They are subject to infection which can migrate to wound. They are serious medical complication and may even lead to death. Impaired sensory function and the inability to make appropriate positional changes are the two most influential factors in the development of pressure sores.40,69
**Autonomic dysreflexia:**

It is a pathological autonomic reflex that typically occurs in the lesion above T-6. The clinical syndrome produces an acute onset of autonomic activity from noxious stimuli below the level of lesion. Most common causes of this pathological reflex are bladder distension, rectal distension, pressure sores, urinary stones, bladder infection, noxious cutaneous stimuli, kidney malfunction etc. The symptoms include hypertension, bradycardia, headache, profuse sweating, increased spasticity, restlessness, vasoconstriction below the level of lesion, vasodilatation above the level of lesion, constricted pupils, nasal congestion, blood vision etc. It can be a fatal situation. If lying flat, the patient should be brought to a sitting position, as much as blood pressure will be lowered in this position. Noxious stimuli should be removed. 20, 35, 72, 81

**Postural hypotension:**

It is a decrease in blood pressure that occurs when assuming an erect or vertical position. It is caused by a loss of sympathetic vasoconstriction control. The problem is enhanced by lack of muscles tone, causing peripheral venous and splanchnic bed pooling. Reduced blood cerebral flow and decrease venous return to the heart occurs, producing symptoms of lightheadness, dizziness or fainting. They tend to occur more frequently with lesions of cervical and upper thoracic region. To minimize this effect, slow progression to vertical position begins with elevation of the head of the bed and progresses to a reclining wheelchair with elevating leg rest and use of tilt table. Vital signs should be monitored carefully.

**Heterotopic ossification:**

It is osteogenesis in soft tissue below the level of lesion. The etiology of this abnormal bone growth is unknown. Multiple theories have been proposed, including tissue hypoxia, secondary to circulatory stasis, abnormal calcium metabolism, local pressure and micro trauma related to every aggressive ROM (range of motion) exercise. It is always extra-articular and extra-capsular. It typically occurs adjacent to large joints with hip and knee most commonly involved. Early symptoms include swelling, decrease ROM, local warmth near a joint. Management include pharmacology, rest and with severe functional limitation surgery.
**Contractures:**

Contractures develop secondary to prolonged shortening of structures across and around a joint, resulting in limitation in limitation of ROM. It involves capsular and pericapsular changes. Lack of active muscles function eliminates normal reciprocal stretching of a muscle groups and surrounding structures as the opposing muscles contracts. Spasticity often results prolonges unopposed muscles shortening in a static position. Faulty positioning, heterotopic ossification, odedema and imbalances in muscles pool contribute to specific direction and location of contracture development. The hip & knee joint is particularly prone to flexion deformities and typically includes components of hip internal rotation and adduction & feet in planter flexion. All joints of the body are at risk of contracture. Most important management consideration is prevention. A consistent and concurrent programme of ROM exercises, positioning and if appropriate, splinting effectively maintains joint motion.

**Deep venous thrombosis (DVT)**

DVT results from development of a thrombus within a vessel. The most important factor contributing to the development following SCI is loss of normal pumping mechanism provided by lower extremity musculature. This slows the flow of blood, allowing higher concentration of pro-coagulation to develop in localized areas. The risk of DVT are heightened with age and prolonged pressure. In addition, loss of vasomotor tone and immobility further enhance the potential development of DVT. The clinical features are local swelling, erythema and heat. Prophylactic anticoagulant plays important role. Other preventive measures include a turning program, gentle passive ROM exercise, elastic support stokings, positioning of lower extremities.

**Pain**

Several classification s are related to source and type of pain as well as to the length of time since onset.

**Traumatic pain:**

Pain experienced following acute traumatic injury is related to the extent and the type of trauma sustained as well to the structures involved. Pain may arise from fracture,
ligamentous or soft tissue damage, muscles spasm or early surgical intervention. Typical management includes immobilization and analgesics.

**Nerve-root pain:**

Pain or irritation may arise from damage to nerve roots at or near the side of cord damage. Nerve root pain is described as sharp stabbing burning or shooting and typically follows a dermatomal pattern. It is most common in cauda equine injuries. Conservative management includes drugs and Trans Cutaneous Electrical Nerve Stimulation (TENS). For more severe cases surgical interventions like nerve root section, posterior rhizotomies are helpful.

**Spinal cord dysaesthesia:**

It is not uncommon for patients to experience many peculiar often painful sensation below the level of lesion. They occur in body parts that otherwise lack sensation and often described by pins and needles or tingling feelings. It is theoretized to be related to scarring at the distal end of the severed spinal cord.  

**Osteoporosis & Renal Calculi:**

Changes in the calcium metabolism following SCI lead to osteoporosis below the level of lesion and development of renal calculi. Treatment consists of dietary management and early continuous weight bearing activities.

**Diagnosis:**

In the emergency room, a doctor may be able to rule out spinal cord injury by carefully inspecting an injured person, testing for sensory function and movement, and asking some questions about the accident. But if the injured person complains of neck pain, isn’t fully awake, or has obvious sign of weakness or neurological injury, emergency diagnostic test may be needed. These tests may include:

**X-RAYS.**

Medical personnel typically order these tests on all trauma victims suspected of having spinal cord injury. X-rays can reveal vertebral problems, tumors, fractures or degenerative changes in the spine.
Computerized Tomography (CT) Scans.

A CT scan may provide a better look at abnormalities seen on an X-ray. This scan uses computers to form a series of cross-sectional images that can define bone, disk, cord and other problems.

Magnetic resonance imaging (MRI)

MRI uses a strong magnetic force and radio waves to produce computer-generated images. This test is extremely helpful for looking at the spinal cord and identifying herniated disks, blood clots or other masses that may be compressing the spinal cord. But MRI can’t be used on people with pacemakers or on trauma victims who need certain life-support machines or cervical traction devices.

Myelography:

Myelography allows doctor to visualize the spinal nerves more clearly. After a special dye is injected into the spinal canal x-rays or CT scans of the vertebrae can suggest a herniated disk or other lesions. This test is used when MRI isn’t possible or when it may yield important additional information that is not provided by other tests. Myelography is now out-dated because it is invasive procedure & it gives complications because of the chemical itself. However, there is some importance after surgery of the vertebral column with stainless steel implants & when there is multi level compression in the spine and also know the decompression on table during surgery.

Treatment and management of paraplegia

In spinal cord injury treatment is not the end of programme-since disability & also other social, vocational problems are left out-we have to retrain paraplegics for the physical, mental, social & vocation resettlement, hence it is treatment as well as management.

Aims of treatment:

- To avoid any deterioration of the neurological status.
- To achieve stability of the spine by conservative or operative methods.
- To obtain the neurological recovery.
- To rehabilitate the paralyzed patient to the best possible extent.
- To resettle the paraplegic patient in family, society and at work place.
Transportation

From the site of accident an trauma, the persons engaged in the transportation, be given education (mass education through media) that the person’s vertebral column and spinal cord should be kept in natural alignment by external support to the spine to prevent further damage. The anesthetic limbs should be protected from hot and sharp objects.\textsuperscript{31}

In the hospital

All the medical emergencies are attended and the vital signs are restored to make the person medically stable. Physical and mental assessment, laboratory tests, X-ray, CT scan or MRI is done.

As per need internal fixation operation are are carried out to make the vertebral column stable; this helps in recovery by way of decompression of the cord. It does not help only in early rehabilitation but also prevents many complications due to bedridden position.\textsuperscript{31}

Orthopedic Services

Paraplegia is the condition in which there is complete paralysis of both lower limbs. Main cause is injury to spinal cord by trauma. There are other causes also like infections (tuberculosis), Carcinoma, Transverse myelitis and Congenital spinal problems. Such patients are seen by public health centre/ community health centre level doctors. These patients are then transferred to District hospitals and from there, referred to medical college hospitals. Here they get specialized and advanced treatment.

In specialized hospital, under the care of Orthopedic Surgeon, patients are given complete bed rest, medicines and injections. Here X-rays are taken for spine, catheter is passed for urination. For cervical spine injury traction assembly is applied through head and weight is applied. In many cases, CT Scan or MRI of spine is done for detail study of vertebral column of spinal cord. Medical treatment is also given for medical problems. The staff nurse is instructed for prevention of bed sore by frequent change of position, bladder and bowel care along with other nursing care. Anti bed-sore bed is used i.e. water bed, air ripple bed, pressure relieving soft sponge bed.

With the help of plate, screws, hooks and rod and special instruments, spinal cord operations are carried out as & when required for stabilization of spine.
- Harrington rod fixation
- Leque fixation
- Hartshill fixation
- Steffee fixation
- Moss-miami fixation and other type of fixation
- Various types of anterior instrumentation

In cervical spine injury patients are operated for fixation of the spine, if not operated complete bed rest is given along with six weeks traction and then patients are gradually mobilized on tilt table. After completion of tilt table these patients are put on wheel chair. Those patients, who have recovered and have enough muscle power limbs, are given gait training.

Now the trend has changed for treatment of spinal cord injury patients. More and more patients are being treated by surgery, in which vertebral column is fixed by different kinds of spinal implants and decompression of the spinal cord. This helps in many ways and changes the protocol of rehabilitation.

Thus patients who are operated will start and finish rehabilitation earlier and many complications like bed sore, deep vein thrombosis, urinary tract infection, respiratory tract infection, stiffness of joints and tightness and contracture of muscles, psychological depression are avoided.
Thus operative procedure has following advantages

1. It reduces the total rehabilitation period.
2. It avoids the major complications of bed-ridden position.
3. It helps in neurological recovery.
4. It also improves the psychological status of the patients
5. It helps patient for vocational rehabilitation.

Epidural injections: epidural injections are given under aseptic precautions in the epidural space which helps reducing the spasticity, increasing the sensory control and motor power. A scientific study has been conducted at paraplegia hospital.

**Research for the Cure in Spinal Cord Injury**

**Present Areas of Cure Research**

Today, cure research focuses on four main areas: neuroprotection, regeneration, transplantation and rehabilitation.

**1. Neuro-protection**

*How can the damaged nerve cells at the site of the injury be protected and kept alive?*

Research results show that after the initial spinal cord injury there is a risk for further (secondary) damage. Cells at the injury site continue to die for days, even weeks, after the initial injury. The damage can affect nerve cells in the spinal cord and the nerves’ protective covering (myelin). More harm can occur when the healthy cells are actually “poisoned” by these damaged cells. Sometime the body rejects the damaged cells before they even have a chance to heal. Researchers have been studying ways to medically stabilize the patient, relieve pressure on the spinal cord and prevent scar and cyst formation. They are also looking at using multiple treatments to prevent secondary damage and late cell death.\(^9,^{87}\)

Research in the area of neuroprotection includes the following:
Methylprednisolone

Methylprednisolone (MP) is an anti-inflammatory steroid. It was the first drug shown to reduce spinal cord damage in humans. It reduces damage to the spinal cord by preventing swelling and inflammation at the injury site. Methylprednisolone is now the American "standard of care." It is given to most individuals within 8 hours after their spinal cord injury; however, its true benefits are still being debated. 87

Interleukin-10

Interleukin-10 (IL-10) is a potent anti-inflammatory substance. Researchers at the Miami Project, led by John Bethea, PhD, are using IL-10 in their research with rats. Rats treated with IL-10 recovered significant use of their hind limbs during the weeks following injury. Further study is needed before this drug can be tested on humans. Researchers must first determine how long after injury IL-10 can be given and still provide therapeutic effects. Findings with animals show that more is not better. Two doses of this highly effective drug can reverse its protective benefits. This could result in greater damage. This emphasizes the importance for testing drugs on animals before doing clinical trials with human patients. More testing is needed to determine IL-10’s use in combination with other drugs, such as methylprednisolone. The use of two different anti-inflammatory drugs may be harmful or not needed. 87

GM-1 Ganglioside (Sygen)

The drug Sygen (GM-1 ganglioside) showed it enhanced nerve growth and regeneration in injured cats. It also counteracted some of the secondary damage. The news of these results had individuals requesting immediate access to this potential “cure” for spinal cord injury rather than waiting for further research studies. A human clinical trial on the use of Sygen was undertaken. But, the results were disappointing. The company has now taken the drug off the American market. The research experience with this drug demonstrates the need to prove the effectiveness of new therapies before they are released for use throughout the country. 87,129
Glutamate (AMPA) Receptor Blockers

Glutamate is a chemical substance that works as a neurotransmitter. The cells of the nervous system release it when the spinal cord is injured. Large amounts of glutamate can kill nerve cells by causing them to fire excessively. Animal studies have shown that Glutamate receptor blockers decrease this harmful activity and further damage to the spinal cord. Human clinical trials with these receptor blockers are being performed in stroke patients. Clinical trials with spinal cord injury patients could begin within a few years.

4-Aminopyridine

The drug Fampridine-SR (also known as 4-aminopyridine or 4-AP) does not have neuroprotective effects. However, research does show it improves function in surviving spinal cord nerve cells long after the injury. One human clinical trial of 4-AP was completed and it did demonstrate functional improvements. Patients are being enrolled for future studies. (3, 4)

Other Neuroprotective Treatments

Research continues on other treatments to prevent or lessen the secondary damage caused by an SCI. These include preventing scar formation, developing improved surgical techniques to stabilize and decompress the spinal cord, and designing a more effective system to get drugs to the spinal cord.

Some possible treatments under investigation include: Cyclohexamide, hypothermia (reducing body temperature to decrease metabolism and excitotoxicity) and opioid antagonists (i.e. Naloxone).

2. Regeneration

- Is it possible to get nerves to grow and regenerate?
- Are there factors preventing spinal nerve regrowth?
- What can be done to promote correct “connections” on both sides of the injury?
- What can be done to make it easier for nerves to grow?
- Researchers are investigating many different areas for answers to these questions on spinal cord regeneration.
Increase Growth Factor Production

Damaged nerves must first grow for regeneration to occur. The neurotrophic proteins function as “growth factors. These help prevent cell death. They also work like a "nerve fertilizer" to help neurons survive and nerves regenerate, allowing messages to flow up and down the spinal cord again.

Scientists are studying several growth factors and how they can be used in treating spinal cord injury. Each growth factor has very specific target cells that it works on. They include NT-3 (Neurotrophin 3); BDNF (brain derived neurotrophic factor); aFGF (acidic Fibroblast Growth Factor) and NGF (nerve growth factor).

Another area of research with growth factors is in spinal cord injuries that are not complete. Some fibers connecting the brain with spinal segments below the level of the injury may survive. The goal of this research is to increase the quality and strength of the nerve impulses in the surviving connections.

Dr. Ira Black at the University of Medicine & Dentistry of New Jersey is using growth factors to promote regrowth of spinal cord nerve fibers. BDNF and NT-3 growth factors are being used along with neurons “grown” in the lab from bone marrow stem cells. Researchers are analyzing their use in spinal cord injured rats to define how they may improve nerve growth.

Results from Lorne Mendell’s lab at the State University of New York, Stony Brook report that neurotrophin molecules (such as NT-3) can improve function at synapses in the spinal cord of newborn rats. The goal is to devise ways to make this finding useful in restoring function to the damaged spinal cord in adult rats and, ultimately in humans.

Implant glial or Schwann cell grafts

Schwann cells from peripheral nerves, and glial cells from the central nervous system (CNS) act as "helper cells" to protect, insulate and nourish neurons. Schwann cells and glial cells also make growth factor proteins, which support nerve function. Researchers have shown that implanting or placing these cells into the injury site can stimulate additional spinal cord regeneration. These cells also help bridge the gap in the
spinal cord at the site of injury. These cells can be genetically engineered to produce additional growth factors and further improve regeneration. All of this research is now being done with animals and results show some improvements in leg movement. However, the results are not reliable enough yet to try with humans.\textsuperscript{87,129}

**Block Inhibitory Process**

One problem that occurs in regeneration is that certain factors keep nerve cells in the central nervous system from growing. Spinal cord tissue contains certain chemicals that stop nerve regeneration. Martin Schwab, a University of Zurich researcher, has identified one of these inhibitory chemicals as a protein called Noga-A. He discovered an inhibitor-neutralizing antibody (IN-1) that can block these inhibitors and promote growth. This process has worked in cell cultures and in animals. His researchers’ next step is to focus on preparing these antibodies for human use.

**Promote correct connections on both sides of injury**

First, researchers must keep nerve cells alive and get them to grow. Then it is necessary for the axons to reconnect to their proper target sites. In other words, the nerves must rejoin with their companion nerve for the connection to be complete and functional. Researchers are working with different substances to guide nerve growth so nerves grow past the injury site and reconnect with the proper nerve.

**Netrins:**

Netrins are proteins produced in the brainstem, that "attract" nerve cells. They encourage nerve cells to migrate to and grow branches toward a "target." Dr. Mark Tessier-Lavigne of Stanford University has identified netrins in several animal models and is evaluating their use with spinal cord injury.

**Neural Glues:**

Neural glues are substances that can fuse together the ends of damaged nerve axons. Scientists at the Center for Paralysis Research, Purdue University, used polyethylene glycol (PEG) in guinea pigs. This neural glue helps to partially restore nerve function immediately following spinal cord compression injury. It is thought that this helps restore nerve cell membranes disrupted by the spinal cord injury.
Fibroblasts:

Fibroblast cells, commonly found in the skin, act as a "bridge" across a spinal cord lesion. Scientists genetically engineer these fibroblast cells to produce neurotrophic factor. The cells can then stimulate regrowth. Rats showed improved leg function following implantation of these fibroblasts in research done by Dr. Marion Murray at MCP Hahneman University.

Electrical stimulation

Researchers at Purdue University’s Center for Paralysis Research and Indiana University School of Medicine are using low-level electrical stimulation on paralyzed dogs. They implant a small battery pack, known as an extraspinal oscillating field stimulator (OFS), near the dog’s spine. It sends a weak electrical signal (thousandths of a volt) to the site of injury. This helps regenerate cells and guide growth in the damaged nerves. In about a third of the cases, the dogs improved significantly. The first human clinical trial of this new treatment is now underway. Patients being entered in the study must be within 18 days from the time of their injury. \(^{87,129}\)

3. Transplantation

What are the effects of transplanting various cells into the injury site to promote regeneration?

Peripheral Nerve Transplants

We now know that damaged or injured peripheral nerves sometimes regenerate but cells and nerves in the spinal cord do not. Scientists are transplanting peripheral nerve cells into the site of injury. Their goal is that the transplanted nerve cells will mature and become a part of the central nervous system.

There are several different approaches being studied related to transplantation. Drs. Cheng and Olson of the Karolinska Institute in Stockholm demonstrated recovery of leg function using transplant techniques in rats. \(^{30}\)

Transplantation procedures to repair the spinal cord involve multiple steps such as:

- creating multiple peripheral nerve bridges.
- re-routing white to gray matter.
filling grafted area with fibrin-based tissue glue.
- adding acidic fibroblast growth factor (aFGF).
- stabilizing the spine to prevent reinjury.

**Fetal Central Nervous System Tissue**

Tissue from a growing fetus contains stem cells, progenitor cells, and many substances that support growth. These can all help with regeneration. The advantage in using stem cells is they can develop into several cell types, depending on the signals they receive. Research is examining if these cells can develop and then re-establish lost circuits when transplanted into the spinal cord.

Researchers at the Albany Medical Center, New York and Washington University in St. Louis are implanting fetal spinal cord cells from pigs into the injury site of mice and rats. Fetal neural cells from pigs are used because they grow rapidly and are “functionally identical to human fetal neural cells.” Another step is masking (hiding) the pig proteins to prevent immediate rejection. Masking is done with antibodies. It appears this eliminates the need for long-term immune-suppressing drugs. The goal of this procedure is for these cells to produce myelin. Myelin is the substance that insulates nerve cells, giving the spinal cord the ability to heal and to send electrical signals. Some paralyzed animals regained partial use of the hind limbs after treatment. In April 2001, clinical trials with humans began. It will be months before researchers know whether these transplanted cells have resulted in any spinal cord regeneration.87,129

**Stem Cells**

Certain kinds of stem cells can produce any kind of cell in the body. This means they can make replacement cells for other body parts, including spinal cord cells. Miami Project researchers showed that they could stimulate unspecialized cells in the CNS (“stem cells”) to divide and develop into nerve and glial cells. This exciting finding has opened up new possibilities for cell line development without an ongoing need for fetal tissue donors.
Stem cells from both rodent and human tissues are being studied. One major question is what determines whether stem cells develop into cells that help regeneration, e.g. nerve cells, or cells that make myelin, and not into cells that prevent regeneration, e.g. scar tissue. Once nerve cells can be reliably obtained from stem cells, then they must show they can grow appropriately to the type of cell lines described above.\textsuperscript{87,99,129,130}

**Activated Macrophages**

A highly publicized human clinical trial is taking place in Israel with individuals who have a complete spinal cord injury. The treatment involves harvesting blood cells (macrophages) from the patient’s own blood. These macrophages are first treated in a lab. They are then implanted in the individual’s spinal cord to “repair” the damaged cord. Recent results report that one patient had limited restoration of leg movement. Phase I of these human trials are also ongoing in Brussels. Patients must be enrolled within weeks of injury.

4.**Rehabilitation**

Rehabilitation is expected to be a crucial part of any cure treatment strategy. It is unlikely that any cure treatment will result in an individual having immediate or complete recovery of all function. The physical therapy routines and other health care practices taught during their initial rehabilitation can help them remain healthy and maintain their flexibility and muscle strength. Some research even suggests that these factors not only maximize the use of the undamaged nerves but also will be vital to recovering movement.

Traditional rehabilitation focused on making up for deficits, or “using what you’re left with.” The renewed hope for a cure has refocused interest on restoring lost function. Researchers must continue to explore rehabilitation methods that can help in recovery after injury.

Recent studies showed CNS reorganization can and does occur. Researchers believe it could be important to simulate movements, such as walking. This movement may help maintain and reinforce spinal cord and brain circuitry. Researchers from the Miami Project use Body-Weight Supported Gait training to “re-educate” the spinal cord
on to walk. Miami Project researcher Blair Calancie, PhD, has been conducting research related to the Central pattern generator (CPG) in the spinal cord for stepping.

**Neuroprostheses**

Recent interventions use new electronic technologies to “bypass” the spinal cord injury and allow direct muscle stimulation. This can help control various bodily functions, such as standing/walking, grasping and urinating. There are a number of electrical and mechanical devices that work with the nervous system to help replace a person’s lost motor and sensory functions.

Miami Project researchers studied Functional Electrical Stimulation (FES) to determine benefits of FES-walking. They thought it could provide effective opportunities for exercise and conditioning in subjects with paraplegia. Results showed that the system was "functional" over short distances and can be used to provide greater mobility in some situations. FES also increases the opportunity for conditioning exercise, which is limited after SCI. FES walking showed much more promise as an exercise tool. The most obvious physical effect was enlarged thigh and calf muscles, but the internal benefits were more revealing. After the training, subjects could exercise for significantly longer periods during an arm-crank test before showing signs of fatigue. 87,129,130

**Future studies: A Multidisciplinary Approach**

Everyone hopes for a single “magic pill” remedy to cure spinal cord injury. However, it is more likely individuals will need a combination of therapies to return maximum function. Spinal cord researchers are now taking a more multidisciplinary approach. They are testing various combinations of therapies and treatments. What is the best combination of stem cell-derived neurons, growth factors and trophic factors to restore function after spinal injury? How can acute surgical management and rehabilitation be utilized? By closely looking at and incorporating each component, it is hoped that an ideal “cure” strategy can be found.

**Nursing care**

The nursing care for paraplegic is a special care. Apart from other routine care, these patients require special attention for bladder and bowel. Care is also taken to avoid
skin damage and pressure sore- a two hourly turning regime is practiced keeping vertebral column straight like a log.

Love affection, sacrifice, service & dedication are the virtues bestowed to the nurse. The nursing care in paraplegics needs additional attention than the care of patients. Apart from the routine work of giving medicines and injections to the patients the nursing staff of paraplegia hospital take care of many other aspects like frequent change of postures in bed ( every 2 hourly), avoiding wrinkles in the bed sheet, avoiding wetting of bed sheets, applying talcum powder on different parts of body etc. if the patient is deprived of this special nursing care he or she may develop bed sores which subsequently may become fatal. In the patients with bedsores regular dressing is done by the nursing staff. They also take care of loss of bladder and bowel control by teaching patients and their relatives the techniques of self intermittent catheterization. They counsel the depressed & dejected patients with a smiling face and inspire them to attend session of various treatment programme in different departments of the hospital.

**STEPS TOWARDS UNIVERSAL DESIGN**

*Govt. of India passed P.W.D.Act 1995*

There are many rights for the disabled and welfare activities for the disabled.

Barrier- free design should be the main planning criterion, with the specific needs of people with sensory, intellectual and physical impairments kept in consideration.

Renovation of old buildings should be done to make them disabled-friendly and barrier free providing ramps, wide doors, convenient amenities, accessible toilets, safe public places, low floor bus etc.

Barrier free design of public places, separate & near the entrance parking place, building, roads, foot paths, transport facility to be promoted.

Houses without threshold, western toilets, railing in the toilets, bed height same to that on wheel chairs. Transport for using public transport there should be low floor buses.
2.3 LITERATURE RELATED TO REHABILITATION THERAPY

Rehabilitation is not just restoration of the lost body functions but the final aim is to place the disabled person back to the family and to integrate the person in the workplace and to provide a meaningful altered life style.

It includes

- Prevention of disability
- Retaining functional activities
- Appliances to compensate for loss of function
- Resettlement in the community
- Vocational training and placement
- Restoration of physical and mental health
- Sexual rehabilitation (Esp. for paraplegic patients)\(^\text{39}\)

**Physical rehabilitation has four aspects:**

1) IBR: Institution based rehabilitation
2) CBR: Community based rehabilitation
3) O.B.R.: Out reached based rehabilitation
4) C.A.H.D: Community approach to Handicap in Development.\(^\text{105}\)

**Need of rehabilitation medicine:**

Once the person becomes disabled (Minor or Major disability) the person is dependent for his activities of daily living (Communication, self care, mobility, feeding & earning for their lively- hood). If proper measures are not taken for the rehabilitation of these disabled they will become a burden to a family, society and the nation at large: hence rehabilitation of a disabled person is an important thing for the person, the family and society and the nation.\(^\text{110}\)

**Principles of rehabilitation medicine Treatment**

1. It is non drug treatment program.
2. Natural Physical agents are used for this treatment-agents are
   - heat
   - cold
   - light
• sunrays
• electricity
• therapeutic exercise
• supportive and assistive gadgets
• human support
• mind of a patient
• team work

3. Patient is the most important person of the rehab medicine team. He is not a passive recipient of the treatment but also an active achiever of the goal.

**Complementary and Alternative Medicine of Rehabilitation**

The term alternative medicine means any form of treatment that is alternative to any form of medicine. Some people believe that it is outside the mainstream of allopathic medicine as practices by the majority of doctors today. Alternative medicines exist in all cultures to some degree and terms such as traditional medicine, indigenous medicine or folk medicine etc. are used to describe such practices. These medicines date back to hundreds or even thousands of years depending on the country and culture concerned.

The recent past has witnessed a renewed interest in traditional and alternative system of medicine. A few decades ago, it was generally assumed by the scientific community that acupuncture needles, magnets, medicinal plants etc. could be safely relegated to no more that a footnote of medical history. But this assumption has, indeed, turned out to be very premature. During the past two decades the upsurge of herbology, acupuncture, yoga, manipulative therapy, physiotherapy, exercise therapy, electro therapy, occupational therapy, speech therapy, psychotherapy etc in every country has been phenomenal. The efficacy and popularity of alternative medicines has been endorsed by not less than the W.H.O., British Medical Association, UNICEF etc. the federal Govt. of the USA has even establishes the office of alternative medicine, and it has suveyrs that about half the world's population resided in countries which have ministries or departments of government responsible for traditional medicines. In many countries, 80% or more of the population living in rural area are cared for by traditional practitioners.
Alternative medicines can play a vital role in national health program, and by taking advantage of the best alternative therapies and combining them with the finest in technological medicine, people would be able to enjoy a standard of health care they have never yet seen and at a much lower cost. After decades of serious obsession with modern medicine, recently there has been a boom in various systems of alternative medicines and more people in general and patients in particular are opting for these traditional systems of maintaining health and curing diseases. One of the most important reasons for this renewed interest is the increasing side effects and spiraling cost of western medicines.

Salient features of Alternative Medicines
1. Considers the human body as a whole being i.e. the sum total of its physical, mental, social & spiritual dimensions.
2. Minimal side effects.
3. Remedies are based on natural ingredients or a drugless therapy using natural physical agents like heat, cold, sunlight, water, exercises, pranayama, dhyan etc.
4. Very low cost.
5. Simple to prescribe and practice.
6. Preventive and promotive aspects of health are equally cared for.
7. Permanent cures for many so called incurred chronic diseases.

VARIOUS SYSTEMS OF ALTERNATIVE MEDICINE

Complementary and alternative medicine embraces a large variety of therapeutic practices, from bio feedback and yoga to herbal medicine and massage. Some therapies are discussed here.

Acupuncture

“Acupuncture is close to 5,000 years old.” Said Terry Courtney, a licensed acupuncture practitioners and chair of the Department of Acupuncture and oriental Medicine at Bastyr University in Kenmore, WA. “It is part of a system of traditional oriental medicine that includes herbology; exercise and breathing techniques like Tai Chi and Qi Gung; oriental body work and message technique such as Tuina and Shiatsu; acupressure; nutrional advice; and meditation and relaxation.” Acupuncture has grown
in availability in the U.S. in recent years and is now license in 41 state including Washington and Puerto Rico.

Acupuncture is benefit for both chronic and acute condition and has been used successfully for immune enhancement and illness prevention, infectious disease, rehabilitation, chemical dependency and pain, Courteney said. “one of the nice thing for acupuncture is that it can be the primary source of health care for some one of the partner along with other medicines or techniques. It’s very versatile that way.” To a hypodermic (in thickness) it is generally pain less, or there is a very slight pricking sensation upon insertion. Most people find experience very comfortable. A good flow of energy improves circulation, helps bladder function, and helps reduce skin break down condition that are of special concern to people with SCI. “If there is a block in a channel or pathway and the energy is not moving well through that area, that can be the source of discomfort, pain or circulatory problems,” Courteney explained. Unblocking that path way would be the focus of acupuncture treatments.

Chiropractic

Chiropractor use manipulation of joints to stimulate the lymph drainage, increase range of motion, improve symptoms come from irritation of the nerves and restor and enhance over all health.

Chiropractic technique varies, from energy based adjustment involving almost no touching of the boy, to high velocity, low amplitude thrust that produce the famous pop or crunch, he said. “depending on what the problem is, any of this treatment can be effective.”

Naturopathy

VinconzPriessnitz (1799-1851) was the man who first started the nature cure clinic over a hundred years ago. Dr Henry Lindlahr is one who devoted his life in this principle and his leading moto is “Nature’s remedies are the best”. Mahatma Gandhi was firm believer in nature cure and believed that disease came from ignoring the laws of nature. According to Naturopathy the medical treatment possesses very little power to cure disease and suppresses the symptoms of disease. The proper method of overcoming the disease is by natural means such as Air, water, Light, Food, Exercise etc.
Nature cure believes that diseases caused by violation of Nature’s Laws. Self control in obedience of natural law is the master key to health. The medical treatment of the Nature cure consists largely in the proper relation and combination of food materials. It stands to reason that nature has provided within the ranges of the natural foods all the elements which man needs in the way of food and medicine.

**Massage therapy**

Warning vigorous massage in paraplegics can lead to many complications e.g. myocytis ossification. Like acupuncture, massage has ancient chinese origin and can be traced back thousands of years, according to the licensed massage therapy Jessica Grey. The benefit of massage includes relaxation of muscles, contraction and spasm; relief of general body tension; and improved circulation.

Massage act as a general cleanser, Grey said, “pushing lymphatic fluids and hastening the elimination of waste and toxic debris ” that can accumulate as a result of the food that is eaten, the air that is breathed, and the tension of the day. After the massage has broken down the toxic, Grey tells her clients to drink plenty of water for the rest of the day in order to flush the toxins out of the body. Massage can help “overcome harmful fatigue by products resulting from strenuous exercise and injury” she said, “And improves muscle tone, nutrition of the tissue and metabolism”

When choosing a massage therapist, look for one who has a license grey said. “ask them if they have had any experience with SCI, if not they willing to learn . tell them what u want to get out of massage” there are many different kinds of massage technique – swedish, rolf, sports etc. as well as significant difference between practitioner and sometimes it takes a while to find the therapist who feels right. Grey often starts treatment with warm packs to warm up the muscles followed by light massage, gradually building to deeper massage. She encourages clients to tell her touch is too light or too deep.

**Yoga**

Yoga is a science of holistic living and not merely a set of Asanas and Pranayama. It is a part of Ayurveda, the science of life.
The Yoga is derived from the sanskrit root ‘’Yuj’’ which means to unite or integrate thus implying a total integration of the physical, mental, intellectual and spiritual aspects of human personality. It aims at the harmonious development of body mind and soul.

Yoga is a traditional science which helps us to co-ordinate body and mind more effectively. It enables a person to maintain tranquility of mind and greater calmness in the conscious state and is perhaps the easiest and safest method in promoting mental health.

The founders of Yoga were the Rishis and Maharishis and the sages who had mastery of mind and body. Knowledge was transmitted to the disciplines (chelas) and later on spread all over India. Yoga is a science that deals with the physical, moral, mental, spiritual well being of a man as a whole.
2.4 LITERATURE RELATED TO PHYSICAL REHABILITATION

Prabhakar MM, Thakker TH. conducted follow-up program in India for patients with spinal cord injury: Paraplegia Safari. (Journal of Spinal cord Medicine, 2006)

In the spinal cord injury patients it has been observed that after discharge, it is very difficult for them to come for follow-up, particularly during first year; due to problem regarding finance, social problems, transportation problem as well as extreme physical handicap. Due to this there were a large number of patients who were coming for readmissions with preventable causes if they had come for follow-up. Therefore, it was felt that the attempt to visit the patient’s residence and to do on spot follow-up would be of great help. Taking a clue from Dennis Burkitt’s “Tumor Safari Concept” a concept of ‘Paraplegia Safari’ evolved.

Objectives of the study were to evaluate and to improve the status of rehabilitation of discharged spinal cord injury patients at their own place and by that to decrease the rate of readmission.

Material and Methods: in this programme a team made up of an orthopedic surgeon, Physiotherapist, Occupational Therapist, Orthoist/Prosthetist and Medical Social worker will visit the rehabilited discharged patients at their own living place. Since 1984 to November 2000, 45 Safari Programme have been conducted in which 447 patients have been benefited. After devasting earthquake in January 2001, 4 paraplegic Safari were conducted up to June 2002, in which 99 earthquake victim spinal cord injury patients were benefited. These patients are helped on the spot in form of need of medical treatment, orthotic (new, repair, replacement) and vocational guidance. Those patients, who require admission for their problems, are helped to come back to paraplegia centre.

Conclusion: this programme helped to obtain true picture of rehabilitation at their own place and to decrease the number of readmission by improving the status of rehabilitation and by so also improving the quality of spinal cord injury patients. This study has helped investigator to evaluate all kind of rehabilitation and gave deeper vision for the study.
Dr. M.M. Prabhakar Conducted study on
Mass scale dorso-lumbar injuries managed for early rehabilitation.
( Gujarat- earthquake-2001)

Study design: A prospective study of treatment of 72 cases of dorsal and lumber spine injury resulting from the January 2001 earthquake of Gujarat from the point of early rehabilitation. Objective of the study was to assess the result of surgical intervention with regards to rehabilitation in the selected patient of mass scale spinal injuries following a major catastrophe. No patient had neurological deterioration following surgery. At 2years follow up, 53% patients have a functionally useful motor power according to the Frankel’s classification. Physical, psychological, vocational, and sexual rehabilitation is faster and better. There were no neurological deterioration or mechanical failures in the conservatively treated group. 96

The study helps investigator to understand the surgical management of traumatic paraplegia for early rehabilitation.

Hall KM, Cohen ME, et al Conducted study on characteristics of functional independence measure in traumatic spinal cord injury. (ARCH Phys Med Rehabil. 1999 Nov;80(11):1471-6.) In their study FIM data collected prospectively at admission and discharge from acute inpatient rehabilitation and at 1,2 and 5 years after injury. They concluded that the cognition items are not informative for detecting changes over time in SCI; at best, these items could serve as crude cognition screening assessment. Motor items in contrast appear to reflect well the functional status of individuals. High correlation among several of motor items suggest item redundancy. FIM motor scores illustrated the neurological and ASIA scores in appropriate cases improvements.

Individuals with ASIA impairments grades of B or C at admission make the most gains in FIM motor scores. 47

Catz A; Itskovich M; Agranov E et al Conducted study on SCIM – spinal cord independence measure: A new disability scale for patients with spinal cord lesions. (Spinal cord, December 1997, Volume 35, Number 12:850-6) It was found that the SCIM is a reliable disability scale and is more sensitive to changes in function in spinal lesion patients than the FIM. The SCIM when administered by a multidisciplinary team may be
a useful instrument for assessing changes in every day performance in patients with spinal cord lesion.\textsuperscript{15}

Tooth L, McKenna K et al, conducted study on Rehabilitation outcomes in traumatic spinal cord injury in Australia: functional status, length of stay and discharge setting.


They studied how degree of impairment complete/incomplete, paraplegia/tetraplegia) impact on patient’s length of stay (LOS), functional status and discharge setting after rehabilitation they found that for patients in the three AN – SNAP classes (Australian national sub-acute and non-acute patient classification system). With the lowest FIM scores, the actual LOS was up to twice the estimated LOS. A large variability in discharge was found within individual AN-SNAP classes, despite similar FIM trademarks scores on admission.\textsuperscript{120}

OtaT, akaboshi K, nagata M, et al Conducted study on Functional assessment of patients with spinal cord injury; measured by motor score and the functional indecency measure. (Spinal cord.1996 Sep;34 (9):531-5)

The purpose of this study was to describe the characteristics of impairment and disability in patients with SCI, using the FIM and motor of the ASIA. They found FIM score reached the plateau in approximately 10 months, 6 months and 3 months post injury in tetraplegia, paraplegia above T5 and that below T6 respectively.\textsuperscript{90}

Middleton JW, Truman G, Geraghty TJ. Conducted study on Neurological level effect on the discharge functional status cord injured persons after rehabilitation.


They found an inverse relationship between FIM score and neurological level for certain motor items supports clinical observations that functional performance in spinal cord injured individual is reduced with greater neurological impairment.\textsuperscript{78}

Fifty-five patients (29 with paraplegia and 26 with tetraplegia) were calculated at admission, before discharge and at 12 months after discharge for motor status by the functional independence Measures (FIM) score. The evaluation of MS, LTS and FIM scores at admission and discharge showed lesions (P<0.001). FIM scores showed significant improvement only in those with complete or incomplete paraplegia (P<0.05).  


They examined functional improvement patterns of 314 consecutive admissions of stroke, SCI and traumatic brain separately for persons grouped by LOS (length of stay), functional status improved linearly during rehabilitation stay with differences in rate of improvement depending on initial functional status. The greater rate of improvement in motor (but not cognitive) functioning in patient with shorter stays.  


They found improved neurological status and impendent function in activities of daily living following acute care and rehabilitation for most persons with SCI and decreased length of initial and subsequent hospital stay and increased survival rates. 

Karriye Ones, EbruYilmazBeydogan, OzlemGultekin, Nil Caglar. Conducted study on functional recovery after spinal cord lesion 2005 (iscos) improvement in America Spinal Injury Association (ASIA) motor index score, level of injury, and FIM scores after spinal cord injury. The functional status on admission of men and women was compared. ASIA motor admission scores revealed no gender group difference (P<0.05). FIM motor scores also revealed no gender for rehabilitation length of stay (LOS) (p>0.05). Male and female patients’ functional outcomes at rehabilitation discharge were compared. FIM
motor scores revealed no gender differences (P>0.05). FIM motor score gain change between discharge and admission rehabilitation) revealed no gender differences (P>0.05). Stevens SL, Caputo JL, Fuller DK, Morgan DW conducted study on Physical activity and quality of life in adults with spinal cord injury.
Department of Health and Human Performance, Middle Tennessee State University, Nashville, Tennessee 37211, USA.
Objective of the study was to document the relationship between level of physical activity and quality of life in persons with spinal cord injury.
Study design was Cross-sectional investigation.
METHODS: Men (n = 32) and women (n = 30) with complete and incomplete spinal cord lesions below C6 volunteered to participate in this study. The average length of time since the onset of disability was 9 years (range, 1.5-40 years). Using an interview-formatted survey (Quality of Well-Being Scale), a measure of quality of life was obtained for each participant. Physical activity levels were determined using the Physical Activity Scale for Individuals with Physical Disabilities.
They found strong positive association (r= .75; P<.05) was observed between level of physical activity and quality of life. Multiple regression analysis also revealed that when level physical activity, anatomical location of the injury, completeness of injury and time since injury were used as explanatory variables, level of physical activity may be effective in improving quality of life in adults with spinal cord injury. 

The study is qualitative study and descriptive statistics used for analysis and interpretation of data. The study helped investigator to develop tool and techniques for survey as well as analysis and interpretation of qualitative data.
Susan Sheehy, PhD (c), RN, FAAN Conducted study on SCI Functional Improvement Via exercise 2006. A structured exercise program that continues beyond a traditional rehabilitation period may lead to motor and sensory gains, increased muscle strength, and improved quality of life in persons with spinal cord injuries.
Kawashina N, Sone Y, Nakazawa K, Akai M, Yano H Energy Conducted study on expenditure during walking with weight-bearing control (WBC) Orthosis in thoracic level of paraplegic patients.  
(Spinal cord, September 2003, Volume 41, Number 9:506-10) WBC enables thoracic level of paraplegic patients to walk at relatively higher speed than conventional Orthosis under similar energy expenditure. The special devices equipped with WBC are therefore considered to lead to improvement of the energy cost of walking.  

Diter DS; Latimer AE; Ginis KA; Arbour KP; McCartney N; Hicks AL Conducted study on maintenance of exercise participation in indivuals with spinal cord injury: effects on quality of life, stress and pain. 
(Spinal Cord, August 2003, Volume 41, number 8:446-50.) They found significant decrease in adherence at the 3 month follow-up compared to the overall 9 months adherence rate (42.7 versus 80.6% respectively; P<0.01). There was also a significant decrease in perceived quality of life) PQOL (P<0.05) and a trend for increased pain (P=0.07) and stress (P=0.12), at follow-up compared to the end of the 9 month trial. So there was a significant negative correlation between pain at the conclusion of the RCT and exercise adherence over the 3 months follow-up period (r = -0.91; p < 0.01). Finally, they concluded that these findings emphasize the importance of continued exercise adherence to the maintenance of exercise related increase in psychological well-being among individuals with SCI.

Hicks AL; Martin KA; Ditor DS; Latimer AE; Craven C; Bugaresti J; McCartney N. Conducted study on Long-term exercise training in persons with spinal cord injury: facts on strength, arm ergometer performance and psychological well-being.  
(Spinal cord, January 2003, volume 41, number 1:34-43) Following training, the EX group had significant increase in submaximal arm ergometry power output (81%; P<0.05), and significant increases in upper body muscle strength 19-34%;P<0.05); no significant changes occurred in CON. Participants in EX reported significantly less pain, stress and depression after training, and scored higher than CON in indices of satisfaction with physical function, level of perceived health and overall quality of life (P<0.05). Therefore exercise training results in significant gains in both physical and psychological wellbeing.

They found strengthening and aerobic rehabilitation programs for patient with sub-acute SCI should be limited to 4 weeks, followed by an independent maintenance exercise program. The strengthening program is safe for those clients.  

Rimaud D, Calmels P, Devillard X et al Conducted study on Training programs in spinal cord injury. (Ann Readapt Med Phys. 2005 Jun; 48(5): 259-69. Epub 2005) found wheelchair ergometers seems to be interesting for SCI because it mimics closely the daily motor tasks of wheelchairs users and allows for adjustment of wheelchair. Both continuous and interval training program are appropriate, but intermittent exercise intensities may be more beneficial since therapy mimic the intermittent nature of daily activity patterns. Furthermore, on the basis of the results of these studies, they recommended that training at or above 70% of maximum heart rate, for 30 minutes of rhythmic exercise, three days per wheel during eight weeks, will provide a sound of basis for design of an endurance exercise program for people with SCI.  

Haisma JA, van der WOude LH Conducted study on physical capacity in wheelchair dependent persons with a spinal cord injury: (a critical review of the literature2006 Nov;44 (11) )

Found that in paraplegia, muscle strength of the upper extremity and respiratory function were comparable to that in the able-bodied population. In tetraplegis muscle strength varied greatly and respiratory function was reduced to 55-59% of the predicted values for an age- gender- and height matched able bodied population. Physical capacity is reduces and caries in SCI. The variation between results is caused by population and methodological differences. Standardized measurement of physical capacity is needed to further develop comparative values for clinical practice and rehabilitation research.  

barriers can facilitate the participation of individuals with spinal cord injury in an exercise program, improving long-term health and wellness.\textsuperscript{102}

\textbf{Noreau L, Shephard RJ Conducted study on Spinal cord injury, exercise and quality of life.}


They concluded that quality of life is closely associated with independent living and, increasingly, it is a key outcome when measuring the success of rehabilitation. Consequently, research designs that examine the impact of exercise upon individuals with disabilities should not only include objective outcome measures, but also subjective measures relating to life satisfaction and quality of life.\textsuperscript{88}

\textbf{Marcel Dijkers Conducted study on Quality of life after spinal cord injury: a meta-analysis of the effect of disablement components.}

(Spinal cord December 1997, volume 35L: number 12, pages 829-840)

Findings from a total of 22 studies, with an average sample size of 102 include the following: persons with SCI tend to report lower subjective wellbeing than non-disabled people; the relationship between impairment and QOL is weak (mean correlation: -0.05; 95% confidence interval : -0.12 to 0.02), and generally not found consistently; the relationship between QOL and (aspects of) handicap is strongest (range for mean r: -0.17 to -0.48), and fairly consistently found.\textsuperscript{76}

\textbf{Kennedy P; Evans MJ; Berry c; Mullin J et al Conducted study on comprehensive analysis of goal achievement during rehabilitation for older and younger adults with spinal cord injury.}

(Spinal cord, January 2003, volume 41, number 1: 44-52)

Their results highlighted important considerations for the rehabilitation of older adults and emphasize the need for active, individually tailored rehabilitation programmes. There are specific as of need (i.e. skin management) where older adults do not achieve comparable levels of independence. Special attention needs to be paid to the problems presented by SCI older adults and efforts should be made to better prepare rehabilitation professionals to adapt to age specific differences.\textsuperscript{63}
Scivoletto G; Morganti B; Ditunno P; Ditunno JF at al Conducted study on effects on age on spinal cord lesion patients rehabilitation.
(Spinal cord, August 2003, volume 41, number 8: 457-64) Findings showed that older individuals with spinal cord and disease do well, but have a less favorable outcome in regard to walking, bladder and bowel independence than younger subjects and have more associated medical problems. Different rehabilitative strategies therefore are required for old subjects who maximize the shorter length of stay and provide the necessary medical care and increased physical assistant resources following discharge.103

RW Effing, NLU van Meetern et al Conducted study on body weight supported treadmill training in chronic incomplete spinal cord injury: a pilot study evaluating functional health status and quality of life. (spinal cord (2006)44, 287-296.) This study demonstrated positive effects of trademill training (TT) on functional health status (FHS). A randomized clinical trial should execute before definite conclusions about the effect of TT on FHS and QOL can be drawn.100

I Dzidic and S Moslavac Conducted study on Functional skills after the rehabilitation of spinal cord injury patients: observation period of 3 years;(spinal cord September 1997, volume 35, Number 9, Pages 620-623) found increased number of young people with spinal cord injuries in Croatia led us to study their functional abilities after completing medical rehabilitation and extended hospitalization, as due to destroyed homes, they had no place to return to. They were all wounded during war in Croatia (1990 1992) and their average age was 27 years. Tetraplegic patients of Hospital for Medical Rehabilitation, VarazdinskeToplice, Croatia achieved a mean modified bather index (MBI) of 57.3 after completing medical rehabilitation and 61.3,3 years later which is a significantly higher rate than is given in Yarkony’s study (30.3 37.8) where American civilian patients were monitored. 1 patients with paraplegia showed similar results (74.5 76.8) relating published by Yarkony (72.0 75.6). 57
2.5 LITERATURE RELATED TO SOCIAL REHABILITATION

Social rehabilitation means Restoration of family and social relationships. Department of public relation and Medical Social Worker play vital role in social rehabilitation of paraplegic patients.

The social worker often must act as an advocate for the client to community agencies in an economic environment of restricted resources. The social worker also plays a pivotal role in the co-ordination of discharge planning for the client and works extensively with the family and significant others as well as directly with the client. He boosts the morale of these patients and guides them about spinal cord injury and its treatment. Awareness is created about spinal cord injury amongst medical personnel and common public with the help of print and electronic media. During treatment he helps the patients by making provisions for necessary medicines, different orthosis with the help of voluntary social service agencies. He counsels the patient and the relatives to accept their disability. To make the patient independent by self employment. He arranges for various means of self-employment and thus plays an important role in the vocational rehabilitation of the patient. He also tries to understand and solve the personal, family and social problems of the patients. He creates interest and prepares patients to participate in celebration of different national and religious festivals.

Flag hosting by paraplegic patients
(Celebration of Kite Flying Day)
Social rehabilitation is big challenge for paraplegic as well as his/her family member.

**Family adjustment:**

As an individual with SCI, it is important to recognize that his injury also has tremendous impact on his family. Although they may not have to adjust to losing the use of their hands or ability to walk, his family may experience a loss of the way their life was before his injury. For example, they may have to adjust to the role of care giver. They may need to work to help with family finances. All the changes that they face can lead to added stress and anxiety.

Family members also grieve after injury. They may ask questions to try and understand the full impact of the injury and to help ease their feelings of sadness and fear. As your family comes to accept the injury they face issues of adjustment similar to those you may experience.

Children are naturally curious and adjust to events by asking questions. They ask questions because they make few assumptions about how the injury impacts their life. Therefore, children adjusts rather quickly to an injury if their questions are answered in a clear and honest manner.\(^\text{22}\)
Problems in Family Adjustment to SCI:

As an adult family member, he may have difficulty in adjustment if he has his own irrational beliefs about life after injury. For example, he may hold the false assumptions that individual with SCI cannot work. He may hold the unrealistic idea that “no one” with SCI can or “should” have children. He may hold the irrational belief that he “must” do everything for his loved one who is injured.

Your actions as a family member are reflected in what you say and do for your loved one. If your actions are based on irrational beliefs, you may be unknowingly acting with less than supportive behavior. For example, if you continue to do things for your loved one that he/she can do, your actions may be encouraging your loved one to be overly dependent on others. You may also be reinforcing your loved one’s false assumptions that individuals with SCI should be pitied or felt sorry for because life has treated them unfairly. You may be enabling your loved one to engage in destructive behavior if you ignore or deny the possibility of a problem with substance abuse. Plus, it is also likely that your irrational beliefs will influence your own feelings, which may then lead to unhealthy behavior and unhealthy results. If you experience prolonged feelings of stress and anxiety, you may be putting yourself at risk for serious health problems such as disease or stroke if you not adjust your views of life after injury.  

Healthy family adjustment to SCI

If you are a family member healthy family adjustment is essentially, taking care of you. For example, you can take time away from your loved one to do these things that you enjoy. You can help minimize your stress and anxiety by working to replace your own false assumptions, unrealistic ideas and irrational beliefs. You can start by learning the facts about SCI. Then, challenging your irrational beliefs with evidence to dispute your beliefs. Finally, replace your false information with facts. Hopefully, you will soon discover that you too are living a healthier, happier and more satisfying life.

Who is the SCI caregiver?

After an individual becomes spinal cord injured there is often the need for assistance in one’s daily activities. This can range from help with bathing or dressing and doing one’s bowel program or providing transportation. Today with the change in health care, we see more family members as source of care and support.
Forty percent of all individuals with SCI use some assistance, with more than half coming from family members (PN/Paraplegia News, 1994).

Females are more likely to have a paid attendant as caregiver, while males are more likely to have their spouse or parent assist. (Spinal cord, 1998: 36(5):337-339)
The family caregiver now is providing both emotional support as well as physical care that were once done by health care providers. The family caregiver is now a part of healthcare delivery system. However, the caregiver often receives little or no preparation, support, or recognition for the work they are doing.

Caregivers for individual with SCI face different problems than other caregivers because individuals with SCI have longer life expectancies than people with chronic diseases such as Alzheimer’s or AIDS. This places the caregiver in this role for an indefinite time.25

**Problems facing the SCI caregivers:**

When family members become spinal cord injured, there are many stresses and changes to deal with. First is the worry and concern for individual’s recovery and medical care. Next are problems dealing with money, transportation, and making the home accessible. The caregiver may have to take time off work, change their work schedule, make a job change, or even quit working so they can take on their new role of caregiver.

The family care giver also may face the difficulty role of seeing that the individual with SCI follows their daily program to maintain good health. This means that while they want to give love and support, they must also take on the role of teacher and supervisor.

It is important to understand that the concern and problem of the caregiver usually are not the same. Results from a recent research project show that caregivers see their problem as:

- Negative attitude of the person with SCI
- Caregiver’s feelings of guilt
- Lack of the appreciation for the caregivers
- Not enough time to do their own activities
- Having to say “no” to the person with SCI and
- Feeling overwhelmed
What the caregivers saw as problems mainly focused on the patient and what caregiver had to manage.

On the other hand the concerns of individual with SCI were related to

- Wanting to walk again
- Their lack of sexual function
- Pain
- Bowel and bladder function
- Lack of money
- Not being able to do simple tasks and
- Being anxious

Their problems were more self-oriented. When individuals are aggravated and frustrated in the pursuit of their goals or routine activities, they are more apt react in hostile manner. The caregiver is often the person who is there and becomes the target of their hostility.

Care giving is not a static experience. Caregivers go through ups ans downs. Resources can erode, physical problems can increase and they may experience depression and anxiety. Some situation get better-some get worse. There is no “typical” family caregiver. Each caregiver and the person they care for unique in their personal needs.

**Caring for the caregiver:**

The health and well-being of the SCI caregiver is very important because this can affect the well-being of the individual with SCI. this role as caregiver can place many demands on them. It can impact the caregiver’s health as well as their relationship with the individual with SCI. if the caregiver becomes sick or emotionally exhausted, they may be unable to provide good care. This can cause an increase in secondary complication, such as pressure sores, thereby increasing the healthcare expenses.

Recent research looked at caregivers of individuals with SCI who were in this role for the first time. Their level of anxiety, depression, as well as their physical health was assessed. This information was collected both during the rehabilitation period and throughout the first year after injury.
Researchers analysed the date in a new way, looking not only at the changes in individual characteristics during this period, but also how the changes related each other. This made it possible to see of caregiver’s emotions or health got worse over time, the factors that were related, and how they interacted.

The results showed that, overall for the group, caregiver do not necessarily get more depressed or anxious over the first year. But this can be misleading because there are some who got worse as well as some who got better. An important finding was that the group, on the average, has 3 to 4 more physical health problems during the first year, ranging from sinus problems to body aches and pains.

Although new caregivers as a group were not more depressed or more anxious, this study did show that those caregivers who were more anxious during the rehabilitation stay tended to report more physical health problems initially. This anxiety also lead to more health problems during the first year.

These findings are contrary to the idea that anxiety is related to the newness of the injury and that caregivers will get better when they get home. Instead this research suggests that caregiver stress can get worse. If caregivers are having problems coping right after the injury, they are likely to have problems a year later. This will also affect the caregiver’s health.

Another important findings is related to both anxiety and depressive behavior. During the first year after injury, changes in the caregiver’s anxiety and depression were related to the degree of expressive support. This means if they did not have people with whom they could talk and express their feelings, they tended to have problems and get more depressed and anxious.

When caregiver who were stressed during the rehabilitation period had someone to talk with who offered support when they returned home, their depression and anxiety decreased. This continued to be true during the first year after injury. If however, the support was not there, they became more anxious and had more problems with depression over the course of year.

It is important for caregivers to have other people with whom they can talk. Without this support the caregiver is at greater risk of having problems with psychological adjustment.
Another finding of this study was that caregiver anxiety was related to the age of the patient. The younger the patient, the higher the level of anxiety. This may be because the caregiver is thrown into a situation that was not supposed to happen. It puts them in quandary about life plans, both their own and that of their child. The older the age at injury, the less anxiety on the part of the caregiver. \textsuperscript{22,25}

The important points to remember for caregivers and those working with them are:

1. Level of anxiety is the best overall predictor of health. If a caregiver is anxious during the rehabilitation phase and having health problem- they are more likely to be poorly adjusted. The health care team during rehabilitation needs to be aware of the emotional and physical health of the family member as well.

2. The caregiver needs other people with whom they can talk and express their feelings. If they do not have this support, they are at greater risk for adjustment problems.

**Health:**

Stay healthy. Your health affects how you feel and your ability to handle problems. By being caregiver, you are at risk for more injury and infections. You are doing more physical activity. Be careful when lifting and moving not to strain muscles. You are in contact with more body fluids and waste. This puts you at risk for infection. Wash your hands, take your vitamins and see that the home stays clean.

Take care of yourself. Keep your doctor’s appointment. Eat three nutritious meals each day; get enough sleep/rest; take time to exercise. Find ways to relax and have fun/laugh.

Try relaxation tapes or read a funny book!

**Support:**

Find someone to talk to about the feelings. Spend time talking with a friend each week. Have coffee together or meet after prayer in the temple. If he is unable to leave the house, ask a friend to come and visit with him. Talk to a friend on the phone several times a week.

Join a caregiver support group. This is a place to get together with other caregivers to share feelings, learn new coping strategies, and feel less alone. If there is not an SCI caregiver support group in your area, you may find a general caregiver support group.
One can also find support on the internet. There are “chat rooms” where we can talk with other caregivers. Avoid isolation.

**Assertiveness - Learn to ask - Speak up!**

Not everyone will ask you what you need. It is up to you to tell them how things are and what is you need. Turn to others - a support group, family, friends, or professional counselors - for help. Let your feelings and needs be known. Caregiver must speak up and assert their rights.

Your need and those of your family member with SCI are different. It is very important that you communicate and understand each other.

**Finances:**

Keep your personal finances in order. Be familiar with benefits of insurance policies, retirement funds, health insurance, and other entitlements. Recheck periodically.

Information - Get more information!

Check with your public library for books, articles and brochures on SCI and/or caregiving. Contact the rehabilitation centre where your family member received rehabilitation services and ask the patient educator for more information.

**Problem solving:**

Being able to problem solve is needed skill for all caregivers. Recent research shows that caregivers with a negative problem orientation are likely to experience distress that may result in more health-related problems for the caregivers and the person with SCI. This could lead to health complication for the individual with SCI and result in financial and emotional strain.

**M. Taricco MD, C Colombo MD and team Conducted study on The social and vocational outcome of spinal cord injuries**

(Paraplegia The international journal of Spinal cord Vol-30 March 1992)

Functional status, perception of adjustment, occupational outcome and social functioning were investigated in a group of Spinal Cord Injury (SCI) patients seen at a specialized spinal unit. Functional status was assessed using a standardized scale measuring patients’ performance of specific tasks, and other measures of outcome were investigated by a structure interview.
Almost two thirds (68%) of the patients were independent according to the standardized scale.

Patients’ autonomy appeared to be threatened by architectural barriers in and about the house: approximately one third (34%) of those classified as ‘independent’ on the standardized rehabilitation scale used needed some help in their everyday life.

A negative occupational outcome emerged: compared to the pre-morbid situation, 43 patients (44%) were worse off; 48 (49%) did not experience substantial change—though it be noted that (68%) of these were virtually unemployed (i.e. student, home maker, retired, unemployed) before the injury; and for 6 (7%) some improvement took place.

With a multivariate analysis age was the only statistically significant predictor of poor occupational outcome, with older patients being worse off irrespective of the extent of disease and functional autonomy.

The study helped investigators prepare structure interview for evaluation of social rehabilitation.118

Friedbert B Herm*, Jo Spackman, et al conducted a study on experiences with family supported rehabilitation of people with spinal cord injury; (Asia Pacific Disability Rehabilitation Journal Vol. 11 @ no.1 @ 2000)

Found that family supported rehabilitation is a new consent in Careen Pastures Hospital. Their experience over two years of rehabilitation for people with spinal cord injury suggest that a modified ‘Patna Medical College’ model has great potential for achieving functional independence for patients who would otherwise be un-rehabilitated. The level of independence reached in the hospital setting is maintained after discharge to the care of the community. Outcome assessment was done by modified Barthel Index. There appears to be little correlation between the level of injury or the number of complications (urinary tract infection, constipation, pressure sore, spasticity) and the level of independence attained, although both of these factors influence the length of stay in hospital.

The training of family members as patients also transfers knowledge about spinal cord injury to the community and it is believed that this has a positive impact on the amount and quality of support that the patient receives.
Their first results of family supported rehabilitation were encouraging. Patients on returning to their home setting are active, participating members of their community. On the basis of the results from these first admissions, the rehabilitation unit was opened to incomplete cervical injuries that had previously been excluded, and two such patients have been successfully rehabilitated.\textsuperscript{38}

\textbf{2.6 LITERATURE RELATED TO PSYCHOLOGICAL REHABILITATION:}

Psychological rehabilitation means Restoration of personal dignity and confidence. Physical trauma of paraplegic patient and hid dependency leads him in psychological trauma also.

\textbf{Adjustment after spinal cord injury}

Adjustment is defined as adapting to a new condition. Everyone makes adjustment during their lifetime. Some of the conditions that we adjust to may be planned and we have time to think about how we are going to react to the situations. For example, we may have to make adjustments in our work hours when we start a new job. Other events may be surprised, and we are forced to adjust to an unplanned event.

\textbf{After spinal cord injury:}

A spinal cord injury is one of the most devastating of all traumatic events. It results in a loss of some or all of an individual’s sensation and movement. It is common for individuals who are newly injured to have health problems. Further more, it takes time to build enough strength to be able fully participate in daily activities.

Individuals who are newly injured will likely experience grief. This is a period of mourning that is similar to that following the death of a loved one. The difference is that patient is grieving the loss of his sense of touch along with his ability to walk or use his hands. Patient is likely to experience many different thoughts and feeling after injury. Some may seem extreme and others mild. There is no step-by step grieving process, but some thoughts and feelings are common after injury.

\textbf{Denial/disbelief:}

Patient may first react to his injury as if nothing happened. He may refuse to except that his loss of feeling and movement is permanent. Instead, he may see the injury as an illness similar to a cold or flu that will soon pass with time.
Sadness:

Obviously, no one is happy to be injured. It does not matter what is the level of injury. Extreme sadness is common after injury because person has experienced a great personal loss. Sadness is that down, or blue feeling that he has, when something bad happens. However, it is important that he does not confuse sadness with depression.

Depression is a medical condition that requires professional treatment. He may be depressed if he has symptoms such as extreme sadness, inactivity, difficulty in thinking and concentrating, a significant increase or decrease in his appetite and/or time spent sleeping and feeling of dejection, hopelessness or worthlessness. He may even have thoughts about suicide if has depression.

Anger

Some people react to their injury with strong feelings of displeasure. He might lash out verbally or want to become physically violent toward others. He may feel angry toward yourself if his actions resulted in his injury. He may even feel anger towards GOD or someone else for causing the injury.

Bargaining

At some time following injury, he may begin to admit to himself that he has serious condition. However, he may still want to hold onto the belief that his injury is nor permanent. He may act as if he accepts his injury as “the way things Are”, but his acceptance may come with the belief that he will be rewarded for his prayers and hard work in therapy and eventually recover from his injury at some point in the foreseeable future.

Acceptance

Grieving usually ends as he comes to accept a realistic view of his current condition and find meaning in your life. He begins to thing about his future as an individual with SCI and set goals to pursue in life.

Adjustment to SCI

Individuals who adjust well to unexpected events generally lead healthy, active, and happy lives after their injury. Individuals who do not adapt well to unexpected events
tend to be less healthy, less active, and unhappier after their injury. He basically experiences two primary issues of adjustment to spinal cord injury.

When he is first injured, it takes time to get used to his life after injury. Some people grieve longer than others, so the adjustment period is different for everyone. It may take as much as a year for him to accept the realities of his injury.

He will also experience a continued process of adjusting to the unique issues that occur in his every day life as a person with SCI.

**Problems adjusting to SCI:**

If he has been injured for year or more and has not come to accept his injury, it is a good idea to look into other areas to find out whether or not he is living problems adjusting to SCI. He may find it hard to believe upon first thought, but what happens to him is not as important as what he is thinking when something happens to him. His thinking directly influences how he feels and reacts to event that occur in his life. This concept is basic for Rational Emotive Behaviour Therapy (REBT). Many counselors and psychologists teach REBT as a way to help people with and without SCI gain healthy view of their lives.

**Events**

An event is something that happens to a person. It can be something as small as misplacing the keys of car or something as devastating as a Spinal Cord Injury.

**Irrational Beliefs**

Anytime an event occurs in one’s life, he starts to talk to himself about that event. This self talk is based on what he knows or what he believes to be true. For example, a person who gets a promotion at work might think, “I earned it”.

There are times when this self talk is based on completely partially false assumptions about an event. If he does not know all the facts involved in the event, his self talk may be based on wrong information or a series of unrealistic, irrational beliefs about the event. Some examples of self based in irrational beliefs are:

My life is over because I can never live my life and be happy after spinal cord injury; and I must be able to walk or must be able to use my hands if I am ever again going to be happy.
Although these irrational beliefs are common for individuals who are newly injured, many persons with SCI continue to hold onto these types of unrealistic, irrational beliefs long after injury. These longer he holds onto such beliefs, the more likely it is that he is not adjusting well to his injury.

He may have even adopted other false assumptions that are limiting his acceptance of his injury. Although there are countless possibilities for self talk, some other examples are:

- Because of my injury, it is now impossible for me to ever work or have a family;
- I am less of a person because of my injury
- No one will accept, respect or love a person with SCI;
- People should feel sorry for me and do things for me because my life has been unfair; and
- Everyone will take advantage of me because I can not defend my self.

**Emotion**

One’s emotional response depends on one’s self talk. For example, individual who are newly injured may think that their life is over because they can not live with a spinal cord injury. This unrealistic self talk may lead to extreme feelings such as anger, fear, and/ or other emotional responses, if he has been injured for a year or more, he may feel sad, lonely, hopeless or worthless if he continues to hold onto irrational beliefs such as “no one can possible accept, respect or love a person with SCI.”

It is also important to know that feelings are neither good nor bad. It is normal to feel excited at times and sad at times. He may feel both sad and excited at the same time. Because his self talk might me different from another person, he may feel different from others about the same event.

**Unhealthy behavior**

He can see that his reaction to his feelings may result in behavior that is bad for him overall heath and happiness. For example, he may not see the need to take proper care of his bladder or skin if he feels worthless. He may isolate himself from others and avoid spending time with family and participating in other enjoyable activities.

Individual with a history of alcohol and/substance abuse may return to their old pattern of self destructive behavior. Other may start drinking or taking drugs. Either way,
substance abuse is unhealthy behavior. People who abuse alcohol will deny there is a problem, but it is estimated that individuals with SCI abuse alcohol at about twice the rate of the general population.

Do you have a problem with substance abuse?

1. Have you ever felt you should cut down your drinking or drug use?
2. Have people annoyed you by criticizing your drinking or drug use?
3. Have you ever felt bad or guilty about your drinking or drug use?
4. Have you ever taken a drink or taken drugs first thing in the morning as an eye opener to steady your nerves or get rid of hangover?

Professional often ask these four questions to help identify person with a drinking problem. If one answered “yes” to one of the above questions, it is a warning sign that he may have a problem with alcohol abuse. If he believes that he or a member of his family has a problem with alcohol or substance abuse, seek help! Ask a family member, doctor, or clergy to help to find help.

Unhealthy results

Unhealthy behavior almost always leads to unhealthy results. When one neglects personal care, he puts himself at greater risk for developing a wide range of health problems such as respiratory complications, urinary tract infection, and pressure sores. These problems can limit his ability to participate in activities. In some extreme cases, he may die. Substance abuse can complicate existing medical problems or lead to other health problems. Substance abuse can also lead to other injuries and a loss of personal relationship.

Healthy adjustment to SCI

No matter what the event, he knows that it triggers self talk. These ideas, thoughts, and/or beliefs lead to his feelings. His behavior and the result of his behavior are guided by his feelings.

One of the biggest keys to adjusting to spinal cord injury is personal motivation.

Individuals who are newly injured are often motivated to attend therapy sessions out of a desire to gain strength and function. He probably has a strong belief that his paralysis is only temporary, and he will soon return to his old “normal” self. This hope is a common reaction after an injury. Unfortunately, it is far more likely for individuals to
recover function based on their level and completeness injury. In fact, only a few people actually fully recover from their injury. Almost all individuals with SCI continue to hope that they will walk again one day. However, a cure for paralysis may or may not come in a lifetime. A health approach to this reality is to move forward with life with injury with the continue hope that advances in medicine will one day lead to a cure. In other words do not wait on a cure but proceed with life!

People who adjust well to injury are usually motivated to meet personal goals. These goals are different for everyone and often change throughout life. For example, patients goal today maybe to get a job, and he may want to have children in future. Research shows that people with SCI who are goal oriented are less likely to be depressed and more likely to obtain some acceptance of their disability than persons who are not goal.

   However it is up to him to find purpose in his life and the motivation to achieve the goals. It may help to think about what he wanted out of his life before he was injured. For example he may have once strived for good health, and enjoyable job and a loving family. There is no reason that he cannot continue to strive for the same things now that he has a spinal cord injury.

**Replacing Irrational beliefs with Rational beliefs:**

   Once patient has motivation for change and sets his personal goals, he may find it easier to identify unrealistic, unfounded information and false assumptions. One can help oneself avoiding irrational beliefs by not using words like always, never, no one, everyone and other “all or nothing” words.

   Over exaggerating (making something small into something big, or something big into something impossible).

   Focusing only on negatives and ignoring the positives.

   Thinking things “should” or “must” be a certain way.

   Trying to predict the future.

It does not matter what is the level of injury, he can challenge his irrational beliefs and replace his false assumptions with information that is based on facts. It is up to him to take time to learn the facts about living with SCI. An individual who is newly injured may want information on bladder or bowel management. An individual who has been injured for a year or more may want information on employment or sexuality.
When patient is looking for education information, only rely on information that comes from knowledge source on issue on SCI. For example most rehabilitation facilities offers patient education classes for individual who are newly injured. Infact he may have been given an informational booklet to take home with him from the rehabilitation centre. He can also easily get educational information on the internet.

Websites such as the National Spinal Cord Injury association and the spinal cord injury information network have information indexed by topics. This websites are great starting points for anyone looking for information to assist in everyday living with SCI. Your may have access to the internet, at home, school work or at your local library.

One can learn to recognize those beliefs that are based on false assumptions for example;

“My life is over because I can never live or be happy after a spinal cord injury”. Individual who are newly injured often use this irrational belief as a way to deny the possibility that their injury is permanent. Individuals who have been injured for over a year may use this statement as a reason to do nothing. To dispute this assumption you focus on the word never, it is similar to words such as “always”, “everyone”, “No one” and “must”. This is “all or nothing” thinking. By using these words you are not allowing your self to believe that there are other possibilities. According to the National Spinal cord statistical centre’s “Facts and Figures at a glance” there are about 2,43, 000 people in the US alone who are currently living with SCI. you are ignoring the fact that many, if not most of the people with SCI are happy.

“Although I hope that my injury is not permanent and I fully recover, I know that many people are happy and living many years with all levels of injury”. This type of rational self talk is supporting your hope for recovery, but it also supports the facts that you can be happy and live with or without an injury. Patient is recognizing the fact that people with same level of injury are living and are happy.

“Because of my injury, it is now impossible for me to ever work or have a family”. This is a first assumption that many people hold on to long after injury. There are some individuals with SCI, family members, friends and other in the community that wrongly believe that “no one” with SCI can work, especially those individuals with high levels of injury. They may wrongly believe that you cannot get married or have children because
you have physical limitation. Patient may even find it hard to imagine that he can work or his family or friends may try to discourage him from becoming a parent especially if he needs help with his own care. These are false assumptions that one can challenge with facts.

“Although I have a injury and physical limitations to what I can do, I can put myself in a position to work and have a family if that is what I want.” This rational self talk acknowledges the fact that he has an injury. In reality he may have a physical limitations that prevent him from doing some jobs which may include the same job that he did before his injury. For example, if he was a construction worker before his injury it is not likely that he can return to that job if he has a high level injury. However, this fact does not mean that he cannot work. With job retraining and support from your family, friends, and employer he may find there are number of jobs that he can do. As far as having a family, he might wish to know about people who are married and have children before injury. It is irrational to think that people who are spouse and parents suddenly become “bad” spouse or “useless” parents simply because they become injured. The facts are to the contrary. Individuals with SCI continue to be loving, caring and supporting spouse and parents no matter what their level of injury. This fact also applies to people who want to have family after injury. Although he may need to find ways to get things done, he need not base his desires to have a family solely on his physical limitations.

**Emotions**

Once patient challenges his irrational beliefs and replace them with beliefs that are based on facts, he is likely to feel differently instead of feeling sad, he might feel hopeful about his future. Instead of feeling worthless, he might begin to feel that he has a value as a person, spouse, parent and an employee.

**Health behavior**

When one begins thinking more rationally and experiencing a change in his feelings. He will usually act differently. If he has set goals for himself, he may make plans on how he intents to reach his goal. He might then might take better care of himself so that he can reach his goals. This is healthy behavior! It is the action one takes to improves one’s life.
Different people have their own way of getting things done. He may find that he can no longer get things done the same way as before his injury. It may be necessary to ask someone for help when he needs it, but he may want to hold onto his irrational beliefs that he “must” do “everything” on his own. When he challenges his irrational beliefs, he may realize that people, both with and without SCI, help each other in many ways. This help may be as little as one person opening a door for another person. Some people simply get more help than others. When you ask for help, you are simply finding ways to overcome obstacles and get things done.

It may be necessary for him to find other ways to get things done. UAB (University of Alabama at Birmingham) is among the leaders in SCI research. In their studies of individuals with SCI and their family caregivers, evidence shows that good problem solving behavior can help individuals with SCI avoid medical problems, and reach their goals.

**Effective problem solving**

Define the problem as clearly as possible. Brainstorm: Make a list of all the possible solutions as one can. Review your list and pick the solution that you think will best solve your problem. Try out solutions. Ask yourself, “Does it work?” Try another solution if your problem is not solved.

**Healthy Results**

Hopefully you will notice that healthier behavior leads to healthier results. When he takes care of his health, he gives himself more of an opportunity to get out into the community and participate in enjoyable activities. He can solve the problems that prevent him from doing those things that he desires. He may soon discover that he is living a healthier, happier, and more satisfying life. It may take time, but he can reach his goals.

G GWhiteneck PhD, S W Charlifue MA conducted study on Mortality, Morbidity and psychological outcomes of persons spinal cord injured more than 20 years ago. Mortality, morbidity, health, functional, and psychosocial outcomes were examined in 834 individual with long term spinal cord injuries. All were treated at one of two British spinal cord injury centres: the National Spinal Injuries Centre in Southport; all were 20 or more years post injury. Using life table techniques, median survival time was determined.
for the overall sample (32 years), and for various subgroups based on level and completeness of injury and age at injury.

With the number of renal deaths decreasing over time, the cause of death in the study group as it age began to approximate those of the general population. Morbidity patterns were found to be associated with age, year post injury, or a combination of these factors, depending upon the particular medical complication examined. A current medical examination of 282 of the survivors revealed significant declines in functional abilities associated with the aging process.

The study helped

Decline with age also were found in measures of handicap and life satisfaction, but three quarters of those interviewed reported generally good health and rated their current quality of life as either good or excellent.\textsuperscript{126}


The psychological consequences and means of measuring adaptation to the disabilities and handicap of acute traumatic spinal cord injury (SCI) are poorly understood. The development of depression, the wish to die, non compliance with treatment, poor motivation with rehabilitation and various forms of self destructive behavior including suicide may all be regarded as sign of poor adjustment.

Study design: case study

The rate of suicide following spinal cord injury has not been extensively studied but appears to be greater than in the general population. Six patients who died by suicide, from a total of 342 patients who were treated for acute spinal cord injury over a 5 year period are described. Clinical features shared by this group of patients included being male; having schizoid, depressive or narcissistic personality traits; alcohol or drug abuse; family or significant others favouring death as a proffered option; and development of significant depression.

Studies have shown that 50% of SCI patients describe suicidal thoughts but the actual frequency of suicide is unknown.\textsuperscript{36}
This study gave vision to investigation for understanding psychological problems as paraplegic patient and also gave insight for preparing tool. Furthermore, study helped investigator for research methodology as case study approach used in the study.

F.K. Judd, MD, J.E. Webber DPM Conducted study on Psychological adjustment following traumatic spinal cord injury: a study using the psychological adjustment to illness scale. Vol 29 -1991

Using the psychological adjustment to illness scale (PSAI) psychological adjustment to traumatic spinal cord injury (SCI) in 52 patients were assessed. Female and paraplegics tended to show better adjustment than males and quadriplegics. Older individuals, those with a history of depression following SCI and those with a history of alcohol and drug abuse predating SCI tended to be less well adjusted.  

This study helped investigator to identify correlation factor of adjustment.
2.7 LITERATURE RELATED TO VOCATIONAL AND OCCUPATIONAL REHABILITATION

Occupational therapy services:

Paraplegia hospital has advanced and well equipped occupational therapy department. Here the occupational therapist are treating the spinal cord injury patients through different therapeutic activities, work, play etc. in scientific way to achieve a goal of maximum independence so that patient can live a nearly normal life.

Occupational therapy treatment starts in the ward. It includes assessment of patient’s neurological status, functional assessment, giving patient upper limb strengthening exercises, breathing exercises, recreational activities and self-care training.

Once the patient’s immobilization period in the ward is completed, tilt table activity from 45 degree to 90 degree is started in occupational therapy department. When the patient completes tilt-table activities upto 90 degree without any complication, the patient is advised to sit in wheelchair.

Patient sitting in wheel chair undergoes following treatment programme in occupational therapy department:

Morning outdoor sports:

Which includes upper and lower limb strengthening exercise, to improve sitting balance and sitting tolerance, push ups, group activities etc. ⁸⁰

Co-ordination Exercise:

Exercise to improve hand function for quadriplegia patients.

Transfer activity: Transfer from wheelchair to Bed, to floor level and from ground to wheelchair. ⁸⁰

A.D.L. Training:

Brushing teeth, eating, drinking, and dressing understanding, toilet activity etc. and kitchen activity training for female patients. ⁸⁰

Functional Aid Training:

Propelling wheelchair, driving tricycles and use of other mobility aids. ⁸⁰

Indoor Games:

Carom, Chess, playing cards, Table tennis and other indoor games for recreation and creating interest, zeal and enjoyment in life.
Pre-vocational Training is given for achieving self-sufficiency in future, which is essential to live respectfully its life.

In this way patient’s physical, social, psychological, emotional and economical aspects are taken care of during treatment in occupational therapy department.

After getting discharge from the hospital, patients come for follow up in outpatient department where the occupational therapist evaluates patient’s neurological status, ADL status and necessary treatment is advised. (Paraplegia in-house magazine).

**Vocational area:**

Patients are given pre-vocational training & opportunity for different vocations & occupations. They are given work of chair knitting, cover making, Mahediwork, sewingwork, AmbercharkhaHandicraftwork, kitchen work etc.

Vocation is an important part of our life. Paraplegics are young adult main bread earner.

After the injury many of them are not in position to return to original job. Patients are evaluated for their physical potential, educational level and about their special skills for earning. A suitable alternative job is advised to them. They are given information about the PWD act 1995 and the benefits from Government and how they are protected by law. By involving the NGO like Red cross, Lions club, Rotary club etc. patients are given necessary help by NGO in form of money or kind e.g. Sewing machine, cutlery articles, Ready made garments etc.


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STUDY DESIGN: Clinical controlled trial. OBJECTIVES: To evaluate the effectiveness of an occupational therapy (OT) program combined with neuromotor rehabilitation, by assessing the degree of functional independence reached by patients with spinal cord injuries at first hospitalization.
2.8 LITERATURE RELATED TO SEXUAL REHABILITATION

The disable are people, and people are sexual. Much of our sense of personhood comes from our ability to play a sexual role. The disabled share with the best of us the misfortune of living in a society that has traditionally avoided and censured sex.

The disable person’s first hurdle in overcoming these obstacles is self reprogramming-rejecting the idea that he or she is not a potentially sexual person and is not loveable by any person. The second is effective militancy-doing something about it. For couples with a disablement problem, the most helpful step is discussion with other individuals or couples who share the problem and counseling each other.

Social convention that sex consists of putting the penis in the vagina that all the rest of rich rang of human and mammalian sexual responses - oral, manual and skin stimulation - are abnormal. Human sex is widely versatile and not limited to genitalia.

Many people believe that a satisfy sex life is not possible for the person with spinal cord injury. Fortunately, some are now finding that sexual satisfaction is possible for those who wish to seek it, whether or not they are capable of non handicapped methods of sexual expression. Your sexuality is your responsibility, as much as your actions within society. Patient should think himself as a sexual being and feel good about it. The importance of good personal hygiene for a better self – image and appealing appearance stressed enough. This is true not only for a sexual relationship but for general health as well. Communication is the essence of all relationship. But for the patient, because of situation, it takes on more importance. During a relationship, there are various stages of trust and communication.

Truthfulness about patient and his capabilities at the beginning of the relationship can prevent problems of unrealistic expectations and disillusionment later. Those paraplegics and quadriplegics, either male of female, who can not achieve a physical orgasm, might ask themselves, why? If I can’t have an orgasm, what is the use? It is our opinion that you do not have a physical orgasm to achieve sexual satisfaction.

Preparing fore-play

Some forethought and discussion with the partner about the necessary mechanics can make getting ready and into bed a turn-on for both of them. Often, just before sexual activity, it is helpful to go into the bathroom and prepare by cleaning up. It is not always
necessary to remove the catheter from penis before attempting intercourse. The catheter may be bent and folded along the shaft of penis where it will be out of the way. In the case of female paraplegic and quadriplegic the catheter also be pushed aside and portioned out of the way.

By talking to each other about sexual topics, fantasies, or the activities want to be experienced, the mere verbalization of the sensation or reactions can brings the patient and partner to such a level of arousal that they both will be ready for physical contact. It can be kissing, hugging, patting, or caressing each other while listening to music or watching a television, either on a couch or in wheelchair, inside, or in a car. Patient may find that stroking partner’s breast, vagina, or penis, having the partner stroke patient’s or both simultaneously. This can be done with hands or with a vibrator, or which there are different types.

Not only the pleasant smell and taste of oil, but if patient and partner choose to use the option of oral-genital simulation or just licking or sucking parts of each other, the oil enhance the sensation. Using mirrors and having good lightening in the room enables you to view each other’s reaction better. Electric battery powered vibrators are especially nice for massaging if hands lack dexterity.

A reflex erection of the penis results from internal or external stimulation around the penis. Often, it can be achieved by manipulation with partner’s hand. For some people, stimulation around rectal opening helps to achieve an erection. In most cases the erection can be maintained for as long as stimulation is present.

**Intercourse**

Men who have spinal cord injuries very low in the back may be unable to have a reflex erection at any time. In this situation a technique called stuffing could be especially helpful. This method can give the partner the sensation of holding the penis in the vagina without the need of erection. In the stuffing technique, the disabled male can assume the dominant position and normal female with her fingers, tuck his flaccid penis into the vagina, female partner takes the soft penis into her vagina with a sort of pulling, sucking movement. The Kegel exercise can aid the able-bodied woman in developing these muscles to a high degree, which can also heighten enjoyment.
For female paraplegic or quadriplegic, the male partner assumes the position on top patient’s leg can be placed around him. Female patient’s legs can also be held up to her chest so that the male partner is lying on the back side of her thighs.\textsuperscript{19}

For paraplegic male, with practice he can learn to have intercourse in the on top position. If his arms are strong, he can achieve a great deal of friction and motion between the penis and vagina by doing push-ups from the on-tops position. When the woman assumes the position on top, the disabled male partner, and has her legs straddling his body, she will then have more freedom for hip and pelvic movement.

In order to get better body motion, patient may want to consider a water bed. A feature of the water bed is valued by some paraplegics, particularly those with a high-level injury, is that the motion of the mattress gives them more body movement during foreplay and intercourse. If leakage of a urinary appliance or the occurrence of a bowel movement during intercourse is a seemingly insurmountable problem, patient and partner can lessen the chance of an accident by using a little care in their positioning. If patient is wearing a catheter and desire intercourse during her menstrual period, she run the risk of a bladder infection should the catheter café against either her or her partner. If she wishes to have intercourse during her menstrual period, she may want to douche first cold water. This usually stops the flow of blood for a while.

**Oral–genital and manual stimulation**

Patient may find that he receive more pleasure with this option, partly because lips and tongue which have not been impaired by injury, are more sensitive to touch and temperature than any other part of body. In addition, the sensations received from the smell, taste, and texture of partner’s skin are heightened and could be quite a turn-on for patient.

Oral-genital sexual activity can be done mutually by two partners who position themselves in a way that make each partner’s genitals easily available to the other’s mouth. The battery-powered electrical vibrator is an especially convenient and pleasure-giving device for stimulating a woman’s genitals.\textsuperscript{119, 127}
S W Charliflue MA, K AGerhart MS Conducted study on Sexual issues of women with spinal cord injuries. Paraplegia The international journal of Spinal cord Vol-30 March 1992

The need for research addressing problems unique to women with spinal cord injuries is well documented. Consequently, 231 such women, ages 18 to 45 were surveyed. Demographic characteristics and data relating to relating to physician usage, female hygiene, pregnancy, contraception, and sexuality were collected. Analysis reveled that 60% of the respondents had post injury amenorrhea; the average time until menses resumption was 5 months. The group’s post injury pregnancy rate was one third its pre injury rate, but women with incomplete paraplegia had significantly more pregnancies than those with complete quaderipegia. Out of 47 women who did carry babies to deliver, one-half had vaginal deliveries; 49% used no anesthesis. Problems during pregnancy included autonomic hyperreflexia, decubitus ulcer, urinary tract infection, water retention, bladder and bowel problems, anemia, spotting, fatigue, cardiac irregularity and toxemia. Many of these problems plagued the women duringlabour and delivery and in the post partum period as well.

Sixty five percent of the women were satisfied with their post injury sexual experiences, although self confidence, spasticity, and lack of spontaneity were issues. Although satisfied with care received from physician, many women were not content with the information provided during rehabilitation, and felt a need for more literature, counseling, and peer support.

Conclusion: There clearly is a perceived need for more and better information and counseling services for women with spinal cord injuries, despite the fact that there may have been improvements in recent years. This study, by documenting self image changes, and issues and concern regarding sexual activities, contraception, pregnancy, and child rearing, may be of help in identifying specific areas where professional and peer support can be of benefit. 117
V. Nikas, MD, P. Fleischman, MSW, AND P. Burton, MSW

Conducted study on Sexual and marital adjustment of world war II Spinal cord injured veterans. Paraplegia The international journal of Spinal cord Vol-30 March 1992

A Survey of the marital and sexual adjustment of world war II spinal cord injured veterans was undertaken at the Spinal Cord Injury Outpatient Clinic at the VA Medical Centre, Sepulveda, California. A questionnaire containing 42 questions was sent to 40 of these veterans who had survived more than 40 years after their injury. Fifteen of the questionnaire were completed, with the result categorized in three areas: Demographic information, Medical information, and marital and sexual information. Eighty percent were married after their injury; 73.4% were married to their original spouse. Two thirds of the SCI veterans fathered children. Of the fathers, 70% fathered children after their injury. 46.7% rated sex as unimportant in their lives, yet many reported that their sexual lives were unsatisfactory. Sex was not openly discussed with their spouse although 55% reported excellent communication with their wives and 70% reported spending their leisure time with their wives. A significant response was the 86.6% of the subjects recommended marriage as a way of life for persons having a new spinal cord injury.

This study is helpful in preparing tool. The tool has fourteen items. It is unstructured tool and reliable and validate to assess effectiveness of sexual rehabilitation.124

2.9 SUMMARY

This chapter helped investigator to develop tool, analysis and interpretation of the data. Review of literature suggests that there is need to conduct the study on comprehensive aspects of rehabilitation.