

# Upper Limb Rehabilitation Following Spinal Cord Injury

## Executive Summary

### **What functional impairments occur to the upper limbs following spinal cord injury?**

SCI can result in complete or partial paralysis of the upper limbs depending on the level and completeness of the lesion. Sensory and autonomic deficits, as well as pain, are also important consequences of SCI that can impact upper extremity function. The use of the upper extremities is critical in completing basic activities of daily living, such as self-feeding, dressing, bathing and toileting. The upper extremities also play a significant role in mobility needs, as transfers, transitional movements, and wheeled mobility are completed using one's arms (Snoek et al., 2004). The level of assistance required may range from completely caregiver dependent to partially functional in activities of daily living, social/recreational activities and work related activities (Yozbatiran & Francisco, 2019). Accordingly, restoration of upper limb function was rated above control of bladder and bowel function, spasticity, pain and sexual function in individuals that have experienced a SCI (Ward & Power, 2019).

### **What are the chances of recovering upper limb function following a spinal cord injury?**

The level of function/independence recovered is influenced by completeness and level of injury (cervical vertebrae C4-C7). In complete SCI (AIS A), no neural transmission occurs below the point of injury (Courtine & Sofroniew, 2019). However, a motor level recovery of two or more levels is rare in those with cervical complete SCI; typically, a recovery of one level occurs (Courtine & Sofroniew 2019). In contrast, in incomplete spinal cord injuries (AIS B, C, D) some neural transmission can still pass through the spinal cord (Courtine & Sofroniew 2019).

The level of injury also plays an important role in determining the outcomes of functional recovery. The most detrimental outcomes are observed if C4 is affected (Nas et al., 2015). At this level of injury, a patient will be able to manage their respiration but will otherwise be completely dependent (Nas et al., 2015). If C5 is affected, the patient will have a better prognosis as they may have active elbow flexion but will still need assistance with ADLs (Nas et al., 2015). Improvements in functional independence are often associated with injury to level C6 or C7 (Nas et al., 2015). Injury to C6 allows for active wrist extensions and a hand grip may be achieved with tenodesis (Nas et al., 2015). This allows for an individual to be independent in activities like nutrition, self-care and hygiene (Nas et al., 2015). Furthermore, injury to C7 allows active elbow extension in addition to active wrist extension (Nas et al., 2015). Therefore, individuals with this injury are capable of transferring successfully in a wheelchair and may have increased independence (Nas et al., 2015).

### **What management options are there for upper limb functional impairments after spinal cord injury?**

Some standardized rehabilitation procedures have been established, however, there is no consensus on the most effective therapeutic options. However, the treatment approach is dependent on the severity/level of injury and the client's goals for rehabilitation.

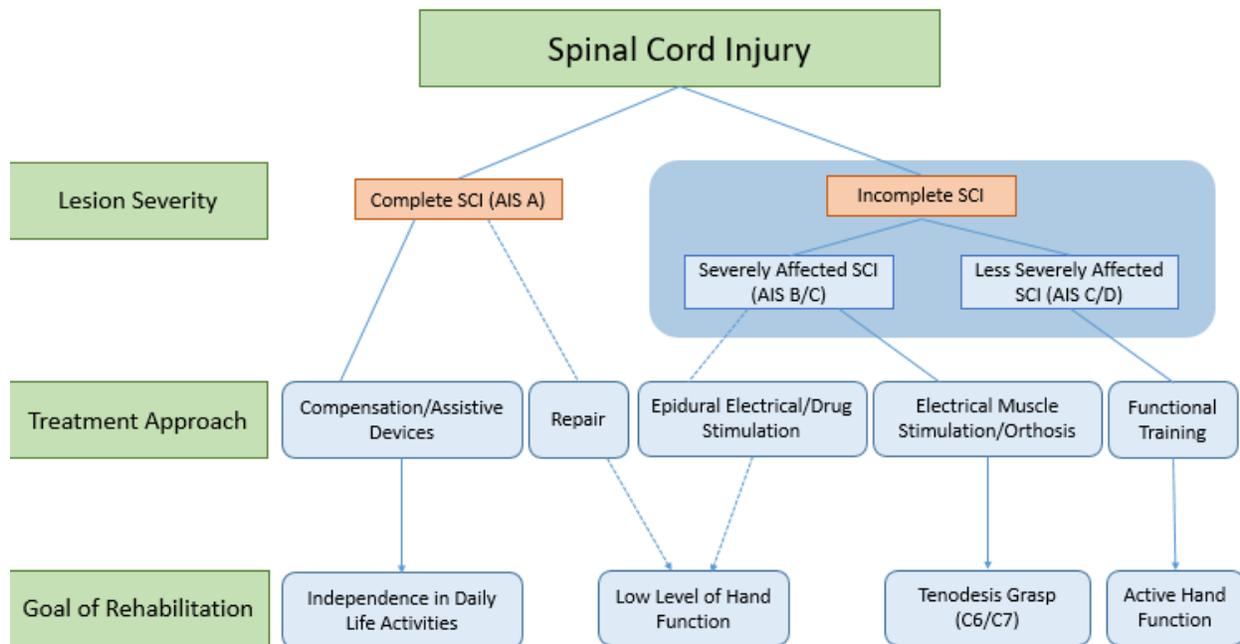
## Non-Pharmacological Options

- Therapy based interventions
- Sensorimotor stimulation interventions
- Surgical interventions
- Complimentary and alternative medicine
- Technology based interventions
- Non-invasive brain stimulation interventions

## Pharmacological Options

- Baclofen
- Neuromuscular modulator

Taken together, the severity of the lesion dictates the treatment approach and the goals of rehabilitation, which are summarized below.



Adapted from Dietz & Fouad, 2013.

