

# **Recommended Knowledge and Skills Framework for Spinal Cord Medicine**

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**Approved by The International Spinal Cord Society**

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## **INTRODUCTION**

*This framework was developed by ISCOS to bring together the broad skills and competencies that a trainee would need to develop to work as a medical practitioner looking after people with spinal cord impairment.*

*Important: It is anticipated that trainees undertaking Spinal Cord Injury Medicine (SCM) training will have previously completed or be undertaking a broad based Physical Medicine and Rehabilitation (PMR) / Rehabilitation Medicine (RM) training. Where that is not the case, additional training will be required to meet the broad based knowledge and competencies expected from a PMR programme. All the generic competencies, knowledge and skills as set out in the PMR / RM curriculum should be satisfactorily met by the trainee in addition to the SCM requirements at the end of training. The entry criteria and curriculum contents for PMR programmes vary from country to country. Excellent examples of this include RM curriculum from the Royal College of Physicians in the UK and the RM curriculum from The Royal Australasian College of Physicians*

*The following curriculum addresses only the requirements in spinal cord injury medicine. ISCOS recognises that there will be considerable variation internationally not only in service delivery models but also in resources, facilities and staff availability. It is hoped that the SCIM curriculum set out below will serve as a template for SCM training programmes but there is recognition that the curriculum will have to be modified to meet local and national requirements.*

*Context – Spinal Cord Medicine is practiced internationally in varying settings spanning varying levels of incomes, social settings, cultures, beliefs and expectations. The practice of spinal cord medicine should take into account the specific context in which the practice is being delivered and the training should reflect the social, cultural and economic context where delivery of SCI services will be implemented. It is of utmost importance to recognise that the expected outcomes will change in different settings and can be influenced by cultural factors and caregivers' expectations. Training in SCM should aim to develop aptitudes, skills and knowledge that are relevant to the context in which the service is delivered.*

### *Structure of the Document*

*This document is divided into 3 broad domains consisting of*

*Knowledge – the background theoretical and academic knowledge that a trainee should have to successfully undertake the practise of SCM and to help develop his / her skill set*

*Skills and competencies - are the proficiencies that the trainee will develop through training or experience and which is helped by the acquisition of knowledge*

*Procedural skills – these are specific interventional skills, which require additional training and practice. The development of such skills will be based on the needs of the system / country that the trainee is working in*

*Miscellaneous skills and knowledge – which are additional to the core knowledge and skill set, which apply to specific situations / conditions*

# 1. DOMAIN: KNOWLEDGE

The trainee consistently demonstrates a knowledge of the:

- 1) Anatomy and physiology of the spinal column and spinal cord , concepts of spinal stability, physiology of bone metabolism, biomechanics of the spinal column.
- 2) Physiology of changes following trauma and patterns of injury related to spinal cord injury
- 3) Autonomic changes associated with a spinal cord injury – early and late and its impact on cardiovascular function
- 4) Evaluation of a patient who has sustained major trauma, including knowledge of primary and secondary survey; Knowledge of common associated injury patterns.
- 5) Safe moving and handling techniques, prevention of secondary injury and complications
- 6) Level of function expected at different levels of spinal cord injury
- 7) Restoration of spinal stability including techniques of reduction / temporary stabilization and the role of surgery
- 8) Principles of non-surgical management of vertebral column injuries
- 9) Role of drugs / neuroprotective agents
- 10) Importance of timely transfer to a specialist spinal injury setting and role of early rehabilitation
- 11) Early medical care of SCI - management of and role of partnership with other medical teams including surgery, orthopaedic surgery, emergency medicine and other appropriate physicians, nursing and allied health staff in an acute hospital settings, including intensive and critical care units, in managing the core aspects such as respiratory treatment, pressure ulcer prevention and management, hypotension, neurogenic shock, bladder and bowel management including acute urinary retention, GI dysfunction including acute abdominal distension and paralytic ileus, temperature control, orthostatic hypotension, venous thrombo-embolic prophylaxis, positioning for prevention of contractures and heterotopic ossification
- 12) Pathophysiology of changes in the respiratory system consequent to a spinal cord injury including knowledge of levels of respiratory dysfunction at different levels of spinal cord injury; impact of ageing on respiratory function. Pathophysiology and clinical features of sleep apnoea in spinal cord injury
- 13) Principles and the role of radiological and non-radiological imaging in SCI
- 14) Pharmacologic alterations associated with SCI, changes in pharmacokinetics, pharmacodynamics, drug interaction, over-medication and compliance
- 15) Specific problems associated with continued spinal cord and brain dysfunction
- 16) Principles of management of the paralysed upper limb including principles of positioning and splinting

- 17) Pathophysiology and mechanisms of neuropathic pain; Principles of assessment of pain (Neuropathic and musculoskeletal)
- 18) Pathophysiology of spasticity including the role of trigger factors. Principles of assessment of spasticity and contractures
- 19) Pathophysiology of neurogenic bladder
- 20) Pathophysiology of neurogenic bowel and long term problems associated with neuropathic bowel dysfunction
- 21) Sexual dysfunction following spinal cord injury including fertility and reproduction
- 22) Aetiology and pathophysiology of pressure ulcers; Knowledge of risk factors and prevention. Principles of conservative and surgical management of pressure ulcers
- 23) Effects of spinal deformity on respiratory function
- 24) Functional goals for self-care, mobility, vocational and recreational activities
- 25) Psychological issues including reaction to disablement, impact on family, sexuality, theories of adjustment to disability and strategies to promote independence (bio psycho social model)
- 26) Epidemiology, aetiology, incidence and prevalence, morbidity and mortality, costs, long-term outcomes of traumatic/non-traumatic SCI
- 27) Physiology of ageing and recognition of common medical problems
- 28) Common causes of non-traumatic spinal cord injury including progressive conditions such as metastatic spinal disease.
- 29) Kinesiology of upper extremity function and the use of muscle substitution patterns in retraining
- 30) Discharge planning, care in the community, liaison with outreach services, care and resources in the community, commissioning of care
- 31) Rationale for and principles of continuing long-term follow-up
- 32) The role of cultural, religious, societal and economic factors that influence rehabilitation outcomes following spinal cord injury
- 33) The impact of spinal cord injury on the wider family unit and the influence of care giver expectations on spinal cord injury rehabilitation outcomes
- 34) Long term complications associated with a spinal cord injury such as osteoporosis, syringomyelia
- 35) Outcome measures and the various outcome measures used in spinal cord injury management
- 36) Assessment of a person with cauda equina syndrome
- 37) Management of people with spinal cord dysfunction related to congenital anomalies and their special requirements
- 38) Neuromodulation in general and specifically as it refers to SCI

- 39) Research in the field of spinal cord injury generally and specifically with reference to translational research and research in spinal cord injury rehabilitation.
- 40) Assessment of a child with spinal cord dysfunction
- 41) Awareness of International Spinal Cord Injury Data Sets and their role in clinical research in the field of spinal cord medicine

## **2. DOMAIN: SKILLS AND COMPETENCIES**

*The trainee consistently and effectively demonstrates the following skills:*

### ***Acute Management***

- 1) Examine the acutely injured patient and complete a detailed neurological examination including level and density of the lesion according to the international Standards for the Neurological Classification of SCI (ISNCSCI). The trainee demonstrates an understanding of alternatives such as the Frankel scale and is able to use this when necessary.
- 2) Identify associated injuries and do a primary and secondary survey
- 3) Evaluate the stability of the spine including imaging evaluation (x-ray, CT, MRI); understand the options for treatment of fractures/dislocations including understanding of indications, benefits, limitations, complications and neurological hazards of spinal surgery, techniques of appropriate spinal immobilization, including spinal orthoses, their components and indications;
- 4) Institute and coordinate conservative treatment whenever advantageous to the patient
- 5) Monitor the evolution of neural dysfunction in order to recognize conditions that may require additional evaluation, consultation or modification of treatment such as a haematoma
- 6) Institute measures for prevention of complications such as venous thromboembolism (VTE), stress ulcers, bradycardia, hypotension
- 7) Manage complications in other body systems resulting from spinal cord injury, especially the pulmonary, genitourinary, endocrine, metabolic, vascular, cardiac, gastro intestinal, musculoskeletal and integumentary systems. The trainee should have an understanding of and be able to recognize spinal and neurogenic shock and the change of function of various body systems in relation to change of reflex activity and modification of management with changes.
- 8) Work collaboratively with a multidisciplinary team consisting of other medical and non-medical professionals in ensuring optimal treatment throughout the treatment pathway.
- 9) An awareness of his / her limitations and knows when to seek help.

## ***Respiratory System***

- 10) Examine, assess and determine the need for respiratory support. The trainee in conjunction with other professionals should be able to coordinate treatment, have knowledge of indications for tracheostomy and be able to coordinate management of airway obstruction, atelectasis, pneumonia, tracheal stenosis, assistive respiration techniques including ventilator-dependency and ventilator weaning. The trainee should have a good understanding of the role of phrenic nerve and diaphragmatic pacing, portable ventilators and additional measures required for domiciliary ventilation. The trainee should have a good understanding of the role of noninvasive respiratory interventions including BIPAP and CPAP and be able to prescribe them where appropriate; awareness of other respiratory interventions and ability to institute such interventions or refer when necessary.

## ***Spasticity***

- 11) Assess spasticity levels, differentiate between spasticity and contractures and assess gait patterns where appropriate.
- 12) Manage spasticity with appropriate pharmacological and non-pharmacological measures.
- 13) Understand the role of trigger factors in exacerbation of spasticity and be able to identify them and treat appropriately.
- 14) Carry out an assessment for Intrathecal baclofen therapy, be able to refill such a system and be able to trouble shoot it where necessary
- 15) Differentiate between focal spasticity and generalized spasticity. Be able to prescribe and where appropriate undertake measures such as intramuscular botulinum toxin injections and phenol / alcohol injections.

## ***Pressure Ulcers***

- 16) Assess pressure ulcers and grade them. Evaluate and manage skin problems utilizing various techniques of prevention such as the proper use of specialized beds, other surfaces, cushions, wheelchairs, etc.,
- 17) Determine the indications for various surgical procedures including resection of bone and the development of flaps and other techniques for soft tissue coverage in consultation with surgical colleagues.
- 18) Develop an understanding of the pre- and post-operative management of these patients and be able to institute appropriate management where necessary.
- 19) Advise on and prescribe on the entire range of interventions including expectant treatment, use of different types of dressings, wound debridement, surgical management of pressure ulcers, maggot therapy and vacuum dressing.
- 20) Assess and advise on the use of concomitant therapies including dietary, trace element and vitamin supplementation. Seek formal dietary advice when necessary
- 21) Perform basic debridement procedures.

## ***Upper Limb, Functional Electrical Stimulation (FES) and Neurophysiology***

- 22) Assess the tetraplegic upper limb and institute measures to prevent complications
- 23) Identify the indications for and the use of clinical neurophysiological testing (EMG, Nerve conduction studies) to assess the extent of neuropraxia, denervation, reinnervation, phrenic nerve function, and spinal cord function;
- 24) Identify the indications and use of neuromuscular stimulation including functional electrical stimulation (FES) as applied to the management of spinal cord impairment
- 25) Understand the concepts of nerve, muscle and tendon transfers, and of other operative procedures that enhance extremity function, and manage the post-operative retraining, when indicated. The trainee should be able to advise the patient and make suitable referrals where appropriate.
- 26) Prescribe and advise on appropriate combination of orthoses, FES and surgical transfers to improve function in the tetraplegic upper limb.

## ***Pain***

- 27) Evaluate pain following spinal cord injury and prescribe appropriate therapies including pharmacological therapies, nerve blocks, nerve ablation, intra thecal therapy, physical therapies and psychological therapies (in conjunction with appropriate specialists where required)

## ***Autonomic Dysfunction***

- 28) Assess a patient with autonomic dysfunction including autonomic dysreflexia.
- 29) Evaluate and commence treatment for complications such as orthostatic hypotension, bradycardia, autonomic dysreflexia, hyperhidrosis; resuscitation procedures to patients with multisystem physiological impairment and unstable spinal injuries, including ISCoS/ASIA Autonomic Standards

## ***Neurogenic Bowel***

- 30) Coordinate and implement management of the neurogenic bowel in conjunction with other professionals. The trainee should have comprehensive knowledge of and be able to advise on the appropriate use of various modalities such as reflex evacuation, manual techniques, trans anal irrigation etc. The trainee should have a good understanding of the role of modification of dietary intake, medication use including complementary medicines, ACE, artificial sphincter, sacral root stimulation, role of colostomy etc.
- 31) Recognize and take measures to prevent long-term complications including faecal impaction, mega colon and hemorrhoids. The trainee should also understand the role of and be able to interpret trans rectal manometry



### ***Neurogenic Bladder***

- 32) Coordinate and implement management of the neurogenic bladder in conjunction with other professionals.
- 33) implement long term follow up and be able to advise on appropriate non-surgical / surgical interventions both for safe management of the neurogenic bladder and for enhancing quality of life.
- 34) Perform urodynamic studies (where appropriate) and interpret video urodynamic findings.
- 35) Recognize the increased risk of renal tract complications such as urinary tract infections, urinary tract stones, high pressure bladder resulting in renal damage and be able to manage them.
- 36) Institute and oversee a long-term renal surveillance programme.

### ***Sexual Dysfunction and Fertility***

- 37) Advise and manage sexual dysfunction in males and females including the use of oral medications, injectable medications, devices, semen retrieval and fertility management
- 38) Advise other medical colleagues on special precautions to be taken during pregnancy and labour in an individual with spinal cord injury

### ***Long term Complications and Surveillance***

- 39) Diagnose and manage the treatment of the complications associated with chronic spinal cord injury including pressure sores, spasticity, pain, urinary calculi, urinary tract infection, fractures, post-traumatic syringomyelia, and progressive respiratory decline
- 40) Set up a program of regular follow-up, evaluation and preventive health care to keep the person at his/her maximum health and rehabilitation status, and coordinate this care with the patient's general practitioner
- 41) Institute a community based rehabilitation programme where necessary

### ***Rehabilitation and formulation of a management plan***

- 42) Be able to assess and manage permanent dysfunction resulting from SCI, relationship between the extent and level of SCI on the residual functional capacity based on neurological (including neurophysiologic testing), musculoskeletal and cardiopulmonary examinations, psycho-social and prevocational evaluations, pre-injury personality and lifestyle, and social support and economic circumstances
- 43) Have awareness of and be able to determine "SMART" goals for self-care, mobility, functional, vocational and avocational activities together with the multi-disciplinary and/or interdisciplinary team (MDT).
- 44) Be able to work well within a multi -disciplinary team with an understanding of the training and capabilities of rehabilitation nurses, social workers, clinical and neuropsychologists, physical therapists, occupational therapists, prosthetists,

- orthotists, speech/language pathologists and recreational and vocational counsellors; dieticians and nutritionists, podiatrists, and exercise physiologists; recognize the professional role and contributions of the nursing professions and the various allied health professions individually and collectively; encouraging their full participation in patient care and management while maintaining medical responsibility; appreciating that a team effort, with as much continuity as practicable, will produce a more satisfying outcome and experience for the patient, family and team members; be able to conduct problem-oriented conferences and setting goals with the participation of the allied health staff and where appropriate the patient; be able to effectively participate in family meetings/discharge planning conferences.
- 45) Understand the role of and be able to refer for physiotherapy interventions including limb range of motion and strengthening, sitting balance, transfers, wheelchair propulsion, standing and gait including treadmill training, hydrotherapy and fitness, motor retraining and conditioning activities.
  - 46) Understand the use of and prescribe a range of orthoses including HKAFO and KAFO; understand the role of and refer for intensive exercise programmes
  - 47) Understand the principles of and be able to refer for occupational therapy - hand facilitation and splinting (resting, short and long opponens splints, flexor-hinge orthoses, writing splints), use of adaptive techniques and assistive devices for ADL, transfer, sitting and mobility in wheelchair (manual and electric), home modifications including computer support and environmental control, driving assessment with modifications and retraining, return to workplace / equipment modification options
  - 48) Assess wheelchairs and cushions and determine their appropriateness
  - 49) Be aware of mobility options and be able to prescribe them as appropriate
  - 50) Working with the MDT, coordinate and facilitate acute and rehabilitative care; coordinate and facilitate activities of the interdisciplinary team with daily rounds and staff conferences, patient and family educational and training sessions, establish short-term and long-term rehabilitation goals, plan the most efficient and effective treatment approaches to assist the patient in acquiring the skills and knowledge for optimal function, promote patient and family education about all aspects of SCI
  - 51) Working with the MDT, be able to carry out a functional assessment, evaluation of activity limitations and participation restrictions and participation measures (eg. FIM, SCIM III, CHART); Finalisation of the discharge to the community plan with post-discharge community reintegration and participation; principles of community care, personal care attendants, patient support organisations and community support services, arranging for the appropriate level of care to match the patient's needs
  - 52) Undertake rehabilitation and discharge planning with a focus on the needs and wishes of the SCI individual, sensitive to the cultural, social and economic factors pertinent to the individual.

## ***Psychological and Psychiatric Aspects***

- 53) Diagnose and manage the psychological dysfunction associated with spinal cord injury in conjunction with appropriate specialists; Assessment and management of psychological issues - reaction to disablement, impact on family, sexuality, theories of adjustment to disability and strategies to promote independence
- 54) Evaluate a patient with psychiatric problems causing or as a consequence of SCI in partnership with a psychiatric team; recognize the additional psychological and psychiatric burden associated with SCI

## ***Special Needs / Groups***

- 55) Be able to evaluate a child with spinal cord injury with an understanding of the unique needs of the child and the parents; Address special needs and problems of children and adolescents with spinal cord injury in areas such as behaviour, bladder and bowel and skin care, growth and development, immunisations, mobility, nutrition, self-care, recreation and schooling, understanding special needs of parents, transition from paediatric to adult rehabilitation services for patients
- 56) Be able to assess and recognize the natural course of a non-traumatic spinal cord injury which should include an understanding of disease specific complications such as neurological deterioration associated with infective discitis or metastatic spinal cord compression; application of principles of management of patients with traumatic SCI to patients with non-traumatic spinal cord impairment taking into account individual general condition, prognosis, psychological, social and financial circumstances
- 57) Is able to identify the effect of associated injuries such as injuries to bone, joint and brachial plexus have on upper limb function
- 58) Is able to evaluate a patient with cauda equina syndrome, congenital abnormalities such as spina bifida
- 59) Is able to manage the rehabilitation of patients with dual impairments of SCI and Acquired Brain Injury and /or other injuries e.g. brachial plexus or other disabling conditions

## **3. DOMAIN: MISCELLANEOUS**

### **The trainee consistently and effectively demonstrates the following skills:**

- 1) Is able to carry out medico-legal evaluation and report-writing providing appropriate information detailing the nature and degree of disability resulting from SCI, including associated injuries, significant complications, and future needs with regard to rehabilitation management, nursing and attendant care, home modifications and equipment, life expectancy and prognosis
- 2) Is able to recognize the impact of SCI on family and friends. The trainee should be able to put in appropriate support strategies recognizing that a well-supported family unit can positively influence rehabilitation outcomes

- 3) Ability to adapt practice to local circumstances recognizing the role of international and regional practice guidelines
- 4) Good communications skills with patients, carers and colleagues recognizing cultural and contextual sensitivities and pressures. There should be a recognition that often long term behavioral modification is required to achieve optimal outcomes and good communication is essential in facilitating such change.

#### **4. DOMAIN : PROCEDURAL SKILLS**

*The trainee consistently and effectively demonstrates the following skills where appropriate based on the requirements of the service he/she is working in (in most cases additional training will be required to develop these competencies; while some of these are basic procedural skills, others are specialist skills, which are unlikely to be required in all settings or for all trainees). The role for the use of a particular procedure should be guided by clinical practice guidelines and systematic reviews, where available:*

- 1) Debridement of pressure ulcers
- 2) Change of tracheostomy tube
- 3) Aspiration of haemothorax
- 4) Insertion of chest drain
- 5) Urethral catheterisation
- 6) Insertion of Suprapubic catheters, Change of suprapubic catheters
- 7) Cystoscopy
- 8) Penile intracavernosal injections
- 9) Video Urodynamics / Ultrasound evaluations of the renal tract
- 10) Proctoscopy / sigmoidoscopy or evaluation of fissures and injection of haemorrhoids
- 11) Use of trans anal irrigation systems (Peristeen and similar)
- 12) Manipulation of joints under anaesthesia
- 13) Injection of local anaesthesia/steroids in joints
- 14) Tendo Achilles transcutaneous tenotomy
- 15) Serial casting to prevent and correct contractures
- 16) Full assessment of causes of acute and excess spasticity

- 17) Initiation of treatment for spasticity including the use of Botulinum toxin injections / phenol / alcohol injections
- 18) EUA, Intrathecal baclofen therapy (assessment, refills, trouble shooting, programming), focal spasticity management (Botulinum toxin, phenol, motor point blocks)
- 19) Intrathecal baclofen pump implantation
- 20) Vibro-ejaculation
- 21) Electro-ejaculation
- 22) Insertion of skull callipers
- 23) Reduction of cervical spine subluxation and dislocation
- 24) Application, use and adjustment of halo vest / Minerva jacket
- 25) Insertion of intra-arterial lines
- 26) Management of home ventilation equipment, cough assist machine, BIPAP, CPAP equipment

Note: If a clinician is to have any procedural or surgical role, they need to be credentialed to perform each task separately; however all physicians working in SCI need to know the underlying factors / processes and if not able to perform an intervention have the ability to refer the patient. ISCOS recognises that SCI clinicians come from different training backgrounds and may require additional training for specific skills. It is not expected that all trainees will carry out the full range of procedures described above.

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