

Key Competency 3. Peripheral Neurological Examination

Through discussion, demonstration and observation, workbook completion and Q&A, the healthcare professional must demonstrate;

1.0 Knowledge and understanding of the anatomy and physiology of the spine

1.1 Demonstrate knowledge and understanding of the gross structure and function of the central and peripheral nervous system, including:

- 1.1.1 Spinal Column, Spinal Cord
- 1.1.2 Spinal plexuses (Brachial, Cervical, Lumbar, Sacral)
- 1.1.3 Spinal nerves and distribution
- 1.1.4 Cranial nerves
- 1.1.5 Afferent/sensory pathways
- 1.1.6 Efferent/motor pathways
- 1.1.7 Somatic nervous system
- 1.1.8 Autonomic nervous system
- 1.1.9 Reflex pathway/arc
- 1.1.10 Tone and clonus
- 1.1.11 Sympathetic division
- 1.1.12 Parasympathetic division

1.2 Describe and demonstrate the normal distribution of dermatomes

- 1.1.1 Head and neck
- 1.2.2 Upper limbs
- 1.2.3 Trunk
- 1.2.4 Lower Limbs
- 1.2.5 Sacral region

1.3 Describe and demonstrate the innervation and actions of the upper and lower limb myotomes

- 1.3.1 Upper limb myotomes C4, C5, C6, C7, C8, T1
- 1.3.2 Lower limb myotomes L2, L3, L4, L5, S1, S2

1.4 Demonstrate knowledge and understanding of peripheral nerve injury with reference to;

- 1.4.1 The effects of spinal cord injury or nerve damage on the peripheral neurological system.
- 1.4.2 Reduced power at/below level of injury
- 1.4.3 Reduced sensation at/below level of injury
- 1.4.4 Upper motor neurone lesions and signs (tone, power, reflexes, coordination)
- 1.4.5 Lower motor neurone lesions and signs (tone, power, reflexes, coordination)
- 1.4.6 Specific reference to diaphragmatic innervation
- 1.4.7 Specific reference to enteric (bladder and bowel) innervation

- 1.4.8 The potential effects of cord oedema on the peripheral neurological system
- 1.4.9 Timescale of usual oedema formation, and resolution (soft tissue injury cascade)
- 1.4.10 Evaluation the use of peripheral assessment in the diagnosis and conditions/injuries affecting the spine or nerve roots.

2.0 Peripheral Neurological Examination of the Spinal Patient

2.1 Demonstrate knowledge through discussion and EBP, which patients require a peripheral neurological examination, rationale, and at what frequency including the following key points

- 2.1.1 Patients with suspected or confirmed Spinal Cord Injury (including Cauda Equina or Conus Medullaris syndrome)
- 2.1.2 Aims and purpose of spinal precautions
- 2.1.3 The indications for initiating C-Spine immobilisation
- 2.1.4 Monitoring deterioration or improvement of symptoms (using the following regime for example)
 - 2-hourly for first 72 hours (to identify any deterioration due to cord oedema)
 - 2-hourly after 72 hours if neurology is continuing to deteriorate
 - BD until discharge
 - Repeat and increase frequency if any objective clinical, or subjective patient concerns

2.2 Provide rationale for the examination of patients admitted for elective surgery including

- 2.2.1 Admission and baseline assessments
- 2.2.3 Frequency of observations if any objective clinical, or subjective patient concerns
- 2.2.4 Frequency of post-operative observations

2.3 Provide rationale for the examination of patients who have suffered spinal trauma/SCI including

- 2.3.1 Identification of any neurological involvement
- 2.3.2 Frequency (e.g. 2 hourly for first 72 hours or until surgery, then convert to post op regime. If neurology stable – BD until discharge)

2.4 Provide rationale for the examination of patients who have had spinal surgery including

- 2.4.1 Monitoring for improvement, or deterioration (which may indicate a post-operative complication such as haematoma)
- 2.4.2 Whilst in recovery (E.g. every 15 minutes for the first hour, and every 30 minutes after that if neurology stable).
- 2.4.3 On the ward and ongoing strategy to include for example;
 - Every 30 minutes for 2 hours, then,
 - Hourly for 4 hours, then,
 - 4 hourly for 24 hours, then,
 - BD until discharge (ROH, 2016)
- 2.4.4. Recognise that if neurology deteriorates at any time, or patient reports subjective deterioration, there is a requirement to increase frequency and escalate immediately.
- 2.4.5 Demonstrate a complete assessment and identify rationale when to escalate to medical team for urgent medical review.
- 2.4.6 Recognise requirement to continue assessments at frequency specified by medical team

3.0 Practical Peripheral Neurological Assessment of the Upper and Lower Limbs

Inspection

3.1 Demonstrate the peripheral neurological assessment and explanation of motor function in the upper limbs including

- 3.1.1 C4 – Shoulder shrugs
- 3.1.2 C5 – Elbow flexion or shoulder abduction
- 3.1.3 C6 – Wrist extension
- 3.1.4 C7 – Elbow extension
- 3.1.5 C8 – Thumb extension/finger flexors
- 3.1.6 T1 – Finger abduction
- 3.1.7 Accurate documentation of findings

3.2 Demonstrate the peripheral neurological assessment and explanation of motor function in the lower limbs including

- 3.2.1 L2 – Hip Flexion
- 3.2.2 L3 – Knee extension
- 3.2.3 L4 - Ankle Dorsiflexion
- 3.2.4 L5 – Great toe extension
- 3.2.5 S1 – Ankle Plantarflexion
- 3.2.6 S2 – Knee flexion
- 3.2.7 Accurate documentation of findings

3.3 Demonstrate and interpret between the MRC grading classification including

- 3.3.1 Understanding of MRC grades and differentiation (0 -5)
- 3.3.2 Patient positioning, handling and modification of test
- 3.3.3 Accurate documentation of findings

3.4 Demonstrate dermatomal (sensory) assessment of the following

- 3.4.1 Upper limb dermatome (sensory) examination
- 3.4.2 Lower limb dermatome (sensory) examination
- 3.4.3 Perineal examination
- 3.4.3 Key points
- 3.4.4 Light touch
- 3.4.5 Pin prick
- 3.4.6 Vibration
- 3.4.7 Accurate documentation of sensation (ASIA sensory grading system 0-2)

3.5 Demonstrate assessment of reflexes including

- 3.5.1 Bicep reflex
- 3.5.2 Brachioradialis reflex
- 3.5.3 Triceps reflex
- 3.5.4 Hoffman's
- 3.5.5 Knee jerk reflex
- 3.5.6 Ankle jerk reflex
- 3.5.7 Babinski reflex
- 3.5.8 Anal wink

- 3.5.9 Bulbocavernosus

3.6 Demonstrate assessment and interpretation of proprioception including

- 3.6.1 Thumb position sense
- 3.6.2 Elbow, shoulder
- 3.6.3 Metatarsal phalangeal joint of the great toe
- 3.6.4 Ankle joint, Knee joint, Hip joint
- 3.6.5 Pronator drift
- 3.6.6 Romberg test
- 3.6.7 Gait

3.7 Demonstrate assessment of co-ordination including

- 3.7.1 Heel shin test
- 3.7.2 Finger nose test

3.8 Demonstrate the assessment and interpretation of tone including

- 3.8.1 Tone and its classification (Modified Ashworth scale (0 – 4))
- 3.8.2 Clonus and its classification

4.0 Demonstrate knowledge and understanding of potential complications, escalation and documentation processes

4.1 Demonstrate knowledge of potential abnormalities/complications relating to;

- 4.1.1 Deterioration in MRC grade
- 4.1.2 Deterioration in sensation score
- 4.1.3 Abnormal findings
- 4.1.4 Peripheral temperature changes to limbs

4.2 Demonstrate knowledge of the escalation process for clinical concerns or deterioration including

- 4.2.1 Who, when, how to escalate
- 4.2.2 Brief, structured accurate handover of findings using SBAR (or another similar tool)
- 4.2.3 Communication with the patient
- 4.2.4 Appropriate tests and use of relevant testing equipment

4.3 Demonstrate knowledge and use of appropriate documentation including

- **4.3.1** Clear documentation
- **4.3.2** Use of appropriate/standardised assessment tools

Appendix 1. Recommended Reading

- 1) International Standards for the Classification of Spinal Cord Injury: Motor Exam Guide
https://asia-spinalinjury.org/wp-content/uploads/2016/02/Motor_Exam_Guide.pdf
https://www.iscos.org.uk/sitefiles/PageFile_20_Motor_Exam_Guide.pdf
- 2) International Standards for the Classification of Spinal Cord Injury: Key Sensory Points
https://www.iscos.org.uk/sitefiles/PageFile_20_Key_Sensory_Points.pdf
- 3) International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) ASIA SCI assessment Form
https://www.iscos.org.uk/uploads/sitefiles/ISNCSCI%20Forms/ASIA_ISCOS_IntlWorksheet_2019.pdf
- 4) Nice Guidelines: Spinal Injury assessment and initial management; NG41 2016
<https://www.nice.org.uk/guidance/ng41/resources/spinal-injury-assessment-and-initial-management-pdf-1837447790533>
<https://www.nice.org.uk/guidance/ng41/evidence/full-guideline-2358425776>
- 5) Managing Spinal Injury: Critical Care. The Initial Management of people with actual or suspected spinal cord injury in high dependency and intensive care units. Paul Harrison SIA 2000.
https://www.ccssth.org/resources/Documents/Spinal/Managing%20spinal%20injury_critical%20care%20SIA%202000.pdf
- 6) Mataliotakis, G.I, Tsirikos, A.I. (2016) Spinal Cord Trauma: Pathophysiology, Classification of Spinal Cord Injury Syndromes, Treatment Principles and Controversies. Available at;
<https://doi.org/10.1016/j.mporth.2016.07.006>
- 7) Buchanen, D, Smith, G.M., Akhtar, N., Grainger, A. (2016) Post-operative Neurological Observations, Are You Getting What You Ordered? The Spine Journal. 5 (319)
- 8) Amiri, A.R., Fouyas, I.P., Cro, S. and Casey, A.T.H. (2013) Postoperative spinal epidural haematoma (SHE): incidence, risk factors, onset and management. The Spine Journal. 13(2). pp134-140 [online]. Available at: <https://pubmed.ncbi.nlm.nih.gov/23218510/>