

NMTRG Guidelines for the assessment and rehabilitation of the Major Trauma patient

Discipline: Occupational Therapy/Physiotherapy

Guideline 1: Management of upper limb peripheral nerve injury

The Occupational therapist/ Physiotherapist (OT/PT) should have knowledge of:

Nerve Anatomy:

Formation of Spinal nerves, Brachial plexus and upper limb neural pathways

Anatomy of a peripheral nerve

Nerve function (Neural conduction)

Nerve Injury:

Mechanisms of Injury (Laceration v Traction v Compression; iatrogenic)

Type of injury (Conduction block/Neurapraxia, avulsion, rupture, neurotmesis, axonotmesis – particularly considering favourable and unfavourable prognosis)

Nerve healing (regeneration) times and Wallerian degeneration

Associated injuries:

Compartment syndrome

Brachial Plexus injuries:

Polytrauma –

Fractures of Face/Skull, Transverse Process, Clavicle, Scapula, Humerus, Pelvis, Lower limb.

Vascular injury (subclavian/axillary/brachial artery)

Head injury (Traumatic Brain Injury)

Accessory nerve injury

Brown-Sequard Syndrome

Horner's sign – stellate ganglion

Psychological affects

Axillary nerve:

Shoulder dislocation, Rotator cuff tear.

Musculocutaneous nerve:

Fractured Humerus, Shoulder dislocation, Stabbing injury.

Radial nerve:

Fractured Humerus, Shoulder dislocation, Stabbing injury.

Ulnar and Median Nerves:

Laceration, crush, Arm/Forearm fractures, shoulder dislocation.

Pain:

Terminology (Nociceptive v Neuropathic pain)

Diagnostic criteria and tools

The OT/PT should be able to recognise:

- Red Flags and Contraindications to treatment.
- Compartment syndrome.

- Brown-Sequard Syndrome.
- Complex Regional Pain Syndrome.

The OT/PT should be able to offer the following interventions:

- Patient education (timescales of recovery, impact of the injury, limb and joint protection, awareness of temperature appreciation, skin damage and how to avoid further damage to an insensate limb).
- Consideration of maintaining cortical representation (e.g. incorporating the limb in function, touch and visual checking, visual imagery, bimanual activities).
- Static and dynamic splinting.
- Appropriate positioning of affected upper limb.
- Active and passive range of movement (ROM) programme/advice.
- Graded exercise prescription.
- Sensory testing/retraining.
- Orthotic supports (e.g. shoulder slings, elbow locking splints) to support protection of the nerve whilst healing /position of the limb for functional tasks.
- Functional and activities of daily living (ADL) advice, graded programme of activity, aids and adaptations.
- Patient centred goal setting, functional outcome measures and patient reported outcomes (PROMS).
- Scar management (massage, silicone get sheeting, paper tape).
- Use of appropriate oedema control/compression garments.
- Appropriate discharge planning with ability to refer to relevant follow up services (Neuromusculoskeletal (NMSK) physiotherapy, Hand Therapy, Specialist Brachial Plexus Injury service , Occupational Therapy, Community rehab team etc.).
- Appropriate level of psychological support /signposting /onward referral.
- Sign post to Vocational rehab/Employment support service.
- Pain management techniques (and able to identify when referral to specialist team required).

The OT/PT is expected to complete this assessment and intervention:

Early/Acute (during the patients admission in Critical care and major trauma ward setting):

- Physical Assessment (Active/Passive ROM, myotomes, dermatomes, reflexes, sensibility).
- Functional Assessment of ADL's and transfers.
- Education of the implications of sensory deficit/impairment on safety and protection of limb.
- Exercise prescription, advice, graded activity programme and aids and adaptations as required.
- Assessment and management of oedema.
- Understanding of wound care and scar management.
- Assessment of splinting needs and provision/fabrication of appropriate static/dynamic splint.

Post-discharge from the acute services into the community/further rehabilitation setting/outpatient:

- Home programme/self-management programme (as above).
- Education of carer if available.

The OT/PT should have knowledge of additional services including:

- Pain management.
- Orthotics.
- Outpatient Services.
- Help at home on discharge.
- Vocational Rehab.
- Community rehab services.
- Specialist Brachial Plexus Injury service (Tertiary referral).
- Psychology services.

- Driving assessment services.

The OT/PT understands how to access the following pathways:

- Specialist Brachial Plexus Injury team Orthopaedic /plastics follow up or referral for nerve reconstruction (potentially Tertiary referral).
- Musculoskeletal (MSK) outpatient physiotherapy/Hand therapy/occupational therapy/neurophysio services.
- Community rehab team services.
- Psychology services including improving access to psychological therapies (IAPT).
- Pain management services.
- Patient support groups/charities (e.g. Red Thread, Traumatic Brachial Plexus Injury group - TBPI).
- Social services/housing.

If required the patient has access to:

- Online educational resources.
- Vocational rehab.
- Community Rehab.
- MSK outpatient and/or specialist service.
- Psychological support.

Considerations for long term rehabilitation

- Stiffness.
- Swelling.
- Pain.
- Reduced function.
- Contracture management.
- Complex Regional Pain Syndrome.
- Learned non-use and loss of cortical representation of the limb.
- Management of persistent pain.
- Return to employment.
- Psychological support.

Resource links

- Haastert-Talini, K., Assmus, H., & Antoniadis, G. (Eds.). (2017). *Modern Concepts of Peripheral Nerve Repair*. Springer International Publishing.

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Lived experience/Psychological effects of nerve injury:

- Ashwood, M., Jerosch-Herold, C. Shepstone, L. (2017). Learning to live with a hand nerve disorder: A constructed grounded theory. *Journal of Hand Therapy*.
- Brown, H., Johnson, K., Gilbert, A. Quick, T.J. (2018) The lived experience of motor recovery of elbow flexion following Oberlin nerve transfer: A qualitative analysis. *Hand Therapy*, 23(4), pp.130-138.
- Goswami R, Anastakis D, Katz J, Davis K (2016) A longitudinal study of pain, personality, and brain plasticity following peripheral nerve injury.
- Gray B. (2016) Quality of life following traumatic brachial plexus injury: A questionnaire study. *International Journal of Orthopaedic and Trauma Nursing*., 22:29–35.
- McDonald, J. Pettigrew, J. (2014). Traumatic brachial plexus injury: the lived experience. . *British Journal of Occupational Therapy*, 77, 147-154.
- Miller, C., Peek, A. L., Power, D., & Heneghan, N. R. (2017). Psychological consequences of traumatic upper limb peripheral nerve injury: A systematic review. *Hand Therapy*, 22(1), 35-45.

- Novak, C.B., Anastakis, D.J., Beaton, D.E., Mackinnon, S.E. and Katz, J. (2011) Biomedical and psychosocial factors associated with disability after peripheral nerve injury. *Journal of Bone and Joint Surgery*, 93(10)929-936.

Rehab:

- Hill J, Turner LC, Jones RD, Jimulia T, Miller C, Power D (2019) The stages of rehabilitation following motor nerve surgery. *Journal of Musculoskeletal Surgery and Research* 3(1):60-67
- Novak, C. B., and Von Der Heyde, R. L. (2013). Evidence and techniques in rehabilitation following nerve injuries. *Hand Clin.* 29, 383–392.
- Novak CB., and Von Der Heyde, R.L (2015) Rehabilitation of the upper extremity following nerve and tendon reconstruction: When and How. *Seminars in Plastic Surgery*, 29, 73-80.

Nerve Transfer:

- Kahn and Moore (2016) Donor activation focused rehabilitation approach. Maximising outcome after nerve transfers. *Hand Clin* 32; 263-277
- Hill et al. (2019) The stages of rehabilitation following motor nerve surgery. *Journal of Musculoskeletal Surgery and Research* 3(1):60-67
- Sturma et al. (2019) Structured Motor Rehabilitation after selected nerve transfers. *Journal of Visualized Experiments* e59840

Pain:

- B. H. Smith, J. Lee, C. Price, A. P. Baranowski, Neuropathic pain: a pathway for care developed by the British Pain Society, *BJA: British Journal of Anaesthesia*, Volume 111, Issue 1, July 2013, Pages 73–79, <https://doi.org/10.1093/bja/aet206>
- International Association for the Study of pain (IASP) terminology page: <https://www.iasp-pain.org/Education/Content.aspx?ItemNumber=1698>
- Jesson, T; Runge, N; Schmid, A. Physiotherapy for people with painful peripheral neuropathies: a narrative review of its efficacy and safety, *PAIN Reports: September/October 2020 - Volume 5 - Issue 5 - p 1-e834* doi: 10.1097/PR9.0000000000000834
- NICE Clinical Guideline “Neuropathic pain in adults: pharmacological management in non-specialist settings” <https://www.nice.org.uk/guidance/cg173/resources/neuropathic-pain-in-adults-pharmacological-management-in-nonspecialist-settings-pdf-35109750554053>
- Osbourne N, Anastakis D, Davis, K (2018) “Peripheral nerve injuries, pain, and neuroplasticity”. *Journal of Hand Therapy* Vol 31, Issue 2, April–June 2018, Pages 184-194.
- Quick TJ, Brown H. Evaluation of functional outcomes after brachial plexus injury. *Journal of Hand Surgery (European Volume)*. 2020;45(1):28-33. doi:[10.1177/1753193419879645](https://doi.org/10.1177/1753193419879645)

E-learning modules:

- British Pain Society & Faculty of Pain Medicine (HEE) e-learning modules (create account with Open Athens) <https://portal.e-lfh.org.uk/>
- Neurological examination: <http://www.oxfordmedicaleducation.com/clinical-examinations/neurological-examination/>

