

Guidance on Competencies for Neuromodulation



Neuromodulation encompasses specialised interventions including spinal cord stimulation (SCS), peripheral nerve stimulation (PNS), and intrathecal drug delivery systems (IDDS). SCS has been in clinical use for more than 50 years for a range of conditions, primarily neuropathic pain, but also selected cardiovascular and pelvic floor indications. NICE supports the use of SCS for neuropathic pain, and its application continues to evolve with advances in stimulation paradigms and technology.

Successful neuromodulation outcomes depend on multiple factors, including appropriate patient selection, procedural expertise, and high-quality long-term follow-up. Although models of service delivery vary, every neuromodulation team must include a physician with core capabilities in patient selection, implantation, perioperative care, detection and management of complications, and ongoing follow-up. Teams must maintain adequate caseloads to sustain competencies, ensure access to continuous professional development, and participate in regular outcome evaluation and peer review.

Neuromodulation services are delivered by multidisciplinary teams that may include Pain Medicine specialists, neurosurgeons, spinal surgeons, psychologists, radiologists, physiotherapists, and specialist nurses. The Faculty of Pain Medicine (FPM) of the Royal College of Anaesthetists focuses on the professional standards for Pain Medicine specialists; therefore, this guidance specifically outlines the competencies required of Pain Medicine physicians involved in neuromodulation practice.

This document describes two levels of involvement:

Section A and Appendix A

Key capabilities required for all Pain Medicine specialists, including those who may encounter SCS patients in emergency or on-call settings. While not all Pain Medicine physicians will provide neuromodulation services, all should hold sufficient knowledge to assess neuromodulation patients safely and manage early complications.

Section B and Appendix B

Key capabilities for Pain Medicine specialists who provide neuromodulation therapy, including trial and permanent implantation, comprehensive follow-up, management of complications, and contribution to service development and governance.

These key capabilities reflect the learning outcomes of the Royal College of Anaesthetists 2021 Curriculum (Stage 3 Special Interest Area: Pain Medicine).

Neuromodulation therapy must be delivered by a competent multidisciplinary team that can appropriately select patients, perform implantation, and provide long-term care. A defined level of procedural and surgical expertise is essential to ensure treatments are delivered safely and complications are managed promptly. Physicians implanting SCS systems must possess skills in patient selection, procedural safety, postoperative follow-up, and recognition and management of complications such as infection, CSF leak, lead migration, neurological compromise, and hardware malfunction. Additional advanced skills are required for clinicians performing definitive implant procedures.

Access to emergency imaging, specifically MRI scanning using SCS conditional protocols—must be ensured. Clear pathways must exist for urgent neurosurgical or spinal surgical referral in the event of complications.

GUIDANCE

Section A: Key Capabilities for All Practitioners in Pain Medicine

- Applies scientific knowledge and the evidence base to support appropriate patient selection for neuromodulation therapies.
- Performs a comprehensive assessment of pain, including location, character, mechanism, and psychosocial contributors, to determine neuromodulation suitability and risk.
- Acts effectively and collaboratively as a member of the multidisciplinary team (MDT).
- Recognises the complications of neuromodulation procedures and implantable technologies, and understands the principles of early assessment and initial management (e.g., infection, new neurological deficit, lead issues, stimulation changes, device malfunction).
- Engages effectively with other healthcare professionals in primary and secondary care, including surgical specialties, for the assessment and management of complications and liaison with specialist neuromodulation teams.
- Understands the appropriate skill mix for multidisciplinary implantable-technology care.
- Communicates clearly and compassionately with patients and their family/carers.

Appendix A: Curriculum (Section A)

1. Basic sciences relevant to SCS
 - a. Neurophysiology and mechanisms of action of SCS
 - b. Spinal cord anatomy and physiology
 - c. Principles of neural stimulation
 - d. Infection prevention and control principles
2. Indications and contraindications for SCS and the evidence base
3. Patient selection, screening, and preparation
 - a. Physical and biological assessment
 - b. Psychological assessment
 - c. Social and functional considerations
 - d. Balanced risk–benefit evaluation
 - e. Understanding alternatives to SCS
 - f. Setting and managing realistic patient expectations
 - g. Rehabilitation support prior to and following SCS insertion
4. Interactions of SCS with other systems
 - a. Medical, electrical, and magnetic equipment (e.g., diathermy, therapeutic ultrasound)
 - b. MRI scanners (SCS-conditional protocols)
 - c. Other implanted devices (e.g., pacemakers, intrathecal pumps)
5. Follow-up care
 - a. Recognising symptoms that may indicate the need for reprogramming, revision, or replacement.
 - b. Identifying when further investigation is required for new or worsening symptoms or suspected device problems.
6. Recognition of complications

- a. Patient-related complications
- b. Device-related complications
- c. Principles of early management of complications, including appropriate escalation pathways

Section B: Key Capabilities for Pain Medicine Specialists Providing Neuromodulation Therapy

- Demonstrates comprehensive knowledge of scientific principles, evidence base, indications, and contraindications for SCS in chronic pain management.
- Performs detailed biopsychosocial assessment for neuromodulation, incorporating MDT input into decision-making.
- Demonstrates knowledge of available SCS systems and selects appropriate technology based on patient-specific needs.
- Performs SCS procedures—both trial and permanent implantation—safely and effectively, using appropriate percutaneous techniques.
- Assesses trial outcomes using validated clinical and patient-reported measures to determine suitability for permanent implantation.
- Recognises, investigates, and manages complications of SCS therapy, including infection, CSF leak, lead migration, neurological compromise, wound problems, and device malfunction, and escalates appropriately.
- Works collaboratively within an MDT including neurosurgeons, radiologists, psychologists, physiotherapists, specialist nurses, and other relevant professionals.
- Communicates clearly and empathetically with patients and carers about treatment expectations, risks, benefits, and long-term considerations.
- Demonstrates understanding of organisational, logistical, and funding considerations for neuromodulation services, including revision and replacement pathways.
- Provides leadership in service development, governance, audit, and quality assurance, including participation in the National Neuromodulation Registry and adoption of evolving best practices.

Appendix B: Curriculum (Section B)

In addition to the competencies in Appendix A:

1. Advanced scientific knowledge
 - a. Basic sciences relevant to SCS, including percutaneous leads.
 - b. Physics relevant to SCS and electrical safety
 - c. Radiation use, regulatory standards, and fluoroscopic safety
 - d. Spinal anatomy and fluoroscopic imaging interpretation
 2. Indications and evaluation
 - a. Indications for SCS trial
 - b. Methods for evaluating trial outcomes.
 - c. Indications for percutaneous electrodes
 - d. Selection of pulse generator type and features
 3. Procedural and surgical skills
 - a. Patient positioning
 - b. Asepsis and infection control (hand hygiene, MRSA screening, prophylactic antibiotics, sterile technique)
 - c. Familiarity with SCS system components
 - d. Epidural access techniques
 - e. Fluoroscopic placement of single and multiple electrodes
 - f. Primary surgical techniques: lead securing, tunnelling, pocket formation, and wound closure
 - g. Assessment of wound healing
 - h. Surgical skills for lead or pulse-generator revision
 4. Intra-operative competencies
 - a. Real-time assessment of lead position
 - b. Intra-operative programming and stimulation testing
 - c. Interpretation of device diagnostics and impedance testing
 5. Follow-up care
 - a. Understanding SCS programming and diagnostics
 - b. Ability to perform and interpret device programming.
 - c. Recognizing and managing symptoms requiring reprogramming or revision.
 - d. Identifying when further investigation is required.
 - e. Management of pulse generator end-of-life and replacement pathways
 6. Management of complications following SCS therapy
- Pain Medicine specialists delivering neuromodulation must be able to:

- a. Apply principles of infection management, including topical, oral, and intravenous antibiotics; recognise indications for salvage versus explantation.
- b. Diagnose and manage epidural haematoma or spinal cord compression, including urgent MRI and neurosurgical referral.
- c. Manage lead migration, fracture, or malposition using reprogramming strategies or revision surgery.
- d. Troubleshoot hardware and telemetry issues, including impedance abnormalities, battery failure, and communication errors.
- e. Diagnose and manage CSF leaks (conservative vs. surgical repair).

- f. Recognise and treat stimulation-related adverse effects including dysaesthesia and neuraxial irritation.
- g. Manage wound complications including dehiscence, pocket infection, and device erosion.

7. Referral pathways

- a. Understanding when to refer for inadequate analgesia despite optimisation.
- b. Referral in the case of complications requiring surgical intervention.
- c. Referral for new or unrelated pain problems arising after SCS implantation.

8. Governance and registry participation

Pain Medicine specialists should:

- a. Maintain a comprehensive and up-to-date record of all patients receiving implantable neuromodulation devices, capturing relevant clinical information such as indications, device characteristics, procedural details, outcomes, and any adverse events, to support clinical governance, audit, and ongoing quality improvement.
- b. Provide patients with unit-specific outcome and complication data to support informed decision-making.
- c. Contribute to the development of local and regional protocols for surveillance, programming, complication management, and out-of-hours arrangements.
- d. Establish formal collaboration with surgeons, radiologists, microbiologists, and other teams to ensure seamless on-call pathways.
- e. Promote and adhere to evidence-based best practice in SCS delivery.