



CSS Fellowship Curriculum

CSS Nationally Based Spine Fellowship Curriculum Document

Introduction:

- Variable background of trainees entering fellowship programs in Canada
- In Canada, there is varied practice of spine surgery amongst specialists of orthopaedic and neurosurgical background. The CSS defines a spine surgeon as an individual who spends 80% of his/her practice practicing spine surgery. It is noted that there are common spine procedures that are performed as part of general neurosurgical and in some orthopaedic practices in Canada.
- Fellowship education is less formalized and evaluated when compared to residency training. Herkowitz et. al. highlighted the importance of an educational curriculum in fellowship amongst other factors that trainees should consider in selecting a clinical fellowship.
- A recent review of the scientific literature was performed including obtaining educational / CME materials available on-line through international spine societies as well as physician accreditation organizations. Materials were collated that were considered relevant to spine surgery fellowship training.
- The CSS has recognized the importance of enhancing spine fellowship education in Canada and is motivated by interest in the end product of future spine surgeons in Canada.
- The CSS executive has endorsed the development of a nationally based spine fellowship education curriculum that is anticipated to be a valued guide to fellowship training programs in Canada.
- The CSS aims to enhance fellowship education through the development of a comprehensive as well as focused/advanced curriculum in fellowship training. A CSS working group has been assembled with broad representation to meet this objective.

Materials and Methods:

- core/advisory group as well as larger working group with broad national academic and community representation.
- assembly of potential competencies completed and has been reviewed with input by working group members (30 members and 2 ex-officios)
- Delphi-methods to be applied Jan/Feb 2014 on final list of competencies (108 cognitive competencies, 84 procedural competencies). A proposed rating scheme has been developed based upon input at the recent 2013 CSS fellowship working group meeting as well as at our July 3, 2013 and Fall 2013 teleconferences
- Monkey survey distributed to working group with 28 completed surveys
- CSS fellowship meeting at 2014 AGM (21 of 28 participation of working group members with 13 additional observers)
- Dissemination of annual meeting discussions to all 28 survey respondents for approval. Final ratification (May/June 2014) of remaining outstanding unresolved cognitive and procedural competencies.
- Distribution of final curriculum document to working group members August 2014

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Demographics of Working Group Survey Members (n=28)

- 11/28 = Neurosurgical background, 17/28 Orthopaedic background
- Pan-Canadian representation
- 22/28 academic practice, 3/28 community practice, 3/28 combined academic and community practice
- 13/28 are or have been a fellowship director/coordinator for hospital or university

Rating for each knowledge and procedural item:

1. item not appropriate for fellowship curriculum
2. item appropriate for a comprehensive fellowship curriculum
3. item appropriate for a focused/advanced fellowship curriculum

definition of 'not appropriate for fellowship curriculum' – an item that is not appropriate at the fellowship level for the training of a Spine Surgeon in Canada and/or a competency that should have been attained during medical school or surgical residency

definition of 'comprehensive curriculum' – item appropriate and considered an important competency to be gained during spine fellowship training

definition of 'focused/advanced' – item considered advanced by nature of the cognitive or procedural competency to be achieved and will require a focused exposure at a tertiary/quaternary centre and/or specialized advanced surgical skills courses to acquire competency

Competent – demonstrate cognitive/procedural ability

Proficiency – demonstrate efficient cognitive/procedural ability

Expert – a cognitive/procedural ability that likely requires several years of independent clinical practice to acquire expertise

A. Cognitive Competencies

General

- 1.1.1 Demonstrate a comprehensive knowledge of the anatomy and physiology of the spine and the nervous system as is pertinent to the management of spine and spinal cord pathology.
- 1.1.2 Demonstrate a comprehensive knowledge of clinical features including signs, symptoms, natural history, and prognosis of spinal traumatic, infectious, metabolic, neoplastic, degenerative, developmental, and congenital spinal disorders.
- 1.1.3 Demonstrate the ability to conduct a thorough history and physical examination for various chief complaints that pertain to the spine.
- 1.1.4 Be able to construct an appropriate differential diagnosis for a variety of spine complaints.

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- 1.1.5 Identify non-surgical spinal cord syndromes including amyotrophic lateral sclerosis, demyelinating conditions, and systemic diseases affecting the spine, and appropriately refer them to appropriate non-surgical specialists.
- 1.1.6 Be able to effectively communicate with the patient and families various treatment options, including operative versus non-operative options in spine care.
- 1.1.7 Demonstrate proficiency in obtaining informed consent for spinal surgical procedures – i.e. engaging in an advanced discussion regarding the options of treatment, risks and benefits, and obtaining informed consent beyond the level of that expected of a surgical resident.
- 1.1.8 Demonstrate the ability to cooperate with other physicians as well as allied health professionals in the creation and implementation of a patient focused plan of spine care.
- 1.1.9 Demonstrate a comprehensive knowledge of the recognition and treatment of intra-operative, peri-operative and post-operative surgical complications pertaining to spine surgery.
- 1.1.10 Demonstrate knowledge in the uses, indications, and relative effectiveness of common spinal orthoses, including knowledge of the degree of segmental, regional, and global immobilization these orthoses provide.
- 1.1.11 Understanding the principles of bone biology relating to spine fusion surgery.
- 1.1.12 Understand the mechanisms of action, surgical indications, relative clinical effectiveness, and complications relating to the use of osteobiologics (e.g. calcium sulphates / phosphates, demineralized bone matrices, autograft, allograft, and bone morphogenic proteins) in spine surgery.
- 1.1.13 Demonstrate knowledge regarding evidence-based medicine on the role of thromboembolic prophylaxis in spinal surgery.
- 1.1.14 Understand the principles of electrophysiological techniques used to assess spinal peripheral neural and spinal cord pathology including EMGs, nerve conduction studies, evoked potentials and multimodality intraoperative monitoring.
- 1.1.15 Demonstrate the ability to describe the technical aspects involved in performing intraoperative spinal neuromonitoring.
- 1.1.16 Understand the principles of imaging assessments including, plain radiography, radionuclide scans, CT, PET, SPECT/CT, and MRI.
- 1.1.17 Understand the principles of radiation safety in treating spinal disorders.
- 1.1.18 Demonstrate knowledge of the procedural steps involved in surgically approaching the anterior/anterolateral thoracic, thoracolumbar, and lumbar spine.

Investigations:

- 1.2.1 Demonstrate an in-depth understanding and the ability to select and interpret various investigations to be used in the work-up of a patient, including but not limited to blood work, plain radiography, radionuclide scans, CT, myelograms, angiograms, MRI, and EMG.
- 1.2.2 Recognize the radiographic signs of degenerative, neoplastic, traumatic, developmental and congenital spinal instability.

Trauma/Emergency:

- 1.3.1 Recognize the need for urgent immobilization of the spine when instability is suspected.
- 1.3.2 Demonstrate knowledge in clearing a trauma patient of spinal injury according to ATLS guidelines including recognition and management of neurogenic shock, unless competency previously attained during surgical residency.
- 1.3.3 Demonstrate the ability to classify injuries according to fracture morphology, instability, and neurological status.
- 1.3.4 Demonstrate the ability to apply the ASIA score, identify spinal shock, and consider the prognostic importance of sacral sparing.
- 1.3.5 Recognition of evidence based medical guidelines regarding methylprednisolone in non-penetrating acute spinal cord injury and an understanding of the randomized controlled trials surrounding methylprednisolone.
- 1.3.6 Recognition of the importance of maintaining mean arterial blood pressures in the setting of acute cervical spinal cord injury.
- 1.3.7 Identify syndromes of spinal cord injury, including complete transverse injury, anterior cord injury, Brown-Sequard injury, central cord injury, posterior cord injury, cruciate paralysis, syringomyelia, conus syndrome, and sacral sparing.
- 1.3.8 Demonstrate the ability to apply evidence-based decision making to the management of the traumatized patient including literature for early surgery for traumatic spinal cord injury and principles of damage control surgery in polytrauma.
- 1.3.9 Discuss the indications for acute reduction, decompression, and stabilization as appropriate in the setting of a polytraumatized patient.
- 1.3.10 Discuss non-operative and operative treatment options for fractures and dislocations affecting the spine.
- 1.3.11 Compare and contrast the indications for non-operative treatment, anterior approaches, posterior, and combined anterior/posterior operative approaches for the treatment of fractures and dislocations of the sub-axial cervical spine.
- 1.3.12 Describe the indications for non-operative, as well as anterior, posterior, and posterolateral procedures in the management of thoracolumbar trauma.
- 1.3.13 Compare and contrast the indications for anterior and posterior spinal fixators in the management of thoracolumbar trauma.
- 1.3.14 Recognize emergency conditions (specifically acute cauda equina syndrome, acute neurological deterioration, acute traumatic spinal cord injury) with knowledge of evidence based medicine of outcomes relating to timing of surgery.
- 1.3.15 Recognize rheumatological modifiers that influence medical decision making in the management of spine trauma including Diffuse Idiopathic Skeletal Hyperostosis (DISH), rheumatoid arthritis, ankylosing spondylitis, and bone metabolic diseases (e.g. osteomalacia, osteoporosis).
- 1.3.16 Recognizing the medical implications of a congenitally narrow spinal canal relating to the risk of neurologic injury following spinal trauma.
- 1.3.17 Recognize and demonstrate knowledge of the surgical treatment required to manage spino-pelvic dissociation.

Metabolic:

- 1.4.1 Demonstrate knowledge of bone metabolic diseases that affect the spine.
- 1.4.2 Recognize the appropriate tests to order in determining bone mineral density and demonstrate knowledge of medical treatment options in treating bone metabolic conditions.
- 1.4.3 Demonstrate knowledge of patient medical comorbidities that influence bone quality and metabolism.
- 1.4.4 Recognize the possibility of instrumentation failure in the osteopenic spine and demonstrate the ability to plan appropriate non-surgical and surgical strategies for spinal conditions in the setting of osteopenia.
- 1.4.5 Demonstrate knowledge of medical and surgical treatment options in the management of vertebral insufficiency fractures.

Spine Oncology/Vascular Conditions

- 1.5.1 Demonstrate knowledge of the symptoms and signs of primary and metastatic spinal tumors.
- 1.5.2 Be competent in establishing a diagnosis of neoplastic spine disease; specifically the early provisional diagnosis of a primary vertebral extra-dural tumor versus metastatic tumor as well as those intra-dural (intramedullary/extramedullary) tumors that affect the spine based on clinical presentation and imaging.
- 1.5.3 Being competent in the local and systemic staging of spinal tumors, whether primary tumors or metastatic.
- 1.5.4 Being competent, based on the final staging including histological verification, in demonstrating knowledge of the appropriate medical and surgical treatment for spinal tumors and assembling/coordinating the appropriate multidisciplinary medical team required for patient care.
- 1.5.5 Demonstrate knowledge of the Enneking Classification and its role in treating primary tumors of the spine.
- 1.5.6 Demonstrating knowledge of the indications for posterior / posterolateral decompression, anterior decompression, or radiotherapy in the setting of primary or metastatic spine tumors.
- 1.5.7 Demonstrate knowledge of options in medical management for spinal metastatic disease including the use of radiation therapy and medications to treat the symptoms of and lessen the complications of skeletal related events (SREs).
- 1.5.8 Demonstrate knowledge on the differences between conventional external beam radiation therapy and newer radiosurgery / stereotactic body radiation therapy (SBRT) options in spine oncology treatment.
- 1.5.9 Demonstrate an understanding of the principles of tumor surgical resection including knowledge of the indications for en bloc resection of tumor versus intra-lesional debulking.
- 1.5.10 Demonstrate the ability to optimize the physical condition of the spine oncology patient before treatment.
- 1.5.11 Demonstrate the ability to recognize and classify spinal instability in spine oncology (e.g. grading systems such as Spine Instability Neoplastic Score (SINS)).

- 1.5.12 Demonstrate knowledge of evidence-based recommendations for the treatment of spinal tumors and recommend treatment for spinal tumors based on evidence-based consideration of benefit versus risk (e.g. consideration for grading systems such as SINS).
- 1.5.13 Demonstrate the ability to recognize spinal vascular malformations, such as arteriovenous malformations, dural arterio-venous fistula, and hemangiomas, including knowledge of treatment options for spinal vascular conditions.

Paediatric Spine

- 1.6.1 Demonstrate the ability to describe the normal growth of the spine.
- 1.6.2 Demonstrate the ability to recognize conditions that alter the normal growth of the spine.
- 1.6.3 Recognize the causes of and demonstrate knowledge on the appropriate management of for paediatric patients presenting with back pain.

Spine Deformity:

- 1.7.1 Demonstrate the ability to perform a history and physical examination appropriate for a patient presenting with spinal deformity.
- 1.7.2 Demonstrate the ability to describe the classification systems for scoliosis, kyphosis, and spondylolisthesis, and craniocervical deformities.
- 1.7.3 Demonstrate the ability to diagnose as well as demonstrate knowledge relating to the management options for spondylolisthesis, spondylolysis, and spondyloptosis
- 1.7.4 Demonstrate the ability to diagnose as well as demonstrate knowledge relating to the management of primary and secondary kyphotic deformities.
- 1.7.5 Demonstrate the ability to recognize the clinical and radiologic features of an underlying genetic condition that may initially present as a spinal deformity.
- 1.7.6 Demonstrate the ability to evaluate spinal balance, flexibility, as well as knowledge of lumbosacral/pelvic radiologic parameters considered important to structural spinal balance.
- 1.7.7 Demonstrate that ability to utilize evidence-based decision making when recommending operative and non-operative interventions for spinal deformity.

Spinal Infection

- 1.8.1 Demonstrate the ability to prescribe the appropriate evidence-based medical therapy relating to pre-operative and peri-operative antibiotic prophylaxis in spine surgery.
- 1.8.2 Demonstrate the ability to perform an appropriate history and physical examination in situations where primary, secondary, or post-operative spinal infection is suspected.
- 1.8.3 Demonstrate the ability to order and interpret appropriate diagnostic tests to confirm infection and identify the causative organism.
- 1.8.4 Demonstrate knowledge on the recommended medical management of infectious lesions of the spine, such as vertebral osteomyelitis, discitis, and epidural abscesses.
- 1.8.5 Demonstrate knowledge of the indications as well as appropriate surgical procedures required in the management of spinal infections.

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- 1.8.6 Demonstrate knowledge that loss of surgical implant fixation or failure of fusion / non-union may represent surgical infection and demonstrate the ability to diagnose as well as knowledge of appropriate surgical procedures that may be required for the management of post-surgical infection.

Auto-immune/genetic:

- 1.9.1 Recognize the symptoms and signs of inflammatory disorders of the spine such as ankylosing spondylitis and Diffuse Idiopathic Skeletal Hyperostosis (DISH).
- 1.9.2 Demonstrate knowledge of the medical and surgical management of cervical disease secondary to rheumatoid arthritis.
- 1.9.3 Demonstrate the ability to diagnose spinal structural pathology as well as knowledge of non-spinal effects of systemic disease in inflammatory conditions that affect the spine.
- 1.9.4 Demonstrate the ability to plan appropriate medical and surgical treatment for inflammatory conditions of the spine.

Degenerative:

- 1.10.1 Demonstrate a comprehensive knowledge of the diagnosis and treatment of degenerative spinal disease.
- 1.10.2 Demonstrate the ability to use evidence-based medicine decisions when making recommendations regarding operative versus non-operative treatment of the degenerative spine.
- 1.10.3 Demonstrate an understanding of the indications and contraindications to disc arthroplasty as well as knowledge of evidence based clinical outcomes in disc arthroplasty when compared to spinal fusion, other motion-sparing spinal procedures, and non-operative medical treatment.
- 1.10.4 Demonstrate proficiency in the diagnosis and knowledge of medical and surgical management for degenerative disc disease, including neurologic effects such as radiculopathy, neurogenic claudication, and cauda equina syndrome.
- 1.10.5 Demonstrate the ability to compare and contrast the surgical treatment options for cervical spondylotic myelopathy and ossification of the posterior longitudinal ligament, including knowledge of procedures such as multilevel anterior cervical corpectomy and fusion, laminectomy, laminectomy and fusion, and laminoplasty.

Pain Management/ Rehabilitation / Recovery

- 1.11.1 Demonstrate an ability to diagnose as well as demonstrate knowledge on the appropriate management of a variety of pain conditions relating to the spine, including the ability to refer to allied health professionals and cooperate in the establishment of a multidisciplinary medical/surgical treatment plan.
- 1.11.2 Demonstrate an in depth understanding of the rehabilitation requirements and expected recovery of both operative and non-operative spinal conditions.
- 1.11.3 Recognize and know how to facilitate the treatment of common pain conditions that may be referred to spine surgeons, such as fibromyalgia, complex regional pain, and chronic neuropathic pain.

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- 1.11.4 Demonstrate the ability to assess a patient's return to work and physical activities, including the ability to manage the medico-legal requests made by third parties.

Research – Scholar Role

- 1.11.5 Demonstrate an understanding of generic and disease specific outcome questionnaires available for the evaluation of outcomes in spinal disease.
- 1.11.6 Demonstrate awareness of academic meetings, journals, and professional societies related to spine care.
- 1.11.7 Demonstrate knowledge of concepts specific to research in the spine, both surgical and non-surgical conditions. These include the development of a research question, hypotheses and specific aims, knowledge of study design, interpretation and critical evaluation of the spine literature.

CanMED Intrinsic Roles:

- 1.12.1 Develop critical appraisal skills with respect to analyzing literature as is pertinent to a spinal surgery practice.
- 1.12.2 Foster an interest in the academic advancement of the field of medicine as it pertains to spinal conditions.
- 1.12.3 Demonstrate professionalism by consistently demonstrating a commitment to your patients, profession, and society through ethical practices at all times.
- 1.12.4 Demonstrate compassion and professionalism when delivering bad news to a spine patient.

B. Procedural Competencies

Demonstrate Proficiency in:

- 2.1.1 patient positioning, prepping and draping.
- 2.1.2 the use and application of Gardner-Wells tongs for traction.
- 2.1.3 the use and application of halo ring for traction.
- 2.1.4 the use and application of halo and vest.
- 2.1.5 closed reduction techniques for spinal disorders.
- 2.1.6 bone graft harvesting techniques.
- 2.1.7 managing intra-operative and postoperative complications such as dural tears, nerve root injury, hemorrhage, epidural hematoma causing neurologic compression, pedicle screw breeches, persistent CSF leak, and surgical site infection.
- 2.1.8 utilizing magnification including a microscope and/or loupes for spinal surgery.
- 2.1.9 techniques to maintain cervical spine precautions during prone positioning (ie Jackson table with Mayfield pins and adaptor).

C-Spine

- 2.2.1 Demonstrate the ability to carry out both anterior and posterior c-spine approaches.
- 2.2.2 Demonstrate proficiency in the closed and open treatment of cervical spine fractures and dislocations.
- 2.2.3 Demonstrate the ability to properly place upper cervical sub-laminar wires
- 2.2.4 Demonstrate proficiency in the ability to implant cervical lateral mass screws, including plate/screw and rod/screw instrumented constructs.
- 2.2.5 Demonstrate the ability to implant cervical trans-laminar screws for cervical stabilization procedures.
- 2.2.6 Demonstrate the ability to safely implant lower cervical/upper thoracic pedicle screws.
- 2.2.7 Demonstrate the ability to perform upper cervical instrumented stabilization procedures, including the ability to insert C2 pars screws, C1-2 (Magerl) trans-articular C1-2 screws, and the Harms/Goel (i.e. C1 lateral mass and C2 pars/pedicle screw/rod) technique for the management of upper cervical spine disorders.
- 2.2.8 Demonstrate the ability to perform a single and multilevel anterior cervical discectomy and/or vertebrectomy.
- 2.2.9 Demonstrate the ability to perform multilevel anterior cervical corpectomies.
- 2.2.10 Demonstrate the ability to perform a single level anterior instrumented fusion following surgical decompression.
- 2.2.11 Demonstrate the ability to perform a multilevel anterior instrumented fusion following surgical decompression.
- 2.2.12 Demonstrate proficiency in multilevel posterior laminectomies with and without foraminotomies.
- 2.2.13 Demonstrate the ability to perform a multi-level posterior cervical laminoplasty with or without instrumentation.

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- 2.2.14 Demonstrate proficiency in performing an occipito-cervical instrumented fusion, including the ability to properly place occipital plates (midline or off midline).
- 2.2.15 Demonstrate the ability to perform common instrumented techniques for performing C1-2 arthrodesis.
- 2.2.16 Demonstrate proficiency in performing a posterior cervical-thoracic instrumented arthrodesis.
- 2.2.17 Demonstrate the ability to perform a cervical odontoid screw fixation.
- 2.2.18 Demonstrate proficiency in revision decompression of the cervical spine.
- 2.2.19 Demonstrate proficiency in revision instrumented fusion of the cervical spine.

T-Spine

- 2.3.1 Demonstrate proficiency in performing posterior/posterolateral transpedicular, costo-transversectomy and lateral extra-cavitary approaches to the thoracic spine.
- 2.3.2 Demonstrate the ability to properly place pedicle screws in the thoracic spine.
- 2.3.3 Demonstrate the ability to properly place laminar, transverse process, and pedicle hooks in the thoracic spine.
- 2.3.4 Demonstrate proficiency in performing a postero-lateral thoracic discectomy.
- 2.3.5 Demonstrate proficiency in performing anterior thoracic discectomy.
- 2.3.6 Demonstrate proficiency in performing an anterior thoracic vertebrectomy with reconstruction.
- 2.3.7 Demonstrate proficiency in performing a posterior multi level thoracic decompression and fusion.
- 2.3.8 Demonstrate proficiency in surgically managing thoracic spinal fractures with and without cord compression.
- 2.3.9 Demonstrate proficiency in revision decompression of the thoracic spine.
- 2.3.10 Demonstrate proficiency in revision instrumented fusion of the thoracic spine.

Lumbrosacral Spine

- 2.4.1 Demonstrate proficiency in performing posterior lumbar discectomies, multi-level decompressions and multi-level instrumented fusions.
- 2.4.2 Demonstrate proficiency in performing anterior/anterolateral spine surgery
- 2.4.3 Demonstrate the ability to perform an in-situ fusion for a high-grade spondylolisthesis or spondyloptosis.
- 2.4.4 Demonstrate proficiency in performing lumbar fusion and/or decompressive surgery for lumbar spinal fractures with and without neurologic injury.
- 2.4.5 Demonstrate proficiency in the placement of lumbar pedicle screws.
- 2.4.6 Demonstrate proficiency in performing an instrumented pars inter-articularis repair for spondylolysis with bone graft.
- 2.4.7 Demonstrate proficiency in performing lumbo-sacral-pelvic instrumented fusions, including the placement of sacral pedicle and iliac wing screws.
- 2.4.8 Demonstrate proficiency in performing a PLIF (Posterolateral interbody) and TLIF (Transforaminal interbody).
- 2.4.9 Demonstrate proficiency in revision decompression of the lumbar spine.
- 2.4.10 Demonstrate proficiency in revision instrumented fusion of the lumbar spine.

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Spine Oncology

- 2.5.1 Demonstrate proficiency in performing a biopsy of a spinal tumor.
- 2.5.2 Demonstrate proficiency in the surgical treatment of metastatic vertebral tumors.

Others

- 2.5.3 Demonstrate proficiency in the use of intra-operative image guided navigation systems (2D, 3D) for spinal disease.
- 2.5.4 Demonstrate proficiency in performing a vertebral augmentations procedure such as vertebroplasty and balloon kyphoplasty for spinal disease.
- 2.5.5 Demonstrate the ability to utilize a cortical bone trajectory for lumbar pedicle screws.

Procedural Competencies

Demonstrate Proficiency in:

- 2.1.1 performing spinal epidural injections.
- 2.1.2 performing spinal transforaminal injections.
- 2.1.3 performing spinal facet injections.
- 2.1.4 performing selective nerve root blocks.
- 2.1.5 performing sacroiliac joint injections.

C-Spine

- 2.2.1 Demonstrate the ability to perform a cervical disc arthroplasty.
- 2.2.2 Demonstrate proficiency in trans-oral approaches for odontoidectomy.
- 2.2.3 Demonstrate the ability to perform a cervical extension osteotomy.

T-Spine

- 2.3.1 Demonstrate proficiency in managing both sagittal and coronal plane deformities of the thoracic spine with instrumentation.

L-Spine

- 2.4.1 Demonstrate the ability to perform a lumbar disc arthroplasty.
- 2.4.2 Demonstrate the ability to perform slip or angular reduction for spondylolisthesis and spondyloptosis.

Spine Oncology

- 2.5.1 Demonstrate proficiency in the surgical treatment of primary extradural spinal tumors.
- 2.5.2 Demonstrate proficiency in the surgical treatment of primary intradural/extramedullary spinal tumors.
- 2.5.3 Demonstrate proficiency in the surgical treatment of primary intradural/intramedullary spinal tumors.

Others

- 2.5.4 Demonstrate proficiency in the use of minimally invasive spine surgery techniques for decompression and instrumented fusion (i.e. tubular systems).
- 2.5.5 Demonstrate the ability to perform a XLIF (Extreme Lateral interbody) and DLIF (Direct Lateral interbody) in spinal disease.
- 2.5.6 Demonstrate proficiency in spinal osteotomies, including Smith-Peterson, pedicle subtraction osteotomies, and vertebral column resection osteotomies.
- 2.5.7 Demonstrate the ability to perform thoracic endoscopic surgical procedures in spinal disease.
- 2.5.8 Demonstrate the ability to perform lumbar endoscopic surgical procedures in spinal disease.
- 2.5.9 Demonstrate proficiency in the surgical management of syringomyelia.
- 2.5.10 Demonstrate proficiency in dorsal column stimulator placement for neuropathic pain.

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Focused / Advanced Procedural Competencies (Nov 4, 2014)

2.5.11 Demonstrate proficiency in intra-thecal baclofen pump placement for intractable spasticity.

A. Cognitive Competencies

General

- 1.1.1 Demonstrate a comprehensive knowledge of the embryology of the spine and spinal cord as it relates to congenital abnormalities and spinal pathology.
- 1.6.1 Demonstrate the ability to describe the normal growth of the spine.
- 1.6.2 Demonstrate the ability to recognize conditions that alter the normal growth of the spine.
- 1.6.3 Recognize the causes of and demonstrate knowledge on the appropriate management of for paediatric patients presenting with back pain.
- 1.6.4 Recognize and demonstrate knowledge on the appropriate management of a paediatric patient presenting with an intradural tumour (for example, an astrocytoma or an ependymoma).
- 1.6.5 Recognize and demonstrate knowledge on the appropriate management of paediatric spinal tumors and tumor-like conditions.
- 1.6.6 Demonstrate proficiency in educating and communicating treatment options with patients and parents of children patients with paediatric disorders.
- 1.6.7 Demonstrate proficiency in obtaining informed consent for treatment from parents and/or paediatric patients with paediatric spinal disorders.
- 1.6.8 Demonstrate knowledge regarding the long-term implications of paediatric spine surgery on the future spinal condition of a patient into adulthood and with the aging spine.

Paediatric Spine

- 1.6.9 Diagnose and demonstrate knowledge on the appropriate management of congenital anomalies and developmental disorders of the spine in a paediatric patient, such as congenital scoliosis, congenital kyphosis, Klippel-Feil syndrome, and Scheurmann's disease.
- 1.6.10 Diagnose and demonstrate knowledge on the appropriate management of open and occult spinal dysraphisms in a paediatric spine.
- 1.6.11 Diagnose and demonstrate knowledge on the appropriate management of a tethered cord in a paediatric patient.
- 1.6.12 Diagnose and demonstrate knowledge on the appropriate management of a paediatric patient with a spondylolysis/spondylolisthesis.
- 1.6.13 Diagnose and demonstrate knowledge on the appropriate management of early and late onset idiopathic scoliosis and kyphosis.
- 1.6.14 Diagnose and demonstrate knowledge on the appropriate management of paediatric spinal trauma.
- 1.6.15 Recognize and demonstrate knowledge on the appropriate management of spinal cord injury with out radiographic abnormality (i.e. SCIWORA).
- 1.6.16 Demonstrate the ability to diagnose and treat paediatric discitis.

Spine Deformity

- 1.7.1 Demonstrate the ability to diagnose as well as demonstrate knowledge related to the management options in congenital, idiopathic, syndromic, and neuromuscular scoliosis.
- 1.7.2 Demonstrate the ability to recognize the clinical and radiographic features of an underlying genetic condition that may initially present as a spinal deformity.
- 1.7.3 Demonstrate the ability to assess skeletal maturity and associated risk of deformity progression in paediatric spinal disorders.

Autoimmune/genetic

- 1.9.1 Being able to recognize genetic disorders that affect the spinal and knowledge of medical and/or surgical treat that may be required for these conditions.
- 1.9.2 Demonstrate knowledge of the clinical and radiological features of individual genetic disorders that affect the spine.

B. Procedural Competencies

Paediatrics

- 2.5.1 Demonstrate proficiency in the application of a halo in the paediatric patient.
- 2.5.2 Demonstrate proficiency in posterior spinal decompression and fusion in a paediatric patient with spondylolysis/spondylolisthesis.
- 2.5.3 Demonstrate proficiency in the surgical management of congenital anomalies and developmental disorders of the spine in a paediatric patient, such as congenital scoliosis, congenital kyphosis, Klippel-Feil syndrome, Scheurmann's disease, neuromuscular scoliosis, and idiopathic scoliosis.
- 2.5.4 Demonstrate proficiency in the surgical management of spinal dysraphisms in a paediatric spine.
- 2.5.5 Demonstrate proficiency in the surgical management in the release of a tethered cord in a paediatric patient.
- 2.5.6 Demonstrate proficiency in the surgical management of paediatric tumors such as intradural tumours including astrocytomas or ependymomas.
- 2.5.7 Demonstrate proficiency in the application of a spinal cast for early onset scoliosis.
- 2.5.8 Demonstrate proficiency in the surgical management of traumatic conditions of the paediatric spine
- 2.5.9 Demonstrate proficiency in the surgical management of infectious conditions of the paediatric spine.