

Appendix E-1

DEFINITIONS FOR RATINGS FOR SKILLS

1. Data Gathering and Interpretive Skills (history, physical examination, imaging, etc.)
 - 3-Excellent:** presents and appropriately interprets all data pertinent to the case
 - 2-Satisfactory:** presents and appropriately interprets enough pertinent data to ensure that poor outcomes are unlikely
 - 1-Marginal:** presents and marginally interprets only minimal pertinent data
 - 0-Unsatisfactory:** neglects to present and interpret pertinent data, fabricates data, or orders unnecessary diagnostic procedures
2. Diagnosis
 - 3-Excellent:** examiner considers the diagnosis presented correct
 - 2-Satisfactory:** examiner considers the diagnosis safe, but lacking in completeness
 - 1-Marginal:** examiner considers the diagnosis incorrect but safe
 - 0-Unsatisfactory:** examiner considers the diagnosis incorrect and/or dangerous
3. Treatment Plan
 - 3-Excellent:** examiner considers the plan satisfactory for the condition
 - 2-Satisfactory:** examiner considers the plan satisfactory but incomplete
 - 1-Marginal:** examiner considers the plan inappropriate, but not dangerous
 - 0-Unsatisfactory:** examiner considers the plan unacceptable, inappropriate, and/or dangerous (e.g., performs unnecessary surgery)
4. Technical Skill
 - 3-Excellent:** examiner considers the candidate performed the procedures correctly
 - 2-Satisfactory:** examiner considers the candidate performed the procedures less than perfectly, but safely
 - 1-Marginal:** examiner considers the candidate performed the procedures poorly, but the patient was not permanently damaged
 - 0-Unsatisfactory:** examiner considers the candidate performed the procedures poorly with permanent debilitating consequences to the patient
5. Outcomes
 - 3-Excellent:** patient outcome as expected for the condition when treated by a competent physician
 - 2-Satisfactory:** patient outcome as expected for the condition when treated by a competent physician, with minor exceptions
 - 1-Marginal:** patient outcome unexpected for the condition when treated by a competent physician, although the original condition was appropriately treated
 - 0-Unsatisfactory:** patient outcome worse than expected for the condition when treated by a competent physician, with major deviation
6. Applied Knowledge
 - 3-Excellent:** no apparent gaps in knowledge of disease or treatment protocols, superb citing of published medical information to support treatment plan
 - 2-Satisfactory:** minimal gaps in knowledge of disease processes or treatment protocols, adequate citing of published medical information to support diagnosis and treatment plan
 - 1-Marginal:** marginal knowledge of disease processes or treatment protocols but adequate to support diagnosis and treatment plan
 - 0-Unsatisfactory:** inadequate knowledge of disease processes or treatment protocols to provide adequate care

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CASE LIST RATING DEFINITIONS

Surgical Indications**3-Excellent:**

surgical procedures are performed for conditions with well-established indications;
procedures listed treat clearly recognizable pathology

2-Satisfactory:

diagnostic indications are usually clear; procedures selected are typically standard and safe

1-Marginal:

procedures with marginal indications are scattered within the list; treatment methods do not always reflect the pathology

0-Unsatisfactory:

a large number of cases have marginal surgical indications, orthopaedic principles are often violated

Surgical Complications**3-Excellent:**

complications are infrequent and typical for the patient group treated

2-Satisfactory:

the complications seem reasonable, but may have been lessened by improved patient care

1-Marginal:

complications are related to technical and other treatment deficiencies, but seldom cause permanent harm

0-Unsatisfactory:

the complications are unnecessarily excessive; many probably could have been avoided

Ethics and Professionalism:**3-Excellent:**

candidate provides compassionate, beneficent, confidential care in the best interests of his or her patients and demonstrates professional attributes

2-Satisfactory:

candidate satisfies the minimal standards of compassionate, beneficent, confidential care of his or her patients and demonstration of professional attributes

1-Marginal:

candidate demonstrates minor deficiencies in caring, compassion, beneficence, confidentiality, or social justice in his or her management of patients and marginally demonstrates professional attributes

0-Unsatisfactory:

candidate fails to provide compassionate, beneficent, confidential care to his or her patients and fails to demonstrate professional attributes

APPENDIX E-2

CORE KNOWLEDGE
ORTHOPAEDIC RESIDENT TRAINING IN SPINE SURGERY**Biomechanics**

1. Understanding normal and abnormal spinal motion
2. Understanding spinal stability
3. Understanding biomechanical testing, e.g., load to failure, etc.
4. Knowledge sufficient to interpret biomechanical testing in a scientific article
5. Knowledge of basic statistics

Clinical

History and Physical

1. Should be adept at taking pertinent history and performing a physical examination
 - a. Neurologic
 - i. Motor and sensory exam
 - ii. Peripheral nervous system and carpal tunnel, neuropathy
 - iii. Non-spinal – peripheral joints, vascular, joints
 - b. Spinal motion
2. Should be aware of natural history of various spinal disorders
3. Ability to develop a differential diagnosis and rule in or out non-spinal cause of symptoms/signs

Imaging

1. Plain radiographs including dynamic films
2. Magnetic resonance imaging with and without contrast
3. Myelography with computed tomography
4. Computed tomography
5. Nuclear imaging
6. Discography
7. Should have basic knowledge at interpreting imaging studies and understanding when and which studies to order for a particular disorder

Electrophysiology

1. Should be able to assess EMG/NCV results and know when to order these tests
2. Should understand and assess changes in intraoperative monitoring including somatosensory and motor-evoked potentials

Treatment

1. Develop an ability to formulate diagnostic plan and carry out basic treatment (surgical and nonsurgical) and understand natural history for:
 - a. Non-specific back or neck pain
 - b. Radicular symptoms/signs
 - c. Degenerative disorders
 - d. Traumatic disorders

Anatomy

1. Knowledge of and participate in anatomical dissection including the following anatomic sites:
 - a. Vertebral column
 - i. Occipitocervical
 - ii. Cervical
 - iii. Thoracic
 - iv. Lumbar
 - v. Sacral
 - vi. Pelvic
 - b. Neurologic
 - i. Spinal cord
 - ii. Cauda equina
 - iii. Nerve roots (spinal and extraforaminal)
 - c. Vascular supply
 - i. Basic vascular tree, e.g., cranium to sacrum
 - ii. Spinal cord – nerve root
 - iii. Pre-sacral
 - d. Disc
 - e. Facets

- f. Ligaments
- g. Muscles
- h. Understand how these components interact to provide stability

Pathophysiology

1. Disc
 - a. Biology – anatomy
 - b. Aging vs normal
 - c. Nutrition
 - d. Vascular supply
2. Pain mechanisms
 - a. Biochemical pain
 - b. Neurologic
 - c. DRG
 - d. Sinuvertebral
 - e. Dorsal rami
3. Spinal cord injury
 - a. Mechanical
 - b. Chemical
 - c. Vascular
 - d. Inflammatory disorders
 - e. Infectious disorders
 - f. Metabolic disorders
 - g. Tumorous disorders
 - h. Deformity
 - i. Congenital disorders
4. Should be competent in application of cranial tongs (Mayfield and Gardner-Well), halo apparatus and indication for use
5. Should understand reduction of fractures or ligamentous instability
6. Should be knowledgeable of orthoses and understand the appropriate type for specific cervical, thoracic, or lumbar spine disorders

Spinal Fusion

1. Understand principles and types of bone-grafting
2. Understand basic science of grafting and fusion
3. Knowledge of indications for fusion
4. Understand differences between the use of autograft, allograft, bone substitutes including BMP, and graft extenders
5. Understand anticipated results of various fusion techniques

Surgery Approaches

Knowledge of anatomy for various approaches listed

1. Anterior
2. Posterior
3. Posterolateral
4. Transthoracic*
5. Thoraco-abdominal*
6. Transabdominal*
7. Retroperitoneal*

(Note: * approach may be done by other surgeon)

Surgery

1. Be competent in approaches for and surgery:
 - a. 1 level ACDF
 - b. Decompressive lumbar laminectomy
 - c. Posterolateral lumbar fusion
 - d. Lumbar discectomy
 - e. Closure of dural tear (primary)
2. Be knowledgeable in postoperative care for these procedures

Spinal Instrumentation

1. Have knowledge of instrumentation systems and indications for use
2. Understand complications related to hardware systems

- a. Approach
 - i. Anterior
 - ii. Posterior
- b. Level
 - i. Cervical
 - ii. Thoracic
 - iii. Thoracolumbar
 - iv. Lumbar
 - v. Lumbosacral
- c. Types of instrumentation
 - i. Wires and cables
 - ii. Plates
 - iii. Rods
 - iv. Fixation with hooks and/or screws
 - v. Cages/spacers

3. Knowledge of FDA-related issues

Complications

1. Knowledge of complications including causes and plans of action when complications occur

Outcomes

1. Basic knowledge of outcomes and how they can be used

Systems-Based Knowledge

1. Be aware of costs and efficiency tools

APPENDIX E-3

EDUCATIONAL AND PROCEDURAL GUIDELINES FOR FELLOWSHIP TRAINING IN SPINAL SURGERY

This guide outlines the general knowledge and lists the procedures that an Orthopaedic Fellow in Spinal Surgery should become competent in following completion of his or her fellowship program.

ANATOMY (OF THE SPINAL COLUMN)

Vertebral column

- Occipitocervical
- Cervical
- Thoracic
- Lumbar
- Sacral

Pelvic

- Neurologic
- Spinal cord
- Cauda equina
- Nerve roots (spinal and extraforaminal)
- Vascular supply
- Basic vascular tree (cranium to sacrum)
- Spinal cord - nerve root

Pre-sacral

- Disc
- Facets
- Ligaments
- Muscles
- Neural Elements

PHYSIOLOGY AND PATHOPHYSIOLOGY RELATED TO AGING, INJURY, DISEASE AND PAIN MECHANISM

Disc

- Anatomy
- Biology (Biochemical/Biomechanical)
- Aging
- Normal variants
- Abnormal

Pain Mechanisms

- Biochemical pain stimulators
 - Types
 - Sources
- Neurologic
 - DRG
 - Sinu-vertebral
 - Dorsal rami
 - Central
 - Radicular/myelopathy
- Spinal Cord Injury
 - Mechanical
 - Chemical
 - Vascular

BIOMECHANICS

Understanding normal and abnormal spinal motion
 Understanding spinal stability
 Understanding biomechanical testing, e.g., load to failure, etc.
 Knowledge sufficient to interpret biomechanical testing in a scientific article
 Basic knowledge of statistics

CLINICAL

History and Physical

Should be adept at taking pertinent history and assessing functional status

Examination

Neurologic

Spinal (central/radicular)

Peripheral

Inspection of spine and trunk – assess deformity and coronal & sagittal balance

Spinal motion

Abdomen – basic examination: appearance, palpation

Chest – basic exam: heart, lungs, deformity

Peripheral joints

Vascular

Ability to separate potential overlapping areas in the differential (e.g., cervical - shoulder, lumbar stenosis - hip, peripheral neuropathy, or vascular)

IMAGING

Plain radiographs including dynamic films

Magnetic resonance imaging

Myelography

Computed tomography

Discography

Nuclear imaging

Should be adept at interpreting imaging studies and understanding when and which studies to order for a particular disorder.

Should understand sensitivity and specificity of each type of imaging test.

ELECTROPHYSIOLOGY

Should understand the role of EMG/NCV and be able to apply the results to the clinical pictures

Should understand and assess changes in intraoperative monitoring

Intraoperative EMG

SSEP

Motor-evoked potentials

TREATMENT

Develop ability for children and/or adult to formulate diagnostic plan, carry out treatment (surgical and nonsurgical)¹, and understand natural history for:

Nonspecific back or neck pain

Radicular and myelopathic symptoms/signs

Degenerative disorders

Traumatic disorders

Spinal cord injuries

Inflammatory disorders

Infectious disorders

Metabolic disorders

Tumorous disorders

Deformity

Congenital disorders

Should be competent in application of cranial tongs, halo apparatus and indications for use

Should be competent in reduction of fractures or deformity with tong traction

Should be knowledgeable of orthoses and understand the appropriate type for specific cervical, thoracic, or lumbar spine disorders

Should be knowledge in use of epidural blocks
 Should be knowledgeable in use of facet blocks and nerve root injections

Spinal Fusion:

- Understand principles and types of bone fusion
- Understand basic science (biology, biomechanics) of fusion
- Knowledge of indications for fusion
- Understand differences between the use of autograft, allograft, graft extenders and enhancers, and BMP, and know which grafts are appropriate for specific conditions

Surgery - Approaches

- Occipitocervical, cervical, thoracic, lumbar, and sacral
- Anterior
- Posterior
- Anterolateral
- Posterolateral
- Lateral (TLIF)
- Transthoracic*
- Thoraco-abdominal*
- Trans-abdominal*
- Retroperitoneal*
- Transoral*
- (* =Approach may be done by other surgeon)

Procedures:

- Discectomy
- Laminotomy
- Laminectomy
- Foraminotomy
- Laminoplasty
- Corpectomy
- Closure of dural tear (primary or secondary)
- Biopsy of vertebra - percutaneous or open

Fusion procedures (cervical, thoracic, lumbar, sacral):

- Interbody graft (autograft, allograft or structural devices)
- Strut graft (autograft, allograft or structural devices)
- Posterolateral
- Posterior
- Anterior-posterior
- Methylmethacrylate and other techniques as structural support

Instrumentation

Approach

- Anterior
- Posterior
- Lateral

Level

- Occipitocervical
- Cervical
- Thoracic
- Thoracolumbar
- Lumbar
- Lumbosacral

Types of Instrumentation

- Wires (cables, etc.)
- Plates
- Rods
- Fixation with hooks and/or screws
- Cages/spacers

Complications

Thorough knowledge of complications including causes and strategies to deal with complications when they occur

Outcomes

Knowledge of outcomes, including research and tools necessary to carry out outcomes program
Be able to interpret outcome data

Systems-Based Practice

Be knowledgeable about costs of surgery, implants, grafts, and equipment
Be knowledgeable in efficient practice methods

Ethics and Professionalism

Conduct consistent with being a physician in dealing with patients, families, co-workers, and ancillary personnel
Ethics consistent with policies and procedures outlined in the ethical code published by AAOS
Appropriate disclosure of industrial relationships