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