ASNR 2018 Neuroradiology CDE Distribution Supporting Documentation

Thank you for downloading a selected sample of Neuroradiology common data element sets. These CDE sets are recommended versions of the specific brain, spine, ENT concepts, findings and observations intended for best practice reporting. These CDE sets were created by the ASNR-ACR-RSNA Common Data Elements (CDE) Neuroradiology Workgroup. The group is charged with cataloging and codifying best-practice concepts or features that appear in Neuroradiology reports for specific clinical use-cases. CDEs are not reporting templates - they are granular concepts and controlled responses. A CDE is a single concept and response. A bundle of related CDEs can be referred to as a CDE set or CDE module. CDEs can be embedded within full reporting templates when appropriate. In the very near future these CDEs will be invoked programmatically or by verbal command. Instructions for how to import these twelve macros into your Powerscribe 360 system are listed below. Below are specific recommendations and "tooltips" for how each should be used as well as a useful graphic (when appropriate) to use for guidance/reference. Unfortunately we do not have a comparable method to import these into other vendor systems at this time however we can provide these as text for those that are interested in trying them in other systems.

Questions and suggestions about the ASNR Neuroradiology CDEs should be directed to: ***support@asnr.org***

How to import the macros into **Powerscribe360:**

1. Once downloaded, place this CDE/macro folder in a convenient place on your desktop PACS/Powerscribe system.
2. Open the **Tools/Autotext** editor from the menu.
3. Select **File/Open** and point to one of the macros (these have a *.rtf suffix) in the folder.
4. The macro for that CDE will appear in your editor.
5. Select **File/SaveAs** in the menu to save this CDE in your personal templates
6. *DO NOT open/save these files in Microsoft Word or any other publishing program or they will get corrupted.*
7. *You can begin using them once you have saved them as your personal autotexts.*
8. *To insert into a template of your choice, begin a dictation and at the appropriate location in your findings section select the macro (CDE set) of your choice to insert it into your report. <u>You will have to delete the actual title that appears on the top of each macro.</u>*

Here is some general Information about each of the macros (CDE sets) is listed below with short instructions/guidelines for use.

1. **Brain MS**
    a. In patients presenting with suspected demyelinating disease/multiple sclerosis (MS), brain MRI is recommended. Key features associated with the diagnosis of multiple sclerosis include the presence, location and quantitation of T2/FLAIR hyperintensities, T1 hypointense “black holes”, enhancing lesions and tumefactive lesions. Additionally there should be comments on brain atrophy and overall disease burden. Providing these data in a structured report has been shown to improve clinical decision making as they contribute to determining whether appropriate criteria (such as McDonald criteria) are met for diagnosing a demyelinating process.
    b. The options under each section are have been recommended in the literature and are fulfilling criteria to diagnose MS. Supratentorially, if a white matter lesions is identified, it is important to note brain location (lobe) as well as whether it is periventricular or juxtacortical. Infratentorial lesions also need to be detailed, as well as any spinal cord lesions that are visualized. Regarding overall disease burden and brain atrophy, more qualitative analysis is provided in absence of a quantitative sequence/postprocessing which would otherwise be recommended. Regarding “black holes”, many lesions appear mildly T1 hypointense, however should not be considered a “black hole” unless near CSF signal.
    c. Supporting Literature:
        i. Traboulsee et al., Revised Recommendations of the Consortium of MS Centers Task Force for a Standardized MRI Protocol and Clinical Guidelines for the Diagnosis and Follow-Up of Multiple Sclerosis, AJNR Am J Neuroradiol. 2016 Mar;37(3):394-401.
        ii. Polman et al., Diagnostic criteria for multiple sclerosis: 2010 revisions to the McDonald criteria, Ann Neurol. 2011 Feb;69(2):292-302.
        iii. Alessandrino et al., Do MRI Structured Reports for Multiple Sclerosis Contain Adequate Information for Clinical Decision Making? AJR Am J Roentgenol. 2018 Jan;210(1):24-29.
        iv. 2018 Revised Guidelines of the Consortium of MS Centers MRI Protocol for the Diagnosis and Follow-up of MS, www.mscare.org/page/MRI_protocol

2. **Pituitary Microadenoma**
    a. Introduction: The imaging characteristics and location of the pituitary microadenoma help the clinician to plan nonsurgical and surgical treatments.
    b. Explanation of the features and options: The macro includes information essential to treatment planning. In addition, the confidence level of the radiologist is provided to help the clinician in making treatment-related decisions.

3. **Pituitary Macroadenoma**
    a. Introduction: The imaging characteristics and location of the pituitary macroadenoma help the clinician to plan nonsurgical and surgical treatments.

b. Explanation of the features and options: The macro includes information essential to treatment planning: the location of the macroadenoma, its border characteristics, signal intensity and enhancement characteristics, effect on the infundibulum and the size in 3 dimfensions. Presence and location of the posterior hypophysis bright spot is noted. The macro also addresses characteristics essential to surgical planning including suprasellar extension, effect on the optic pathway, invasion of the cavernous sinus and effect upon the internal carotid artery, as well as invasion of the sphenoid sinus and clivus.

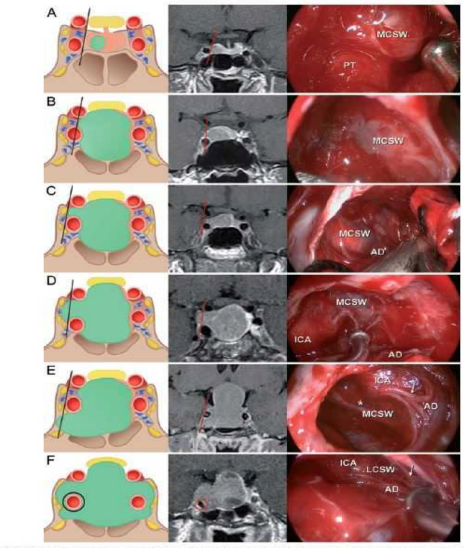


FIG. 1. Graphic schemes *(left)*, coronal MR images *(center)*, and endoscopic views *(right)*. **A**: Grade 0: the adenoma does not encroach on the CS space. Thus, the tangent of the medial aspects of the intracavernous and supracavernous ICAs is not passed.[44] **B**: Grade 1: the medial tangent is passed, but the extension does not go beyond a line drawn between the cross-sectional centers of the intracavernous and supracavernous ICAs (the intercarotid line).[44] **C**: Grade 2: the tumor extends beyond the intercarotid line but not past the tangent on the lateral aspects of the intracavernous and supracavernous ICAs.[44] **D**: Grade 3A: the tumor extends lateral to the lateral tangent of the intracavernous and supracavernous ICAs into the superior CS compartment.[44] **E**: Grade 3B: the tumor extends lateral to the lateral tangent of the intracavernous and supracavernous ICAs into the inferior CS compartment. **F**: Grade 4: there is total encasement of the intracavernous carotid artery.[44] AD = adenoma; LCSW = lateral CS wall (seen after removing the medial CS wall); MCSW = medial CS wall; PT = pituitary gland. The asterisk indicates an invaded medial CS wall, and arrows indicate trabeculae. Copyright Engelbert Knosp. Published with permission.

i. The Knosp grading system details invasion of the cavernous sinus: Knosp E, Steiner E, Kitz K, Matula C. Pituitary adenomas with invasion of the cavernous sinus space: a magnetic resonance imaging classification compared with surgical findings. Neurosurgery. 1993 Oct;33(4):610-7. Pubmed citation Micko AS, Wöhrer A, Wolfsberger S, Knosp E. Invasion of the cavernous sinus space in pituitary adenomas: endoscopic verification and its correlation with an MRI-based classification. J Neurosurg. 2015 Apr;122(4):803-11. Epub 2015 Feb 6. doi: 10.3171/2014.12.JNS141083- Pubmed citation

4. Inflammatory Sinus

a. Introduction: This Sinus CDE is structured to cover the relevant sinus drainage patterns and sinuses using picklists. This includes fronto ethmoidal, maxillary infundibular, spheno ethmoidal, and osteomeatal unit.

b. Explanation of the features and options

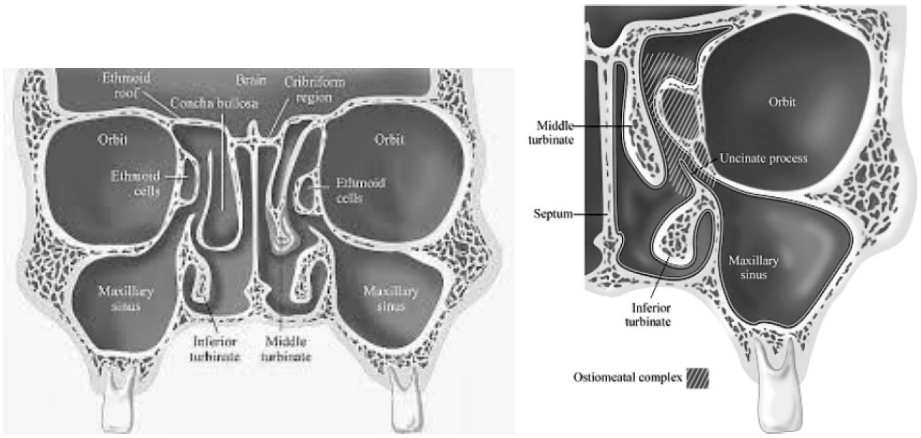
i. Each of the pick lists include an option for normal, mucosal thickening, complete opacification, or opacification with chronic osteoneogenesis. Picklists are structured to parse as normal prose once selected. This gives the advantage of reading well for consultants but still providing data that is secondarily available for query or outcome measurements.

ii. There are additional "Checklist points" to remind about relevant anatomy and surgical considerations. For example, there are binary operators for exposed/unexposed anterior ethmoids given their relevance for ESS.

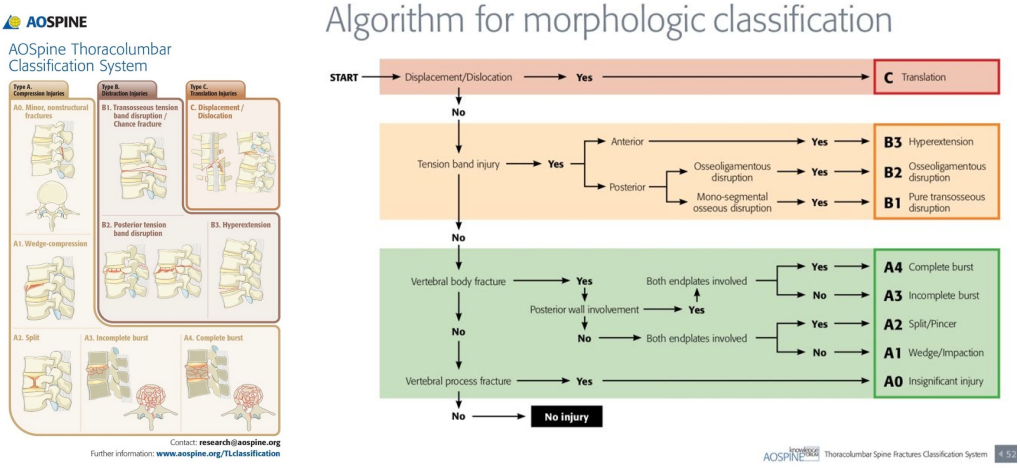
iii. Additionally, dentition assessment is included to help consider odontogenic contributions to sinus disease.

iv. Impression picklist essentially helps you to decide if there is an obstructive or non obstructive pattern of sinus disease.

c. Relevant graphic: (Newton, Jonathan & Wong Ah-See, Kim. (2008). A review of nasal polyposis. Therapeutics and clinical risk management. 4. 507-12.)

d. 

5. **AO Spine TLICS**
    a. Introduction: Thoracolumbar spine trauma requires accurate and efficient diagnosis for effective management. A number of classification schemes have been proposed: the 2013 AO Spine TLICS classification is the newest, most user-friendly, and most widely used by the surgical community. A number of studies have proven the AO Spine TLICS reliable and reproducible. The AO TLICS considers three criteria: fracture morphology, the presence of specific clinical modifiers, and the neurological status. Data for the first two of these criteria come from the radiological evaluation, and should be reported in the language of the multidisciplinary team.The original study is found here: Vaccaro A R, Oner C, Kepler C K. et al. AO Spine thoracolumbar spine injury classification system: fracture description, neurological status, and key modifiers. Spine. 2013;38(23):2028–2037.
    b. Explanation of the features and options: Morphology is classified into three primary groups by severity. Type C: Translation or displacement of the vertebral body, the most severe; Type B: Fracture with failure of the anterior or posterior tension band; and Type A: Compression or burst fracture. Type A injuries subtypes depend upon involvement of the posterior vertebral body wall (Burst: Types A:3 or A:4) and endplates (One endplate: Type A:1, both endplates: Type A:2). The algorithm for evaluation goes from most severe (rule out Type C, go on to Type B, etc…) to least severe.Modifiers include indeterminate tension band injury and comorbid spine conditions: ankylosing conditions (AS, DISH) and osteoporosis, which should be recognizable on the imaging study.
    c. Relevant graphic



6. AO Spine SLIC

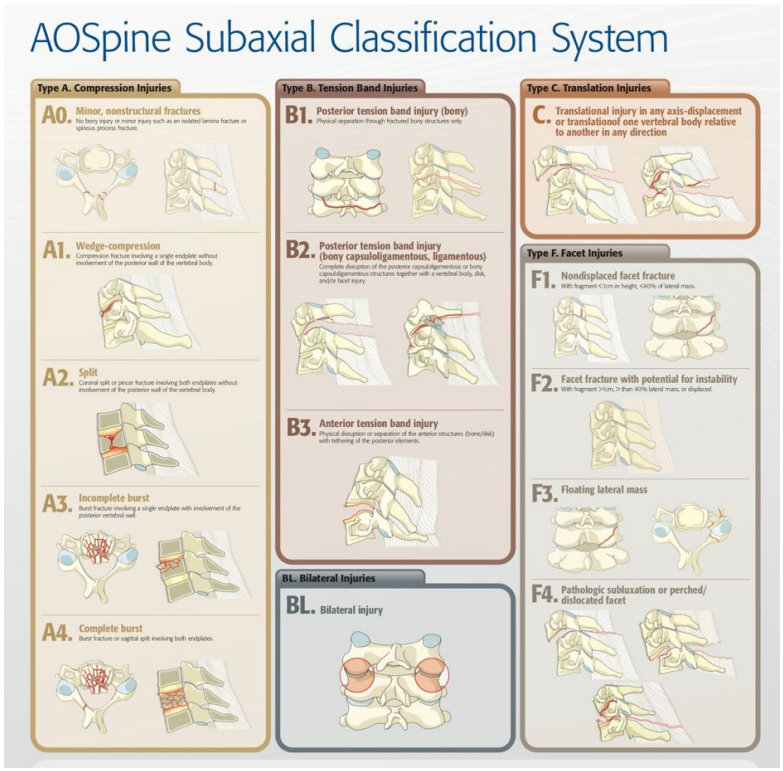
a. Introduction: Subaxial cervical spine trauma requires accurate and efficient diagnosis for effective management. A number of cervical spine classification schemes have been proposed: the 2016 AO Spine SLIC classification is the newest, most user-friendly, and most widely used by the surgical community. A number of studies have proven the AO SLIC reliable and reproducible. The AO SLIC considers four criteria: fracture morphology, facet injury, the presence of specific modifiers, and the neurological status. Data for the first three of these criteria come from the radiological evaluation, and should be reported in the language of the multidisciplinary team. The original study is found here: Vaccaro AR, Koerner JD, Radcliff KE, et al. AOSpine subaxial cervical spine injury classification system. Eur Spine J. 2016;25(7):2173-84.

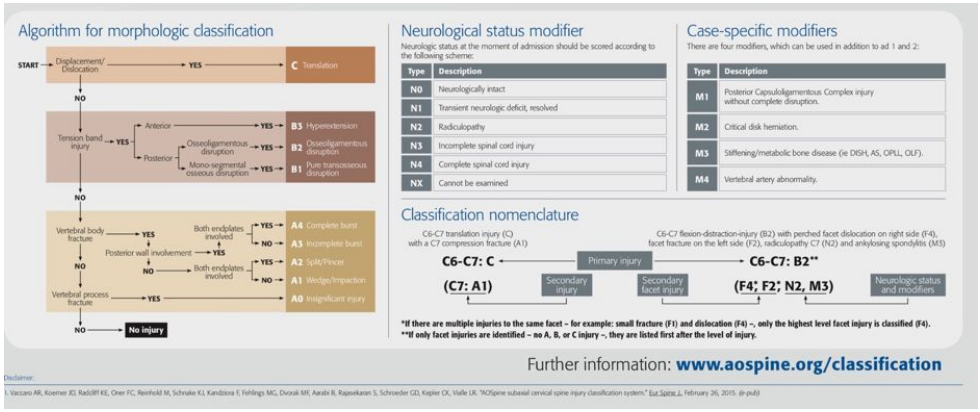
b. Explanation of the features and options: Morphology is classified into three primary groups by severity. Type C: Translation or displacement of the vertebral body, the most severe; Type B: Fracture with failure of the anterior or posterior tension band; and Type A: Compression or burst fracture. Type A injuries subtypes depend upon involvement of the posterior vertebral body wall (Burst: Types A:3 or A:4) and endplates (One endplate: Type A:1, both endplates: Type A:2). The algorithm for evaluation goes from most severe (rule out Type C, go on to Type B, etc…) to least severe.

   i. There are four categories of facet injury. Facet injuries can be present without morphologic injury. The presence of bilateral facet involvement should also be noted.

   ii. Modifiers include incomplete disruption of the posterior ligamentous complex, critical disc herniation, vertebral artery injury, and comorbid spine conditions: ankylosing conditions and osteoporosis, which should be recognizable on the imaging study.

c. Relevant graphic





7. **SINS (belong with Epidural Spinal CC)**
    a. Introduction: Optimal multidisciplinary management of osseous spinal metastatic disease requires clear, consistent communication with terminology used across specialties. Data from the radiology report is vital to appropriate initial triage and treatment planning.
        i. The Spinal Instability Neoplastic Score, created in 2010, has near universal acceptance as a tool which can direct patients with an unstable, or potentially unstable spine to surgical consultation. Osseous metastases have high morbidity, with pathologic fractures resulting in severe pain or paralysis. Patients with known, or unknown metastases, presenting to the emergency room, outpatient clinic, or hospital benefit

from appropriate triage, to ensure surgical stabilization in the setting of an unstable spine.

ii. This scale incorporates five imaging findings and one clinical finding, which may or may not be known to the radiologist. Each of these is associated with a point value. In each category, the more severe the finding, the larger the number of points assigned.

iii. The SINS score can be applied to all visualized metastases on CT or MRI. However, only a score for the worst level is required in order to give a recommendation for surgical consultation for an unstable spine.

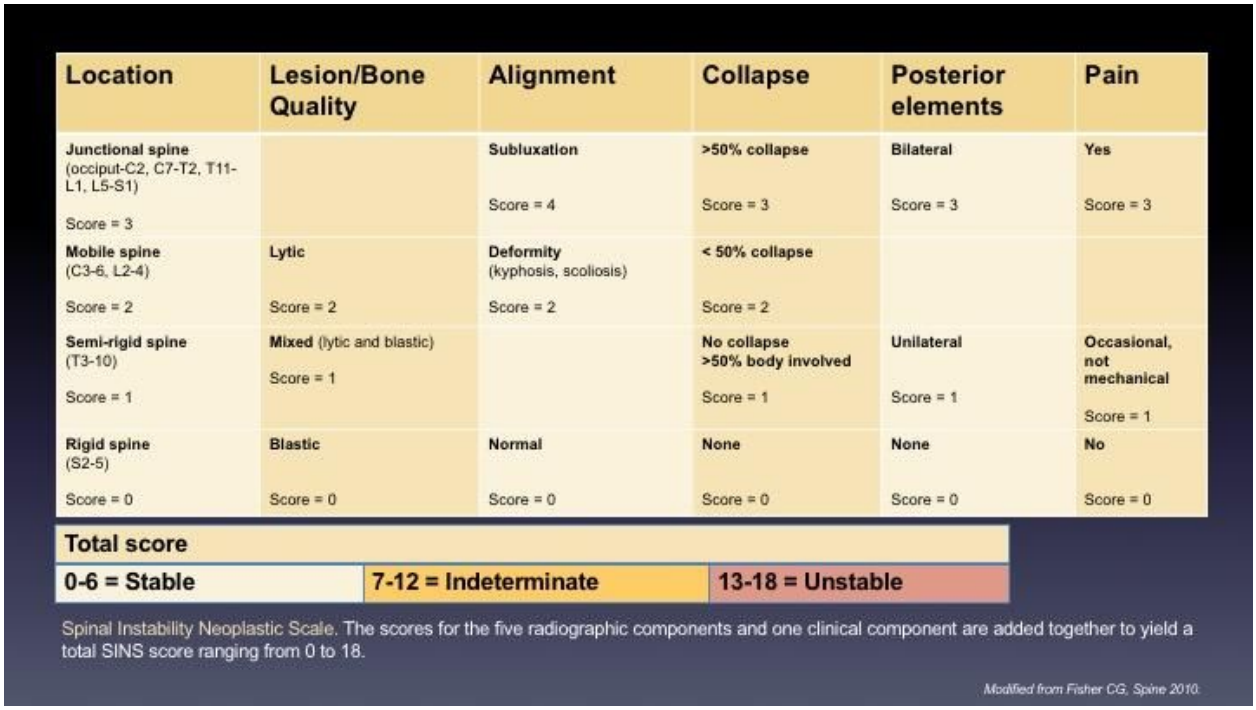
iv. The original description of the SINS score: Fisher CG, Dipaola CP, Ryken TC, et al. A novel classification system for spinal instability in neoplastic disease: an evidence-based approach and expert consensus from the Spine Oncology Study Group. Spine. 2010;35(22):E1221-9.

b. Explanation of the features and options

The CDEs included in the SINS macro include:

1. Spine location. Biomechanical properties of different regions of the spine determine propensity for failure. Junctional regions are assigned the highest number of points.
2. Lesion quality. Lytic lesions are more likely to fail than blastic metastases, and receive a higher number of points.
3. Alignment. Translation or subluxation indicates instability. New kyphosis or scoliosis suggests potential or worsening instability. Normal alignment receives the lowest number of points.
4. Collapse. Existing collapse reflects instability and is assigned the highest number of points. If no collapse is present, but greater than 50% of the vertebral body is infiltrated/replaced, there is potential for collapse.
5. Posterior elements: The posterior elements and costovertebral joints are vital for spine stability. Involvement of both posterior elements receives the highest number of points.
6. Pain. Mechanical back pain, as evidenced by pain with axial loading, upright posture, is a feature of oncologic instability. Biologic pain related to tumor infiltration of the vertebral body may coexist, but is not a feature of instability. The radiologist may or may not know the patient's pain status. If unknown, this can stated, and the total without the pain score calculated with this caveat.
7. The points are added for the total SINS score, which reflects current and potential spinal instability. Category and management recommendations based upon the total score include "Stable", "Indeterminate: surgical consultation recommended", and "Unstable: prompt surgical consultation is recommended".

c. Relevant graphic



Location	Lesion/Bone Quality	Alignment	Collapse	Posterior elements	Pain
Junctional spine (occiput-C2, C7-T2, T11-L1, L5-S1) Score = 3		**Subluxation** Score = 4	**>50% collapse** Score = 3	**Bilateral** Score = 3	**Yes** Score = 3
Mobile spine (C3-6, L2-4) Score = 2	**Lytic** Score = 2	**Deformity** (kyphosis, scoliosis) Score = 2	**< 50% collapse** Score = 2		
Semi-rigid spine (T3-10) Score = 1	**Mixed** (lytic and blastic) Score = 1		**No collapse >50% body involved** Score = 1	**Unilateral** Score = 1	**Occasional, not mechanical** Score = 1
Rigid spine (S2-5) Score = 0	**Blastic** Score = 0	**Normal** Score = 0	**None** Score = 0	**None** Score = 0	**No** Score = 0

Total score		
0-6 = Stable	**7-12 = Indeterminate**	**13-18 = Unstable**

Spinal Instability Neoplastic Scale. The scores for the five radiographic components and one clinical component are added together to yield a total SINS score ranging from 0 to 18.

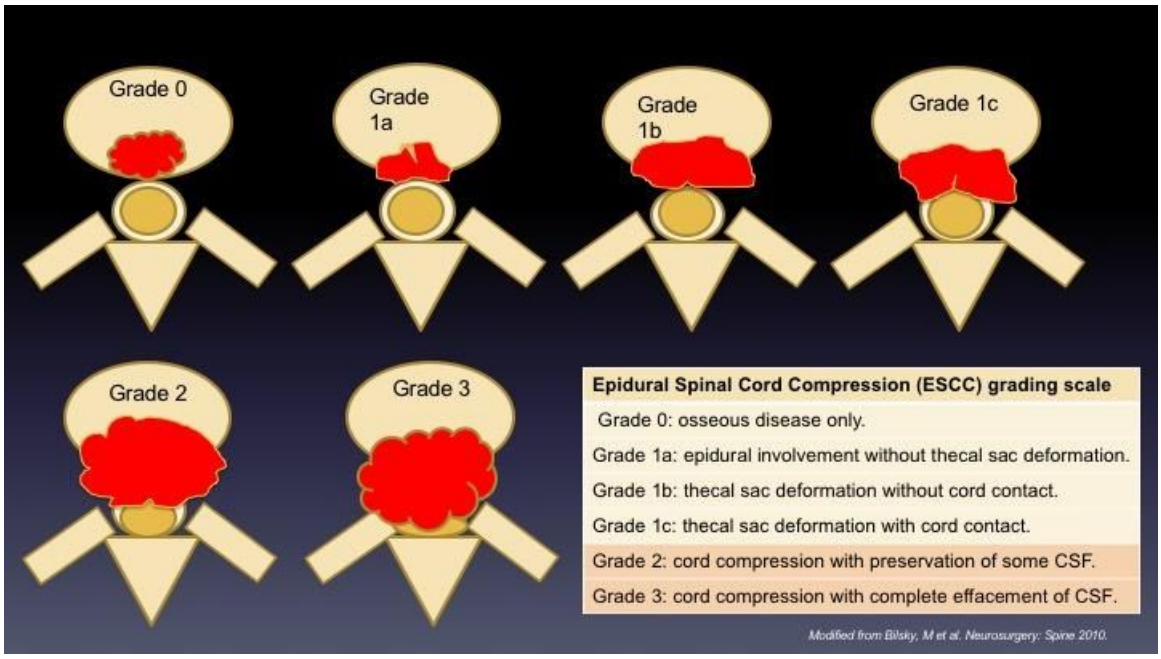
Modified from Fisher CG, Spine 2010.

8. Epidural Spinal CC (belongs with SINS)

a. Introduction: Optimal multidisciplinary management of osseous spinal metastatic disease requires clear, consistent communication with terminology used across specialties. Data from the radiology report is vital to appropriate initial triage and treatment planning.
   i. The Epidural spinal cord compression scale[1] was created in 2010 in order to standardize the reporting of cord compression for the purpose of surgical and radiation treatment planning. Until this time, there was no consensus on the definition of low grade versus high grade cord compression. The significance for treatment of spinal metastatic lies in the necessity of surgical decompression before stereotactic radiosurgery in the setting of high grade cord compression.

b. Explanation of the features and options: The scale has four grades: Grade 0 (bone involvement only) and 1 (epidural extension) are considered low grade compression and Grades 2 (partial effacement of CSF) and 3 (complete effacement of CSF) are high grade. Grade 1 is further divided into three subgrades for the purpose of radiotherapy planning. Grading is performed at the level of greatest cord compression on an axial T2 weighted image.
   i. The original description of the ESCC can be found here: Bilsky MH, Laufer I, Fourney DR, et al. Reliability analysis of the epidural spinal cord compression scale. J Neurosurg Spine. 2010;13(3):324-8.

c. Relevant graphic



9. Lymph Node

a. Introduction

i. This CDE is derived from the AJCC 8th edition Head and Neck Cancer staging system, the image-based nodal classification schemes, and relevant literature on imaging biomarkers for risk stratification. The goal is to produce radiology reports that contain all of the necessary imaging information for tumor staging in a multidisciplinary environment. Also emphasized are features that might exclude oncologic surgery.

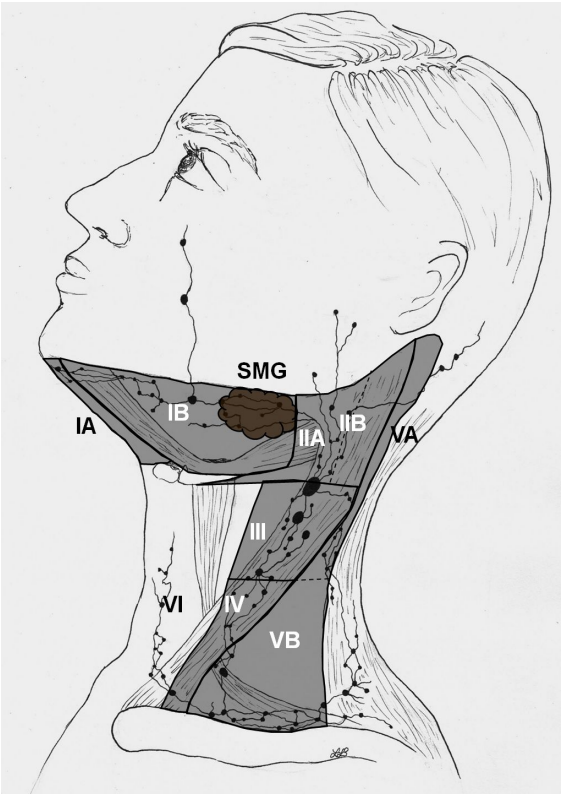
b. Explanation of the features and options

i. The acronym ENE (extranodal extension) has replaced other terms such as ECS (extracapsular spread) in the AJCC staging system

ii. The latest version of the NI-RADS scheme (including an atlas of example cases) can be found at the ACR website: https://www.acr.org/Clinical-Resources/Reporting-and-Data-Systems/NI-RADs

iii. Cystic vs. necrotic nodes may be difficult -- a thick, uniform wall suggests necrosis. Truly cystic nodes suggest HPV-associated cancer and carry a better prognosis.

c. Relevant graphic

i. 

10. CT Ischemic Stroke

a. Introduction

i. This CDE set is partly derived from the National Institute of Neurologic Disease and Stroke (NINDS) common data elements pertaining to CT ischemic stroke imaging. The CDEs are broadly divided into categories describing the anatomic and vascular distribution of ischemic stroke, qualitative and quantitative CT imaging biomarkers of acute/subacute infarction, hemorrhagic complications, and associated neurovascular disease.

b. Explanation of the features and options

i. Anatomic Distribution of Stroke:

1. Laterality: Right vs Left

2. Superficial vs Deep Types: Cortical vs Subcortical or Lacunar (<2 cm) Infarcts

3. Anatomic Location: Frontal lobe, Parietal lobe, Temporal lobe, Occipital lobe, Cerebellum, Pons, Midbrain, Medulla, Corona radiata, Insula, Anterior limb of Internal Capsule, Posterior limb of Internal Capsule, Caudate, Globus Pallidus, Putamen, Thalamus

4. Size / Volume: AP x TV x CC measurements and abc/2 calculation

ii. Vascular Distribution of Stroke:

1. Laterality: Right vs Left

2. Circulation: Anterior vs Posterior

3. Vascular Territory: ACA, MCA, PCA, SCA, AICA, PICA, Lenticulostriate/Basilar Perforator, Thalamoperforator, Anterior Choroidal
4. Vascular Mechanism/Pattern: Thromboembolic (large vessel stroke), Perforator (small vessel stroke), Watershed/Borderzone (hypoperfusion ischemia/infarction)

iii. Acute Ischemic Stroke Imaging Signs:

1. Early qualitative CT imaging biomarkers of ischemia and infarction are a result from cytotoxic edema manifested as hypoattenuation: loss of the cortical gray white matter interface, and obscuration of the deep gray nuclei (basal ganglia) or insular ribbon.

2. ASPECTS (Alberta Stroke Program Early CT Score) is a reliable and reproducible technique to quantitatively assess ischemic changes in suspected large vessel anterior circulation stroke. It may be a surrogate imaging biomarker for core infarct volumes, and assist in the selection of patients for mechanical thrombectomy in the hyperacute setting. It is graded on a 10 point scale as 0 (ischemic change) or 1 (normal) in each of 6 middle cerebral artery cortical and 4 basal ganglia territories (see graphic below):
    a. Subganglionic:
        M1 - frontal operculum
        M2 - anterior temporal lobe
        M3 - posterior temporal lobe
    b. Supraganglionic:
        M4 - anterior MCA
        M5 - lateral MCA
        M6 - posterior MCA
    c. Basal Ganglia:
        Caudate nucleus (C)
        Lentiform nucleus (L)
        Insula (I)
        internal capsule (IC)

iv. Subacute Ischemic Stroke Imaging Signs:

1. Mass effect: Low attenuation regions with sulcal effacement and gyral thickening consistent with cytotoxic edema and inflammation
2. Midline Shift and Herniation: Subfalcine, Uncal, or Transtentorial
3. If contrast enhanced CT imaging performed:
    a. Intravascular Enhancement - vascular stasis from persisting thromboembolic large vessel occlusion
    b. Parenchymal Enhancement - luxury perfusion from increased permeability and disruption of the blood-brain

barrier after spontaneous reperfusion or thrombolysis /thrombectomy

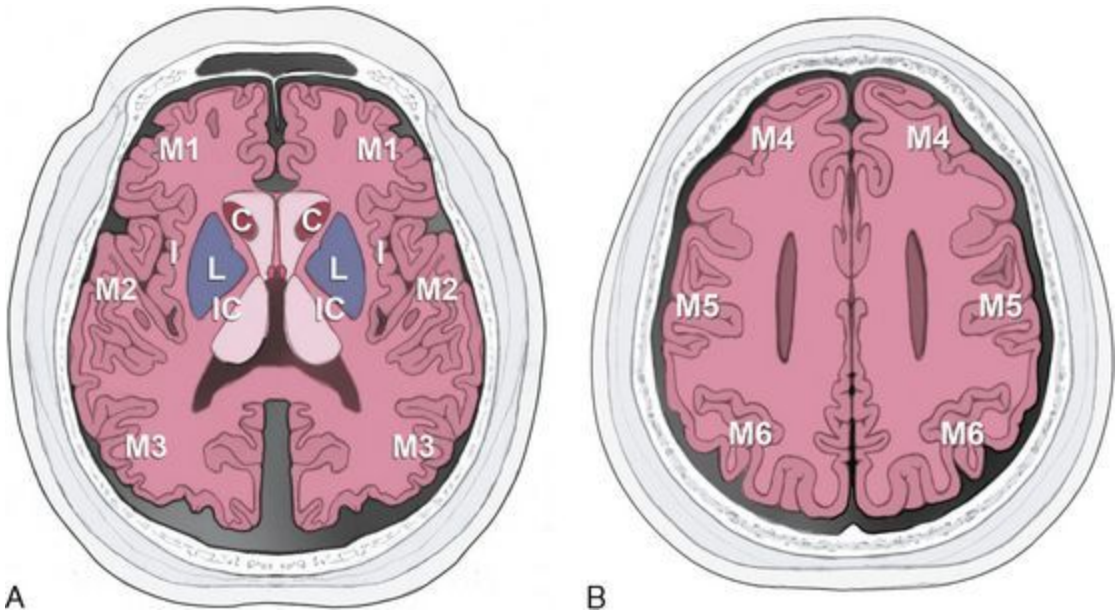
v. *Hemorrhagic Complications of Ischemic Stroke:*
   1. Laterality: Right vs Left
   2. Anatomic Location: Frontal lobe, Parietal lobe, Temporal lobe, Occipital lobe, Cerebellum, Pons, Midbrain, Medulla, Corona radiata, Insula, Anterior limb of Internal Capsule, Posterior limb of Internal Capsule, Caudate, Globus Pallidus, Putamen, Thalamus
   3. Type: Subarachnoid Hermorrhage vs Petechial or Intraparenchymal Hemorrhage
   4. Size / Volume: AP x TV x CC measurements and abc/2 calculation
   5. ECASS (European Cooperative Acute Stroke Study) classification of hemorrhagic infarct transformation or reperfusion hemorrhage (4 types):
      a. Hemorrhagic Infarction 1 (HI1) - isolated petechial staining or small petechiae along the margins of the infarct
      b. Hemorrhagic Infarction 2 (HI2) - confluent petechiae within the infarct, but without mass effect.
      c. Parenchymal Hemorrhage 1 (PH1) - homogeneous clot occupying <30% of the infarct volume with mild mass effect
      d. Parenchymal Hemorrhage 2 (PH2) - homogenous clot occupying >30% of the infarct volume with significant mass effect

      Hacke W, Kaste M, Fieschi C, Toni D, Lesaffre E, von Kummer R, Boysen G, Bluhmki E, Höxter G, Mahagne MH, et al. **Intravenous thrombolysis** with **recombinant tissue plasminogen activator** for **acute hemispheric stroke**. The **European Cooperative Acute Stroke Study(ECASS)** JAMA. 1995 Oct 4;274(13):1017-25.

vi. *Neurovascular Disease:*
   1. Laterality: Right vs Left
   2. Vascular Locations::Cavernous/Supraclinoid ICA, A1-A2 ACA, M1-M2 MCA, V4 VA-BA, P1-P2 PCA
      Frontal/Temporall/Parietal/Occipital.Cerebellar Cortical Vein, Internal Cerebral Vein, Vein of Galen
      Superior Sagittal/Trasverse/Sigmoid/Strraight Sinuses
   3. Thromboembolic Occlusions: Hyperdense artery, cortical vein or dural venous sinus sign
      a. If contrast enhanced CT performed: filling defects, cord or empty delta sign
   4. Atherosclerotic Calcifications

c. Relevant graphic:

i. ASPECTS



11. Spinal Cord Injury

a. Introduction

i. This CDE set is derived from the National Institute of Neurologic Disease and Stroke (NINDS) recommended elements for describing spinal cord injury on MRI. The features center on the length and location of spinal cord edema and hemorrhage relative to the normal appearing spinal cord parenchyma and are expressed by a vertebral body level and four subparts (1-4) which divide the vertebral body into three equal parts (top third, middle third, bottom third) and a fourth part representing the intervening disc space. So, a feature that is located at the midportion of C5 would be expressed as C5.2; a feature at the C5/6 disc space would be expressed as C5.4 etc. The set also includes the BASIC score which is evaluated on axial T2 weighted images and is used to supplement the cross-sectional assessment of injury.

b. Explanation of the features and options

i. *Upper boundary of edema:* Interface between the most rostral contiguous intramedullary segment of edema (high signal) involving more than half of the cord diameter on T2WI.

ii. *Lower boundary of edema:* Interface between the most caudal contiguous intramedullary segment of edema (high signal) involving more than half of the cord diameter on T2WI.

iii. *Upper boundary of hemorrhage:* Interface between the most rostral contiguous intramedullary segment of hemorrhage (low intrinsic signal) involving more than half of the cord diameter on T2WI/GRE.

iv. *Lower boundary of hemorrhage:* Interface between the most caudal contiguous intramedullary segment of hemorrhage (low intrinsic signal) involving more than half of the cord diameter on T2WI/GRE.

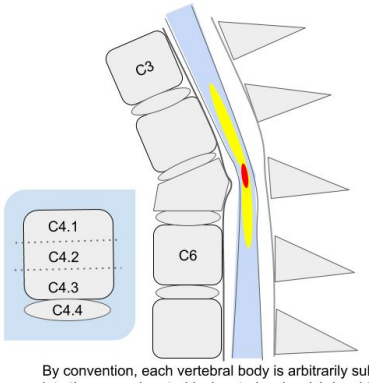
v. *SCI Epicenter:* Geographic center of the intramedullary injury. This typically is located at the midportion of the intramedullary hemorrhage/edema and could coincide with the site of spinal disruption/subluxation/angulation of the surrounding spinal soft tissues.

vi. BASIC score: Integer scale from 0 to 4. 0 is normal and a grade of 4 represents the entire cross section of the spinal cord (gray and white matter) are involved. Ref: J Neurosurg Spine. 2015 Oct;23(4):495-504.

c. Relevant graphics:

Fig1

Anatomic location designations of impact zone (center), rostral & caudal limits of spinal cord edema and hemorrhage



By convention, each vertebral body is arbitrarily subdivided into three equal parts (designated as level.1, level.2, level.3) with the intervertebral disc below as the fourth subpart (level.4). On this diagram, the rostral limit of edema is at C3.4 and the caudal extent is C6.2. Hemorrhage is demarcated by C5.1 and C5.2. Lesion center is at C5.2

Fig5

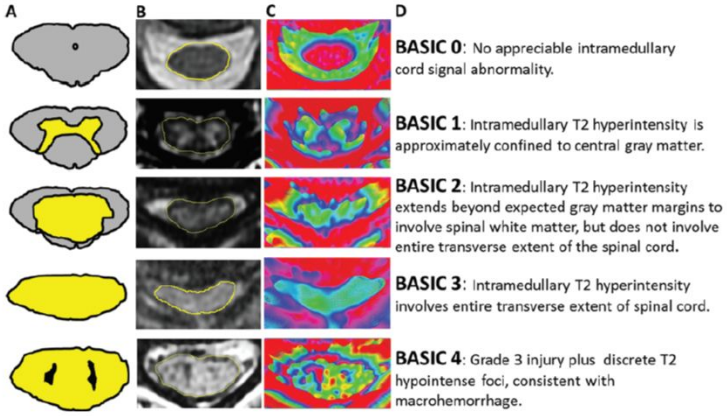


FIG. 1. The BASIC score of SCIs. Cartoon schematics (**A**), representative axial T2-weighted MRI scans (**B**), 3D-color surface plots based on the axial T2 image (**C**), and brief definitions (**D**) for each of the 5 BASIC scores (ranging from 0 to 4). In the representative MRI scans (**B**), the external contour of the spinal cord is outlined in *yellow* for better delineation. Figure is available in color online only.

12. Spinal Cord MS

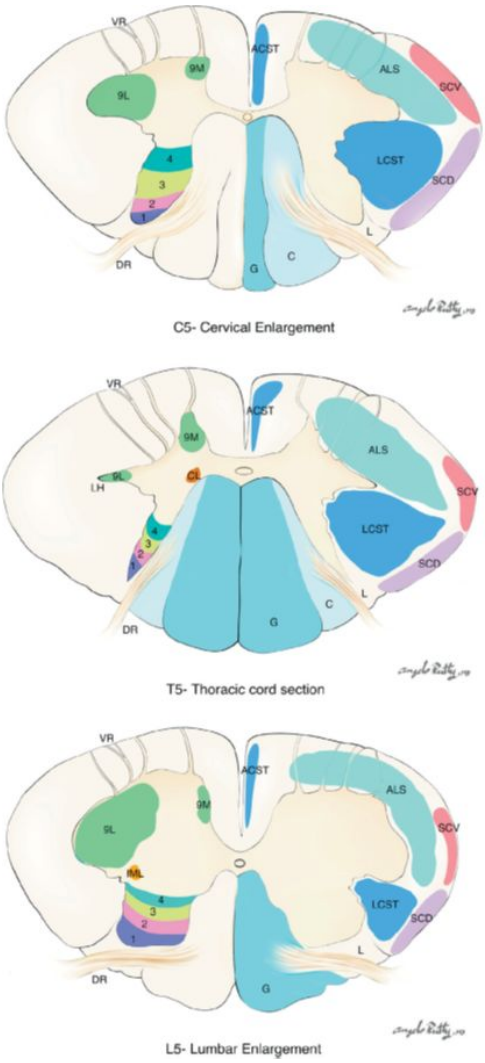
a. Introduction: Introduction: MRI is useful to support the diagnosis of multiple sclerosis (MS). It is especially useful in supporting the diagnosis of MS in patients who present with a typical clinically isolated syndrome. MR can used to substitute clinical findings in the determination of dissemination in space or time.

MR of the brain is recommended in all patients with suspicion of MS. (Thompson, 2018) MR of the spine is advisable when the presentation localizes to the cord, a progressive course, diagnosis in an atypical patient population or additional data is needed to fulfill the criteria for disease dissemination in space. The spinal cord

has been reported to be frequently involved in MS ranging from 47% to 90%. (Rocca, 1999)

b. Explanation of the features and options: the picklists are embedded in the macro to help guide the description of an abnormal signal focus within the cord.

c. Relevant graphics:



Representation of relevant gray and white matter anatomical structures. (A)Cervical segment (C5—cervical enlargement), (B) thoracic segment(T5), and (C) lumbar segment (L5—lumbar enlargement). Note the changes in the gray-white matter relation at different segments.1, lamina1; 2, lamina2; 3, lamina3; 4, lamina4; 9L, lamina9—lateral motor column (extremities); 9M, lamina9—medial motor column (axial muscles); ACST, anterior corticospinal tract; ALS, anterolateral system(SPT); C, cuneatus; CL, Clarke nucleus (C8-L3); DR, dorsal nerve root; G, gracilis; IML, intermediolateral nucleus (T1-L2); L, Lissauer tract; LCST, lateral corticospinal tract; LH, lateral horn; SCD, dorsal spinocerebellar tract; SCV, ventral spinocerebellar tract; VR, ventral nerve root.

Ref: Eric Diaz and Humberto Morales: Spinal cord anatomy and clinical syndromes. Seminars in Ultrasound CT and MRI 37:360-371, 2016. ant graphic