

Additional file 2 International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) scoring sheet

ASIA INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY (ISNCSCI) ISCOS

Patient Name: _____ Date/Time of Exam: _____
 Examiner Name: _____ Signature: _____

RIGHT

MOTOR KEY MUSCLES

U^RER (Upper Extremity Right)

Elbow flexors C5
 Wrist extensors C6
 Elbow extensors C7
 Finger flexors C8
 Finger abductors (little finger) T1

Comments (Non-key Muscle? Reason for NT? Pain?):

T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
L1

L^RER (Lower Extremity Right)

Hip flexors L2
 Knee extensors L3
 Ankle dorsiflexors L4
 Long toe extensors L5
 Ankle plantar flexors S1

(VAC) Voluntary Anal Contraction (Yes/No)

RIGHT TOTALS (MAXIMUM)

U^RER U^REL = U^REMS TOTAL L^RER + L^REL = L^REMS TOTAL

• Key Sensory Points

LEFT

MOTOR KEY MUSCLES

U^LEL (Upper Extremity Left)

Elbow flexors C5
 Wrist extensors C6
 Elbow extensors C7
 Finger flexors C8
 Finger abductors (little finger) T1

MOTOR (SCORING ON REVERSE SIDE)

1 = palpable or visible contraction
 2 = active movement, gravity eliminated
 3 = active movement, against gravity
 4 = active movement, against some resistance
 5 = active movement, against full resistance
 NT = normal contracted for parasthesia
 NT = not testable

SENSORY (SCORING ON REVERSE SIDE)

0 = absent
 1 = altered
 2 = normal
 NT = not testable

L^LER (Lower Extremity Left)

Hip flexors L2
 Knee extensors L3
 Ankle dorsiflexors L4
 Long toe extensors L5
 Ankle plantar flexors S1

(DAP) Deep Anal Pressure (Yes/No)

LEFT TOTALS (MAXIMUM)

U^LEL U^LER = U^LEMS TOTAL L^LER + L^LEL = L^LEMS TOTAL

NEUROLOGICAL LEVELS

1. SENSORY R L

2. MOTOR R L

3. NEUROLOGICAL LEVEL OF INJURY (NLI)

4. COMPLETE OR INCOMPLETE?

5. ASIA IMPAIRMENT SCALE (AIS)

ZONE OF PARTIAL PRESERVATION

Sensory R L
 Motor R L

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Muscle Function Grading

- 0 = total paralysis
- 1 = palpable or visible contraction
- 2 = active movement, full range of motion (ROM) with gravity eliminated
- 3 = active movement, full ROM against gravity
- 4 = active movement, full ROM against gravity and moderate resistance in a muscle specific position
- 5 = (normal) active movement, full ROM against gravity and full resistance in a functional muscle position expected from an otherwise unimpaired person
- 5* = (normal) active movement, full ROM against gravity and sufficient resistance to be considered normal if identified inhibiting factors (i.e. pain, disease) were not present
- NT = not testable (i.e. due to immobilization, severe pain such that the patient cannot be graded, amputation of limb, or contracture of >= 50% of the normal ROM)

Sensory Grading

- 0 = Absent
- 1 = Altered, either decreased/impaired sensation or hypersensitivity
- 2 = Normal
- NT = Not testable

When to Test Non-Key Muscles:

In a patient with an apparent AIS B classification, non-key muscle functions more than 3 levels below the motor level on each side should be tested to most accurately classify the injury (differentiate between AIS B and C).

Movement	Root level
Shoulder: Flexion, extension, abduction, adduction, internal and external rotation	C5
Elbow: Supination	
Elbow: Pronation	
Wrist: Flexion	C6
Finger: Flexion at proximal joint, extension	
Thumb: Flexion, extension and abduction in plane of thumb	C7
Finger: Flexion at MCP joint	
Thumb: Opposition, adduction and abduction perpendicular to palm	C8
Finger: Abduction of the index finger	T1
Hip: Adduction	L2
Hip: External rotation	L3
Hip: Extension, abduction, internal rotation	L4
Knee: Flexion	
Toe: MP and IP extension	
Hallux and Toe: DIP and PP flexion and abduction	L5
Hallux: Adduction	S1

ASIA Impairment Scale (AIS)

- A = Complete.** No sensory or motor function is preserved in the sacral segments S4-5.
- B = Sensory Incomplete.** Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-5 (light touch or pin prick at S4-5 or deep anal pressure) AND no motor function is preserved more than three levels below the motor level on either side of the body.
- C = Motor Incomplete.** Motor function is preserved at the most caudal sacral segments for voluntary anal contraction (VAC) OR the patient meets the criteria for sensory incomplete status (sensory function preserved at the most caudal sacral segments (S4-S5) by LT, PP or DAP), and has some sparing of motor function more than three levels below the ipsilateral motor level on either side of the body. (This includes key or non-key muscle functions to determine motor incomplete status.) For AIS C - less than half of key muscle functions below the single NLI have a muscle grade >= 3.
- D = Motor Incomplete.** Motor incomplete status as defined above, with at least half (half or more) of key muscle functions below the single NLI having a muscle grade >= 3.
- E = Normal.** If sensation and motor function as tested with the ISNCSCI are graded as normal in all segments, and the patient had prior deficits, then the AIS grade is E. Someone without an initial SCI does not receive an AIS grade.

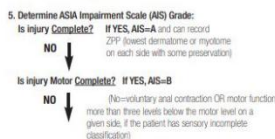
Using ND: To document the sensory, motor and NLI levels, the ASIA Impairment Scale grade, and/or the zone of partial preservation (ZPP) when they are unable to be determined based on the examination results.



Steps in Classification

The following order is recommended for determining the classification of individuals with SCI.

1. Determine sensory levels for right and left sides.
The sensory level is the most caudal intact dermatome for both pin prick and light touch sensation.
2. Determine motor levels for right and left sides.
Defined by the lowest key muscle function that has a grade of at least 3 (on supine testing), providing the key muscle functions represented by segments above that level are judged to be intact (graded at a 5).
Note: In regions where there is no myotome to test, the motor level is presumed to be the same as the sensory level, if testable motor function above that level is also normal.
3. Determine the neurological level of injury (NLI).
This refers to the most caudal segment of the cord with intact sensation and antigravity (3 or more) muscle function strength, provided that there is normal (intact) sensory and motor function rostrally (respectively).
The NLI is the most cephalad of the sensory and motor levels determined in steps 1 and 2.
4. Determine whether the injury is Complete or Incomplete.
(i.e. absence or presence of sacral sparing)
If voluntary anal contraction = No AND all S4-5 sensory scores = 0 AND deep anal pressure = No, then injury is Complete.
Otherwise, injury is Incomplete.
5. Determine ASIA Impairment Scale (AIS) Grade:
Is injury Complete? If YES, AIS=A and can record ZPP (lowest dermatome or myotome on each side with some preservation)



If sensation and motor function is normal in all segments, AIS=E
 Note: AIS E is used in follow-up testing when an individual with a documented SCI has recovered normal function. If at initial testing no deficits are found, the individual is neurologically intact; the ASIA Impairment Scale does not apply.