The Vital Role of Medical Examiners and Autopsy Data in Trauma System Development

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Disclosures
• None

Genesis and Evolution of the AIS
(Abbreviated Injury Score)
• Need for a standardized system
• Classify type and severity of injury from vehicular crashes
• Consensus derived
• 1969 Multidisciplinary Task Group
  • SAE – Society of Automotive Engineers
  • AMA – American Medical Association
  • AAAM – Association for the Advancement of Automotive Medicine
• 75 descriptions of the most frequent MVC injuries
AIS Concepts and Purpose

- Simple method to rank injury by severity relative to importance to the body
- Standardized terminology
- Usable for multiple causes of injury
- Injury descriptors organized anatomically
- Reflects severity of single injury unaffected by time, sequela or outcome
- Should be more than a threat to life scale

AIS Scaling System

- Anatomically based – clinical training not needed to collect data
- Not variable as are physiologic measurements (by drugs, tx, age, etc.)
- Ordinal scale: 1 – minor to 5 – critical to 6 – maximum (not survivable)
  - *Not* a linear relationship
- Nine body regions
- Essentially a severity of injury scale – But death is *not* part of the scale
- AIS 2005 updated in 2008

Severity Number

- The AIS single digit severity number indicates relative severity in an "average patient" who sustains only that injury
- Average patient
  - 40-45
  - Free of pre-existing conditions
  - Free of treatment complications
  - Receives timely, appropriate care
- Found appropriate to pediatric populations
- The few exceptions incorporated in 1994 revision as separate codes
7 Digit Unique Identifier

- Pre-dot code: alcdab
  - a: Body region (zero)
  - b: Type of anatomic structure
  - c: Specific anatomic structure
  - d: Level of injury within region and structure
  - e: AIS
  - f: AIS severity number (0-6, 9)

Regions:
- 4: Lower extremity
- 5: Skeletal
- 6: Femoral
- 9: Not further specified
- 4: Severe

Injury Severity Score

- Developed by Susan Baker in 1971 to assess severity of multiply injured patients
- Weighted system using highest AIS in three of six body regions
- ISS is sum of the squares of the highest AIS in three regions
- NISS (new ISS) – three most severe AIS regardless of body region
- ISS uses 6 regions
- Score ranges from 1 – 75 (AIS of 6 anywhere = 75; 5² + 5² + 5² = 75)

Body Regions

AIS
- 1: Head
- 2: Face
- 3: Neck
- 4: Thorax
- 5: Abdomen
- 6: Spine
- 7: Upper extremity
- 8: Lower extremity
- 9: Unspecified

ISS
- 1: Head & neck
- 2: Face
- 3: Chest
- 4: Abdomen/pelvis
- 5: Extremities/pelvic girdle
- 6: External
Revised Trauma Score

- Revised Trauma Score is a physiological scoring system with demonstrated accuracy in predicting death.
- Consists of Glasgow Coma Scale, Systolic Blood Pressure and Respiratory Rate.
- \[ RTS = 0.9368 \text{GCS} + 0.7326 \text{SBP} + 0.2908 \text{RR} \]

The TRISS Score

- Trauma Injury Severity Score gives the probability that an injured person will survive serious trauma based on age, physiologic parameters and the AIS.
- This allows Trauma Registrars to predict survivability (Probability of Survival or Ps) and allows the ACS to compare standardized data and judge the effectiveness of treatment across trauma centers.

Calculation of TRISS
Autopsy and AIS Coding

- According to the AAAM:
  - "Autopsy or medical examiner reports will be more detailed and complete than ED records."
  - Trauma registrars rely on the most reliable source of information (vide supra).
  - Taught to code conservatively; "probable", "possible", "rule-out" not coded.
  - Cannot code without proper verification (autopsy or imaging studies).
  - Faced with contradictory information, use most reliable source (vide supra).

- Code 9 injury:
  - Trauma has occurred but no information as to specific organ or region
  - "System to the head" surviving
  - Cannot get AIS code

Injury Source Hierarchy
Examples
• No autopsy or incompletely documented autopsy
  • Liver laceration – 541820.2
  • AIS 4
• Well documented autopsy
  • Multiple liver lacerations 1 cm deep or "rupture" – 541826.4
  • AIS 16
  • Liver lacerations with disruption of more than 75% of a lobe or involving retrohepatic cava – 541828.5
  • AIS 25

Examples
• No autopsy or incompletely documented autopsy
  • Multiple rib fractures – 450210.2
  • AIS 4
• Well documented autopsy
  • Bilateral flail chest – 450214.5
  • AIS 25
  • Note – flail chest is three or more ribs fractured in more than one location
Examples
• No autopsy or incompletely documented autopsy
  • Multiple head injuries – 100099.9
  • AIS 0
• Subdural hematoma – 140650.3
  • AIS 9
• Cerebellar contusion – 140402.3
  • AIS 9
• Internal carotid injury – 121099.3
  • AIS 9
• Well documented autopsy
  • Cerebral contusion (extensive, massive or >50cc) – 140618.5
  • AIS 25
• Subdural hematoma >50cc (25cc if <=10) – 140655.5
  • AIS 25
• Cerebellar contusion >30cc – 140405.5
  • AIS 25
• Bilateral internal carotid artery lacerations – 121003.6
  • AIS 36

Examples
• No autopsy or incompletely documented autopsy
  • Subdural hematoma – 140650.3
  • AIS 9
• Liver laceration – 541820.2
  • AIS 4
• Multiple rib fractures – 450210.2
  • AIS 4
• Total AIS = 17
• Well documented autopsy
  • Subdural hematoma >50cc (25cc if <=10) – 140655.5
  • AIS 25
• Liver lacerations involving retrohepatic cava – 541828.5
  • AIS 25
• Bilateral flail chest – 450214.5
  • AIS 25
• Total AIS = 75 (maximum possible)

References
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