MAIS 3+

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AIS Concepts and Purpose

- Rank injury by severity relative to importance to whole body
  - Severity unaffected by time, consequences or outcome
- Standardize terminology
- Usable for multiple injury causes
- Describe injury anatomically
- More than a threat to life scale

AIS Definition

- An anatomically-based, consensus-derived, global severity scoring system that classifies each injury by body region according to its relative importance on a 6-point ordinal scale.

AIS Definition

- **AIS Descriptors identify damage to the anatomic structure from the transfer of energy and NOT physiologic response.**
  - **Example: Cerebral Contusion, Liver Laceration, Femur Fracture**

Sochor & Heltzel, 2015

Advantages of Anatomical Scale

- **Clinical training is not necessary**
  - Anatomic measurements are not variable as are physiological measurements which can be affected by:
    - *Time from injury to treatment*
    - *Pre-hospital care*
    - *Presence of alcohol/other drugs*
    - *Patient's age, ability to compensate for massive volume losses*

AIS Definition

- **Ordinal Scale**:

1	Minor
2	Moderate
3	Serious
4	Severe
5	Critical
6	**Maximal**

Unique Numerical Identifier

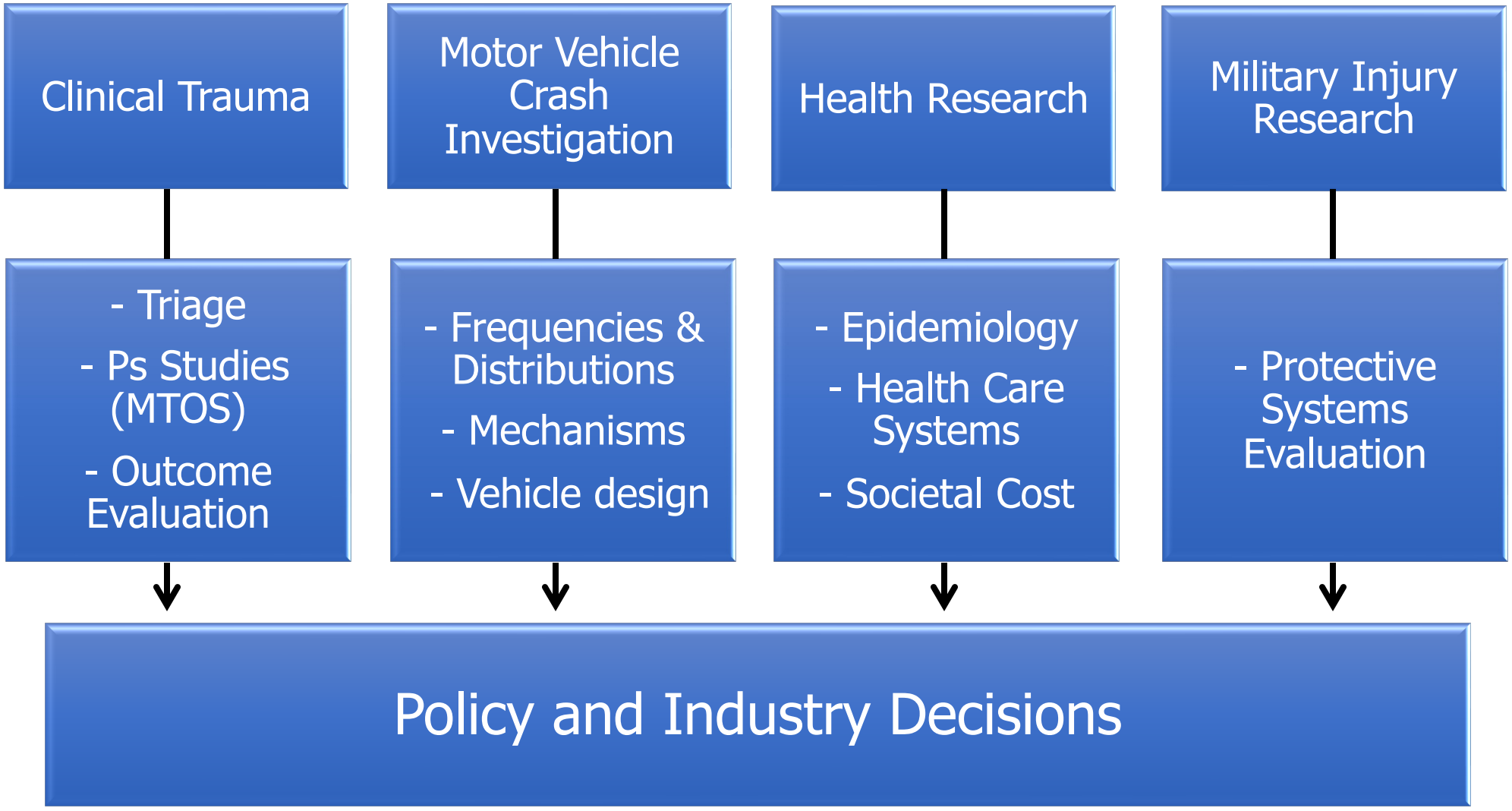
Example – Femur fracture, NFS = ***853000.3***

Pre-dot code = 853000	
8	Body Region *(AIS chapter)*
5	Structure type *(Skeletal)*
30	Specific structure *(Femur)*
00	Level of injury *(NFS = Not further specified)*
3	Severity number *(3 = serious)*

Multiple Injuries

- AIS = severity of a single injury
- *MAIS = highest AIS severity for a patient with multiple injuries*
- *ISS = sum of the squares of the highest AIS severity in each of the three most severely injured, separate ISS body regions*

CURRENT AIS USES



AIS3+ Potential Challenges

- ICD modifiers are different for each region and that may be where the conversion table is a challenge
- Data may not be robust (such as police data and an incomplete hospital record)
- Payment schemes – some health systems are not providing appropriate injury ICD codes due to coding guidelines for reimbursement

AIS is the ROOT of *Injury* Observations

AIS
ABBREVIATED INJURY SCALE

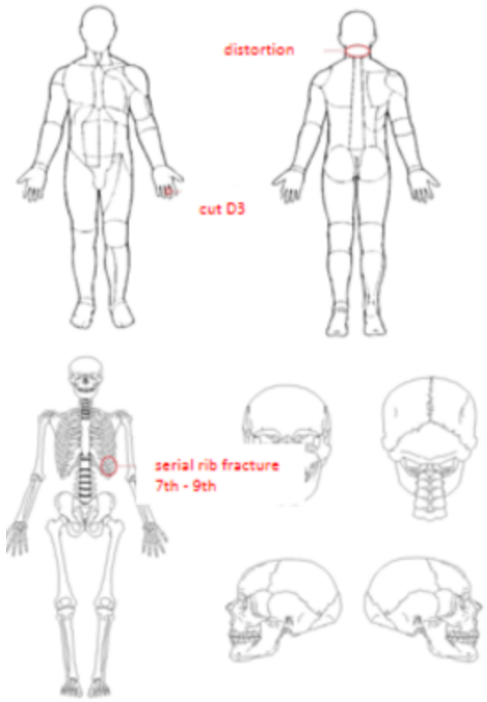
AIS

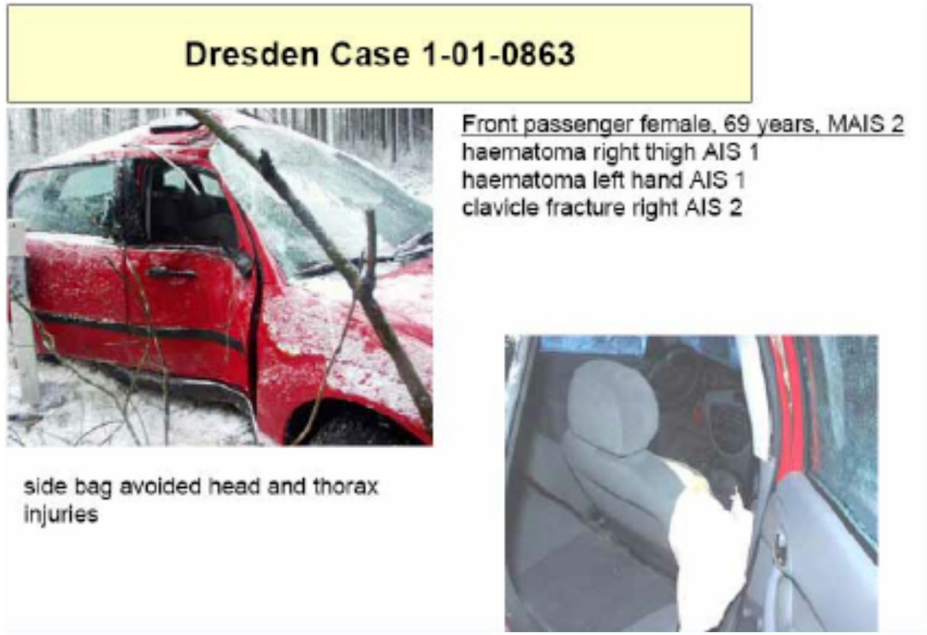
GIDAS
GERMAN IN-DEPTH ACCIDENT STUDY

NTDB™
NATIONAL TRAUMA DATA BANK

GIDAS

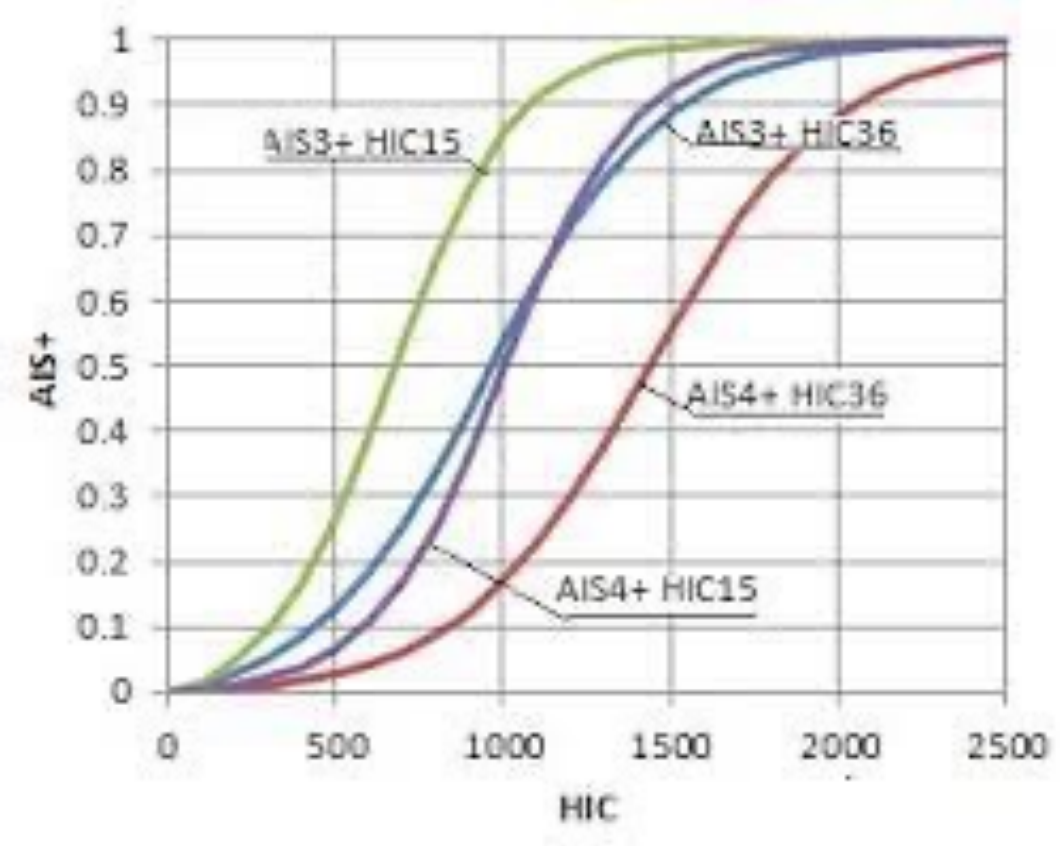
- Front passenger, female, 68 years old.
- Serious injured by the impact, marks caused by the airbag/seatbelt, impacting marks (deformation) at the right dashboard (serial rib fracture AIS3, distortion of the cervical spine AIS1, cut left finger AIS1)





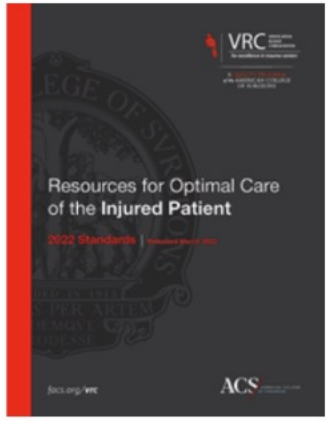
GIDAS accident case example

Motorcycle Helmet Standards



National Trauma Data Base

ACS COT releases new 2022 trauma center standards



The 2022 Standards also include new education requirements that relate to the registry team. In all trauma centers:

- At least one registrar must be a current Certified Abbreviated Injury Scale Specialist (Standard 4.31).
- All staff members who have a registry role must take and pass the most recent version of the AIS course from the Association for the Advancement of Automotive Medicine (Standard 4.32).
- All staff members who have a registry role must take an ICD-10 course (or an ICD-10 refresher course) every 5 years (Standard 4.32).

These new requirements are in addition to the longstanding requirement that registrars participate in a course that covers abstraction, data validation and other registry-related topics.

EuroNCAP

All ATD (crash test dummy) injury assessment tools are based on the AIS

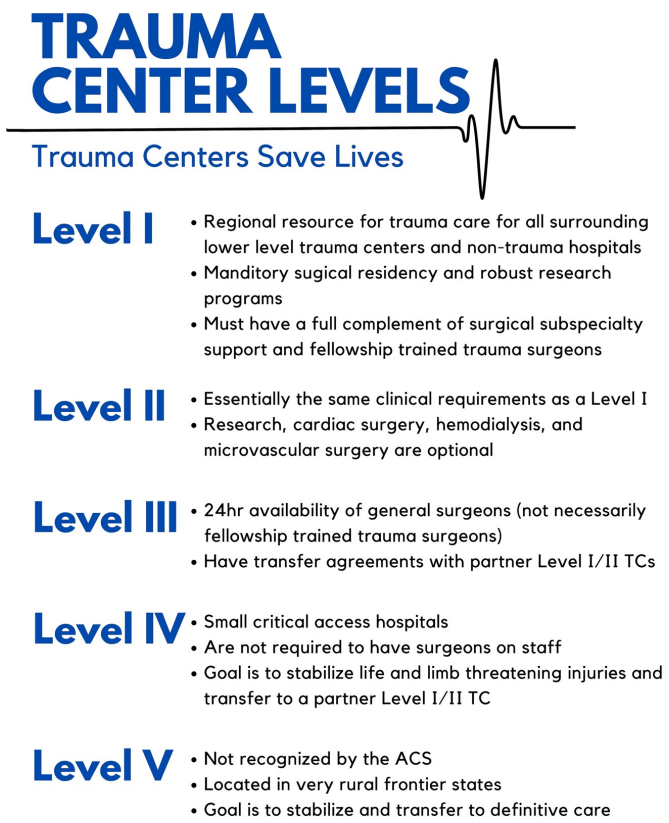
TABLE A2. Injury Assessment Reference Values for Various Body Regions, Except the Neck.

Body Region	Injury Assessment Criteria	Infants			Children			Adults		
		6 Month	12 Month	18 Month	3 Year	6 Year	10 Year	Small Female	Mid Male	Large Male
Head	Pk. 15 ms HIC	377	389	440	568	723	741	779	700	670
	Pk. CG Acc. (G)	156	154	160	175	189	189	193	180	175
Thorax	Pk. Stern. Defl., D_x (mm)									
	• Shoulder Belt	23	24	25	28	31	36	41	50	55
	• Belt + Airbag	23	24	25	28	31	36	41	50	55
	• Bag Loading, AIS≥3	-	-	-	-	-	40.4	39.0	47.7	52.8
	• Bag Loading, AIS≥4	29.3	31.1	32.6	35.8	39.7	46.5	52.5	64.3	71.1
	Pk. Rib to Spine Defl., D_y (mm)	19	20	21	23	26	30	34	42	46
	Pk. Defl. Rate, dD_x/dt & dD_y/dt (m/s)	7.8	7.6	7.9	8.0	8.5	8.4	8.2	8.2	8.2
	Pk. T4 Acc. (G)	88	87	89	92	93	82	73	60	54
Abd.	Pk. Rib to Spine Defl., D_x and D_y (mm)	18	19	20	22	24	28	32	39	43
	Pk. Defl. Rate, dD_x/dt & dD_y/dt (m/s)	7.8	7.6	7.9	8.0	8.5	8.4	8.2	8.2	8.2
	Internal Load, F_y (N)	550	640	710	840	1080	1430	1830	2500	2960
Pelvis	Pk. Pubic Load, F_y (N)	1320	1540	1690	2010	2600	3440	4390	6000	7110
	Pk. Iliac Crest Load, F_y (N)	1240	1410	1540	1850	2290	3140	4000	6000	7340
	Pk. Sacrum Load, F_y (N)	1240	1410	1540	1850	2290	3140	4000	6000	7340
Shldr.	Pk. Lateral Force, F_y (N)	880	1020	1130	1340	1730	2290	2290	4000	4740
	Pk. Lateral Defl., D_y (N)	34	36	38	42	46	54	61	75	83
Upper Extrem.	Pk. M_R, Upper Arm (Nm)	41	46	49	59	77	108	130	214	308
	Pk. M_R, Forearm (Nm)	14	15	16	20	26	38	44	90	110
Lower Extrem.	Time Dependent* Femur Compression									
	• Pk. Compr., F_z (N)	700	890	1180	1510	2700	4480	6160	9070	11,500
	• Plateau Compr., F_z (N)	500	740	980	1250	2250	3730	5130	7560	9820
	• Time, t (ms)	3	3	4	5	6	8	9	10	11
	Pk. Tibia to Femur Trans., D_x (mm)	4	5	6	6	8	10	12	15	17
	Pk. Med. or Lat. Tibia Plateau Load, F_z (N)	300	420	550	580	1050	1730	2550	4000	4910
	Pk. Tibia Compr., F_z (N)	600	840	1100	1160	2100	3460	5100	8000	9820
	Tibia Index, TI	1	1	1	1	1	1	1	1	1
	TI Intercepts									
	• M_c (Nm)	5	8	11	12	30	64	114	225	306
	• F_c (N)	2.7	3.8	5.0	5.2	9.4	15.5	22.9	35.9	44.1
	Pk. Ankle Moment, M_y or M_x (Nm)	5	8	11	12	30	64	114	225	306

*See Figure A3 for time-dependent femur criterion.

US Level I Trauma Centers

- Trauma center designation based on Injury Severity Score (ISS)
- Level I: Admit at least 1,200 trauma patients yearly or have 240 admissions with an Injury Severity Score of more than 15.



AIS Humble Beginnings

- AIS designed to become the language for trauma injury descriptions
- As the dictionary became more complex - Users of the AIS demanded rigorous adherence to the rules and mapping
- WHO approached about ICD descriptors for a more common language and alignment with AIS dictionary. Preliminary talks between the WHO and AAAM did not lead to agreement (20 years ago). Neither side was at a point in the maturity of their respective programs.

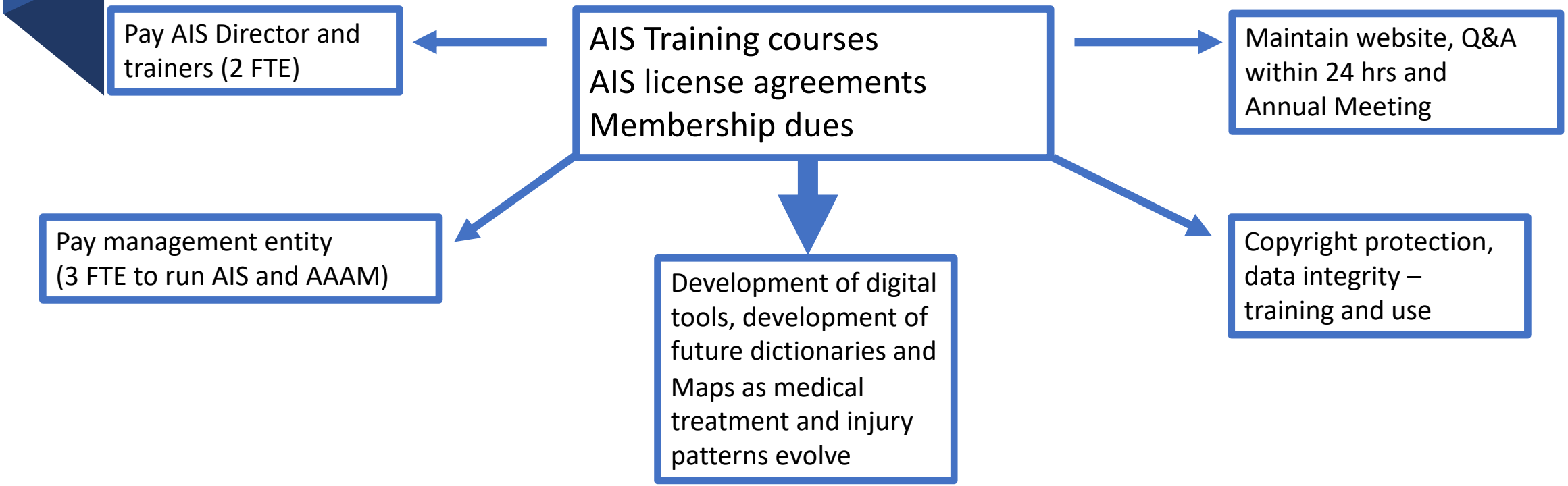
AAAM Non-profit Entity

- US tax code 503c status
- 1970s – 2004 – AIS dictionary NO COPYRIGHT
- AIS training done on a voluntary basis for 30 years, AAAM picked up the expense through AAAM membership dues and sales of dictionary *hard copies*.
- AIS 2005 – first copyright of dictionary
  - Data integrity
  - Cost of development of new AIS dictionary and data modernization

AAAM is a voluntary organization

- To belong to AAAM every member pays annual dues
- Members and non-members pay to attend the annual conference
- All officer positions of AAAM are NON-PAID positions (President to committee chairs).
- Travel reimbursement for officers only when traveling on behalf of the AAAM

Where does the $$$$ go?



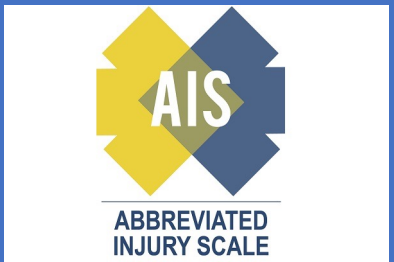
Data Integrity is the driving force

- AAAM became concerned over several decades with how the AIS dictionary was being manipulated by outside entities
  - Changing codes (Government entities had approximately 10% of codes which were changed, including AIS injury level).
  - Codes which were NOT in the dictionary were being inserted into national datasets which compromised the data integrity.
  - Entities utilizing the AIS dictionary without training and thus not following the coding rules.
  - For profit entities creating products based off of the AIS dictionary.
  - Translation into other languages without appropriate validation.

Data Modernization

- The income from training courses fund AAAM annual conference and upkeep of the dictionary.
- ICD – AIS injury code mapping – paid for by AAAM (ICD9 & 10 to AIS 2005 update 2008).
- ICD 11 – AIS 2015 early in the process – will not be completed for at least another year or two as it will need to be integrated into the new digital platform.
- Digital AIS 2015 – Dictionary application for phones, tablets, etc. Extremely expensive investment but will help put AIS into the hands of any person with a mobile phone.

AIS is the basis for most Trauma Evaluation Tools



- Injury Severity Score = AIS^2 x AIS^2 x AIS^2
- TRISS –Trauma Injury Severity Score
- RTS – Revised Trauma Score
- NISS – New Injury Severity Score

Thank You!

For MAIS3+ coding questions, please send an email to:

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