Appendix A. Search Strategies

Database: Ovid MEDLINE(R) and Ovid OLDMEDLINE(R)
Search Strategy:
----
1 exp Glasgow Coma Scale/ (7598)
2 exp Trauma Severity Indices/ (26320)
3 ((glasgow adj3 coma*) or tgcs or mgcs or gcs).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (17103)
4 2 and 3 (8526)
5 1 or 4 (8526)
6 exp Craniocerebral Trauma/ (133918)
7 (tbi or ((head or brain* or cereb* or crani* or skull*) adj3 (injur* or traum* or wound* or damag*))).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (136121)
8 6 or 7 (196584)
9 exp Emergencies/ (35777)
10 exp Emergency Medical Services/ (105134)
11 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or ((field* or onsite or on-site or scene* or accident*) adj5 triag*)).mp. (40109)
12 exp Emergency Treatment/ (100260)
13 exp emergency medicine/ (10629)
14 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or ((field* or onsite or on-site or scene* or accident*) adj5 triag*)).mp. (40109)
15 exp accidents/ (152529)
16 (emergency or emergencies or triage or priorit*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (302727)
17 15 and 16 (13350)
18 9 or 10 or 12 or 13 or 14 or 17 (249494)
19 5 and 8 and 18 (990)
20 limit 19 to english language (889)
21 limit 19 to abstracts (928)
22 20 or 21 (973)

Database: Ovid MEDLINE(R)
Search Strategy:
----
1 exp Glasgow Coma Scale/ (7453)
2 exp Trauma Severity Indices/ (26003)

3 ((glasgow adj3 coma*) or tgcs or mgcs or gcs).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (16669)
4 2 and 3 (8367)
5 1 or 4 (8367)
6 exp "wounds and injuries"/ (764490)
7 exp accidents/ (153435)
8 exp violence/ (73131)
9 (tbi or ((head or brain* or cereb* or crani* or skull*) adj3 (injur* or traum* or wound* or damag*))).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (133113)
10 ((case* or patient* or triag* or unconsciou* or consciou* or call* or "911" or emergenc*) adj5 (injur* or traum* or wound* or damag* or hurt*)).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (158827)
11 6 or 7 or 8 or 9 or 10 (1040851)
12 exp Emergencies/ (36151)
13 exp Emergency Medical Services/ (104345)
14 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or ((field* or onsite or on-site or scene* or accident*) adj5 triag*)).mp. (39234)
15 exp Emergency Treatment/ (100137)
16 exp emergency medicine/ (10652)
17 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or ((field* or onsite or on-site or scene* or accident*) adj5 triag*)).mp. (39234)
18 exp accidents/ (153435)
19 (emergency or emergencies or triage or priorit*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (297798)
20 18 and 19 (13245)
21 12 or 13 or 15 or 16 or 17 or 20 (248295)
22 5 and 11 and 21 (1587)
23 limit 22 to english language (1444)
24 limit 22 to abstracts (1483)
25 23 or 24 (1562)

Database: CINAHL
Search Strategy:
----
1 (MH "Head Injuries+") (29202)
2 (tbi or ((head or brain* or cereb* or crani* or skull*) n3 (injur* or traum* or wound* or damag*))) (31690)
3 1 or 2 (38057)
4 (MH "Trauma Severity Indices+") (10932)

5 ((glasgow n3 coma*) or tgcs or mgcs or gcs) (6372)
6 4 or 5 (11,836)
7 (MH "Emergency Medical Services+") (69526)
8 (MH "Emergency Medical Technicians") or (MH "Emergency Medical Technician Attitudes") (8776)
9 (MH "Physicians, Emergency") or (MH "Emergency Nurse Practitioners") (2383)
10 (MH "Emergency Nursing") (11557)
11 pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* (27129)
12 (emergency or emergencies or accident*) n5 (triage or priorit* or classif* or identif*) (2730)
13 7 or 8 or 9 or 10 or 11 or 12 (90644)
14 3 and 6 and 13 (774)

Database: CINAHL
Search Strategy:
----
1 (MH "trauma+") or (MH "wounds and injuries+") or (MH "emergency patients+") or (MH "accidents+") or (MH "violence+") (286638)
2 (tbi or ((head or brain* or cereb* or crani* or skull*) n3 (injur* or traum* or wound* or damag*))) (31922)
3 1 or 2 (293880)
4 (MH "Trauma Severity Indices+") (10983)
5 ((glasgow n3 coma*) or tgcs or mgcs or gcs) (6432)
6 4 or 5 (11915)
7 (MH "Emergency Medical Services+") (69734)
8 (MH "Emergency Medical Technicians") or (MH "Emergency Medical Technician Attitudes") (8800)
9 (MH "Physicians, Emergency") or (MH "Emergency Nurse Practitioners") (2395)
10 (MH "Emergency Nursing") (11562)
11 pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* (27291)
12 (emergency or emergencies or accident*) n5 (triage or priorit* or classif* or identif*) (2762)
13 7 or 8 or 9 or 10 or 11 or 12 (91020)
14 3 and 6 and 13 (2364)

Database: EBM Reviews - Cochrane Central Register of Controlled Trials
Search Strategy:
----
1 (injur* or traum* or wound* or damag*).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword] (47806)
2 ((glasgow adj3 coma*) or tgcs or mgcs or gcs).mp. (1148)
3 ((traum* or injur*) adj3 sever* adj5 (rated or rating* or scale*)).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword] (123)
4 2 or 3 (1175)

5 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or emergency or emergencies or accident* or triage or priorit* or classif* or identif*).mp. [mp=title, original title, abstract, mesh headings, heading words, keyword] (125583)
6 1 and 4 and 5 (217)

Database: EBM Reviews - Cochrane Database of Systematic Reviews
Search Strategy:
----
1 (injur* or traum* or wound* or damag*).mp. [mp=title, abstract, full text, keywords, caption text] (4650)
2 ((glasgow adj3 coma*) or tgcs or mgcs or gcs).mp. (88)
3 ((traum* or injur*) adj3 sever* adj5 (rated or rating* or scale*)).mp. [mp=title, abstract, full text, keywords, caption text] (24)
4 2 or 3 (97)
5 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or emergency or emergencies or accident* or triage or priorit* or classif* or identif*).mp. [mp=title, abstract, full text, keywords, caption text] (8818)
6 1 and 4 and 5 (80)

Database: PsycINFO
Search Strategy:
----
1 exp Traumatic Brain Injury/ (13891)
2 exp Head Injuries/ (5271)
3 exp trauma/ (59345)
4 exp accidents/ (11000)
5 exp violence/ (62018)
6 (tbi or ((head or brain* or cereb* or crani* or skull*) adj3 (injur* or traum* or wound* or damag*))).mp. (47797)
7 1 or 2 or 3 or 4 or 5 or 6 (155040)
8 ((glasgow adj3 coma*) or tgcs or mgcs or gcs).mp. (4566)
9 ((traum* or injur*) adj5 (critical* or sever* or threat*) adj7 (rat* or scale* or index* or classif* or identif*)).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures] (1171)
10 8 or 9 (5448)
11 exp Emergency Services/ (6316)
12 exp accidents/ (11000)
13 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or ((field* or onsite or on-site or scene* or accident*) adj5 triag*)).mp. (2424)
14 (emergency or emergencies or triage or ((priorit* or early or earlie* or rapid* or quick* or swift*) adj5 (treat* or therap* or interven* or interven* or transport* or procedur*))).mp. (60383)
15 11 or 12 or 13 or 14 (72337)
16 7 and 10 and 15 (546)

Database: Health and Psychosocial Instruments
Search Strategy:
----
1 (tbi or ((head or brain* or cereb* or crani* or skull*) adj3 (injur* or traum* or wound* or damag*))).mp. (1769)
2 ((glasgow adj3 coma*) or tgcs or mgcs or gcs).mp. (329)
3 ((traum* or injur*) adj3 sever* adj5 (rated or rating* or scale*)).mp. [mp=title, acronym, descriptors, measure descriptors, sample descriptors, abstract, source] (23)
4 2 or 3 (350)
5 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or ((field* or onsite or on-site or scene* or accident*) adj5 triag*)).mp. (96)
6 (emergency or emergencies or accident* or triage or priorit*).mp. (1413)
7 5 or 6 (1486)
8 1 and 4 and 7 (8)
9 4 and 7 (23)

Database: Health and Psychosocial Instruments
Search Strategy:
----
1 (injur* or traum* or wound* or damag*).mp. [mp=title, acronym, descriptors, measure descriptors, sample descriptors, abstract, source] (7032)
2 ((glasgow adj3 coma*) or tgcs or mgcs or gcs).mp. (330)
3 ((traum* or injur*) adj3 sever* adj5 (rated or rating* or scale*)).mp. [mp=title, acronym, descriptors, measure descriptors, sample descriptors, abstract, source] (23)
4 2 or 3 (351)
5 (pre-hospital* or prehospital or paramedic* or emt or ems or emergency medical technician* or ambulance* or emergency or emergencies or accident* or triage or priorit* or classif* or identif*).mp. [mp=title, acronym, descriptors, measure descriptors, sample descriptors, abstract, source] (6531)
6 1 and 4 and 5 (29)

Appendix B. Inclusion and Exclusion Criteria

	Include	Exclude
Population	Patients with known or suspected trauma.	Nonhuman population, patients without known or suspected trauma, patients transferred from another hospital.
Intervention	**GCS motor score (mGCS):** Focus on studies of the mGCS using a cutoff score of ≤5 to indicate patients who require high level trauma care, but will include studies that use alternative cutoffs or modifications of mGCS. **GCS total score (tGCS):** Focus on studies that use a cutoff tGCS score of ≤13 to indicate patients who require high level trauma care, but will include studies that use alternative cutoffs or modifications of tGCS. **Potential modifiers:** age or other patient characteristics (such as TBI vs. unspecified or other trauma, systolic blood pressure, level of intoxication, type of trauma, or intubation or receipt of medication in the field), the training and background of the person administering the instrument, and the timing/setting of assessment (i.e., in the field vs. upon presentation to the emergency department or urban vs. rural location).	Studies that evaluate the utility of mGCS or tGCS in combination with other predictors, including guidelines and triage criteria.
Comparisons	**Main KQs:** Head-to-head comparisons of mGCS vs. tGCS **Sub KQs:** No comparison required	Other measures, comparison of transferred and direct transport patients, or no comparison for main KQs
Outcomes	**KQ1:** Predictive utility for mortality, morbidity, ISS ≥16, or utilization indicators of severe injury (e.g., receipt of intracranial monitoring within 48 hours of admission, receipt of surgery within 12 hours of admission, or receipt of early intubation [in the field or immediately upon arrival to the ED]), as measured by diagnostic accuracy, adjusted risk estimates, measures of discrimination (e.g., the c-index), measures of calibration (e.g., the Hosmer-Lemeshow test), and risk reclassification rates. **KQ2:** Over- or under-triage, proportion of patients who are transferred to a higher or lower level of care. **KQ3:** Clinical outcomes, mortality (prior to hospital arrival, in the emergency department, or after hospital admission); morbidity, including cognitive impairment, and medical complications related to the brain injury; quality of life, including functional capacity at discharge or followup. **KQ4:** Reliability (e.g., inter-rater and intra-rater kappa); ease of use (e.g., time to complete, measures of missing data, user reported satisfaction).	Costs, prevalence rates.
Timing	Administered soon after injury (in the field) or immediately upon arrival in the emergency department.	After admission to the ICU, after >24 hours in the hospital.
Setting	Out-of-hospital setting (in the field) or immediately upon arrival at the hospital emergency department.	Studies conducted in the ICU or in the developing world.
Study Design	Randomized trials, cohort, and case-control studies.	Case reports, case series, cross-sectional studies, and modeling studies.
Language	English-language abstracts (includes English-language abstracts of non English-language papers) and papers.	Non English-language papers.

ED= emergency department; GCS= Glasgow Coma Scale; ICU= intensive care unit; ISS= injury severity score; KQ= key question; mGCS= motor scale of GCS; TBI= traumatic brain injury; tGCS= total GCS; vs.= versus

Appendix C. List of Included Studies

Acker SN, Ross JT, Partrick DA, et al. Glasgow motor scale alone is equivalent to Glasgow Coma Scale at identifying children at risk for serious traumatic brain injury. J Trauma Acute Care Surg. 2014;77(2):304-9.
PMID: 25058258.

Al-Salamah MA, McDowell I, Stiell IG, et al. Initial emergency department trauma scores from the OPALS study: the case for the motor score in blunt trauma. Acad Emerg Med. 2004;11(8):834-42.
PMID: 15289188.

Arbabi S, Jurkovich GJ, Wahl WL, et al. A comparison of prehospital and hospital data in trauma patients. J Trauma. 2004;56(5):1029-32.
PMID: 15179242.

Beskind DL, Stolz U, Gross A, et al. A comparison of the prehospital motor component of the Glasgow coma scale (mGCS) to the prehospital total GCS (tGCS) as a prehospital risk adjustment measure for trauma patients. Prehosp Emerg Care. 2014;18(1):68-75.
PMID: 24329032.

Bledsoe BE, Casey MJ, Feldman J, et al. Glasgow Coma Scale Scoring is Often Inaccurate. Prehospital Disaster Med. 2015;30(1):46-53.
PMID: 25489727.

Brown JB, Forsythe RM, Stassen NA, et al. Evidence-based improvement of the National Trauma Triage Protocol: The Glasgow Coma Scale versus Glasgow Coma Scale motor subscale. J Trauma Acute Care Surg. 2014;77(1):95-102; discussion 1-2.
PMID: 24977762.

Caterino JM, Raubenolt A. The prehospital simplified motor score is as accurate as the prehospital Glasgow coma scale: analysis of a statewide trauma registry. Emerg Med J. 2012;29(6):492-6.
PMID: 21795294.

Caterino JM, Raubenolt A, Cudnik MT. Modification of Glasgow Coma Scale criteria for injured elders. Acad Emerg Med. 2011;18(10):1014-21.
PMID: 21951715.

Cicero MX, Cross KP. Predictive value of initial Glasgow coma scale score in pediatric trauma patients. Pediatr Emerg Care. 2013;29(1):43-8.
PMID: 23283262.

Corrigan JD, Kreider S, Cuthbert J, et al. Components of traumatic brain injury severity indices. J Neurotrauma. 2014;31(11):1000-7.
PMID: 24521197.

Davis DP, Serrano JA, Vilke GM, et al. The predictive value of field versus arrival Glasgow Coma Scale score and TRISS calculations in moderate-to-severe traumatic brain injury. J Trauma. 2006;60(5):985-90.
PMID: 16688059.

Dinh MM, Oliver M, Bein K, et al. Level of agreement between prehospital and emergency department vital signs in trauma patients. Emerg Med Australas. 2013;25(5):457-63.
PMID: 24099376.

Eken C, Kartal M, Bacanli A, et al. Comparison of the Full Outline of Unresponsiveness Score Coma Scale and the Glasgow Coma Scale in an emergency setting population. Eur J Emerg Med. 2009;16(1):29-36.
PMID: 19106717.

Feldman A, Hart KW, Lindsell CJ, et al. Randomized controlled trial of a scoring aid to improve glasgow coma scale scoring by emergency medical services providers. Ann Emerg Med. 2015;65(3):325-9.e2.
PMID: 25199613.

Gill M, Steele R, Windemuth R, et al. A comparison of five simplified scales to the out-of-hospital Glasgow Coma Scale for the prediction of traumatic brain injury outcomes. Acad Emerg Med. 2006;13(9):968-73.
PMID: 16894005.

Gill M, Windemuth R, Steele R, et al. A comparison of the Glasgow Coma Scale score to simplified alternative scores for the prediction of traumatic brain injury outcomes. Ann Emerg Med. 2005;45(1):37-42.
PMID: 15635308.

Haukoos JS, Gill MR, Rabon RE, et al. Validation of the Simplified Motor Score for the prediction of brain injury outcomes after trauma. Ann Emerg Med. 2007;50(1):18-24.
PMID: 17113193.

Healey C, Osler TM, Rogers FB, et al. Improving the Glasgow Coma Scale score: motor score alone is a better predictor. J Trauma. 2003;54(4):671-8; discussion 8-80.
PMID: 12707528.

Heim C, Schoettker P, Gilliard N, et al. Knowledge of Glasgow coma scale by air-rescue physicians. Scand J Trauma Resusc Emerg Med. 2009;17:39.
PMID: 19723331.

Holmes JF, Palchak MJ, MacFarlane T, et al. Performance of the pediatric glasgow coma scale in children with blunt head trauma. Acad Emerg Med. 2005;12(9):814-9.
PMID: 16141014.

Johnson DL, Krishnamurthy S. Send severely head-injured children to a pediatric trauma center. Pediatr Neurosurg. 1996;25(6):309-14.
PMID: 9348151.

Kerby JD, MacLennan PA, Burton JN, et al. Agreement between prehospital and emergency department glasgow coma scores. J Trauma. 2007;63(5):1026-31.
PMID: 17993947.

Lane PL, Baez AA, Brabson T, et al. Effectiveness of a Glasgow Coma Scale instructional video for EMS providers. Prehospital Disaster Med. 2002;17(3):142-6.
PMID: 12627917.

Leijdesdorff HA, van Dijck JT, Krijnen P, et al. Injury pattern, hospital triage, and mortality of 1250 patients with severe traumatic brain injury caused by road traffic accidents. J Neurotrauma. 2014;31(5):459-65.
PMID: 24093437.

Majdan M, Steyerberg EW, Nieboer D, et al. Glasgow coma scale motor score and pupillary reaction to predict six-month mortality in patients with traumatic brain injury: comparison of field and admission assessment. J Neurotrauma. 2015;32(2):101-8.
PMID: 25227136.

Nesiama JA, Pirallo RG, Lerner EB, et al. Does a prehospital Glasgow Coma Scale score predict pediatric outcomes? Pediatr Emerg Care. 2012;28(10):1027-32.
PMID: 23023472.

Reisner A, Chen X, Kumar K, et al. Prehospital heart rate and blood pressure increase the positive predictive value of the Glasgow Coma Scale for high-mortality traumatic brain injury. J Neurotrauma. 2014;31(10):906-13.
PMID: 24372334.

Ross SE, Leipold C, Terregino C, et al. Efficacy of the motor component of the Glasgow Coma Scale in trauma triage. J Trauma. 1998;45(1):42-4.
PMID: 9680010.

Takahashi C, Okudera H, Origasa H, et al. A simple and useful coma scale for patients with neurologic emergencies: the Emergency Coma Scale. Am J Emerg Med. 2011;29(2):196-202.
PMID: 20825789.

Thompson DO, Hurtado TR, Liao MM, et al. Validation of the Simplified Motor Score in the out-of-hospital setting for the prediction of outcomes after traumatic brain injury. Ann Emerg Med. 2011;58(5):417-25.
PMID: 21803448.

Timmons SD, Bee T, Webb S, et al. Using the abbreviated injury severity and Glasgow Coma Scale scores to predict 2-week mortality after traumatic brain injury. J Trauma. 2011;71(5):1172-8.
PMID: 22071922.

Van de Voorde P, Sabbe M, Rizopoulos D, et al. Assessing the level of consciousness in children: a plea for the Glasgow Coma Motor subscore. Resuscitation. 2008;76(2):175-9.
PMID: 17728046.

Appendix D. List of Excluded Studies

Exclusion Code Key

Codes	Reason
2	Background or discussion paper only, no data for evidence
3	Wrong population (nonhuman population, patients without known or suspected trauma, transferred patients)
4	Wrong intervention (measure other than the GCS, composite variables [GCS + something], guidelines/triage criteria)
5	Wrong outcome (costs, prevalence rates, doesn't report outcome of interest)
6	Wrong study design (case reports, case series, cross-sectional studies [KQ 1-3, only], and modeling studies)
7	Wrong publication type (opinion, editorial, letter, guideline document not used for background)
8	Wrong comparison (other measures, non head-to-head comparison studies for main KQs, direct vs. transferred patients)
9	Wrong setting (in hospital or ICU not ED, not immediately upon arrival in ED [>4 hours], studies conducted in the developing world, unable to determine where/when GCS administered)
10	Not English language but may be relevant
11	Review not meeting our requirements (i.e. wrong study designs included, no risk of bias assessment, only one library searched, nonsystematic review, more updated review available)
12	Studies outside of search dates (published before January 1995)
13	Indirect studies (tGCS, mGCS, or SMS only) for KQ 1 that do not address one of the subgroups of interest (e.g., pediatrics, elderly, intoxicated individuals, intubated patients, TBI vs. other trauma patients, etc.)

ED=emergency department; GCS=Glasgow Coma Scale; ICU=intensive care unit; KQ=key question; mGCS=motor only compotent of GCS; SMS=Simplified Motor Score; TBI=traumatic brain injury; tGCS=total score of GCS; vs.=versus

Guidelines for the operation of burn centers. J Burn Care Res. 2007;28(1):134-41. PMID:17211214.
Exclusion: 4

Findings question the applicability of widely used trauma triage scores to assess older patients. Orthopedics Today. 2014;34(11):15- 1p.
Exclusion: 6

Abdel-Aty M, Keller J. Exploring the overall and specific crash severity levels at signalized intersections. Accid Anal Prev. 2005;37(3):417-25. PMID:15784195.
Exclusion: 11

Abu-Kishk I, Vaiman M, Rosenfeld-Yehoshua N, et al. Riding a bicycle: do we need more than a helmet? Pediatr Int. 2010;52(4):644-7. PMID:20487373.
Exclusion: 4

Ackerman R, Waldron RL. Difficulty breathing: agreement of paramedic and emergency physician diagnoses. Prehosp Emerg Care. 2006;10(1):77-80. PMID:16418095.
Exclusion: 4

Acosta CD, Delgado MK, Gisondi MA, et al. Characteristics of Pediatric Trauma Transfers to a Level I Trauma Center: Implications for Developing a Regionalized Pediatric Trauma System in California. Acad Emerg Med. 2010;17(12):1364-73. PMID:21122022.
Exclusion: 6

Adams SD, Cotton BA, Wade CE, et al. Do not resuscitate status, not age, affects outcomes after injury: An evaluation of 15,227 consecutive trauma patients. J Trauma Acute Care Surg. 2013;74(5):1327-30 4p. PMID:23609286.
Exclusion: 4

Ahmed N, Bialowas C, Kuo YH, et al. Impact of preinjury anticoagulation in patients with traumatic brain injury. South Med J. 2009;102(5):476-80. PMID:19373146.
Exclusion: 4

Ahun E, Koksal O, Sigirli D, et al. Value of the Glasgow coma scale, age, and arterial blood pressure score for predicting the mortality of major trauma patients presenting to the emergency department. Ulus Travma Acil Cerrahi Derg. 2014;20(4):241-7. PMID:25135017.
Exclusion: 4

Alderson P, Roberts I. Corticosteroids for acute traumatic brain injury. Cochrane Database Syst Rev. 2009(3)
PMID:15674869.
Exclusion: 4

Alkhoury F, Courtney J. Outcomes after severe head injury: a National Trauma Data Bank-based comparison of Level I and Level II trauma centers. Am Surg. 2011;77(3):277-80.
PMID:21375836.
Exclusion: 9

Allen CJ, Hannay W, Murray C, et al. Causes of death differ between elderly and adult falls. J Trauma Acute Care Surg. 2015;79(4):617-21.
PMID:26402536.
Exclusion: 4

Allen S, Zhu S, Sauter C, et al. A comprehensive statewide analysis of seatbelt non-use with injury and hospital admissions: new data, old problem. Acad Emerg Med. 2006;13(4)
PMID:16531597.
Exclusion: 4

Anders JF, Adelgais K, Hoyle JD, et al. Comparison of Outcomes for Children With Cervical Spine Injury Based on Destination Hospital From Scene of Injury Comparación de los Resultados en Niños con Lesión de Columna Cervical según el Hospital de Destino desde el. Acad Emerg Med. 2014;21(1):55-64.
PMID:24552525.
Exclusion: 4

Andriessen TM, Horn J, Franschman G, et al. Epidemiology, severity classification, and outcome of moderate and severe traumatic brain injury: a prospective multicenter study. J Neurotrauma. 2011;28(10):2019-31.
PMID:21787177.
Exclusion: 13

Anonymous. The Brain Trauma Foundation. The American Association of Neurological Surgeons. The Joint Section on Neurotrauma and Critical Care. Glasgow coma scale score. J Neurotrauma. 2000;17(6-7):563-71.
PMID:10937902.
Exclusion: 11

Anonymous. Routine early corticosteroid infusion increases death rate after serious head injury. Evidence-Based Healthcare and Public Health. 2005;9(2):165-6.
Exclusion: 4

Arbabi S, Jurkovich GJ, Wahl WL, et al. Effect of patient load on trauma outcomes in a Level I trauma center. J Trauma. 2005;59(4):815-8; discussion 9-20.
PMID:16374267.
Exclusion: 4

Arbogast KB, Ghati Y, Menon RA, et al. Field investigation of child restraints in side impact crashes. Traffic Inj Prev. 2005;6(4):351-60.
PMID:16266944.
Exclusion: 4

Arslan ED, Solakoglu AG, Komut E, et al. Assessment of maxillofacial trauma in emergency department. World J Emerg Surg. 2014;9(1):13.
PMID:24484727.
Exclusion: 4

Arthur M, Newgard CD, Mullins RJ, et al. A population-based survival assessment of categorizing level III and IV rural hospitals as trauma centers. J Rural Health. 2009;25(2):182-8.
PMID:19785584.
Exclusion: 4

Asikainen I, Kaste M, Sarna S. Patients with traumatic brain injury referred to a rehabilitation and re-employment programme: Social and professional outcome for 508 Finnish patients 5 or more years after injury. Brain Inj. 1996;10(12):883-99.
PMID:8939307.
Exclusion: 4

Asikainen I, Nybo T, Muller K, et al. Speed performance and long-term functional and vocational outcome in a group of young patients with moderate or severe traumatic brain injury. Eur J Neurol. 1999;6(2):179-85.
PMID:10053230.
Exclusion: 4

Atabaki SM. Prehospital Evaluation and Management of Traumatic Brain Injury in Children. Clin Pediatr Emerg Med. 2006;7(2):94-104.
Exclusion: 7

Atabaki SM. Pediatric head injury. Pediatr Rev. 2007;28(6):215-24.
PMID:17545333.
Exclusion: 11

Atanasijevic TC, Popovic VM, Nikolic SD. Characteristics of chest injury in falls from heights. Leg Med (Tokyo). 2009;11 Suppl 1:S315-7.
PMID:19282225.
Exclusion: 4

Athanasiou T, Krasopoulos G, Nambiar P, et al. Emergency thoracotomy in the pre-hospital setting: a procedure requiring clarification. Eur J Cardiothorac Surg. 2004;26(2):377-86.
PMID:15296900.
Exclusion: 4

Atkin C, Freedman I, Rosenfeld JV, et al. The evolution of an integrated State Trauma System in Victoria, Australia. Injury. 2005;36(11):1277-87.
PMID:16214472.
Exclusion: 7

Aubuchon M, Hemmes B, Poeze M, et al. Prehospital care in patients with severe traumatic brain injury: does the level of prehospital care influence mortality? Eur J Trauma Emerg Surg. 2013;39(1):35-41.
PMID:26814921.
Exclusion: 4

Babu MA, Nahed BV, Demoya MA, et al. Is trauma transfer influenced by factors other than medical need? An examination of insurance status and transfer in patients with mild head injury. Neurosurgery. 2011;69(3):659-67; discussion 67.
PMID:21499151.
Exclusion: 3

Baethmann A, Chapuis D, Wirth A. System analysis of patient management during the pre- and early clinical phase in severe head injury. Acta Neurochir Suppl. 1999;73:93-7.
PMID:10494349.
Exclusion: 3

Baethmann A, Lehr D, Wirth A. Prospective analysis of patient management in severe head injury. Acta Neurochir Suppl. 1998;71:107-10.
PMID:9779158.
Exclusion: 4

Baethmann A, Wirth A, Schlesinger-Raab A. Prospective system analysis of the pre- and early hospital care in severe head injury in Bavaria at a population-based level. Eur Surg Res. 2002;34(1-2):42-6.
PMID:11867900.
Exclusion: 4

Baez AA, Giraldez EM, De Pena JM. Precision and reliability of the Glasgow Coma Scale score among a cohort of Latin American prehospital emergency care providers. Prehospital Disaster Med. 2007;22(3):230-2.
PMID:17894218.
Exclusion: 3

Baker M. Reviewing the application of the Glasgow Coma Scale: Does it have interrater reliability? British Journal of Neuroscience Nursing. 2008;4(7)
Exclusion: 11

Balestreri M, Czosnyka M, Chatfield DA, et al. Predictive value of Glasgow Coma Scale after brain trauma: change in trend over the past ten years. J Neurol Neurosurg Psychiatry. 2004;75(1):161-2.
PMID:14707332.
Exclusion: 9

Ball CG, Dente CJ, Kirkpatrick AW, et al. Occult pneumothoraces in patients with penetrating trauma: Does mechanism matter? Can J Surg. 2010;53(4):251-5.
PMID:20646399.
Exclusion: 4

Ball CG, Rozycki GS, Feliciano DV. Upper extremity amputations after motor vehicle rollovers. J Trauma. 2009;67(2):410-2.
PMID:19667899.
Exclusion: 4

Balogh Z, King KL, Mackay P, et al. The epidemiology of pelvic ring fractures: a population-based study. J Trauma. 2007;63(5):1066-73 8p.
PMID:17993952.
Exclusion: 4

Banerjee S, Barry MJ, Paterson JM. Paediatric pelvic fractures: 10 years experience in a trauma centre. Injury. 2009;40(4):410-3 4p.
PMID:19232592.
Exclusion: 4

Bankole S, Asuncion A, Ross S, et al. First responder performance in pediatric trauma: a comparison with an adult cohort. Pediatr Crit Care Med. 2011;12(4):e166-70.
PMID:20729789.
Exclusion: 4

Bansal V, Conroy C, Lee J, et al. Is bigger better? The effect of obesity on pelvic fractures after side impact motor vehicle crashes. J Trauma. 2009;67(4):709-14.
PMID:19820575.
Exclusion: 4

Barker MD, Whyte J, Pretz CR, et al. Application and clinical utility of the Glasgow Coma Scale over time: a study employing the NIDRR traumatic brain injury model systems database. J Head Trauma Rehabil. 2014;29(5):400-6.
PMID:23535391.
Exclusion: 13

Barnett AS, Wang NE, Sahni R, et al. Variation in Prehospital Use and Uptake of the National Field Triage Decision Scheme. Prehosp Emerg Care. 2013;17(2):135-48 14p.
PMID:23452003.
Exclusion: 13

Barraco RD, Chiu WC, Bard MR, et al. Practice management guidelines for the appropriate triage of the victim of trauma. Eastern Association for the Surgery of Trauma. 2010
Exclusion: 5

Barraco RD, Chiu WC, Clancy TV, et al. Practice management guidelines for the diagnosis and management of injury in the pregnant patient: the EAST Practice Management Guidelines Work Group. J Trauma. 2010;69(1):211-4.
PMID:20622592.
Exclusion: 7

Bastos R, Calhoon JH, Baisden CE. Flail chest and pulmonary contusion. Semin Thorac Cardiovasc Surg. 2008;20(1):39-45.
PMID:18420125.
Exclusion: 4

Batchinsky AI, Cancio LC, Salinas J, et al. Prehospital loss of R-to-R interval complexity is associated with mortality in trauma patients. J Trauma. 2007;63(3):512-8.
PMID:18073594.
Exclusion: 4

Batchinsky AI, Salinas J, Kuusela T, et al. Rapid prediction of trauma patient survival by analysis of heart rate complexity: impact of reducing data set size. Shock. 2009;32(6):565-71.
PMID:19487984.
Exclusion: 4

Batchinsky AI, Skinner JE, Necsoiu C, et al. New measures of heart-rate complexity: effect of chest trauma and hemorrhage. J Trauma. 2010;68(5):1178-85 8p.
PMID:20173662.
Exclusion: 4

Bazarian JJ, Eirich MA, Salhanick SD. The relationship between pre-hospital and emergency department Glasgow coma scale scores. Brain Inj. 2003;17(7):553-60.
PMID:12775268.
Exclusion: 3

Beca J, Cox PN, Taylor MJ, et al. Somatosensory evoked potentials for prediction of outcome in acute severe brain injury. J Pediatr. 1995;126(1):44-9.
PMID:7815222.
Exclusion: 3

Beekley AC, Sebesta JA, Blackbourne LH, et al. Prehospital tourniquet use in Operation Iraqi Freedom: effect on hemorrhage control and outcomes. J Trauma. 2008;64(2 Suppl):S28-37; discussion S.
PMID:18376169.
Exclusion: 4

Behera C, Rautji R, Dogra TD. Fatal accidental fall from height in infants and children: a study from South Delhi. Med Sci Law. 2010;50(1):22-4.
PMID:20349690.
Exclusion: 4

Beilman GJ, Blondet JJ, Nelson TR, et al. Early hypothermia in severely injured trauma patients is a significant risk factor for multiple organ dysfunction syndrome but not mortality. Ann Surg. 2009;249(5):845-50.
PMID:19387315.
Exclusion: 4

Benner JP, Brauning G, Green M, et al. Disagreement between transport team and ED staff regarding the prehospital assessment of air medically evacuated scene patients. Air Med J. 2006;25(4):165-9.
PMID:16818166.
Exclusion: 4

Bennett TD, Kaufman R, Schiff M, et al. Crash analysis of lower extremity injuries in children restrained in forward-facing car seats during front and rear impacts. J Trauma. 2006;61(3):592-7.
PMID:16966993.
Exclusion: 4

Benzer A, Traweger C, Ofner D, et al. Statistical modelling in analysis of outcome after trauma Glasgow-Coma-Scale and Innsbruck-Coma-Scale. Anasthesiol Intensivmed Notfallmed Schmerzther. 1995;30(4):231-5.
PMID:7632857.
Exclusion: 5

Berbiglia L, Lopez PP, Bair L, et al. Patterns of early mortality after trauma in a neighborhood urban trauma center: can we improve outcomes? Am Surg. 2013;79(8):764-7 4p.
PMID:23896241.
Exclusion: 3

Bernstein ML, Chung KC. Early management of the mangled upper extremity. Injury. 2007;38 Suppl 5:S3-7.
PMID:18061189.
Exclusion: 7

Berry C, Ley EJ, Margulies DR, et al. Prospective evaluation of posttraumatic vasospasm: determining its clinical significance after traumatic brain injury. Am Surg. 2014;80(3):310-2.
PMID:24666876.
Exclusion: 8

Bertrand S, Cuny S, Petit P, et al. Traumatic rupture of thoracic aorta in real-world motor vehicle crashes. Traffic Inj Prev. 2008;9(2):153-61.
PMID:18398779.
Exclusion: 4

Bidez MW, Cochran JE, Jr., King D, et al. Occupant dynamics in rollover crashes: influence of roof deformation and seat belt performance on probable spinal column injury. Ann Biomed Eng. 2007;35(11):1973-88.
PMID:17641975.
Exclusion: 4

Biros MH, Heegaard W. Prehospital and resuscitative care of the head-injured patient. Curr Opin Crit Care. 2001;7(6):444-9.
PMID:11805548.
Exclusion: 7

Blakey CM, Biant LC, Birch R. Ischaemia and the pink, pulseless hand complicating supracondylar fractures of the humerus in childhood: long-term follow-up. J Bone Joint Surg Br. 2009;91(11):1487-92.
PMID:19880895.
Exclusion: 4

Boatright DH, Byyny RL, Hopkins E, et al. Validation of rules to predict emergent surgical intervention in pediatric trauma patients. J Am Coll Surg. 2013;216(6):1094-102.e6 1p.
PMID:23623222.
Exclusion: 5

Bochicchio GV, Lumpkins K, O'Connor J, et al. Blast injury in a civilian trauma setting is associated with a delay in diagnosis of traumatic brain injury. Am Surg. 2008;74(3):267-70.
PMID:18376697.
Exclusion: 5

Bolland K, Sooriyarachchi MR, Whitehead J. Sample size review in a head injury trial with ordered categorical responses. Stat Med. 1998;17(24):2835-47.
PMID:9921605.
Exclusion: 4

Borman JB, Aharonson-Daniel L, Savitsky B, et al. Unilateral flail chest is seldom a lethal injury. Emerg Med J. 2006;23(12):903-5.
PMID:17130594.
Exclusion: 4

Bouillon B, Lefering R, Vorweg M, et al. Trauma score systems: Cologne Validation Study. J Trauma. 1997;42(4):652-8.
PMID:9137253.
Exclusion: 13

Boyle MJ, Smith EC, Archer F. A review of patients who suddenly deteriorate in the presence of paramedics. BMC Emerg Med. 2008;8:9.
PMID:18655721.
Exclusion: 4

Boyle MJ, Smith EC, Archer F. Is mechanism of injury alone a useful predictor of major trauma? Injury. 2008;39(9):986-92 7p.
PMID:18674759.
Exclusion: 4

Boyle MJ, Smith EC, Archer FL. Trauma incidents attended by emergency medical services in Victoria, Australia. Prehosp Disaster Med. 2008;23(1):20-8.
PMID:18491657.
Exclusion: 4

Braakman R, Avezaat CJ, Maas AI, et al. Inter observer agreement in the assessment of the motor response of the Glasgow 'coma' scale. Clin Neurol Neurosurg. 1977;80(2):100-6.
PMID:209920.
Exclusion: 12

Branas CC, MacKenzie EJ, Williams JC, et al. Access to trauma centers in the United States. JAMA. 2005;293(21):2626-33.
PMID:15928284.
Exclusion: 6

Brattström O, Granath F, Rossi P, et al. Early predictors of morbidity and mortality in trauma patients treated in the intensive care unit. Acta Anaesthesiol Scand. 2010;54(8):1007-17 11p.
PMID:20626360.
Exclusion: 9

Brewer ES, Reznikov B, Liberman RF, et al. Incidence and predictors of intracranial hemorrhage after minor head trauma in patients taking anticoagulant and antiplatelet medication. J Trauma. 2011;70(1):E1-5.
PMID:20693913.
Exclusion: 3

Brown CV, Sowery L, Curry E, et al. Recombinant factor VIIa to correct coagulopathy in patients with traumatic brain injury presenting to outlying facilities before transfer to the regional trauma center. Am Surg. 2012;78(1):57-60.
PMID:22273315.
Exclusion: 4

Brown HL. Trauma in pregnancy. Obstet Gynecol. 2009;114(1):147-60.
PMID:19546773.
Exclusion: 7

Brown JB, Forsythe RM, Stassen NA, et al. The National Trauma Triage Protocol: Can this tool predict which patients with trauma will benefit from helicopter transport? J Trauma Acute Care Surg. 2012;73(2):319-25 7p.
PMID:22846934.
Exclusion: 4

Brown JB, Stassen NA, Bankey PE, et al. Helicopters and the civilian trauma system: national utilization patterns demonstrate improved outcomes after traumatic injury. J Trauma. 2010;69(5):1030-6 7p.
PMID:21068607.
Exclusion: 5

Brown JB, Stassen NA, Bankey PE, et al. Mechanism of injury and special consideration criteria still matter: an evaluation of the National Trauma Triage Protocol. J Trauma. 2011;70(1):38-44; discussion -5.
PMID:21217479.
Exclusion: 13

Brown JB, Stassen NA, Cheng JD, et al. Trauma center designation correlates with functional independence after severe but not moderate traumatic brain injury. J Trauma. 2010;69(2):263-9.
PMID:20699734.
Exclusion: 4

Brown KV, Murray CK, Clasper JC. Infectious complications of combat-related mangled extremity injuries in the British military. J Trauma. 2010;69 Suppl 1:S109-15.
PMID:20622604.
Exclusion: 4

Brown KV, Ramasamy A, McLeod J, et al. Predicting the need for early amputation in ballistic mangled extremity injuries. J Trauma. 2009;66(4 Suppl):S93-7; discussion S7-8.
PMID:19359976.
Exclusion: 4

Brown LH, Hubble MW, Cone DC, et al. Paramedic determinations of medical necessity: a meta-analysis. Prehosp Emerg Care. 2009;13(4):516-27.
PMID:19731166.
Exclusion: 5

Bruijns SR, Guly HR, Bouamra O, et al. The value of the difference between ED and prehospital vital signs in predicting outcome in trauma. Emerg Med J. 2013
PMID:23616498.
Exclusion: 4

Bruno MA, Ledoux D, Lambermont B, et al. Comparison of the Full Outline of UnResponsiveness and Glasgow Liege Scale/Glasgow Coma Scale in an intensive care unit population. Neurocrit Care. 2011;15(3):447-53.
PMID:21526394.
Exclusion: 3

Bruns B, Gentilello L, Elliott A, et al. Prehospital hypotension redefined. J Trauma. 2008;65(6):1217-21 5p.
PMID:19077604.
Exclusion: 4

Bulger EM, Kaufman R, Mock C. Childhood crash injury patterns associated with restraint misuse: implications for field triage. Prehosp Disaster Med. 2008;23(1):9-15.
PMID:18491655.
Exclusion: 4

Bulger EM, May S, Brasel KJ, et al. Out-of-hospital hypertonic resuscitation following severe traumatic brain injury: a randomized controlled trial. JAMA. 2010;304(13):1455-64.
PMID:20924011.
Exclusion: 4

Bulger EM, Nathens AB, Rivara FP, et al. Management of severe head injury: institutional variations in care and effect on outcome. Crit Care Med. 2002;30(8):1870-6.
PMID:12163808.
Exclusion: 3

Bunn TL, Slavova S, Bernard AC. Work-related injuries in a state trauma registry: relationship between industry and drug screening. J Trauma Acute Care Surg. 2014;77(2):280-5.
PMID:25058254.
Exclusion: 5

Burd RS, Jang TS, Nair SS. Evaluation of the relationship between mechanism of injury and outcome in pediatric trauma. J Trauma. 2007;62(4):1004-14 11p.
PMID:17426560.
Exclusion: 4

Bush BA, Novack TA, Malec JF, et al. Validation of a model for evaluating outcome after traumatic brain injury. Arch Phys Med Rehabil. 2003;84(12):1803-7.
PMID:14669187.
Exclusion: 9

Caille S, Deguise E, Feyz M, et al. Early prediction of neuropsychological deficits and global outcome during the acute phase of treatment following traumatic brain injury. Brain Cogn. 2000;44(1):30-4.
Exclusion: 9

Callaway DW, Wolfe R. Geriatric trauma. Emerg Med Clin North Am. 2007;25(3):837-60, x.
PMID:17826220.
Exclusion: 7

Camilloni L, Farchi S, Giorgi Rossi P, et al. Mortality in elderly injured patients: the role of comorbidities. Int J Inj Contr Saf Promot. 2008;15(1):25-31.
PMID:18344093.
Exclusion: 4

Cancio LC, Batchinsky AI, Salinas J, et al. Heart-rate complexity for prediction of prehospital lifesaving interventions in trauma patients. J Trauma. 2008;65(4):813-9.
PMID:18849796.
Exclusion: 13

Cannada LK, Cooper C. The mangled extremity: limb salvage versus amputation. Curr Surg. 2005;62(6):563-76.
PMID:16293486.
Exclusion: 4

Cannon CM, Braxton CC, Kling-Smith M, et al. Utility of the shock index in predicting mortality in traumatically injured patients. J Trauma. 2009;67(6):1426-30.
PMID:20009697.
Exclusion: 4

Carrick MM, Morrison CA, Alexis DJ, et al. Thoracoabdominal shotgun wounds: an evaluation of factors associated with the need for surgical intervention. Am J Surg. 2009;198(1):64-9 6p.
PMID:19555785.
Exclusion: 4

Cassidy LD, Potoka DA, Adelson PD, et al. Development of a novel method to predict disability after head trauma in children. J Pediatr Surg. 2003;38(3):482-5.
PMID:12632372.
Exclusion: 4

Caterino JM, Valasek T, Werman HA. Identification of an age cutoff for increased mortality in patients with elderly trauma. Am J Emerg Med. 2010;28(2):151-8.
PMID:20159383.
Exclusion: 4

Caulfield EV. Prehospital ventilation of traumatic brain injured adult patients and early post injury neurological outcomes. Washington, D.C.: School of Nursing, Catholic University of America; 2008.
Exclusion: 4

Celso B, Tepas J, Langland-Orban B, et al. A systematic review and meta-analysis comparing outcome of severely injured patients treated in trauma centers following the establishment of trauma systems. J Trauma. 2006;60(2):371-8 8p. PMID:16508498.
Exclusion: 4

Challen K, Walter D. Physiological scoring: an aid to emergency medical services transport decisions? Prehosp Disaster Med. 2010;25(4):320-3. PMID:20845317.
Exclusion: 4

Champion HR, Lombardo LV, Shair EK. The importance of vehicle rollover as a field triage criterion. J Trauma. 2009;67(2):350-7. PMID:19667889.
Exclusion: 4

Chandler CL, Cummins B. Initial assessment and management of the severely head-injured patient. Br J Hosp Med. 1995;53(3):102-8. PMID:7728308.
Exclusion: 6

Chandler WL. Procoagulant activity in trauma patients. Am J Clin Pathol. 2010;134(1):90-6. PMID:20551272.
Exclusion: 4

Chang DC, Bass RR, Cornwell EE, et al. Undertriage of elderly trauma patients to state-designated trauma centers. Arch Surg. 2008;143(8):776-81; discussion 82. PMID:18711038.
Exclusion: 4

Chang L-Y, Wang H-W. Analysis of traffic injury severity: An application of non-parametric classification tree techniques. Accid Anal Prev. 2006;38(5):1019-27. PMID:16735022.
Exclusion: 4

Cheddie S, Muckart DJ, Hardcastle TC, et al. Direct admission versus inter-hospital transfer to a level I trauma unit improves survival: an audit of the new Inkosi Albert Luthuli Central Hospital trauma unit. South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde. 2011;101(3):176-8. PMID:21382248.
Exclusion: 4

Chen L, McKenna TM, Reisner AT, et al. Decision tool for the early diagnosis of trauma patient hypovolemia. J Biomed Inform. 2008;41(3):469-78. PMID:18255342.
Exclusion: 4

Chen L, Piao Y, Zeng F, et al. Moderate hypothermia therapy for patients with severe head injury. Chin J Traumatol. 2001;4(3):164-7. PMID:11835723.
Exclusion: 4

Chen L, Reisner AT, Gribok A, et al. Can we improve the clinical utility of respiratory rate as a monitored vital sign? Shock. 2009;31(6):574-80. PMID:19008777.
Exclusion: 4

Chen L, Reisner AT, Gribok A, et al. Exploration of prehospital vital sign trends for the prediction of trauma outcomes. Prehosp Emerg Care. 2009;13(3):286-94. PMID:19499463.
Exclusion: 4

Chen L, Reisner AT, McKenna TM, et al. Diagnosis of hemorrhage in a prehospital trauma population using linear and nonlinear multiparameter analysis of vital signs. Conf Proc IEEE Eng Med Biol Soc. 2007;2007:3748-51. PMID:18002813.
Exclusion: 4

Cherry RA, King TS, Carney DE, et al. Trauma team activation and the impact on mortality. J Trauma. 2007;63(2):326-30 5p. PMID:17693831.
Exclusion: 13

Cheung DS, Kharasch M. Evaluation of the patient with closed head trauma: an evidence based approach. Emerg Med Clin North Am. 1999;17(1):9-23, vii. PMID:10101338.
Exclusion: 3

Chi JH, Knudson MM, Vassar MJ, et al. Prehospital hypoxia affects outcome in patients with traumatic brain injury: a prospective multicenter study. J Trauma. 2006;61(5):1134-41. PMID:17099519.
Exclusion: 4

Chisholm KM, Harruff RC. Elderly deaths due to ground-level falls. Am J Forensic Med Pathol. 2010;31(4):350-4.
PMID:20938326.
Exclusion: 4

Chiu WC, Haan JM, Cushing BM, et al. Ligamentous injuries of the cervical spine in unreliable blunt trauma patients: incidence, evaluation, and outcome. J Trauma. 2001;50(3):457-63; discussion 64.
PMID:11265024.
Exclusion: 4

Christensen TL, Brandes SB. Urologic injuries sustained after free falls from hunting tree stands. South Med J. 2008;101(4):383-7.
PMID:18360347.
Exclusion: 4

Ciesla DJ, Pracht E, Tepas 3rd JJ, et al. Measuring trauma system performance: Right patient, right place-Mission accomplished? J Trauma Acute Care Surg. 2015;79(2):263-8.
PMID:26218695.
Exclusion: 4

Ciesla DJ, Pracht EE, Cha JY, et al. Geographic distribution of severely injured patients: implications for trauma system development. J Trauma Acute Care Surg. 2012;73(3):618-24 7p.
PMID:22710789.
Exclusion: 4

Cipolle MD, Geffe K, Getchell J, et al. Long-term outcome in elderly patients after operation for traumatic intracranial hemorrhage. Del Med J. 2014;86(8):237-44.
PMID:25252435.
Exclusion: 5

Cirera E, Plasencia A, Ferrando J, et al. Factors associated with severity and hospital admission of motor-vehicle injury cases in a southern European urban area. Eur J Epidemiol. 2001;17(3):201-8.
PMID:11680536.
Exclusion: 4

Claridge JA, Golob JF, Jr., Leukhardt WH, et al. Trauma team activation can be tailored by prehospital criteria. Am Surg. 2010;76(12):1401-7.
PMID:21265356.
Exclusion: 5

Claridge JA, Schulman AM, Sawyer RG, et al. The "July phenomenon" and the care of the severely injured patient: fact or fiction? Surgery. 2001;130(2):346-53.
PMID:11490370.
Exclusion: 4

Clark DE, Hannan EL, Wu C. Predicting risk-adjusted mortality for trauma patients: logistic versus multilevel logistic models. J Am Coll Surg. 2010;211(2):224-31 8p.
PMID:20670860.
Exclusion: 4

Clark DE, Qian J, Winchell RJ, et al. Hazard regression models of early mortality in trauma centers. J Am Coll Surg. 2012;215(6):841-9 9p.
PMID:23036828.
Exclusion: 13

Clark DE, Ryan LM. Concurrent prediction of hospital mortality and length of stay from risk factors on admission. Health Serv Res. 2002;37(3):631-45.
PMID:12132598.
Exclusion: 4

Clesham K, Mason S, Gray J, et al. Can emergency medical service staff predict the disposition of patients they are transporting? Emerg Med J. 2008;25(10):691-4.
PMID:18843076.
Exclusion: 4

Codner P, Obaid A, Porral D, et al. Is field hypotension a reliable indicator of significant injury in trauma patients who are normotensive on arrival to the emergency department? Am Surg. 2005;71(9):768-71.
PMID:16468515.
Exclusion: 4

Cohn SM, Nathens AB, Moore FA, et al. Tissue oxygen saturation predicts the development of organ dysfunction during traumatic shock resuscitation. J Trauma. 2007;62(1):44-54; discussion -5.
PMID:17215732.
Exclusion: 4

Cole E. HOW REGIONAL TRAUMA SYSTEMS IMPROVE OUTCOMES. Emerg Nurse. 2015;23(6):24-9 6p.
PMID:26451941.
Exclusion: 7

Cone DC, Domeier R. Examining the applicability of guidelines promulgated in 2003 by the American College of Surgeons' Committee on trauma. J Trauma. 2005;59(5):1273; author reply -4.
PMID:16385316.
Exclusion: 4

Conroy C, Hoyt DB, Eastman AB, et al. Rollover crashes: predicting serious injury based on occupant, vehicle, and crash characteristics. Accid Anal Prev. 2006;38(5):835-42.
PMID:16540073.
Exclusion: 4

Conroy C, Tominaga GT, Erwin S, et al. The influence of vehicle damage on injury severity of drivers in head-on motor vehicle crashes. Accid Anal Prev. 2008;40(4):1589-94.
PMID:18606294.
Exclusion: 4

Cook A, Weddle J, Baker S, et al. A comparison of the Injury Severity Score and the Trauma Mortality Prediction Model. J Trauma Acute Care Surg. 2014;76(1):47-53 7p.
PMID:24368356.
Exclusion: 4

Cook WL, Tomlinson G, Donaldson M, et al. Falls and fall-related injuries in older dialysis patients. Clin J Am Soc Nephrol. 2006;1(6):1197-204.
PMID:17699348.
Exclusion: 4

Cooke WH, Salinas J, Convertino VA, et al. Heart rate variability and its association with mortality in prehospital trauma patients. J Trauma. 2006;60(2):363-70; discussion 70.
PMID:16508497.
Exclusion: 4

Cooke WH, Salinas J, McManus JG, et al. Heart period variability in trauma patients may predict mortality and allow remote triage. Aviat Space Environ Med. 2006;77(11):1107-12.
PMID:17086761.
Exclusion: 4

Corner EJ, Wood H, Englebretsen C, et al. The Chelsea critical care physical assessment tool (CPAx): validation of an innovative new tool to measure physical morbidity in the general adult critical care population; an observational proof-of-concept pilot study. Physiotherapy. 2013;99(1):33-41.
PMID:23219649.
Exclusion: 4

Cox S, Currell A, Harriss L, et al. Evaluation of the Victorian state adult pre-hospital trauma triage criteria. Injury. 2012;43(5):573-81.
PMID:21074157.
Exclusion: 13

Criss EA. Research review. JEMS. 2007;32(4)
Exclusion: 5

Criss EA. Research review. JEMS. 2008;33(2)
Exclusion: 5

Criss EA. Research review. JEMS. 2010;35(2)
Exclusion: 7

Cross KP, Cicero MX. Head-to-head comparison of disaster triage methods in pediatric, adult, and geriatric patients. Ann Emerg Med. 2013;61(6):668-76.e7.
PMID:23465555.
Exclusion: 4

Crossman J, Bankes M, Bhan A, et al. The Glasgow Coma Score: reliable evidence? Injury. 1998;29(6):435-7.
PMID:9813699.
Exclusion: 9

Cryer C, Davie G. Alcohol, ethnicity and service use in trauma patients: challenges of presenting and interpreting effect modification. Injury. 2011;42(1):63-5 3p.
PMID:21129742.
Exclusion: 4

Cudnik MT, Newgard CD, Daya M, et al. The impact of rapid sequence intubation on trauma patient mortality in attempted prehospital intubation. J Emerg Med. 2010;38(2):175-81 7p.
PMID:18790586.
Exclusion: 3

Cudnik MT, Newgard CD, Sayre MR, et al. Level I versus Level II trauma centers: an outcomes-based assessment. J Trauma. 2009;66(5):1321-6.
PMID:19430234.
Exclusion: 13

Cudnik MT, Sayre MR, Hiestand B, et al. Are all trauma centers created equally? A statewide analysis. Acad Emerg Med. 2010;17(7):701-8 8p.
PMID:20653583.
Exclusion: 8

Cudnik MT, Werman HA, White LJ, et al. Prehospital factors associated with mortality in injured air medical patients. Prehosp Emerg Care. 2012;16(1):121-7.
PMID:21958032.
Exclusion: 13

Culley JM, Svendsen E, Craig J, et al. A Validation Study of 5 Triage Systems Using Data From the 2005 Graniteville, South Carolina, Chlorine Spill. J Emerg Nurs. 2014;40(5):453-60 8p.
PMID:25063047.
Exclusion: 4

Da Silva Nunes M, Hora EC, Fakhouri R, et al. TRAUMA IN ADOLESCENTS AND ADULTS: SEVERITY ASSESSMENT BY ANATOMICAL SCORE. Journal of Nursing UFPE / Revista de Enfermagem UFPE. 2013;7(1):15-22 8p.
Exclusion: 9

Danne P, Brazenor G, Cade R, et al. The major trauma management study: an analysis of the efficacy of current trauma care. Aust N Z J Surg. 1998;68(1):50-7.
PMID:9440457.
Exclusion: 9

Davidson GH, Rivara FP, Mack CD, et al. Validation of prehospital trauma triage criteria for motor vehicle collisions. J Trauma Acute Care Surg. 2014;76(3):755-61 7p.
PMID:24553545.
Exclusion: 6

Davis DP, Fakhry SM, Wang HE, et al. Paramedic rapid sequence intubation for severe traumatic brain injury: perspectives from an expert panel. Prehosp Emerg Care. 2007;11(1):1-8.
PMID:17169868.
Exclusion: 4

Davis DP, Kene M, Vilke GM, et al. Head-injured patients who "talk and die": the San Diego perspective. J Trauma. 2007;62(2):277-81.
PMID:17297312.
Exclusion: 4

Davis DP, Peay J, Serrano JA, et al. The impact of aeromedical response to patients with moderate to severe traumatic brain injury. Ann Emerg Med. 2005;46(2):115-22.
PMID:16046940.
Exclusion: 3

Davis DP, Vadeboncoeur TF, Ochs M, et al. The association between field Glasgow Coma Scale score and outcome in patients undergoing paramedic rapid sequence intubation. J Emerg Med. 2005;29(4):391-7.
PMID:16243194.
Exclusion: 4

Davis RL, Hughes M, Gubler KD, et al. The use of cranial CT scans in the triage of pediatric patients with mild head injury. Pediatrics. 1995;95(3):345-9.
PMID:7862471.
Exclusion: 3

de Jongh MA, Meeuwis JD, van Baar ME, et al. Evaluation of trauma care by comparing mortality risks and admission policy in a Dutch trauma region. Injury. 2008;39(9):1007-12.
PMID:18656195.
Exclusion: 4

de Jongh MA, van Stel HF, Schrijvers AJ, et al. The effect of Helicopter Emergency Medical Services on trauma patient mortality in the Netherlands. Injury. 2012;43(9)
PMID:22305588.
Exclusion: 5

Delgado MK, Yokell MA, Staudenmayer KL, et al. Factors associated with the disposition of severely injured patients initially seen at non–trauma center emergency departments: disparities by insurance status. JAMA Surg. 2014;149(5):422-30 9p.
PMID:24554059.
Exclusion: 5

Dellinger AM, Stevens JA. The injury problem among older adults: mortality, morbidity and costs. J Safety Res. 2006;37(5):519-22.
PMID:17140602.
Exclusion: 4

Demetriades D, Kuncir E, Brown CV, et al. Early prediction of mortality in isolated head injury patients: a new predictive model. J Trauma. 2006;61(4):868-72.
PMID:17033553.
Exclusion: 13

Demetriades D, Kuncir E, Murray J, et al. Mortality prediction of head Abbreviated Injury Score and Glasgow Coma Scale: analysis of 7,764 head injuries. J Am Coll Surg. 2004;199(2):216-22.
PMID:15275876.
Exclusion: 13

Demetriades D, Martin M, Salim A, et al. Relationship between American College of Surgeons trauma center designation and mortality in patients with severe trauma (injury severity score > 15). J Am Coll Surg. 2006;202(2):212-5; quiz A45.
PMID:16427544.
Exclusion: 4

Demirhan R, Onan B, Oz K, et al. Comprehensive analysis of 4205 patients with chest trauma: a 10-year experience. Interact Cardiovasc Thorac Surg. 2009;9(3):450-3.
PMID:19541693.
Exclusion: 4

Dent DL, Croce MA, Menke PG, et al. Prognostic factors after acute subdural hematoma. J Trauma. 1995;39(1):36-42; discussion -3.
PMID:7636908.
Exclusion: 13

Di Bartolomeo S, Sanson G, Nardi G, et al. Effects of 2 patterns of prehospital care on the outcome of patients with severe head injury. Arch Surg. 2001;136(11):1293-300.
PMID:11695976.
Exclusion: 5

Diamond IR, Parkin PC, Wales PW, et al. Preventable pediatric trauma deaths in Ontario: a comparative population-based study. J Trauma. 2009;66(4):1189-94; discussion 94-5.
PMID:19359936.
Exclusion: 4

Dinh MM, Bein KJ, Byrne CM, et al. Deriving a prediction rule for short stay admission in trauma patients admitted at a major trauma centre in Australia. Emerg Med J. 2014;31(4):263-7.
PMID:23407379.
Exclusion: 13

Diringer MN, Edwards DF. Does modification of the Innsbruck and the Glasgow Coma Scales improve their ability to predict functional outcome? Arch Neurol. 1997;54(5):606-11.
PMID:9152117.
Exclusion: 9

DiRusso SM, Sullivan T, Holly C, et al. An artificial neural network as a model for prediction of survival in trauma patients: validation for a regional trauma area. J Trauma. 2000;49(2):212-20; discussion 20-3.
PMID:10963531.
Exclusion: 4

Do HQ, Hesselfeldt R, Steinmetz J, et al. Is paediatric trauma severity overestimated at triage? An observational follow-up study. Acta Anaesthesiol Scand. 2014;58(1):98-105 8p.
PMID:24308697.
Exclusion: 4

Do HQ, Steinmetz J, Rasmussen LS. In-hospital mortality pattern of severely injured children. Injury. 2012;43(12):2060-4 5p.
PMID:22209161.
Exclusion: 9

Dorlac WC, DeBakey ME, Holcomb JB, et al. Mortality from isolated civilian penetrating extremity injury. J Trauma. 2005;59(1):217-22.
PMID:16096567.
Exclusion: 4

Drayna PC, Browne LR, Guse CE, et al. Prehospital Pediatric Care: Opportunities for Training, Treatment, and Research. Prehosp Emerg Care. 2015;19(3):441-7 7p.
PMID:25658967.
Exclusion: 4

DuBose JJ, Browder T, Inaba K, et al. Effect of trauma center designation on outcome in patients with severe traumatic brain injury. Arch Surg. 2008;143(12):1213-7; discussion 7.
PMID:19075174.
Exclusion: 13

Ducharme-Crevier L, Wainwright M. Acute Management of Children With Traumatic Brain Injury. Clin Pediatr Emerg Med. 2015;16(1):48-54.
Exclusion: 7

Ducrocq SC, Meyer PG, Orliaguet GA, et al. Epidemiology and early predictive factors of mortality and outcome in children with traumatic severe brain injury: experience of a French pediatric trauma center. Pediatr Crit Care Med. 2006;7(5):461-7.
PMID:16885795.
Exclusion: 3

Duma SM, Moorcroft DM, Gabler HC, et al. Analysis of pregnant occupant crash exposure and the potential effectiveness of four-point seatbelts in far side crashes. Annu Proc Assoc Adv Automot Med. 2006;50:187-98.
PMID:16968637.
Exclusion: 4

Dunham CM, Barraco RD, Clark DE, et al. Guidelines for emergency tracheal intubation immediately after traumatic injury. J Trauma. 2003;55(1):162-79.
PMID:12855901.
Exclusion: 3

Dutton RP. Making medics smarter. Crit Care Med. 2010;38(3):992-3.
PMID:20168160.
Exclusion: 7

Eastman AL, Arnoldo BA, Hunt JL, et al. Pre-burn center management of the burned airway: do we know enough? J Burn Care Res. 2010;31(5):701-5.
PMID:20634705.
Exclusion: 4

Eastridge BJ, Butler F, Wade CE, et al. Field triage score (FTS) in battlefield casualties: validation of a novel triage technique in a combat environment. Am J Surg. 2010;200(6):724-7; discussion 7.
PMID:21146011.
Exclusion: 4

Eckstein M. The value of prehospital Glasgow Coma Scale (GCS) to predict the need for patient hospitalization. J Trauma. 2003;54(3):628; author reply -9.
PMID:12634552.
Exclusion: 7

Edelman DA, White MT, Tyburski JG, et al. Post-traumatic hypotension: should systolic blood pressure of 90-109 mmHg be included? Shock. 2007;27(2):134-8.
PMID:17224786.
Exclusion: 4

Ehrlich PF, Brown JK, Sochor MR, et al. Factors influencing pediatric Injury Severity Score and Glasgow Coma Scale in pediatric automobile crashes: results from the Crash Injury Research Engineering Network. J Pediatr Surg. 2006;41(11):1854-8.
PMID:17101358.
Exclusion: 4

El Kady D. Perinatal outcomes of traumatic injuries during pregnancy. Clin Obstet Gynecol. 2007;50(3):582-91.
PMID:17762411.
Exclusion: 7

Elliott M. Interrater reliability of the Glasgow Coma Scale. J Neurosci Nurs. 1996;28(4):213-4.
PMID:8880594.
Exclusion: 7

Emircan S, Ozguc H, Akkose Aydin S, et al. Factors affecting mortality in patients with thorax trauma. Ulus Travma Acil Cerrahi Derg. 2011;17(4):329-33.
PMID:21935831.
Exclusion: 9

Englander J, Bushnik T, Duong TT, et al. Analyzing risk factors for late posttraumatic seizures: a prospective, multicenter investigation. Arch Phys Med Rehabil. 2003;84(3):365-73.
PMID:12638104.
Exclusion: 5

Engum SA, Mitchell MK, Scherer LR, et al. Prehospital triage in the injured pediatric patient. J Pediatr Surg. 2000;35(1):82-7.
PMID:10646780.
Exclusion: 4

Esposito TJ, Reed RL, 2nd, Gamelli RL, et al. Neurosurgical coverage: essential, desired, or irrelevant for good patient care and trauma center status. Ann Surg. 2005;242(3):364-70; discussion 70-4.
PMID:16135922.
Exclusion: 4

Evans SL, Nance ML, Arbogast KB, et al. Passenger compartment intrusion as a predictor of significant injury for children in motor vehicle crashes. J Trauma. 2009;66(2):504-7.
PMID:19204529.
Exclusion: 4

Fabbri A, Servadei F, Marchesini G, et al. Early predictors of unfavourable outcome in subjects with moderate head injury in the emergency department. J Neurol Neurosurg Psychiatry. 2008;79(5):567-73. PMID:17766433.
Exclusion: 3

Falcone RA, Jr., Haas L, King E, et al. A multicenter prospective analysis of pediatric trauma activation criteria routinely used in addition to the six criteria of the American College of Surgeons. J Trauma Acute Care Surg. 2012;73(2):377-84 9p. PMID:22846943.
Exclusion: 9

Falcone RE, Herron H, Dean B, et al. Emergency scene endotracheal intubation before and after the introduction of a rapid sequence induction protocol. Air Med J. 1996;15(4):163-7. PMID:10162102.
Exclusion: 4

Falcone RE, Herron H, Werman H, et al. Air medical transport of the injured patient: scene versus referring hospital. Air Med J. 1998;17(4):161-5. PMID:10185097.
Exclusion: 4

Fang JF, Shih LY, Lin BC, et al. Pelvic fractures due to falls from a height in people with mental disorders. Injury. 2008;39(8):881-8. PMID:18617168.
Exclusion: 4

Fang R, Markandaya M, DuBose JJ, et al. Early in-theater management of combat-related traumatic brain injury: A prospective, observational study to identify opportunities for performance improvement. J Trauma Acute Care Surg. 2015;79(4 Suppl 2):S181-7. PMID:26406428.
Exclusion: 4

Farmer KA, McGrath SP, Blike GT. An experimental architecture for observation of triage related decision making. Conf Proc IEEE Eng Med Biol Soc. 2007;2007:1774-7. PMID:18002321.
Exclusion: 4

Fayssoux RS, Tally W, Sanfilippo JA, et al. Spinal injuries after falls from hunting tree stands. The spine journal : official journal of the North American Spine Society. 2008;8(3):522-8. PMID:18023620.
Exclusion: 4

Ferris JD, Smith I, Robertson CE. Emergency department at the cutting edge. Eur J Emerg Med. 2008;15(2):67-70. PMID:18446066.
Exclusion: 4

Fiissel D, Pattison G, Howard A. Severity of playground fractures: play equipment versus standing height falls. Inj Prev. 2005;11(6):337-9. PMID:16326766.
Exclusion: 4

Finkelstein EA, Chen H, Prabhu M, et al. The relationship between obesity and injuries among U.S. adults. Am J Health Promot. 2007;21(5):460-8. PMID:17515011.
Exclusion: 4

Fischer J, Mathieson C. The history of the Glasgow Coma Scale: implications for practice. Crit Care Nurs Q. 2001;23(4):52-8. PMID:11852950.
Exclusion: 7

Fischer PE, Colavita PD, Fleming GP, et al. Delays in transfer of elderly less-injured trauma patients can have deadly consequences. Am Surg. 2014;80(11):1132-5. PMID:25347505.
Exclusion: 4

Fitzharris M, Yu J, Hammond N, et al. Injury in China: a systematic review of injury surveillance studies conducted in Chinese hospital emergency departments. BMC Emerg Med. 2011;11(1):18- 1p. PMID:22029774.
Exclusion: 9

Franschman G, Andriessen TMJC, Boer C, et al. Physician-based emergency medical service deployment characteristics in severe traumatic brain injury: A Dutch multicenter study. Injury. 2013;44(9):1232-6. PMID:23816167.
Exclusion: 3

Franschman G, Greuters S, Loer SA, et al. Prehospital treatment guidelines in severe traumatic brain injury: what really happens outside the hospital? Resuscitation. 2010;81(2):261. PMID:19969408.
Exclusion: 3

Franschman G, Peerdeman SM, Andriessen TM, et al. Effect of secondary prehospital risk factors on outcome in severe traumatic brain injury in the context of fast access to trauma care. J Trauma. 2011;71(4):826-32.
PMID:21427618.
Exclusion: 3

Frohlich M, Lefering R, Probst C, et al. Epidemiology and risk factors of multiple-organ failure after multiple trauma: an analysis of 31,154 patients from the TraumaRegister DGU. J Trauma Acute Care Surg. 2014;76(4):921-7; discussion 7-8.
PMID:24662853.
Exclusion: 13

Fuglistaler-Montali I, Attenberger C, Fuglistaler P, et al. In search of benchmarking for mortality following multiple trauma: a Swiss trauma center experience. World J Surg. 2009;33(11):2477-89.
PMID:19693630.
Exclusion: 13

Gabbe BJ, Cameron PA, Finch CF. The status of the Glasgow Coma Scale. Emerg Med (Fremantle). 2003;15(4):353-60.
PMID:14631703.
Exclusion: 11

Gabbe BJ, Cameron PA, Wolfe R, et al. Prehospital prediction of intensive care unit stay and mortality in blunt trauma patients. J Trauma. 2005;59(2):458-65.
PMID:16294092.
Exclusion: 4

Galvagno Jr SM, Sikorski R, Hirshon JM, et al. Helicopter emergency medical services for adults with major trauma. Cochrane Database Syst Rev. 2015(12)
PMID:26671262.
Exclusion: 11

Galvagno SM, Jr., Haut ER, Zafar S, et al. Association between helicopter vs ground emergency medical services and survival for adults with major trauma. JAMA. 2012;307(15):1602-10.
PMID:22511688.
Exclusion: 5

Gangavati AS, Kiely DK, Kulchycki LK, et al. Prevalence and characteristics of traumatic intracranial hemorrhage in elderly fallers presenting to the emergency department without focal findings. J Am Geriatr Soc. 2009;57(8):1470-4.
PMID:19558474.
Exclusion: 4

Garner AA, Mann KP, Fearnside M, et al. The Head Injury Retrieval Trial (HIRT): A singlecentre randomised controlled trial of physician prehospital management of severe blunt head injury compared with management by paramedics only. Emerg Med J. 2015;32(11):869-75.
PMID:25795741.
Exclusion: 5

Garthe E, Mango NK, Prenney B. Statewide air medical transports for Massachusetts. Air Med J. 2002;21(6):22-8.
PMID:12585073.
Exclusion: 4

Garwe T, Cowan LD, Neas BR, et al. Directness of transport of major trauma patients to a level I trauma center: a propensity-adjusted survival analysis of the impact on short-term mortality. J Trauma. 2011;70(5):1118-27.
PMID:20693925.
Exclusion: 4

Garwe T, Cowan LD, Neas BR, et al. A propensity score analysis of prehospital factors and directness of transport of major trauma patients to a level I trauma center. J Trauma. 2011;70(1):120-9.
PMID:20526210.
Exclusion: 5

Gebhart ME, Pence R. START triage: does it work? Disaster Manag Response. 2007;5(3):68-73.
PMID:17719507.
Exclusion: 4

Geeraedts LM, Jr., Kaasjager HA, van Vugt AB, et al. Exsanguination in trauma: A review of diagnostics and treatment options. Injury. 2009;40(1):11-20.
PMID:19135193.
Exclusion: 4

George RL, McGwin G, Jr., Metzger J, et al. The association between gender and mortality among trauma patients as modified by age. J Trauma. 2003;54(3):464-71.
PMID:12634524.
Exclusion: 4

Giannoudis PV, Grotz MR, Tzioupis C, et al. Prevalence of pelvic fractures, associated injuries, and mortality: the United Kingdom perspective. J Trauma. 2007;63(4):875-83.
PMID:18090020.
Exclusion: 4

Gill M, Martens K, Lynch EL, et al. Interrater reliability of 3 simplified neurologic scales applied to adults presenting to the emergency department with altered levels of consciousness. Ann Emerg Med. 2007;49(4):403-7, 7.e1.
PMID:17141146.
Exclusion: 3

Gill MR, Reiley DG, Green SM. Interrater reliability of Glasgow Coma Scale scores in the emergency department. Ann Emerg Med. 2004;43(2):215-23.
PMID:14747811.
Exclusion: 3

Glassberg E, Lipsky AM, Lending G, et al. Blood glucose levels as an adjunct for prehospital field triage. Am J Emerg Med. 2013;31(3):556-61 6p.
PMID:23380089.
Exclusion: 4

Gleich SJ, Bennett TD, Bratton SL, et al. Pediatric trauma transport performance measures in a mountain state: adherence and outcomes. J Trauma. 2011;71(4):1016-22.
PMID:21336186.
Exclusion: 5

Gloeckner DC, Moore TL, Steffey D, et al. Implications of vehicle roll direction on occupant ejection and injury risk. Annu Proc Assoc Adv Automot Med. 2006;50:155-70.
PMID:16968635.
Exclusion: 4

Goettler CE, Fugo JR, Bard MR, et al. Predicting the need for early tracheostomy: a multifactorial analysis of 992 intubated trauma patients. J Trauma. 2006;60(5):991-6.
PMID:16688060.
Exclusion: 13

Goldschlager T, Rosenfeld JV, Winter CD. 'Talk and die' patients presenting to a major trauma centre over a 10 year period: a critical review. J Clin Neurosci. 2007;14(7):618-23; discussion 24.
PMID:17433688.
Exclusion: 4

Gordon E, von Holst H, Rudehill A. Outcome of head injury in 2298 patients treated in a single clinic during a 21-year period. J Neurosurg Anesthesiol. 1995;7(4):235-47.
PMID:8563443.
Exclusion: 9

Gorelick MH, Atabaki SM, Hoyle J, et al. Interobserver agreement in assessment of clinical variables in children with blunt head trauma. Acad Emerg Med. 2008;15(9):812-8.
PMID:19244631.
Exclusion: 6

Gottschalk SB, Wood D, DeVries S, et al. The Cape Triage Score: a new triage system South Africa. Proposal from the Cape Triage Group. Emerg Med J. 2006:149-53 5p.
PMID:16439753.
Exclusion: 4

Grba-Bujevic M, Bosan-Kilibarda I, Strikic N. The use of hypertonic-hyperoncotic solution for hypovolemic shock in trauma patients in prehospital setting. Neurol Croat. 2012;61(SUPPL 2):21-4.
Exclusion: 4

Grote S, Bocker W, Mutschler W, et al. Diagnostic value of the Glasgow Coma Scale for traumatic brain injury in 18,002 patients with severe multiple injuries. J Neurotrauma. 2011;28(4):527-34.
PMID:21265592.
Exclusion: 3

Guo QF, Xu ZH. Rescue and treatment of severely injured lower extremities. Chin J Traumatol. 2005;8(2):81-5.
PMID:15769305.
Exclusion: 4

Gurkin SA, Parikshak M, Kralovich KA, et al. Indicators for tracheostomy in patients with traumatic brain injury. Am Surg. 2002;68(4):324-8; discussion 8-9.
PMID:11952241.
Exclusion: 4

Guyette FX, Gomez H, Suffoletto B, et al. Prehospital dynamic tissue oxygen saturation response predicts in-hospital lifesaving interventions in trauma patients. J Trauma Acute Care Surg. 2012;72(4):930-5 6p.
PMID:22491607.
Exclusion: 4

Guzel A, Ceylan A, Tatli M, et al. [Falls from height in childhood in Diyarbakir province: a questionnaire study combined with clinical data]. Ulus Travma Acil Cerrahi Derg. 2009;15(3):277-84.
PMID:19562552.
Exclusion: 4

Haas B, Gomez D, Zagorski B, et al. Survival of the fittest: the hidden cost of undertriage of major trauma. J Am Coll Surg. 2010;211(6):804-11 8p. PMID:21036070.
Exclusion: 4

Haider AH, Chang DC, Haut ER, et al. Mechanism of injury predicts patient mortality and impairment after blunt trauma. J Surg Res. 2009;153(1):138-42. PMID:18805554.
Exclusion: 4

Haines CJ, Lutes RE, Blaser M, et al. Paramedic initiated non-transport of pediatric patients. Prehosp Emerg Care. 2006;10(2):213-9. PMID:16531379.
Exclusion: 4

Hall JR, Reyes HM, Meller JL, et al. The outcome for children with blunt trauma is best at a pediatric trauma center. J Pediatr Surg. 1996;31(1):72-6; discussion 6-7. PMID:8632290.
Exclusion: 5

Hammell CL, Henning JD. Prehospital management of severe traumatic brain injury. BMJ. 2009;338(7705):1262. PMID:19454738.
Exclusion: 4

Hampton DA, Fabricant LJ, Differding J, et al. Prehospital intravenous fluid is associated with increased survival in trauma patients. J Trauma Acute Care Surg. 2013;75:S9-15. PMID:23778518.
Exclusion: 4

Hannay RS, Wyrzykowski AD, Ball CG, et al. Retrospective review of injury severity, interventions and outcomes among helicopter and nonhelicopter transport patients at a Level 1 urban trauma centre. Can J Surg. 2014;57(1):49-54. PMID:24461227.
Exclusion: 13

Hannon M, Hadjizacharia P, Chan L, et al. Prognostic significance of lower extremity long bone fractures after automobile versus pedestrian injuries. J Trauma. 2009;67(6):1384-8. PMID:20009692.
Exclusion: 13

Hansoti B, Beattie T. Can the height of fall predict long bone fracture in children under 24 months? Eur J Emerg Med. 2005;12(6):285-6. PMID:16276259.
Exclusion: 4

Harrington DT, Connolly M, Biffl WL, et al. Transfer times to definitive care facilities are too long: a consequence of an immature trauma system. Ann Surg. 2005;241(6):961-6; discussion 6-8. PMID:15912045.
Exclusion: 5

Harris JE, Draper HL, Rhodes AI, et al. High yield criteria for emergency cranial computed tomography in adult patients with no history of head injury. J Accid Emerg Med. 2000;17(1):15-7. PMID:10658984.
Exclusion: 3

Härtl R, Gerber LM, Iacono L, et al. Direct transport within an organized state trauma system reduces mortality in patients with severe traumatic brain injury. J Trauma. 2006;60(6):1250-6. PMID:16766968.
Exclusion: 5

Hasler RM, Kehl C, Exadaktylos AK, et al. Accuracy of prehospital diagnosis and triage of a Swiss helicopter emergency medical service. J Trauma Acute Care Surg. 2012;73(3):709-15. PMID:22929499.
Exclusion: 4

Haug E, Miner J, Dannehy M, et al. Bispectral electroencephalographic analysis of head-injured patients in the emergency department. Acad Emerg Med. 2004;11(4):349-52. PMID:15064207.
Exclusion: 5

Hauschild O, Strohm PC, Culemann U, et al. Mortality in patients with pelvic fractures: results from the German pelvic injury register. J Trauma. 2008;64(2):449-55. PMID:18301214.
Exclusion: 4

Hayes JR, Bechtel NM, Beck RA, et al. Assessment of Ohio's adult and pediatric legislatively mandated prehospital trauma triage criteria. J Trauma Nurs. 2007;14(3):144-51. PMID:18080578.
Exclusion: 4

Heard K, Bebarta VS. Reliability of the Glasgow Coma Scale for the emergency department evaluation of poisoned patients. Hum Exp Toxicol. 2004;23(4):197-200.
PMID:15171571.
Exclusion: 4

Heffernan DS, Thakkar RK, Monaghan SF, et al. Normal presenting vital signs are unreliable in geriatric blunt trauma victims. J Trauma. 2010;69(4):813-20.
PMID:20938267.
Exclusion: 4

Heis HA, Bani-Hani KE, Elheis MA. Overview of extremity arterial trauma in Jordan. Int Angiol. 2008;27(6):522-8.
PMID:19078916.
Exclusion: 4

Helling TS. Trauma care at rural level III trauma centers in a state trauma system. J Trauma. 2007;62(2):498-503.
PMID:17297341.
Exclusion: 5

Helling TS, Watkins M, Evans LL, et al. Low falls: an underappreciated mechanism of injury. J Trauma. 1999;46(3):453-6.
PMID:10088850.
Exclusion: 4

Henry MC, Hollander JE, Alicandro JM, et al. Incremental benefit of individual American College of Surgeons trauma triage criteria. Acad Emerg Med. 1996;3(11):992-1000.
PMID:8922003.
Exclusion: 6

Heron R, Davie A, Gillies R, et al. Interrater reliability of the Glasgow Coma Scale scoring among nurses in sub-specialties of critical care. Aust Crit Care. 2001;14(3):100-5.
PMID:11899634.
Exclusion: 9

Hill AD, Fowler RA, Nathens AB. Impact of interhospital transfer on outcomes for trauma patients: a systematic review. J Trauma. 2011;71(6):1885-901 17p.
PMID:22182900.
Exclusion: 5

Hill DA, Delaney LM, Roncal S. A chi-square automatic interaction detection (CHAID) analysis of factors determining trauma outcomes. J Trauma. 1997;42(1):62-6.
PMID:9003259.
Exclusion: 13

Hitosugi M, Motozawa Y, Kido M, et al. Traffic injuries of the pregnant women and fetal or neonatal outcomes. Forensic Sci Int. 2006;159(1):51-4.
PMID:16055293.
Exclusion: 4

Holcomb JB, Niles SE, Miller CC, et al. Prehospital physiologic data and lifesaving interventions in trauma patients. Mil Med. 2005;170(1):7-13.
PMID:15724847.
Exclusion: 4

Holcomb JB, Salinas J, McManus JM, et al. Manual vital signs reliably predict need for life-saving interventions in trauma patients. J Trauma. 2005;59(4):821-8; discussion 8-9.
PMID:16374268.
Exclusion: 13

Holdgate A, Ching N, Angonese L. Variability in agreement between physicians and nurses when measuring the Glasgow Coma Scale in the emergency department limits its clinical usefulness. Emerg Med Australas. 2006;18(4):379-84.
PMID:16842308.
Exclusion: 3

Hollander JE, Go S, Lowery DW, et al. Interrater reliability of criteria used in assessing blunt head injury patients for intracranial injuries. Acad Emerg Med. 2003;10(8):830-5.
PMID:12896882.
Exclusion: 4

Holmes JF, Wisner DH, McGahan JP, et al. Clinical prediction rules for identifying adults at very low risk for intra-abdominal injuries after blunt trauma. Ann Emerg Med. 2009;54(4):575-84.
PMID:19457583.
Exclusion: 4

Holmes M, Garver M, Albrecht L, et al. Comparison of two comorbidity scoring systems for older adults with traumatic injuries. J Am Coll Surg. 2014;219(4):631-7 7p.
PMID:25154672.
Exclusion: 4

Hoogervorst EM, van Beeck EF, Goslings JC, et al. Developing process guidelines for trauma care in the Netherlands for severely injured patients: results from a Delphi study. BMC Health Serv Res. 2013;13(1):79- 1p.
PMID:23452394.
Exclusion: 4

Howard JL, 2nd, Cipolle MD, Horvat SA, et al. Preinjury warfarin worsens outcome in elderly patients who fall from standing. J Trauma. 2009;66(6):1518-22.
PMID:19509609.
Exclusion: 13

Hranjec T, Sawyer RG, Young JS, et al. Mortality factors in geriatric blunt trauma patients: creation of a highly predictive statistical model for mortality using 50,765 consecutive elderly trauma admissions from the National Sample Project. Am Surg. 2012;78(12):1369-75.
PMID:23265126.
Exclusion: 13

Hsiao KH, Dinh MM, McNamara KP, et al. Whole-body computed tomography in the initial assessment of trauma patients: is there optimal criteria for patient selection? Emerg Med Australas. 2013;25(2):182-91.
PMID:23560970.
Exclusion: 13

Hsiao KY, Chen IC, Yang CJ, et al. Is direct transport to a trauma centre best for patients with severe traumatic brain injury? A study in south-central Taiwan. Emerg Med J. 2012;29(2):156-9.
PMID:21045218.
Exclusion: 4

Hsiao KY, Hsiao CT, Weng HH, et al. Factors predicting mortality in victims of blunt trauma brain injury in emergency department settings. Emerg Med J. 2008;25(10):670-3.
PMID:18843067.
Exclusion: 13

Hu PF, Mackenzie C, Dutton R, et al. Statewide real-time in-flight trauma patient vital signs collection system. AMIA Annu Symp Proc. 2008:980.
PMID:18998900.
Exclusion: 4

Huber-Wagner S, Stegmaier J, Mathonia P, et al. The sequential trauma score - a new instrument for the sequential mortality prediction in major trauma. Eur J Med Res. 2010;15(5):185-95.
PMID:20562057.
Exclusion: 4

Hutter M, Woltmann A, Hierholzer C, et al. Association between a single-pass whole-body computed tomography policy and survival after blunt major trauma: a retrospective cohort study. Scand J Trauma Resusc Emerg Med. 2011;19:73.
PMID:22152001.
Exclusion: 13

Ibanez J, Arikan F, Pedraza S, et al. Reliability of clinical guidelines in the detection of patients at risk following mild head injury: results of a prospective study. J Neurosurg. 2004;100(5):825-34.
PMID:15137601.
Exclusion: 3

Ikossi DG, Lazar AA, Morabito D, et al. Profile of mothers at risk: an analysis of injury and pregnancy loss in 1,195 trauma patients. J Am Coll Surg. 2005;200(1):49-56.
PMID:15631920.
Exclusion: 5

Ivarsson BJ, Henary B, Crandall JR, et al. Significance of adult pedestrian torso injury. Annu Proc Assoc Adv Automot Med. 2005;49:263-77.
PMID:16179153.
Exclusion: 4

Ivascu FA, Howells GA, Junn FS, et al. Predictors of mortality in trauma patients with intracranial hemorrhage on preinjury aspirin or clopidogrel. J Trauma. 2008;65(4):785-8.
PMID:18849791.
Exclusion: 5

Janus TJ, Vaughan-Sarrazin MS, Baker LJ, et al. Predictors of pneumonia in trauma patients with pulmonary contusion. J Trauma Nurs. 2012;19(3):139-47.
PMID:22955708.
Exclusion: 13

Jayaraman S, Sethi D. Advanced training in trauma life support for ambulance crews. Cochrane Database Syst Rev. 2014(8):N.PAG-N.PAG 1p.
PMID:25144654.
Exclusion: 5

Johnson K, Fischer T, Chapman S, et al. Accidental head injuries in children under 5 years of age. Clin Radiol. 2005;60(4):464-8.
PMID:15767104.
Exclusion: 4

Johnson NJ, Carr BG, Salhi R, et al. Characteristics and outcomes of injured patients presenting by private vehicle in a state trauma system. Am J Emerg Med. 2013;31(2):275-81 7p.
PMID:23000329.
Exclusion: 4

Jones JM, Skaga NO, Sovik S, et al. Norwegian survival prediction model in trauma: modelling effects of anatomic injury, acute physiology, age, and co-morbidity. Acta Anaesthesiol Scand. 2014;58(3):303-15.
PMID:24438461.
Exclusion: 13

Jones K, Sharp C, Mangram AJ, et al. The effects of preinjury clopidogrel use on older trauma patients with head injuries. Am J Surg. 2006;192(6):743-5.
PMID:17161086.
Exclusion: 4

Joosse P, de Jong WJ, Reitsma JB, et al. External validation of the Emergency Trauma Score for early prediction of mortality in trauma patients. Crit Care Med. 2014;42(1):83-9.
PMID:23982027.
Exclusion: 13

Joosse P, Saltzherr TP, van Lieshout WA, et al. Impact of secondary transfer on patients with severe traumatic brain injury. J Trauma Acute Care Surg. 2012;72(2):487-90.
PMID:22327988.
Exclusion: 8

Juarez VJ, Lyons M. Interrater reliability of the Glasgow Coma Scale. J Neurosci Nurs. 1995;27(5):283-6.
PMID:8568344.
Exclusion: 9

Juhra C, Vordemvenne T, Hartensuer R, et al. Telematics in acute trauma care. Stud Health Technol Inform. 2009;143:467-71.
PMID:19380978.
Exclusion: 7

Kaiser M, Ahearn P, Nguyen XM, et al. Early predictors of the need for emergent surgery to control hemorrhage in hypotensive trauma patients. Am Surg. 2009;75(10):986-90.
PMID:19886150.
Exclusion: 4

Kam CW, Kitchell AK, Yau HH, et al. Outcome of major trauma patients in a Hong Kong general hospital. Eur J Emerg Med. 1998;5(3):297-306.
PMID:9827831.
Exclusion: 4

Kann SH, Hougaard K, Christensen EF. Evaluation of pre-hospital trauma triage criteria: a prospective study at a Danish level I trauma centre. Acta Anaesthesiol Scand. 2007;51(9):1172-7.
PMID:17711567.
Exclusion: 4

Kapapa T, Konig K, Pfister U, et al. Head trauma in children, Part 1: Admission, diagnostics, and findings. J Child Neurol. 2010;25(2):146-56.
PMID:19671889.
Exclusion: 4

Kaur B, Geary M, Palmer J, et al. Neurological outcome and early intracranial hypertension after paediatric traumatic brain injury. Dev Med Child Neurol. 2014;56:7-8.
Exclusion: 4

Kejriwal R, Civil I. Time to definitive care for patients with moderate and severe traumatic brain injury--does a trauma system matter? N Z Med J. 2009;122(1302):40-6.
PMID:19834521.
Exclusion: 4

Kelly ML, Roach MJ, Banerjee A, et al. Functional and long-term outcomes in severe traumatic brain injury following regionalization of a trauma system. J Trauma Acute Care Surg. 2015;79(3):372-7.
PMID:26307868.
Exclusion: 4

Kevric J, Jelinek GA, Knott J, et al. Validation of the Full Outline of Unresponsiveness (FOUR) Scale for conscious state in the emergency department: comparison against the Glasgow Coma Scale. Emerg Med J. 2011;28(6):486-90.
PMID:20943845.
Exclusion: 3

Kilaru S, Garb J, Emhoff T, et al. Long-term functional status and mortality of elderly patients with severe closed head injuries. J Trauma. 1996;41(6):957-63.
PMID:8970546.
Exclusion: 3

Kilic YA, Konan A, Yorganci K, et al. A novel fuzzy-logic inference system for predicting trauma-related mortality: emphasis on the impact of response to resuscitation. Eur J Trauma Emerg Surg. 2010;36(6):543-50 8p.
PMID:26816309.
Exclusion: 4

Kim D, Kobayashi L, Chang D, et al. Development of a preliminary risk index to identify trauma patients at risk for an unplanned intubation. J Trauma Acute Care Surg. 2014;76(1):167-71.
PMID:24368373.
Exclusion: 3

Kimura A, Nakahara S, Chadbunchachai W. The development of simple survival prediction models for blunt trauma victims treated at Asian emergency centers. Scand J Trauma Resusc Emerg Med. 2012;20:9.
PMID:22296837.
Exclusion: 13

King DR, Ogilvie MP, Pereira BM, et al. Heart rate variability as a triage tool in patients with trauma during prehospital helicopter transport. J Trauma. 2009;67(3):436-40.
PMID:19741382.
Exclusion: 4

Kirves H, Handolin L, Niemela M, et al. Paramedics' and pre-hospital physicians' assessments of anatomic injury in trauma patients: a cohort study. Scand J Trauma Resusc Emerg Med. 2010;18:60.
PMID:21092167.
Exclusion: 4

Kissoon N, Tepas JJ, 3rd, Peterson RJ, et al. The evaluation of pediatric trauma care using audit filters. Pediatr Emerg Care. 1996;12(4):272-6.
PMID:8858651.
Exclusion: 5

Klein MB, Kramer CB, Nelson J, et al. Geographic access to burn center hospitals. JAMA. 2009;302(16):1774-81.
PMID:19861669.
Exclusion: 4

Klein MB, Nathens AB, Emerson D, et al. An analysis of the long-distance transport of burn patients to a regional burn center. J Burn Care Res. 2007;28(1):49-55 7p.
PMID:17211200.
Exclusion: 4

Klemenc-Ketis Z, Bacovnik-Jansa U, Ogorevc M, et al. Outcome predictors of Glasgow Outcome Scale score in patients with severe traumatic brain injury. Ulus Travma Acil Cerrahi Derg. 2011;17(6):509-15.
PMID:22290003.
Exclusion: 3

Kleppel JB, Lincoln AE, Winston FK. Assessing head-injury survivors of motor vehicle crashes at discharge from trauma care. Am J Phys Med Rehabil. 2002;81(2):114-22; quiz 23-5, 42.
PMID:11807348.
Exclusion: 4

Klin B, Rosenfeld-Yehoshua N, Abu-Kishk I, et al. Bicycle-related injuries in children: disturbing profile of a growing problem. Injury. 2009;40(9):1011-3.
PMID:19535061.
Exclusion: 4

Kohli A, Banerjee KK. Pattern of injuries in fatal falls from buildings. Med Sci Law. 2006;46(4):335-41.
PMID:17191637.
Exclusion: 4

Koksal O, Ozdemir F, Bulut M, et al. Comparison of trauma scoring systems for predicting mortality in firearm injuries. Ulus Travma Acil Cerrahi Derg. 2009;15(6):559-64.
PMID:20037873.
Exclusion: 5

Kondo Y, Abe T, Kohshi K, et al. Revised trauma scoring system to predict in-hospital mortality in the emergency department: Glasgow Coma Scale, Age, and Systolic Blood Pressure score. Crit Care. 2011;15(4):R191.
PMID:21831280.
Exclusion: 5

Kononen DW, Flannagan CA, Wang SC. Identification and validation of a logistic regression model for predicting serious injuries associated with motor vehicle crashes. Accid Anal Prev. 2011;43(1):112-22.
PMID:21094304.
Exclusion: 4

Koval KJ, Tingey CW, Spratt KF. Are patients being transferred to level-I trauma centers for reasons other than medical necessity? J Bone Joint Surg Am. 2006;88-A(10):2124-32 9p.
PMID:17015587.
Exclusion: 4

Kuhne CA, Homann M, Ose C, et al. [Emergency room patients]. Unfallchirurg. 2003;106(5):380-6.
PMID:12750811.
Exclusion: 10

Kulvatunyou N, Friese RS, Joseph B, et al. Incidence and pattern of cervical spine injury in blunt assault: it is not how they are hit, but how they fall. J Trauma Acute Care Surg. 2012;72(1):271-5.
PMID:22027889.
Exclusion: 9

Kuo WY, Lin HJ, Foo NP, et al. Will computed tomography (CT) miss something? The characteristics and pitfalls of torso CT in evaluating patients with blunt solid organ trauma. Ulus Travma Acil Cerrahi Derg. 2011;17(3):215-9.
PMID:21935798.
Exclusion: 9

Kuppermann N, Holmes JF, Dayan PS, et al. Identification of children at very low risk of clinically-important brain injuries after head trauma: A prospective cohort study. Lancet. 2009;374(9696):1160-70.
PMID:19758692.
Exclusion: 3

Kuppermann N, Holmes JF, Dayan PS, et al. "Identification of children at very low risk of clinically-important brain injuries after head trauma: A prospective cohort study": Erratum. Lancet. 2014;383(9914):308.
Exclusion: 7

Lahausse JA, Fildes BN, Page Y, et al. The potential for automatic crash notification systems to reduce road fatalities. Ann Adv Automot Med. 2008;52:85-92.
PMID:19026225.
Exclusion: 4

Lakstein D, Blumenfeld A, Sokolov T, et al. Tourniquets for hemorrhage control on the battlefield: a 4-year accumulated experience. J Trauma. 2003;54(5 Suppl):S221-5.
PMID:12768129.
Exclusion: 4

Lalezarzadeh F, Wisniewski P, Huynh K, et al. Evaluation of prehospital and emergency department systolic blood pressure as a predictor of in-hospital mortality. Am Surg. 2009;75(10):1009-14 6p.
PMID:19886155.
Exclusion: 4

Lange RT, Iverson GL, Brubacher JR, et al. Effect of blood alcohol level on Glasgow Coma Scale scores following traumatic brain injury. Brain Inj. 2010;24(7-8):919-27.
PMID:20545447.
Exclusion: 5

Lansink KW, Leenen LP. Do designated trauma systems improve outcome? Curr Opin Crit Care. 2007;13(6):686-90 5p.
PMID:17975391.
Exclusion: 7

Lapostolle F, Gere C, Borron SW, et al. Prognostic factors in victims of falls from height. Crit Care Med. 2005;33(6):1239-42.
PMID:15942337.
Exclusion: 4

Larson JT, Dietrich AM, Abdessalam SF, et al. Effective use of the air ambulance for pediatric trauma. J Trauma. 2004;56(1):89-93.
PMID:14749572.
Exclusion: 4

Lavelle JM, Shaw KN. Evaluation of head injury in a pediatric emergency department: pretrauma and posttrauma system. Arch Pediatr Adolesc Med. 1998;152(12):1220-4.
PMID:9856433.
Exclusion: 4

Lavoie A, Emond M, Moore L, et al. Evaluation of the Prehospital Index, presence of high-velocity impact and judgment of emergency medical technicians as criteria for trauma triage. CJEM. 2010;12(2):111-8.
PMID:20219158.
Exclusion: 4

Leach SR, Swor RA, Jackson RE, et al. Do outcome measures for trauma triage agree? Prehosp Emerg Care. 2008;12(4):467-9.
PMID:18924010.
Exclusion: 4

Lecky F, Russell W, Fuller G, et al. The Head Injury Transportation Straight to Neurosurgery (HITS-NS) randomised trial: a feasibility study. Health technology assessment (Winchester, England). 2016;20(1):1-198.
PMID:26753808.
Exclusion: 6

Lee A, Garner A, Fearnside M, et al. Level of prehospital care and risk of mortality in patients with and without severe blunt head injury. Injury. 2003;34(11):815-9.
PMID:14580812.
Exclusion: 4

Lee C, Porter K. The prehospital management of pelvic fractures. Emerg Med J. 2007;24(2):130-3.
PMID:17251627.
Exclusion: 4

Lee YT, Feng XY, Lin YC, et al. Pediatric trauma team activation: are we making the right call? Eur J Pediatr Surg. 2014;24(1):46-50.
PMID:23852723.
Exclusion: 13

Lehr D, Baethmann A, Reulen HJ, et al. Management of patients with severe head injury in the preclinical phase: a prospective analysis. J Trauma. 1997;42(5 Suppl):S71-5.
PMID:9191699.
Exclusion: 3

Leong LB, Sukarom S, Vasu A, et al. Identifying predictors of an abnormal computed tomographic scan among patients with a head injury and a Glasgow Coma Scale of 15. Eur J Emerg Med. 2013;20(2):86-90.
PMID:22387753.
Exclusion: 4

Lerner EB, Shah MN, Swor RA, et al. Comparison of the 1999 and 2006 trauma triage guidelines: where do patients go? Prehosp Emerg Care. 2011;15(1):12-7.
PMID:21054176.
Exclusion: 4

Lesko MM, Jenks T, O'Brien SJ, et al. Comparing model performance for survival prediction using total Glasgow Coma Scale and its components in traumatic brain injury. J Neurotrauma. 2013;30(1):17-22.
PMID:22931390.
Exclusion: 4

Levine SD, Colwell CB, Pons PT, et al. How well do paramedics predict admission to the hospital? A prospective study. J Emerg Med. 2006;31(1):1-5.
PMID:16798145.
Exclusion: 4

Liberman M, Mulder D, Sampalis J. Advanced or basic life support for trauma: meta-analysis and critical review of the literature. J Trauma. 2000;49(4):584-99.
PMID:11038074.
Exclusion: 4

Liberman M, Mulder DS, Jurkovich GJ, et al. The association between trauma system and trauma center components and outcome in a mature regionalized trauma system. Surgery. 2005;137(6):647-58.
PMID:15933633.
Exclusion: 13

Lichenstein R, Glass TF, Quayle KS, et al. Presentations and outcomes of children with intraventricular hemorrhages after blunt head trauma. Arch Pediatr Adolesc Med. 2012;166(8):725-31.
PMID:22473883.
Exclusion: 4

Lichtveld RA, Panhuizen IF, Snit RBJ, et al. Predictors of death in trauma patients who are alive on arrival at hospital. Eur J Trauma Emerg Surg. 2007;33(1):46-51.
PMID:26815974.
Exclusion: 4

Lieberman JD, Pasquale MD, Garcia R, et al. Use of admission Glasgow Coma Score, pupil size, and pupil reactivity to determine outcome for trauma patients. J Trauma. 2003;55(3):437-42; discussion 42-3.
PMID:14501883.
Exclusion: 4

Lin G, Becker A, Lynn M. Changes in vital signs of trauma victims from prehospital to hospital settings. Journal of Paramedic Practice. 2011;3(10):558-62.
Exclusion: 13

Lin G, Becker A, Lynn M. Do pre-hospital trauma alert criteria predict the severity of injury and a need for an emergent surgical intervention? Injury. 2012;43(9):1381-5.
PMID:21145057.
Exclusion: 4

Lin YR, Wu HP, Chen WL, et al. Predictors of survival and neurologic outcomes in children with traumatic out-of-hospital cardiac arrest during the early postresuscitative period. J Trauma Acute Care Surg. 2013;75(3):439-47.
PMID:24089114.
Exclusion: 4

Lipsky AM, Gausche-Hill M, Henneman PL, et al. Prehospital hypotension is a predictor of the need for an emergent, therapeutic operation in trauma patients with normal systolic blood pressure in the emergency department. J Trauma. 2006;61(5):1228-33.
PMID:17099534.
Exclusion: 4

Lipsky AM, Klein Y, Givon A, et al. Accuracy of initial critical care triage decisions in blast versus non-blast trauma. Disaster Med Public Health Prep. 2014;8(4):326-32.
PMID:24946892.
Exclusion: 3

Liu CC, Wang CY, Shih HC, et al. Prognostic factors for mortality following falls from height. Injury. 2009;40(6):595-7.
PMID:19375698.
Exclusion: 13

Liu NT, Holcomb JB, Wade CE, et al. Utility of vital signs, heart rate variability and complexity, and machine learning for identifying the need for lifesaving interventions in trauma patients. Shock. 2014;42(2):108-14.
PMID:24727872.
Exclusion: 13

London JA, Rosengart MR, Jurkovich GJ, et al. Prospective payments in a regional trauma center: the case for recognition of the transfer patient in diagnostic related groups. J Trauma. 2006;60(2):390-5; discussion 5-6.
PMID:16508501.
Exclusion: 4

Louahem DM, Nebunescu A, Canavese F, et al. Neurovascular complications and severe displacement in supracondylar humerus fractures in children: defensive or offensive strategy? J Pediatr Orthop B. 2006;15(1):51-7.
PMID:16280721.
Exclusion: 4

Lubin JS, Delbridge TR, Cole JS, et al. EMS and emergency department physician triage: injury severity in trauma patients transported by helicopter. Prehosp Emerg Care. 2005;9(2):198-202.
PMID:16036847.
Exclusion: 4

Lunsjo K, Tadros A, Hauggaard A, et al. Associated injuries and not fracture instability predict mortality in pelvic fractures: a prospective study of 100 patients. J Trauma. 2007;62(3):687-91.
PMID:17414348.
Exclusion: 4

Lustenberger T, Inaba K, Talving P, et al. Bicyclists injured by automobiles: relationship of age to injury type and severity-a national trauma databank analysis. J Trauma. 2010;69(5):1020-5.
PMID:20526215.
Exclusion: 4

Macken L, Manovel A. Trauma bypass in south-eastern Sydney: an 8-year review. Emerg Med Australas. 2005;17(2):137-42.
PMID:15796728.
Exclusion: 4

Mackenzie CF, Hu P, Sen A, et al. Automatic pre-hospital vital signs waveform and trend data capture fills quality management, triage and outcome prediction gaps. AMIA Annu Symp Proc. 2008:318-22.
PMID:18999022.
Exclusion: 4

MacKenzie EJ, Rivara FP, Jurkovich GJ, et al. A national evaluation of the effect of trauma-center care on mortality. N Engl J Med. 2006;354(4):366-78.
PMID:16436768.
Exclusion: 13

Mackersie RC. Pitfalls in the evaluation and resuscitation of the trauma patient. Emerg Med Clin North Am. 2010;28(1):1-vii 28p.
PMID:19945596.
Exclusion: 4

MacLeod JB, Cohn SM, Johnson EW, et al. Trauma deaths in the first hour: are they all unsalvageable injuries? Am J Surg. 2007;193(2):195-9.
PMID:17236846.
Exclusion: 4

Majdan M, Lingsma HF, Nieboer D, et al. Performance of IMPACT, CRASH and Nijmegen models in predicting six month outcome of patients with severe or moderate TBI: an external validation study. Scand J Trauma Resusc Emerg Med. 2014;22:68.
PMID:25406964.
Exclusion: 13

Majidi S, Siddiq F, Qureshi AI. Prehospital neurologic deterioration is independent predictor of outcome in traumatic brain injury: analysis from National Trauma Data Bank. Am J Emerg Med. 2013;31(8):1215-9.
PMID:23809095.
Exclusion: 4

Mamelak AN, Pitts LH, Damron S. Predicting survival from head trauma 24 hours after injury: a practical method with therapeutic implications. J Trauma. 1996;41(1):91-9.
PMID:8676429.
Exclusion: 4

Manthey DE, Nicks BA. Penetrating trauma to the extremity. J Emerg Med. 2008;34(2):187-93.
PMID:17976791.
Exclusion: 4

Marcin JP, Pollack MM. Triage scoring systems, severity of illness measures, and mortality prediction models in pediatric trauma. Crit Care Med. 2002;30(11 Suppl):S457-67.
PMID:12528788.
Exclusion: 7

Markovchick VJ, Moore EE. Optimal trauma outcome: trauma system design and the trauma team. Emerg Med Clin North Am. 2007;25(3):643-54, viii.
PMID:17826210.
Exclusion: 7

Marmarou A, Lu J, Butcher I, et al. Prognostic value of the Glasgow Coma Scale and pupil reactivity in traumatic brain injury assessed pre-hospital and on enrollment: an IMPACT analysis. J Neurotrauma. 2007;24(2):270-80.
PMID:17375991.
Exclusion: 13

Martin JT, Alkhoury F, O'Connor JA, et al. 'Normal' vital signs belie occult hypoperfusion in geriatric trauma patients. Am Surg. 2010;76(1):65-9 5p.
PMID:20135942.
Exclusion: 4

Martin M, Izenberg S, Cole F, et al. A decade of experience with a selective policy for direct to operating room trauma resuscitations. Am J Surg. 2012;204(2):187-92.
PMID:22813640.
Exclusion: 9

Matsuyama T, Okuchi K, Seki T, et al. Prognostic factors in hanging injuries. Am J Emerg Med. 2004;22(3):207-10.
PMID:15138959.
Exclusion: 4

Matthes G, Stengel D, Bauwens K, et al. Predictive factors of liver injury in blunt multiple trauma. Langenbecks Arch Surg. 2006;391(4):350-4.
PMID:16261391.
Exclusion: 4

Mauritz W, Leitgeb J, Wilbacher I, et al. Outcome of brain trauma patients who have a Glasgow Coma Scale score of 3 and bilateral fixed and dilated pupils in the field. Eur J Emerg Med. 2009;16(3):153-8.
PMID:19282759.
Exclusion: 4

Mayer L, Meuli M, Lips U, et al. The silent epidemic of falls from buildings: analysis of risk factors. Pediatr Surg Int. 2006;22(9):743-8.
PMID:16871397.
Exclusion: 4

McCowan CL, Swanson ER, Thomas F, et al. Outcomes of pediatric trauma patients transported from rural and urban scenes. Air Med J. 2008;27(2):78-83.
PMID:18328971.
Exclusion: 4

McCowan CL, Swanson ER, Thomas F, et al. Scene transport of pediatric patients injured at winter resorts. Prehosp Emerg Care. 2006;10(1):35-40.
PMID:16418089.
Exclusion: 4

McCoy CE, Menchine M, Sampson S, et al. Emergency medical services out-of-hospital scene and transport times and their association with mortality in trauma patients presenting to an urban Level I trauma center. Ann Emerg Med. 2013;61(2):167-74 8p.
PMID:23142007.
Exclusion: 4

McDermott FT, Rosenfeld JV, Laidlaw JD, et al. Evaluation of management of road trauma survivors with brain injury and neurologic disability in Victoria. J Trauma. 2004;56(1):137-49.
PMID:14749581.
Exclusion: 4

McGuffie AC, Graham CA, Beard D, et al. Scottish urban versus rural trauma outcome study. J Trauma. 2005;59(3):632-8.
PMID:16361906.
Exclusion: 4

McGwin G, Jr., MacLennan PA, Fife JB, et al. Preexisting conditions and mortality in older trauma patients. J Trauma. 2004;56(6):1291-6.
PMID:15211139.
Exclusion: 4

McMahon CG, Kenny R, Bennett K, et al. Effect of acute traumatic brain injury on baroreflex function. Shock. 2011;35(1):53-8.
PMID:20458265.
Exclusion: 4

McManus J, Yershov AL, Ludwig D, et al. Radial pulse character relationships to systolic blood pressure and trauma outcomes. Prehosp Emerg Care. 2005;9(4):423-8.
PMID:16263676.
Exclusion: 4

Meisler R, Thomsen AB, Abildstrom H, et al. Triage and mortality in 2875 consecutive trauma patients. Acta Anaesthesiol Scand. 2010;54(2):218-23.
PMID:19817720.
Exclusion: 13

Meizoso JP, Valle EJ, Allen CJ, et al. Decreased mortality after prehospital interventions in severely injured trauma patients. J Trauma Acute Care Surg. 2015;79(2):227-31.
PMID:26218690.
Exclusion: 4

Menakuru SR, Behera A, Jindal R, et al. Extremity vascular trauma in civilian population: a seven-year review from North India. Injury. 2005;36(3):400-6.
PMID:15710157.
Exclusion: 4

Meredith W, Rutledge R, Fakhry SM, et al. The conundrum of the Glasgow Coma Scale in intubated patients: a linear regression prediction of the Glasgow verbal score from the Glasgow eye and motor scores. J Trauma. 1998;44(5):839-44; discussion 44-5.
PMID:9603086.
Exclusion: 13

Meredith W, Rutledge R, Hansen AR, et al. Field triage of trauma patients based upon the ability to follow commands: a study in 29,573 injured patients. J Trauma. 1995;38(1):129-35.
PMID:7745643.
Exclusion: 13

Metz TD, Abbott JT. Uterine trauma in pregnancy after motor vehicle crashes with airbag deployment: A 30-case series. J Trauma. 2006;61(3):658-61.
PMID:16967003.
Exclusion: 4

Michetti CP, Hanna R, Crandall JR, et al. Contemporary analysis of thoracic aortic injury: importance of screening based on crach characteristics. J Trauma. 2007;63(1):18-24 7p.
PMID:17622864.
Exclusion: 4

Mitra B, Cameron P, Butt W. Population-based study of paediatric head injury. J Paediatr Child Health. 2007;43(3):154-9.
PMID:17316189.
Exclusion: 5

Moore L, Lavoie A, LeSage N, et al. Statistical validation of the Revised Trauma Score. J Trauma. 2006;60(2):305-11.
PMID:16508487.
Exclusion: 13

Morris DS, Rohrbach J, Sundaram LMT, et al. Early hospital readmission in the trauma population: are the risk factors different? Injury. 2014;45(1):56-60 5p.
PMID:23726120.
Exclusion: 9

Motozawa Y, Hitosugi M, Abe T, et al. Effects of seat belts worn by pregnant drivers during low-impact collisions. Am J Obstet Gynecol. 2010;203(1):62.e1-8.
PMID:20435292.
Exclusion: 4

Mountain D, Sistenich V, Jacobs IG. Characteristics, management and outcomes of adults with major trauma taking pre-injury warfarin in a Western Australian population from 2000 to 2005: a population-based cohort study. Med J Aust. 2010;193(4):202-6.
PMID:20712539.
Exclusion: 13

Mukherjee K, Rimer M, McConnell MD, et al. Physiologically focused triage criteria improve utilization of pediatric surgeon-directed trauma teams and reduce costs. J Pediatr Surg. 2010;45(6):1315-23.
PMID:20620338.
Exclusion: 4

Mulholland SA, Cameron PA, Gabbe BJ, et al. Prehospital prediction of the severity of blunt anatomic injury. J Trauma. 2008;3:754-60.
PMID:18332820.
Exclusion: 13

Mulholland SA, Gabbe BJ, Cameron P. Is paramedic judgement useful in prehospital trauma triage? Injury. 2005;36(11):1298-305.
PMID:16214474.
Exclusion: 4

Mutschler M, Nienaber U, Munzberg M, et al. Assessment of hypovolaemic shock at scene: is the PHTLS classification of hypovolaemic shock really valid? Emerg Med J. 2014;31(1):35-40.
PMID:23302502.
Exclusion: 13

Nabaweesi R, Arnold MA, Chang DC, et al. Prehospital predictors of risk for pelvic fractures in pediatric trauma patients. Pediatr Surg Int. 2008;24(9):1053-6.
PMID:18679692.
Exclusion: 4

Nabaweesi R, Morlock L, Lule C, et al. Do prehospital criteria optimally assign injured children to the appropriate level of trauma team activation and emergency department disposition at a level I pediatric trauma center? Pediatr Surg Int. 2014;30(11):1097-102.
PMID:25142797.
Exclusion: 13

Nakahara S, Matsuoka T, Ueno M, et al. Triage protocol modifications to reduce undertriage...J Trauma. 2010 Oct;69(4):998; J Trauma. 2010 Oct;69(4):997; J Trauma. 2010 Sep;69(3):733. J Trauma. 2011;71(1):267-8 2p.
PMID:21818045.
Exclusion: 5

Nakahara S, Matsuoka T, Ueno M, et al. Predictive factors for undertriage among severe blunt trauma patients: what enables them to slip through an established trauma triage protocol? J Trauma. 2010;68(5):1044-51 8p.
PMID:20480540.
Exclusion: 5

Nakamura Y, Daya M, Bulger EM, et al. Evaluating age in the field triage of injured persons. Ann Emerg Med. 2012;60(3):335-45 11p.
PMID:22633339.
Exclusion: 3

Namiki J, Yamazaki M, Funabiki T, et al. Inaccuracy and misjudged factors of Glasgow Coma Scale scores when assessed by inexperienced physicians. Clin Neurol Neurosurg. 2011;113(5):393-8.
PMID:21295908.
Exclusion: 3

Narayan RK, Michel ME, Ansell B, et al. Clinical trials in head injury. J Neurotrauma. 2002;19(5):503-57.
PMID:12042091.
Exclusion: 4

Narci A, Solak O, Turhan-Haktanir N, et al. The prognostic importance of trauma scoring systems in pediatric patients. Pediatr Surg Int. 2009;25(1):25-30.
PMID:19009298.
Exclusion: 13

Nathens AB, Maier RV, Brundage SI, et al. The effect of interfacility transfer on outcome in an urban trauma system. J Trauma. 2003;55(3):444-9.
PMID:14501884.
Exclusion: 4

Newgard C, Mullins R, Hedges J, et al. Establishing the need for trauma center care: anatomic injury or resource utilization?...2007 Society for Academic Emergency Medicine Annual Meeting. Acad Emerg Med. 2007;14:S61-S 1p.
Exclusion: 7

Newgard C, Zive D, Rea T, et al. 85: A Multi-Site Assessment and Validation of the ACSCOT Trauma Triage Criteria for Identifying Seriously Injured Children and Adults. Ann Emerg Med. 2010;56(3):S28-S9.
Exclusion: 7

Newgard CD, Holmes JF, Haukoos JS, et al. Improving early identification of the high-risk elderly trauma patient by emergency medical services. Injury. 2016;47(1):19-25.
PMID:26477345.
Exclusion: 4

Newgard CD, Cudnik M, Warden CR, et al. The predictive value and appropriate ranges of prehospital physiological parameters for high-risk injured children. Pediatr Emerg Care. 2007;23(7):450-6.
PMID:17666925.
Exclusion: 5

Newgard CD, Hedges JR, Adams A, et al. Secondary triage: early identification of high-risk trauma patients presenting to non-tertiary hospitals. Prehosp Emerg Care. 2007;11(2):154-63 10p.
PMID:17454801.
Exclusion: 5

Newgard CD, Hedges JR, Diggs B, et al. Establishing the need for trauma center care: anatomic injury or resource use? Prehosp Emerg Care. 2008;12(4):451-8.
PMID:18924008.
Exclusion: 4

Newgard CD, Hedges JR, Stone JV, et al. Derivation of a clinical decision rule to guide the interhospital transfer of patients with blunt traumatic brain injury. Emerg Med J. 2005;22(12):855-60.
PMID:16299192.
Exclusion: 5

Newgard CD, Hsia RY, Mann NC, et al. The trade-offs in field trauma triage: a multiregion assessment of accuracy metrics and volume shifts associated with different triage strategies. J Trauma Acute Care Surg. 2013;74(5):1298-306; discussion 306.
PMID:23609282.
Exclusion: 4

Newgard CD, Hui SH, Griffin A, et al. Prospective validation of an out-of-hospital decision rule to identify seriously injured children involved in motor vehicle crashes. Acad Emerg Med. 2005;12(8):679-87.
PMID:16079420.
Exclusion: 5

Newgard CD, Lewis RJ, Jolly BT. Use of out-of-hospital variables to predict severity of injury in pediatric patients involved in motor vehicle crashes. Ann Emerg Med. 2002;39(5):481-91.
PMID:11973555.
Exclusion: 4

Newgard CD, Lewis RJ, Kraus JF, et al. Seat position and the risk of serious thoracoabdominal injury in lateral motor vehicle crashes. Accid Anal Prev. 2005;37(4):668-74.
PMID:15949458.
Exclusion: 13

Newgard CD, Mann NC, Hsia RY, et al. Patient Choice in the Selection of Hospitals by 9-1-1 Emergency Medical Services Providers in Trauma Systems. Acad Emerg Med. 2013;20(9):911-9 9p.
PMID:24050797.
Exclusion: 5

Newgard CD, McConnell KJ, Hedges JR. Variability of trauma transfer practices among non-tertiary care hospital emergency departments. Acad Emerg Med. 2006;13(7):746-54 9p.
PMID:16723727.
Exclusion: 5

Newgard CD, Meier EN, Bulger EM, et al. Revisiting the "Golden Hour": An Evaluation of Out-of-Hospital Time in Shock and Traumatic Brain Injury. Ann Emerg Med. 2015;66(1):30-41, .e1-3.
PMID:25596960.
Exclusion: 13

Newgard CD, Nelson MJ, Kampp M, et al. Out-of-hospital decision making and factors influencing the regional distribution of injured patients in a trauma system. J Trauma. 2011;70(6):1345-53.
PMID:21817971.
Exclusion: 4

Newgard CD, Richardson D, Holmes JF, et al. Physiologic field triage criteria for identifying seriously injured older adults. Prehosp Emerg Care. 2014;18(4):461-70.
PMID:24933614.
Exclusion: 4

Newgard CD, Rudser K, Atkins DL, et al. The availability and use of out-of-hospital physiologic information to identify high-risk injured children in a multisite, population-based cohort. Prehosp Emerg Care. 2009;13(4):420-31.
PMID:19731152.
Exclusion: 5

Newgard CD, Rudser K, Hedges JR, et al. A critical assessment of the out-of-hospital trauma triage guidelines for physiologic abnormality. J Trauma. 2010;68(2):452-62 11p.
PMID:20154558.
Exclusion: 4

Newgard CD, Schmicker RH, Hedges JR, et al. Emergency medical services intervals and survival in trauma: assessment of the 'golden hour' in a North American prospective cohort. Ann Emerg Med. 2010;55(3):235-46.e4 1p.
PMID:19783323.
Exclusion: 13

Newgard CD, Zive D, Holmes JF, et al. A multisite assessment of the American College of Surgeons Committee on Trauma field triage decision scheme for identifying seriously injured children and adults. J Am Coll Surg. 2011;213(6):709-21.
PMID:22107917.
Exclusion: 4

Newland C, Belcher T, Bostrom O, et al. Occupant-to-occupant interaction and impact injury risk in side impact crashes. Stapp car crash journal. 2008;52:327-47.
PMID:19085168.
Exclusion: 4

Newton EJ, Love J. Acute complications of extremity trauma. Emerg Med Clin North Am. 2007;25(3):751-61, iv.
PMID:17826216.
Exclusion: 4

Nicholl J, Hughes S, Dixon S, et al. The costs and benefits of paramedic skills in pre-hospital trauma care. Health technology assessment (Winchester, England). 1998;2(17):i-iv, 1-72.
PMID:9846260.
Exclusion: 4

Nichols SD, McCarthy MC, Ekeh AP, et al. Outcome of cervical near-hanging injuries. J Trauma. 2009;66(1):174-8.
PMID:19131821.
Exclusion: 5

Nirula R, Maier R, Moore E, et al. Scoop and run to the trauma center or stay and play at the local hospital: hospital transfer's effect on mortality. J Trauma. 2010;69(3):595-9.
PMID:20838131.
Exclusion: 4

Nirula R, Talmor D, Brasel K. Predicting significant torso trauma. J Trauma. 2005;59(1):132-5.
PMID:16096552.
Exclusion: 4

Nishijima DK, Dager WE, Schrot RJ, et al. The efficacy of factor VIIa in emergency department patients with warfarin use and traumatic intracranial hemorrhage. Acad Emerg Med. 2010;17(3):244-51.
PMID:20370756.
Exclusion: 5

Nishijima DK, Shahlaie K, Echeverri A, et al. A clinical decision rule to predict adult patients with traumatic intracranial haemorrhage who do not require intensive care unit admission. Injury. 2012;43(11):1827-32.
PMID:21839444.
Exclusion: 3

Nore AK, Ommundsen OE, Steine S. [How to distinguish between illness, injury or intoxication in the emergency unit?]. Tidsskr Nor Laegeforen. 2001;121(9):1055-8.
PMID:11354881.
Exclusion: 10

Norwood SH, McAuley CE, Berne JD, et al. A prehospital glasgow coma scale score < or = 14 accurately predicts the need for full trauma team activation and patient hospitalization after motor vehicle collisions. J Trauma. 2002;53(3):503-7.
PMID:12352488.
Exclusion: 13

Novack TA, Bush BA, Meythaler JM, et al. Outcome after traumatic brain injury: pathway analysis of contributions from premorbid, injury severity, and recovery variables. Arch Phys Med Rehabil. 2001;82(3):300-5.
PMID:11245749.
Exclusion: 9

Ocak G, Sturms LM, Hoogeveen JM, et al. Prehospital identification of major trauma patients. Langenbecks Arch Surg. 2009;394(2):285-92.
PMID:18581133.
Exclusion: 13

O'Connor JV, Kufera JA, Kerns TJ, et al. Crash and occupant predictors of pulmonary contusion. J Trauma. 2009;66(4):1091-5.
PMID:19359919.
Exclusion: 4

Odetola FO, Davis MM, Cohn LM, et al. Interhospital transfer of critically ill and injured children: an evaluation of transfer patterns, resource utilization, and clinical outcomes. J Hosp Med. 2009;4(3):164-70.
PMID:19301371.
Exclusion: 4

Oh EJ, Kim YM, Jegal DW, et al. Diagnostic value of Elecsys S100 as a marker of acute brain injury in the emergency department. J Clin Lab Anal. 2007;21(6):387-92.
PMID:18022928.
Exclusion: 9

O'Reilly GM, Jolley DJ, Cameron PA, et al. Missing in action: a case study of the application of methods for dealing with missing data to trauma system benchmarking. Acad Emerg Med. 2010;17(10):1122-9.
PMID:21040114.
Exclusion: 4

Osifo OD, Iribhogbe P, Idiodi-Thomas H. Falls from heights: epidemiology and pattern of injury at the accident and emergency centre of the University of Benin Teaching Hospital. Injury. 2010;41(5):544-7.
PMID:19717148.
Exclusion: 4

Osterwalder JJ. Could a regional trauma system in eastern Switzerland decrease the mortality of blunt polytrauma patients? A prospective cohort study. J Trauma. 2002;52(6):1030-6.
PMID:12045627.
Exclusion: 4

Ott MM, Eriksson E, Vanderkolk W, et al. Antiplatelet and anticoagulation therapies do not increase mortality in the absence of traumatic brain injury. J Trauma. 2010;68(3):560-3.
PMID:20065871.
Exclusion: 4

Otte D, Haasper C, Eis V, et al. Characteristics of pole impacts to side of passenger cars in European traffic accidents and assessment of injury mechanisms--analysis of German and UK in-depth data. Stapp car crash journal. 2008;52:349-62.
PMID:19085169.
Exclusion: 4

Owings JT, Wisner DH, Battistella FD, et al. Isolated transient loss of consciousness is an indicator of significant injury. Arch Surg. 1998;133(9):941-6.
PMID:9749844.
Exclusion: 5

Ozyurekoglu T, Napolitano M, Kleinert JM. Hay baler injuries to the upper extremity. J Trauma. 2007;63(1):62-9.
PMID:17622870.
Exclusion: 4

Paladino L, Subramanian RA, Nabors S, et al. Triage hyperglycemia as a prognostic indicator of major trauma. J Trauma. 2010;69(1):41-5.
PMID:20665990.
Exclusion: 4

Patel MS, Malinoski DJ, Nguyen XM, et al. The impact of select chronic diseases on outcomes after trauma: a study from the National Trauma Data Bank. J Am Coll Surg. 2011;212(1):96-104.
PMID:21184957.
Exclusion: 4

Paulson EH, Gerberich SG, Alexander BH, et al. Fall-related injuries among agricultural household members: Regional Rural Injury Study II (RRIS-II). J Occup Environ Med. 2006;48(9):959-68.
PMID:16966964.
Exclusion: 4

Pearson WS, Ovalle F, Jr., Faul M, et al. A review of traumatic brain injury trauma center visits meeting physiologic criteria from The American College of Surgeons Committee on Trauma/Centers for Disease Control and Prevention Field Triage Guidelines. Prehosp Emerg Care. 2012;16(3):323-8.
PMID:22548387.
Exclusion: 5

Petsas A, Waldmann C. Where should patients with severe traumatic brain injury be managed?: Patients can be safely managed in a nonspecialist center. J Neurosurg Anesthesiol. 2010;22(4):354-6.
PMID:20844379.
Exclusion: 7

Phillips S, Rond PC, 3rd, Kelly SM, et al. The failure of triage criteria to identify geriatric patients with trauma: results from the Florida Trauma Triage Study. J Trauma. 1996;40(2):278-83.
PMID:8637079.
Exclusion: 4

Pickering A, Carter J, Hanning I, et al. Emergency department measurement of urinary S100B in children following head injury: can extracranial injury confound findings? Emerg Med J. 2008;25(2):88-9.
PMID:18212143.
Exclusion: 4

Pickering A, Cooper K, Harnan S, et al. Impact of prehospital transfer strategies in major trauma and head injury: Systematic review, meta-analysis, and recommendations for study design. J Trauma Acute Care Surg. 2015;78(1):164-77.
PMID:25539218.
Exclusion: 11

Pickering A, Grundy K, Clarke A, et al. A cohort study of outcomes following head injury among children and young adults in full-time education. Emerg Med J. 2012;29(6):451-4.
PMID:21617161.
Exclusion: 3

Pieske O, Rauscher S, Baur P, et al. Automatische Unfallmelder: Erste Erfahrungen aus der Anwendung (Leitthema). Unfallchirurg. 2010;113(5):350-5.
Exclusion: 4

Pintar FA, Maiman DJ, Yoganandan N. Injury patterns in side pole crashes. Annu Proc Assoc Adv Automot Med. 2007;51:419-33.
PMID:18184505.
Exclusion: 4

Pollak AN, Jones AL, Castillo RC, et al. The relationship between time to surgical debridement and incidence of infection after open high-energy lower extremity trauma. J Bone Joint Surg Am. 2010;92(1):7-15.
PMID:20048090.
Exclusion: 4

Poltavski D, Muus K. Factors associated with incidence of "inappropriate" ambulance transport in rural areas in cases of moderate to severe head injury in children. J Rural Health. 2005;21(3):272-7.
PMID:16092304.
Exclusion: 4

Poon WS, Zhu XL, Ng SC, et al. Predicting one year clinical outcome in traumatic brain injury (TBI) at the beginning of rehabilitation. Acta Neurochir Suppl. 2005;93:207-8.
PMID:15986757.
Exclusion: 9

Potoka DA, Schall LC, Ford HR. Development of a novel age-specific pediatric trauma score. J Pediatr Surg. 2001;36(1):106-12.
PMID:11150447.
Exclusion: 4

Potoka DA, Schall LC, Gardner MJ, et al. Impact of pediatric trauma centers on mortality in a statewide system. J Trauma. 2000;49(2):237-45.
PMID:10963534.
Exclusion: 5

Pracht EE, Langland-Orban B, Flint L. Survival advantage for elderly trauma patients treated in a designated trauma center. J Trauma. 2011;71(1):69-77 9p.
PMID:21818016.
Exclusion: 4

Pracht EE, Tepas JJ, 3rd, Celso BG, et al. Survival advantage associated with treatment of injury at designated trauma centers: a bivariate probit model with instrumental variables. Med Care Res Rev. 2007;64(1):83-97.
PMID:17213459.
Exclusion: 4

Pracht EE, Tepas JJ, 3rd, Langland-Orban B, et al. Do pediatric patients with trauma in Florida have reduced mortality rates when treated in designated trauma centers? J Pediatr Surg. 2008;43(1):212-21.
PMID:18206485.
Exclusion: 4

Prasad K. The Glasgow Coma Scale: a critical appraisal of its clinimetric properties. J Clin Epidemiol. 1996;49(7):755-63.
PMID:8691225.
Exclusion: 11

Price TG, Hooker EA, Neubauer J. Prehospital provider prediction of emergency department disposition: implications for selective diversion. Prehosp Emerg Care. 2005;9(3):322-5.
PMID:16147483.
Exclusion: 4

Prichayudh S, Verananvattna A, Sriussadaporn S, et al. Management of upper extremity vascular injury: outcome related to the Mangled Extremity Severity Score. World J Surg. 2009;33(4):857-63.
PMID:19189175.
Exclusion: 4

Purtill MA, Benedict K, Hernandez-Boussard T, et al. Validation of a prehospital trauma triage tool: a 10-year perspective. J Trauma. 2008;65(6):1253-7 5p.
PMID:19077609.
Exclusion: 4

Quayle KS, Powell EC, Mahajan P, et al. Epidemiology of blunt head trauma in children in U.S. emergency departments. N Engl J Med. 2014;371(20):1945-7.
PMID:25390756.
Exclusion: 3

Rahbar MH, Fox EE, del Junco DJ, et al. Coordination and management of multicenter clinical studies in trauma: Experience from the PRospective Observational Multicenter Major Trauma Transfusion (PROMMTT) Study. Resuscitation. 2012;83(4):459-64 6p.
PMID:22001613.
Exclusion: 4

Rainer TH, Houlihan KP, Robertson CE, et al. An evaluation of paramedic activities in prehospital trauma care. Injury. 1997;28(9-10):623-7.
PMID:9624340.
Exclusion: 4

Randazzo C, Stolz U, Hodges NL, et al. Pediatric tree house-related injuries treated in emergency departments in the United States: 1990-2006. Acad Emerg Med. 2009;16(3):235-42.
PMID:19281495.
Exclusion: 4

Raum MR, Nijsten MW, Vogelzang M, et al. Emergency trauma score: an instrument for early estimation of trauma severity. Crit Care Med. 2009;37(6):1972-7.
PMID:19384227.
Exclusion: 13

Rehn M, Eken T, Kruger AJ, et al. Precision of field triage in patients brought to a trauma centre after introducing trauma team activation guidelines. Scand J Trauma Resusc Emerg Med. 2009;17:1.
PMID:19134177.
Exclusion: 4

Reisner AT, Chen L, McKenna TM, et al. Automatically-computed prehospital severity scores are equivalent to scores based on medic documentation. J Trauma. 2008;65(4):915-23 9p.
PMID:18849811.
Exclusion: 4

Reith FC, Brennan PM, Maas AI, et al. Lack of Standardization in the Use of the Glasgow Coma Scale: Results of International Surveys. J Neurotrauma. 2016;33(1):89-94.
PMID:25951090.
Exclusion: 5

Reith FC, Van den Brande R, Synnot A, et al. The reliability of the Glasgow Coma Scale: a systematic review. Intensive Care Med. 2016;42(1):3-15.
PMID:26564211.
Exclusion: 3

Remick KN, Schwab CW, Smith BP, et al. Defining the optimal time to the operating room may salvage early trauma deaths. J Trauma Acute Care Surg. 2014;76(5):1251-8 8p.
PMID:24747456.
Exclusion: 4

Rhee P, Kuncir EJ, Johnson L, et al. Cervical spine injury is highly dependent on the mechanism of injury following blunt and penetrating assault. J Trauma. 2006;61(5):1166-70.
PMID:17099524.
Exclusion: 4

Richmond TS, Kauder D, Strumpf N, et al. Characteristics and outcomes of serious traumatic injury in older adults. J Am Geriatr Soc. 2002;50(2):215-22.
PMID:12028201.
Exclusion: 4

Rickards CA, Ryan KL, Ludwig DA, et al. Is heart period variability associated with the administration of lifesaving interventions in individual prehospital trauma patients with normal standard vital signs? Crit Care Med. 2010;38(8):1666-73.
PMID:20562705.
Exclusion: 4

Ringburg AN, de Ronde G, Thomas SH, et al. Validity of helicopter emergency medical services dispatch criteria for traumatic injuries: a systematic review. Prehosp Emerg Care. 2009;13(1):28-36.
PMID:19145521.
Exclusion: 11

Ringburg AN, Frissen IN, Spanjersberg WR, et al. Physician-staffed HEMS dispatch in the Netherlands: Adequate deployment or minimal utilization? Air Med J. 2005;24(6):248-51.
PMID:16314279.
Exclusion: 4

Rivara FP, Koepsell TD, Wang J, et al. Outcomes of trauma patients after transfer to a level I trauma center. J Trauma. 2008;64(6):1594-9 6p.
PMID:18545129.
Exclusion: 4

Robertson BD. Differences in service delivery and patient outcome between rural and urban areas: The case of traumatic brain injury at a Level I pediatric trauma center in North Texas. Diss Abstr Int. 2010;71(1-A):354.
Exclusion: 3

Rogers FB, Osler T, Krasne M, et al. Has TRISS become an anachronism? A comparison of mortality between the National Trauma Data Bank and Major Trauma Outcome Study databases. J Trauma Acute Care Surg. 2012;73(2):326-31 6p.
PMID:22846935.
Exclusion: 5

Rogers FB, Osler T, Lee JC, et al. In a Mature Trauma System, There Is No Difference in Outcome (Survival) Between Level I and Level II Trauma Centers. J Trauma. 2011;70(6):1354-7 4p.
PMID:21817972.
Exclusion: 4

Rogers FB, Osler TM, Shackford SR, et al. Study of the outcome of patients transferred to a level I hospital after stabilization at an outlying hospital in a rural setting. J Trauma. 1999;46(2):328-33.
PMID:10029042.
Exclusion: 4

Ross DW, Rewers A, Homan MB, et al. Factors associated with the interfacility transfer of the pediatric trauma patient: implications for prehospital triage. Pediatr Emerg Care. 2012;28(9):905-10.
PMID:22929144.
Exclusion: 8

Rouxel JP, Tazarourte K, Le Moigno S, et al. [Medical prehospital rescue in head injury]. Ann Fr Anesth Reanim. 2004;23(1):6-14.
PMID:14980318.
Exclusion: 10

Rovlias A, Kotsou S. Classification and regression tree for prediction of outcome after severe head injury using simple clinical and laboratory variables. J Neurotrauma. 2004;21(7):886-93.
PMID:15307901.
Exclusion: 4

Rowley G, Fielding K. Reliability and accuracy of the Glasgow Coma Scale with experienced and inexperienced users. Lancet. 1991;337(8740):535-8.
PMID:1671900.
Exclusion: 12

Ruffolo DC. Trauma care and managing the injured pregnant patient. J Obstet Gynecol Neonatal Nurs. 2009;38(6):704-14.
PMID:19930286.
Exclusion: 7

Rush RM, Jr., Beekley AC, Puttler EG, et al. The mangled extremity. Curr Probl Surg. 2009;46(11):851-926.
PMID:19804853.
Exclusion: 7

Rush RM, Jr., Kjorstad R, Starnes BW, et al. Application of the Mangled Extremity Severity Score in a combat setting. Mil Med. 2007;172(7):777-81.
PMID:17691695.
Exclusion: 4

Rusnak M, Janciak I, Majdan M, et al. Severe traumatic brain injury in Austria I: introduction to the study. Wien Klin Wochenschr. 2007;119(1-2):23-8.
PMID:17318747.
Exclusion: 9

Ryb GE, Dischinger PC. Scene mobility status as a predictor of injury severity and mortality due to vehicular crashes. J Trauma. 2011;71(3):737-41 5p.
PMID:21909003.
Exclusion: 5

Ryb GE, Dischinger PC. Disparities in trauma center access of older injured motor vehicular crash occupants. J Trauma. 2011;71(3):742-7.
PMID:21909004.
Exclusion: 5

Ryb GE, Dischinger PC, Braver ER, et al. Expected differences and unexpected commonalities in mortality, injury severity, and injury patterns between near versus far occupants of side impact crashes. J Trauma. 2009;66(2):499-503.
PMID:19204528.
Exclusion: 4

Sadaka F, Patel D, Lakshmanan R. The FOUR score predicts outcome in patients after traumatic brain injury. Neurocrit Care. 2012;16(1):95-101. PMID:21845490.
Exclusion: 9

Sagraves SG, Newell MA, Bard MR, et al. Tissue oxygenation monitoring in the field: a new EMS vital sign. J Trauma. 2009;67(3):441-3; discussion 3-4. PMID:19741383.
Exclusion: 4

Sagraves SG, Phade SV, Spain T, et al. A collaborative systems approach to rural burn care. J Burn Care Res. 2007;28(1):111-4. PMID:17211209.
Exclusion: 4

Salvucci JA. Literature Review: Helicopter Transport and Mortality. EMS World. 2011;40(7):22- 1p.
Exclusion: 7

Salvucci JA. LITERATURE REVIEW: Undertriage by Age. EMS World. 2012;41(8):14- 1p.
Exclusion: 7

Sampalis JS, Denis R, Frechette P, et al. Direct transport to tertiary trauma centers versus transfer from lower level facilities: impact on mortality and morbidity among patients with major trauma. J Trauma. 1997;43(2):288-95; discussion 95-6. PMID:9291375.
Exclusion: 4

Sampalis JS, Nathanson R, Vaillancourt J, et al. Assessment of mortality in older trauma patients sustaining injuries from falls or motor vehicle collisions treated in regional level I trauma centers. Ann Surg. 2009;249(3):488-95. PMID:19247039.
Exclusion: 4

Saniova B, Drobny M, Drobna E, et al. Acute consciousness disorders in intensive care medicine - value of its grading for prognostic conclusion. Neuroendocrinol Lett. 2012;33(2):167-76. PMID:22592197.
Exclusion: 9

Sartorius D, Le Manach Y, David JS, et al. Mechanism, glasgow coma scale, age, and arterial pressure (MGAP): a new simple prehospital triage score to predict mortality in trauma patients. Crit Care Med. 2010;38(3):831-7. PMID:20068467.
Exclusion: 13

Savitsky E, Rodenberg H. Prediction of the intensity of patient care in prehospital helicopter transport: use of the revised trauma score. Aviat Space Environ Med. 1995;66(1):11-4. PMID:7695544.
Exclusion: 13

Savolainen P, Mannering F. Probabilistic models of motorcyclists' injury severities in single- and multi-vehicle crashes. Accid Anal Prev. 2007;39(5):955-63. PMID:17324370.
Exclusion: 4

Sawauchi S, Murakami S, Ogawa T, et al. [Acute subdural hematoma associated with diffuse brain injury: analysis of 526 cases in Japan neurotrauma data bank]. No Shinkei Geka. 2007;35(1):43-51. PMID:17228767.
Exclusion: 10

Scarborough K, Slone DS, Uribe P, et al. Reduced mortality at a community hospital trauma center: the impact of changing trauma level designation From II to I. Arch Surg. 2008;143(1):22-7; discussion 7-8. PMID:18209149.
Exclusion: 4

Scheetz LJ. Relationship of age, injury severity, injury type, comorbid conditions, level of care, and survival among older motor vehicle trauma patients. Res Nurs Health. 2005;28(3):198-209. PMID:15884027.
Exclusion: 4

Scheetz LJ. Prehospital factors associated with severe injury in older adults. Injury. 2010;41(9):886-93. PMID:20542270.
Exclusion: 11

Scheetz LJ. Trends in the accuracy of older person trauma triage from 2004 to 2008. Prehosp Emerg Care. 2011;15(1):83-7. PMID:20874504.
Exclusion: 4

Scheyerer MJ, Dutschler J, Billeter A, et al. Effect of elevated serum alcohol level on the outcome of severely injured patients. Emerg Med J. 2014;31(10):813-7. PMID:23850886.
Exclusion: 4

Schiff JS, Moore B, Louie J. Pediatric trauma--unique considerations in evaluating and treating children. Minn Med. 2005;88(1):46-51.
PMID:15719549.
Exclusion: 7

Schiff MA, Holt VL. Pregnancy outcomes following hospitalization for motor vehicle crashes in Washington State from 1989 to 2001. Am J Epidemiol. 2005;161(6):503-10.
PMID:15746466.
Exclusion: 4

Schiff MA, Mack CD, Kaufman RP, et al. The effect of air bags on pregnancy outcomes in Washington State: 2002-2005. Obstet Gynecol. 2010;115(1):85-92.
PMID:20027039.
Exclusion: 4

Schiff MA, Tencer AF, Mack CD. Risk factors for pelvic fractures in lateral impact motor vehicle crashes. Accid Anal Prev. 2008;40(1):387-91.
PMID:18215572.
Exclusion: 4

Schmidt MJ, Handel D, Lindsell CJ, et al. Evaluating an emergency medical services-initiated nontransport system. Prehosp Emerg Care. 2006;10(3):390-3.
PMID:16801286.
Exclusion: 4

Schulman CI, Wilbur V, Leibowitz B, et al. The SceneScore for improved pre-hospital triage of motor-vehicle crash victims. Annu Proc Assoc Adv Automot Med. 2007;51:49-60.
PMID:18184484.
Exclusion: 4

Seel RT, Kreutzer JS. Depression assessment after traumatic brain injury: an empirically based classification method. Arch Phys Med Rehabil. 2003;84(11):1621-8.
PMID:14639561.
Exclusion: 9

Seid M, Azazh A, Enquselassie F, et al. Injury characteristics and outcome of road traffic accident among victims at Adult Emergency Department of Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia: a prospective hospital based study. BMC Emerg Med. 2015;15:10.
PMID:25990560.
Exclusion: 9

Sethi D, Aljunid S, Saperi SB, et al. Comparison of the effectiveness of major trauma services provided by tertiary and secondary hospitals in malaysia. J Trauma. 2002;53(3):508-16.
PMID:12352489.
Exclusion: 4

Shackford SR. Prehospital fluid resuscitation of known or suspected traumatic brain injury. J Trauma. 2011;70(5 Suppl):S32-3.
PMID:21841567.
Exclusion: 4

Shackford SR, Bourguignon PR, Wald SL, et al. Hypertonic saline resuscitation of patients with head injury: a prospective, randomized clinical trial. J Trauma. 1998;44(1):50-8.
PMID:9464749.
Exclusion: 4

Shafi S, Ahn C, Parks J, et al. Quality of Care Within a Trauma Center Is not Altered by Injury Type. J Trauma. 2010;68(3):716-20.
PMID:20220425.
Exclusion: 4

Shafi S, Friese R, Gentilello LM. Moving beyond personnel and process: a case for incorporating outcome measures in the trauma center designation process. Arch Surg. 2008;143(2):115-9; discussion 20.
PMID:18283135.
Exclusion: 4

Shah MI. Prehospital management of pediatric trauma. Clin Pediatr Emerg Med. 2010;11(1):10-7.
Exclusion: 6

Shah S, Muncer SJ. A comparison of rehabilitation outcome measures for traumatic brain injury. OTJR (Thorofare N J). 2003;23(1):2-9.
Exclusion: 9

Shahin H, Gopinath SP, Robertson CS. Influence of alcohol on early Glasgow Coma Scale in head-injured patients. J Trauma. 2010;69(5):1176-81; discussion 81.
PMID:21068620.
Exclusion: 5

Shapiro MJ, McCormack JE, Jen J. Let the surgeon sleep: trauma team activation for severe hypotension. J Trauma. 2008;65(6):1245-52.
PMID:19077608.
Exclusion: 4

Sharma OP, Oswanski MF, Rabbi J, et al. Pelvic fracture risk assessment on admission. Am Surg. 2008;74(8):761-6.
PMID:18705583.
Exclusion: 4

Shavit I, Grant VJ, Kramsky A, et al. A comparison of two mechanisms of severe paediatric injury in northern Israel. Injury. 2009;40(5):541-4.
PMID:19328486.
Exclusion: 4

Shaw GJ, Jauch EC, Zemlan FP. Serum cleaved tau protein levels and clinical outcome in adult patients with closed head injury. Ann Emerg Med. 2002;39(3):254-7.
PMID:11867977.
Exclusion: 4

Shawhan RR, McVay DP, Casey L, et al. A simplified trauma triage system safely reduces overtriage and improves provider satisfaction: a prospective study. Am J Surg. 2015;209(5):856-63 8p.
PMID:25784644.
Exclusion: 4

Shifflette VK, Lorenzo M, Mangram AJ, et al. Should Age Be a Factor to Change From a Level II to a Level I Trauma Activation? J Trauma. 2010;69(1):88-92 5p.
PMID:20622583.
Exclusion: 4

Shiozaki T, Sugimoto H, Taneda M, et al. Selection of severely head injured patients for mild hypothermia therapy. J Neurosurg. 1998;89(2):206-11.
PMID:9688114.
Exclusion: 3

Shoqirat N. Nursing students' understanding of the Glasgow Coma Scale. Nurs Stand. 2006;20(30):41-7.
PMID:16623292.
Exclusion: 3

Shores EA, Lammel A, Hullick C, et al. The diagnostic accuracy of the Revised Westmead PTA Scale as an adjunct to the Glasgow Coma Scale in the early identification of cognitive impairment in patients with mild traumatic brain injury. J Neurol Neurosurg Psychiatry. 2008;79(10):1100-6.
PMID:18223020.
Exclusion: 5

Sihler KC, Hemmila MR. Injuries in nonurban areas are associated with increased disability at hospital discharge. J Trauma. 2009;67(5):903-9.
PMID:19901647.
Exclusion: 9

Sikic M, Mikocka-Walus AA, Gabbe BJ, et al. Bicycling injuries and mortality in Victoria, 2001-2006. Med J Aust. 2009;190(7):353-6.
PMID:19351307.
Exclusion: 4

Silka PA, Geiderman JM, Kim JY. Diversion of ALS ambulances: characteristics, causes, and effects in a large urban system. Prehosp Emerg Care. 2001;5(1):23-8.
PMID:11194065.
Exclusion: 5

Simmons E, Hedges JR, Irwin L, et al. Paramedic injury severity perception can aid trauma triage. Ann Emerg Med. 1995;26(4):461-8.
PMID:7574129.
Exclusion: 4

Simons R, Brasher P, Taulu T, et al. A population-based analysis of injury-related deaths and access to trauma care in rural-remote Northwest British Columbia. J Trauma. 2010;69(1):11-9.
PMID:20622573.
Exclusion: 4

Sloan EP, Koenigsberg M, Clark JM, et al. The use of the Revised Trauma Score as an entry criterion in traumatic hemorrhagic shock studies: data from the DCLHb clinical trials. Prehospital Disaster Med. 2012;27(4):330-44.
PMID:22840198.
Exclusion: 3

Smith HL, Sidwell RA. Trauma patients over-triaged to helicopter transport in an established Midwestern state trauma system. J Rural Health. 2013;29(2):132-9.
PMID:23551643.
Exclusion: 5

Smith J, Caldwell E, Sugrue M. Difference in trauma team activation criteria between hospitals within the same region. Emerg Med Australas. 2005;17(5-6):480-7.
PMID:16302941.
Exclusion: 6

Snoek A, Dekker M, Lagrand T, et al. A clinical decision model identifies patients at risk for delayed diagnosed injuries after high-energy trauma. Eur J Emerg Med. 2013;20(3):167-72.
PMID:22510539.
Exclusion: 5

Sokol KK, Black GE, Azarow KS, et al. Prehospital interventions in severely injured pediatric patients: Rethinking the ABCs. J Trauma Acute Care Surg. 2015;79(6):983-90.
PMID:26680137.
Exclusion: 4

Sola JE, Cheung MC, Yang R, et al. Pediatric FAST and elevated liver transaminases: An effective screening tool in blunt abdominal trauma. J Surg Res. 2009;157(1):103-7.
PMID:19592033.
Exclusion: 4

Spain DA, Bellino M, Kopelman A, et al. Requests for 692 transfers to an academic level I trauma center: implications of the emergency medical treatment and active labor act. J Trauma. 2007;62(1):63-7; discussion 7-8.
PMID:17215734.
Exclusion: 4

Spaniolas K, Cheng JD, Gestring ML, et al. Ground level falls are associated with significant mortality in elderly patients. J Trauma. 2010;69(4):821-5.
PMID:20938268.
Exclusion: 13

Sperry JL, Gentilello LM, Minei JP, et al. Waiting for the patient to "sober up": Effect of alcohol intoxication on glasgow coma scale score of brain injured patients. J Trauma. 2006;61(6):1305-11.
PMID:17159670.
Exclusion: 5

Spiguel L, Glynn L, Liu D, et al. Pediatric pelvic fractures: a marker for injury severity. Am Surg. 2006;72(6):481-4.
PMID:16808198.
Exclusion: 4

Sporer KA, Solares M, Durant EJ, et al. Accuracy of the initial diagnosis among patients with an acutely altered mental status. Emerg Med J. 2013;30(3):243-6.
PMID:22362650.
Exclusion: 4

Staff T, Eken T, Wik L, et al. Physiologic, demographic and mechanistic factors predicting New Injury Severity Score (NISS) in motor vehicle accident victims. Injury. 2014;45(1):9-15.
PMID:23219241.
Exclusion: 4

Stanic-Canji D, Popovic N, Draskovic B. [Importance of transport in prehospital treatment of children with craniocerebral injuries]. Srp Arh Celok Lek. 2007;135(3-4):179-83.
PMID:17642458.
Exclusion: 10

Staudenmayer KL, Hsia RY, Mann NC, et al. Triage of elderly trauma patients: a population-based perspective. J Am Coll Surg. 2013;217(4):569-76.
PMID:24054408.
Exclusion: 13 for KQ1, 5 for KQ2

Stead LG, Wijdicks EF, Bhagra A, et al. Validation of a new coma scale, the FOUR score, in the emergency department. Neurocrit Care. 2009;10(1):50-4.
PMID:18807215.
Exclusion: 3

Stein SC, Spettell C. The Head Injury Severity Scale (HISS): A practical classification of closed-head injury. Brain Inj. 1995;9(5):437-44.
PMID:7550215.
Exclusion: 9

Stewart KE, Cowan LD, Thompson DM, et al. Association of Direct Helicopter Versus Ground Transport and In-hospital Mortality in Trauma Patients: A Propensity Score Analysis. Acad Emerg Med. 2011;18(11):1208-16 9p.
PMID:22092906.
Exclusion: 13

Strnad M, Lesjak VB, Vujanović V, et al. Predictors of Mortality and Prehospital Monitoring Limitations in Blunt Trauma Patients. Biomed Res Int. 2015;2015:1-7 p.
PMID:25710039.
Exclusion: 13

Stuke LE, Duchesne JC, Greiffenstein P, et al. Not all mechanisms are created equal: a single-center experience with the national guidelines for field triage of injured patients. J Trauma Acute Care Surg. 2013;75(1):140-5 6p.
PMID:23940858.
Exclusion: 4

Sturms LM, Hoogeveen JM, Le Cessie S, et al. Prehospital triage and survival of major trauma patients in a Dutch regional trauma system: relevance of trauma registry. Langenbecks Arch Surg. 2006;391(4):343-9.
PMID:16699803.
Exclusion: 4

Subbe CP, Slater A, Menon D, et al. Validation of physiological scoring systems in the accident and emergency department. Emerg Med J. 2006;23(11):841-5.
PMID:17057134.
Exclusion: 4

Sugerman DE, Xu L, Pearson WS, et al. Patients with severe traumatic brain injury transferred to a Level I or II trauma center: United States, 2007 to 2009. J Trauma Acute Care Surg. 2012;73(6):1491-9.
PMID:23188242.
Exclusion: 5

Sugimoto K, Aruga T, Hirata M, et al. Geriatric trauma patients at a suburban level-I trauma center in Japan. Prehosp Disaster Med. 1999;14(3):186-90.
PMID:10724744.
Exclusion: 4

Sukumaran S, Henry JM, Beard D, et al. Prehospital trauma management: a national study of paramedic activities. Emerg Med J. 2005;22(1):60-3.
PMID:15611550.
Exclusion: 4

Sullivent EE, Faul M, Wald MM. Reduced mortality in injured adults transported by helicopter emergency medical services. Prehosp Emerg Care. 2011;15(3):295-302.
PMID:21524205.
Exclusion: 4

Talbert S. Changing physiological status predicts severe injury and need for specialized trauma center resources. J Trauma Nurs. 2009;16(1):18-23.
PMID:19305295.
Exclusion: 4

Talmor D, Legedza AT, Nirula R. Injury thresholds after motor vehicle crash--important factors for patient triage and vehicle design. Accid Anal Prev. 2010;42(2):672-5.
PMID:20159093.
Exclusion: 4

Talmor D, Thompson KM, Legedza AT, et al. Predicting severe head injury after light motor vehicle crashes: Implications for automatic crash notification systems. Accid Anal Prev. 2006;38(4):767-71.
PMID:16530717.
Exclusion: 4

Talving P, Teixeira PG, Barmparas G, et al. Motorcycle-related injuries: effect of age on type and severity of injuries and mortality. J Trauma. 2010;68(2):441-6.
PMID:20154556.
Exclusion: 4

Tang A, Hashmi A, Pandit V, et al. A critical analysis of secondary overtriage to a Level I trauma center. J Trauma Acute Care Surg. 2014;77(6):969-73.
PMID:25423540.
Exclusion: 4

Tauber M, Koller H, Moroder P, et al. Secondary intracranial hemorrhage after mild head injury in patients with low-dose acetylsalicylate acid prophylaxis. J Trauma. 2009;67(3):521-5; discussion 5.
PMID:19741394.
Exclusion: 3

Taussky P, Widmer HR, Takala J, et al. Outcome after acute traumatic subdural and epidural haematoma in Switzerland: a single-centre experience. Swiss Med Wkly. 2008;138(19-20):281-5.
PMID:18491241.
Exclusion: 5

Tazarourte K, Atchabahian A, Tourtier JP, et al. Pre-hospital transcranial Doppler in severe traumatic brain injury: a pilot study. Acta Anaesthesiol Scand. 2011;55(4):422-8.
PMID:21288224.
Exclusion: 3

Templeton J, Oakley PA, MacKenzie G, et al. A comparison of patient characteristics and survival in two trauma centres located in different countries. Injury. 2000;31(7):493-501.
PMID:10908742.
Exclusion: 5

Tencer AF, Kaufman R, Mack C, et al. Factors affecting pelvic and thoracic forces in near-side impact crashes: a study of US-NCAP, NASS, and CIREN data. Accid Anal Prev. 2005;37(2):287-93.
PMID:15667815.
Exclusion: 4

Testerman GM. 300 all-terrain vehicle crashes: an East Tennessee trauma center's experience. Tenn Med. 2009;102(8):45-7.
PMID:19691202.
Exclusion: 4

Tham KY, Seow E, Lau G. Pattern of injuries in helmeted motorcyclists in Singapore. Emerg Med J. 2004;21(4):478-82.
PMID:15208235.
Exclusion: 4

Thomson DP, Thomas SH. Guidelines for air medical dispatch. Prehosp Emerg Care. 2003;7(2):265-71.
PMID:12710791.
Exclusion: 6

Tien HC, Jung V, Rizoli SB, et al. An evaluation of tactical combat casualty care interventions in a combat environment. J Am Coll Surg. 2008;207(2):174-8.
PMID:18656043.
Exclusion: 4

Tiesman H, Young T, Torner JC, et al. Effects of a rural trauma system on traumatic brain injuries. J Neurotrauma. 2007;24(7):1189-97.
PMID:17610358.
Exclusion: 5

Timberlake GA. Blunt pancreatic trauma: experience at a rural referral center. Am Surg. 1997;63(3):282-6.
PMID:9036900.
Exclusion: 4

Ting JY. Impact of interhospital transfer on outcomes for patients with trauma. J Trauma Acute Care Surg. 2012;72(6):1723- 1p.
PMID:22695448.
Exclusion: 4

Tinkoff GH, O'Connor RE. Validation of new trauma triage rules for trauma attending response to the emergency department. J Trauma. 2002;52(6):1153-8; discussion 8-9.
PMID:12045646.
Exclusion: 8

Tohira H, Jacobs I, Matsuoka T, et al. Impact of the version of the abbreviated injury scale on injury severity characterization and quality assessment of trauma care. J Trauma. 2011;71(1):56-62 7p.
PMID:21818015.
Exclusion: 8

Tohme S, Delhumeau C, Zuercher M, et al. Prehospital risk factors of mortality and impaired consciousness after severe traumatic brain injury: an epidemiological study. Scand J Trauma Resusc Emerg Med. 2014;22:1.
PMID:24393519.
Exclusion: 3

Tornetta P, 3rd, Mostafavi H, Riina J, et al. Morbidity and mortality in elderly trauma patients. J Trauma. 1999;46(4):702-6.
PMID:10217237.
Exclusion: 13

Tourtier JP, Le Moullec D, Jault P, et al. Shock index and undertriage. J Trauma. 2010;69(3):733- 1p.
PMID:20838153.
Exclusion: 7

Tourtier JP, Lenoel A, Trueba F, et al. Triage of elderly trauma patients. J Trauma. 2010;69(3):732-3 2p.
PMID:20838150.
Exclusion: 4

Tsai SH, Chen WL, Yang CM, et al. Emergency air medical services for patients with head injury. Surg Neurol. 2006;66 Suppl 2:S32-6.
PMID:17071253.
Exclusion: 4

Tuma M, El-Menyar A, Abdelrahman H, et al. Prehospital intubation in patients with isolated severe traumatic brain injury: a 4-year observational study. Crit Care Res Pract. 2014
PMID:24527211.
Exclusion: 4

Twijnstra MJ, Moons KG, Simmermacher RK, et al. Regional trauma system reduces mortality and changes admission rates: a before and after study. Ann Surg. 2010;251(2):339-43.
PMID:20010086.
Exclusion: 4

Udekwu P, Kromhout-Schiro S, Vaslef S, et al. Glasgow Coma Scale score, mortality, and functional outcome in head-injured patients. J Trauma. 2004;56(5):1084-9.
PMID:15179250.
Exclusion: 5

Uleberg O, Vinjevoll OP, Eriksson U, et al. Overtriage in trauma - what are the causes? Acta Anaesthesiol Scand. 2007;51(9):1178-83.
PMID:17714579.
Exclusion: 4

Vaca FE, Anderson CL, Herrera H, et al. Crash injury prediction and vehicle damage reporting by paramedics. West J Emerg Med. 2009;10(2):62-7.
PMID:19561820.
Exclusion: 4

Van Camp LA, Delooz HH. Current trauma scoring systems and their applications. Eur J Emerg Med. 1998;5(3):341-53.
PMID:9827839.
Exclusion: 7

Van Haren RM, Thorson CM, Valle EJ, et al. Novel prehospital monitor with injury acuity alarm to identify trauma patients who require lifesaving intervention. J Trauma Acute Care Surg. 2014;76(3):743-9 7p.
PMID:24553543.
Exclusion: 4

van Laarhoven JJEM, Lansink KWW, van Heijl M, et al. Accuracy of the field triage protocol in selecting severely injured patients after high energy trauma. Injury. 2014;45(5):869-73 5p.
PMID:24472800.
Exclusion: 4

Vandromme MJ, Griffin RL, Kerby JD, et al. Identifying risk for massive transfusion in the relatively normotensive patient: utility of the prehospital shock index. J Trauma. 2011;70(2):384-90 7p.
PMID:21307738.
Exclusion: 4

Vandromme MJ, Griffin RL, Weinberg JA, et al. Lactate is a better predictor than systolic blood pressure for determining blood requirement and mortality: could prehospital measures improve trauma triage? J Am Coll Surg. 2010;210(5):861-7, 7-9.
PMID:20421067.
Exclusion: 4

Viano D, von Holst H, Gordon E. Serious brain injury from traffic-related causes: priorities for primary prevention. Accid Anal Prev. 1997;29(6):811-6.
PMID:9370017.
Exclusion: 4

Viano DC, Parenteau CS. Ejection and severe injury risks by crash type and belt use with a focus on rear impacts. Traffic Inj Prev. 2010;11(1):79-86 8p.
PMID:20146147.
Exclusion: 4

Viano DC, Parenteau CS. Severe injury to near- and far-seated occupants in side impacts by crash severity and belt use. Traffic Inj Prev. 2010;11(1):69-78.
PMID:20146146.
Exclusion: 4

Viano DC, Parenteau CS, Edwards ML. Rollover injury: effects of near- and far-seating position, belt use, and number of quarter rolls. Traffic Inj Prev. 2007;8(4):382-92.
PMID:17994492.
Exclusion: 4

Vish NL, Powell EC, Wiltsek D, et al. Pediatric window falls: not just a problem for children in high rises. Inj Prev. 2005;11(5):300-3.
PMID:16203839.
Exclusion: 4

Vivien B, Yeguiayan JM, Le Manach Y, et al. The motor component does not convey all the mortality prediction capacity of the Glasgow Coma Scale in trauma patients. Am J Emerg Med. 2012;30(7):1032-41.
PMID:22035584.
Exclusion: 3

Vos PE, van Voskuilen AC, Beems T, et al. Evaluation of the traumatic coma data bank computed tomography classification for severe head injury. J Neurotrauma. 2001;18(7):649-55.
PMID:11497091.
Exclusion: 5

Walker N, Russell RJ, Hodgetts TJ. British military experience of pre-hospital paediatric trauma in Afghanistan. J R Army Med Corps. 2010;156(3):150-3.
PMID:20919614.
Exclusion: 4

Waterhouse C. An audit of nurses' conduct and recording of observations using the Glasgow Coma Scale. British Journal of Neuroscience Nursing. 2008;4(10):492-99.
Exclusion: 5

Weber JM, Jablonski RA, Penrod J. Missed opportunities: under-detection of trauma in elderly adults involved in motor vehicle crashes. J Emerg Nurs. 2010;36(1):6-9.
PMID:20109770.
Exclusion: 4

Weninger P, Hertz H. Factors influencing the injury pattern and injury severity after high speed motor vehicle accident--a retrospective study. Resuscitation. 2007;75(1):35-41.
PMID:17481799.
Exclusion: 4

White L, Cudnik M, Werman H. Can Prehospital Triage Criteria Predict Clinical Outcomes for Trauma Patients Transported by Air...2011 Air Medical Transport Conference Abstracts Scientific Assembly, Monday, October 17, 2011. Air Med J. 2011;30(5):255- 1p.
Exclusion: 7

Wiese MF. British hospitals and different versions of the Glasgow coma scale: telephone survey. BMJ. 2003;327(7418):782-3.
PMID:14525875.
Exclusion: 5

Wijdicks EF. Clinical scales for comatose patients: the Glasgow Coma Scale in historical context and the new FOUR Score. Reviews in neurological diseases. 2006;3(3):109-17.
PMID:17047576.
Exclusion: 5

Williams TM, Sadjadi J, Harken AH, et al. The necessity to assess anticoagulation status in elderly injured patients. J Trauma. 2008;65(4)
PMID:18849789.
Exclusion: 4

Wolf L. Triage and early recognition of significant head injury in the geriatric trauma patient. J Emerg Nurs. 2006;32(4):357-9.
PMID:16863891.
Exclusion: 6

Wong DK, Lurie F, Wong LL. The effects of clopidogrel on elderly traumatic brain injured patients. J Trauma. 2008;65(6):1303-8.
PMID:19077618.
Exclusion: 4

Wright DW, Kellermann AL, Hertzberg VS, et al. ProTECT: a randomized clinical trial of progesterone for acute traumatic brain injury. Ann Emerg Med. 2007;49(4):391-402.
PMID:17011666.
Exclusion: 13

Wright DW, Yeatts SD, Silbergleit R, et al. Very early administration of progesterone for acute traumatic brain injury. N Engl J Med. 2014;371(26):2457-66.
PMID:25493974.
Exclusion: 4

Wu J, Sheng L, Wang S, et al. Analysis of clinical risk factors associated with the prognosis of severe multiple-trauma patients with acute lung injury. J Emerg Med. 2012;43(3):407-12 6p.
PMID:19625158.
Exclusion: 4

Wuerz R, Taylor J, Smith JS. Accuracy of trauma triage in patients transported by helicopter. Air Med J. 1996;15(4):168-70.
PMID:10162103.
Exclusion: 4

Yanar H, Demetriades D, Hadjizacharia P, et al. Pedestrians injured by automobiles: risk factors for cervical spine injuries. J Am Coll Surg. 2007;205(6):794-9.
PMID:18035263.
Exclusion: 4

Yang DB, Yu WH, Dong XQ, et al. Plasma copeptin level predicts acute traumatic coagulopathy and progressive hemorrhagic injury after traumatic brain injury. Peptides. 2014;58:26-9.
PMID:24905622.
Exclusion: 9

Yildiz M, Bozdemir MN, Kilicaslan I, et al. Elderly trauma: the two years experience of a university-affiliated emergency department. Eur Rev Med Pharmacol Sci. 2012;16 Suppl 1:62-7.
PMID:22582487.
Exclusion: 4

Yoganandan N, Pintar FA, Zhang J, et al. Lateral impact injuries with side airbag deployments--a descriptive study. Accid Anal Prev. 2007;39(1):22-7.
PMID:16911812.
Exclusion: 4

Young JS, Bassam D, Cephas GA, et al. Interhospital versus direct scene transfer of major trauma patients in a rural trauma system. Am Surg. 1998;64(1):88-91; discussion -2.
PMID:9457044.
Exclusion: 4

Zafonte RD, Hammond FM, Mann NR, et al. Relationship between Glasgow coma scale and functional outcome. Am J Phys Med Rehabil. 1996;75(5):364-9.
PMID:8873704.
Exclusion: 9

Zalstein S, Danne P, Taylor D, et al. The Victorian major trauma transfer study. Injury. 2010;41(1):102-9 8p.
PMID:19615682.
Exclusion: 4

Zautcke JL, Coker SB, Jr., Morris RW, et al. Geriatric trauma in the State of Illinois: substance use and injury patterns. Am J Emerg Med. 2002;20(1):14-7.
PMID:11781905.
Exclusion: 4

Zechnich AD, Hedges JR, Spackman K, et al. Applying the trauma triage rule to blunt trauma patients. Acad Emerg Med. 1995;2(12):1043-52.
PMID:8597914.
Exclusion: 4

Zhang G, Cao L, Hu J, et al. A field data analysis of risk factors affecting the injury risks in vehicle-to-pedestrian crashes. Ann Adv Automot Med. 2008;52:199-214.
PMID:19026237.
Exclusion: 4

Zimmer-Gembeck MJ, Southard PA, Hedges JR, et al. Triage in an established trauma system. J Trauma. 1995;39(5):922-8.
PMID:7474009.
Exclusion: 4

Zink BJ. Traumatic brain injury outcome: concepts for emergency care. Ann Emerg Med. 2001;37(3):318-32.
PMID:11223769.
Exclusion: 7

Zuercher M, Ummenhofer W, Baltussen A, et al. The use of Glasgow Coma Scale in injury assessment: a critical review. Brain Inj. 2009;23(5):371-84.
PMID:19408162.
Exclusion: 11

Zwingmann J, Lefering R, DGU(®) T, et al. Outcome and risk factors in children after traumatic cardiac arrest and successful resuscitation. Resuscitation. 2015;96:59-65.
PMID:26232515.
Exclusion: 3

Appendix E. Risk of Bias Criteria

Risk Prediction Studies[1]

Criteria:

- The study sample adequately represents the population of interest
- The study data available (i.e., participants not lost to followup) adequately represent the study sample
- The prognostic factor is measured in a similar way for all participants
- The outcome of interest is measured in a similar way for all participants
- Important potential confounding factors are appropriately accounted for
- The observed effect of the prognostic factor on the outcome is very likely to be distorted by another factor related to prognostic factor and outcome

Definitions of risk of bias based on above criteria:

Low: The least risk of bias, and results are generally considered more valid than studies with the same study design but more flaws. Low risk of bias studies include clear descriptions of the population, setting, interventions, and comparison groups clear reporting of missing data; apply appropriate means to prevent; and appropriately measure outcomes.

Moderate: Susceptible to some bias, though not enough to necessarily invalidate the results. These studies may not meet all the criteria for ”low” risk of bias rating, but do not have flaws likely to cause major bias. The study may also be missing information, making it difficult to assess limitations and potential problems.

High: Have significant flaws that may invalidate the results. They may have a serious or “fatal” flaw or set of flaws in design, analysis, or reporting; large amounts of missing information; or discrepancies in reporting. The results of these studies will be least as likely to reflect flaws in the study design as the true difference between the compared interventions.

Reliability and Ease of Use Studies[2]

Criteria:

Patient Selection

For assessments of interrater reliability and field versus emergency department (ED) agreement

- Are raters rating the same patient?
- Are raters rating all patients in a set time frame or a random selection of patients?
- Are no or only small numbers of patients dropped as two ratings were not possible?

For assessments of ease of use

- Is a rationale given for the sample size/number of dual ratings?
- Is scoring/assessment done on more than one patient and a range of patient situations?

Index Test(s)

For assessments of interrater reliability and field versus ED agreement

- Are raters blinded to the other rater?

Not applicable for assessments of ease of use

Reference Standard

For assessments of interrater reliability and field versus ED agreement

- Is the approach to scoring agreement explained and appropriate (e.g. Kappa, % agreement, exact match or in same category)?

For assessments of ease of use

- Is how the correct answer was determined clearly described?
- Was the correct answer verified with more than one expert?

Flow and Timing

For assessments of interrater reliability

- Are ratings of the patient being made within a reasonable amount of time or time within which it could be expected that score did not change (at the same time or within minutes)?

For assessments of field versus ED agreement

- Is ED rating immediately upon arrival?

For assessments of ease of use

- Is it clear if the field rating is before or after resuscitation?
- Was the scoring done in a way to simulate field or ED (e.g., limited amount of time, video preferable to written etc.)?

Definition of risk of bias based on above criteria:

Low: Evaluates relevant available screening test; uses a credible reference standard; interprets reference standard independently of screening test; reliability of test assessed; has few or handles missing data in a reasonable manner; includes a large number (>100), broad-spectrum of patients with and without disease; study attempts to enroll a random or consecutive sample of patients who meet inclusion criteria screening cutoffs pre-stated.

Moderate: Evaluates relevant available screening test; uses reasonable although not best standard; interprets reference standard independent of screening test; moderate sample size (50 to 100 subjects) and a "medium" spectrum of patients (i.e. applicable to most screening settings).

High: Has important limitation such as: uses inappropriate reference standard; screening test improperly administered; biased ascertainment of reference standard; very small sample size of very narrow selected spectrum of patients.

References

1. Hayden JA, van der Windt DA, Cartwright JL, et al. Assessing bias in studies of prognostic factors. Ann Intern Med. 2013;158(4):280-6. PMID: 23420236.
2. Whiting PF, Rutjes AW, Westwood ME, et al. QUADAS-2: a revised tool for the quality assessment of diagnostic accuracy studies. Ann Intern Med. 2011;155(8):529-36. PMID: 22007046.

Appendix F. Strength of Evidence Domains and Definitions

Strength of Evidence Criteria[1]

The set of five required domains comprises the main constructs that Evidence-based Practice Centers (EPCs) should use for all major outcomes and comparisons of interest. As briefly defined below in Table 1, these domains represent related but separate concepts, and each is scored independently. The concepts are explained in more detail in below.

Table 1. Required domains and their definitions

Domain	Definition and Elements	Score and Application
Study Limitations	Study limitations is the degree to which the included studies for a given outcome have a high likelihood of adequate protection against bias (i.e., good internal validity), assessed through two main elements: • Study design: Whether RCTs or other designs such as nonexperimental or observational studies. • Study conduct. Aggregation of ratings of risk of bias of the individual studies under consideration.	Score as one of three levels, separately by type of study design: • Low level of study limitations • Medium level of study limitations • High level of study limitations
Directness	Directness relates to (a) whether evidence links interventions directly to a health outcome of specific importance for the review, and (b) for comparative studies, whether the comparisons are based on head-to-head studies. The EPC should specify the comparison and outcome for which the SOE grade applies. Evidence may be indirect in several situations such as: • The outcome being graded is considered intermediate (such as laboratory tests) in a review that is focused on clinical health outcomes (such as morbidity, mortality). • Data do not come from head-to-head comparisons but rather from two or more bodies of evidence to compare interventions A and B—e.g., studies of A vs. placebo and B vs. placebo, or studies of A vs. C and B vs. C but not direct comparisons of A vs. B. • Data are available only for proxy respondents (e.g., obtained from family members or nurses) instead of directly from patients for situations in which patients are capable of self-reporting and self-report is more reliable. Indirectness always implies that more than one body of evidence is required to link interventions to the most important health outcome.	Score as one of two levels: • Direct • Indirect If the domain score is indirect, EPCs should specify what type of indirectness accounts for the rating.
Consistency	Consistency is the degree to which included studies find either the same direction or similar magnitude of effect. EPCs can assess this through two main elements: • Direction of effect: Effect sizes have the same sign (that is, are on the same side of no effect or a MID) • Magnitude of effect: The range of effect sizes is similar. EPCs may consider the overlap of CIs when making this evaluation. The importance of direction vs. magnitude of effect will depend on the key question and EPC judgments.	Score as one of three levels: • Consistent • Inconsistent • Unknown (e.g., single study) Single-study evidence bases (including mega-trials) cannot be judged with respect to consistency. In that instance, use “Consistency unknown (single study).”

Domain	Definition and Elements	Score and Application
Precision	Precision is the degree of certainty surrounding an effect estimate with respect to a given outcome, based on the sufficiency of sample size and number of events. • A body of evidence will generally be imprecise if the OIS is not met. OIS refers to the minimum number of patients (and events when assessing dichotomous outcomes) needed for an evidence base to be considered adequately powered. • If EPCs performed a meta-analysis, then EPCs may also consider whether the CI crossed a threshold for an MID. • If a meta-analysis is infeasible or inappropriate, EPCs may consider the narrowness of the range of CIs or the significance level of p-values in the individual studies in the evidence base.	Score as one of two levels: • Precise • Imprecise A precise estimate is one that would allow users to reach a clinically useful conclusion (e.g., treatment A is more effective than treatment B).
Reporting Bias	Reporting bias results from selectively publishing or reporting research findings based on the favorability of direction or magnitude of effect. It includes: • Study publication bias, i.e., nonreporting of the full study. • Selective outcome reporting bias, i.e., nonreporting (or incomplete reporting) of planned outcomes or reporting of unplanned outcomes. • Selective analysis reporting bias, i.e., reporting of one or more favorable analyses for a given outcome while not reporting other, less favorable analyses. Assessment of reporting bias for individual studies depends on many factors–e.g. availability of study protocols, unpublished study documents, and patient-level data. Detecting such bias is likely with access to all relevant documentation and data pertaining to a journal publication, but such access is rarely available. Because methods to detect reporting bias in observational studies are less certain, this guidance does not require EPCs to assess it for such studies.	Score as one of two levels: • Suspected • Undetected Reporting bias is suspected when: • Testing for funnel plot asymmetry demonstrates a substantial likelihood of bias, And/or • A qualitative assessment suggests the likelihood of missing studies, analyses, or outcomes data that may alter the conclusions from the reported evidence. Undetected reporting bias includes all alternative scenarios.

CI = confidence internal; EPC = Evidence-based Practice Center; MID = minimally important difference; OIS = optimal information size; SOE = strength of evidence

Study Limitations Domain

Definition

Scoring the study limitations domain is the essential starting place for grading strength of the body of evidence. It refers to the judgment that the findings from included studies of a treatment (or treatment comparison) for a given outcome are adequately protected against bias (i.e., have good internal validity), based on the design and conduct of those studies. That is, EPCs assess the ability of the evidence to yield an accurate estimate of the true effect without bias (nonrandom error).

Directness Domain

Definition

Directness of evidence expresses how closely available evidence measures an outcome of interest. Assessing directness has two parts: directness of outcomes and directness of comparisons. Applicability of evidence (external validity) is considered explicitly but separately from strength of evidence.

Consistency Domain

Definition

Consistency refers to the degree of similarity in the direction of effects or the degree of similarity in the effect sizes (magnitudes of effect) across individual studies within an evidence base. EPCs may choose which of these two notions of consistency (direction or magnitude) they are scoring; they should be explicit about this choice.

Precision Domain

Definition

Precision is the degree of certainty surrounding an estimate of effect with respect to an outcome. It is based on the potential for random error evaluated through the sufficiency of sample size and, in the case of dichotomous outcomes, the number of events. A precise body of evidence should enable decisionmakers to draw conclusions about whether one treatment is inferior, equivalent, or superior to another.

Reporting Bias

Definition

Reporting bias occurs when authors, journals, or both decide to publish or report research findings based on their direction or magnitude of effect. Table 2 defines the three main types of reporting bias that either authors or journals can introduce: publication bias and outcome and analysis reporting bias.

Four Strength of Evidence Levels

The four levels of grades are intended to communicate to decisionmakers EPCs' confidence in a body of evidence for a single outcome of a single treatment comparison. Although assigning a grade requires judgment, having a common understanding of the interpretation will be useful for helping EPCs as they conduct their own global assessment and for improving consistency across reviewers and EPCs.

Table 2 summarizes the four levels of grades that EPCs use for the overall assessment of the body of evidence. Grades are denoted high, moderate, low, and insufficient. They are not designated by Roman numerals or other symbols. EPCs should apply discrete grades and should not use designations such as "low to moderate" strength of evidence.

Table 2. Strength of evidence grades and definitions

Grade	Definition
High	**We are very confident that the estimate of effect lies close to the true effect for this outcome.** The body of evidence has few or no deficiencies. We believe that the findings are stable, i.e., another study would not change the conclusions.
Moderate	**We are moderately confident that the estimate of effect lies close to the true effect for this outcome.** The body of evidence has some deficiencies. We believe that the findings are likely to be stable, but some doubt remains.
Low	**We have limited confidence that the estimate of effect lies close to the true effect for this outcome.** The body of evidence has major or numerous deficiencies (or both). We believe that additional evidence is needed before concluding either that the findings are stable or that the estimate of effect is close to the true effect.
Insufficient	**We have no evidence, we are unable to estimate an effect, or we have no confidence in the estimate of effect for this outcome**. No evidence is available or the body of evidence has unacceptable deficiencies, precluding reaching a conclusion.

Each level has two components. The first, principal definition concerns the level of confidence that EPCs place in the estimate of effect (direction or magnitude of effect) for the benefit or harm; this equates to their judgment as to how much the evidence reflects a true effect. The second, subsidiary definition involves an assessment of the level of deficiencies in the body of evidence and belief in the stability of the findings, based on domain scores and a more holistic, summary appreciation of the possibly complex interaction among the individual domains.

Assigning a grade of high, moderate, or low implies that an evidence base is available from which to estimate an effect for either the benefit or the harm. The designations of high, moderate, and low should convey how confident EPCs would be about decisions based on evidence of differing grades, which can be based on either quantitative or qualitative assessment.

For comparative effectiveness questions, the comparison is typically a choice of either direction (A>B, A=B, A<B) or magnitude (difference between A and B). In some instances assigning different grades regarding the direction and the magnitude of an effect may be appropriate. An example of this situation is when studies consistently find that an intervention improves an outcome (e.g., apnea-hypopnea index is reduced by a statistically significant amount or beyond a minimally important difference), but the degree of heterogeneity about the estimate is high (e.g., range -10 to -46 events/minute; $I^2 = 86\%$).

The importance of the distinctions among high, moderate, and low levels (and the distinction with insufficient strength of evidence) can vary by the type of outcome, comparison, and decisionmaker. EPCs understand that some stakeholders may want to take action only when evidence is of high or moderate strength, whereas others may want to understand clearly the implications of low versus insufficient evidence. Even when strength of evidence is low or insufficient, consumers, clinicians, and policymakers may find themselves in the position of having to make choices and decisions, and they may consider factors other than the evidence from a specific systematic review, such as patient values and preferences, costs, or resources.

References

1. Methods Guide for Effectiveness and Comparative Effectiveness Reviews. AHRQ Publication No. 10(13)-EHC063-EF. Rockville (MD) :Agency for Healthcare Research and Quality. January 2014. Availible at: www.effectivehealthcare.ahrq.gov.

Appendix G. Strength of Evidence Table

Key Question Outcome	Study Design Number of Studies (N)	Study Limitations	Directness	Consistency	Precision	Reporting Bias	Main Findings	Strength of Evidence Grade
KQ 1. Predictive Utility								
In-hospital mortality								
tGCS vs. mGCS: Discrimination	11 (385,753)	Moderate	Direct	Consistent*	Precise	Not detected	Difference in AUROC: 0.013 (0.007 to 0.019)	Moderate
tGCS (≤13) vs. mGCS (≤5): Diagnostic accuracy	4 (813,444)	Moderate	Direct	Consistent	Imprecise	Not detected	Differences in sensitivity 0% to 3%, difference in specificity 0% to 5%	Low
tGCS vs. SMS: Discrimination	5 (110,435)	Moderate	Direct	Consistent	Precise	Not detected	Difference in AUROC 0.030 (0.024 to 0.036)	Moderate
tGCS (≤13) vs. SMS (≤1): Diagnostic accuracy	1 (52,412)	Moderate	Direct	Unable to determine	Precise	Not detected	Sensitivity 75% (73% to 76%) vs. 72% (70% to 74%); specificity 88% (87% to 88%) vs. 89% (89% to 87%)	Low
mGCS vs. SMS: Discrimination	4 (56,223)	Moderate	Direct	Consistent	Precise	Not detected	Difference in AUROC 0.014 (0.006 to 0.021)	Moderate
Neurosurgical intervention								
tGCS vs. mGCS: Discrimination	6 (68,102)	Moderate	Direct	Consistent	Precise	Not detected	Difference in AUROC 0.027 (0.020 to 0.034)	Moderate
tGCS (≤13) vs. mGCS (≤5): Diagnostic accuracy	1 (1,410)	Moderate	Direct	Unable to determine	Imprecise	Not detected	Sensitivity 63% (38% to 84%) vs. 68% (43% to 87%); specificity 82% (80% to 84%) vs. 83% (81% to 85%)	Low
tGCS vs. SMS: Discrimination	5 (108,635)	Moderate	Direct	Consistent	Precise	Not detected	Difference in AUROC 0.032 (0.025 to 0.039)	Moderate
tGCS (≤13) vs. SMS (≤1): Diagnostic accuracy	1 (52,412)	Moderate	Direct	Unable to determine	Precise	Not detected	Sensitivity 60% (56% to 63%) vs. 53% (49% to 56%); specificity 85% (84% to 85%) vs. 86% (86% to 87%)	Low
mGCS vs. SMS: Discrimination	4 (56,223)	Moderate	Direct	Consistent	Precise	Not detected	Difference in AUROC 0.002 (-0.005 to 0.010)	Moderate

Key Question Outcome	Study Design Number of Studies (N)	Study Limitations	Directness	Consistency	Precision	Reporting Bias	Main Findings	Strength of Evidence Grade
Severe brain injury								
tGCS vs. mGCS: Discrimination	5 (134,186)	Moderate	Direct	Consistent[†]	Precise	Not detected	Difference in AUROC 0.050 (0.034 to 0.065)	Moderate
tGCS (≤13) vs. mGCS (≤5): Diagnostic accuracy	1 (1,410)	Moderate	Direct	Unable to determine	Precise	Not detected	Sensitivity 62% (55% to 68%) vs. 61% (54% to 67%); specificity 85% (83% to 88%) vs. 89% (88% to 91%)	Low
tGCS vs. SMS: Discrimination	5 (100,223)	Moderate	Direct	Consistent*	Precise	Not detected	Difference in AUROC 0.048 (0.038 to 0.059)	Moderate
tGCS (≤13) vs. SMS (≤1): Diagnostic accuracy	1 (52,412)	Moderate	Direct	Unable to determine	Precise	Not detected	Sensitivity 45% (44% to 46%) vs. 41% (40% to 42%); specificity 89% (89% to 90%) vs. 90% (90% to 91%)	Low
mGCS vs. SMS: Discrimination	4 (56,223)	Moderate	Direct	Consistent	Precise	Not detected	Difference in AUROC 0.000 (-0.008 to 0.007)	Moderate
Emergency intubation								
tGCS vs. mGCS: Discrimination	5 (66,039)	Moderate	Direct	Consistent*	Precise	Not detected	Difference in AUROC 0.038 (0.023 to 0.052)	Moderate
tGCS vs. SMS: Discrimination	5 (108,635)	Moderate	Direct	Consistent*	Precise	Not detected	Difference in AUROC 0.040 (0.030 to 0.050)	Moderate
tGCS (≤13) vs. SMS (≤1): Diagnostic accuracy	1 (52,412)	Moderate	Direct	Unable to determine	Precise	Not detected	Sensitivity 76% (74% to 77%) vs. 73% (71% to 74%); specificity 89% (89% to 89%) vs. 91% (90% to 91%)	Low
mGCS vs. SMS: Discrimination	4 (56,223)	Moderate	Direct	Consistent	Precise	Not detected	Difference in AUROC 0.000 (-0.007 to 0.007)	Moderate

Key Question Outcome	Study Design Number of Studies (N)	Study Limitations	Directness	Consistency	Precision	Reporting Bias	Main Findings	Strength of Evidence Grade
Trauma center need								
tGCS vs. mGCS: Discrimination, diagnostic accuracy	1 (811,143)	Moderate	Direct	Unable to determine	Precise	Not detected	AUROC 0.62 vs. 0.61, sensitivity 30% vs. 27%, specificity 93% vs. 95%	Low
Severe injury (ISS >15)								
tGCS vs. mGCS: Discrimination, diagnostic accuracy	1 (104,035)	Moderate	Direct	Unable to determine	Precise	Not detected	AUROC 0.720 (0.715 to 0.724) vs. 0.681 (0.677 to 0.686)	Low
KQ 1a. Effects of patient and assessment setting on comparative predictive utility								
Age: Discrimination	13 (440,208)	Moderate	Indirect	Consistent	Precise	Not detected	Differences in the AUROC were similar in studies that enrolled children and those that enrolled mixed populations of adults and children	Low
Type of trauma: Discrimination	13 (440,208)	Moderate	Indirect	Consistent	Precise	Not detected	Differences in the AUROC were similar in studies that evaluated patients with TBI and those that enrolled mixed trauma patients	Low
Assessment setting: Discrimination	11 (427,434)	Moderate	Indirect	Inconsistent	Precise	Not detected	Differences in the AUROC were inconsistent in two studies that compared field and ED assessments. Differences in discrimination were similar in studies that used field versus ED score	Insufficient
KQ 2. Under- and over-triage	No studies	No studies	No studies	No studies	No studies	No studies	No studies	Insufficient
KQ 3. Clinical outcomes	No studies	No studies	No studies	No studies	No studies	No studies	No studies	Insufficient

Key Question Outcome	Study Design Number of Studies (N)	Study Limitations	Directness	Consistency	Precision	Reporting Bias	Main Findings	Strength of Evidence Grade
KQ 4. Reliability and ease of use								
Interrater reliability	2 (135)	High	Direct	Unable to determine	Imprecise	Not detected	The interrater reliability of the tGCS and mGCS appears to be high, but evidence was insufficient to determine if there were differences between scales	Insufficient
Ease of use: Proportion of correct scores using written or video patient scenarios	3 (498)	Moderate	Direct	Consistent	Imprecise	Not detected	Three studies found the tGCS associated with a lower proportion of correct scores than the mGCS (differences in proportion of correct scores ranged from 6% to 27%), though the difference was statistically significant in only one study	Low
Ease of use: Effects of training on proportion of correct scores	3 (299)	Moderate	Direct	Consistent	Imprecise	Not detected	Three studies found that training or use of a scoring aid increased the proportion of correct scores on both the tGCS and mGCS (increase in proportion of correct scores ranged from 32% to 70%)	Low

Key Question Outcome	Study Design Number of Studies (N)	Study Limitations	Directness	Consistency	Precision	Reporting Bias	Main Findings	Strength of Evidence Grade
KQ 4a. Effects of patient, assessor, and setting on reliability and ease of use								
Interrater reliability or ease of use	1 (3,052)	Moderate	Direct	Unable to determine	Imprecise	Not detected	Evidence was insufficient to assess effects of patient, assessor, or setting on comparative interrater reliability of the tGCS versus the mGCS	Insufficient
Injury severity: Effects on proportion of correct scores	3 (470)	Moderate	Direct	Consistent	Imprecise	Not detected	The proportion of correct GCS scores was generally lowest for assessment of patient scenarios with moderate injury severity in three studies, including one study that evaluated the tGCS and the mGCS	Low

AUROC=area under the receiver operating characteristics curve; ED= emergency department; ISS=injury severity score; KQ= Key Question; mGCS= motor Glasgow coma scale; n= number; SMS= simplified motor scale; TBI=traumatic brain injury; tGCS= total Glasgow Coma Scale; vs.= versus

*I-square >50% but range in differences in AUROC across studies <0.05
†I-square 0% in 4 studies of mixed populations of adults and children, pooled estimate similar to estimate in mixed populations, estimate higher in study of children but no statistically significant subgroup effect

Appendix H. Head-to-Head Studies for Predictive Utility

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Acker, *et al.,* 2014	Retrospective cohort	Children ≤18 years old who were admitted to the hospital with a diagnosis of TBI and had complete tGCS and mGCS data available.	Age (mean, years): 6.9 (SD 5.8) Male: 65% Race: NR TBI: 100% ISS (median): 17 (IQR: 10-26) tGCS on presentation (median): 15 (IQR: 8-15) mGCS on presentation (median): 6 (IQR: 4-6) *Cause of injury* -Fall: 21% -MVC: 22% -NAT: 18% -Other: 39%	USA, Colorado Urban 2 Level 1 pediatric trauma centers 2002 to 2011	2,231	Need for craniotomy (10.4%) Need for ICP monitoring (16.9%) Admission to the ICU (56.5%) Hospital stay of ≥5 days (30.4%) Discharge to rehabilitation (13.2%) Dependence on caretakers at followup (76.9%) Mortality (8.4%)
Al-Salamah, *et al.,* 2004	Retrospective analysis of prospective cohort	Patients who had an injury caused by any mechanism, ISS >12, transported by land ambulance, entered into the Ontario Trauma Registry Comprehensive Data set	Age (mean, years): 44 (SD 21) Male: 70% Race: NR *Primary site of injury on arrival to ED* -Head and neck: 32% -Chest and abdomen: 11% -Lower extremity: 3% -Upper extremity: 3% -Spine: 2% -Multiple sites: 36% -Unknown: 13% Endotracheal intubation before arrival to ED: 0.3% Required intubation in ED: 16%	Canada, Ontario Trauma registry 72% urban, 28% suburban or rural 1994 to 2002	795	Mortality (18%) ICU admission (8%) Composite outcome of ICU admission or requiring intubation in the ED (NR)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Acker, *et al.*, 2014	tGCS vs. mGCS (from tGCS)	On presentation, but otherwise not described	Mentions univariate analysis was adjusted using the Bonferroni method for multiple comparisons, but adjustments not described and only goodness of fit data reported	NR	NR
Al-Salamah, *et al.*, 2004	tGCS vs. mGCS (from tGCS)	Trauma team, not otherwise described	Only diagnostic accuracy and discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Acker, *et al.,* 2014	NR	NR
Al-Salamah, *et al.,* 2004	NR	**Test characteristics (95% CI)* of mortality, tGCS (score ≤13) vs. mGCS (score ≤5)** Sensitivity: 80.28% (72.78 to 86.48) vs. 80.28% (72.78 to 86.48) Specificity: 67.99% (64.26 to 71.56) vs. 73.05% (69.47 to 76.42%) PLR: 2.51 (2.18 to 2.88) vs. 2.98 (2.56 to 3.46) NLR: 0.29 (0.21 to 0.41) vs. 0.27 (0.19 to 0.38) PPV: 35.29% (30.08 to 40.78) vs. 39.31% (33.65 to 45.19) NPV: 94.07% (91.54 to 96.02) vs. 94.46% (92.09 to 96.28)

Author, Year	**Discrimination or Calibration**	**Risk of Bias**
Acker, *et al.,* 2014	**AUC (95% CI), p-value, tGCS vs. mGCS** *All ages (0-18 years)* Survived to hospital discharge: 0.949 (0.938 to 0.961) vs. 0.941 (0.926 to 0.957), p=0.06 Craniotomy: 0.642 (0.603 to 0.681) vs. 0.638 (0.601 to 0.675), p=0.64 ICU admission: 0.772 (0.754 to 0.790) vs. 0.721 (0.705 to 0.738), p<0.001 LOS >4 days: 0.683 (0.660 to 0.706) vs. 0.644 (0.622 to 0.666), p<0.001 Discharge to rehabilitation: 0.804 (0.782 to 0.826) vs. 0.766 (0.740 to 0.792), p<0.001 Dependent on caregiver: 0.757 (0.732 to 0.783) vs. 0.747 (0.722 to 0.772), p=0.06 ICP monitoring: 0.808 (0.784 to 0.832) vs. 0.774 (0.748 to 0.800), p<0.001 *Youngest age group (0-3 years)* Survived to hospital discharge: 0.949 (0.934 to 0.964) vs. 0.936 (0.911 to 0.962), p=0.10 Craniotomy: 0.680 (0.617 to 0.743) vs. 0.659 (0.597 to 0.721), p=0.17 ICU admission: 0.786 (0.758 to 0.814) vs. 0.723 (0.696 to 0.750), p<0.001 LOS >4 days: 0.630 (0.594 to 0.666) vs. 0.589 (0.555 to 0.623), p<0.001 Discharge to rehabilitation: 0.772 (0.732 to 0.811) vs. 0.713 (0.667 to 0.760), p<0.001 Dependent on caregiver: 0.808 (0.774 to 0.842) vs. 0.787 (0.752 to 0.821), p=0.02 ICP monitoring: 0.728 (0.686 to 0.769) vs. 0.685 (0.643 to 0.726), p<0.001	Moderate
Al-Salamah, *et al.,* 2004	**Mortality, tGCS vs. mGCS** AUC: 0.82 vs. 0.81 Hosmer-Lemeshow Goodness of Fit p-value: <0.01 vs. <0.01 **ICU admission, tGCS vs. mGCS** p-value: 0.02 vs. 0.03 **ICU admission or required intubation in the ED, tGCS vs. mGCS** p-value: <0.001 vs. <0.001	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Beskind, *et al.*, 2014	Retrospective cohort	Trauma patients presenting to the ED via EMS at a level 1 trauma center	Age (median, years): 32 (IQR: 20-51) Male: 65.5% Race: NR Blunt trauma: 88.8% Penetrating trauma: 10.7% Burn trauma: 0.6% AIS 2005 body region -Head or neck: 28.8% -External: 26.5% -Extremities or pelvic girdle: 21.2% -Chest: 10.8% -Abdominal or pelvic contents: 6.3% -Face: 5.4% GCS ≤13: 10.8% mGCS ≤5: 8.2% ISS ≥16: 11.7% Head AIS ≥3: 11.9% BP: NR Alcohol intoxication: NR Medication/procedures in field: NR	USA, Southern Arizona Urban, University Health Network Level 1 trauma center 2008 to 2010	9,816	Survival to hospital discharge (97.1%) Out-of-hospital or ED intubation (4.1%) Neurosurgical intervention (3.8%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Beskind, *et al.*, 2014	tGCS vs. mGCS (from tGCS)	Out-of-hospital, otherwise not described	Only discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Beskind, *et al.*, 2014	NR	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Beskind, *et al.*, 2014	**AUC (95% CI). tGCS vs. mGCS** Survival to discharge: 0.899 (0.874 to 0.923) vs. 0.888 (0.864 to 0.913), mean difference=0.010 (0.002 to 0.018) Intubation in out-of-hospital setting or ED: 0.966 (0.955 to 0.976) vs. 0.948 (0.933 to 0.963), mean difference=0.018 (0.011 to 0.024) Neurosurgical intervention: 0.690 (0.661 to 0.718) vs. 0.671 (0.643 to 0.699), mean difference=0.019 (0.008 to 0.029) *Patients with ISS ≥16 (n=1,151)* Survival to discharge: 0.844 (0.815 to 0.874) vs. 0.837 (0.808 to 0.866), mean difference=0.008 (-0.001 to 0.018) Intubation in out-of-hospital setting or ED: 0.914 (0.895 to 0.932) vs. 0.905 (0.884 to 0.926), mean difference=0.009 (0.0001 to 0.017) Neurosurgical intervention: 0.571 (0.533 to 0.609) vs. 0.570 (0.531 to 0.608), mean difference=0.002 (-0.013 to 0.016) *Patients with head AIS ≥3 (n=1,165; TBI)* Survival to discharge: 0.869 (0.838 to 0.899) vs. 0.855 (0.824 to 0.886), mean difference=0.014 (0.005 to 0.023) Intubation in out-of-hospital setting or ED: 0.918 (0.899 to 0.937) vs. 0.907 (0.884 to 0.929), mean difference=0.012 (0.002 to 0.021) Neurosurgical intervention: 0.596 (0.558 to 0.635) vs. 0.602 (0.565 to 0.640), mean difference=-0.006 (-0.021 to 0.009)	Low

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Brown, *et al.*, 2014	Retrospective cohort	Patients age ≥3 years transported from the scene of injury during 2007 to 2008 identified in the NTDB Exclusion: patients undergoing interfacility transfer.	Age (median): 39 (IQR: 23-57) Male: 66.1% Race: NR ISS (median): 9 (IQR: 4-13) Survival: 95.7% Trauma center need: 38.7% GCS score ≤13: 16.8% mGCS score ≤5: 14.2% SBP<90 mm Hg: 5.2% Respiratory rate <10 or >29: 6.3% Any step 1 criteria of the NTTP: 23% Penetrating injury: 11.6% Flail chest: 0.4% Open skull fracture: <0.1% ≥2 long bone fractures: 1.3% Pelvic fracture: 6.3% Crush injury: 0.5% Amputation: 0.2% Paralysis: 0.4% Any step 2 criteria of the NTTP: 19.9% Any step 1 or 2 criteria of the NTTP: 46.5%	USA Trauma registry 2007 to 2008	811,143	Trauma center need (38.7%): ISS >15; ICU admission of ≥24 hours; need for urgent surgery (ED disposition to the OR); or death in the ED

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Brown, *et al.*, 2014	tGCS vs. mGCS (from tGCS)	Out-of-hospital, otherwise not described	Adjusted for other triage criteria in the first 2 steps of the NTTP (SBP, respiratory rate, and anatomy of injury)	NR	Forward stepwise logistic regression

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Brown, *et al.*, 2014	**OR (95% CI) tGCS (score ≤13) vs. mGCS (score ≤5)** All patients, with missing data imputed: 3.03 (2.94 to 3.13, p<0.01) vs. 3.37 (3.27 to 3.48, p<0.01) Only completed cases (59% of subjects had tGCS vs. 58% had mGCS present): 4.84 (4.40 to 4.57) vs. 4.87 (4.70 to 4.97)	**Need for trauma center, tGCS (score ≤13) vs. mGCS (score ≤5)** *GCS scores alone* Sensitivity: 30.3% vs. 26.7% Specificity: 93.1% vs. 95.1% Accuracy: 66.3% vs. 66.1% r^2: 0.882 vs. 0.964 *GCS scores incorporated into the NTTP Step 1 and 2 criteria* Sensitivity: 62.1% vs. 60.4% Specificity: 65.7% vs. 67.1% Accuracy: 64.2% vs. 64.2%

Author, Year	Discrimination or Calibration	Risk of Bias
Brown, *et al.*, 2014	**AUC, tGCS vs. mGCS** GCS scores alone: 0.617 vs. 0.609, p<0.01 GCS scores incorporated into NTTP Step 1 and 2 criteria: 0.639 vs. 0.637, p=0.10	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Caterino and Raubenolt, 2012	Retrospective cohort	Patients ≥16 years transported from the scene to a hospital by EMS, entered into the Ohio Trauma Registry, with complete EMS GCS scores	Age (mean, years): 53 Male: 55.9% White: 79.9% Black: 13.5% Hispanic: 1.5% Other race: 1.7% Race not documented: 3.4% Injury type -Blunt: 90.2% -Penetrating: 8.2% -Burn: 1.3% -Asphyxial: 0.3% Systolic pressure by EMS (mean): 158 mm Hg ISS (median): 9 ISS >15: 26.6% GCS ≤13: 16.0%	USA, Ohio Urban, hospitals Trauma and non-trauma centers 2002 to 2007	52,412	Mortality (5.8%) TBI (15.2%): skull fracture with underlying brain injury, intracranial hemorrhage, cerebral contusion, or nonspecific intracranial injury Neurosurgical intervention (1.5%) Any emergency intubation (7.6%) ED intubation (6.4%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Caterino and Raubenolt, 2012	tGCS vs. SMS (from tGCS)	Out-of-hospital, obtained by EMS providers	Only diagnostic accuracy and discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Caterino and Raubenolt, 2012	NR	**Test characteristics (95% CI)* tGCS ≤13 vs. SMS ≤1 vs. SMS 0** *Mortality* Sensitivity: 75.03% (73.45 to 76.56) vs. 72.20% (70.57 to 73.79) vs. 66.91% (65.20 to 68.58) Specificity: 87.63% (87.34 to 87.92) vs. 89.42% (89.14 to 89.69) vs. 93.80% (93.58 to 94.01) PLR: 6.07 (5.88 to 6.26) vs. 6.82 (6.60 to 7.06) vs. 10.79 (10.34 to 11.26) NLR: 0.28 (0.27 to 0.30) vs. 0.31 (0.29 to 0.33) vs. 0.35 (0.34 to 0.37) PPV: 27.20% (26.25 to 28.17) vs. 29.59% (28.55 to 30.64) vs. 39.92% (38.57 to 41.28) NPV: 98.28% (98.15 to 98.40) vs. 98.12% (97.99 to 98.25) vs. 97.87% (97.74 to 98.00) *TBI* Sensitivity: 45.40% (44.30 to 46.50) vs. 40.81% (39.72 to 41.89) vs. 30.12% (29.12 to 31.15) Specificity: 89.30% (89.01 to 89.59) vs. 90.50% (90.22 to 90.77) vs. 94.10% (93.88 to 94.32) PLR: 4.24 (4.09 to 4.40) vs. 4.30 (4.13 to 4.47) vs. 5.11 (4.86 to 5.37) NLR: 0.61 (0.60 to 0.62) vs. 0.65 (0.64 to 0.67) vs. 0.74 (0.73 to 0.75) PPV: 43.20% (42.13 to 44.27) vs. 43.50% (42.38 to 44.64) vs. 47.79% (46.60 to 49.18) NPV: 90.12% (89.84 to 90.40) vs. 89.51% (89.22 to 89.79) vs. 88.25% (87.96 to 88.54)

Author, Year	Discrimination or Calibration	Risk of Bias
Caterino and Raubenolt, 2012	**AUC (95% CI), tGCS vs. SMS** *Non-parametric analysis* Mortality: 0.85 (0.84 to 0.86) vs. 0.82 (0.81 to 0.83) TBI: 0.72 (0.71 to 0.72) vs. 0.66 (0.65 to 0.66) Neurosurgical intervention: 0.75 (0.73 to 0.77) vs. 0.70 (0.68 to 0.72) Any emergency intubation: 0.86 (0.85 to 0.87) vs. 0.83 (0.82 to 0.83) ED intubation: 0.86 (0.86 to 0.87) vs. 0.83 (0.82 to 0.84) *Parametric analysis* Mortality: 0.87 (0.86 to 0.88) vs. 0.86 (0.85 to 0.88) TBI: 0.80 (0.80 to 0.81) vs. 0.78 (0.76 to 0.80) Neurosurgical intervention: 0.82 (0.81 to 0.84) vs. 0.81 (0.78 to 0.84) Any emergency intubation: 0.90 (0.90 to 0.91) vs. 0.91 (0.90 to 0.91) ED intubation: 0.91 (0.90 to 0.91) vs. 0.91 (0.90 to 0.92)	Moderate

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Caterino and Raubenolt, 2012 Continued		*Neurosurgical intervention* Sensitivity: 60.05% (56.53 to 63.50) vs. 52.93% (49.37 to 56.46) vs. 42.24% (38.76 to 45.78) Specificity: 84.70% (84.39 to 85.01) vs. 86.40% (86.10 to 86.69) vs. 90.70% (90.45 to 90.95) PLR: 3.92 (3.69 to 4.17) vs. 3.89 (3.63 to 4.17) vs. 4.54 (4.17 to 4.95) NLR: 0.47 (0.43 to 0.51) vs. 0.54 (0.51 to 0.59) vs. 0.64 (0.60 to 0.68) PPV: 5.64% (5.15 to 6.15) vs. 5.59% (5.08 to 6.14) vs. 6.47% (5.81 to 7.18) NPV: 99.29% (99.20 to 99.36) vs. 99.18% (99.09 to 99.26) vs. 99.04% (98.95 to 99.13) *Any emergency intubation* Sensitivity: 75.50% (74.13 to 76.83) vs. 72.71% (71.30 to 74.09) vs. 63.49% (61.98 to 64.99) Specificity: 88.90% (88.62 to 89.18) vs. 90.60% (90.34 to 90.86) vs. 94.70% (94.50 to 94.90) PLR: 6.80 (6.59 to 7.01) vs. 7.74 (7.48 to 8.00) vs. 11.98 (11.46 to 12.52) NLR: 0.28 (0.26 to 0.29) vs. 0.30 (0.29 to 0.32) vs. 0.39 (0.37 to 0.40) PPV: 35.87% (34.84 to 36.91) vs. 38.88% (37.77 to 40.00) vs. 49.63% (48.25 to 51.01) NPV: 97.78% (97.64 to 97.92) vs. 97.58% (97.44 to 97.72) vs. 96.93% (96.77 to 97.08) *ED intubation* Sensitivity: 76.89% (75.43 to 78.31) vs. 74.09% (72.57 to 75.57) vs. 64.61% (62.96 to 66.23) Specificity: 88.20% (87.91 to 88.48) vs. 89.83% (89.56 to 90.09) vs. 94.00% (93.79 to 94.21) PLR: 6.52 (6.32 to 6.72) vs. 7.28 (7.05 to 7.53) vs. 10.77 (10.32 to 11.24) NLR: 0.26 (0.25 to 0.28) vs. 0.29 (0.27 to 0.31) vs. 0.38 (0.36 to 0.39) PPV: 30.82% (29.83 to 31.82) vs. 33.22% (32.15 to 34.30) vs. 42.41% (41.05 to 43.78) NPV: 98.24% (98.11 to 98.36) vs. 98.07% (97.94 to 98.19) vs. 97.49% (97.35 to 97.63)

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Cicero and Cross, 2013	Retrospective cohort	Patients in the NTDB data set from 2007-2009, ages <19 years. Exclusion: interfacility transfers, ED LOS >7 days or greater than the total recorded hospital LOS.	Age (mean, years): 12.6 (SD 5.5) Male: 67% Nonwhite race: 38% ED LOS (mean, minutes): 227 (SD 229) Hospital LOS (mean, days): 3.8 (SD 6.8) ISS (mean): 9.9 (SD 10.3)	USA Trauma registry 2007 to 2009	104,035	Mortality (3.8%) Death on arrival (NR): having a recorded ED disposition of death regardless of duration of resuscitation efforts Major injury (15%): having a recorded ISS >15 ED LOS (NA): duration from arrival until disposition or death Hospital LOS (NA): duration of admission to any hospital inpatient service
Corrigan, *et al.*, 2014	Retrospective cohort	Patients in the NTDB data set with a diagnosis of TBI, ages ≥18 years, were not transferred in from another hospital, did not die in the ED, with no missing data.	NR	USA Trauma registry 2007 to 2010	77,470	Days in the ICU (NA) Discharged alive (NR) LOS days (NA) Discharged home, if alive (NR)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Cicero and Cross, 2013	tGCS vs. mGCS (from tGCS)	Out-of-hospital, otherwise not described	Only discrimination reported; no adjustment performed	NR	NR
Corrigan, *et al.*, 2014	tGCS vs. mGCS (from tGCS)	Out-of-hospital, otherwise not described	Only discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Cicero and Cross, 2013	NR	NR
Corrigan, *et al.*, 2014	NR	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Cicero and Cross, 2013	**tGCS vs. mGCS** *AUC (95% CI)* Overall mortality: 0.946 (0.941 to 0.951) vs. 0.940 (0.935 to 0.945) Death on arrival: 0.958 (0.953 to 0.963) vs. 0.953 (0.948 to 0.959) Major injury: 0.720 (0.715 to 0.724) vs. 0.681 (0.677 to 0.686) **Likelihood of surviving at arrival to ED (95% CI)** tGCS=3: 0.71 (0.70 to 0.72) tGCS=15: 1 (1.0 to 1.0) **LOS tGCS=3 vs. tGCS=14 or 15** ED LOS (hours): 2 vs. 4 Hospital LOS (days): 8 vs. approximately 4	Moderate
Corrigan, *et al.,* 2014	**tGCS vs. mGCS** *ICU days* AIC: 371699 vs. 373272 R^2: 0.1318 vs. 0.1140 *Discharged alive* AIC: 31456 vs. 32351 SC: 31520.430 vs. 32416.138 c-index: 0.886 vs. 0.878 *LOS days* AIC: 461601 vs. 462758 R^2: 0.0956 vs. 0.0820 *Discharged home (if alive)* AIC: 71373 vs. 72631 SC: 71437.519 vs. 72695.471 c-index: 0.763 vs. 0.750	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Davis, *et al.*, 2006	Retrospective registry cohort	Adult patients with moderate-to-severe TBI (head/neck AIS ≥3) and available GCS scores. Exclusion: head/neck AIS was defined by a neck injury.	NR	USA, California (San Diego) Urban, other data NR Date NR	12,882	Mortality (NR) Neurosurgical intervention (NR): composite endpoint, which included mortality, craniotomy, invasive intracranial pressure monitoring, or ICU admission >48 hours
Eken, *et al.*, 2009	Prospective cohort	Patients >17 years old with an altered level of consciousness, after any trauma to the head, neurological complaints of lateralizing motor, and/or sensory deficits, dysarthria, dysphasia, or facial asymmetry were eligible. Exclusion: patients who were intubated or administered sedative or paralytic agents before presentation to ED.	Age (median, years): 59 (range: 18-97) Male: 64% Race: NR	Turkey Tertiary care ED of hospital Level IV trauma center 2006	185	3-month mortality (25%) Hospital mortality (14%) 3-month morbidity using an MRS (39%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Davis, *et al.*, 2006	tGCS vs. mGCS (from tGCS)	In-field and upon admission to ED, otherwise not described	NR	NR	Linear regression model adjusted for field GCS, otherwise not described.
Eken, *et al.*, 2009	tGCS vs. mGCS (from tGCS)	On presentation to ED, otherwise not described	Only discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Davis, *et al.*, 2006	NR	NR
Eken, *et al.*, 2009	NR	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Davis, *et al.,* 2006	**Reported AUC (optimized threshold value)** *Mortality* Preadmission tGCS (field or arrival): 0.84 (5.016) Preadmission mGCS: 0.83 (3.010) Field tGCS: 0.84 (5.016) Arrival tGCS: 0.84 (6.024) *Neurosurgical intervention* Preadmission tGCS (field or arrival): 0.80 (11.016) Preadmission mGCS 0.78 (5.010) Field tGCS: 0.80 (12.024) Arrival tGCS: 0.83 (12.024)	Moderate
Eken, *et al.,* 2009	**Reported AUC (95% CI) tGCS vs. mGCS** 3-month mortality: 0.726 (0.656 to 0.789) vs. 0.679 (0.606 to 0.745) Hospital mortality: 0.735 (0.655 to 0.797) vs. 0.662 (0.589 to 0.730) Modified Rankin Scale 3-6, all patients: 0.720 (0.650 to 0.784) vs. 0.651 (0.578 to 0.720) MRS 3-6, patients with trauma: 0.776 (0.657 to 0.869) vs. 0.706 (0.582 to 0.811) MRS 3-6, patients without trauma: 0.655 (0.562 to 0.740) vs. 0.597 (0.503 to 0.686)	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Gill, *et al.,* 2005	Retrospective cohort	Patients of all ages presenting to level 1 trauma center who met standard trauma alert criteria	Age (median, years): 24 (IQR: 15-38) Male: 71.5% Race: NR Trauma mechanism -MVC: 60.8% -Homicide and injury purposely inflicted by other persons: 20.7% -Motor vehicle, nontraffic accidents: 3.8% -Other accidents: 3.0% -Suicide and self-inflicted injury: 1.9% -Other road vehicle accidents: 1.4%	USA, California (Loma Linda) Urban, University Level 1 trauma center and children's hospital 1990 to 2002	8,432	ED intubation (26.4%) Neurosurgical intervention (9.3%) Clinically significant brain injury (17.1%) Mortality (11.4%)
Gill, *et al.,* 2006	Retrospective cohort	Patients of all ages presenting to level 1 trauma center who met standard trauma alert criteria	Age (median, years): 24 (IQR: 16-38) Male: 70% Race: NR	USA, California (Loma Linda) Urban, University Level 1 trauma center and children's hospital 1990 to 2002	7,233	ED intubation (26%) Neurosurgical intervention (9%) Clinically significant brain injury (17%) Mortality (10%)
Haukoos, *et al.,* 2007	Retrospective cohort	All adult and pediatric patients who presented to the ED and were included in the trauma registry	Age (median, years): 32 (IQR: 21-45) Male: 71% Race: NR ISS score (median): 9 (IQR: 2-14) Trauma mechanism -MVC: 49% -Homicide and injury purposely inflicted by other persons: 21% -Accidental falls: 17% -Other accidents: 5% -Suicide and self-inflicted injury: 2% -Other road vehicle crashes: 2% -Motor vehicle nontraffic crash: 1%	USA, Colorado Urban, Denver Health Medical Center Level 1 trauma center 1995 to 2004	21,170	Intubation, out-of-hospital or ED (18%) Brain injury (14%) Neurosurgical intervention (7%) Mortality (5%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Gill, *et al.,* 2005	tGCS vs. mGCS (from tGCS) vs. SMS (from tGCS)	Administered in ED by ED physicians	Only discrimination reported; no adjustment performed	NR	NR
Gill, *et al.,* 2006	tGCS vs. mGCS (from tGCS) and SMS (from tGCS)	Administered out-of-hospital, otherwise not described	Only discrimination reported; no adjustment performed	NR	NR
Haukoos, *et al.,* 2007	tGCS vs. mGCS (from tGCS) vs. SMS (from tGCS)	Administered in ED by ED physicians	Only discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Gill, *et al.,* 2005	NR	NR
Gill, *et al.,* 2006	NR	NR
Haukoos, *et al.,* 2007	NR	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Gill, *et al.,* 2005	**Reported AUC for tGCS vs. mGCS vs. SMS (CI's not reported)** ED intubation: 0.865 vs. 0.826 vs. 0.826 Neurosurgical intervention: 0.874 vs. 0.848 vs. 0.851 Brain injury: 0.826 vs. 0.789 vs. 0.791 Mortality: 0.906 vs. 0.894 vs. 0.878	Low
Gill, *et al.,* 2006	**Reported AUC (95% CI) for tGCS vs. mGCS vs. SMS** ED intubation: 0.83 (0.81 to 0.84) vs. 0.79 (0.78 to 0.80) vs. 0.79 (0.77 to 0.80) Neurosurgical intervention: 0.86 (0.85 to 0.88) vs. 0.84 (0.82 to 0.85) vs. 0.83 (0.81 to 0.84) Clinically significant brain injury (TBI): 0.83 (0.82 to 0.84) vs. 0.79 (0.78 to 0.81) vs. 0.79 (0.77 to 0.80) Hospital mortality: 0.89 (0.88 to 0.90) vs. 0.88 (0.87 to 0.89) vs. 0.86 (0.86 to 0.89)	Low
Haukoos, *et al.,* 2007	**Reported AUC (95% CI) for tGCS vs. mGCS vs. SMS** Intubation: 0.86 (0.85 to 0.87) vs. 0.81 (0.80 to 0.82) vs. 0.81 (0.80 to 0.82) Brain injury: 0.76 (0.75 to 0.77) vs. 0.71 (0.70 to 0.72) vs. 0.71 (0.70 to 0.72) Neurosurgical intervention: 0.83 (0.82 to 0.84) vs. 0.80 (0.79 to 0.81) vs. 0.80 (0.79 to 0.81) Mortality: 0.92 (0.91 to 0.93) vs. 0.90 (0.89 to 0.91) vs. 0.89 (0.88 to 0.90)	Low

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Healey, *et al.*, 2003	Retrospective cohort	Patients in the NTDB data set with complete GCS data.	Age: NR Male: NR Race: NR GCS score=15: 80%	USA Trauma registry 1994 to 2001	202,255	Mortality (NR)
Holmes, *et al.*, 2005	Prospective cohort	Pediatric patients <18 years with blunt head trauma presenting to the ED. Exclusion: children with trivial head trauma defined by falls from ground level or trauma resulting from walking or running into stationary objects if the only abnormal finding was a scalp laceration or abrasion, and children transferred who had undergone CT scanning before transfer.	Ages ≤2 years: 16% Ages >2 years: 84% Male: NR Race: NR	USA, California (Davis) Level 1 trauma center 1998 to 2001	2,043	TBI, either on cranial CT scan (intracranial hemorrhage, hematoma, contusion, or cerebral edema) or in need of acute intervention (5%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Healey, *et al.*, 2003	tGCS vs. mGCS (from tGCS)	Out-of-hospital, otherwise not described	Only diagnostic accuracy and discrimination reported; no adjustment performed	NR	NR
Holmes, *et al.*, 2005	tGCS vs. mGCS (from tGCS)	Presentation to ED, otherwise not described	Only discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Healey, *et al.,* 2003	NR	NR
Holmes, *et al.,* 2005	NR	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Healey, *et al.*, 2003	**tGCS vs. mGCS** AUC (95% CI): 0.891 (0.888 to 0.894) vs. 0.873 (0.870 to 0.875), p=0.000 Misclassification: 4.9% vs. 5.1%	Low
Holmes, *et al.*, 2005	**Reported AUC (95% CI) tGCS vs. mGCS** *TBI on cranial CT scan* Ages ≤2 years: 0.72 (0.56 to 0.87) vs. 0.60 (0.48 to 0.72) Ages >2 years: 0.82 (0.76 to 0.87) vs. 0.71 (0.65 to 0.77) *TBI in need of acute intervention* Ages ≤2 years: 0.97 (0.94 to 1.0) vs. 0.76 (0.59 to 0.93) Ages >2 years 0.87 (0.83 to 0.92) vs. 0.76 (0.71 to 0.81)	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Ross, *et al.*, 1998	Retrospective cohort	All patients ≥13 years transported directly to the trauma center. Exclusion: patients seen initially at another hospital and transferred to the trauma center.	Age (mean, years): 37.1 (range: 13-95) Male: 69% Race: NR Airway intubation in the field: 3.5% Blunt mechanism of injury: 85% ISS (mean): 14.4 ISS (median): 13 No head injury: 43.8% AIS≤2 (concussion): 25% AIS=3: 16.3%	USA, New Jersey Level 1 trauma center 1994 to 1996	1,410	Severe head injury (14.8%): AIS ≥4 or AIS=5 Mortality (6%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Ross, *et al.*, 1998	tGCS vs. mGCS (from tGCS)	Out-of-hospital, otherwise not described	Effect of shock on neurologic status (patients, n=3, with SBP<90 mm Hg)	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Ross, *et al.*, 1998	NR	**Test characteristics (95% CI)* tGCS (score ≤13) vs. mGCS (score ≤5)** *AIS score =5* Sensitivity: 93.33% (83.80 to 98.15) vs. 90.16% (79.81 to 96.30) Specificity: 84.51% (82.46 to 86.40) vs. 85.40% (83.40 to 87.24) PLR: 6.02 (5.23 to 6.94) vs. 6.17 (5.30 to 7.20) NLR: 0.08 (0.03 to 0.20) vs. 0.12 (0.05 to 0.25) PPV: 21.13% (16.38 to 26.55) vs. 21.83% (16.89 to 27.44) NPV: 99.65% (99.11 to 99.90) vs. 99.48% (98.88 to 99.81) *AIS score ≥4* Sensitivity: 61.72% (54.76 to 68.34) vs. 60.77% (53.79 to 67.43) Specificity: 85.47% (83.05 to 87.67) vs. 89.59% (87.73 to 91.26) PLR: 4.25 (3.52 to 5.13) vs. 5.84 (4.79 to 7.12) NLR: 0.45 (0.38 to 0.53) vs. 0.44 (0.37 to 0.52) PPV: 48.68% (42.52 to 54.87) vs. 50.40% (44.05 to 56.73) NPV: 90.91% (88.81 to 92.73) vs. 92.92% (91.29 to 94.33) *Mortality* Sensitivity: 71.28% (61.02 to 80.14) vs. 72.34% (62.15 to 81.07) Specificity: 84.95% (82.91 to 86.84%) vs. 86.02% (84.03 to 87.85) PLR: 4.74 (3.95 to 5.68) vs. 5.17 (4.31 to 6.21) NLR: 0.34 (0.25 to 0.47) vs. 0.32 (0.23 to 0.45) PPV: 25.28% (20.16 to 30.96) vs. 26.98% (21.61 to 32.91) NPV: 97.64% (96.59 to 98.44) vs. 97.75% (96.73 to 98.53) *Craniotomy* Sensitivity: 63.16% (38.36 to 83.71) vs. 68.42% (43.45 to 87.42) Specificity: 81.81% (79.68 to 83.81) vs. 82.82% (80.73 to 84.77) PLR: 3.47 (2.42 to 4.98) vs. 3.98 (2.87 to 5.52) NLR: 0.45 (0.25 to 0.81) vs. 0.38 (0.20 to 0.74) PPV: 4.53% (2.36 to 7.78) vs. 5.16% (2.78 to 8.66) NPV: 99.39% (98.74 to 99.75) vs. 99.48% (98.88 to 99.81)

Author, Year	Discrimination or Calibration	Risk of Bias
Ross, *et al.*, 1998	NR	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Thompson, *et al.,* 2011	Retrospective cohort	All adult and pediatric patients who presented to the ED and were included in the trauma registry	Age (median, years): 33 (IQR: 22-48) Male: 71% Race: NR ISS (median): 9 (IQR: 4-17) Out-of-hospital GCS score (median): 15 (IQR: 14-15) Mechanism of injury -Blunt: 81% -Penetrating, stab: 7% -Penetrating, gunshot: 6% -Other: 6%	USA, Colorado Urban, Denver Health Medical Center Level 1 trauma center 1999 to 2008	19,408	Emergency tracheal intubation (18%) Clinically meaningful brain injury (18%) Need for neurosurgical intervention (8%) Mortality (6%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Thompson, *et al.,* 2011	tGCS vs. mGCS (from tGCS) vs. SMS (from tGCS)	Out-of-hospital, otherwise not described	Only diagnostic accuracy and discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Thompson, *et al.*, 2011	NR	**Test characteristics (95% CI) SMS=0 vs. SMS≤1** *Primary analysis, with missing GCS data multiply imputed* Emergency tracheal intubation Sensitivity: 0.61 (0.56 to 0.66) vs. 0.67 (0.62 to 0.72) Specificity: 0.65 (0.58 to 0.73) vs. 0.62 (0.56 to 0.68) PLR: 1.75 (1.47 to 2.09) vs. 1.79 (1.58 to 2.03) NLR: 0.60 (0.55 to 0.66) vs. 0.52 (0.47 to 0.58) Brain injury Sensitivity: 0.55 (0.51 to 0.59) vs. 0.62 (0.59 to 0.65) Specificity: 0.64 (0.56 to 0.71) vs. 0.61 (0.54 to 0.67) PLR: 1.53 (1.30 to 1.81) vs. 1.59 (1.38 to 1.83) NLR: 0.70 (0.66 to 0.75) vs. 0.63 (0.58 to 0.67) Neurosurgical intervention Sensitivity: 0.66 (0.62 to 0.70) vs. 0.74 (0.70 to 0.77) Specificity: 0.63 (0.55 to 0.70) vs. 0.59 (0.53 to 0.65) PLR: 1.78 (1.52 to 2.08) vs. 1.82 (1.60 to 2.07) NLR: 0.54 (0.50 to 0.59) vs. 0.44 (0.40 to 0.49) Mortality Sensitivity: 0.83 (0.75 to 0.91) vs. 0.86 (0.78 to 0.94) Specificity: 0.63 (0.56 to 0.70) vs. 0.59 (0.54 to 0.65) PLR: 2.25 (1.89 to 2.68) vs. 2.13 (1.92 to 2.37) NLR: 0.27 (0.19 to 0.37) vs. 0.23 (0.15 to 0.34) Composite outcome (any one of the outcomes) Sensitivity: 0.53 (0.49 to 0.57) vs. 0.59 (0.55 to 0.63) Specificity: 0.66 (0.58 to 0.74) vs. 0.64 (0.57 to 0.70) PLR: 1.57 (1.30 to 1.89) vs. 1.63 (1.41 to 1.88) NLR: 0.71 (0.67 to 0.76) vs. 0.64 (0.60 to 0.69) *Sensitivity analysis, with missing GCS data excluded* Emergency tracheal intubation Sensitivity: 0.63 (0.62 to 0.65) vs. 0.69 (0.67 to 0.70) Specificity: 0.61 (0.60 to 0.62) vs. 0.60 (0.59 to 0.61) PLR: 1.62 (1.57 to 1.68) vs. 1.71 (1.66 to 1.76) NLR: 0.60 (0.58 to 0.63) vs. 0.52 (0.50 to 0.55)

Author, Year	Discrimination or Calibration	Risk of Bias
Thompson, *et al.*, 2011	**Reported AUC (95% CI) tGCS vs. mGCS vs. SMS** *Primary analysis, with missing GCS data multiply imputed* Emergency tracheal intubation: 0.70 (0.63 to 0.77) vs. 0.65 (0.60 to 0.70) vs. 0.65 (0.62 to 0.67) Brain injury: 0.66 (0.60 to 0.71) vs. 0.61 (0.57 to 0.65) vs. 0.61 (0.58 to 0.64) Neurosurgical intervention: 0.70 (0.64 to 0.77) vs. 0.66 (0.61 to 0.71) vs. 0.66 (0.64 to 0.69) Mortality: 0.82 (0.74 to 0.90) vs. 0.76 (0.70 to 0.83) vs. 0.74 (0.70 to 0.77) Composite (any one of the outcomes): 0.66 (0.60 to 0.72) vs. 0.61 (0.57 to 0.66) vs. 0.61 (0.58 to 0.64) *Sensitivity analysis, with missing GCS data excluded* Emergency tracheal intubation: 0.80 (0.79 to 0.81) vs. 0.77 (0.76 to 0.78) vs. 0.77 (0.76 to 0.78) Brain injury: 0.75 (0.74 to 0.76) vs. 0.70 (0.69 to 0.71) vs. 0.70 (0.69 to 0.71) Neurosurgical intervention: 0.79 (0.78 to 0.81) vs. 0.77 (0.75 to 0.78) vs. 0.77 (0.76 to 0.78) Mortality: 0.90 (0.89 to 0.91) vs. 0.88 (0.87 to 0.89) vs. 0.87 (0.86 to 0.88) Composite (any one of the outcomes): 0.77 (0.76 to 0.78) vs. 0.72 (0.72 to 0.73) vs. 0.72 (0.71 to 0.73)	Moderate

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Thompson, *et al.* 2011 Continued		<u>Brain injury</u> Sensitivity: 0.57 (0.56 to 0.59) vs. 0.63 (0.61 to 0.65) Specificity: 0.60 (0.59 to 0.60) vs. 0.58 (0.58 to 0.59) PLR: 1.42 (1.37 to 1.47) vs. 1.51 (1.46 to 1.55) NLR: 0.72 (0.69 to 0.75) vs. 0.64 (0.61 to 0.67) <u>Neurosurgical intervention</u> Sensitivity: 0.68 (0.66 to 0.70) vs. 0.75 (0.73 to 0.77) Specificity: 0.59 (0.58 to 0.60) vs. 0.57 (0.56 to 0.58) PLR: 1.65 (1.59 to 1.72) vs. 1.74 (1.68 to 1.80) NLR: 0.54 (0.50 to 0.59) vs. 0.44 (0.40 to 0.48) <u>Mortality</u> Sensitivity: 0.85 (0.83 to 0.87) vs. 0.88 (0.86 to 0.90) Specificity: 0.59 (0.59 to 0.60) vs. 0.57 (0.56 to 0.58) PLR: 2.08 (2.02 to 2.14) vs. 2.04 (1.99 to 2.10) NLR: 0.26 (0.23 to 0.30) vs. 0.22 (0.18 to 0.25) <u>Composite outcome (any one of the outcomes)</u> Sensitivity: 0.55 (0.54 to 0.57) vs. 0.61 (0.59 to 0.62) Specificity: 0.62 (0.61 to 0.63) vs. 0.61 (0.60 to 0.62) PLR: 1.44 (1.39 to 1.48) vs. 1.54 (1.50 to 1.59) NLR: 0.73 (0.70 to 0.75) vs. 0.65 (0.63 to 0.67)

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Timmons, *et al.*, 2011	Retrospective cohort	Patients with TBI, ages ≥16 years, who entered the ED of the 8 clinical centers. Excluded those with head AIS score of 6.	Age 16-29 years: 34% Age 30-44 years: 22% Age 45-59 years: 20% Age 60-74 years: 12% Age ≥75 years: 12% Male: 71% Hispanic: 7% Non-Hispanic: 93% American Indian/Alaskan Native: 0.4% Asian: 2% Black: 21% Native Hawaiian/Pacific Islander: 0.2% White: 75% Another race: 2% *Mechanism of injury* -MVC: 47% -Motorcycle or bicycle accident: 10% -Assault: 11% -Fall: 29% -Sports: 1% -Another mechanism: 2%	USA 8 clinical centers in the USA 2003 to 2005	2,808	Mortality (12%): in hospital death during first 2 weeks after injury

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Timmons, *et al.*, 2011	tGCS vs. mGCS (from tGCS)	GCS used was the best GCS in the first 4 hours after injury but before operation. Personnel not described.	Age measured in 15 year ranges, hypotension, and other life threatening injury	**Reported RR (95% CI) for mortality** *mGCS score=6 as referent* mGCS chemically paralyzed patients (GCS score=3, intubated patients): 5.5 (3.5 to 8.7) mGCS score=1: 17.0 (12.1 to 23.9) mGCS score=2: 12.9 (8.3 to 20.0) mGCS score=3: 8.0 (4.6 to 14.0) mGCS score=4: 3.7 (2.4 to 5.8) mGCS score=5: 2.2 (1.4 to 3.2) *tGCS score≤13 as referent* tGCS chemically paralyzed patients (GCS score=3, intubated patients): 5.8 (3.6 to 9.3) tGCS score 3-8: 8.4 (5.5 to 13.0) tGCS score 3-8 intubated patients: 6.9 (4.9 to 9.7) tGCS score 9-12: 2.9 (1.7 to 4.9) tGCS score 9-12 intubated patients: 1.5 (0.8 to 2.8)	Adjusted for potential confounders that the estimated effect (beta) for GCS or head AIS by >10%, and all models were stratified by trauma center to arrive at a summary estimate adjusted for the site.

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Timmons, *et al.*, 2011	**Reported RR (95% CI) for mortality** *mGCS score=6 as referent* mGCS chemically paralyzed patients (GCS score=3, intubated patients): 4.1 (2.5 to 6.6) mGCS score=1: 9.3 (6.3 to 13.5) mGCS score=2: 7.8 (4.8 to 12.7) mGCS score=3: 6.3 (3.5 to 11.3) mGCS score=4: 2.8 (1.8 to 4.5) mGCS score=5: 1.9 (1.3 to 3.0) *tGCS score≥13 as referent* tGCS chemically paralyzed patients (GCS score=3, intubated patients): 4.1 (2.5 to 6.8) tGCS score 3-8: 5.5 (3.4 to 8.9) tGCS score 3-8 intubated patients: 4.5 (3.1 to 6.6) tGCS score 9-12: 2.2 (1.3 to 3.8) tGCS score 9-12 intubated patients: 1.4 (0.8 to 2.7)	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Timmons, *et al*., 2011	NR	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N	Outcomes (Proportion with Outcome)
Van de Voorde, *et al.,* 2008	Prospective cohort	TBI patients (defined as LOS in hospital >48 hours or death, and any brain AIS'90 score) ages 0-18 years admitted in 2005 to 1 of 18 participating hospitals. Excluded if had a high AIS'90 score in any other body region that was thought to contribute significantly to outcome, if they were ictal or postictal on first GCS assessment of if data collection was insufficient.	Age (mean, years): 8.2 (SD 5.3) Male: 59% tGCS (median) 14.5 mGCS (median): 6 tGCS score=15: 50% mGCS score=6: 60% ISS (median): 16	Belgium Pediatric trauma registry (PENTA) 2005	96	Mortality (10%)

Author, Year	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Van de Voorde, *et al.,* 2008	tGCS vs. mGCS (from tGCS)	Best GCS on scene, or upon ED admission if no pre-hospital intervention	Only diagnostic accuracy and discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Van de Voorde, *et al.,* 2008	NR	**Test characteristics (95% CI)* of mortality, sensitivity and specificity** tGCS score <15: 100% (69.15 to 100) vs. 56.10% (44.70 to 67.04) tGCS score <14: 100% (69.15 to 100) vs. 70.73% (59.65 to 80.26) tGCS score <13: 100% (69.15 to 100) vs. 74.39% (63.56 to 83.40) mGCS score <6: 100% (69.15 to 100) vs. 74.36% (63.21 to 83.58) mGCS score <5: 100% (69.15 to 100.0) vs. 85.90% (76.17 to 92.74)

Author, Year	Discrimination or Calibration	Risk of Bias
Van de Voorde, *et al.*, 2008	NR	Moderate

Please see Appendix C. Included Studies for full study references.

AIC= Akaike information criterion; AIS= Abbreviated Injury Scale; AUC= area under the receiver operating characteristics curve; BP= blood pressure; CI= confidence interval; CT= computed tomography; ED= emergency department; EMS= emergency medical services; GCS= Glasgow Coma Scale; ICP= intracranial pressure; ICU= intensive care unit; IQR= interquartile range; ISS= injury severity score; LOS= length of stay; mGCS= motor scale of GCS; MRS= Modified Rankin Scale; MVC= motor vehicle crash; N= number; NA= not available; NAT= nonaccidental trauma; NLR= negative likelihood ratio; NPV= negative predictive value; NR= not reported; NTDB= National Trauma Data Bank; NTTP= National Trauma Triage Protocol; OR= odds ratio; PENTA= pediatric trauma registry; PLR= positive likelihood ratio; PPV= positive predictive value; RR= relative risk; SBP= systolic blood pressure; SC= Schwartz criterion; SD= standard deviation; SMS= 3-point simplified motor score; TBI= traumatic brain injury; tGCS= total GCS; vs.= versus

*Calculated

Appendix I. Indirect Studies for Predictive Utility

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N
Caterino, *et al.*, 2011	Retrospective cohort	Patients ≥16 years transported from the scene to a hospital by EMS, entered into the Ohio Trauma Registry, with complete EMS GCS scores	Age ≥ 70 years: 30% (n=15,708) Male: 56% White: 80% Nonwhite: 13.5% Hispanic: 1.4% ISS score <15 (mild): 65% ISS score >15 (moderate, severe): 26.6% Survived to hospital discharge: 94.2% Intubated in out-of-hospital setting or ED: 7.6% Trauma type was TBI:15.2% EMS GCS score <13: 12.8% Initial EMS BP <90 mmHg: 5.2% Initial EMS BP ≥90 mmHg: 92.6% Neurosurgical intervention: 1.5%	USA, Ohio Urban and rural settings Ohio Trauma Registry 2002 to 2007	52,412

Author, Year	Outcomes	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Caterino, *et al.*, 2011	Mortality (in hospital) Clinical brain injury (skull fractures with underlying brain injury, intracranial hemorrhage, cerebral contusion, or nonspecific intracranial injury) Neurosurgical intervention (operations on the brain, skull, or meninges, including diagnostic and therapeutic procedures such as shunts, craniotomies, and ventriculostomies) Emergency intubation	tGCS	Out-of-hospital, obtained by EMS providers	Under estimation of confidence levels	NR	Imputed data to construct a series of multivariate logistic regression models

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Caterino, *et al.*, 2011	**Adults ≥70 years of age vs. <70 years of age** *Reported OR (95% CI)* Mortality, tGCS 14 vs. 15: 1.40 (1.07 to 1.83) vs. 1.22 (0.88 to 1.71) Mortality, tGCS 13 vs. 14: 2.34 (1.57 to 3.52) vs. 1.45 (0.91 to 2.30) TBI, tGCS 14 vs. 15: 2.50 (2.06 to 3.02) vs. 2.51 (2.24 to 2.81) TBI, tGCS 13 vs. 14: 1.00 (0.71 to 1.43) vs. 1.11 (0.93 to 1.33) Neurosurgical intervention, tGCS 14 vs. 15: 0.67 (0.38 to 1.20) vs. 2.02 (1.45 to 2.80) Neurosurgical intervention, tGCS 13 vs. 14: 2.41 (1.05 to 5.55) vs. 1.59 (1.03 to 2.42) Intubation, tGCS 14 vs. 15: 2.22 (1.59 to 3.10) vs. 3.12 (2.60 to 3.74) for tGCS score 14 vs. 13 Intubation, tGCS 13 vs. 14: 1.16 (0.63 to 2.12) vs. 1.50 (1.18 to 1.92) *Reported OR (95% CI), tGCS score ≤14 in adults ≥70 years of age vs. ≤13 in adults <70 years of age* Mortality: 4.68 (2.90 to 7.54) TBI: 1.84 (1.45 to 2.34) Neurosurgical intervention: 0.39 (0.20 to 0.78) Intubation: 0.38 (0.26 to 0.56)	**Test characteristics (95% CI) of tGCS score 13 elders vs. adults** *Mortality* Sensitivity: 50.7% (47.5 to 53.9) vs. 85.7% (84.1 to 87.2) Specificity: 93.8% (93.4 to 94.2) vs. 85.0% (84.6 to 85.4) PLR: 8.20 (7.51 to 8.96) vs. 5.72 (5.55 to 5.90) NLR: 0.52 (0.49 to 0.56) vs. 0.17 (0.15 to 0.19) *TBI* Sensitivity: 27.5% (25.7 to 29.3) vs. 53.0% (51.6 to 54.3) Specificity: 94.3% (93.9 to 94.7) vs. 87.1% (86.8 to 87.5) PLR: 4.85 (4.41 to 5.34) vs. 3.26 (3.16 to 3.35) NLR: 0.77 (0.75 to 0.79) vs. 0.44 (0.42 to 0.45) *Neurosurgical intervention* Sensitivity: 42.7% (35.7 to 49.9) vs. 65.9% (61.9 to 69.7) Specificity: 91.5% (91.0 to 91.9) vs. 81.8% (81.4 to 82.2) PLR: 5.02 (4.24 to 5.94) vs. 3.61 (3.40 to 3.85) NLR: 0.63 (0.56 to 0.71) vs.0.42 (0.37 to 0.47) *Intubation* Sensitivity: 57.5% (53.3 to 61.6) vs. 78.5% (77.0 to 79.8) Specificity: 92.9% (92.5 to 93.3) vs. 87.1% (86.8 to 87.5) PLR: 8.07 (7.37 to 8.84) vs. 6.10 (5.90 to 6.30) NLR: 0.46 (0.42 to 0.50) vs. 0.25 (0.23 to 0.26) **Test characteristics (95% CI) of tGCS score <14 elders vs. adults** *Mortality* Sensitivity: 59.2 (56.1 to 62.3) vs. 88.2 (86.7 to 89.5) Specificity: 85.1% (84.6 to 85.7) vs. 76.9% (76.4 to 77.3) PLR: 3.99 (3.74 to 4.26) vs. 3.81 (3.72 to 3.91) NLR: 0.48 (0.44 to 0.52) vs. 0.15 (0.14 to 0.17) *TBI* Sensitivity: 42.7% (40.7 to 44.7) vs. 65.0% (63.7 to 66.3) Specificity: 86.8% (86.3 to 87.4) vs. 80.0% (79.6 to 80.5) PLR: 3.24 (3.04 to 3.46) vs. 3.26 (3.16 to 3.35) NLR: 0.66 (0.64 to 0.68) vs. 0.44 (0.42 to 0.45)

Author, Year	Discrimination or Calibration	Risk of Bias
Caterino, *et al*., 2011	NR	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N
Caterino, *et al.*, 2011 Continued					
Johnson and Krishnamurthy, 1996	Retrospective cohort	Children seen by the neurosurgical service at the Children's Hospital in Washington D.C. during 1985 to 1988.	Age (mean, years): 7.33 (SD 5.08 Male: NR Race: NR GCS (mean): 13.37 (SD (3.32) GCS score ≤8: 6.7% ISS (mean): 10.22 (SD 9.93) TS (mean): 14.31 (SD 2.75) Revised TS (mean): 7.17 (SD 1.46) Arrived intubated: 0.9% Mortality: 1.9% PICU LOS (mean, days): 3.71 (SD 7.85) *Mechanism of injury* -MVA: 45.7% -Falls: 32.2% -Abuse: 2.5% -Assault: 8.3% -Struck by object: 7.6 -Other: 3.7%	USA, Washington D.C. Urban, Children's hospital Level 1 trauma center 1985 to 1988	841

Author, Year	Outcomes	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Caterino, *et al.*, 2011 Continued						
Johnson and Krishnamurthy, 1996	Mortality	tGCS	Senior neurosurgical resident performed assessment within 30 minutes of arrival to trauma center	Only diagnostic accuracy reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Caterino, *et al.*, 2011 Continued		**Neurosurgical intervention** Sensitivity: 49.7% (42.6 to 56.9) vs. 74.9% (71.2 to 78.4) Specificity: 82.8% (82.2 to 83.4) vs. 73.9% (73.5 to 74.4) PLR: 2.89 (2.51 to 3.34) vs. 2.88 (2.74 to 3.02) NLR: 0.61 (0.53 to 0.70) vs. 0.34 (0.30 to 0.39) **Intubation** Sensitivity: 66.3% (62.2 to 70.1) vs. 84.0% (82.7 to 85.2) Specificity: 84.2% (83.6 to 84.8) vs. 79.0% (78.6 to 79.5) PLR: 4.20 (3.9 to 4.5) vs. 4.01 (3.91 to 4.11) NLR: 0.40 (0.36 to 0.45) vs. 0.20 (0.19 to 2.20)
Johnson and Krishnamurthy, 1996	NR	**Test characteristics (95% CI)* of tGCS score <13** Sensitivity: 100% (79.41 to 100) Specificity: 85.58% (82.99 to 87.90) PLR: 6.93 (5.87 to 8.19) NLR: 0 PPV: 11.85% (6.93 to 18.53) NPV: 100% (99.48 to 100)

Author, Year	Discrimination or Calibration	Risk of Bias
Caterino, *et al.*, 2011 Continued		
Johnson and Krishnamurthy, 1996	NR	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N
Leijdesdorff, *et al.,* 2014	Retrospective cohort	Trauma patients with severe TBI (AIS codes for intracranial injury and skeletal injury with severity code ≥3). Exclusion: patients deceased at the scene of the accident and not admitted to the hospital.	Age (mean, years): 45.2 (SD 23.2) Male: 61.2% Race: NR ISS (mean): 18.3 (SD 9.2) ISS <16: 40.9% ISS ≥16: 58.8% In hospital mortality: 8.1% *Trauma type* -Brainstem: 1.2% -Cerebellum: 7% -Cerebrum: 86.2% -Contusion: 51.8% -Hemorrhage: 54.7% -Skull fracture: 43.8% -Skull base fracture: 25% -Skull vault fracture: 23.9% GCS score ≤13: 25%	Netherlands Urban Level I, II, and III trauma centers 2003 to 2011	1,250

Author, Year	Outcomes	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Leijdesdorff, *et al.,* 2014	Mortality	tGCS	NR	Data missing for n=3 patients with severe TBI	**Crude OR (95% CI) for risk of in-hospital mortality with GCS score >12 as reference** GCS score 8–12: 5.57 (2.36 to 13.15) GCS score <8: 28.09 (13.95 to 56.58) GCS score unknown: 5.20 (2.44 to 11.07)	Multivariate logistic regression analysis, age, GCS, and ISS independent prognostic factors for mortality

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Leijdesdorff, *et al.,* 2014	**Adjusted OR (95% CI) for risk of in-hospital mortality with GCS score >12 as reference** GCS score 8–12: 3.89 (1.61 to 9.40) GCS score <8: 19.24 (9.11 to 40.62) GCS score unknown: 4.46 (2.05 to 9.68)	**Test characteristics (95% CI)* tGCS score ≤12 vs. tGCS score <8** Sensitivity: 87.2% (77.7 to 93.7) vs. 71.8% (60.5 to 81.4) Specificity: 70.7% (67.5 to 73.7) vs. 85.9% (83.4 to 88.1) PLR: 2.97 (2.60 to 3.40) vs. 5.10 (4.11 to 6.32) NRL: 0.18 (0.10 to 0.32) vs. 0.33 (0.23 to 0.47) PPV: 21.0% (16.7 to 25.8) vs. 31.3% (24.6 to 38.6) NPV: 98.4% (97.1 to 99.2) vs. 97.1% (95.7 to 98.2)

Author, Year	Discrimination or Calibration	Risk of Bias
Leijdesdorff, *et al*., 2014	NR	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N
Majdan, *et al.*, 2015	Prospective cohort	All patients with GCS score ≤12 within 48 hours after the accident and/or AIS head score >2 were included in the study.	Age (median, years): 50 (IQR: 29-69) Male: 72% Race: NR ISS (median): 26 (IQR: 17–41) 6-month mortality: 39% Intubated in out-of-hospital setting: 55% *Trauma type* -Traumatic subarachnoid hemorrhage: 59% -Epidural hematoma: 17% -Subdural hematoma hypotension: 54% -Hypotension: 11% -Hypoxia: 19% *Mechanism of injury* -Traffic accident: 39% -Same-level fall: 28% -High-level fall: 12% -Violence: 2% -Other cause: 16% -Unknown cause: 2% Head trauma: 100% GCS score ≤12: 100% Filed GCS (median): 6 (IQR: 3-11)	Austria Urban International Neurotrauma Research Organization (INRO) In the field and hospital 2009 to 2012	445

Author, Year	Outcomes	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Majdan, *et al.*, 2015	Prognostic performance of mGCS in the field and at admission Intubation 6 month mortality Extended Glasgow Outcome Scale at hospital discharge and at 6 months	mGCS, tGCS	Physicians or paramedics in the field and by an anesthesiologist at admission	No specific measures for interrater disagreements	**Reported OR (95% CI) of field vs. admission mGCS on 6-month mortality, with mGCS score=6 as reference** mGCS score=1: 23.2 (7.7 to 69.4) vs. 4 (1.7 to 9.1) mGCS score=2: 41.1 (6.3 to 267.9) vs. 2.5 (0.4 to 17.6) mGCS score=3: 5.9 (1.6 to 21.5) vs. 1.5 (0.4 to 6.1) mGCS score=4: 4.4 (1.4 to 14.4) vs. 1.2 (0.4 to 3.9) mGCS score=5: 6.2 (1.9 to 20.3) vs. 1.2 (0.4 to 3.8)	Logistic regression models fit using GCS motor score and pupillary reactivity in field and at admission as single predictors, 6-month mortality as response variable

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Majdan, *et al.*, 2015	**Reported OR (95% CI of field vs. admission mGCS on 6-month mortality, with mGCS score ≤5 as reference** *Adjusted for age and pupillary reaction* mGCS score=1: 5.3 (2.5 to 11.4) vs. 2.9 (1.4 to 6.1) mGCS score=2: 15.6 (2.2 to 108) vs. 1.9 (0.2 to 21.6) mGCS score=3: 1.4 (0.47 to 4.4) vs. 1.5 (0.6 to 7.2) mGCS score=4: 1.8 (0.74 to 4.2) vs. 0.8 (0.2 to 2.8) *Adjusted for age, CT classification, hypoxia, hypotension, traumatic subarachnoid hemorrhage, epidural hematoma, and pupillary reaction* mGCS score=1: 3 9 (1.1 to 8.7) vs. 1.29 (0.45 to 3.7) mGCS score=2: 53.2 (2.7 to 1040) vs. unable to report due to singularity mGCS score=3: 0.63 (0.14 to 2.8) vs. 3.1 (0.49 to 19.1) mGCS score=4: 0.44 (0.11 to 1.7) vs. 0.8 (0.17 to 3.8)	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Majdan, *et al.*, 2015	Univariable AUC of mGCS to predict 6-month mortality field vs. admission: 0.754 vs. 0.635	Moderate

Author, Year	Study Design	Eligibility Criteria	Population Characteristics	Setting and Dates Assessments Performed	N
Nesiama, *et al.*, 2012	Retrospective cohort	Patients 5 to 18 years old with blunt TBI, transported by the Milwaukee County EMS (MCEMS) System to the Children's Hospital of Wisconsin (CHW), with data on out-of-hospital and ED GCS scores. Exclusion: children without both scores documented, preexisting neurological illness, history of bleeding disorder, penetrating head trauma, and those transferred from other centers.	Age (mean, years): 11 (SD 4.0) Male: 69% White: 33.5% Black: 48.6% Hispanic: 11.9% Asian: 2.7% Other race/ethnicity: 3.2% Trauma type: 100% TBI GCS score ≤13: 27%	USA, Wisconsin Urban Children's Hospital of Wisconsin (CHW) trauma registry Level 1 trauma center 2000 to 2005	185
Reisner, *et al.*, 2014	Retrospective cohort	Patients with available GCS score and at least one reliable high-mortality TBI value in the initial 15 minutes of transportation.	Age (mean, years): 38 Male: 72% Race: NR Survived to hospital discharge: NR Intubated: 22% *Trauma type* -Blunt injury: 87% -Penetrating injury: 11% Head trauma: 100% GCS <15: 46% 24-h PRBC volume $\geq$ 1: 19% 24-h PRBC volume $\geq$ 1 and hemorrhagic injury: 9% 24-h PRBC volume $\geq$ 4: 9% 24-h PRBC volume $\geq$ 4 and hemorrhagic injury: 6% ICP monitoring or craniotomy: 5% Mortality: 7% Intubation: 22% Head AIS 3: 10% Head AIS 4: 7% Head AIS ≥5: 4%	USA, Houston Urban Trauma Vitals database system, U.S. Army Institute of Surgical Research Level 1 trauma center 2001 to 2007	1,158

Author, Year	Outcomes	Glasgow Coma Scale Used	Personnel Performing Assessments and Where Assessed	Potential Confounders	Results: Univariate	Method for Constructing Multivariate Model
Nesiama, *et al.*, 2012	Mortality GOS score	tGCS	Out-of-hospital firefighter emergency medical technicians and paramedics in the field, and providers, in the ED	Only diagnostic accuracy reported; no adjustment performed	NR	NR
Reisner, *et al.*, 2014	Mortality AIS	tGCS	EMS paramedics and critical care flight nurses	Only discrimination reported; no adjustment performed	NR	NR

Author, Year	Results: Multivariate	Measures of Diagnostic Accuracy
Nesiama, *et al.*, 2012	NR	**Test characteristics (95% CI),* out-of-hospital vs. ED tGCS score ≤13** *Mortality* Sensitivity: 80.0% (28.4 to 99.5) vs. 80.0% (28.4 to 99.5) Specificity: 74.4% (67.4 to 80.6) vs. 76.0% (68.3 to 82.7) PLR: 3.13 (1.89 to 5.18) vs. 3.34 (1.97 to 5.64) NLR: 0.27 (0.05 to 1.55) vs. 0.26 (0.05 to 1.52) PPV: 8.0% (2.2 to 19.2) vs. 10.3% (2.9 to 24.2) NPV: 99.3% (95.9 to 100) vs. 99.1% (95.1 to 100) *GOS score of severe disability* Sensitivity: 39.7% (27.0 to 53.4) vs. 39.6% (25.8 to 54.7) Specificity: 80.7% (72.2 to 87.5) vs. 80.2% (70.8 to 87.6) PLR: 2.05 (1.26 to 3.36) vs. 2.00 (1.17 to 3.41) NLR: 0.75 (0.60 to 0.94) vs. 0.75 (0.59 to 0.97) PPV: 51.1% (35.8 to 66.3) vs. 50.0% (33.4 to 66.6) NPV: 72.4% (63.8 to 80.0) vs. 72.6% (63.1 to 80.8)
Reisner, *et al.*, 2014	NR	NR

Author, Year	Discrimination or Calibration	Risk of Bias
Nesiama, *et al.*, 2012	NR	Moderate
Reisner, *et al.*, 2014	**AUC (95% CI), any tGCS vs. GCS <15 vs. GCS ≤8** Head AIS ≥5: 0.90 (0.86 to 0.93) vs. 0.80 (0.76 to 0.85) vs. 0.59 (0.52 to 0.66) All-cause mortality: 0.85 (0.80 to 0.90) vs. 0.82 (0.77 to 0.86) vs. 0.65 (0.59 to 0.70) Head AIS ≥5/procedure: 0.89 (0.86 to 0.92) vs. 0.78 (0.73 to 0.82) vs. 0.55 (0.49 to 0.62)	Moderate

Please see Appendix C. Included Studies for full study references.

AIS=Abbreviated Injury Scale; AUC=area under the receiver operating characteristics curve; BP=blood pressure; CHW= Children's Hospital of Wisconsin; CI=confidence interval; CT= computed tomography; ED=emergency department; EMS=emergency medical services; GCS=Glasgow Coma Scale; GOS=Glasgow Outcome Scale; ICP=intracranial pressure; INRO= International Neurotrauma Research Organization; IQR=interquartile range; ISS=injury severity score; LOS=length of stay; MCEMS= Milwaukee County Emergency Medical Services; mGCS=motor scale of GCS; MVA= motor vehicle accident; n= number; NLR= negative likelihood ratio; NPV= negative predictive value; NR=not reported; OR= odds ratio PICU= pediatric intensive care unit; PLR= positive likelihood ratio; PPV= positive predictive values; PRBC=packed red blood cells; SD= standard deviation; TBI=traumatic brain injury; tGCS=total GCS; TS= Trauma Scores; vs.= versus

*Calculated

Appendix J. Studies of Reliability and Ease of Use

Author, Year	Study Design Objective	GCS Used Measures Assessed	Type of Assessment or Intervention	Setting of Assessment	Personnel Performing Assessments	N
Arbabi, *et al.,* 2004	Cross-sectional study comparing out-of-hospital and ED data.	tGCS	Field vs. ED agreement	2 Level 1 Trauma Centers (1 urban) in the USA with actual patient data. Conducted from January 1994 to December 2001	Not reported	Eligible patients: 19,409 Analyzed patients: 7,823 (had field and ED GCS data)
Bledsoe, *et al.,* 2015	Cross-sectional study to evaluate tGCS and its components in standardized video vignettes by EMS personnel in educational settings.	tGCS and mGCS (taken from tGCS)	Ease of use: correct scoring vs. expert scoring (2 board certified neurologists)	Setting NR, providers were from Nevada, Texas, Florida, and Minnesota, and provided simulation of 10 standardized video vignettes. Conducted from January to March in 2013	AEMT CCP EMT Nurse Paramedic Physician Resident	217 Providers AEMT: 25 CCP: 6 EMT: 19 Nurse: 82 Paramedic: 43 Physician: 10 Resident: 22 Not stated: 10 2,084 completed observations

Author, Year	Eligibility Criteria	Provider Characteristics	Patient Characteristics	Outcomes
Arbabi, *et al.*, 2004	Adult, ≥18 years old, trauma patients. Exclusion: transfers from an outside hospital, burn patients	Not reported	Not reported separately for subset with GCS data	Agreement on GCS category (3-8, 9-13, 14-15)
Bledsoe, *et al.*, 2015	Convenience sample of attendees at educational setting.	Age (mean, years): 36.2 Male: 53.0% Race: NR *Years of experience* <1 year: 22.7% 1 to 10 years: 49.8% >10 years: 34.6% Not stated: 5.1%	Vignettes used, patient characteristics NR. *Number of vignettes at each tGCS Score* 3: 1 5: 2 9: 1 11: 2 13: 1 14: 2 15: 1	Accuracy: percent correct score

Author, Year	Results	Risk of Bias
Arbabi, *et al.*, 2004	**Agreement between field vs. ED assessment, no significant differences** Same GCS category: 82% (6,382) Higher/improved category in ED: 3% (229) Lower/worsened category in ED: 15% (1,212)	High
Bledsoe, *et al.*, 2015	**Correct Scores (95% CI) tGCS vs. mGCS** Total across all vignettes and participants: 33.1% (30.2 to 36.0) vs. 59.8% (58.1 to 61.5) Highest percent correct by provider (in residents for both measures): 51% (44.5 to 57.5) vs. 78% (71. to 84.5) Lowest percent correct by provider: 29% (10.3 to 47.7) for nurses vs. 51% (43.7 to 58.3) for EMTs **Other outcomes** -9.2% assigned values that did not exist -Accuracy was lowest for tGCS scores of 9 to 13 (<20%; data taken from figure values NR)	Low

Author, Year	Study Design Objective	GCS Used Measures Assessed	Type of Assessment or Intervention	Setting of Assessment	Personnel Performing Assessments	N
Dinh, *et al.,* 2013	Cross-sectional study comparing EMS and ED vital signs.	tGCS	Field vs. ED agreement	Major trauma center in Sydney, Australia with actual field data. Conducted from January 2011 to October 2012	NR	Eligible patients: 1,265 Analyzed patients: 1,181

Author, Year	Eligibility Criteria	Provider Characteristics	Patient Characteristics	Outcomes
Dinh, *et al.,* 2013	Patients ≥15 year old transported directly from the scene of injury via ambulance Exclusion: transfer from another hospital, transported by aeromedical retrieval, missing EMS data, inconsistent arrival time, or no vital signs at scene or ED.	None reported	Age (mean, years): 43 (SD 20) Male: 70% Race: NR Prehospital intubation: 1.2% Penetrating trauma: 7% GCS score ≤13: 10% ISS score >15: 14.5% Mortality: 10.5%	Agreement using intra class coefficients and Bland-Altman plots

Author, Year	Results	Risk of Bias
Dinh, *et al*., 2013	Intra class correlation coefficient: 0.74 (95% CI, 0.37 to 1.12) Bland- Altman plot: 96.3% of out-of hospital-EO pairs within predetermined range of acceptability of 3 points	Moderate

Author, Year	Study Design Objective	GCS Used Measures Assessed	Type of Assessment or Intervention	Setting of Assessment	Personnel Performing Assessments	N
Feldman, *et al.,* 2015	RCT to assess ability of EMS personal to correctly score the tGCS and its components and to determine if scoring improves with the use of a scoring aid.	tGCS and mGCS (taken from tGCS)	Ease of use: correct scoring with a scoring aid vs. scoring without a scoring aid	Setting NR, providers were from an urban, academic Level 1 trauma center in Ohio, provided with simulation of 9 standardized written scenarios. Conducted from April to June in 2013	EMTs Paramedics	Screened: 261 Enrolled: 180 Analyzed: 178
Heim, *et al.,* 2009	Cross-sectional survey to assess knowledge of GCS and scoring of a clinical scenario.	tGCS and mGCS (taken from tGCS)	Ease of use: knowledge and correct scoring of a clinical case	16 helicopter bases in Switzerland given simulated clinical scenario. Conducted in May 2004	Trained air rescue physicians	Eligible provider: 130 Completed provider: 103 Analyzed provider: 103

Author, Year	Eligibility Criteria	Provider Characteristics	Patient Characteristics	Outcomes
Feldman, *et al.,* 2015	EMTs or paramedics who had transported a patient to the ED and were >18 years old.	Age (mean, years): 36 (SD 9) Male: 88.2% White: 83.1% Black: 14.5% American Indian/Alaskan Native: 1.1% Asian/Pacific Islander: 0.6% Other race: 0.6% Basic EMT: 46.9% Intermediate EMT: 1.1% Paramedic: 52.0% Experience (mean, years): 12 (SD 4)	Scenarios used, patient characteristics NR. Mild, moderate, and severe TBI; no other information provided.	Accuracy: complete agreement Score within 1 point
Heim, *et al.,* 2009	Based at 1 of 16 participating helicopter bases, with prior training in air rescue, which included registrars (in training), fellows, consultants (specialist in hospital), or private practices.	**Level** Registrar: 38.8% Fellow: 35.0% Consultant: 7.7% Private practice: 18.5% **Specialty** Anesthesia: 61.2% General medicine: 18.5% Internal medicine: 16.5% Other: 3.9%	Patient in scenario has TBI, no other details reported	GCS scoring of case Knowledge of GCS components

Author, Year	Results	Risk of Bias
Feldman, *et al.*, 2015	**Accuracy tGCS vs. mGCS** All scenarios: 41.0% vs. 50.6% Mild TBI scenarios: 54.2% vs. 74.6% Moderate TBI scenarios: 28.8% vs. 35.6% Severe TBI scenarios: 40.0% vs. 41.7% **Accuracy tGCS with aid vs. tGCS without aid** All scenarios: 25.0% vs. 56.7%; difference: 31.9% (95% CI, 18.3 to 45.6) Mild TBI scenarios: 44.8% vs. 63.3%; difference: 14.3% (95% CI, -6.1 to 34.6) Moderate TBI scenarios: 10.3% vs. 46.7%; difference: 31.4% (95% CI, 10.5 to 52.3) Severe TBI scenarios: 20.0% vs. 60.0%; difference: 40.0% (95% CI, 16.9 to 63.1) **Accuracy mGCS with aid vs. mGCS without aid** All scenarios: 30.7% vs. 70.0%; difference: 39.7% (95% CI, 26.2 to 53.1) Mild TBI scenarios: 58.6% vs. 90.0%; difference: 29.3% (95% CI, 6.1 to 52.5) Moderate TBI scenarios: 20.7% vs. 50.0%; difference: 40.0% (95% CI, 17.4 to 62.6) Severe TBI scenarios: 13.3% vs. 70.0%; difference: 56.7% (95% CI, 36.2 to 77.1)	Low
Heim, *et al.*, 2009	**Incorrect (correct) scores** tGCS: 36.9% (63.1%) mGCS: 27.2% (72.8%) Registrars (trainees): 47.5% Fellow: 33.3% Consultant: 0% Private practice: 36.8% Specialty was not associated with difference in errors (anesthesia, internal medicine, general practice, other) All respondents knew the GCS Incorrectly named components: 5.8% Attributed wrong number of points: 3.9% Knew minimum was 3: 100% Knew maximum was 15: 99%	High

Author, Year	Study Design Objective	GCS Used Measures Assessed	Type of Assessment or Intervention	Setting of Assessment	Personnel Performing Assessments	N
Holmes, *et al.*, 2005	Cross-sectional study comparing the pediatric GCS in children ≤2 years and the standard GCS in children >2 years.	tGCS and mGCS (taken from tGCS)	Interrater reliability	Level 1 trauma center in California using actual patient data. Conducted from 1998 to 2001	Faculty emergency physicians	5% convenience sample of 2,043 ~102 (actual number NR)
Kerby, *et al.*, 2007	Cross-sectional study of linkage of EMS and trauma registry data.	tGCS and mGCS (taken from tGCS)	Field vs. ED agreement	Field and ED assessments of actual patient registry data linked from one Level 1 trauma center in Alabama, USA. Conducted from January 2000 to June 2003	EMTs all levels ED personnel, not specified	Eligible patients: 6,448 Enrolled patients (data in EMS and ED): 3,669 Analyzed patients (had both field and ED GCS scores available): 3,052

Author, Year	Eligibility Criteria	Provider Characteristics	Patient Characteristics	Outcomes
Holmes, *et al.*, 2005	Pediatric patients <18 years with blunt head trauma presenting to the ED. Exclusion: children with trivial head trauma defined by falls from ground level or trauma resulting from walking or running into stationary objects if the only abnormal finding was a scalp laceration or abrasion, and children transferred who had undergone CT scanning before transfer.	None reported	Not reported for the 5% used for interrater reliability	Weighted kappa
Kerby, *et al.*, 2007	Patients in trauma registry who were >19 years and transported to ED with blunt or penetrating injury. Exclusion: transfers from other hospitals.	None reported	Age (mean, years): 38.9 (SD 15.7) Male: 68.6% White: 56.9% Black: 38.5% Other race: 4.6% Field intubation: 1.7% Blunt trauma: 81.0% Penetrating trauma: 19.0% Alcohol intoxication: 22.9% Positive illicit drugs: 11.4% ISS (mean): 10.6 (SD 9.1) Mortality: 2.7%	Weighed kappa

Author, Year	Results	Risk of Bias
Holmes, *et al.*, 2005	**Weighted kappa (95% CI) across raters** tGCS: 0.77 (0.38 to 1.00) for ≤2 year olds and 0.91 (0.75 to 1.00) for >2 year olds mGCS: 0.91 (0.75 to 1.00) for ages combined	High
Kerby, *et al.*, 2007	**Weighed kappa (95% CI) tGCS vs. mGCS** Overall: 0.53 (0.48 to 0.58) vs. 0.48 (0.43 to 0.53) Transport time of <20 minutes: 0.56 (0.50 to 0.61) vs. 0.52 (0.46 to 0.57) Transport time of ≥20 minutes: 0.42 (0.32 to 0.52) vs. 0.35 (0.25 to 0.46) Examination of changes in blood pressure/hemodynamic stability show improvement from prehospital to ED suggesting difference may be primarily due to patient improvement.	High

Author, Year	Study Design Objective	GCS Used Measures Assessed	Type of Assessment or Intervention	Setting of Assessment	Personnel Performing Assessments	N
Lane, *et al.,* 2002	Pre-post study to assess the impact of a teaching video on correct scoring of the tGCS.	tGCS	Ease of use: improvement in correct scoring	Setting NR, providers were from the USA, Mid Atlantic region, provided with simulations of 4 scenarios in 60-second videos. Conducted in 2000, no specific dates reported	EMT Paramedic students	75 (pre-post)
Lane, *et al.,* 2002	Pre-post study to assess the impact of a teaching video on correct scoring of the tGCS, with randomized assignment to use of GCS reference cards.	tGCS	Ease of use: improvement in correct scoring	Setting NR, providers were from the USA, Mid Atlantic region, provided with simulations of 4 scenarios in 60-second videos. Conducted in 2000, no specific dates reported	EMT Paramedic students	46 (pre-post but 2 cohorts with and without cards)
Nesiama, *et al.,* 2012	Cross-sectional study to determine agreement between the out-of-hospital tGCS and the ED tGCS.	tGCS	Field vs. ED agreement	USA, Wisconsin Urban Children's Hospital of Wisconsin trauma registry Level 1 trauma center 2000 to 2005	Advanced Life Support paramedic crew leader ED staff (usually physician or nurse)	Screened: 427 Eligible: 377 Included: 196 Analyzed: 185

Author, Year	Eligibility Criteria	Provider Characteristics	Patient Characteristics	Outcomes
Lane, *et al.*, 2002	Attendees at annual EMS meeting.	Basic EMT: 55% Paramedic EMT: 35% RN: 7% Other level of training: 3% Male: NR Race: NR Years of service (mean): 13.0 (95% CI, 10.8 to 15.09) Urban setting: 32% Rural setting: 24% Suburban setting: 44% Participated in trauma course within 5 years: 62.7%	Scenarios used, patient characteristics NR. *Correct tGCS and mGCS score used* Scenario 1: 15 and 6 Scenario 2: 8 and 4 Scenario 3: 5 and 3 Scenario 4: 15 and 6	Accuracy: percent correct pre- and post-video
Lane, *et al.*, 2002	Paramedic class participants.	**Group 1 (with reference cards) vs. group 2 (without reference cards)** Basic EMT: 100% vs. 100% Years of service (mean): 5.2 (95% CI, 2.92 to 7.39) vs. 3.2 (95% CI, 2.21 to 4.29) Participated in trauma course within 5 years: 100% vs. 84.6%	Scenarios used, patient characteristics NR. *Correct tGCS and mGCS score used* Scenario 1: 15 and 6 Scenario 2: 8 and 4 Scenario 3: 5 and 3 Scenario 4: 15 and 6	Accuracy: percent correct pre- and post-video
Nesiama, *et al.*, 2012	Patients 5 to 18 years old with blunt TBI, transported by the Milwaukee County EMS System to the Children's Hospital of Wisconsin, with data on out-of-hospital and ED GCS scores. Exclusion: children without both scores documented, preexisting neurological illness, history of bleeding disorder, penetrating head trauma, and those transferred from other centers.	None reported	Age (mean, years): 11 (SD 4.0) Male: 69% White: 33.5% Black: 48.6% Hispanic: 11.9% Asian: 2.7% Other race/ethnicity: 3.2% Trauma type: 100% TBI GCS score ≤13: 27%	Out-of-hospital and ED GCS scores agreement

Author, Year	Results	Risk of Bias
Lane, *et al.,* 2002	**Accuracy pre vs. post for tGCS** All 4 scenarios together: 14.7% vs. 64.0%; RR 4.36 (95% CI, 2.46 to 7.73) Scenario 1: 76.0% vs. 98.7; RR 1.30 (95% CI, 1.14 to 1.48) Scenario 2: 36.0% vs. 74.7; RR 2.07 (95% CI, 1.49 to 2.88) Scenario 3: 45.3% vs. 94.7%; RR 2.09 (95% CI, 1.62 to 2.69) Scenario 4: 64.0% vs. 89.3%; RR 1.40 (95% CI, 1.16 to 1.68)	Moderate
Lane, *et al.,* 2002	**Multivariate analysis for associations with correct scores for post video assessments, standardized beta** Participation in prehospital trauma course: 0.429, p=0.001 Years of training and level of service were not significant No significant associations noted for pre video assessments	Moderate
Nesiama, *et al.,* 2012	**Kappa (95% CI) tGCS:** 0.69 (0.57 to 0.81) **Weighed kappa (95% CI) tGCS:** 0.74 (0.63 to 0.85) Pearson correlation 0.841 Concordance correlation 0.839 ED scores tended to be higher than prehospital but the difference was very small (0.4371) on average and there was no difference in the medians.	Moderate

Author, Year	Study Design Objective	GCS Used Measures Assessed	Type of Assessment or Intervention	Setting of Assessment	Personnel Performing Assessments	N
Takahashi, *et al.*, 2011	Cross-sectional study evaluating agreement between raters and accuracy of each scale of the GCS.	tGCS only	Interrater reliability	10 medical facilities including 4 university hospitals in Japan provided with actual patient data. Conducted from April 2007 to April 2008	Physicians Nurses Residents Paramedics Medical students	Patients: 495 -TBI patients: 66 (13.3%), for which interrater reliability was assessed Total raters: 33 -Physicians: 15 -Nurses: 8 -Residents: 4 -Paramedics: 3 -Medical students: 3

Author, Year	Eligibility Criteria	Provider Characteristics	Patient Characteristics	Outcomes
Takahashi, *et al.*, 2011	Patients ages 5 to 99 years. Exclusion: patients for whom the evaluation posed a risk of aggravating their condition due to time loss.	None reported other than profession	Not reported separately for TBI **Overall** Age (mean, years): 58.6 (SD 22.4) Male: 52.7% Race: NR	Weighted kappa

Author, Year	Results	Risk of Bias
Takahashi, *et al.*, 2011	Weighted kappa (95% CI) across raters TBI patients only: 0.74 (0.71 to 0.76)	Moderate

Please see Appendix C. Included Studies for full study references.

AEMT= advanced emergency medical technician; CCP= critical care paramedic; CI=confidence interval; CT= computed tomography; ED= emergency department; EMS= emergency medical services; EMT= emergency medical technician; GCS= Glasgow Coma Scale; ISS=injury severity score; mGCS= motor Glasgow coma scale; n= number; NR=not reported; RCT= randomized controlled trial; RN= registered nurse; RR= relative risk; SD= standard deviation; TBI=traumatic brain injury; tGCS= total Glasgow Coma Scale; vs.= versus

Appendix K. Quality Assessment of Studies of Predictive Utility

Author, Year	Study Participation	Study Attrition	Prognostic Factor Measurement	Outcome Measurement	Study Confounding	Statistical Analysis and Reporting	Risk of Bias
Acker, *et al.*, 2014	Low	Unclear, attrition not reported.	Low, 110/2,341 excluded due to GCS missing data.	Unclear, details on methods for measuring outcomes not reported.	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Moderate
Al-Salamah, *et al.,* 2004	Low	Low, 20/815 excluded due to missing data from trauma registry.	Low, 20/815 excluded due to missing data from trauma registry.	Unclear, details on methods for measuring outcomes not reported.	Not applicable, study reports diagnostic accuracy and discrimination only.	Not applicable, study reports diagnostic accuracy and discrimination only.	Moderate
Beskind, *et al.* , 2014	Low	Low	Moderate, approximately 25% missing GCS data, multiple imputation performed.	Low	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Low
Brown, *et al.*, 2014	Low	Unclear, attrition not reported.	Moderate, approximately 40% missing GCS data, multiple imputation performed.	Low (NTDB)	Low	Low	Moderate
Caterino and Raubenolt, 2012	Low	Unclear, attrition not reported.	High, approximately 25% missing GCS data, excluded from analysis.	Low	Not applicable, study reports diagnostic accuracy and discrimination only.	Not applicable, study reports diagnostic accuracy and discrimination only.	Moderate
Caterino, Raubenolt, and Cudnik, 2011	Unclear	Unclear	Unclear	Low	Low	Low	Moderate
Cicero and Cross, 2013	Low	Low, between 2% and 4% missing data for outcomes.	High, approximately 51% excluded due to missing GCS data.	Low (NTDB)	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Moderate
Corrigan, *et al.*, 2014	Low	Unclear, approximately 50% missing data (either GCS or outcomes).	Unclear, approximately 50% missing data (either GCS or outcomes).	Low (NTDB)	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Moderate
Davis, *et al.*, 2006	Low	Moderate, 30% missing outcome data.	Unclear. Missing GCS data not reported.	Unclear, details on methods for measuring outcomes not reported.	Not applicable, study report discrimination only.	Not applicable, study reports discrimination only.	Moderate
Eken, *et al.*, 2009	Low	Low, <2% missing data for outcomes.	Unclear, missing GCS data not reported.	Unclear, details on methods for measuring outcomes not reported.	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Moderate
Gill, *et al.*, 2005	Low	Low, <1% missing data for outcomes.	Low, 216/8,648 excluded due to missing data.	Low	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Low

Author, Year	Study Participation	Study Attrition	Prognostic Factor Measurement	Outcome Measurement	Study Confounding	Statistical Analysis and Reporting	Risk of Bias
Gill, *et al.,* 2006	Low	Low, <1% missing data for outcomes.	Low, 1415/8,648 excluded due to missing GCS data.	Low	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Low
Haukoos, *et al.,* 2007	Low	Low	Low, 583/21,753 excluded due to missing GCS data.	Low	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Low
Healey, *et al.,* 2003	Low	Unclear, attrition not reported.	Low, 1,926 missing GCS scores for 204,181 patients, excluded from analysis.	Low (NTDB)	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Low
Holmes, *et al.,* 2005	Low	Unclear, attrition not reported.	Unclear, missing GCS data not reported.	Low	Not applicable, study reports discrimination only.	Not applicable, study reports discrimination only.	Moderate
Johnson and Krishnamurthy, 1996	Low	Unclear, attrition not reported.	Unclear, missing GCS data not reported.	Low	Not applicable, study reports diagnostic accuracy only.	Not applicable, study reports diagnostic accuracy only.	Moderate
Leijdesdorff, *et al.,* 2014	Moderate	Low	Moderate	Low	Low	Moderate	Moderate
Majdan, *et al.,* 2015	Low	Unclear	Unclear	Unclear, not reported if data was validated.	Low	Low	Moderate
Nesiama, *et al.,* 2012	Unclear	Low	Moderate	Low	Unclear	Moderate	Moderate
Reisner, *et al.,* 2014	Unclear	Unclear	Unclear	Unclear	Low	Low	Moderate
Ross, *et al.,* 1998	Low	Unclear, attrition not reported.	High, 56% missing GCS data, excluded from analysis.	Unclear, details on methods for measuring outcomes not reported.	Not applicable, study reports diagnostic accuracy only.	Not applicable, study reports diagnostic accuracy only.	Moderate
Thompson, *et al.* , 2011	Low	Low, <1% missing data for outcomes.	Unclear, missing GCS data not reported.	Low	Not applicable, study reports diagnostic accuracy and discrimination only.	Not applicable, study reports diagnostic accuracy and discrimination only.	Moderate
Timmons, *et al,.* 2011	Low	Unclear, attrition not reported.	Unclear, missing GCS data not reported.	Low	Low	Low	Moderate
Van de Voorde, *et al.,* 2008	Low	Unclear, attrition not reported.	Unclear, missing GCS data not reported.	Unclear, details on methods for measuring outcomes not reported.	Not applicable, study reports diagnostic accuracy only.	Not applicable, stud reports diagnostic accuracy only.	Moderate

Please see Appendix C. Included Studies for full study references.

GCS= Glasgow Coma Scale; NTDB= National trauma Data Bank

Appendix L. Quality Assessments of Studies of Reliability and Ease of Use

Author, year	Assessment Type	Patient Selection	Index Tests	Reference Standard	Flow and Timing	Risk of Bias
Arbabi, *et al.,* 2004	Field vs. ED agreement	High	Unclear	Moderate	Unclear	High
Blesdsoe, *et al.,* 2015	Ease of use	Low	Not applicable	Moderate	Low	Low
Dinh, *et al.,* 2013	Field vs. ED agreement	Low	Unclear	Moderate	Low	Moderate
Feldman, *et al.,* 2015	Ease of use	Low	Not applicable	Moderate	Low	Low
Heim, *et al.,* 2009	Ease of use	High	Not applicable	Unclear	Moderate	High
Holmes, *et al.,* 2005	Interrater reliability	High	Unclear	Moderate	Unclear	High
Kerby, *et al.,* 2007	Field vs. ED agreement	High	High	Moderate	Unclear	High
Lane, *et al.,* 2002	Ease of use	High	Not applicable	Unclear	Low	Moderate
Nesiama, *et al.,* 2012	Field vs. ED agreement	Moderate	High	Low	Moderate	Moderate
Takahashi, *et al.,* 2011	Interrater reliability	High	Moderate	Moderate	Low	Moderate

Please see Appendix C. Included Studies for full study references.

ED= emergency department; vs.= versus