

Forskningsöversikt traumatologi

Katastrofmedicinskt centrum Linköping
Kunskapscentrum i traumatologi
på uppdrag av Socialstyrelsen

Bevakningsperiod 2 oktober 2021 - 1 oktober 2022



Sammanställt av Katastrofmedicinskt centrum, Linköping, Region Östergötland
Kunskapscentrum i traumatologi på uppdrag av Socialstyrelsen
Författarna svarar för innehåll och slutsatser.

Linköping, 31 oktober 2022

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Introduktion

Denna rapport utgör en forskningsöversikt över kunskapsområdet traumatologi och är en av tre årliga leveranser inom uppdraget som kunskapscentrum i katastrofmedicin genomför på uppdrag av Socialstyrelsen. I upphandlingsdokument (2.7-31938/2019) beskrivs leveransen som följer: Forskningsöversikten ska omfatta en sammanställning av vetenskaplig litteratur (artiklar i vetenskapliga tidskrifter och doktorsavhandlingar) samt presentationer på vetenskapliga möten och konferenser i urval som publicerats och/eller presenterats under föregående år. Baserat på ovanstående underlag ska Kunskapscentrumet identifiera och kortfattat sammanfatta forskningsresultat inom kunskapsområdet som direkt eller indirekt kan stärka den svenska hälso- och sjukvårdens katastrofmedicinska beredskap...Kunskapscentrumet ska även identifiera kunskapsluckor inom kunskapsområdet samt analysera och dra slutsatser gällande behov av framtida forskningsstudier som kan stärka den svenska hälso- och sjukvårdens katastrofmedicinska beredskap.

Metod

Urvalet av artiklar är baserat på det omvärldsbevakningsarbete som pågått under bevakningsperioden: kunskapscentrumet har identifierat källor med utgångspunkt i instruktion i upphandlingsdokument och på basen av publikationpraxis inom det svenska fältet och därutöver kontinuerligt inhämtat publikationer från databasen PubMed. För begränsning i ett brett forskningsfält har sökning i databas koncentrerats på trauma, traumavård och/eller injury och forskning som pågår i eller utgår från Sverige. Bevakning av utvalda tidskrifter inkluderar internationell forskning och riktlinjer från medicinska föreningar och ämnesföreträdare. Manuell bevakning av utvalda tidskrifter och tips från involverat nätverk kompletterade databassökning. Publikationer om akutvård och prehospital vård med inriktning på trauma, kvalitetssäkring och transfusion inkluderades. Specifika skadetyper associerade till ortopedi eller sportmedicin exkluderades.

PubMed-sökning

Söktermer : Trauma or trauma care or injury and Sweden
Trauma care and Sweden in Swedish

Bevakade tidskrifter

Prehospital and Disaster Medicine
European Journal of Trauma and Emergency Care
American Journal of Emergency Care
Journal of Trauma and Acute Care Surgery
Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine
Academic Emergency Medicine
Prehospital Emergency Care
Journal of American College of Surgeons
World Journal of Surgery
British Journal of Surgery
Annals of Surgery
JAMA Surgery
Resuscitation
Injury
Burns
Trauma

Resultat

Tematisk indelning av de 266 inkluderade publikationerna resulterade i 13 kategorier (se bilaga 1). Fem månader in i bevakningsperioden startade Ryssland ett anfallskrig mot Ukraina, vilket har lett till ökning i publikation av artiklar och editorials inom militärmedicin, militär-civil samverkan och lärdomar från fältet 'tactical medicine' för tillämpning i civilsjukvården. Till exempel innehöll Journal of Trauma and Acute Care Surgery's augustinumner 2022 ett supplement med artiklar om militärmedicin, blodförsörjning, trauma i fält, triage och militär-civilsamverkan.

Khorrman-Manesh A, Goniewicz K, Burkle FM, Robinson Y.
Review of Military Casualties in Modern Conflicts-The Re-emergence of Casualties From Armored Warfare.
Mil Med. 2022 Mar 28;187(3-4):e313-e321.

Khorrman-Manesh et al. gör en översikt av kunskapsläget för skadade från bepansrad krigsföring. Bepansrade fordon möjliggör mobilisering och koncentring av styrkor i moderna konflikter, men anti-tankvapen kan orsaka stor skada för soldater. Senaste utvecklingen i Ukraina och Georgien visar på att moderna konflikter innefattar tungt bepansrad krigsföring på mark, delvis på grund av graden på sofistikerade luftvärnssystem i bruk i dag. Olika typer av vapen mot bepansrade fordon orsakar olika typer av skador; minor leder till sprängskador i nedre extremiteter och bäcken, ryggskador och hjärnskador. Anti-tankmissiler orsakar spräng- och brännskador, hjärnskador och shellshock. Vanligaste orsaken till morbiditet och mortalitet förblir sprängskada och ballistisk skada, accelerations- och deaccelerationsskada, termisk skada och förgiftning, men med ökning i skottskada och brännskador observerade i moderna konflikter. Den medicinska utgången av bepansrad, mekaniserad krigsföring är skadade från detonationer och skottskador, där över 50 procent av skadade inte överlever 24 timmar utan adekvat vård, och i urban miljö drivs siffran upp av begränsade möjligheter till evakuering. Översikten uppmärksammar behovet av registerföring och data för att kunna skapa korrekta skade-estimeringar. Behovet av planering för evakuering och utbildad personal i alla led är avgörande för att kunna erbjuda vård för skadade i modern krigsföring.

Blödningskontroll

Sedan the Hartford Consensus (2013) och lanseringen av Stop the Bleed-kampanjen i USA har forskning genererats om allmänheten som första insatsaktör och utbildning i blödningskontrollerade tekniker. Säker prehospital tourniquet-applisering av lekmän och andra aktörer har undersökts och en studie genomförd för 'American Association for the Surgery of Trauma' (AAST) i USA och test av tourniquet med audiovisuell hjälp för lekmän lyfts i denna översikt.

Schroll, Rebecca ; Smith, Alison; Alabaster, Kelsey et al.
AAST multicenter prospective analysis of prehospital tourniquet use for extremity trauma.
Journal of Trauma and Acute Care Surgery: June 2022 - Volume 92 - Issue 6 - p 997-1004

AAST-studien inkluderade 1312 skadade (extremiteter) som behandlats på 29 AAST-traumacentrum mellan 2015 och 2020. Störst andel tourniqueter applicerades av akutsjukvården (46,9 procent), följt av polis eller räddningstjänst (30 procent); 0,4 procent applicerades av läkare eller sjuksköterska närvarande på skadeplats, och 0,6 procent av icke-medicinskt utbildad lekman; för 22 procent av applicerade tourniqueter fanns inte data för vem som satt förbandet. Improviserad tourniquet hade applicerats på 29 skador. Resultaten visar att prehospitalt applicerad tourniquet var associerat med tre gånger lägre risk för att den skadade anlände till sjukhus med cirkulationssvikt. I den aktuella studien fanns ingen signifikant skillnad i mängd transfunderade blodprodukter under de första 24 timmarna efter ankomst till sjukhus mellan tourniquet- och kontrollgrupperna. Ingen skillnad i förekomst av nervskada fanns, trots att frekvensen amputation var högre i tourniquet-gruppen (10,7 procent jämfört med kontrollgruppens 5,7 procent). Ingen skillnad i mortalitet fanns mellan grupperna, men tid till död var signifikant kortare i kontrollgruppen (2,3 dagar \pm 0,1 dag jämfört med tourniquet-gruppens 4,2 dagar \pm 0,2 dag). Studien är den största prospektiva utvärderingen av prehospital tourniquetapplisering, och den största multicenter-studien som genomförts på civil population.

Goolsby, Craig; Jonson, Carl-Oscar; Goralnick, Eric; et al.

The Untrained Public's Ability to Apply the Lay-person Audiovisual Assist Tourniquet vs a Combat Application Tourniquet: A Randomized Controlled Trial.

Journal of the American College of Surgeons: September 27, 2022 – Volume – Issue – 10.1097/XCS.0000000000000432

Ett av Stop the Bleed-kampanjens fem mål är att blödningskontrollkit ska innehålla just-in-time-instruktioner och visuella hjälpmedel för användning av utrustningen. I samarbete med forskare från bland annat UCAL Medical Center, Harvard Medical School och National Center for Disaster Medicine and Public Health Medicine i USA har forskare vid Katastrofmedicinskt centrum utvecklat en tourniquet som ska kunna användas av lekmän, utan träning. LAVA (Layperson Audiovisual Assist) tourniqueten ger en serie röst- och ljussignaler för att vägleda användaren. Förspänning av bandet sker automatiskt med hjälp av en fjäderbelastad inrullning, och LAVA-tourniqueten har ett greppvänligt vridhjul och en mätare som återkopplar på det tryck som användaren applicerar. Studiedeltagare för att testa tourniqueten rekryterades i Sverige på central allmän plats och på universitetsområdet i Linköping, och i USA på bland annat mässan som anordnas i samband med Boston Marathon. Resultaten visade att otränade lekmän fyra gånger oftare placerade LAVA-tourniqueten på rätt sätt jämfört med en klassisk tourniquet för militärt bruk. Deltagarna hade också positiva åsikter om användbarheten av LAVA, och applicerade LAVA-tourniqueten snabbare än den klassiska tourniqueten (stoppade den simulerade blödningen på kortare tid).

Skjutvapenvåld

Skjutvapenvåldet och dess följder för akut- och skjutvården har varit ett aktuellt ämne under bevakningsperioden. I maj 2022 skedde den värsta skolskjutningen sedan Sandy Hook (2012) i Uvalde, Texas där gärningsmannen dödade 19 barn och två vuxna, och skadade 17 personer. Septembernumret 2022 av The Journal of the Medical Association (JAMA) var ett temanummer tillägnat "Firearms and Violence". Chefsredaktörerna för JAMA inleder ledaren "The Unrelenting Epidemic of Firearm Violence" med att poängtera att

vapenvåldet är ett kliniskt, folkhälsomässigt, samhälleligt och politiskt problem i massiv skala.

Khoshnood AM.

Increasing rates of firearm violence in Sweden: a challenge for the emergency care. Eur J Emerg Med. 2022 Apr 1;29(2):95-96.

Koshnood diskuterar vapenvåldets konsekvenser för akutmedicinen i Sverige i en perspectives-artikel publicerad i European Journal of Emergency Medicine våren 2022. Enligt statistik från Brottsförebyggande rådet (BRÅ) har andra typer av dödligt våld minskat medan skjutvapenvåldet ökat, och andelen dråp med skjutvapen ökat från 20 procent till 40 procent sedan 2010-talet. Följder för akutvården ett är stort antal extremitetsskador och nedstängda akutmottagningar på grund av tillströmning av personer kopplade till fallet, och för ambulansvården osäkra arbetsförhållanden och ibland behov av poliseskort vid ankomst till skadeplats. Uppdatering kring rättsliga faktorer som omringar traumafall till följd av skjutvapenvåld är även aktuellt.

Lyons JG.

Epidemiology of ballistic fractures in the United States: A 20-year analysis of the Firearm Injury Surveillance Study. Injury. 2022 Nov;53(11):3663-3672.

I september 2022 publicerades en deskriptiv epidemiologisk studie på ballistiska skador i USA under en 20-årsperiod. Data från Firearm Injury Surveillance Study studerades för att identifiera vapeninducerade frakturer som behandlats på akutkliniker mellan 2000 och 2019. Störst andel skador fanns på nedre extremiteterna (45,9 procent av fallen), följt av övre extremiteter (32,8 procent). Diafysär femurfraktur var den mest frekventa skadan till antal (fraktur på mitten av lårbenet). Vanligaste orsaken bakom ballistisk skada var överfall. Under studietiden kunde en ökning i person-years at risk (PYR) observeras, från 15,7 år per 1 miljon invånare till 96,8.

Särskilda händelser

Gathen, M., Welle, K., Jaenisch, M. et al.
Are orthopaedic surgeons prepared? An analysis of severe casualties from the 2021 flash flood and mudslide disasters in Germany.
Eur J Trauma Emerg Surg 48, 4233–4241 (2022).

I juli 2021 drabbades delar av Tyskland av störtfloder, översvämningar och lerskred. 184 personer avled i Rheinland-Pfalz och Nordrhein-Westfalen. Syftet med beskriven studie var att samla data om skadepanorama och lärdomar från hantering av naturkatastrof i västra Europa. Patienter med muskuloskeletala skador som vårdades på ett sjukhus i Bonn under första veckan av händelsen inkluderades. Masskadeprotokoll aktiverades inte på grund av stegvis ankomst av patienter till sjukhuset, och triagering och intag fungerade för allvarligt skadade. Medel-ISS (Injury Severity Score) var $5,7 \pm 2,7$; ingen skadad var drabbad av polytrauma. Störst andel skador var på nedre extremiteter och mjukvävstrauman. Bäckenskador, skador på ryggrad och hjärnskakningar utgjorde resten av typskadorna. 63 patienter behandlades (ortopedisk och traumakirurgi), 30 procent tillhörde triagekategorierna "very urgent" och "immediate". Inga intrahospitala dödsfall förekom. Hantering och flytt av patienter försvårades av brist på kommunikation mellan sjukhusen i området på grund av elavbrott och kollapsat mobilnät. Informationsutbyte skedde främst via akutvården, och triagering genomfördes på skadepplats av ambulanssjuksköterskor och akutläkare för transport till traumacentrum. Författarna förespråkar starkt multidisciplinär hantering av liknande händelse och träning i traumaomhändertagande i svår/resursknapp miljö; patienterna uppvisade olika symptom utöver skador, och discipliner som intermedicin, neurokirurgi, eller oral-och käkkirurgi krävdes i flera fall. Utöver medicinsk hantering tillkom mikrobiologisk uppföljning (exponering för förorenat vatten) och psyko-logiskt stöd för de drabbade.

El Zahran, T., Geha, M., Sakr, F. et al.
The Beirut Port Blast: spectrum of injuries and clinical outcomes at a large tertiary care center in Beirut, Lebanon.
Eur J Trauma Emerg Surg (2022).

Tidig morgon den 4 augusti 2020 exploderade 2750 ton ammoniumnitrat i hamnen i Beirut, Libanon. Explosionen var den största icke-

nukleära detonationen i modern tid. Inkluderad retrospektiv studie beskriver skadepanorama, behandling och utgång för skadade direkt efter explosionen och upp till en vecka efteråt vid akutkliniken på the American University of Beirut Medical Center (AUBMC). Med 42 platser på akutkliniken inkom över 500 patienter under första dygnet efter detonationen. 359 vuxna och pediatrika patienter påverkade av explosionen med tillgänglig dokumentation inkluderades i aktuell studie; 95,6 procent var vuxna. Mest förekommande skadan var penetrerande trauma (45,7 procent) på övre extremiteter och nedre extremiteter. Efter extremiteter var skalle och ansikte samt thorax mest presenterade skadelokalisation. Observerade skadetyper var öppna sår/skärsår (35,1 procent), kontusioner (34,2 procent), frakturer (18,9 procent) samt stukningar, vrickningar och dislokationer (6,1 procent). 60,4 procent av omhändertagande krävde diagnostisk avbildning, hos 64 procent av fallen fanns positiva fynd. Skadepanorama överensstämmer med tidigare observerade fall och andra studier av Beirut-händelsen; stor andel skador och lacerationer uppkommer från krossat glas vid detonation i urban miljö.

Svenska kohortstudier

Holmberg, L., Mani, K., Thorbjørnsen, K. et al.
Trauma triage criteria as predictors of severe injury - a Swedish multicenter cohort study.
BMC Emerg Med 22, 40 (2022).

Tidigare studier om de nationella traumalarmskriterierna som infördes 2017 är begränsade i till exempel undersökt population. Studien av Holmberg, L et al. syftade till att inkludera hela traumapopulationen och genomföra en multicenter kohortstudie för att utvärdera kriterierna på individ- och gruppnivå, för att se om ytterligare revision av kriterierna krävs. New Injury Severity Score (NISS) användes för skade-evaluering. Inkluderade patienter var registrerade i SweTrau under år 2018 (n=626) vid sex akutsjukhus i mellersta Sverige (varav ett universitetssjukhus). Resultaten visar att traumalarmskriterierna är effektiva för att identifiera allvarlig skada och patienter i behov av akut omhändertagande. Både under- och övertriagering har minskat sedan kriterierna implementerades. Nuvarande kombination av kriterier var överlägsen andra undersökta kombinationer, och inget nytt kriterium visade på så stor effekt att en förändring vore motiverad.

Lovisa Strömmer, Fredrik Lundgren, Poya Ghorbani, Thomas Troëng.

Risk-adjusted mortality in severely injured adult trauma patients in Sweden. *BJS Open*, Volume 6, Issue 2, April 2022, zrac017

Risk-justerad traumamortalitet (risk-adjusted mortality, RAM) utgörs av en jämförelse med observerad mortalitet och predikterad mortalitet. Den predikterade mortaliteten beräknas statistiskt baserat på olika prediktorer för död på grund av trauma, som till exempel allvarlighetsgrad för skada. RAM används internationellt för att jämföra traumavården för olika patientpopulationer. Studien syftade till att skapa en prediktionsmodell för traumamortalitet, och jämföra RAM-ratios för kliniskt relevanta subgrupper i den svenska traumapopulationen som behandlats på universitetssjukhus eller akutsjukhus. Patienter registrerade i SweTrau med ISS över 15, ålder över 15 och känd överlevnad upp till 30 dagar efter sjukhusvistelse i tidspannet 1 januari 2013 - 31 december 2017 inkluderades, och tre subgrupper undersöktes. RAM-ratios beräknades för patienter med liknande riskprofil som behandlats på olika sjukhus, och resultaten visar att skillnad i RAM mellan sjukhustyper drivs av skillnader i mortalitet på grund av traumatisk hjärnskada. Ingen data i studien visar på att akutsjukhusens traumavårdskvalitet var lägre för patienter utan TBI eller för penetrerande trauma.

Wickbom F, Persson L, Olivecrona Z, Undén J. Management of paediatric traumatic brain injury in Sweden: a national cross-sectional survey. *Scand J Trauma Resusc Emerg Med*. 2022 May 12;30(1):35..

Enkätstudie över omhändertagande av barn med traumatisk hjärnskada i Sverige sedan publicering av Scandinavian Neurotrauma Committee Guidelines 2016 (SNC16). Enkätfrågorna behandlade första 24 timmarna av hanteringsrutiner för pediatrik TBI, inkluderat en analys över utveckling av rutiner sedan 2006 (jämfört med tidigare studie av Åstrand et al.). Rutiner över Sverige skiljer sig fortsättningsvis men implementering av riktlinjer, rutiner för skriftliga observationer och information till patient och måls-män har förbättrats. Aktuell studie kan fungera som baslinje för implementeringsstudier för SNC16 i Sverige.

Riktlinjer

Kategorin riktlinjer innefattar publikationer om behandling, protokoll och beslutsstöd från valideringsstudier och föreningar och beslutande organ.

Olsen F, Lundborg F, Kristiansson J et al. Validation of the Nottingham Hip Fracture Score (NHFS) for the prediction of 30-day mortality in a Swedish cohort of hip fractures. *Acta Anaesthesiol Scand*. 2021 Nov;65(10):1413-1420

Hörer TM, Pirouzram A, Khan M et al., Damage Control Resuscitation Committee. Endovascular Resuscitation and Trauma Management (EVTM)-Practical Aspects and Implementation. *Shock*. 2021 Dec 1;56(1S):37-41.

de Moya, Marc; Brasel, Karen J; Brown, Carlos et al. Evaluation and management of traumatic pneumothorax: A Western Trauma Association critical decisions algorithm. *Journal of Trauma and Acute Care Surgery*: January 2022 - Volume 92 - Issue 1 - p 103-107

Yorkgitis, Brian K; Berndtson, Allison E; Cross, Alisa et al. American Association for the Surgery of Trauma/ American College of Surgeons-Committee on Trauma Clinical Protocol for inpatient venous thrombo-embolism prophylaxis after trauma. *Journal of Trauma and Acute Care Surgery*: March 2022 - Volume 92 - Issue 3 - p 597-604

Inaba, Kenji MD; Alam, Hasan B; Brasel, Karen J. et al. A Western Trauma Association critical decisions algorithm: Resuscitative endovascular balloon occlusion of the aorta. *Journal of Trauma and Acute Care Surgery*: April 2022 - Volume 92 - Issue 4 - p 748-753

Newgard, Craig D.; Fischer, Peter E.; Gestrung, Mark et al. National Guideline for the Field Triage of Injured Patients: Recommendations of the National Expert Panel on Field Triage, 2021. *Journal of Trauma and Acute Care Surgery*: April 27, 2022

Nelson, Adam; Reina, Raul; Northcutt, Ashley et al.
Prospective validation of the Rib Injury Guidelines
for traumatic rib fractures.
Journal of Trauma and Acute Care Surgery: June
2022 - Volume 92 - Issue 6 - p 967-973

Joseph, Bellal; Obaid, Omar; Dultz, Linda et al.
Validating the Brain Injury Guidelines: Results of
an American Association for the Surgery of Trauma
prospective multi-institutional trial.
Journal of Trauma and Acute Care Surgery: August
2022 - Volume 93 - Issue 2 - p 157-165

Mahoney, Eric J.; Bugaev, Nikolay; Appelbaum,
Rachel; et al.
Management of the open abdomen: A systematic
review with meta-analysis and practice
management guideline from the Eastern
Association for the Surgery of Trauma.
Journal of Trauma and Acute Care Surgery:
September 2022 - Volume 93 - Issue 3 - p e110-
e118

Pågående registerforskning, enligt SweTraus årsrapport

Utöver tidigare rapporterade uttag har följande uttag för studier gjorts från SweTrau under 2021

Denise Bäckström, Linköping: "Covid-19 pandemins sekundära traumatologiska effekter".

Carl Montan, Stockholm: "Traumaledarfunktionen och sammansättning av svenska traumateam".

Avhandlingar baserade på SweTrau-data under bevakningsperioden

Eriksson, J.
Aspects of risk factors, pathophysiology and outcomes in trauma.
Stockholm: Karolinska Institutet, 2022. Doktorsavhandling (disputation 2022-02-18).

Syftet med avhandlingsarbetet var att identifiera risk- och skyddsfaktorer för komplikationer och dödlighet hos de patienter som överlever den akuta fasen efter trauma.

von Oelreich, E.
Long-term outcomes after trauma and intensive care.
Stockholm: Karolinska Institutet, 2021. Doktorsavhandling (disputation 2021-11-19).

Avhandlingsarbetet ämnade att höja kunskapen om morbiditet över lång tid och vårdresultat för traumapatienter och patienter som överlevt intensivvård genom fyra epidemiologiska studier med hjälp av nationella och regionala register. Studierna visar att traumapatienten drabbas av signifikant långtidsmorbiditet som är oberoende av traumarelaterade faktorer och att opioider är associerade till ökad risk för död.

Bilaga 1

Kategoriindelning av totalt 266 inkluderade publikationer.

Identifierad kategori	Antal inkluderade publikationer
Prediktion, behandling	61
Epidemiologi, skador	36
Transfusion, koagulopati	27
Triage, MCI, avsiktliga attacker	23
Pediatrik och äldre patientgrupp	20
Traumatisk hjärnskada- TBI	19
Prehospitalt	16
Rehabilitering, uppföljning	12
Forskningsmetodik	12
Tactical medicine	11
Covid-19	10
Traumateam, utbildning	10
Riktlinjer	9

Prediktion, behandling

Becker, L., Schulz-Drost, S., Spering, C. et al.	Effect of surgical stabilization of rib fractures in polytrauma: an analysis of the TraumaRegister DGU®.	Eur J Trauma Emerg Surg (2022).
Bentin, J.M., Possfelt-Møller, E., Svenningsen, P. et al.	A characterization of trauma laparotomies in a scandinavian setting: an observational study.	Scand J Trauma Resusc Emerg Med 30, 43 (2022).
Bieler, D., Trentzsch, H., Franke, A. et al.	Evaluation of a standardized instrument for post hoc analysis of trauma-team-activation-criteria in 75,613 injured patients an analysis of the TraumaRegister DGU®.	Eur J Trauma Emerg Surg 48, 1101–1109 (2022).
Brigode, W., Adra, A., Capron, G. et al.	The American Association for the Surgery of Trauma (AAST) Liver Injury Grade Does Not Equally Predict Interventions in Blunt and Penetrating Trauma.	World J Surg 46, 2123–2131 (2022).
Candefjord S, Asker L, Caragounis EC.	Mortality of trauma patients treated at trauma centers compared to non-trauma centers in Sweden: a retrospective study.	Eur J Trauma Emerg Surg. 2022 Feb;48(1):525-536.
Chun, Magnus BS; Zhang, Yichi BS; Becnel, Chad MD, et al.	New Injury Severity Score and Trauma Injury Severity Score are superior in predicting trauma mortality,	Journal of Trauma and Acute Care Surgery: March 2022 - Volume 92 - Issue 3 - p 528-534
Dijkink, S., van Zwet, E.W., Krijnen, P. et al.	The impact of regionalized trauma care on the distribution of severely injured patients in the Netherlands.	Eur J Trauma Emerg Surg 48, 1035–1043 (2022).
Douglas, Molly; Obaid, Omar; Castanon, Lourdes	After 9,000 laparotomies for blunt trauma, resuscitation is becoming more balanced and time to intervention shorter: Evidence in action.	Journal of Trauma and Acute Care Surgery: September 2022 - Volume 93 - Issue 3 - p 307-315
Driessen, M.L.S., van Klaveren, D., de Jongh, M.A.C. et al.	Modification of the TRISS: simple and practical mortality prediction after trauma in an all-inclusive registry.	Eur J Trauma Emerg Surg (2022).
Elkbuli, A et al.	Interfacility transfers and the prevalence of dead on arrival among trauma populations transferred to ACSCOT-verified trauma centers: A nationwide analysis of the ACS-TQIP dataset	The American Journal of Emergency Medicine 2022 available online Jan 13
Fakhry, Samir M.; Morse, Jennifer L.; Wilson, Nina Y. et al.	Hyperglycemia in nondiabetic adult trauma patients is associated with worse outcomes than diabetic patients: An analysis of 95,764 patients.	Journal of Trauma and Acute Care Surgery: September 2022 - Volume 93 - Issue 3 - p 316-322
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