01. Geriatric trauma
Curr Opin Crit Care. 2015 Dec;21(6):520-6. doi: 10.1097/MCC.0000000000000246.
Adams SD, Holcomb JB.
PDF: No free PDF available
URL: https://www.ncbi.nlm.nih.gov/pubmed/26539925

PURPOSE OF REVIEW: The landscape of trauma is changing due to an aging
population. Geriatric patients represent an increasing number and proportion of trauma admissions and deaths. This review explores recent literature on geriatric trauma, including triage criteria, assessment of frailty, fall-related injury, treatment of head injury complicated by coagulopathy, goals of care, and the need for ongoing education of all surgeons in the care of the elderly.
RECENT FINDINGS: Early identification of high-risk geriatric patients is imperative to initiate early resuscitative efforts. Geriatric patients are typically undertriaged because of their baseline frailty being underappreciated; however, centers that see more geriatric patients do better. Rapid reversal of anticoagulation is important in preventing progression of brain injury. Anticipation of difficult disposition necessitates early involvement of physical therapy for rehabilitation and case management for appropriate placement.
SUMMARY: Optimal care of geriatric trauma patients will be based on the well established tenets of trauma resuscitation and injury repair, but with distinct elements that address the physiological and anatomical challenges presented by geriatric patients.

02. Geriatric Trauma: A Clinical and Ethical Review
J Trauma Nurs. 2016 Jan-Feb;23(1):36-41; quiz E3-4. doi: 10.1097/JTN.0000000000000179.
Stevens CL, Torke AM
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26745538

Because of advances in medicine and other sciences, the average human life span is longer now than any other time in history. The physiologic effects of aging as well as multimorbidity, polypharmacy, and other geriatric-specific syndromes create additional challenges when elderly patients experience a traumatic injury. However, there is a growing evidence base that can inform the clinical decision-making process. This narrative review of the literature addresses the state of the science regarding geriatric syndromes, guidelines and protocols, indices and models for prognostication, outcomes and ethical concerns in the treatment of geriatric trauma.

03. Geriatric Trauma
Emerg Med Clin North Am. 2016 Aug;34(3):483-500. doi: 10.1016/j.emc.2016.04.004.
Reske-Nielsen C, Medzon R.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/27475011

Within the next 15 years, 1 in 5 Americans will be over age 65. $34 billion will be spent yearly on trauma care of this age group. This section covers situations in trauma unique to the geriatric population, who are often under-triaged and have significant injuries underestimated. Topics covered include age-related pathophysiological changes, underlying existing medical conditions and certain daily medications that increase the risk of serious injury in elderly trauma patients. Diagnostic evaluation of this group requires liberal testing, imaging, and a multidisciplinary team approach. Topics germane to geriatric trauma including hypothermia, elder abuse, and depression and suicide are also covered.

04. Evidence-Based Care of Geriatric Trauma Patients
Surg Clin North Am. 2017 Oct;97(5):1157-1174. doi: 10.1016/j.suc.2017.06.006.
Brooks SE, Peetz AB.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/28958363
The doubling of the geriatric population over the next 20 years will challenge the existing health care system. Optimal care of geriatric trauma patients will be of paramount importance to the health care discussion in America. These patients warrant special consideration because of altered anatomy, physiology, and the resultant decreased ability to tolerate the stresses imposed by traumatic insult. Despite increased risk for worsened outcomes, nearly half of all geriatric trauma patients will be cared for at non-designated trauma centers. Effective communication is crucial in determining goals of care and arriving at what patients would consider a meaningful outcome.

05. High-risk geriatric protocol: improving mortality in the elderly
J Trauma Acute Care Surg. 2012 Aug;73(2):435-40. doi: 10.1097/TA.0b013e31825c7cf4.
Bradburn E, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/22846952
BACKGROUND: Injured geriatric patients pose unique challenges to the trauma team because of their abnormal responses to shock and injury. We have developed the high-risk geriatric protocol (GP) that seeks to identify high-risk geriatric patients. We hypothesized that a high-risk GP would improve outcome in this select group of patients.
METHODS: Patients from 2000 to 2010 were included. Patients 65 years or older who met high-risk GP based on comorbidities and/or physiologic parameters were compared with those patients who had not received GP before its implementation as well as other non-GP patients. This protocol includes a geriatric consultation, as well as a lactate levels, arterial blood gas levels, and echo test to assess for occult shock. Age, trauma activation, preexisting conditions, Injury Severity Score, Revised Trauma Score, and mortality were reviewed. Univariate and multivariate analyses were conducted to identify factors predictive of mortality.
RESULTS: A total of 3,902 patients were evaluated. Patients receiving GP were less likely to die (odds ratio, 0.63 [0.39-0.99], p = 0.046). For all patients, there was a dramatic increase in mortality for those patients older than 75 years.
CONCLUSION: The GP, adjusted for other covariates, significantly reduced mortality in our patient population. Thus, this study confirms the overall effectiveness of our GP, which is hallmarked by prompt identification of those patients with occult shock and a multidisciplinary care of the aged population.

06. Trauma and transfusion in the geriatric patient
Curr Opin Anaesthesiol. 2018 Apr;31(2):238-242. doi: 10.1097/ACO.0000000000000556. Scher CS.
PDF: No free PDF available
URL: https://www.ncbi.nlm.nih.gov/pubmed/29389749
PURPOSE OF REVIEW: The percentage of people over the age of 65 is growing rapidly and anesthesiologists must develop a medical understanding that is comprehensive to meet the unique medical needs of this population. The changing physiology of an elderly population makes them extremely vulnerable to trauma and the administration of blood products. Although most of these cases involve orthopedic attention, it is not less dangerous as a blunt trauma case.
RECENT FINDINGS: This article addresses some of the main concerns for the anesthesiologists of providing a hemostatic resuscitation in the geriatric population. Should blood that is new lead to better outcomes than blood that was collected more than 14 days from the injury? What role does patient

frailty have in trauma and transfusion outcomes? Is the massive transfusion protocol safe for the geriatric population? As this subset of the population grows, the number of patients on anticoagulation therapy will grow. Knowledge of the bone marrow plays an important role in geriatric trauma. How does head trauma in the elderly differ from the younger patient?
SUMMARY: The information in this article is by no means comprehensive. Nongeriatric trauma protocols are far from being validated. Applying these protocols to the geriatric protocols must be investigated in terms of safety and benefits.

07. Frailty and Prognostication in Geriatric Surgery and Trauma
Clin Geriatr Med. 2019 Feb;35(1):13-26. doi: 10.1016/j.cger.2018.08.002. Epub 2018 Oct 3.
Maxwell CA, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30390979
Frailty is a predominant predictor of poor outcomes in older populations. This article presents a review of the concept of frailty and its role for prognostication among geriatric trauma and surgery patients. We discuss models of frailty defined in the scientific literature, emphasizing that frailty is a process of biologic aging. We emphasize the importance of screening, assessment, and inclusion of frailty indices for the development and use of prognostication instruments/tools in the population of interest. Finally, we discuss best practices for the delivery of prognostic information in acute care settings and specific recommendations for trauma and surgical care settings.

08. Acute trauma and multiple injuries in the elderly population
Curr Opin Anaesthesiol. 2015 Apr;28(2):145-50. doi: 10.1097/ACO.0000000000000173.
Joyce MF, Gupta A, Azocar RJ.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/25674989
PURPOSE OF REVIEW: Traumatic injuries in the rapidly growing elderly population pose a significant challenge to the healthcare community. These injuries are associated with significant morbidity and mortality, and as a result cause a financial burden on the medical system. Although normal decline in physiologic reserve can provide some explanation for these poor outcomes, there is significant room for improvement. This review will summarize recent literature around the evaluation and management of elderly trauma patients with a particular focus on those with hip fractures.
RECENT FINDINGS: It is becoming increasingly evident that customized evaluation and management of elderly trauma patients is a key factor in improving outcomes. Geriatric-specific triage and assessment criteria have been developed and initial results are encouraging. In particular, the use of frailty as an assessment tool in these patients has been shown to be an independent predictor of outcomes. Further, assessment of these tools in elderly trauma patients with hip fractures has provided a wealth of information about their use and limitations.
SUMMARY: Differentiated, geriatric-specific triaging, assessment and treatment pathways in the care of elderly trauma patients will ultimately lead to improvements in outcomes. These improvements have already started to be seen in the realm of orthogeriatrics.

09. Severe trauma in the geriatric population
World J Crit Care Med. 2017 May 4;6(2):99-106. doi: 10.5492/wjccm.v6.i2.99. eCollection 2017 May 4.
Llompart-Pou JA, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/28529911

Geriatric trauma constitutes an increasingly recognized problem. Aging results in a progressive decline in cellular function which leads to a loose of their capacity to respond to injury. Some medications commonly used in this population can mask or blunt the response to injury. Falls constitute the most common cause of trauma and the leading cause of trauma-related deaths in this population. Falls are complicated by the widespread use of antiplatelets and anticoagulants, especially in patients with brain injury. Under-triage is common in this population. Evaluation of frailty could be helpful to solve this issue. Appropriate triaging and early aggressive management with correction of coagulopathy can improve outcome. Limitation of care and palliative measures must be considered in cases with a clear likelihood of poor prognosis.

10. Impact of age on the clinical outcomes of major trauma

Eur J Trauma Emerg Surg. 2016 Jun;42(3):317-32. doi: 10.1007/s00068-015-0557-1. Epub 2015 Aug 8.
Hildebrand F, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26253883
PURPOSE: In view of demographic changes over the past few decades, the average age of trauma patients is progressively increasing. We therefore aimed to summarize the specific characteristics of geriatric trauma and to identify potential fields for further research to improve the care of elderly trauma patients.
METHODS: Review of the literature.
RESULTS: Due to the diverse risk factors (e.g., pre-existing conditions, limited physiological reserve), geriatric patients are prone to developing severe complications, even after less severe trauma. Yet, age is not considered as the only predictor of worse outcomes, and it should not be considered the only criterion for limiting care in those patients. It is crucial that age-specific treatment guidelines are developed to optimize the outcomes for senior trauma patients. Based on the current literature, these guidelines should emphasize the importance of field triage directly to a trauma center, along with the activation of the trauma team. Furthermore, early intensive monitoring, aggressive resuscitation, and time of surgical intervention are of upmost importance to reduce mortality.
CONCLUSION: The impact of several factors [age, premedical conditions (PMC), decreased physiological reserves, and impaired immune function] on the post-traumatic course of elderly trauma patients needs to be clarified in future experimental and clinical studies for the early identification of geriatric high-risk patients and for the development of age-adapted therapeutic strategies.

11. Enhanced Recovery After Surgery: Are the Principles Applicable to Adult and Geriatric Acute Care and Trauma Surgery?

Anesthesiol Clin. 2019 Mar;37(1):67-77. doi: 10.1016/j.anclin.2018.10.001. Epub 2018 Nov 22.
Singh M, Askari R, Stopfkuchen-Evans M.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30711234
The incorporation of enhanced recovery after surgery (ERAS) fundamentals into perioperative medicine has improved the patient care experience and hastened recovery time while reducing hospital costs. Research studies have shown that incorporating ERAS principles in the adult or geriatric acute care surgery populations minimizes time to resumption of preoperative activity and reduces hospital length of stay. ERAS principles are widely applicable to these patient cohorts and may be applicable in trauma patients. Increased physician and nursing education to promote widespread utilization of enhanced recovery protocols will further improve quality of health care administered in the twenty-first century.

12. Injury in the aged: Geriatric trauma care at the crossroads.

J Trauma Acute Care Surg. 2015 Jun;78(6):1197-209. doi: 10.1097/TA.0000000000000656.

Kozar RA, et al.

PDF: Read PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/26151523

No abstract

13. Trauma in the elderly patient.

Br J Radiol. 2018 Jul;91(1087):20170739. doi: 10.1259/bjr.20170739. Epub 2018 Apr 30.

Atinga A, et al.

PDF: Read PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/29509505

Major Trauma Centres and Emergency Departments are treating an increasing number of elderly trauma patients in the UK. Elderly patients, defined as those over the age of 65 years, are more susceptible to injury from lesser mechanisms of trauma than younger adults. The number of elderly trauma cases is rising yearly, accounting for >25% of all major trauma nationally. The elderly have different physiological reserves and a different response to trauma due to premorbid frailty, co-existing conditions and prescribed medication. These factors need to be appreciated in trauma triaging, radiological assessment and clinical management. A lower threshold for trauma-call activation is recommended, including a lower threshold for advanced imaging. We will review general principles of trauma in the elderly, outline injury patterns in this age group and illustrate the radiological features per anatomical site, from head to pelvis and the extremities. We advocate using contrast-enhanced computed tomography as the primary diagnostic imaging modality as concern about intravenous contrast agent-induced nephropathy is relatively minor. Prompt investigation and diagnosis leads to timely appropriate treatment, therefore the radiologist can discerningly improve morbidity and mortality in this vulnerable group.

14. Antithrombotics in trauma: management strategies in the older patients.

J Blood Med. 2017 Oct 4;8:165-174. doi: 10.2147/JBM.S125209. eCollection 2017. Wong H, et al.

PDF: Read PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/29042825

The ageing population has resulted in a change in the demographics of trauma, and older adult trauma now accounts for a growing number of trauma admissions. The management of older adult trauma can be particularly challenging, and exhibits differences to that of the younger age groups affected by trauma. Frailty syndromes are closely related with falls, which are the leading cause of major trauma in older adults. Comorbid disease and antithrombotic use are more common in the older population. Physiological changes that occur with ageing can alter the expected clinical presentation of older persons after injury and their susceptibility to injury. Following major trauma, definitive control of hemorrhage remains essential for improving outcomes. In the initial assessment of an injured patient, it is important to consider whether the patient is taking anticoagulants or antiplatelets and if measures to promote hemostasis such as reversal are indicated. After hemostasis is achieved and bleeding has stopped, longer-term decisions to recommence antithrombotic agents can be challenging, especially in older people. In this review, we discuss one aspect of management for the older trauma patients in greater detail, that is, acute and longer-term management of antithrombotic therapy. As we consider the health needs of an ageing population, rise in elderly trauma and increasing use of antithrombotic therapy, the need for research in this area becomes more pressing to establish best practice and evidence-based care.

15. Frailty in trauma: A systematic review of the surgical literature for clinical assessment tools.
J Trauma Acute Care Surg. 2016 May;80(5):824-34. doi: 10.1097/TA.0000000000000981.
McDonald VS, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26881488
BACKGROUND: Elderly trauma patients have outcomes worse than those of similarly injured younger patients. Although patient age and comorbidities explain some of the difference, the contribution of frailty to outcomes is largely unknown because of the lack of assessment tools developed specifically to assess frailty in the trauma population. This systematic review of the surgical literature identifies currently available frailty clinical assessment tools and evaluates the potential of each instrument to assess frailty in elderly patients with trauma.
METHODS: This review was registered with PROSPERO (the international prospective register of systematic reviews, registration number CRD42014015350). Publications in English from January 1995 to October 2014 were identified by a comprehensive search strategy in MEDLINE, EMBASE, and CINAHL, supplemented by manual screening of article bibliographies and subjected to three tiers of review. Forty-two studies reporting on frailty assessment tools were selected for analysis. Criteria for objectivity, feasibility in the trauma setting, and utility to predict trauma outcomes were formulated and used to evaluate the tools, including their subscales and individual items.
RESULTS: Thirty-two unique frailty assessment tools were identified. Of those, 4 tools as a whole, 2 subscales, and 29 individual items qualified as objective, feasible, and useful in the clinical assessment of trauma patients. The single existing tool developed specifically to assess frailty in trauma did not meet evaluation criteria.
CONCLUSION: Few frailty assessment tools in the surgical literature qualify as objective, feasible, and useful measures of frailty in the trauma population. However, a number of individual tool items and subscales could be combined to assess frailty in the trauma setting. Research to determine the accuracy of these measures and the magnitude of the contribution of frailty to trauma outcomes is needed.

16. Redefining the association between old age and poor outcomes after trauma: The impact of frailty syndrome.
J Trauma Acute Care Surg. 2017 Mar;82(3):575-581. doi: 10.1097/TA.0000000000001329.
Joseph B, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/28225741
BACKGROUND: Frailty syndrome (FS) is a well-established predictor of outcomes in geriatric patients. The aim of this study was to quantify the prevalence of FS in geriatric trauma patients and to determine its association with trauma readmissions, repeat falls, and mortality at 6 months.
METHODS: we performed a 2-year (2012-2013) prospective cohort analysis of all consecutive geriatric (age, ≥ 65 years) trauma patients. FS was assessed using a Trauma-Specific Frailty Index (TSFI). Patients were stratified into: nonfrail, TSFI ≤ 0.12; prefrail, TSFI = 0.1 to 0.27; and frail, TSFI > 0.27. Patient follow-up occurred at 6 months to assess outcomes. Regression analysis was performed to assess independent associations between TSFI and outcomes.
RESULTS: Three hundred fifty patients were enrolled. Frail patients were more likely to develop in-hospital complications (nonfrail, 12%; prefrail, 17.4%; and frail, 33.4%; p = 0.02) and an adverse discharge disposition compared with nonfrail and prefrail (nonfrail, 8%; prefrail,18%; and frail, 47%; p = 0.001). Six-month follow-up was recorded in 80% of the patients. Compared with nonfrail patients, frail patients were more likely to have had a trauma-related readmission (odds ratio [OR], 1.4; 95% confidence interval [CI], 1.2-3.6) and/or repeated falls (OR, 1.6; 95%CI, 1.1-2.5) over the 6-month period.

Overall 6-month mortality was 2.8% (n = 10), and frail elderly patients were more likely to have died (OR, 1.1; 95% CI, 1.04-4.7) compared with nonfrail patients.

CONCLUSION: Over a third of geriatric trauma patients had FS. TSFI provides a practical and accurate assessment tool for identifying elderly trauma patients who are at increased risk of both short-term and long-term outcomes. Early focused intervention in frail geriatric patients is warranted to improve long-term outcomes.

17. Frailty as a prognostic factor for the critically ill older adult trauma patients.
Am J Surg. 2019 Feb 22. pii: S0002-9610(18)31690-8. doi: 10.1016/j.amjsurg.2019.01.035. [Epub ahead of print] Hamidi M, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30833015
BACKGROUND: Frailty is highly prevalent in the elderly and confers high risk for adverse outcomes. We aimed to assess the impact of frailty on critically ill older adult trauma patients.
METHODS: We analyzed the ACS-TQIP(2010-2014) including all critically-ill trauma patients ≥65y. The modified frailty index (mFI) was calculated. Following stratified into frail and non-frail, propensity score matching was performed. Our primary outcome measure was in-hospital complications. Secondary outcome measures included mortality and discharge disposition.
RESULTS: We identified 88,629 patients, of which 34,854 patients (frail: 17,427, non-frail: 17,427) were matched. Overall 14% died. Frail patients had higher rates of complications (34% vs. 18%, p < 0.001), mortality (18.1% vs. 9.7%, p < 0.001), and were more likely to be discharged to rehab/SNF (58.7% vs. 21.2% p < 0.001) compared to non-frail patients.
CONCLUSION: Critically-ill frail patients are more likely to have higher morbidity and mortality. Frailty can be used as an objective measure to identify high-risk patients.

18. The impact of frailty on failure-to-rescue in geriatric trauma patients: A prospective study.
J Trauma Acute Care Surg. 2016 Dec;81(6):1150-1155. Joseph B, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/27602908
INTRODUCTION: Failure-to-rescue (FTR) (defined as death from a major complication) is considered as an index of hospital quality in trauma patients. However, the role of frailty in FTR events remains unclear. We hypothesized that FTR rate is higher in elderly frail trauma patients.
METHODS: We performed a prospective cohort study of all elderly (age ≥ 65 years) trauma patients presenting at our level one trauma center. Patient's frailty status was calculated utilizing the Trauma Specific Frailty Index (TSFI) within 24 hours of admission. Patients were stratified into non-frail, pre-frail, and frail. FTR was defined as death from a major complication (respiratory, infectious, cardiac, and renal). Binary logistic regression analysis was performed after adjusting for age, gender, injury severity (ISS), and vital parameters to assess the relationship between frailty status and FTR.
RESULTS: A total of 368 elderly trauma patients were evaluated of which 25% (n = 93) were non-frail, 38% (n = 139) pre-frail, and 37% (n = 136) frail. Overall, 30% of the patients developed in-hospital complications; of them, mortality occurred in 26% of the patients (FTR group). In the FTR group, 69% of the patients were frail compared to 17% pre-frail and 14% non-frail (p = 0.002). On multivariate regression analysis for predictors of FTR, frail status was an independent predictor of FTR (OR [95% CI] = 2.67 [1.37-5.20]; p = 0.004). On sensitivity analysis, positive predictive value of TSFI for FTR was 69% and negative predictive value for FTR was 67%.
CONCLUSION: In elderly trauma patients, the presence of frailty increased the odds of FTR almost threefold as compared to non-frail. Although FTR has been considered as an indicator of health care quality, the findings of this study suggest that frailty status independently contributes to FTR. This needs

to be considered in the future development of quality metrics, particularly in the case of geriatric traumapatients.

19. Prospective evaluation of frailty and functional independence in older adult trauma patients.

PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30343875

BACKGROUND: The aim of our study was to assess the association between frailty and functional status in geriatric trauma patients.

METHODS: 3-year (2013-2015) prospective analysis and included all geriatric trauma patients(≥65y) discharged to a single rehabilitation center from our level-I trauma center. Frailty was measured using Trauma-Specific-Frailty-Index (TSFI) while Functional status was assessed using functional-independence-measure (FIM) at admission and discharge from rehabilitation center. Multivariate linear regression analysis was performed.

RESULTS: 267 patients were enrolled. Mean age was 76.9 ± 7.1y, 63.6% were males. Overall, 22.8% were frail, and 37.4% were pre-frail. On linear regression, higher motor-FIM, higher cognitive-FIM scores at admission, and longer length-of-stay at rehab were independently associated with increased discharge FIM score. While, ISS (injury-severity-score), pre-frail and frail status were negatively correlated with FIM gain.

CONCLUSION: Frail patients were less likely to recover to their baseline functional status compared with non-frail patients. Early focused intervention in frail elderly patients is warranted to improve functional status in this population.

20. Prospective evaluation of health-related quality of life in geriatric trauma patients

PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/31235245

BACKGROUND: Frailty is an established predictor of adverse outcomes in geriatric patients. Health-related quality of life (HRQoL) is an important outcome measure among trauma patients. This prospective observational study examined the impact of frailty on health-related quality of life in geriatric trauma patients.

METHODS: We prospectively enrolled geriatric (age ≥65 years) trauma patients. We calculated the frailty index (FI) within 24 hours of admission using the trauma-specific frailty index. Patients were stratified into frail (frailty index ≥0.27) and nonfrail (frailty index <0.27). Health-related quality of life was calculated at discharge and at 30 days (day) after discharge using the RAND Short Form-36 (SF-36). Outcome measures were health-related quality of life at discharge, 30-days postdischarge, and delta health-related quality of life. Regression analysis was performed to control for demographic, vital signs, and injury parameters.

RESULTS: We enrolled 296 patients. The mean age was 75.1 ± 9.8 years, 59% were male, and 81% were white. Frail patients accounted for 34%, and they had a lower health-related quality of life at discharge (366 vs 548, P < .01) and at 30-day postdischarge (393 vs 744, P < .01). Nonfrail patients scored higher in 6 out of 8 domains of health-related quality of life. Nonfrail patients had improved delta health-related quality of life (P < .01), unlike frail patients (P = .11). A linear regression model revealed an inverse relationship between frailty and improvement in health-related quality of life over 30-day postdischarge (β = -0.689, [confidence interval, -0.963 to -0.329] P = .01). This association remained statistically

significant after controlling for potential confounding covariates, such as age, sex, race, and injury severity.

CONCLUSION: Compared with nonfrail geriatric trauma patients, those who were frail had poor health-related quality of life at discharge and at 30-day postdischarge. Frailty negatively affects the recovery of health-related quality of life after trauma. The use of frailty indices may help identify and develop targeted interventions to improve health-related quality of life among geriatric trauma patients.

21. A Comparison of Scoring Systems for Predicting Short- and Long-term Survival After Trauma in Older Adults

Acad Emerg Med. 2019 Jun;26(6):621-630. doi: 10.1111/acem.13727. Epub 2019 Apr 3.
Meagher AD, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30884022

OBJECTIVES: Early identification of geriatric patients at high risk for mortality is important to guide clinical care, medical decision making, palliative discussions, quality assurance, and research. We sought to identify injured older adults at highest risk for 30-day mortality using an empirically derived scoring system from available data and to compare it with current prognostic scoring systems.

METHODS: This was a retrospective cohort study of injured adults ≥ 65 years transported by 44 emergency medical services (EMS) agencies to 49 emergency departments in Oregon and Washington from January 1, 2011, through December 31, 2011, with follow-up through December 31, 2012. We matched data from EMS to Medicare, inpatient, trauma registries, and vital statistics. Using a primary outcome of 30-day mortality, we empirically derived a new risk score using binary recursive partitioning and compared it to the Charlson Comorbidity Index (CCI), modified frailty index, geriatric trauma outcome score (GTOS), GTOS II, and Injury Severity Score (ISS).

RESULTS: There were 4,849 patients, of whom 234 (4.8%) died within 30 days and 1,040 (21.5%) died within 1 year. The derived score, the geriatric trauma risk indicator (GTRI; emergent airway or CCI ≥ 2), had 87.2% sensitivity (95% confidence interval [CI] = 83.0% to 91.5%) and 30.6% specificity (95% CI = 29.3% to 31.9%) for 30-day mortality (area under the receiving operating characteristic curve [AUROC] = 0.589, 95% CI = 0.566 to 0.611). AUROC values for other scoring systems ranged from 0.592 to 0.678. When the sensitivity for each existing score was held at 90%, specificity values ranged from 7.5% (ISS) to 30.6% (GTRI).

CONCLUSIONS: Older, injured adults transported by EMS to a large variety of trauma and nontrauma hospitals were more likely to die within 30 days if they required emergent airway management or had a higher comorbidity burden. When compared to other risk measures and holding sensitivity constant near 90%, the GTRI had higher specificity, despite a lower AUROC. Using GTOS II or the GTRI may better identify high-risk older adults than traditional scores, such as ISS, but identification of an ideal prognostic tool remains elusive.

22. Prospective Evaluation and Comparison of The Predictive Ability of Different Frailty Scores to Predict Outcomes in Geriatric Trauma Patients.

J Trauma Acute Care Surg. 2019 Aug 5. doi: 10.1097/TA.0000000000002458. [Epub ahead of print].
Hamidi M, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/31389924

BACKGROUND: Different frailty scores have been proposed to measure frailty. No study has compared their predictive ability to predict outcomes in trauma patients. The aim of our study was to compare the predictive ability of different frailty scores to predict complications, mortality, discharge disposition and 30-day readmission in trauma patients.

METHODS: We performed a 2-year (2016-2017) prospective cohort analysis of all geriatric (age > 65) trauma patients. We calculated the following frailty scores on each patient; the trauma specific frailty index (TSFI), the modified frailty index (mFI) derived from the Canada Study of Health and Aging (CSHA), the Rockwood frailty score (RFS), and the International Association of Nutrition and Aging 5-item a frailty scale (FS). Predictive models, using both unadjusted and adjusted logistic regressions, were created for each outcome. The unadjusted c-statistic was used to compare the predictive ability of each model.

RESULTS: A total of 341 patients were enrolled. Mean age was 76±9 years, median ISS was 13[9-18], and median GCS was 15[12-15]. The unadjusted models indicated that both the TSFI and the RFS had comparable predictive value, as indicated by their unadjusted c-statistics, for mortality, in-hospital complications, SNF disposition and 30-day readmission. Both TSFI and RFS models had unadjusted c-statistics indicating a relatively strong predictive ability for all outcomes. The unadjusted mFI and FS models did not have a strong predictive ability for predicting mortality and in-hospital complications. They also had a lower predictive ability for SNF disposition and 30-day readmissions.

CONCLUSIONS: There are significant differences in the predictive ability of the four commonly used frailty scores. The TSFI and the RFS are better predictors of outcomes compared to the mFI and the FS. The TSFI is easy to calculate and might be used as a universal frailty score in geriatric trauma patients

23. Preinjury physical frailty and cognitive impairment among geriatric trauma patients determine postinjury functional recovery and survival.

PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/26595712

BACKGROUND: Injury is an external stressor that often initiates a cycle of decline in many older adults. The influence of physical frailty and cognitive decline on 6-month and 1-year outcomes after injury is unreported. We hypothesized that physical frailty and cognitive impairmentwould be predictive of 6-month and 1-year postinjury function and overall mortality.

METHODS: The sample involved patients who are 65 years or older admitted to a Level I trauma center between October 2013 and March 2014 with a primary injury diagnosis. Surrogates of 188 patients were interviewed within 48 hours of hospital admission to determine preinjury cognitive and physical frailty impairments using brief screening instruments. Follow-up was completed on 172 patients at 6 months and 176 patients at 1 year to determine posthospitalization status and outcomes. Data analysis involved frequencies, measures of central tendency, χ analyses, linear and logistic regression.

RESULTS: The mean age of the patients was 77 years. The median Injury Severity Score (ISS) was 10. The mechanism of injury involved falls from standing (n = 101, 54%). Preinjury vulnerabilities included cognitive impairment (AD8 Dementia Screen [AD8] score ≥ 2, n = 93, 50%) and physical frailty (Vulnerable Elders Survey [VES-13] score ≥ 4, n = 94, 50%). Overall, median physical frailty scores did not return to baseline in the majority of survivors at 1 year. Multivariate regression analysis revealed that preinjury cognitive impairment (6 months, AD8, β = -0.20, p = 0.002) and preinjury physical frailty (6 months, Barthel Index, β = 0.60, p < 0.001; 1 year, Barthel Index, β = 0.52, p < 0.001) are independently associated with physical function (frailty). Multivariate logistic regression analysis revealed that age (odds ratio [OR], 1.09; 95% confidence interval [CI], 1.04-1.14), injury severity (OR, 1.07; 95% CI, 1.02-1.12), and preinjury physical frailty (OR, 1.28; 95% CI, 1.14-1.47) are independently associated with overall mortality at 1 year.

CONCLUSION: Preinjury physical frailty is the predominant predictor of postinjury functional status and mortality in geriatric trauma patients. Identification of frailty and appropriate follow-up are crucial for decision making by providers, patients, and family caregivers.

24. Handling of informed consent and patient inclusion in research with geriatric trauma patients - a matter of protection or disrespect?

Clin Interv Aging. 2019 Feb 13;14:321-334. doi: 10.2147/CIA.S191751. eCollection 2019.
Jensen JS, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30863026

BACKGROUND: Despite the aging of numerous societies and future health care challenges, clinical research in the elderly is underrepresented. The aim of this review was to analyze the current practice exemplary in gerontotraumatology and to discuss potential improvements.

MATERIALS AND METHODS: A literature review was performed in 2016 based on a PubMed search for gerontotraumatologic studies published between 2005 and 2015. Trials were evaluated for methodology and ethical and age-related aspects.

RESULTS: The search revealed 649 articles, 183 of which met the inclusion criteria. The age range for inclusion was heterogeneous; one-third of trials included patients <65 years and only 11% excluded very elderly. Seventy-four trials excluded patients with typical comorbidities, with 55% of these without stating scientific reasons. Frailty was assessed in 94 trials and defined as the exclusion criterion in 66 of them. Informed consent (IC) was reportedly obtained in 144 trials; descriptions of the IC process mostly remained vague. Substitute decision making was described in 19 trials; the consenting party remained unclear in 45 articles. Diagnosed dementia was a primary exclusion criterion in 31% of the trials. Seventeen trials assessed decisional capacity before inclusion, with six using specific assessments.

CONCLUSION: Many trials in gerontotraumatology exclude relevant subgroups of patients, and thus risk presenting biased estimates of the relevant treatment effects. Exclusion based on age, cognitive impairment, or other exhaustive exclusion criteria impedes specific scientific progress in the treatment of elderly patients. Meaningful trials could profit from a staged, transparent approach that fosters shared decision making. Rethinking current policies is indispensable to improve treatment and care of elderly trauma patients and to protect study participants and researchers alike.

25. A comparison of prognosis calculators for geriatric trauma: A Prognostic Assessment of Life and Limitations After Trauma in the Elderly consortium study

J Trauma Acute Care Surg. 2017 Jul;83(1):90-96. doi: 10.1097/TA.0000000000001506. Madni TD, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/28422904

BACKGROUND: The nine-center Prognostic Assessment of Life and Limitations After Trauma in the Elderly consortium has validated the Geriatric Trauma Outcome Score (GTOS) as a prognosis calculator for injured elders. We compared GTOS' performance to that of the Trauma Injury Severity Score (TRISS) in a multicenter sample.

METHODS: Three Prognostic Assessment of Life and Limitations After Trauma in the Elderly centers not submitting subjects to the GTOS validation study identified subjects aged 65 years to 102 years admitted from 2000 to 2013. GTOS was specified using the formula [GTOS = age + (Injury Severity Score [ISS] × 2.5) + 22 (if transfused packed red cells (PRC) at 24 hours)]. TRISS uses the Revised Trauma Score (RTS), dichotomizes age (<55 years = 0 and ≥55 years = 1), and was specified using the updated 1995 beta coefficients. TRISS Penetrating was specified as [TRISSP = -2.5355 + (0.9934 × RTS) + (-0.0651 × ISS) + (-1.1360 × Age)]. TRISS Blunt was specified as [TRISSB = -0.4499 + (0.8085 × RTS Total) + (-0.0835 × ISS) + (-1.7430 × Age)]. Each then became the sole predictor in a separate logistic regression model to estimate probability of mortality. Model performances were evaluated using misclassification rate, Brier score, and area under the curve.

RESULTS: Demographics (mean + SD) of subjects with complete data (N = 10,894) were age, 78.3 years ± 8.1 years; ISS, 10.9 ± 8.4; RTS = 7.5 ± 1.1; mortality = 6.9%; blunt mechanism = 98.6%; 3.1 % of subjects

received PRCs. The penetrating trauma subsample (n = 150) had a higher mortality rate of 20.0%. The misclassification rates for the models were GTOS, 0.065; TRISSB, 0.051; and TRISSP, 0.120. Brier scores were GTOS, 0.052; TRISSB, 0.041; and TRISSP, 0.084. The area under the curves were GTOS, 0.844; TRISSB, 0.889; and TRISSP, 0.897.

CONCLUSION: GTOS and TRISS function similarly and accurately in predicting probability of death for injured elders. GTOS has the advantages of a single formula, fewer variables, and no reliance on data collected in the emergency room or by other observers.

26. Estimating Geriatric Mortality after Injury Using Age, Injury Severity, and Performance of a Transfusion: The Geriatric Trauma Outcome Score

J Palliat Med. 2015 Aug;18(8):677-81. doi: 10.1089/jpm.2015.0027. Epub 2015 May 14.

Zhao FZ, et al.

PDF: Read PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/25974408

BACKGROUND: A tool to determine the probability of mortality for severely injured geriatric patients is needed.

OBJECTIVE: We sought to create an easily calculated geriatric trauma prognostic score based on parameters available at the bedside to aid in mortality probability determination.

METHODS: All patients ≥ 65 years of age were identified from our Level I trauma center's registry between January 1, 2000 and December 31, 2013. Measurements included age, Injury Severity score (ISS), units of packed red blood cells (PRBCs) transfused in the first 24 hours, and patients' mortality status at the end of their index hospitalization. As a first step, a logistic regression model with maximum likelihood estimation and robust standard errors was used to estimate the odds of mortality from age, ISS, and PRBCs after dichotomizing PRBCs as yes/no. We then constructed a Geriatric Trauma Outcome (GTO) score that became the sole predictor in the re-specified logistic regression model.

RESULTS: The sample (n = 3841) mean age was 76.5 ± 8.1 years and the mean ISS was 12.4 ± 9.8. In-hospital mortality was 10.8%, and 11.9% received a transfusion by 24 hours. Based on the logistic regression model, the equation with the highest discriminatory ability to estimate probability of mortality was GTO Score = age + (2.5 × ISS) + 22 (if given PRBCs). The area under the receiver operating characteristic curve (AUC) for this model was 0.82. Selected GTO scores and their related probability of dying were: 205 = 75%, 233 = 90%, 252 = 95%, 310 = 99%. The range of GTO scores was 67.5 (survivor) to 275.1 (died).

CONCLUSION: The GTO model accurately estimates the probability of dying, and can be calculated at bedside by those possessing a working knowledge of ISS calculation.

27. Trauma Surgeon and Palliative Care Physician Attitudes Regarding Goals-of-Care Delineation for Injured Geriatric Patients

Am J Hosp Palliat Care. 2019 Aug;36(8):669-674. doi: 10.1177/1049909118823182. Epub 2019 Jan 6.

Cunningham HB, et al.

PDF: Read PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/30614253

BACKGROUND: The value of defining goals of care (GoC) for geriatric patients is well known to the palliative care community but is a newer concept for many trauma surgeons. Palliative care specialists and trauma surgeons were surveyed to elicit the specialties' attitudes regarding (1) importance of GoC conversations for injured seniors; (2) confidence in their own specialty's ability to conduct these conversations; and (3) confidence in the ability of the other specialty to do so.

METHODS: A 13-item survey was developed by the steering committee of a multicenter, palliative care-focused consortium and beta-tested by trauma surgeons and palliative care specialists unaffiliated with

the consortium. The finalized instrument was electronically circulated to active physician members of the American Association for the Surgery of Trauma and American Academy for Hospice and Palliative Medicine.

RESULTS: Respondents included 118 trauma surgeons (8.8%) and 244 palliative care specialists (5.7%). Palliative physicians rated being more familiar with GoC, were more likely to report high-quality training in performing conversations, believed more palliative specialists were needed in intensive care units, and had more interest in conducting conversations relative to trauma surgeons. Both groups believed themselves to perform GoC discussions better than the other specialty perceived them to do so and favored their own specialty leading team discussions.

CONCLUSIONS: Both groups believe themselves to conduct GoC discussions for injured seniors better than the other specialty perceived them to do so, which led to disparate views on the optimal leadership of these discussions.

28. End-of-Life Decision-Making for Patients With Geriatric Trauma Cared for in a Trauma Intensive Care Unit

Am J Hosp Palliat Care. 2018 Aug;35(8):1063-1068. doi: 10.1177/1049909117752670. Epub 2018 Jan 24. Wooster M, et al.

PDF: Read PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/29366336

BACKGROUND: The geriatric trauma population is growing and fraught with poor physiological response to injury and high mortality rates. Our primary hypothesis analyzed how prehospital and in-hospital characteristics affect decision-making regarding continued life support (CLS) versus withdrawal of care (WOC). Our secondary hypothesis analyzed adherence to end-of-life decisions regarding code status, living wills, and advanced directives.

MATERIALS AND METHODS: We performed a retrospective review of patients with geriatric trauma at a level I and level II trauma center from January 1, 2007, to December 31, 2014. Two hundred seventy-four patients met inclusion criteria with 144 patients undergoing CLS and 130 WOC.

RESULTS: A total of 13 269 patients with geriatric trauma were analyzed. Insurance type and injury severity score (ISS) were found to be significant predictors of WOC (P = .013/.045). Withdrawal of care patients had shorter time to palliative consultation and those with geriatrics consultation were 16.1 times more likely to undergo CLS (P = .026). Twenty-seven (33%) patients who underwent CLS and 31 (24%) patients who underwent WOC had a living will, advanced directive, or DNR order (P = .93).

CONCLUSIONS: Of the many hypothesized predictors of WOC, ISS was the only tangible independent predictor of WOC. We observed an apparent disconnect between the patient's wishes via living wills or advanced directives "in a terminal condition" and fulfillment during EOL decision-making that speaks to the complex nature of EOL decisions and further supports the need for a multidisciplinary approach.

29. Burn Surgeon and Palliative Care Physician Attitudes Regarding Goals of Care Delineation for Burned Geriatric Patients

J Burn Care Res. 2018 Oct 23;39(6):1000-1005. doi: 10.1093/jbcr/iry027. Cunningham HB, et al.

PDF: No Free PDF available

URL: https://www.ncbi.nlm.nih.gov/pubmed/29771351

Palliative care specialists (PCS) and burn surgeons (BS) were surveyed regarding: 1) importance of goals of care (GoC) conversations for burned seniors; 2) confidence in their own specialty's ability to conduct these conversations; and 3) confidence in the ability of the other specialty to do so. A 13-item survey was developed by the steering committee of a multicenter consortium dedicated to palliative care in the injured geriatric patient and beta-tested by BS and PCS unaffiliated with the consortium. The finalized instrument was electronically circulated to active physician members of the American Burn Association

and American Academy for Hospice and Palliative Medicine. Forty-five BS (7.3%) and 244 PCS (5.7%) responded. Palliative physicians rated being more familiar with GoC, were more comfortable having a discussion with laypeople, were more likely to have reported high-quality training in performing conversations, believed more palliative specialists were needed in intensive care units, and had more interest in conducting conversations relative to BS. Both groups believed themselves to perform GoC discussions better than the other specialty perceived them to do so. BS favored leading team discussions, whereas palliative specialists preferred jointly led discussions. Both groups agreed that discussions should occur within 72 hours of admission. Both groups believe themselves to conduct GoC discussions for burned seniors better than the other specialty perceived them to do so, which led to disparate views on perceptions for the optimal leadership of these discussions.

30. The acute inflammatory response after trauma is heightened by frailty: A prospective evaluation of inflammatory and endocrine system alterations in frailty

J Trauma Acute Care Surg. 2019 Jul;87(1):54-60. doi: 10.1097/TA.0000000000002229.
Palmer J, et al.
PDF: Read the PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30768559
BACKGROUND: Frailty is a geriatric syndrome characterized by decreased physiological reserves, increased inflammation, and decreased anabolic-endocrine response. The biomarkers associated with frailty are poorly understood in trauma. The aim of this study was to analyze the association between frailty and immune: IL-1β, IL-6, IL-2Rα, tumor necrosis factor (TNF)-α, and endocrine biomarkers: insulin-like growth factor-1 and growth hormone in trauma patients.
METHODS: We conducted a 1-year (2017-2018) prospective analysis of geriatric (≥65 years) trauma patients admitted to our Level I trauma center. Frailty was measured using the trauma-specific frailty index (TSFI) and blood samples were collected within 24 hours of admission. Patients were stratified into two groups: frail (TSFI > 0.25) and nonfrail (TSFI ≤ 0.25). We then measured the levels of immune and endocrine biomarkers by a colorimetric output that was read by a spectrophotometer (Quantikine ELISA). The outcome measures were the levels of the immune and endocrine markers in the two groups. Multivariable linear regression was performed.
RESULTS: A total of 100 geriatric trauma patients were consented and enrolled. The mean age was 77.1 ± 9.8 years and 34% were female. Thirty-nine (39%) patients were frail. Frail patients were more likely to present after falls (p = 0.01). There was no difference in age (p = 0.78), sex (p = 0.77), systolic blood pressure (p = 0.16), and heart rate (p = 0.24) between the two groups. Frail patients had higher levels of TNF-α (p = 0.01), IL-1β (p = 0.01), and IL-6(p = 0.01) but lower levels of growth hormone (p = 0.03) and insulin-like growth factor-1 (p < 0.04) compared with nonfrail patients. There was no difference in the level of IL-2Rα (p = 0.25). On regression analysis, frailty was positively correlated with the levels of proinflammatory biomarkers, that is, TNF- α, IL-1 β, and IL-6 and negatively correlated with endocrine biomarkers.
CONCLUSION: This study supports the association between frailty and immune and endocrine markers. Frailty acts synergistically with trauma in increasing the acute inflammatory response. Moreover, frail patients have lower levels of anabolic hormones. Understanding the inflammatory and endocrine response in frail trauma patients may result in better therapeutic strategies.

31. Improving survival after an emergency resuscitative thoracotomy: a 5-year review of the Trauma Quality Improvement Program

Trauma Surg Acute Care Open. 2018 Oct 9;3(1):e000201. doi: 10.1136/tsaco-2018-000201. eCollection 2018. Joseph B, et al.
PDF: Read PDF HERE

URL: https://www.ncbi.nlm.nih.gov/pubmed/30402559

BACKGROUND: Advancement in trauma care has led to the evolution of emergency resuscitative thoracotomy (ERT) for the revival of trauma patients. We now have more precise understanding of selecting suitable patients for achieving optimal outcomes. The aim of our study was to analyze the utilization and survival trends during the past 5 years, as well as factors that influence survival after ERT.

METHODS: A 5-year (2010-2014) analysis of all trauma patients ≥18 years who underwent ERT in the American College of Surgeons Trauma Quality Improvement Program. Outcome measures were utilization rates and survival trends after ERT during the 5-year period. Regression analysis was performed.

RESULTS: 2229 patients underwent ERT, mean age was 37±17 years, 81% were male. Overall 56% patients had penetrating mechanism, location of major injury was thorax in 48, and 71% had signs of life (SOL) on arrival. The overall survival rate was 9.6%. From 2010-2014 ERT utilization has decreased from 331/100 000 to 243/100 000 trauma admissions (p=0.002) and the survival rate has improved from 7.9% to 11.3% (p<0.001). On regression, the independent predictors of survival were penetrating mechanism, age<60 years, SOL on arrival, no prehospital CPR and ISS. No patient aged >60 years with a blunt mechanism of injury (MOI) survived, and there were no survivors above the age of 70 years, regardless of injury mechanism.

DISCUSSION: Utilization of ERT has been decreased during the study period along with improved survival rates. The results of our study demonstrate that performing ERT on patients aged >60 years with a blunt MOI or on any patient aged ≥70 years, regardless of MOI, is futile and should be avoided.

32. Geriatric traumatic brain injury—What we know and what we don't

Stein DM, et al.; AAST Geriatric Trauma/ACS Committee.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30256343

33. Vital Signs Strongly Predict Massive Transfusion Need in Geriatric Trauma Patients.

PDF: No free PDF available
URL: https://www.ncbi.nlm.nih.gov/pubmed/27457863

Early recognition of massive transfusion (MT) requirement in geriatric trauma patients presents a challenge, as older patients present with vital signs outside of traditional thresholds for hypotension and tachycardia. Although many systems exist to predict MT need in trauma patients, none have specifically evaluated the geriatric population. We sought to evaluate the predictive value of presenting vital signs in geriatric trauma patients for prediction of MT. We retrospectively reviewed geriatric trauma patients presenting to our Level I trauma center from 2010 to 2013 requiring full trauma team activation. The area under the receiver operating characteristic curve was calculated to assess discrimination of arrival vital signs for MT prediction. Ideal cutoffs with high sensitivity and specificity were identified. A total of 194 patients with complete data were analyzed. Of these, 16 patients received MT. There was no difference between the MT and non-MT groups in sex, age, or mechanism. Systolic blood pressure, pulse pressure, diastolic blood pressure, and shock index all were strongly predictive of MT need. Interestingly, we found that heart rate does not predict MT. MT in geriatric trauma patients can be reliably and simply predicted by arrival vital signs. Heart rate may not reflect serious hemorrhage in this population.

34. Early predictors for massive transfusion in older adult severe trauma patients.

Injury. 2017 May;48(5):1006-1012. doi: 10.1016/j.injury.2016.12.028. Epub 2016 Dec 29.
Ohmori T, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/28063676

35. Frailty screening and a frailty pathway decrease length of stay, loss of independence, and 30-day readmission rates in frail geriatric trauma and emergency general surgery patients.
J Trauma Acute Care Surg. 2018 Jul;85(1):167-173. doi: 10.1097/TA.0000000000001931.
Engelhardt KE, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/29659475
Many scoring systems for the early prediction of the need for massive transfusion (MT) have been reported; in most of these, vital signs are regarded as important. However, the validity of these scoring systems in older patients remains unclear because older trauma patients often present with normal vital signs. In this study, we investigated the effectiveness of previously described scoring systems, as well as risk factors that can provide early prediction of the need for MT in older severe trauma patients.
METHODS: We prospectively collected data from a cohort of severe trauma patients (ISS ≥16 and age ≥16years) admitted from January 2007 to March 2015. Trauma Associated Severe Hemorrhage (TASH), Assessment of Blood Consumption (ABC), and Prince of Wales Hospital (PWH) scores were compared between a younger and an older group. Furthermore, the predictors associated with MT in older severe trauma patients were assessed using multivariable logistic regression analyses.
RESULTS: The area under the curve (AUC) was significantly smaller for older group than for younger group for all three scoring systems (p<0.05). The most important risk factors to predict the need for MT were related to anatomical factors including FAST results (odds ratio (OR): 5.58, 95% confidence interval (CI): 2.10-14.99), unstable pelvic fracture (OR: 21.56, 95% CI: 6.05-90.78), and long bone open fracture of the lower limbs (OR: 12.21, 95% CI: 4.04-39.09), along with pre-injury anticoagulant agent use (OR: 5.22, 95% CI: 1.30-19.61), antiplatelet agent use (OR: 3.81, 95% CI: 1.57-9.04), lactate levels (OR: 1.20, 95% CI: 1.04-1.39) and shock index (OR: 2.67, 95% CI: 1.05-6.84). Traditional vital signs were not early risk factors.
CONCLUSION: We suggest that MT in older trauma patients should be considered on the basis of anatomical factors, pre-injury anticoagulant or antiplatelet agent use, lactate level and SI even if traditional vital signs are normal.

36. Advanced Monitoring System for Daily Activity in Elderly People
In 2019 IEEE International Conference on Consumer Electronics (ICCE) 2019 Jan 11 (pp. 1-2). IEEE.
Zambrano-Montenegro D, Bellido-Outeiriño FJ, García-Bermúdez R, Flores-Arias JM, Huhn A
No free PDF or Links available

37. Fall detection system for elderly people using IoT and ensemble machine learning algorithm.
Personal and Ubiquitous Computing. 2019:1-7. Yacchirema D, de Puga JS, Palau C, Esteve M.
https://ieeexplore.ieee.org/document/8661928
PDF: No free PDF Available
The purpose of this paper is to evaluate the use of accelerometers in the detection of daily motion activities as well as falls, applied to an intelligent home system for dependent adults, thus determining the effectiveness of the use of these technological components for Ambient Assisted Living (AAL) environments. The proposed system aims to get the pattern of daily motion activities such as walking, getting up from a chair or suffering a fall in different ways by means of an accelerometer plus a gyroscope in a low energy and low weight device, minimally invasive.

38. Unenhanced CT for clinical triage of elderly patients presenting to the emergency department with acute abdominal pain
Diagnostic and interventional imaging. 2019 Jun 14. Barat M, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/31208938

PURPOSE: The purpose of this study was to compare the diagnostic accuracy and inter-reader agreement of unenhanced computed tomography (CT) to those of contrast-enhanced CT for triage of patients older than 75years admitted to emergency department (ED) with acute abdominal pain (AAP). PATIENTS AND METHODS: Two hundred and eight consecutive patients presenting with AAP to the ED who underwent CT with unenhanced and contrast-enhanced images were retrospectively included. There were 90 men and 118 women with a mean age of 85.4±4.9 (SD) (range: 75-101.4years). Three readers reviewed unenhanced CT images first, and then unenhanced and contrast-enhanced CT images as a single set. Diagnostic accuracy was compared to the standard of reference defined as the final diagnosis obtained after complete clinico-biological and radiological evaluation. Correctness of the working diagnosis proposed by the ED physician was evaluated. Intra- and inter-reader agreements were calculated using the kappa test and interclass correlation. Subgroup analyses were performed for patients requiring only conservative management and for those requiring intervention. RESULTS: Diagnostic accuracy ranged from 64% (95% CI: 62-66%) to 68% (95% CI: 66-70%) for unenhanced CT, and from 68% (95% CI: 66-70%) to 71% (95% CI: 69-73%) for both unenhanced and contrast-enhanced CT. Contrast-enhanced CT did not significantly improve the diagnostic accuracy (P=0.973-0.979). CT corrected the working diagnosis proposed by the ED physician in 59.1% (range: 58.1-60.0%) and 61.2% (range: 57.6-65.5%) of patients before and after contrast injection (P>0.05). Intra-observer agreement was moderate to substantial (k=0.513-0.711). Inter-reader agreement was substantial for unenhanced (kappa=0.745-0.789) and combined unenhanced and contrast-enhanced CT (kappa=0.745-0.799). Results were similar in subgroup analyses. CONCLUSION: Unenhanced CT alone is accurate and associated with high degrees of inter-reader agreement for clinical triage of patients older than 75years with AAP in the emergency setting.

39. Traumatic brain injuries in elderly patients; to be transferred or not?
The American Journal of Surgery. 2019 Aug 5. Khosravi MH.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/31405520

GUIDELINES
40. Evidence-based review of trauma center care and routine palliative care processes for geriatric trauma patients; A collaboration from the American Association for the Surgery of Trauma Patient Assessment Committee, the American Association for the Surgery of Trauma Geriatric Trauma Committee, and the Eastern Association for the Surgery of Trauma Guidelines Committee.
J Trauma Acute Care Surg. 2019 Apr;86(4):737-743. doi: 10.1097/TA.0000000000002155. Aziz HA, et al.
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/30531333

BACKGROUND: Despite an aging population and increasing number of geriatric trauma patients annually, gaps in our understanding of best practices for geriatric trauma patients persist. We know that trauma center care improves outcomes for injured patients generally, and palliative care processes can improve outcomes for disease-specific conditions, and our goal was to determine effectiveness of these interventions on outcomes for geriatric trauma patients.

METHODS: A priori questions were created regarding outcomes for patients 65 years or older with respect to care at trauma centers versus nontrauma centers and use of routine palliative care processes. A query of MEDLINE, PubMed, Cochrane Library, and EMBASE was performed. Letters to the editor, case reports, book chapters, and review articles were excluded. GRADE (Grading of Recommendations Assessment, Development and Evaluation) methodology was used to perform a systematic review and create recommendations.

RESULTS: We reviewed seven articles relevant to trauma center care and nine articles reporting results on palliative care processes as they related to geriatric trauma patients. Given data quality and limitations, we conditionally recommend trauma center care for the severely injured geriatric trauma patients but are unable to make a recommendation on the question of routine palliative care processes for geriatric trauma patients.

CONCLUSIONS: As our older adult population increases, injured geriatric patients will continue to pose challenges for care, such as comorbidities or frailty. We found that trauma center care was associated with improved outcomes for geriatric trauma patients in most studies and that utilization of early palliative care consultations was generally associated with improved secondary outcomes, such as length of stay; however, inconsistency and imprecision prevented us from making a clear recommendation for this question. As caregivers, we should ensure adequate support for trauma systems and palliative care processes in our institutions and communities and continue to support robust research to study these and other aspects of geriatric trauma.

41. Practice management guidelines for geriatric trauma: the EAST Practice Management Guidelines Work Group
J Trauma. 2003 Feb;54(2):391-416. Jacobs DG, et al; EAST Practice Management Guidelines Work Group.
PDF: Read PDF HERE

MILITARY PRIORITIES
42. The Top 10 Research and Development priorities for battlefield surgical care
Martin, M. et al. 2019 Journal of Trauma and Acute Care Surgery
PDF: Read PDF HERE
URL: https://www.ncbi.nlm.nih.gov/pubmed/31246901