5 The Role of the Emergency Physician for Injured Geriatric Patient Care in the ED

Dave Milzman and Sarada Rao

Introduction

The rapidly aging population is now shifting the focus of healthcare. As the population lives longer, a greater percentage of individuals are living longer, more active, and subsequently at more of a risk to suffer from a traumatic injury. This means that more older persons are at risk to fall down and fracture a hip and suffer from a subdural hematoma and more at risk to be struck in a crosswalk and suffer from multiple trauma. Injuries in the geriatric population presenting to the emergency department (ED) are undergoing a change in presentations and complexity. Geriatric trauma is increasing both in absolute number and proportion of annual trauma admissions, with admissions in level I and II trauma centers up from 23% in 2003 to 30% in 2009 [1]. The geriatric trauma patient is three to five times more likely to die from trauma than a younger patient who sustains a similar mechanism of injury [2, 3].

As the number of elderly patients continues to grow, the healthcare system will need to embrace the challenges of caring for older adults [4]. Certainly there exists some major differences in mechanisms of injurious forces suffered by older patients compared to 18–25-year-old counterparts, as well as patient tolerance for injury with resultant trauma. Blunt trauma is overwhelmingly the predominant mechanism of injury for geriatric patients. Enhanced care means increased vigilance for recognizing preinjury health issues and risks for increased morbidities and mortalities in these patients. It is therefore imperative that emergency physicians are able to be prepared to care for these individuals who oftentimes have complex medical conditions, arrive with atypical presentations that can obscure the diagnostic process, and require special needs during their visit. Rapid early intervention for medical complexities is important as older populations tend to have worse outcomes than their younger counterparts [2, 5]. This chapter explores these evolving management models within the context of contemporary emergency care for geriatric adults.

Historically, the traditional emergency care model has been used in the diagnostic process in the care for geriatric patient. This model focuses

D. Milzman, M.D., F.A.C.E.P. (✉)
Georgetown University School of Medicine, Washington, DC, USA

Department of Emergency Medicine and Divison of Trauma, Washington Hospital Center, Washington, DC, USA

Study Center for Brain Injury, Washington Hospital Center, Washington, DC, USA
e-mail: milzman@georgetown.edu

S. Rao, M.D.
Georgetown University School of Medicine, Washington, DC, USA

Department of Surgery, Eastern Virginia Residency Program, Norfolk, VA, USA

A. Rodriguez et al. (eds.), *Geriatric Trauma and Acute Care Surgery*,
https://doi.org/10.1007/978-3-319-57403-5_5

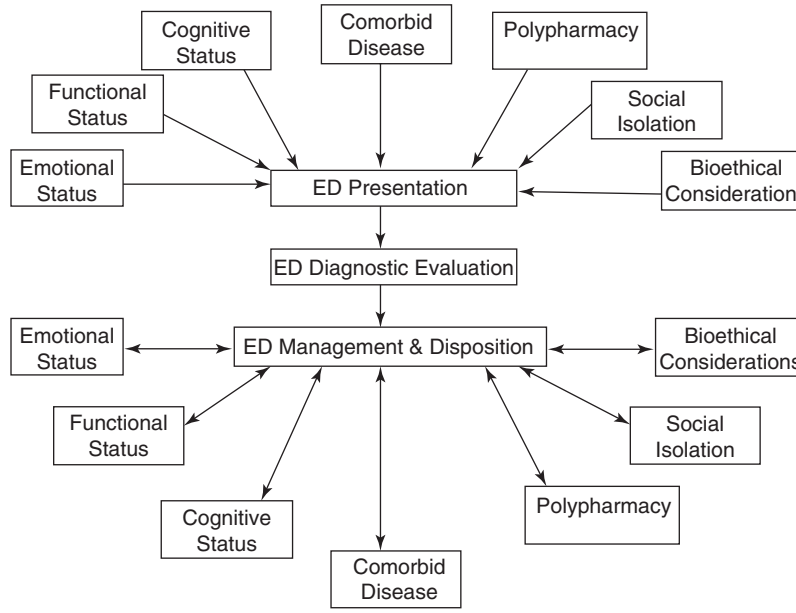

Fig. 5.1 Geriatric ED model of care [1]. There are differences from standard EM care models where many more factors impact both patient presentation and especially disposition (with permission from The Clinics Elsevier Publications, Pending approval)

on a linear and therapeutic medical decision making. While this can be useful in younger individual who comes into the emergency room, it is ineffective for an older emergency or trauma patient. The geriatric emergency care model is multifactorial and incorporates essential elements of older adult well-being including social isolation, transportation limitations, fixed incomes, cognitive status, and functional disability (Fig. 5.1) [1, 6].

Role of the ED Doctor in the Prehospital and Hospital Triage

The role of the emergency physician in prehospital care of the acutely injured patient has changed markedly in the past decade with increased role and responsibility as surgeon coverage in trauma has also changed. The idea that only a surgeon can adequately assess an injured patient is over. Now in this age of mostly nonoperative management of nonorthopedic injuries, the emergency department assessment has proven most valuable in optimal resource allocation with apparently similar outcomes. The initial evaluation of trauma starts with discussing triage with prehospital providers. Emergency physicians have always served as leaders in EMS care and their expertise in triage is well documented [7, 8].

Emergency physicians are the first line of care for the majority of patients presenting to the hospital. Even when sent from an office for medical clearance; the judgement for patient stability is attained through ED screening. Decisions on trauma center activation also rest with a discussion between the emergency medical services (EMS) and emergency physician in order to decide whether a patient is triaged to trauma or can be sent to the emergency department.

The current American College of Surgeons' Committee on Trauma guidelines recommend that all injured patients aged 55 years and older should be considered for transfer to a trauma center as a special consideration [9]. There is little current support in the literature for age, alone, to upgrade trauma patients and this semi-arbitrary number needs to be amended. The triage rule, to send all patients with advanced age, has not been found statistically correct [10, 11]. The problem with this data is that it is not independent of other factors such as preexisting disease, medication (especially those affecting platelets and coagulation), and decreased mental capacity and level of self-care. The ability to ascertain such information, prehospital, at the scene or en route, is most difficult. The reliabil-

ity of such information, from an injured patient or rarely bystander/family member, is not a reasonable expectation.

More recent research has failed to find that enhanced consideration of age 55 years of age results in reduced mortality with an unacceptable rate of over-triage to trauma centers [10, 12]. Age alone, as secondary triage criteria, needs reconsideration without physiologic or serious mechanism of injury findings. There are trauma attendings that believe that over-triage rates approaching 30–35% are acceptable to prevent increased death or disability and that it must be increased for geriatric trauma patients [13]. Trauma team activation must account for a lack of a clear history of events and understanding of the injury mechanism. Early over-triage often occurs because injury mechanism or initial assessment appears to warrant trauma center evaluation. It is well understood that older patients have lower physiologic reserve and delay in injury detection is linked to worse outcomes [14, 15].

Use of prehospital predictors such as Revised Trauma Score function poorly for geriatric patients and yet not enough treating emergency physicians and trauma surgeons recognize this fact. New reports using systolic blood pressure criteria in the National Trauma Triage Protocol for geriatric trauma "110 (SBP in mmHG) is the new 90" are vital to improving care of geriatric patients [16]. These added "considerations" require more time and thought on part of EMS. More widespread teaching of early shock markers in geriatric patients is needed. These include narrowing of the pulse pressure, higher "normal" resting heart rates and blood pressures, and less physiologic reserve as well as less tolerance of the usual 2.0 L of IV fluid bolus resuscitation in patients with increased rates of renal and cardiac dysfunction [16]. Shock Index (SI) is an accurate and specific predictor of morbidity and mortality in geriatric trauma patients. It is not part of usual triage at this time but has been found superior to heart rate and systolic blood pressure for predicting mortality in geriatric trauma patients. A value (SI = HR/SBP) greater than or equal to 1 should be transferred to a Level 1 trauma center [17].

Additionally rapid neurological assessment with Glasgow Coma Score (GCS) also requires some modification for prehospital decision making in geriatric patients. Changing the EMS trauma triage cutoff for elders from GCS 13 to GCS 14 results in improved sensitivity for clinically relevant outcomes. In injured elders, with GCS 14 have greater odds of mortality and TBI than younger adults with GCS 13 [18].

EP are best positioned to retrain or at least reorient prehospital providers. They must make quick determinations in the department if geriatric patients at greatest risk for occult injuries need early enhanced care approach; that can only be received from a trauma team activation. Geriatric patients often with minor mechanisms may require ED upgrade for higher risk injuries such as hip and pelvic fractures and likely TBI.

Information of prescription drug use is not known prehospital. Therefore, patients at increased risk from medication with antiplatelet or anticoagulants suffer delayed intervention. Preexisting disease states often require trauma center triage and the ED is better equipped and experienced to serve as a better arbiter to decide on trauma team activation with enhanced rapid diagnosis and treatment of such injury.

It is extremely common for EMS to under-triage geriatric injuries, usually nonvertical fall from standing and low-speed vehicular crash which account for majority of geriatric trauma mechanisms [12, 19–21]. Due to preexisting injuries, lower bone densities, and greater rates of anticoagulant and antiplatelet medications more injuries result from low-force trauma [22]. Accurately describing injuries in geriatric patients rarely is fully available prehospital. An abundance of evidence describes that injured geriatric patients are less likely to be appropriately triaged for initial care at trauma centers despite the fact that the risk for adverse, postinjury outcome is more likely due to limits of patient comorbidities, and cardiovascular reserve as well as "general frailty" [12, 20, 21].

The study of the Maryland system found that among over 26,000 patients, under-triage was found increased among geriatric patients (>65 years) compared to younger patients 50% versus 17.8%, $p < 0.001$, respectively [20]. There clearly

is a discoverable bias against elderly receiving transport to higher trauma center level. The reason includes EMS provider bias, due to beliefs they possess for poorer geriatric patients outcomes [23]. Too often decisions are made that older patients fail to survive many complex injuries and may be under-triaged. However, the opposite is actually true, where the majority of geriatric trauma victims return to independent living [24].

Diagnostic and Therapeutic Decision Making in the ED for Geriatric Trauma

Care of the whole patient, especially the chronically ill, geriatric patient, is likely outside the norm for most trauma attendings and their trauma team. The ED is more used to such complicated, multisystem medical failures. The determination of what caused the trauma and obtaining pre-event status is valuable and can alter treatment decisions. This precipitating medical event in older trauma patients will complicate assessment, response to treatment, and outcome. This problem in geriatric trauma requires treating physicians to assess initially for traumatic injury but also be well aware of possible medical conditions that may also need treatment that caused or at least contributed to the traumatic injury. Hypoglycemia, stroke, or seizure while driving may mimic a TBI and needed intervention delayed [24].

Does a fall and hip fracture require a trauma center evaluation? An intertrochanteric fracture from a fall alone is an ISS of 9 and if there is another abrasion or injury we now are pushing double digits in a patient likely with significant comorbidities and older age, would rapid evaluation and earlier operative clearance and resuscitation improve outcome? This question has been addressed by having designated geriatric teams care for such patients routinely in the ED. There are many evidence-based reports of success and improved care with shorter hospital days and fewer complications when the patients were admitted in the past, under orthopedic teams with medical consults [25, 26]. Geriatricians routinely oversee the medical management for the patient and provide operative risk assessment and surgical clearance. Then the designated orthopedic surgery team can focus solely on the perioperative and postoperative care of the prosthetic and healing. The improved care comes from better medical workup of ongoing causation of the trauma, not just repairing a specific injury, which likely fails to address a larger ongoing medical problem [27].

The role of the treating physician in a trauma center has been shown to be optimized when the most experienced physicians are present. The great problem is not that a board-certified EP cannot be adequately trained to care for an injured geriatric patient and achieve similar outcomes as a surgeon. The concern is that in the setting of overcrowded EDs there is inadequate triage, time, and personnel to assure that geriatric patients are both assessed and treated in a manner that reduces delays in detection and maximizes early and appropriate resuscitative efforts, and relief of suffering. The current state of ED overcrowding appears to clearly point toward figuring out enhanced geriatric medical in trauma centers, due to lack of adequate timely intervention in the ED. For acutely injured patients. there is not good data to prove this assertion currently. However; this finding appears to be so obvious that waiting for randomized, controlled trials may not be necessary. ED triage of geriatric trauma only works in efficient, not overcrowded, ED where the lag from triage to physician assessing critical and emergent patients is minimal.

In the latest edition of Optimized Care of the Injured patient, the role of attending physician is clearly described as “having the best and the brightest medical professionals available to treat injured patients” [28]. The guidelines state the responsibility for board-eligible or board-certified general surgeons and emergency medicine physicians to be “available 24 h a day in facilities providing the highest level of care and cannot abdicate that responsibility to a resident in training”[8, 10, 28]. In addition, the attending requires significant trauma experience more than simply Advanced Trauma Life Support certification. ATLS was designed not for a leader in trauma care, but as a minimum standard for care of trauma patients in setting of limited resources.

The need for an experienced trauma leader is most apparent in dealing with complicated geriatric patients where occult injury is not usually apparent, history seldom is clear, and most often the mechanism of injury is underwhelming. Minor fall from standing can produce significant traumatic brain injuries such as subdural hematoma and hip fractures, whereas a younger patient may not even seek care for a similar fall. Early on, altered mental status, headache, and minor neuro changes that may be symptoms of TBI can be masked by prior CVA, dementia, medication, or prior chronic complaints. Almost none of the ACS COT triage criteria will adequately predict most injuries in geriatric patients [9, 28]. The usual is anything but usual in geriatric trauma patient care. Under-triage occurs too frequently in this population due to minor-appearing mechanisms expecting same outcomes as with younger, healthier patients with many fewer pre-existing disease states. Most providers fail to consider the frailty and medication use of geriatric patients. Also, there is failrly widespread use of antiplatelet and anticoagulant therapy in geriatric patients compared to younger matched set, as well as a lesser ability to withstand minor mechanism without suffering fracture, is well documented [29, 30].

Recent findings in ED and trauma ordering of head CT, using the ACEP guidelines instead of Canadian head CT decision rules, show great increases in nontherapeutic uses of brain CT [31]. Actual positive findings are small, less than 5% of all scans, and those with occult findings requiring neurosurgical intervention are less than 1% of all geriatric brain CT obtained. This is not stating that traumatic lesion does not occur in geriatric patients; geriatric brain injury is increased compared to nonelderly and occurs despite less severe mechanisms [32, 33]. Since most geriatric head injuries happen from falls from a standing mechanism, usual trauma team activation by mechanism is not met. However, resultant injury rates occur with significant TBI resulting greater than 10% of time (brain AIS >2) [29, 30]. Furthermore, initial GCS on these patients is not sufficiently low <13, to achieve trauma team activation, or patients are assumed chronically altered and end up in the ED [18].

There are no matched prospective evaluations of isolated geriatric head trauma treated in ED compared to trauma center evaluation. The use of nonstandardized scores like the CRASH CT found that elderly patients with TBI deserve tailored assessment and care by providers familiar with the issues that make their clinical course unique [33]. The increased rates of preexisting disease, higher rates of anticoagulants, and complicating comorbidities all make it essential for rapid evaluation and diagnosis of these patients to optimize their outcomes. Too often delayed detection will lead to lower success for neurosurgical intervention. Trauma center care results in obtaining brain CT faster and more often than comparable ED evaluations of geriatric fall patients.

The older patient is a truly changing dynamic; age is no longer the major determinant as well as general health. In past studies, increasing age was directly correlated with preexisting disease states [34]. However, the younger patient with renal disease has increased mortality independent of age and ISS. Similarly, once a patient has more than two PED, they have 18% increased mortality controlling for injury compared to those without PED, independent of age [34, 35]. In the new view of trauma patients, a healthy 65-year-old should do better than a hypertensive, diabetic, obese 38-year-old patient. We are currently lacking good studies for at what age, even a healthy, disease-free geriatric patient starts to note increased mortality compared to an also healthy younger patient. Knowledge of a patient's usual heart rate and blood pressure, or at least a good approximation, is most important. When in doubt, use usual markers such as lactate, and shock index and pulse pressure which can rapidly assist the treating physician as to early presence of hypoperfused shock state.

The role of the emergency physician can be critical in the early resuscitation of the elderly trauma patient and unfortunately in the busy ED fails to provide sufficient early intervention that a trauma center could improve upon. The critical immediate postinjury assessment and resuscitation period is too often full of delays in exact injury identification and inadequate and long course in adequate fluid response.

The early need for invasive monitoring, especially in the geriatric patient, is an important question that had been well studied in the late 1980s by Scalea et al. with improvements in outcome demonstrated with early invasive monitoring with pulmonary artery catheters [36]. This major improvement came at the same time that the PA catheter was being blamed for increased mortality in the medical ICU population; that makes Scalea's study even more important [37]. Recently, the rapid and heavily invasive approach to sepsis treatment has been demonstrated as adding little improvement in patient outcome in large multicenter studies from North America, the United Kingdom, and Australia (respectively) PROCESS, PROMISE, and ARISE [38–41]. All found the usual ED care of the sickest sepsis patients was equal to advanced, more invasive care, even in geriatric patients [42].

It is clear that repeat evaluation using standard resuscitation methods performed as well as invasively monitored patients have improved outcomes. Sepsis is not exactly the same mechanism as trauma, but the resuscitation timing is not so different. Most important is bedside assessment and continuous reassessment until the patient has demonstrated improvement and stability not only in vital signs but also in biomarkers. The availability of a senior physician at the bedside is the key difference in trauma center handling of the geriatric patient and a focused exam in the ED. The usual consultation the next day as is routine for geriatricians with orthopedic cases is not adequate for trauma. Only the emergency physician and trauma surgeon are available on an immediate basis 24/7 to provide not only consultation but also immediate assessment and intervention.

Pitfalls of the Emergency Department

The emergency physician often has too many other responsibilities during a shift to focus solely on resuscitation of single patients for prolonged time periods. It is a failure of the ED, limited by overcrowding with patients, which reduces availability for the physician at the bedside to provide necessary patient care adn resuscitation in a timely manner.

In geriatric patients, a key question in resuscitative decision is the timing of transfusion of blood products versus early crystalloid for traumatic shock. In the emergency department the great majority of geriatric patients receive IV fluids, mainly crystalloid. This is done not to assure renal perfusion and maintain normal pulse pressure, but instead to treat standard vital signs: tachycardia, and hypotension. In geriatric patients, all too often overlooked or overcompensated for is the concern of decreased cardiac output, and the risk of decreasing pulmonary oxygenation and increasing lung water from fluid overload.

However, most recent data favors judicious fluid resuscitation favoring keeping patients slightly dryer, but meeting needed improvement in pressure and biomarkers [28]. If resuscitation forgoes invasive monitoring of central pressures and oxygenation, frequent repeat marker analysis is necessary to confirm lack of occult shock state. It is relatively rare to get back to the excellence of the late 1980s and early 1990s when traumatologists like Scalea were resuscitating geriatric patients with PA catheters with continuous ScvO2 to detect acute changes in perfusion [37]. These interventions like the Early Goal Directed Protocols, outlined so well with Rivers in 2000 [38], are rarely employed now, nearly two decades later, as evidence-based medicine retrospective analysis has failed to support such important interventions in their entirety.

The most recent sepsis research into protocols found that "usual care" in the ED has improved greatly [39–41]. The problem remains, however, that are we really comparing similar patients? In stage II and III traumatic shock, patients, especially geriatric patients, benefit greatly from excessive intervention and monitoring in the trauma bay compared to the ED. Even trauma centers have gone away from invasive monitoring and more expectant care. This style of resuscitation may reduce some morbidity of over-resuscitation but will not allow for optimal care of some of the most severely injured geriatric patients.

The lack of recognition of decreased baseline mental capacities directly impacts excessive workup and causes increased hospital length of stays. Cognitive impairments including dementia (in many forms) have been found in over one-quarter of geriatric ED patients, although less than one-third of these patients actually had documentation. Delays in emergency department patient assessments have become more routine now than at any time in the past 30 years. Misunderstanding of even falls from standing in the elderly on ED triage nurse and even with physician-assisted triage will result in delayed assessment and significant delay in some brain trauma and orthopedic injuries. Only the careful and thorough rapid trauma team evaluation allows for such improved outcome in injured geriatric patients.

The acceptable rate of radiographic and lab evaluation is not always that much different from that obtained in the ED with the huge caveat that it is done in much more rapid and organized manner. Trauma team activation allows for a better "team" assessment of injured patients, especially geriatric, and without the time delay that could be more than 2–4 h and set the patient up for increased morbidity and mortality form delay in diagnosis, proper consultation with specialist, and delivery of therapeutic operative care.

This is not to say that the ED always underperforms. It is, however; most likely that a large percentage of geriatric patients brought to the ED after suffering a traumatic injury are misunderstood due to appearances and underestimation of injury mechanism. Usual mechanisms of injury in geriatric patients include low falls, not vertical falls, from height, lower vehicular speeds, and fewer blunt assault and penetrating traumatic injuries, which make ED personnel to mistreat injured elderly patients.

Difficulties to Determine Final Destination of the Patient

There are two main decisions to be made on patient arrival by EMS: whether to keep the patient in ED or upgrade to trauma team activation. Often, difficulty in properly assigning geriatric patient destination is very institution dependent. The key determinant should always be patient stability. In any case, an unstable patient, with any possible trauma, should undergo trauma activation. The exception would be if medical causation is clearly identifiable as cause of the traumatic event, and those patients can stay in ED if an emergency attending physician is immediately available to care for the patient.

Since many geriatric patients present following relatively minor mechanisms but with semisignificant derangement of initial presentation, there is a great variability in triaged destination. Reviewing mechanisms in geriatric trauma is an important clue to optimal destination of the patient for care. If there is a high-speed vehicular crash with an alert patient, trauma activation is most appropriate as long as no obvious arrhythmia, or correctable mental status abnormality. Causes of high-speeed MVCs such as diabetes (medication-induced hypoglycemia), seizure, stroke or cardiac arrhythmia causing syncoope; all could be important to treat than soley ruling out the traumatic injury. Fall from standing, down steps, or other minor mechanical mishap during what should be normal ambulation likely is better treated in the emergency department.

An ideal scenario is to have a geriatric patient evaluated where nursing and support staff is most comfortable with the disease process. For example, oversight of medical emergencies that include monitoring for arrhythmias as well as neurologic or respiratory issues that involve noninvasive ventilatory support is better managed in the emergency department whereas injuries that involve open fractures, traumatic brain injury, complex wounds, and surgical abdomens are much better taken care of through trauma activation. The clear key is speed to determine diagnosis and comfort level with treatment intervention. Administering large amounts of blood products in ventilated patients goes best in trauma whereas insulin or amiodarone drips are better managed in the emergency department. A list of suggested causative mechanisms and hospital disposition focuses on optimal outcome based on perceived timely intervention.

The greatest impact on outcome, excluding severity of injury and underlying preinjury general health, is time to treatment of a medical cause of trauma. Rapid assessment utilizing whole-body scan radiograph, FAST, and identifying perfusion deficit in geriatric trauma is much more important in this population as they have reduced clinical reserves to withstand even short periods of shock. Proper triage prehospital would be optimal, but current geriatric guidelines are limited and difficult for even the best prehospital provider to accurately discern. Age alone is a poor predictor. An important example would be a 48-year-old (nongeriatric patient) on dialysis with history of liver disease and prior TED on a newer anticoagulant who suffered a trip and fall compared to a healthy 64-year-old biking. Limitations on handling medically complex patients have clearly been identified in trauma centers where consultation to nonsurgeons is limited and not planned. Having the emergency physician take lead on such cases clearly can improve speed, knowledge, and care of the patient.

Again, there is limited data to confirm this mostly anecdotal finding. Multicenter investigations to determine the optimal destination of contnued patient resuscitation are needed. It also remains unclear where geriatric postoperative patients or nonoperative observation patients can best be monitored. Most medical wards are not adept at usual surgical monitoring and surgical wards may not be as comfortable with medical patient care. The treating team needs to be actively directing care, so the ultimate placement should rest with the physician providing the greatest ongoing care.

During the assessment phase in the ED elderly patients routinely receive less analgesia than nonelderly patients [43]. They are under-resuscitated due to overestimation of nontolerance of fluid administration and delays in definitive care due to ED delay in diagnosis and proper consultation, with many specialty evaluations (surgical) waiting until the following day. There are also issues with delays in initiating proper diet in geriatric patients and in ensuring that diet placed in front of them actually gets consumed. Few studies exist that document the impact of advanced nutritional assessment, but of the existing studies that demonstrate poor nutrition, mortality is increased in geriatric pneumonia patients who lack adequate diet at 72 postadmit [44].

Would comfort care measures be better attained on a trauma service than admitted geriatric trauma in the ED. There are currently insufficient studies that compare similar patients with significant outcome markers. The determinants of a reduced mortality are multifactorial and difficult to unbundle from inherent patient physiologic and protoplasm issues compared to rapidity and thoroughness of interventions as well as accuracy.

Significance and Repercussions, in the Outcome, Related to the ED Patient Stay Before Final Decisions Are Made

Does a trauma team activation for a geriatric fall patient with rapid imaging of brain and a total body scan for possible associated fractures improve the usual ED care? The new ‘usual’ wait to be seen in the E.D. needs to be compared for morbidity and mortality. However, improvements will likely not be discernible by measuring mortality differences due to low death rates and morbidity change will also be difficult to determine for comparison will not be easy to match to controls. Length of stays may be shorter in the ED with a simple return to home, whereas detecting additional injury can result in longer stays. This more accurate placement, to rehabilitation sites; However, will cause delays in proper SNF placement [45]. To avoid anecdotal conclusions, multisite studies must be designed to see if the idea of geriatric trauma centers will improve care, reduce morbidities, and reduce longer term disability.

Geriatric trauma centers and even geriatric ED sections require a closer evaluation. Among acute injuries, patients older than 55 and certainly over 65 years are less likely to be involved in usual traumatic injuries due to much reduced exposure to causative mechanisms [46]. Falls, vehicular crash, and some interpersonal violence are the

leading presenting mechanisms to trauma centers and ED for geriatric injuries. In pediatric trauma care there is a clear advantage to having the trauma team evaluate patients and lead to reduced delays in intervention and improved outcomes. Before creation of the trauma team, relevant specialists were individually called to the ED for patient evaluation. When a formal trauma response team was organized, time required for ED treatment of severe trauma was decreased, and consequently survival was better than predicted compared with the reference major trauma outcome study population [47]. The need for geriatric trauma center with enhanced designation and a better integrated surgical-medical cooperative team format would allow for enhanced integration of care in most expedient manner [47, 48]. Delays will exist in all complicated patients, but identifying early and initiating protocol-driven diagnostics can reduce delays in identifying medically sick and needy trauma patients.

Conclusion

In years to come, the proportion of older patients presenting to the emergency department is expected to increase exponentially. These patients are at greater risk for adverse outcomes than younger patients. The currently used disease-oriented models do not sufficiently consider the complexity of older ED patients. In order to address these emerging issues and provide better care for the growing, aging population care, future emergency medicine management models will need to incorporate appropriately trained personnel, reliable streams of communication between prehospital trauma services and emergency department as well as inpatient services, well-developed and comprehensive protocols, and lastly a geriatric-friendly infrastructure. The implementation and wide use of such age-centered approaches will help to further improve the quality of care for acutely injured geriatric patient.

The emergency physician is uniquely prepared and capable to assist the trauma team in both assessment and concern for preexisting illness concerns as well as limited tolerance for "usual" resuscitation protocols. The medical side of trauma care is not foreign to trauma surgeons. However, the focus may be alternatively delayed. Trauma team activation for geriatric patients requires a true "team" approach with the surgeon needing to recognize early if the presenting injury is actually secondary to the causative medical condition that may be responsible for the injury. In that case, early consultation with the emergency physician can be vitally important in optimizing outcome. There is limited, existing evidence-based practice detailing who is really most capable of providing care to injured elderly patients.

Prehospital Geriatric Patient Assessment

Criteria for injured Geriatric Patient to be sent to Trauma Center, Not the E.D.

Vital Signs

GCS < 15 with any suspected TBI
SBP ≤ 100 mmHg or any Shock Index (HR/SBP) > 1
HR > 110 or > 90 if patient is on Beta Blocker or other heart rate controlling medication
RR < 10 or > 24 or assisted ventilation to maintain pulse Ox >94%

Mechanism Criteria

Falls (any height) with any evidence of TBI
Any vehicular pedestrian collision,
Any vehicular crash with a long-bone fracture or multiple body regions injured
And all traumatic injury mechanism with the following age and pre-existing disease states
All patients > 70 years
Age > 55 years with more than 2 preexisting conditions
Age > 65 with more than 1 preexisting condition

Preexisting Disease Considerations:

Stroke
Diabetes
Active Coronary Artery Disease, Prior MI
CHF
COPD

Use of Anticoagulant or Clotting Disorder
All Immune Compromised patients (AIDS, Cancer patients on Chemotherapy)
Liver or Renal Failure and Hemodiaslyis patients

For resuscitation, judicious use of fluids initial bolus of 500CC less likely for interosseous infusion success.

References

1. Carpenter CR, Platts-Mills TF. Evolving prehospital, emergency department, and "inpatient" management models for geriatric emergencies. Clin Geriatr Med. 2013;29(1):31–47.
2. Taylor MD, Tracy JK, Meyer W, Pasquale M, Napolitano LM. Trauma in the elderly: intensive care unit resource use and outcome. J Trauma. 2002;53(3):407–14.
3. JM K, Sciadini MF, Sinclair E, O'Toole RV. Geriatric trauma: demographics, injuries, and mortality. J Orthop Trauma. 2012;26(9):e161–5.
4. Centers for Disease Control and Prevention. The state of aging and health in America 2013. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2013.
5. Meldon SW, Reilly M, Drew BL, et al. Trauma in the very elderly: a community-based study of outcomes at trauma and nontrauma centers. J Trauma. 2002;52:79Y84.
6. Sanders AB, Witzke DB, Jones JS, Richmond K, Kidd P. Principles of care and application of the geriatric emergency care model. In: Sanders AB, editor. Emergency care of the elder person. St. Louis, MO: Beverly-Cracom Publications; 1996. p. 59–93.
7. Mohan D, Barnato AE, Rosengart MR, et al. Trauma triage in the emergency departments of nontrauma centers: an analysis of individual physician caseload on triage patterns. J Trauma Acute Care Surg. 2013;74(6):1541–7.
8. Sasser SM, Hunt RC, Faul M, et al. Centers for Disease Control and Prevention. Guidelines for elder triage of injured patients: recommendations of the National Expert Panel on Field Triage, 2011. MMWR Recomm Rep. 2012;61(RR-1):1–20.
9. Committee on Trauma, American College of Surgeons. Collaborative clinical services. In: Rotondo M, Cribari C, Smith S, editors. Resources for optimal care of the injured patient. Chicago: American College of Surgeons; 2014. p. 76–87.
10. Kohn MA, Hammel JM, Bretz SW, Stangby A. Trauma team activation criteria as predictors of patient disposition from the emergency department. Acad Emerg Med. 2004;11(1):1–9.
11. A H, Ibrahim-Zada I, Rhee P, Aziz H, Fain MJ, Friese RS, Joseph B. Predictors of mortality in geriatric trauma patients: a systematic review and meta-analysis. J Trauma Acute Care Surg. 2014;76(3):894–901.
12. 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.
13. Gage AM, Traven N, Rivara FP, Jurkovich GJ, Arbabi S. Compliance with Centers for Disease Control and Prevention elder triage guidelines in an established trauma system. J Am Coll Surg. 2012;215(1):148–54.
14. Davis JW, Kaups KL. Base deficit in the elderly: a marker of severe injury and death. J Trauma. 1998;45:873–7.
15. Sterling DA, O'Connor JA, Bonadies J. Geriatric falls: injury severity is high and disproportionate to mechanism. J Trauma. 2001;50:116Y119.
16. JB B, Gestring ML, Forsythe RM, Stassen NA, Billiar TR, Peitzman AB, Sperry JL. Systolic blood pressure criteria in the National Trauma Triage Protocol for geriatric trauma: 110 is the new 90. J Trauma Acute Care Surg. 2015;78(2):352–9.
17. Pandit V, Rhee P, Hashmi A, Kulvatunyou N, Tang A, Khalil M, O'Keeffe T, Green D, Friese RS, Joseph B. Shock index predicts mortality in geriatric trauma patients: an analysis of the National Trauma Data Bank. J Trauma Acute Care Surg. 2014;76(4):1111–5.
18. JM C, Raubenolt A, Cudnik MT. Modification of Glasgow Coma Scale criteria for injured elders. Acad Emerg Med. 2011;18(10):1014–21.
19. Yilmaz S, Karcioglu O, Sener S. The impact of associated diseases on the etiology, course and mortality in geriatric trauma patients. Eur J Emerg Med. 2006;13:295–8.
20. Chang DC, Bass RR, Cornwell EE, et al. Undertriage of elderly trauma patients to state-designated trauma centers. Arch Surg. 2008;143:776–81. discussion 782
21. Scheetz LJ. Effectiveness of prehospital trauma triage guidelines for the identification of major trauma in elderly motor vehicle crash victims. J Emerg Nurs. 2003;29:109.
22. McMillian WD, Rogers FB. Management of prehospital antiplatelet and anticoagulant therapy in traumatic head injury: a review. J Trauma. 2009;66:94.
23. Meldon SW, Reilly M, Drew BL, et al. Trauma in the very elderly: a community-based study of outcomes at trauma and nontrauma centers. J Trauma. 2002;52:79–84.
24. Bonne S, Schuerer DJE. Trauma in the older adult: epidemiology and evolving geriatric trauma principles. Clin Geriatr Med. 2013;29(1):137–50.
25. Vidán M, Serra JA, Moreno C, Riquelme G, Ortiz J. Efficacy of a comprehensive geriatric intervention in older patients hospitalized for hip fracture: a randomized, controlled trial. J Am Geriatr Soc. 2005;53:1476–82.
26. Fisher AA, Davis MW, Rubenach SE, Sivakumaran S, Smith PN. Outcomes for older patients with hip fractures: the impact of orthopedic and geriatric medicine cocare. J Orthop Trauma. 2006;20:172–80.

27. Gowing R, Jain M. Injury patterns and outcomes associated with elderly trauma victims in Kingston, Ontario. Can J Surg. 2007;50(6):437–44.
28. Calland J, Ingraham A, Martin N, et al. Evaluation and management of geriatric trauma: an Eastern Association for the Surgery of Trauma practice management guideline. J Traum Acute Care. 2012;73:S345–50.
29. Sterling DA, O'Connor JA, Bonadies J. Geriatric falls: injury severity is high and disproportionate to mechanism. J Trauma. 2001;50(1):116–9.
30. Cohn B, Keim S, Sanders A. Can anticoagulated patients be discharged home safely from the emergency department after minor head injury? J Emerg Med. 2014;46(3):410–7.
31. Hodgkinson S, Pollit V, Sharpin C. Early management of head injury, summary of updated NICE guidance. BMJ. 2014;348:g104.
32. Sadro C, Sandstrom C, Verma N, et al. Geriatric trauma: a radiologist's guide to imaging trauma patients aged 65 years and older. Radiographics. 2015;35:1263–85.
33. JA S, Wang J, Mills B, et al. The application of the CRASH-CT prognostic model for older adults with traumatic brain injury: a population-based observational cohort study. J Head Trauma Rehabil. 2016;31:E8–E14.
34. Milzman DP, Boulanger BR, Rodriguez A, et al. Pre-existing disease in trauma patients: a predictor of fate independent of age and injury severity score. J Trauma. 1992;32(2):236–43.
35. Ferraris VA, Ferraris SP, Saha SP. The relationship between mortality and preexisting cardiac disease in 5,971 trauma patients. J Trauma. 2010;69(3):645–52.
36. Scalea T, Holman M, Fuortes M, et al. Central venous blood oxygen saturation: an early accurate measurement of volume during hemorrhage. J Trauma. 1988;28:725.
37. Scalea T, Simon H, Duncan A, et al. Geriatric blunt multiple trauma: improved survivial with early invasive monitoring. J Trauma. 1990;30:129–36.
38. Nguyen HB, Jaehne AK, Jayaprakash N, et al. Early goal-directed therapy in severe sepsis and septic shock: insights and comparisons to ProCESS, ProMISe, and ARISE. Crit Care. 2016;20(1):160–72.
39. Process Investigators, Yealy DM, Kellum JA, Huang DT, Barnato AE, Weissfeld LA, et al. A randomized trial of protocol-based care for early septic shock. N Engl J Med. 2014;370(18):1683–93.
40. ARISE Investigators, Anzics Clinical Trials Group, Peake SL, Delaney A, Bailey M, Bellomo R, Cameron PA, et al. Goal-directed resuscitation for patients with early septic shock. N Engl J Med. 2014;371(16):1496–506.
41. Mouncey PR, Osborn TM, Power GS, Harrison DA, Sadique MZ, Grieve RD, et al. Trial of early, goal-directed resuscitation for septic shock. N Engl J Med. 2015;372(14):1301–11.
42. Angus DC, Barnato AE, Bell D, Bellomo R, Chong CR, Coats TJ, et al. A systematic review and meta-analysis of early goal-directed therapy for septic shock: the ARISE, ProCESS and ProMISe Investigators. Intensive Care Med. 2015;41(9):1549–60.
43. VS MD, Thompson KA, Lewis PR, Sise CB, Sise MJ, Shackford SR. Frailty in trauma: a systematic review of the surgical literature for clinical assessment tools. J Trauma Acute Care Surg. 2016;80(5):824–34.
44. Mangram AJ, Shifflette VK, Mitchell CD, et al. The creation of a geriatric trauma unit "G-60". Am Surg. 2011;77(9):1144–6.
45. Smith JSJ, Martin LF, Young WW, Macioce DP. Do trauma centers improve outcome over non-trauma centers: the evaluation of regional trauma care using discharge abstract data and patient management categories. J Trauma. 1990;30:1533–8.
46. Bouras T, Stranjalis G, Korfias S, et al. Head injury mortality in a geriatric population: differentiating an "edge" age group with better potential for benefit than older poor-prognosis patients. J Neurotrauma. 2007;24:1355–61.
47. Fallon WF Jr, Rader E, Zyzanski S, et al. Geriatric outcomes are improved by a geriatric trauma consultation service. J Trauma. 2006;61(5):1040–6.
48. State of Ohio, State Board of Emergency Medical Services, Trauma Committee. Geriatric Trauma Task Force Report and Recommendations. www.ems.ohio.gov/datacenter/Geriatric%20Trauma%20Triage%20Study.pdf.