



EM CASES SUMMARY

Episode 159 Geriatric Trauma Part 1 Under-triage, Resuscitation, Airway, Head & C-spine Imaging, Clearing the C-spine

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The problem of under-triaging geriatric trauma patients

Undertriage, both at the ED triage and to the lead trauma center, may be the single most important modifiable problem in trauma in older adults. In Ontario, >2/3 of older adults with major traumatic injuries (often related to minor mechanisms of injury such as ground-level falls) are triaged to a non-trauma center and <50% of these patients are transferred to a trauma center. Observational studies suggest as much as a 25% reduction in mortality, a reduction in delirium (51 vs 41%, P = 0.05) and fewer discharges to long term care (6.5% vs 1.7%, P=.03) when injured older patients are cared for at a lead trauma hospital. Trauma centers not only provide definitive surgical care, but they improve mortality and functional outcomes through access to

multidisciplinary teams specialized in trauma care. Older patients with non-operative injuries also benefit from care at a lead trauma center. The lack of need for emergency surgery should *not* preclude consideration for transfer to a lead trauma center. Ground-level falls are the most common mechanism of injury in older patients and carry a 10-fold higher mortality rate in older patients.

What can we do as emergency physicians to mitigate undertriage of older trauma patients? Be an advocate for your older trauma patients even if they have non-operative injuries, be familiar with your local trauma transfer guidelines (see below for example) and maintain a low threshold to transfer older trauma patients to a lead trauma center.



The lack of need for emergency surgery should not preclude consideration for transfer to a lead trauma center.

TRAUMA CENTRE CONSULTATION GUIDELINES

These guidelines are meant to facilitate consultations with, and/or transfer to, a trauma centre and should be applied using clinical judgement. Final decision to transfer remains at the discretion of the referring and receiving physicians.

The decision to transfer should be made within 1 hour.

All consultations with a TTL should be coordinated through CritiCall Ontario: 1-800-668-4357

ALL TRAUMA PATIENTS	SPECIAL CONSIDERATIONS
<p style="font-size: x-small;">For ALL paediatric and adult injuries, contact CritiCall Ontario for the appropriate Trauma Centre.</p> <p>Systems Criteria</p> <p>Any patient (with a major traumatic injury [severe multisystem, life-or-limb threatening single system]) requiring trauma consultation or who requires more care than can be provided at the referring centre based on the assessment of the ED physician. Not all patients with single system injuries will need to be transferred to a Lead Trauma Hospital and may be able to receive care where local expertise exists.</p> <p>Physiological Criteria</p> <ul style="list-style-type: none"> • GCS <10 due to traumatic injury • Significant alteration of consciousness due to trauma • Hypotension (due to trauma) that is unresponsive or only transiently responsive to fluids • Hypothermia (Body Temp) <32°C (with traumatic injuries) <p>Anatomical Criteria (one or more of the following)</p> <ul style="list-style-type: none"> • Suspected spinal cord injury with paraplegia or quadriplegia • Moderate-to-severe head trauma • Severe (or suspected severe) penetrating injury to the head, neck, torso or groin (stab wound or GSW) • A requirement for blood products to maintain vital signs • Amputation above the wrist or ankle • Pelvic fractures with hemodynamic instability or significant hematoma • Major crush or vascular injury • Trauma with burn or inhalation injury <p style="font-size: x-small;">Refer to AHA (American Burn Association Burn Centre Referral Criteria). Please refer to the Neurosurgery Cranial and Spinal Consultation Criteria for isolated Cranial and Spinal Neurosurgical cases found on site.</p>	<p>High risk considerations which may warrant transfer to Lead Trauma Centre at a lower threshold. These considerations include:</p> <ul style="list-style-type: none"> • Age > 55; • Age < 15; • Anticoagulation; • Immunosuppression; • Pregnancy; or • Other significant medical problems <p>A CT Scan may not always be required for the decision to transfer if it will delay definitive management.</p> <p style="font-size: x-small;">For any considerations, consult with on-call trauma team leader through CritiCall Ontario.</p> <div style="text-align: right; padding-top: 10px;">   </div>

Example of trauma center activation guidelines for educational purposes only. Note that patients age >55 are considered high risk which "may warrant transfer to lead trauma center at a lower threshold"

Anatomic and physiologic considerations in geriatric trauma care

- Comorbid disease, medications and frailty may all affect the expected physiologic presentation of trauma in older people
- Multiple studies have shown frailty to be more predictive of poor outcomes than age after trauma
- Consider removal from backboard ASAP, measures to prevent hypothermia, being vigilant in maintaining c-spine precautions, more frequent assessments, acting on small changes in vital signs more readily, binding the pelvis early and placing an arterial line early

Hemodynamic considerations, the utility of the Age Shock Index (ASI) and fluid resuscitation

Normal vital signs in the elderly patient should not be considered as reassuring as they might be in younger patients. It is more challenging to recognize the early symptoms of shock in older patients owing to diminished physiologic reserve, chronic diseases that impair their ability to respond to injury, medications for cardiac conditions, e.g. antihypertensives, β -blockers, all of which may blunt a physiologic tachycardic response to stress or hemorrhage.

Concerning vitals in the geriatric trauma population:

1. $sBP < 110$ or sBP 40 less than baseline

2. $HR > 90$
3. $RR < 10$

Use **Age-adjusted Shock Index (age x HR/SBP)** to augment (but not replace) clinical suspicion. It alone is not sensitive enough to rule out serious injury.

If age-adjusted shock index > 50: suspect shock or occult shock

***Pitfall:** A negative Age Shock Index should not be used as a rule out for significant injury*

Other hemodynamic considerations include narrow window of normal volume status (patients are often volume deplete, however they are more sensitive to fluid overload). Be judicious with fluid resuscitation, use PoCUS as a tool to guide resuscitation and consider placement of an arterial line. While blood products are generally favoured over crystalloid in the hypotensive young trauma patient, our elderly trauma patients are often fluid deplete at baseline and may be on diuretics that further worsen their volume status. In the elderly trauma patient, it is reasonable to give a small bolus of crystalloid (250-500cc) and reassess their volume status during the initial resuscitation.

***Pitfall:** A common pitfall is to be dogmatic about volume resuscitation only with blood products in all trauma patients suspected of hemorrhagic shock. Do not dismiss crystalloids in geriatric trauma patients the way you might in younger patients; many older trauma patients are volume depleted at baseline.*

Airway considerations in the geriatric trauma patient

Older patients often have multiple predictors of a difficult anatomic (dentures, restricted mouth opening, c-collar) and physiologic (low pulmonary reserve, underlying disease etc) airway. Endotracheal intubation carries a higher risk of complications in older patients such that the pros and cons should be carefully considered.

1. Preoxygenation

- Lower physiologic pulmonary reserve, pre-oxygenate fully whenever possible
- Do a finger sweep to feel for dislodged dentures
- Dentures provide an excellent scaffold during pre-oxygenation/BVM, but may inhibit laryngoscopy; the timing of denture removal just prior to laryngoscopy when making the switch from BVM to ETT is important

2. Airway equipment

- Consider hyperangulated videolaryngoscope + adjunct (bougie in all but grade 3b and 4 airways) given reduced c-spine and jaw mobility

3. RSI medications dose adjustments

- Given higher risk of hypotension and slower distribution time, reduce dosages of induction agent (3/4 to 1/2 usual adult dose)
- Use higher dose of paralytic (eg. rocuronium 1.2mg/kg)

Neurologic considerations in the geriatric trauma patient

- Cognitive impairment and/or prior CVA may preclude a reliable assessment
- Older patients often demonstrate delayed neurologic signs of significant intracranial pathology due to cerebral atrophy

***Pitfall:** undertreating and overdosing analgesics in older trauma patients is a common pitfall. Both treating pain and proper dosing that is lower than 'standard' adult dosing of analgesics helps reduce the risk of delirium and agitation in these patients.*

Common injury patterns in the geriatric trauma patient

Falls: head, spinal column, chest and pelvic injuries

Older people with low mechanism falls are more likely to sustain a head injury and chest injury (rather than FOOSH pattern injury, especially if they have consumed alcohol) and have associated spinal column bony or cord injuries. They are also more likely to suffer lateral compression fractures of the pelvis and more pelvic bleeding requiring transfusion and angiography.

MVC: spinal column, chest and aortic injuries

Seatbelt induced thoracic and aortic trauma at low speeds are more common. Also be vigilant of hyperextension injuries of the neck and chest injuries (including rib and clavicle fractures) which are associated with high mortality in the older trauma patient.

Geriatric trauma workup

Lactate and base deficit (BD)

Both serum lactate and base deficit are important biomarkers for shock and occult shock and should be considered predictors of serious or severe injury in geriatric trauma patients, even when physical examination is unrevealing. Serum lactate (>2) or base deficit (<-6) are associated with major injury and mortality in trauma patients and may be present even in older trauma patients with normal/near normal vital signs and low impact injury (eg. ground-level fall).

***Pearl:** consider a lower threshold to obtain a serum lactate and base deficit in older trauma patients to help discover occult hemorrhagic shock*

Head and C-spine imaging

Osteoporosis and overall reduced bone mass mean older patients are more likely to sustain fractures (especially of the spinal column) at much lower forces. 50% of C-spine injuries in geriatric patients are unstable. Older patients are at higher risk for central and anterior cord syndromes. Our experts recommend that any geriatric trauma patient who is undergoing a head CT for trauma should also undergo cervical spine imaging.

Which geriatric trauma patients do *not* need c-spine imaging?

The Canadian C-spine Rule studies excluded patients >65 years of age. While the NEXUS criteria for c-spine imaging found a 100% sensitivity for clinically significant c-spine injury in a

subgroup analysis of older patients, this has not been validated. Our experts recommend that for those who are ambulatory, do not meet high risk criteria of the Canadian C-Spine rule, have no signs of trauma above the clavicle, and on reliable examination have no c-spine tenderness or paresthesias, c-spine imaging may be deferred.

Clearing the c-spine in geriatric trauma patients

There are significant patient harms associated with delayed c-spine clearance including pressure ulcers, dysphagia, aspiration pneumonia, respiratory failure, agitation, and delirium. The goal at each center should be to have processes in place to quickly evaluate and clear the c-spine. There is literature suggesting that MRI to evaluate for occult c-spine injury in blunt trauma can change management up to 6% of the time. However, other data suggest that the incidence of occult c-spine injuries in this setting is as low as 0.12%. The Eastern Association for the Surgery of Trauma guidelines recommends that in the obtunded adult blunt trauma patient, a cervical collar can be safely removed after a negative high-quality CT scan result alone. If patients have an abnormal CT c-spine or it is difficult to obtain a reliable clinical exam due to underlying cognitive impairment, our experts recommend an MRI to evaluate for occult c-spine injury. Depending on your location of practice and accessibility to MRI imaging, transfer to a lead trauma hospital may be warranted to facilitate urgent imaging.

Resuming anticoagulation after minor head injury in the geriatric trauma patient

Literature suggests that cessation of anticoagulation is unnecessary following an ED visit for head injury if imaging is not indicated or if imaging rules out a bleed. Specifically, in the context of warfarin for primary stroke prevention in atrial fibrillation, a person must fall about 295 times in 1 year for the risk of a subdural hemorrhage to outweigh the benefits of warfarin therapy. This risk benefit ratio would predictably be even more favorable for direct oral anticoagulants since direct oral anticoagulants have been shown to have a lower risk of intracranial hemorrhage than warfarin. While the risk of bleeding may not be modifiable, our experts stress the importance of identifying modifiable risk factors that contribute to falls in the elderly (vestibular disorder/poor balance, Vitamin D insufficiency, medications linked to falls, postural hypotension, vision impairment, home hazards), and having a low threshold to provide occupational therapy in the home for fall prevention.

Take home points for geriatric trauma part 1

- Maintain a low threshold to transfer elderly trauma patients to a lead trauma hospital
- Occult shock can be difficult to identify in the elderly; use the Age Shock Index, lactate, and base deficit to complement your clinical assessment

- Older trauma patients are often volume deplete at baseline; consider 250-500cc crystalloid bolus in the initial resuscitation
- Older trauma patients need optimized pre-oxygenation due to lower pulmonary reserve
- Dentures in for BVM, remove just before laryngoscopy
- Avoid the common pitfall of undertreating pain in the older trauma patient
- Lower analgesic and induction agent dose, but higher paralytic dose
- Lower threshold to perform c-spine imaging, especially if obtaining CT head
- Clearing c-spine urgently is of high importance; if unable to clear in timely manner or lack of advanced imaging, consider transfer to a lead trauma hospital
- Anticoagulation in the setting of CT-negative head trauma – do not need to withhold anticoagulants, but do identify and manage modifiable risk factors for falls

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