

# **Trauma and the Elderly**

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## **Multi-dimentional Understanding**

### **Denny Tranel, PsyD, MPAS, PAC**

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- Hold doctorate in Clinical Psychology (PsyD). Dissertation research evaluated the neurochemical response to trauma
- 30 + years Emergency Medicine Experience.
- 5 ½ years Air Force Medic
- Local Alaska EMT then Paramedic. Finally EMS officer and then EMS Chief Mat-Su Borough Central EMS
- 18 months independent duty paramedic Iraq 2004-2005
- 7 years flight paramedic
- Graduated PA school 2010. 8 years experience Emergency Medicine with 3 years advanced training as Advanced Practice ED Provider in Inner City ED (140,000 patient volume).

## Disclaimer

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- This is an overview. My intention is to cover “must not misses” and to get departments talking
- It’s the tip of the iceberg. It is recommended that EMS agencies and ED’s work to develop protocols designed to treat Elderly Trauma Patients.

## Goal

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- To Review the pathophysiology of aging
- Gain an understanding of the special considerations needed when assessing and treating elderly trauma patients.

## Elderly Trauma Overview

Trauma is the 4<sup>th</sup> leading cause of death in the United States

- 1) Heart Disease
- 2) Malignant Neoplasm (cancer)
- 3) Chronic Lower Respiratory Disease (COPD)
- 4) Accidents (unintentional injuries)

## Leading Causes of Accidental Death

All Ages	>65 years of age
1) MVC	1) Falls
2) Poisoning	2) MVC
3) Falls	3) Unspecified
4) Homicide	4) Suffocation

## Definition of “elderly”

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- Medicaid definition: equal to or greater than 65 years of age
- Some define:
  - “young old” as 65-79.
  - “old old” 80 and above.

## Complications of Aging

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- Normal physical and physiological changes associated w aging
- Comorbidities
- Prescription Drugs

## Elderly Trauma Patients

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- Elderly are less likely to be involved in trauma.  
HOWEVER:
  - Mechanism is often not as impressive as the injury or outcome
  - Elderly are often under triaged.

## Case Study #1:

### 67 year old male. Fall from standing position

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- EMS report: en route to the ED non-emergent w 67 year old male who was pushed by son during an altercation. ETOH involved. Fell backwards onto ground from standing position. No complaints at this time. Police wanted him evaluated due to ETOH use and altercation.
- VSNL. Alert and oriented to time, place, person. Obvious ETOH use. No LOC. Denies head/neck/back pain. Did have loss of bladder. States he “peed myself because I had to pee”.
- No interventions done.

## ED Presentation

- U/A in ED, pt with obvious slurred speech. Laughing and joking. Denies HA, vision change, neck or back pain. No chest/abd pain. No nausea/vomiting/diaphoresis. Denies recent illness. States he was in an argument w his son. Son pushed him. He fell backwards, landing on bottom and falling onto back. Head did hit ground.
- No medical hx, no allergies, no medications. Admits to daily alcohol use and 1 ppd smoking.
- VS: BP: 150/89, HR 110, RR 24, SAO2 98% RA.

## Physical Exam

- Rapid Trauma Assessment: Airway open, talking w no change in voice. Easily managing secretions. Breathing normally. No obvious distress. Speaking in full sentences. Normal Breath sounds upper chest. Bleeding: no blood from mouth/nose/ears. Trauma scan: no blood noted on body sweep. Circulation: strong radial pulses. HR on monitor slightly tachy (110). C-spine: (pt not in c collar). On palpation of C spine, no pain on palpation. Pt placed in c collar.
- Secondary Exam: no blood or fluids from nose/ears/mouth. No battle signs or racoon eyes. No obvious deformity or fx to skull. HR regular. Breath Sounds: Equal and clear high (pt sitting up). No pain on palpation to chest, abd, pelvis. Moving all extremities. No pain on palpation to T/L spine. No numbness/tingling anatomical "saddle" area. PMS x 4 w full ROM all extremities.



## Normal physical and physiological changes associated with aging

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- Musculo-skeletal:
- Age related weakness, unsteady gait, slowed reaction time
- More likely to have osteoarthritis, scoliosis, kyphosis: all impact mobility and functioning.
- Osteoporosis: more common in women than men.
- MOST COMMON FRACTURES: hip, distal radius, humerus, vertebral bodies.

## Musculo-skeletal continued

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- Bone density decreases leading to increased fractures EVEN WITH “MINOR” INJURIES.
- Increased cervical rigidity causing decreased neck and head mobility: Higher risk of “high” cervical fractures (C1 and C2) fractures

## Psychological

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- We OFTEN underestimate alcoholism, substance abuse and underlying mental health issues such as depression, PTSD.

## Findings

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Patient was found to have C 2 fracture. His blood alcohol was .350. He was placed in Philadelphia Collar and Transferred to Level I Trauma Center.

At transport, no neurological deficits. Continued to have no pain, no neuro deficits in arms/legs.

Did get changed out of soiled clothing.



## C2 Odontoid Fracture

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## Take Homes

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- Injuries from relatively minor accidents can have devastating consequences
- Falls from ground level OFTEN lead to serious injuries in elderly
- Complications such as underlying substance abuse can lead to under diagnosis.
- Assume serious injuries until they are ruled out at advanced testing.
- In elderly, 54% of c spine injuries occur w falls from standing position.
- Pain perception often leads to inability to measure quality/intensity of pain.

## Take Home: Falls

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- 1/3 of people 65 and over fall yearly
- 1/2 of institutionalized patients fall annually, 1/2 of them repeatedly fall
- Elderly are more likely to suffer incomplete spinal cord injuries such as central cord injuries, cervical distraction injuries and odontoid fractures (C2).
- 71% of falls associated with injuries.
- ***Injuries are OFTEN out of proportion to mechanism.***

## Group questions/discussion

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- My experience: alcohol has always been a friend of the ages. I have noticed an increasing number of patients who are considered elderly who are using other illicit drugs. Interesting and challenging when combined with prescribed medications.
- Prescribed medications: significant number of elderly patients on chronic pain medications and sedative (benzo's).
- Important to understand this effectively rules out the ability to rule out c spine injury in the field.

## Case Study #2

### 72 yo male, fall from standing position

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HX: Mr Jones transported to the ED code yellow (non-emergent) co LT side pain after tripping and falling in the bathroom at local casino. Per patient, he stepped back away from sink after washing his hands and tripped over “my big feet”. He fell backwards and hit LT side on granite sink corner.

EMS responded. Reported stable vital signs w SBP 110, HR 96, RR 24, SAO2 92% RA. IV started, pt given 1 mg dilaudid for pain. Transferred code yellow to ED.

UA in ED, pt is obvious distress, co of constant pain in LT chest wall, increased w movement and/or deep inspiration.

## Case #2

### 72 yo male, fall

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Past Medical HX: Mr Jones has hx of AFIB and Hypertension. He had an AMI in 2015 and had two STENTS placed. He has no past surgical hx. He takes coumadin, metoprolol and Cardizem. His INR was checked last 2 months ago

Primary Trauma Assessment: Pt is in acute distress. He looks sick. He is talking in 2-3 words per breath sentences. His airway is open. Breathing: increased RR 24. lung sounds are equal high. SAO2 92% RA. Circulation: strong radial pulses w HR 96. SBP 108/s.

## Case #2

### 72 yo male, fall

Trauma Scan: no blood from nose, ears, mouth. Pain on palpation to LT chest wall. ABD tender LUQ. No blood from rectum/penis. No pain on palpation or obvious injury to back/spine. (c-collar placed in field.) no pain on palpation c spine.

Pt with 1 large bore IV. NS hanging at TKO u/a in ED.

## Comorbidities

### 65 and older

- 66% of patients over the age of 65 have comorbidities compared to 4.6% under 55 years of age.
- 80% have at least one chronic medical condition
- 50% have at least two chronic medical conditions
- MOST are on more than two medications making polypharmacy a significant factor in assessment and treatment.
- 60% have hypertension, 10% have resp disease, 22% have diabetes, 9% have CHF

## Case #2 Discussion

In Elderly, profound shock may be present even in setting of “normal” vital signs. Our gentleman has SBP 108/s, HR 96, RR 24, SAO2 92%.

However, on Beta blocker and calcium channel blocker.

**Beta Blocker:** may prevent tachycardia in response to hypotension/shock

**Calcium Channel Blocker:** may prevent vasoconstriction in response to hypotension.

## Case #2 Discussion

### **Anticoagulation Drugs:**

Relatively minor wound can have significant bleeding.

Rates of uncontrollable bleeding increased

OFTEN the condition taking coumadin to treat increases mortality.

There is an increased risk of trauma related complications such as injury to GI, liver, spleen and kidneys. There is also an increased risk of intracranial bleeds.

## Case #2 discussion continued

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- Blood pressures considered normal in younger patients may represent hypotension when compared to baseline blood pressures in elderly.
- HR greater than 90 and SBP less than 110 have been correlated with increased mortality in elderly.
- TAKE HOME: Avoid being falsely reassured by “normal” vital signs. Have low index of suspicion for shock.
- Have LOW THRESHOLD for transfer to Trauma Center.

## Case #2 Finding

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- CT Head/Cspine: negative for acute
- CT Chest/ABD/Pelvis: positive for multiple rib fractures with small hemothorax. Bruising to spleen w no tear. No injury to T/L spine, pelvis. No other organ injury in abd/pelvis.
- INR 2.4 (normal goal for AFIB 2-3). All other labs WNL. No blood in urine.



## Multiple rib fractures, hemothorax pulmonary contusion

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## Musculo-Skeletal

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- Elderly have increased chest wall rigidity and osteoporosis.
- Multiple rib fractures: > 4 leads to increased morbidity and mortality secondary to pneumonia, atelectasis, acute lung injury and ARDS.
- Chest fractures more easily. Pts w rib fractures have twice the mortality of younger patients with same fractures.
- Mortality increases w number of rib fractures
  - One or two fractures: 12% mortality, seven or more fractures: 40% mortality

## Cardiovascular

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- Thickened valves and vessel walls contribute to hypertension and cardiac arrhythmias
- Coronary artery disease makes vessels and heart less responsive. There is increased demand ischemia (always think ischemia).
- Patients do poorly w both too little and too much fluids.
- NORMAL BP can be hypotension.
- There is decreased maximal heart rate, stroke volume and cardiac output.

## Cardiovascular

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- Heart loses ability to respond to compensatory mechanism.
- Inability to respond w tachycardia: Due to age related changes, medications such as beta blockers, and/response limited due to pacemaker parameters.
- Shock develops early. May go unrecognized due to lack of tachycardia.
- Less able to respond to stress.
- Less able to respond to changes in blood pressure.

## Pulmonary System

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- Decreased vital capacity- decreased ability to clear secretions
- Decreased ciliary clearance.
- Decreased lung compliance. Increased dependence upon diaphragmatic breathing and work of breathing.
- Decreased sensitivity to changes in oxygen content of blood.
- Loss of alveolar elastic recoil stiffening of chest wall.
- Reduced oxygen exchange and decreased ventilation/perfusion ratio.

## Case #2 Conclusion

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- It was determined that patient was in shock.
- Fluid hydration, reversal of INR with vitamin K and emergent transfer to Level I trauma center initiated.
- Patient stable at transport. At time of transport, only small hemothorax. Decision made w trauma surgeon to start reversal of INR and hold off chest tube until re-evaluation at trauma center.
- Oxygen applied to compensate for respiratory changes due to chest trauma

## Group Discussio/Questions

- The medic brought this patient in non-emergent. Trauma Code not activated. This was the middle of the night. I was called from sleep room. I was at the patients bedside within 5 minutes. My assessment was that the patient was in acute distress. When medic returned from putting ambulance away he was surprised by “how much more in distress the patient looked”.
- Elderly patients have little reserve and then “fall off the cliff”. We, as medics have had this drilled into our heads regarding PEDS. Elderly fit the same pattern.

## Case #3

### 83 year old female with dementia. Multiple falls

Ambulance paged out for female with scalp contusion status post fall. Per staff, patient is resident of local nursing home who has had several falls over the past two weeks. Per staff, she has baseline dementia. She fell two weeks ago and hit her head when she fell. She was evaluated in the ED at that time and had a negative CT Head/cspine.

Today staff called after she fell again. They stated that although CT was negative for head bleed two weeks ago, pt has had increasing confusion, staggered gait and trouble balancing self since that fall.

### Case #3

#### 83 year old female, multiple falls

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- EMS applied c collar which pt immediately took off. In the ED, moving all extremities. Pleasantly confused. Denies injury. Unaware of contusion LT forehead. Pupils are equal, reactive to light. Unable to obtain further medical hx due to baseline confusion. Pt complaining of “pain all over” asking for pain medications.
- C Collar again attempted. Pt refused. Became agitated and anxious when we attempted to place collar.

### Neuro/CNS

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- Elderly have a decreased number of neurons and decreased functioning of neurons.
- Brain mass shrinks increasing relative intracranial space.
- There is decreased elasticity of the bridging veins lining the meninges resulting in increased risk of rupture on impact. This leads to increased risk of subdural and epidural hematomas.
- Shrinking brain mass also increases susceptibility to shearing forces and axonal injuries.

## Neuro/CNS

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- There is decreased temperature response, higher risk for hypothermia
- There is decreased sensory perception: may be unaware of injuries
- There is decreased cognition leading to poor memory, impaired judgement and greater difficulty with data acquisition.
- \*\*\*GCS is less reliable due to chronic disease. GCS actually more likely to be higher with some degree of injury compared to younger patients.
- Very difficult to measure LOC when unknown baseline.

## Skin

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- Atrophy of subcutaneous fat leads to 20% loss of dermal thickness
- Pressure ulcers develop within minutes. Skin is prone to breakdown (get them off spinal boards).
- Thermoregulation System:
  - Less responsive thermoregulation mechanisms. More likely to develop hypothermia
  - Less effective compensation (shivering and cutaneous vasoconstriction)



## Case #3 Conclusion

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- Pt had an intracerebral bleed. CT showed an old bleed with a new bleed. There was mild mid-line shift.
- Pt was also hypothermic at admission. She was aggressively warmed and responded well to BEAR hugger. Temperature normalized.
- It was determined that patient was DNR/DNI. She was admitted locally for further evaluation and neurological monitoring.

Head bleed  
Intracerebral

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## Case #3 Discussion

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- There is a small percentage of patients who have an initial CT negative for acute bleed that are found later to have a head bleed. One neurosurgeon that I talked to stated that patients can have a slow, venous bleed that takes time to present.
- Initial traumatic brain injuries (concussions) leave a patient more susceptible to a brain bleed with another head injury
- Assume head bleed w onset of mental status change after fall.
- Low level falls can cause significant damage in elderly.

## Group discussion/questions

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- Your information is invaluable. UpToDate stresses getting the following information:
  - 1) What happened immediately before the trauma (eg altered LOC, difficulty breathing, change in vision)?
  - 2) What medications is the patient taking (eg BB, CCB, anticoagulants)?
  - 3) What underlying illnesses does the patient have?
  - 4) What was the patient's baseline level of motor and cognitive function prior to traumatic event?
  - 5) Does patient have written advanced directive or health care proxy?

## Conclusions: Mechanism of Injury

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- No other population is more susceptible to serious injury secondary to low-energy mechanisms (particularly falls) than elderly.
- Geriatric patients are 5 times more likely to die from trauma than younger patients with similar injuries.
- $\frac{3}{4}$  of traumas related to falls (2.5 million ED visits annual)
- 1 out of 5 falls causes serious injury such as broken bones or head injuries
- 95% of elderly hip fractures related to falls.

## Conclusion: Impact of Underlying Conditions

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- Vital signs and physical exam can be deceptive
- Vital signs are often falsely reassuring
- HR > 90 and SBP < 110 associated w increased mortality
- An SBP < 120 can be hypotensive in normal SBP 170
- Meds and pacemakers can confuse vital signs, physical exam and response to actual trauma
- OFTEN: above lead to underestimation of severity of trauma and misinterpretation of physical exam finding

## Conclusion: Take homes

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- There is significant risk for under triaging elderly patients.
- There is improved survival when elderly patients are transferred to a Level I,II trauma center specializing/experienced in dealing w elderly trauma patients: 8% mortality compared to 56% mortality in lower level of care
- Elderly are physiologically different and have significant trauma from more “mild” mechanisms of injury.

## TREATMENT

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- 1) Standard hemodynamic measurements are inadequate to determine stability
- 2) Lack of recognition of injury severity may cause significant under triage
- 3) Aggressive treatment of traumatic injuries decreases geriatric mortality
- 4) Always check blood sugar
- 5) Airway: oxygen for everyone

Elderly have decreased protective airway reflex....more likely to aspirate

## Treatment

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- 6) Intubation: consider early intubation in signs of shock, chest trauma, mental status changes
- 7) Reduce opioid and sedative doses by 50% due to renal and hepatic changes
- 8) CIRCULATION: patients with history of hypertension and normal blood pressures are UNSTABLE until proven otherwise.
- 9) Keep them warm.....

## Questions?

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Thank you very much

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