

Body of evidence: A geriatric trauma case study

By Margaret Dymond

Abstract:

Geriatric trauma patients presenting to emergency departments have special needs to be considered during all phases of the assessment, planning, intervention, and evaluation phases of the trauma process. Considerations to the normal physiologic process of aging, pre-existing medical conditions, and medication use will influence the geriatric patient's response to care and treatment. This case presents some interesting issues during the trauma resuscitation and how the care plan required adaptation to the usual trauma interventions. Reassessments are key to determining the problem area and understanding the physiology of aging. The case discusses a frequent type of mechanism of injury in the geriatric population but a not so common injury.

Key words: geriatric trauma, older adult falls, effects of anticoagulants, hypotension in older adults

Introduction

Geriatric trauma patients, described by Calland et al. (2012) as generally over age 65 years, are challenging to manage, and account for a significant number of emergency department visits and hospital admissions. Cutugno (2011) states that older adults account for 25% of all hospital trauma admissions and by 2050 it is estimated that 40% of trauma patients will be > 65 years of age.

To improve outcomes in geriatric trauma patients and planning interventions, the trauma team should recognize that assessment during the primary and secondary survey includes understanding the unique physiology of age and related changes to body systems, presence of co-morbid conditions, and poly pharmacy use that may affect the patient's response to care (Bourg et al., 2012). Both Calland et al. (2012) and Cutugno (2011) agree that these are factors to consider when planning care and evaluating the patient's response to resuscitation.

Objectives

- Review the age related changes to organ systems in geriatric patients
- Review the importance of assessing for the presence of co-morbid factors and poly pharmacy use when planning and evaluating care
- Discuss the importance of serial reassessments in trauma patients

Initial case presentation

A 79-year-old female loses her balance and falls down 12 steps onto the basement landing in her home. She was attempting to let the dog outside and "forgot" she was close to the basement steps. The fall was heard by the family. The family members found the patient on the bottom step, escorted the patient up the stairs into the kitchen area and called 911.

Emergency Medical Services (EMS) arrived on scene at 1950 hours with the patient sitting upright in a chair.

Fact: Body of Evidence

The Alberta Centre for Injury Control and Research (2011) and Aschenasy et al. (2006) state the most common mechanisms of injury in geriatric trauma patients are motor vehicle crashes and falls. Falls carry a special risk; 20% of the elderly population greater than 80 years of age will die within one year of a hip fracture and geriatric patients who fall have injuries that tend to be more severe than injuries sustained by younger patients from similar falls (Aschenasy et al., 2006).

EMS found the patient with regular respirations (RR) at 18 per minute and non-laboured. The air entry was equal bilaterally and chest sounds clear. Oxygen saturation was unobtainable. The radial pulses were irregular and weak at 68 beats per minute (bpm). The skin was moist and cool to touch. Blood pressure (B/P) was 76/40. There was no evidence of external bleeding. The Glasgow coma score (GCS) was 12 out of 15 with inappropriate answers to questions. Pupils were equal and reactive. The patient and family report no loss of consciousness.

The pre-hospital team findings on the secondary survey found no abnormality to the chest or abdomen. The patient had

Table 1.

Past Medical History	Medications (Generic name)
Ischemic Heart Disease, MI Angioplasty and Stent in 2008	Clopidigrel 75mg daily
Hyperlipidemia	Enteric coated Aspirin 81mg daily
Hypertension	Levothyroxine 0.05 mg daily
Transient Ischemic Attack, 2012	Amlodipine Besylate 5mg daily
Chronic Renal Failure	Atorvastatin 40mg daily
Thyroidectomy for Cancer, 2010	Fluticasone propionate and Salmeterol oral inhaler 250/50 1 puff twice daily
Chronic Obstructive Lung Disease	Vitamin B12 monthly,
Smoker x 50 years	Vitamin D 1,000 IU daily
Glaucoma	Calcitrol (Vit B3) 0.25mcg PO every other day
Osteoporosis	Latanoprost eye drops

evidence of bruising to the left buttock and complained of pain to the head, left hip, and left shoulder. The patient was incontinent of urine. The patient's past medical history and medications are found in Table 1. EMS interventions included C-spine immobilization, oxygen at 3 litres per nasal cannula, intravenous fluids (IV) of normal saline 500 millilitres (mLs), cardiac monitoring with noted global ST segment depression, and a blood glucose of 14.8 mmol/L.

Based on the EMS pre-hospital assessment, should this patient be transferred to a designated trauma facility?

Geriatric patients can be under triaged to trauma facilities (Calland et al., 2012). Under triage occurs when there is failure to recognize the unique physiology of older adults and response to injury in this population. Older adults have a limited cardiovascular reserve and often have pre-existing medical conditions (PEMC) that influence response to injury. The Eastern Association Surgery and Trauma (EAST) (Calland, 2012) suggests those patients with advanced age (> 65 years) and PEMC should lower the threshold to transport to a designated trauma centre. Age is not an independent predictor of trauma outcome and should not be used for denying or limiting care (Cutugno, 2011).

Case progression

This patient was transferred to a trauma centre based on mechanism of injury, altered GCS, and presence of hypotension. She arrived 1.5 hours post fall at 2100 hours. The patient is a frail, thin, and pale-appearing older female in some distress. The airway is open and clear. The RR is 16 breaths per minute. Breath sounds are equal and clear and air entry is equal bilaterally. There is pain to palpation on the left anterior chest. Oxygen saturation is 96% on 3 litres of oxygen per nasal cannula. The patient's skin is pale, cool, and dry. B/P is 100/36 mmHg. Peripheral pulses are weak. Capillary refill time is greater than 3 seconds. Heart sounds are normal. The patient is placed on a cardiac monitor and is in normal sinus rhythm at 69 bpm. The GCS is 13/15. The pupils are equal and reactive. The patient has poor recall of the fall. There is no external bleeding. The abdomen is soft to palpation with faint bowel sounds. The pelvis is stable. Other physical findings include occipital swelling, hematoma over the left humerus, bruise left buttock and right hand, and pain in the left shoulder and left hip. The patient is log rolled to the left side. The posterior exam and rectal examination is normal. The rectal temperature is 32° Celsius. See Table 2 for working problem list.

Table 2: Initial assessment problem list
<ul style="list-style-type: none"> • Mild Hypotension – Shock • Poor peripheral perfusion • Head Injury and altered level of consciousness • Possible neck injury • Possible chest, abdominal and pelvic injury • Possible limb fractures • Hypothermia

Initial ED interventions include trauma blood work including type and screen, radiography of the C-spine, thoracic spine and lumbar spine, chest, pelvis, left shoulder, left hip, and left scapula, and computerized tomography (CT) scanning of the head, c-spine, chest, abdomen, and pelvis. Two large bore peripheral IV sites are initiated with an IV bolus of warmed normal saline 1000 mLs over one hour. Additional interventions include a focused assessment sonogram for trauma (FAST) exam, external reheating, maintaining spinal precautions, Fentanyl IV for analgesia, cardiac and non-invasive B/P monitoring, continuous oxygen saturation, oxygen at 3 litres nasal cannula, and a 12-lead electrocardiogram (ECG).

Body of Evidence: Facts of Geriatric Trauma

The presence of four or more chronic medications increases the risks of falls in the elderly and more than 80% of patients evaluated after an accidental fall are found to be on medications easily implicated to the fall (Aschkenasy, 2006). EAST (Calland, 2012) geriatric trauma guidelines state PEMC and complications negatively influence outcomes. Older adults have a 9–10 fold greater chance of death if the systolic B/P < 114 mm/hg (Heffernan et al, 2010).

Case progression and reassessment

At 2140 hours the B/P has fallen to 81/40 mm Hg, heart rate is 81 bpm. Most initial laboratory testing is normal. The abnormal values include a lactate of 3.8mmol/L and a base deficit of -8.3 mmol/L. The hemoglobin is 112gms/L. Cardiac markers are within normal range. Elevated serum lactates could be signs of occult hypovolemia, hypoperfusion, and impending shock. An elevated base deficit is an independent risk factor for an adverse outcome in the elderly (Calland, 2012; Callaway et al., 2009). Additional interventions include a second warmed normal saline IV fluid bolus of 1000 mLs. The B/P normalizes for a brief period. See Table 3 for a summary of injuries.

Body of Evidence: Facts of Geriatric Trauma

Labib et al. (2011) report factors such as age, low GCS, C spine injury, requirement for blood transfusions, intubation, and infectious complications increase hospital mortality. Elderly patients with rib fractures have nearly twice the mortality as younger victims despite a lower ISS score and high GCS. Older persons are high-risk for major pulmonary complications (Aschkenasy, 2006).

Table 3: Summary of injuries
Type 2 odontoid fracture Fracture 3rd and 4th rib left side Fracture left shoulder and scapula Soft tissue injuries to left shoulder, left hip, right hand, occiput CT Head – no acute changes CT Chest – rib fractures, bi-basilar atelectasis CT Abdomen/pelvis – no acute changes, biliary stone FAST exam – negative for fluid 12 Lead ECG – ST depression globally

Case progression, back to basics, and reassessment

At 0030 hours, the patient's vital signs are B/P 79/50, HR 72 bpm, RR 18/min, rectal temp 33° C and has received 3,000 ml IV fluid (warmed) of normal saline. The patient is poorly compensating. Her GCS is 14/15, chest is clear, heart sounds normal, abdomen is soft, and she complains of pain in her left hip.

Why is she hypotensive?

An approach commonly used to assess hypotension and cause for shock is using the CODE mnemonic as outlined in Table 4.

Response to trauma and the aging adult

Geriatric patients have an altered response to stress and a limited cardiovascular response due to the effects of aging (Cutugno, 2011). See Table 5 for age related physiologic changes. This patient's PEMC, the normal aging effects on body systems and experiencing a fall will have influence on her ability to respond to stress. The episodes of hypotension in this case can lead to further ischemia of the vital organs (brain, heart, lungs, kidney, liver) further compromising perfusion. The patient has PEMC adding complexity in her ability to respond to stress. Altered pulmonary, cardiovascular, and renal PEMC in addition to the injuries in this patient affected the overall clinical response.

An additional concern was the patient's hypothermia. Hypothermia can lead to poor cardiac function and a tendency for bleeding. At low body temperatures cardiac output falls, heart rate falls (American College of Surgeons, 2012) and hypothermia is associated with coagulopathy (Stevenson, 2014). Aschkenasy et al. (2006) state elderly patients may be at risk for hypothermia when found lying exposed for long periods, poor heating in the

Table 4: Code mnemonic for shock

CODE	Patient issue
Cardiogenic	Cardiac injury Myocardial infarction Arrhythmias Poor cardiac function - cardiomyopathy
Obstructive	Tension pneumothorax Cardiac tamponade Pulmonary embolus
Distributive	Neurogenic Anaphylaxis Sepsis
Exsanguinating hemorrhage	External and or internal blood losses

Table 5: Review of age-related physiologic changes

System	Age-related changes	Potential complications
Pulmonary	Decreased cough and gag reflex Relaxed musculature of the oropharynx Alveolar loss Decreased elasticity chest wall	Aspiration Hypoventilation Atelectasis
Cardiovascular	Cardiac reserve decreased Atherosclerotic changes Decreased sympathetic reserve Poor temperature control	Tissue hypoxia - ischemia Inability to manage stress Hypothermia
Neurologic	Decreased cerebral blood flow Cerebral atrophy Increased risk shearing injury Poor balance and proprioception Cognition impaired	Tissue Hypoxia - CVA Subdural hematoma Falls and fractures Confusion/delirium
Musculoskeletal	Loss of muscle strength/mass Decreased bone density/mass Decreased ROM of joints Decreased mobility	Falls Fractures
Renal	Decreased renal mass Decreased renal function Decreased sense of thirst	Tissue hypoxia – renal failure Decreased drug clearance Risk dehydration
Nutrition Metabolic Gastrointestinal	Malnutrition Decreased basal metabolic rate Decreased heat production Decreased GI motility	Anemia, slow healing Hypothermia Constipation
Cutugno et al., 2011; Aschenasy et al., 2006; Williams, 2003; Jagos, 2014		

home, hypothyroidism, sepsis, substance abuse, and low basal metabolic rate. This patient was last seen well a few minutes prior to the fall. Hypothyroidism and sepsis were considered in this case as potential reasons for the hypothermia. Warmed fluids and active external rewarming were ongoing interventions.

Case progression

The trauma team decides that combined factors are responsible for the ongoing problem with this patient's hemodynamic response to the injuries. These include a poor cardiovascular response due to her recent trauma (chest injury), PEMC of heart disease, cerebral vascular disease, renal disease, probable adrenal insufficiency and responsible for her cardiogenic shock state. Consideration was given to the patient's home medications and a possible antihypertensive overdose. This can be considered with persistent hypotension in patients with no source of hemorrhage (Aschkenasy, 2006). Calcium channel blockers may prevent peripheral vasoconstriction and this effect may contribute to hypotension (American College of Surgeons, 2012). Additional interventions include reversing the calcium channel blocker effects of her antihypertensive medication Norvasc on cardiac function and increasing her adrenal response in efforts to improve her perfusion and response to stress. The patient is given Glucagon 5mg IV, Calcium Gluconate 2 grams IV, Hydrocortisone 100mg IV, and warmed saline fluid boluses. These interventions are expected to increase inotropic activity in the heart, increase vascular tone, and cardiac output. There is a transient rise in her blood pressure with these interventions but not for long.

Case reassessment: 0240 hours critical care team is consulted

The patient's current VS are: B/P 59/37 mmHg, HR 97, RR-12, oxygen saturation of 100% with ongoing oxygen administration, rectal temp of 34.9° C. Her GCS is 14/15. She has no complaints of shortness of breath or chest pain. Chest exam reveals air entry is equal, chest sounds clear, skin is pale, abdominal exam is normal and stool for occult blood is negative.

The patient has received a total volume of 3.5 litres of warmed normal saline, medications to improve cardiac function by reversing calcium channel blockade, and external re-warming. Additional interventions include review of systems (see Figure 1), repeat 12-lead ECG, repeat venous blood gas, troponin, and blood cultures.

Results of blood work and where is she bleeding?

The results of her repeat lab work includes Hemoglobin – 67 gm/L, second Troponin is normal, lactate 1.1 mmol/L, base deficit -8.5 mmol/L. There are no new changes on the 12-lead ECG. The trauma team performed another primary and secondary survey. All previous CT scans were negative for internal bleeding. A second FAST exam was performed and negative for chest or abdominal bleeding. A second log roll was performed, which revealed a very large left buttock hematoma. The development of the hematoma was related to her Plavix use.

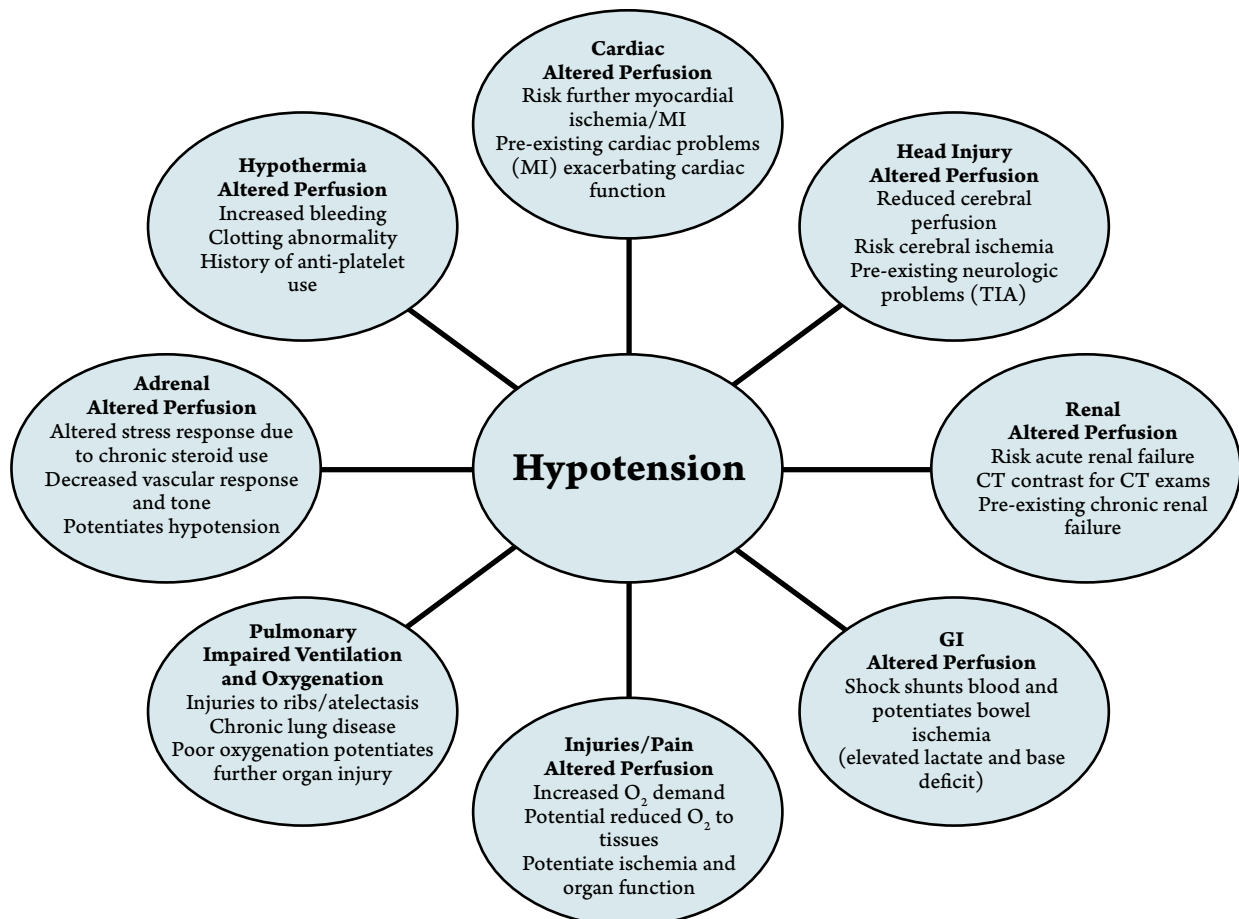


Figure 1: Review of systems: Patient problem

The trauma team was concerned regarding the hypothermia and link to increased bleeding risk and ongoing base deficit—a sign of decreased tissue perfusion (Callaway et al., 2009). The triad of hypothermia, acidosis, and coagulopathy increases mortality (Mikhail, 1999). Priorities include warming the patient and treating shock.

The ICU trauma team's Interventions include inserting an arterial line left radial artery, a central venous catheter in the right femoral vein, administering two units of Packed Red Blood Cells (PRBC), continue rewarming with external reheating, admission to the trauma observation unit, the spine consulting team to assess the neck fracture, and hold all anti-platelet agents.

Case progression and conclusion: 0430 hours

The patient responded to blood transfusions and rewarming. Her vital signs at 0430 hrs are B/P 122/55 mmHg, HR 102, RR19, rectal temp of 36° C, and an oxygen saturation of 98% with continued oxygen therapy. The repeat HGB at 0600 was 111gms/L. The patient was transferred and managed on the trauma unit and required no surgical management for her injuries. She had an endoscopic procedure to remove her asymptomatic biliary stone. She was discharged home after a three-week hospitalization and recovery period.

The patient returned to ED after discharge home within two days complaining of increased pain in her left buttock and dizziness. Her hemoglobin was found to be 75 gms/L. She required a further transfusion of two units PRBC for an expanding hematoma in her left buttock. She was discharged five days later in good condition and has had no further encounters or admissions for any related problems to the fall.

Discussion

Geriatric trauma patients with PEMC and poly pharmacy use add a different dimension to trauma care. Although the priorities of care are similar in all age groups, older adults bring challenges to the resuscitation effort.

First, age-related changes to body systems are considerations when planning care. Function of the major organ systems in older adults is less efficient. The older adult may have a limited ability to respond to the stress of injury. In this case, the patient's fall combined with her pre-existing medical conditions (PEMC) affected the system's response to stress. The hypotension will further decrease perfusion to organ systems that already are compromised potentiating further ischemia and organ injury. The presence of PEMC increases mortality independent of the aging process (Aschenasy, 2006).

Second, the patient's PEMC affected the stress response to injury (Jagos, 2014). Her pre-existing cardiac status combined with the hemorrhage in the buttock affected the cardiovascular response to stress. Hypotension can worsen the cardiac response with poor overall perfusion to organ systems further complicating the clinical picture (Heffernan et al., 2010). Geriatric patients are more sensitive to volume overload due to cardiac disease (American College of Surgeons, 2012). When treating hypotension, Jagos (2014) recommends consideration

of smaller fluid boluses and observing for signs of fluid overload. This would be an important consideration in this case. The patient has limited cardiac reserve and will not tolerate large volumes of fluid. Inotropic support should be considered when fluid therapy fails to achieve goals for perfusion. Administration of PRBCs can increase oxygen carrying capacity and improved oxygen delivery to tissues.

Third, trauma patients can have injuries not so obvious to the team after the initial primary and secondary surveys are accomplished and routine investigations finished. This patient had a unique injury and presentation. The trauma team should keep focused on the interventions ordered and the patient's response. Reassess the patient's physical response to injury frequently and consider the age-related changes and PEMC when performing the reassessments.

A fourth consideration is the patient's rib fractures and associated atelectasis, and scapular fracture. These are injuries related to a direct blow. Rib fractures are concerning injuries in elderly patients who have a higher mortality than younger age groups with similar injuries (American College of Surgeons, 2012). Atelectasis is a more frequent complication of rib fractures in the elderly. These injuries combined with the normal changes of aging and decreasing pulmonary reserve can lead to respiratory failure quickly. A failing cardiovascular system and pulmonary reserve in this patient due to injuries and pre existing conditions will contribute further to acidosis and alter tissue and organ perfusion.

Another factor in geriatric care is discussion regarding existing advanced directives or goals of care. The trauma team should identify the patient's wishes when planning care. Evidence supports that age significantly increases mortality from injury but early aggressive care has been shown to improve survival (American College of Surgeons, 2012).

Another issue in geriatric care is elder maltreatment. ATLS (American College of Surgeons, 2012) defines elder maltreatment as any willful infliction of injury, unreasonable confinement, intimidation, or cruel punishment that results in harm. The trauma team was concerned regarding the mechanism of injury and unexplained hypothermia. The patient was interviewed by four or five consulting services. The story did not change, so elder maltreatment was ruled out.

Summary

The geriatric trauma patient is a unique and special population. Knowledge of the aging process with the physiologic change and the impact of PEMC on the stress response to injury assist the trauma team to plan interventions tailored to the patient. When the end goals of resuscitation are not achieved, serial reassessments are required with a thorough review of body systems, PEMC, medication use, and review of diagnostic imaging to determine the problem and plan care.

Factors associated with increased hospital mortality in the geriatric population include age, low GCS on arrival, the need for endotracheal intubation, the requirement for blood transfusions, and complications from hospital admission

(Heffernan et al., 2010). Implications for emergency nurses are to have care and attention to the unique challenges with elderly patients. Customizing the care plan can influence the response in a positive manner despite the odds of a less than optimal outcome.

The key to successful resuscitation in this vulnerable population is early aggressive care (Labib et al., 2011). Other considerations for emergency nurses includes injury prevention strategies in daily assessments (falls prevention), assessing elderly trauma

patients for maltreatment during the trauma assessment, and including goals of care or advanced directives, as appropriate.

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FORENSIC NURSING

Interview with Colleen Varcoe

Introduction

Dr. Colleen Varcoe, PhD, RN, is a Professor at the School of Nursing, University of British Columbia. She has received numerous awards for her extensive research in violence against women and ethics. She was the recipient of the 2006 National Emergency Nurses Affiliation Award of Excellence in Nursing Research. Dr. Varcoe recently was a keynote speaker at the International Association of Forensic Nurses (IAFN) conference in October, 2014 in Phoenix, Arizona. Her UBC profile has a list of her publications and can be found at <http://www.nursing.ubc.ca/faculty/biopage.aspx?c=15.3297097167559>

1. What are your current professional roles?

I am a professor in the School of Nursing at the University of British Columbia. As a professor, I teach nursing students from undergraduates to doctoral students, and conduct my program of research focused on structural and interpersonal violence and all forms of inequity.

2. You have a varied nursing background; can you tell us how you came to be doing what you are doing?

I became a nurse, in part, because my mother was a nurse, and I both respected her and had a sense of the role through her. Initially I saw nursing as a way to gain employment to support me through medical school. However, encountering the wide scope and diversity of nursing, I quickly discovered that I would far rather be a nurse than a physician any day! I do research in the area of violence



and inequity for a range of personal and professional reasons. First, as a child, I experienced and witnessed considerable violence in my home, perpetrated by my stepfather. This fuelled my passion for contributing to a more effective social