Major trauma in the elderly: The effects of ageing on ED assessment

By Elaine Cole

Canada's population is ageing. In 2016, there were more people aged 65 and over than those aged 17 and under (Statistics Canada, 2016). This population change is predicted to continue and by 2036 one quarter of people in Canada will be aged 65 or more (Canadian Medical Association, 2016). Improvements in health, social care and lifestyle have resulted in people living for longer and many are remaining relatively active, therefore the incidence of traumatic injury in this age group is rising. The proportion of elderly trauma presenting to the Emergency Department (ED) is growing annually (Kozar et al., 2015) and the volume of older people with significant injury is expected make up more than a third (39%) of global trauma admissions by 2050 (Banks & Lewis, 2013).

Unlike pediatric trauma care, the optimal management of elderly trauma currently lacks age-specific treatment guidelines and clinical protocols. Many severely injured older patients have altered responses to shock and injury, which present unique challenges for the ED trauma team (Bradburn et al., 2012). Increased age is associated with a progressive decline in physiological function, which alters the body's ability to respond to traumatic injury (Panda et al., 2009), especially in frail elderly patients with multiple health problems (Joseph et al., 2017). Older trauma patients are frequently under-triaged (Ichwan et al., 2015; Reske-Nielsen & Medzon, 2016) and co-existing diseases or medications may alter signs or symptoms of injury (Llompart-Pou, Perez-Barcena, Chico-Fernandez, Sanchez-Casado, & Raurich, 2017). These factors can cause delays to accessing expert care or initial misdiagnosis, both of which contribute to poor outcomes after traumatic injury (Hranjec, Sawyer, Young, Swenson, & Calland, 2012). Whilst integrated geriatric trauma services in Canada (Wong et al., 2017) and the U.S. (Wiles, Day, & Harris, 2016) are known to improve outcomes, this remains an aspiration for many hospitals and the responsibility for initially managing older trauma lies with the ED team.

This paper will discuss some of the age-related differences that may influence the assessment and management of elderly trauma patients in the ED. For the purposes of this paper 'elderly', 'geriatric' or 'older' describe patients aged 65 years or over, whilst acknowledging that this may differ between clinical settings.

Mechanisms of injury in elderly trauma

In comparison to younger adults, older people can sustain a significant injury from a relatively trivial or minor mechanism (Cryer, 2013). Blunt trauma dominates in this age group (Adams et al., 2012; Dinh, Roncal, Byrne, & Petchell, 2013), and a quarter of severe trauma will result from road traffic collisions (Bonne & Schuerer, 2013). However, it has become increasingly apparent that the most common mechanism of injury in older people is falling (Gillespie et al., 2012; Kozar et al., 2015; TARN, 2017).

The more active 'younger elderly' may fall outdoors (Kelsey, Procter-Gray, Hannan, & Li, 2012; Kim, 2016), but many older people fall indoors in so-called low-level or low-energy falls (Gelbard et al., 2014; TARN, 2017). Whilst low-level falls are usually uncomplicated for younger patients, they are the leading cause of traumatic brain injury (TBI) and mortality for older trauma (Carpenter et al., 2014; Llompart-Pou et al., 2017). Despite this, many trauma triage or ED trauma protocols currently do not have low-level falls as an activation criterion. Warfarin (Coumadin) use is common in the elderly and the need for emergency reversal to minimize brain (and other) hemorrhage is well documented. However, many patients in Canada are now prescribed Direct Oral Anticoagulants (DOACs) (Wood et al., 2017) and unlike Warfarin, not all DOACs—such as Rivaroxaban—have reversal agents (Barletta et al., 2017; Kobayashi et al., 2017). The risks of adverse outcomes and mortality after a fall are increased in anticoagulated elderly trauma patients (Boltz, Podany, Hollenbeak, & Armen, 2015). For the ED nurse, falls in older patients warrant a high index of suspicion for severe injury, especially in the presence of oral anticoagulants. The underlying cause of the fall also requires investigation.

Initial assessment of elderly trauma and the effects of ageing

The physiology of the ageing process means that the 'normal' physiological response to injury may differ in older patients. Comorbid diseases may further complicate this and approximately 75% of older people in Canada report having one or more chronic conditions (Canadian Institute for Health Information, 2014). Comorbid (or co-existing) diseases and the associated medications challenge 'normal' trauma assessment where beta-blockers or pacemakers may mask abnormal vital signs such as tachycardia (Bonne & Schuerer, 2013; Stevens & Torke, 2016).

Airway assessment and cervical spine immobilization

Timely airway assessment and management is a priority as for any trauma patient. However, there is an increased risk of an obstructed airway in the elderly due to foreign bodies such as dental prosthetics or lose decaying teeth (Dalton, Rushing, Escott & Monroe 2015). Further, the requirement for in-line cervical spine immobilization may be challenged by factors such as kyphosis, lordosis or degenerative disorders of the neck and no attempts to force the patient into a supine position should be made (Rao, Phan, Mobbs, Wilson & Ball 2016). Finally, there is an increased incidence of occult (or undetected) cervical spine injuries in elderly head injured patients (Kozar et al., 2015). Therefore, if TBI is suspected, the cervical spine should be included in the head CT scan.

Respiratory assessment

Ageing is associated with decreased respiratory reserve, as lung tissue becomes increasingly inelastic and alveolar function diminishes (Johnson, Botros, Groban, & Bryan, 2015). Chronic lung diseases such as emphysema or COPD increase the risk of respiratory failure in the elderly. Furthermore, the thoracic rib cage is stiffer and even 'minor' chest injury or single rib fractures could lead to significant respiratory complications (Wardhan, 2013). Age-related physiological changes to the respiratory system and co-morbid disease can result in oxygen saturation levels being low (<95% on air) in the pre-injury state. However lower Sp02 saturations in elderly trauma should be considered abnormal until injury is ruled out. Radiation exposure is not a concern in this age group and early chest x-ray (or CT scan) is essential to detect thoracic injuries.

Cardiovascular assessment

Elderly trauma is anecdotally considered to be 'head injuries and hip fractures'. Yet, a recent British study reported that major hemorrhage is a significant burden in older trauma patients (Stanworth et al., 2016). During cardiovascular trauma assessment in the ED, abnormal vital signs (such as tachycardia and hypotension) are usually indicators for trauma team activation (Heffernan et al., 2010). However initial systolic BP (SBP) and heart rate are poor at predicting serious injury amongst older adults (Newgard et al., 2014). Greater than 50% of the geriatric population suffer underlying hypertension and cardiovascular disease (Bonne & Schuerer, 2013) where a 'normal' SBP may be 150mmHg or higher. It is, therefore, difficult to assess hypotension in these patients and traditionally accepted vital signs such SBP<90mmHg may be extremely low or pre-terminal for some older people (Heffernan et al., 2010). Adults between the ages of 65 and 95 years will vary greatly as age increases, therefore there can be no 'one size fits all' for a hypotensive threshold for older people.

However, recent reports suggest that higher values of SBP <110 to 117 mm Hg are more sensitive in predicting hypotension, severe injury and mortality in older trauma (Brown et al., 2015; Newgard et al., 2014; Oyetunji et al., 2011). To assist with assessment of hemorrhage in the elderly laboratory markers of hypoperfusion such as lactate or base deficit may be helpful. An elevated venous lactate ≥ 2.5 mmol/L was better at identifying hemodynamic instability than SBP in older trauma (Salottolo, Mains, Offner, Bourg, & Bar-Or, 2013) and raised lactate (≥ 2.0 mmol/L) in elderly trauma is reported to be a risk factor for poor outcome (Vanzant et al., 2015). The American College of Surgeons suggests that a base deficit should be expedited in geriatric trauma assessment (Cryer, 2013). Base deficit values of ≥6mEq/L (Base Excess ≤-6mEq/L) are markers of severe injury and 60% mortality in older trauma patients (Calland et al., 2012; Davis & Kaups, 1998).

Neurologic assessment

Accurate neurologic assessment in elderly trauma may be challenging with pre-existing cognitive impairment such as dementia or Alzheimer's, or age-related factors such as hearing loss. The Glasgow Coma Scale (GCS) is used to determine the extent of neurologic injury in patients with TBI and to identify those who may require neurosurgical care. Yet, this assessment may have limited utility in older people (Salottolo, Levy, Slone, Mains, & Bar-Or, 2014). Studies suggest that GCS in older trauma patients may not reflect the severity of TBI and scores were found to be higher in the elderly compared to younger patients with the same severity of injury (Kehoe, Rennie, & Smith, 2015; Kehoe et al., 2016). This is possibly due to brain atrophy, which allows more space within the cranium for a hematoma to grow, or that subdural hematomas—common in the elderly—evolve more slowly reducing GCS at a later stage (Kehoe et al., 2016; Salottolo et al., 2014). Timely CT head scanning is essential to identify and classify TBI (Carney, 2016). However, older age is associated with delay to CT scan (Kirkman et al., 2013; TARN, 2017), which may be caused, in part, by failing to recognize a reduced GCS. Once again, variations in age make it difficult to give a precise cut-off value that may indicate TBI, but GCS of 14 or less has been found to be predictive of severe injury (Newgard et al., 2014) in the elderly until proven otherwise.

In summary, identification of severe injury in elderly trauma is challenging. Age-related physiological changes and co-morbid diseases complicate the trauma assessment of older people. As the elderly population increases, it is essential that ED nurses can assess this age group appropriately.

Key messages for elderly trauma assessment in the ED include:

- Irrespective of how 'young' the external appearance of the older trauma patient is, **there will be underlying changes to physiology** that may mask the 'normal' signs of injury.
- **Low-level falls can cause severe injury in the elderly** and thorough examination is mandatory.
- **Oral anticoagulants can complicate injury and worsen outcome**. Early diagnostics and advice on reversal are essential.
- **Vital signs may not fit 'normal' parameters**:
  - Low oxygen saturations should be considered trauma-related hypoxia until proven otherwise. Check the Arterial Blood Gases!
  - An SBP of <120 mmHg may be hypotension in older people
  - Lactate ≥ 2.0 mmol/L or Base Deficit ≥6mEq/L may be better markers of severe injury than SBP
  - 'Normal' GCS (14–15) in elderly head injury does not rule out TBI.

About the author

*Dr. Elaine Cole: PhD, MSc, Post Grad Dip (Education), BSc, RN. My background is in ED and critical care nursing. After a number of years working as an Advanced Practitioner in the ED, I completed my PhD in November 2014 (which examined the relationship between hemorrhage and infection after severe injury). My current role is the Director of Research and Innovation for the pan London Major Trauma System (**www.londontraumasystem.org**), where I support clinical innovation and collaborative research across the Greater London region. I am also one of the tutors and module leaders for the MSc Trauma Sciences at Queen Mary University of London, London, UK.*

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❧

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❧

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