



Resuscitation of the Critically Ill Geriatric Patient

Key Article

Khoujah D, Martinelli AN, Winters ME. Resuscitating the critically ill geriatric emergency department patient. Emerg Med Clin N Am. 2019; 569-81.

Background

- The World's population is aging.
 - Currently, 15% of the US population is > 65 years of age.
 - Projected to increase to 20% by 2030.
- Elderly are the fastest growing segment of the population.
 - Greater number of comorbidities: > 60% have 2 or more chronic conditions
 - Greater number of medications
- Elderly account for 20% of ED visits and up to 50% of hospital admissions
- Early and aggressive treatment does improve outcomes.
 - Unfortunately, older patients are often treated differently than younger counterparts due to lack of knowledge/comfort with resuscitation, or treatment bias.

Age-Related Physiologic Changes

- *Immunosenescence*
 - Impaired ability to react to immunologic insults
 - Occurs due to a decrease in both humoral and cellular immunity
 - Also, physical barriers in adults are impaired – skin fragility, motility of respiratory cilia decreases, prevalence of indwelling hardware increases
 - Overall, immunosenescence increases susceptibility to infection, decreases ability to mount response to infection, and increases likelihood of atypical presentations.
- *Cognitive Impairment*
 - Acute or chronic mental status change can affect up to 25% of those who present to the ED.
 - Can create a challenge in caring for the older patient
 - Cognitive impairment should not be attributed to age alone.
 - Delirium is a sign of acute illness in the elderly, but is often frequently missed.
- *Frailty and Impaired Mobility*
 - Frailty is defined as age-associated decline in physiology reserves and resistance to stressors.
 - Stronger correlation to poor outcomes than age itself

- Frailty, combined with impaired mobility increases the older adult's risk of falls, trauma, and leads to worsened outcome in the setting of acute illness.
- *Respiratory Physiology*
 - Increased chest wall rigidity, worsened kyphosis, decreased respiratory muscle strength, and decreased elastic recoil of the lung – leads to decreased vital capacity.
 - Also more likely to have underlying lung disease – fibrosis, lung scarring, and COPD.
 - Additional changes:
 - Loss of protective cough mechanism
 - Decreased mucociliary clearance
 - Decreased diffusion capacity
 - Increased V/Q mismatch
 - Dysfunction of the peripheral and central chemoreceptors
 - Overall leads to decreased pulmonary reserve and increased risk of hypoxia and hypercarbia.
- *Cardiovascular Physiology*
 - Progressive stiffening of both arterial vasculature and the myocardium
 - Leads to higher baseline BPs and more precipitous drop in BP when exposed to a stressor.
 - Diastolic dysfunction and decreased cardiac output from myocardial stiffening
- *Renal Function*
 - Kidney mass and number of glomeruli decrease with age
 - Leads to decreased renal function and decreased ability to retain sodium and water
 - Serum creatinine should not be used to estimate renal function in elderly – creatinine normally decreases with age in setting of lower lean body mass and malnutrition
 - Prudent to calculate the CrCl to determine overall renal function
- *Pharmacokinetics/Pharmacodynamics*
 - Responses to medications change with aging.
 - TBW and circulating protein levels decrease but total body fat concentration increases.
 - This alters the volume of distribution and total plasma levels of hydrophilic, lipophilic, and highly protein-bound medications.
 - Important to also take into account the physiologic decrease in renal function.

Clinical Manifestations

- Physical Exam
 - *Vital signs*
 - Due to physiologic changes of elderly, consider different thresholds for tachycardia, hypotension, and fever.
 - Proposed threshold for HR: > 90 bpm

- Proposed threshold for BP: SBP < 100 mm Hg; decrease of SBP > 40 mm Hg from baseline
 - Proposed temp threshold: fever ≥ 37.2 orally or ≥ 37.5 C rectal
 - Tachypnea is the most sensitive sign for critical illness in older patients.
- *Skin*
 - Capillary refill time normally longer in older patients
 - Other classic signs (skin turgor, mucous membranes, axillary moisture) not reliable measures of hydration status
- Medications
 - ADEs are leading cause of hospitalization and death in the older patient – up to 10% of admission for elderly
 - Changes in pharmacokinetics and pharmacodynamics increase the risk of ADEs, especially in the presence of reduced renal function

Resuscitation Pearls

- *Airway*
 - Numerous anatomic changes occur with aging:
 - Decreased neck mobility
 - Increased nasal polyps
 - Atrophy of orbicularis oris muscle
 - Dental decay, loose teeth, edentulous
 - TMJ stiffness
 - Decreased thyromental distance
 - Decreased submandibular compliance
 - Increased parapharyngeal fat
 - Floppy epiglottis
 - Most notable is the tendency of the airway to collapse and be obstructed
 - May make BVM ventilation difficult
- *RSI*
 - Geriatric patients should be adequately preoxygenated
 - Given difficulty in maintaining a seal, BVM should be a two-person technique – leave dentures in place during BVM to allow for a better seal.
 - Use caution when positioning geriatric patient for intubation due to decreased neck mobility, especially those with rheumatoid arthritis.
 - Patients are more likely to sustain peri-intubation hypotension during RSI.
 - Consider reducing dose of sedative
 - Anticipate need for IVFs and possibly pressors
 - No need to adjust dose of NMBA
- *Breathing/Mechanical Ventilation*
 - Currently no clinical guidelines focused on MV in the elderly patient. General recommendations are to use LTV ventilation strategies similar to younger patients.
- *Circulation*

- Patients at high risk of cardiac decompensation – lower physiologic reserve, increased incidence of CAD and heart failure
- Also at increased risk of volume overload, organ congestion, and organ failure with excessive fluid administration.
- Consider smaller fluid boluses followed by more frequent reassessments of tissue perfusion.
- Use general principles of critical care to guide vasopressor use in elderly
- *Medications*
 - Patients are more sensitive to the effects of medications – particularly cardiovascular and CNS agents
 - Likely to respond differently than the average adult patient
 - Start with lowest recommended dose then titrate to effect
 - Adjust in correlation with renal and hepatic function

Specific Scenarios/Diseases

- *Sepsis*
 - Evaluation
 - Older patients constitute more than 50% of patients seen in the ED with severe sepsis.
 - Older patients have decreased ability to mount tachycardia or fever, making diagnosis of sepsis more difficult.
 - 1/3rd of patients with bacteremia will be afebrile
 - More often, older patients have atypical presentations such as confusion, decreased functional status, failure to thrive, or generalized weakness.
 - Neither leukocytosis nor elevated procalcitonin have been shown to be sensitive for bacteremia in the elderly.
 - Use of lactate in older patients has been validated as a maker of perfusion.
 - Cast a wide net looking for sources of infection – perform a thorough exam looking for ulcers/indwelling catheters, etc.
 - Certain diagnostic studies may be less sensitive in older patients
 - CXR may be less sensitive and specific due to presence of comorbidities and dehydration.
 - Patients are also more likely to have an intraabdominal complication, necessitating a low threshold for CTs.
 - Management
 - Antipyretics can be given for fever
 - Fluid resus should still target an appropriate amount, but administered in smaller aliquots and more frequent assessment
 - Give vasoactive medications as needed – norepinephrine
 - Administer appropriate broad spectrum antibiotics – consider high prevalence of MDR organisms in the older patient, especially if a resident of a long-term care facility or nursing home; also consider local resistance patterns and institutional antibiograms

- Given the initial dose at standard dosages, with subsequent doses adjusted for renal function
- *Trauma*
 - Evaluation
 - Falls are the most common mechanism of trauma in older patients
 - Rib fractures are associated with a high morbidity and mortality – older patients more likely to have complications such as PTX, hemothorax, and pulmonary contusions.
 - Pelvic fractures carry a high rate of mortality in older adults – higher risk of hemorrhage than younger patients and increased need for angio and blood products
 - ISS or low GCS should not be used as the sole indicator of critical illness, as older patients with low ISS and high GCS can still have significant illness and mortality.
 - Management
 - Aggressive resuscitation should be directed by the vital signs and lactate concentration.
 - Some have suggested 110 mm Hg as a threshold for aggressive resuscitation in the elderly population – has not been studied
 - Limit crystalloids – as you would in younger patients – to prevent dilutional coagulopathy.
 - Permissive hypotension has not provide safe or effective in older patients
 - Consider MTP in older patients according to the same guidelines as for younger patients – age is not an independent risk factor for death and should not be used to implement a restricted resuscitation strategy.