

Chapter 44

ANESTHESIA CONSIDERATIONS IN THE ELDERLY POPULATION

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INTRODUCTION

The focus of deployed military medical facilities is the care of its personnel. However, the realities of medical care in a combat zone make civilian casualties inevitable. Each nation establishes its own criteria for how these patients are to be treated, but the biological contrast between civilian casualties and young, fit soldiers is stark. A significant injury score is far more likely to prove fatal in the elderly than in service members, so those who survive trauma are likely to be less severely injured than their military counterparts. Depending upon the proximity of Role 3 facilities to local population concentrations, some of these patients will present with nontraumatic surgical issues.

Most developed nations define the elderly as

aged over 65 years. However, characteristics of older patients as a group vary widely according to the geographical location of the conflict. Patients from developed countries are more likely to suffer comorbidities associated with a higher socio-economic lifestyle, while patients in third world locations are characterized by a high prevalence of poor nutrition and ill health, including infective disease. Currently in Afghanistan some 40% of patients admitted to the surgical facilities at Camp Bastion are Afghan nationals aged over 40 years. Many of these people are physiologically much older than Westerners of the same age by virtue of poor general health, often exacerbated by narcotic abuse.

PHYSIOLOGY OF OLD AGE

Wherever their location, older people share a common physiology. Exhibit 44-1 lists the key features relevant to anesthesia. This list is perhaps best summarized by acknowledging that the elderly have limited physiological reserve and will not tolerate gross disturbances in physiological function. The physiology of the elderly must be respected in the practical conduct of anesthesia.

Preoperative Assessment

As with all patients, preoperative assessment of the elderly begins with a history and physical examination. The aim is to ascertain the extent of known pathology or detect unsuspected conditions. Subsequent radiological and laboratory investigations should be conducted with the objective of identifying problems that should be corrected or improved prior to surgery. The assessment will be limited when the need for surgery is urgent.

Cardiovascular Disease

In the Western world ischemic heart disease is common, and cardiac failure is also not unusual. The potential morbidity associated with cardiac failure and ischemic heart disease is apparent in the relative risks given to various preoperative risk factors in Goldman's landmark study of patients aged over 40 years (Exhibit 44-2).¹

Patients with arrhythmia (or a history of arrhythmia) require an electrocardiogram, unless the problem is obviously benign. Atrial fibrillation is a common problem, and a rapid uncontrolled ventricular rate needs correction. Note any history of syncope, seizures,

or repeated falls. Such patients may have a bradycardia, and any clinical diagnosis must be supported by an electrocardiogram because some uncommon conduction defects require cardiological intervention before

EXHIBIT 44-1

PHYSIOLOGICAL CHARACTERISTICS OF THE ELDERLY RELEVANT TO ANESTHESIA

- Lung volumes decrease with age; lung is less elastic. Consequent reduction in gas exchange.
- Atheroma and reduction in myocardial contractility cause impaired response to hemorrhage; this situation is worsened by arrhythmia or conduction disorders.
- Hypotension has potentially significant implications for cerebral and coronary artery perfusion.
- Renal function: kidney mass, volume, and blood flow are reduced, with a consequent reduction in GFR. Intolerance of water and salt loading
- Temperature control: loss of subcutaneous fat and reduced muscle mass cause susceptibility to hypothermia.
- Basal metabolic rate is lowered, which also contributes to difficulty in maintaining normothermia.

GFR: glomerular filtration rate

EXHIBIT 44-2**GOLDMAN RISK FACTOR AND SCORE**

- Third heart sound (11)
- Elevated jugular venous pressure (11)
- Myocardial infarction in past 6 months (10)
- Electrocardiogram shows ventricular ectopic activity or nonsinus rhythm (7)
- Age > 70 years (5)
- Emergency procedure (4)
- Known or suspected significant aortic stenosis (3)
- Intrathoracic, intraabdominal, or aortic surgery (3)
- Poor general status (3)

Patients with scores > 25 had a 56% incidence of death and a 22% incidence of cardiovascular complications.

Data source: Goldman L, Caldera DL, Nussbaum SR, et al. Multifactorial index of cardiac risk in noncardiac surgical procedures. *N Engl J Med.* 1977;297:845-850.

surgery. Beware of any new murmur found in patients aged 60 or over, particularly so if the physical signs suggest aortic stenosis. Patients with undiagnosed or poorly controlled hypertension are unlikely to be deferred for treatment. In the acute setting, recognize that pain and anxiety may be a factor.

Respiratory Disease

In certain geographical locations there may be an increased incidence of a specific respiratory pathology such as tuberculosis. In the developed world chronic obstructive pulmonary disease is frequent in the older population. These patients can often be improved by nebulized therapy and treating any coexistent chest infection. Preoperative physiotherapy can also be beneficial in improving physiological function. A chest radiograph can be decisive in excluding a pneumothorax or pleural effusion, and arterial blood gas analysis will measure the effects on gas exchange. Exhibit 44-3 lists preoperative features associated with postoperative respiratory failure in noncardiac surgery. These indices are extracted from a study of US veterans.² Like the Goldman index, this list demonstrates the direct influence of biological age and general medical condition on morbidity.

EXHIBIT 44-3**FACTORS INFLUENCING POST-OPERATIVE RESPIRATORY FAILURE**

- age > 65 years
- ASA class \geq II
- cachexia
- cardiac failure
- chronic obstructive pulmonary disease and smoking
- reduced consciousness level
- general anesthesia
- emergency surgery
- upper abdominal surgery, vascular surgery
- raised creatinine
- albumin < 35 g/L

ASA: American Society of Anesthesiologists

Renal Disease

Chronic renal impairment is frequent in elderly patients. In these cases, prolonged preoperative starvation is potentially deleterious, and preoperative intravenous fluids may be necessary.

Medication

When relevant, the history should include recording the patient's own medication. During the perioperative period a number of pharmacological influences on anesthesia and surgery are possible (Table 44-1).

Preoperative Clinical Investigations

In the United Kingdom, the National Institute for Clinical Excellence has produced exhaustive recommendations for preoperative testing in elective surgery.³ The recommendations are based upon the fitness of the patient and the complexity of surgery. These are standards expected in mature healthcare systems; in the deployed environment, particularly when faced with a significant number of casualties requiring emergency care, their application must be dictated by sound clinical assessment of the patient's physiology. When managing trauma, investigations should include urinalysis; hemoglobin, urea, and electrolyte measurement; arterial blood gases; and digital radiology or computerized tomography as necessary.

TABLE 44-1
PHARMACOLOGICAL CONSIDERATIONS FOR SURGERY IN THE ELDERLY

Drug	Comments
Steroids	Dose must be increased in perioperative period to ensure adequate stress response.
Warfarin	Warfarin is long acting. In an emergency, reversal can be imitated with IV vitamin K (1 mg) and maintained with fresh frozen plasma (initial dose: 10–15 mL / kg) and/or further doses of vitamin K.
Insulin	Acute illness, surgery, and anesthesia disturb glucose homeostasis. For all major surgery (with patient dependent on intravenous fluids postsurgery), a sliding scale regime is required until normal oral intake is established.
Antihypertensives	The reduced plasma volume of the starved or hypovolemic patient dictates that diuretics and/or ACE inhibitors and angiotensin receptor antagonists be omitted before surgery.
Angina therapy	Maintain nitrates and calcium channel antagonists.
Antiarrhythmia medications	Continue perioperatively to optimize hemodynamics.
Antiplatelet medications	Note the implications for proposed regional anesthesia. Where permissible, preoperative omission may reduce hemorrhagic complications.
Bronchodilators	Patients should use their usual inhalers as usual to minimize the potential hazards of bronchospasm. Nebulized delivery may be required perioperatively.

ACE: angiotensin-converting enzyme; IV: intravenous

ANESTHESIA

There is no one superior anesthetic technique for this age group, but some key practical considerations are listed in Exhibit 44-4. With respect to drug delivery, this list might be summarized as “inject with care.” The elderly patient can experience significant hemodynamic and respiratory depression following inappropriate intravenous bolus injections.

Regional anesthesia has traditionally proven very useful in elderly trauma patients, but will have limited utility in the presence of acute trauma associated with hypovolemia. In the normovolemic patient, the strength of regional techniques (even when provided as a single injection) is the ability to provide good perioperative analgesia while reducing exposure to opiates and volatile anesthetics. The relationship between regional anesthesia and thromboprophylaxis must be monitored.⁴

Preoperative fasting is poorly tolerated in the elderly. Accepted general guidelines for the “nil by mouth” period are 6 hours for solids and 2 hours for clear fluids. Sips of water should be allowed closer to the operation, as well as small quantities of water

taken with any essential medications. When there is uncertainty over the exact time of surgery, it is sound clinical practice to commence a crystalloid infusion during the waiting period. The usual fluids are 0.9% saline and lactated Ringer (Hartmann) solution.

Preoperative intravenous fluids may also be necessary to correct dehydration or electrolyte imbalance. The formula should vary according to the patient’s condition but must address the normal daily requirement (40 mL/kg), plus any additional losses resulting from illness or trauma and electrolyte requirements. Diuretics cause sodium and potassium loss in the urine. Hyponatremia and hypokalemia are easily worsened by using inappropriate fluid replacement therapy; it is an error to routinely prescribe 5% dextrose in large volumes. Anemia is also poorly tolerated by the elderly, particularly in the postoperative phase. The anesthetist should have a low threshold for transfusion.

Exhibit 44-5 describes an anesthetic technique used by the authors that provides an example of how the recommendations listed above can be successfully combined.

OPERATIONAL FACTORS

This chapter discusses patients being managed in a conflict zone alongside military casualties. The

deployed military medical system should have a predefined eligibility matrix that prevents resources

EXHIBIT 44-4

ANESTHETIC CONSIDERATIONS IN ELDERLY PATIENTS

- Venous access: thin skin and inelastic vessel walls can make cannulation difficult.
- Induction agents: doses must be titrated to effect to avoid hypotension.
- Opiate intolerance: sensitivity to opiates occurs because of reduced metabolism; doses must be adjusted accordingly.
- Intravenous fluids: balanced salt solutions should be used for maintenance; DO NOT USE 5% dextrose. During surgery fluid overload and cardiac failure is a risk.
- Respiration: hypercapnia must be avoided because carbon dioxide narcosis can result.
- Critical target organs share a blood pressure/flow dependency; maintain normotension.
- Drug metabolism: drugs that rely on renal excretion require dose reduction; competitive muscle relaxants require adequate reversal to ensure full return of neuromuscular function.
- Hypothermia: ambient temperature control necessary as well as active warming of patient and fluids.
- Pressure area care: damage is more likely than in younger patients due to reduced body mass.
- Recovery from anesthesia: in the acute phase supplemental oxygen is necessary to modify diffusion hypoxia and reduce the metabolic consequences of shivering.
- Postoperative confusion is common; it is often drug related (eg, with opiates) but also arises for cognitive reasons.
- Regional anesthesia: attractive as a means of minimizing exposure to opiates but must be applied carefully in the presence of thrombocytopenia or coagulation disorders.

EXHIBIT 44-5

GENERAL ANESTHESIA FOR INTERNAL FIXATION OF A FRACTURED NECK OF THE FEMUR

- Pre-oxygenate the patient.
- Establish secure intravenous access and check with a saline flush.
- Use slow intravenous induction. The final dose may be as little as one-tenth that used in a young patient.
- Anticipate hypertension during endotracheal intubation, followed by hypotension when a volatile agent is introduced.
- Decide what levels of hypertension and hypotension need intervention and respond with fluids or vasoactive drugs as necessary.
- After induction, perform a femoral nerve block and supplement with intravenous paracetamol.
- During surgery correct anemia or additional hemorrhage with transfusion.
- Encourage wound infiltration with further local anesthetic.
- Actively warm the patient throughout and prescribe supplemental oxygen during recovery.

EXHIBIT 44-6

CONSIDERATIONS FOR DEPLOYED MILITARY TEAMS

- Disposition and extent of local healthcare resources.
- Need to avoid overloading deployed facilities.
- Lack of support specialties for surgical teams, which limits the ability to investigate and optimize patient's medical condition.
- Treatment decision making is influenced by all of the above.

intended for military personnel from being drained inappropriately by treatment of indigenous populations. This system can create ethical difficulties, particularly when prolonged treatment or intensive care might otherwise be indicated. The eligibility matrix will vary from

one conflict to another and will always be influenced by the existing local civilian medical facilities. Exhibit 44-6 lists some pertinent considerations for deployed medical directors and other senior commanders that can limit the level of care that might otherwise be offered.

SUMMARY

The accepted principles of anesthesia and perioperative care apply to the elderly population, but their

practical applications must always respect and where necessary be modified by the physiology of old age.

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