2 Geriatric Decision-Making in the Emergency Department: A Surgeon's Perspective

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2.1 Introduction

As the population of older patients increases, geriatric emergency surgery becomes more and more common. An estimated 46.3 million persons (14.5% of the US population) are aged 65 or older in 2014, and that number is expected to increase to 98 million, or 23.5%, by 2060 [1]. This fact alone portends increased contact with the medical community, and a concomitant increase in surgical emergencies.

Operative intervention on the geriatric population is technically similar to surgery on younger patients: the anatomy does not change, and the principles of surgery are the same; however, the physiology does change, and so does the ability to withstand major surgery. For these reasons, the perioperative and postoperative courses, complications, and pitfalls can be wildly different. The decrease in physiologic reserve experienced by geriatric patients also obviously changes the risk and benefit analysis behind different surgical interventions for different disease and injury processes.

This chapter will deal with geriatric surgical decision-making as considered from several different vantage points. We will consider physiologic and pharmacologic issues, as well as perioperative risk mitigation and stratification strategies; we

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will consider behavioral, cultural, and legal facets, as they pertain particularly to geriatric patients. In summation, the goal is to care for geriatric patients in a manner consistent with their desires and to be thoughtful about all of the complicating factors that may influence the decision to operate. This approach does not guarantee a good outcome, but it does guarantee a thoughtful and thorough approach to marrying the right level of intervention to each patient, consistent with her or his clinical condition and, perhaps more importantly, wishes.

2.2 Physiologic and Pharmacologic Factors in Geriatric Surgery

As people age, they experience increasing rates of serious comorbidity and frailty, and these factors complicate the performance of surgery in this population. Patients' experiences in the elective surgery realm mean that time to plan medication use on the day of surgery, multispecialty and multidisciplinary collaboration in the preoperative and postoperative phases, and close follow-up in the postsurgical phase. However, in the emergent setting, there is often not sufficient time to alter preoperative medication use or to mitigate chronic conditions optimally. This means that disordered and deranged organ function, worsened by the acute, presumably surgical untreated disease, shock, surgery, or anesthesia physiologically stresses further the geriatric patient. Some of the more common comorbidities that directly impact the perioperative care of the surgical patient include: Coronary Artery Disease (CAD), Chronic Obstructive Pulmonary Disease (COPD), Chronic Kidney Disease (CKD), liver dysfunction, malnutrition, neurologic and psychiatric disease, musculoskeletal atrophy and frailty, and Adrenal Insufficiency (AI).

Coronary Artery Disease (CAD) is extremely common despite advances in diagnosis and treatment, a leading cause of morbidity and mortality [2]. Approximately 40% of patients >80 years of age have evidence of severe CAD at necropsy. Additionally, a greater percentage (60%) has evidence of obstructive CAD [3]. Coronary disease in the octogenarian is, therefore, more the rule than the exception.

Unlike in the elective surgical population, there is little time to intervene or even sometimes fully assess the geriatric emergency surgical patient. However, age itself is only a minor contributor to overall perioperative risk in the latest American College of Cardiology guidelines. For example, preexisting hypertension, diabetes mellitus, or renal failure contributes to a higher incidence of perioperative myocardial infarction (MI) (5.1%), cardiac death (5.7%), or ischemia (12–17.7%) [4]. Additional risk factors in the elderly include the need for emergency surgery, major surgical procedures, ASA physical status III or IV, and poor nutritional status.

Cardiovascular disease and arrhythmia, often a result of ischemic heart disease, have several pharmacologic implications that may complicate or protect in times of emergent surgery. There is some data that Statins are protective in both hemorrhages and septic shock, and beta-adrenergic receptor blockade may confer some benefit in vasculopathic patients [3]. However, the anticoagulated or platelet inhibited patient confers immediate, serious added risk for the emergent surgical patient.

Anticoagulation with warfarin should be addressed prior to surgery with Prothrombin Complex Concentrate, Factor VII, Vitamin K, and/or Fresh Frozen Plasma, as available [2–4]. Direct oral anticoagulants (DOACs) have reversal agents currently available, but they have not been demonstrated to improve outcomes when administered and should be evaluated on a case-by-case basis [2].

Electrocardiographic evaluation is essential in all geriatric patients, because of the incidence of underlying cardiac disease that may be previously clinically silent [4]. An echocardiogram might be indicated in the presence of cardiac murmur, new arrhythmia, or concern for aortic stenosis. A person experiencing a myocardial infarction may require emergent intervention, which is fraught with complications if stenting is indicated, because of the requirement for antiplatelet use [5]. Additionally, if a patient is experiencing malignant arrhythmias, cardioversion or medical management may be necessary. Similarly, if Mobitz II or III heart block is identified on EKG, or other arrhythmias which may require pacing and emergency transvenous pacer prior to induction may be required [6]. Aside from this limited evaluation and intervention, cardiac status should not impact true emergency surgical decision-making.

Chronic Obstructive Pulmonary Disease and other chronic lung conditions are an infrequent cause of perioperative mortality, although the complication rates are higher in the perioperative period. The respiratory mortality ranged from 0–0.6% depending on the surgical sites and the presence of pulmonary risk factors. Aspiration during anesthesia had a high mortality of 5% [5]. Risk factors for developing pulmonary embolism include age, malignancy, obesity, and the type of surgery performed. Recent studies demonstrated that prophylactic low-dose aspirin or low-dose low-molecular weight heparin in high risk elderly surgical patients are effective and safe to prevent or decrease the risk of DVT and pulmonary embolism. Advanced age is, therefore, a significant risk factor for morbidity or mortality of deep venous thrombosis (DVT) and pulmonary embolism. Neuraxial block can reduce the odds of pulmonary embolism by 55% and deep vein thrombosis by 44% [6, 7]. The Pulmonary Embolism Prevention Trial Collaborative Group recently reported that aspirin reduced the morbidity and mortality of DVT and pulmonary embolism by 30% with a slight increase in gastrointestinal bleeding of lesser severity in elderly patients undergoing surgery for hip fracture [7].

Chronic Kidney Disease (CKD) is a risk factor for perioperative morbidity and mortality. Patients experience changes to perioperative drug metabolism and clearance, CKD is a risk factor for serious postoperative complications, such as acute renal failure and cardiovascular complications which are associated with increased morbidity and mortality [8]. Much of the increased risk is due to the fact that greater than 40% of the population with CKD has Diabetes Mellitus as the cause of their renal disease [7, 8]. A preoperative serum creatinine >2 mg dL^{-1} was found to be an independent predictor of cardiac complications, and was associated with major cardiac complications in 9% of cases [8]. Serum creatinine should be evaluated preoperatively and monitored postoperatively along with markers for renal failure, including acid-base status, potassium and phosphate metabolism, and total body fluid status [6–8]. If feasible, hemodialysis before and immediately after surgery

should be effected; however, in the true surgical emergency, this is rarely possible or prudent. In the postoperative phase, Renal Replacement Therapy (RRT) with Continuous Veno-Venous Hemofiltration (CVVH) or hemodialysis results in less hemodynamic instability and should be instituted as soon as possible, even without fluid removal [8, 9]. Finally, in the postoperative period, attention should be given to the development of secondary hyperparathyroidism [9] and calcium monitored in the perioperative period frequently.

Chronic Liver Disease, especially in its end-stage, confers extremely high risk on the surgical patient, largely due to sepsis and hepatic failure. In a systematic review conducted by de Goede et al., the overall risk of perioperative morbidity and mortality were 30.1% and 11.6%, respectively and the coexistence of portal hypertension was found to be associated with a twofold increase in mortality [10]. The Child-Turcotte classification system was initially proposed in 1964 to predict mortality after portosystemic shunt surgery. It was then modified in 1972 by Pugh et al. The Child-Pugh classification relies on three objective laboratory (albumin level, bilirubin level, and prothrombin time) and two subjective clinical (severity of ascites and encephalopathy) criteria to stratify patients into three classes. It is easy to remember and apply, and the data is typically readily available, making it convenient, and fairly accurate. Predicted mortality varies from 10% for Child-Pugh A, 30% for Child-Pugh B, and up to 80% for Child-Pugh C [10].

The Model of End-Stage Liver Disease (MELD), published in 2000, represented a more specific scoring system designed to better predict mortality after transjugular intrahepatic portosystemic shunt (TIPS) procedures. It is based on bilirubin, creatinine, and international normalized ratio (INR) values. In the original publication, a MELD score < 8 was predictive of good post-TIPS survival, whereas a MELD score > 18 translated into significantly greater mortality [10]. Since then, several data have validated the MELD system for myriad surgical procedures, with only slightly variable cutoff values used to stratify expected patients with poor outcomes. In a recent review of the available literature, Hanje et al. concluded that elective general surgery in the abdominal cavity could be recommended for MELD scores <10, but should be discouraged with MELD scores >15 [10]. Unfortunately, and similar to the limitations associated with the Child-Pugh score, the MELD is not specific to patients with surgical emergencies [11].

Malnutrition is extremely important to surgical healing and confers an increase in perioperative morbidity and mortality, including increases in surgical infections, delirium, and prolonged lengths of stay. Obviously underweight patients, patients with temporalis or truncal muscle wasting, or patients with sequelae of malnutrition, such as pressure ulcers, should be identified preoperatively so that appropriate mitigation steps can be taken in the early postoperative phase [12]. There is little that can be done to mitigate the perioperative risks associated with malnutrition in the emergent surgical patient preoperatively; however, placement of surgical feeding access, either transnasaly or surgically at the time of surgery, improves outcomes and reduces the number of days without nutrition in the surgical patient [12, 13]. Enteral feeding is preferred and should be started as soon as feasible. Total Parenteral Nutrition is less desirable and is associated with increases in wound

infection, urinary tract infection, Central Venous Catheter infections, and deep space infections, as well as electrolyte abnormalities, hyperglycemia, lengths of stay, and costs [13].

Neurologic and psychiatric diseases most commonly afflicting emergent geriatric surgical patients include dementia, substance withdrawal, and deliriuim. Dementia confers added risk for delirium and typically worsens with critical illness and surgical intervention. Delirium is defined as an acutely altered and fluctuating mental status, with an altered level of consciousness and disorientation [14]. It is quite common and often undiagnosed in the geriatric population, with an incidence ranging from 9% to 87% [14]. Risk factors for the development of delirium include older age, dementia, psychopathological symptoms, medical comorbidities, frailty, and functional impairment. The risk factors are additive, and, therefore, patients can be assessed and identified as having a higher risk for delirium postoperatively so that supportive and environmental steps can be taken to mitigate the delirium, as much as possible [15].

Substance abuse increases the risk of delirium in the postoperative period up to threefold [16]. The management of delirium is supportive, therefore, a high index of suspicion for withdrawal and delirium is indicated when geriatric patients screen positive for substance abuse. Withdrawal from chronic use is problematic for alcohol abuse, which is fairly common and typically treated with benzodiazepines or ethanol, and for benzodiazepine use particularly. Approximately 30–100% of patients on long-term benzodiazepines become dependent [17], with withdrawal symptoms including formication, anxiety and panic attacks, insomnia, hallucinations, seizures, fasiculations, psychosis, and delirium [17]. Treatment of benzodiazepine dose is usually effected with gradually decreasing doses or through the use of antiepileptic medications including carbamazepine [17].

The diagnosis of delirium is usually established with the use of assessment scales or tools, one of the most common being the Confusion Assessment Method-Intensive Care Unit (CAM-ICU) tool. This scoring system has well-established reliability and validity for assessing delirium [18]. Other popular tools include the Mini-Mental Status Exam, Informant Questionnaire on Cognitive Decline in the Elderly, and the Memorial Delirium Assessment Scale [15].

Many common medications may cause or exacerbate delirium in elderly patients, including H2 blockers, corticosteroids, diphenhydramine, belladonna, promethazine, warfarin, opiates, benzodiazepines, and antiparkinsonian medications. If possible these should be discontinued when delirium is a factor in postoperative care. Also, ethanol withdrawal or withdrawal from other substances may often be confused with or exacerbate delirium. Careful history should identify patients at risk for ethanol withdrawal, and treatment for withdrawal should be accompanied by treatment with thiamine, to reduce the effects of Korsakoff's psychosis [18].

Treatment of delirium consists firstly in addressing routine metabolic causes, including electrolyte abnormalities, glucose, oxygenation, and ventilation. Additionally, routine sources of sepsis should be sought and ruled out, including urosepsis, pneumonia, line sepsis, and surgical site infection. If found, these should be addressed quickly. Besides optimizing environmental support, pharmacological

treatment is sometimes necessary in addition to optimizing environmental and supportive measures. Environmental supports, such as hearing and vision aids nearby, attention to early resumption of enteral nutrition, sleep hygiene, patients being helped out of bed, tubes and catheters removal, avoidance of dehydration and hypovolemia, family involvement and interaction, and attention to electrolyte abnormalities, have been demonstrated to reduce delirium from 15% to 10% [19].

Pharmacologic management includes haloperidol, which is the treatment of choice for delirium [19], and is considered superior to benzodiazepines both for the avoidance of side effects attributed to benzodiazepines as well as superior outcomes in symptom management. Atypical antipsychotics are not superior to haloperidol but may be preferred for ease of administration, preferred route, or length of half-life [20]. Usually, loading doses of 2–5 mg are repeated every 15 min while agitation persists. After the delirium is controlled, scheduled antipsychotic medication is prescribed over the next few days to prevent relapses [20].

Potential side effects of treatment of delirium that require monitoring include extrapyramidal side effects and prolonged QT syndrome. Daily EKC should be obtained to follow corrected QT (cQT) intervals, and if found to be greater than 440 ms in males and 460 ms in females, the haloperidol should be discontinued. Corrected QT interval is used because it is heart rate independent [19]. Extrapyramidal side effects include acute dystonia, akathisia, drug-induced Parkinsonism, and Tardive Dyskinesia. Acute dystonia typically occurs within minutes of atypical antipsychotic medication administration. It is characterized by painful convulsive movements of the neck, tongue, and body [20]. Usual treatment is anticholinergic drugs, including Benzhexol or benztropine intramuscularly. Akathisia is a very distressing side effect that occurs usually days to weeks after taking antipsychotic drugs and is characterized by difficulty in keeping one's legs in place. Treatment includes reducing antipsychotic dose or beta-adrenergic receptor blockers such as Propranolol. Drug-induced Parkinsonism presents identically to Parkinson's disease. It includes muscle stiffness, pill-rolling tremor, and Bradykinesia. It typically begins several months after antipsychotic drug treatment. It is treated with Benzhexol or other anticholinergic medications. Tardive dyskinesia is the most difficult side effect of atypical antipsychotics to treat. It typically begins years after chronic treatment with antipsychotic drugs. It is characterized by irregular movements of the tongue and face. The prognosis is usually poor [19].

Adrenal insufficiency is a difficult problem to diagnose and is often not immediately obvious to treating physicians. Estimates are that up to 20–30% of patients admitted to the ICU are adrenally insufficient [20–22]. The benefits of treating relative adrenal insufficiency in septic shock, sepsis, subarachnoid hemorrhage, and critical illness are well documented [20–22]. Especially well studied is the effect of treating relative adrenal insufficiency in cardiac surgery patients. Patients have less dependence of vasopressors and improved clinical outcome [21, 22]. In sepsis, the Surviving Sepsis campaign recommends treating vasopressor dependence after fluid resuscitation with empiric corticosteroids [22]. This represents a paradigm shift over decades ago when steroids were thought to be universally detrimental.

Patients chronically taking corticosteroids as outpatients should be suspected of relative adrenal insufficiency, even without biochemical proof of glandular dysfunction. These patients should be treated for relative adrenal insufficiency as a matter of routine [23, 24]. Early treatment with steroids clearly reduces mortality and decreases vasopressor use [23, 24], and in patients with hemodynamic instability, shock, and vasopressor requirement, adrenal insufficiency should be considered and treated empirically, preferably within the first hour after vasopressor use is required [20].

Etomidate is a popular drug for the induction of anesthesia, especially in the cardiac surgery population, because it does not depress myocardial activity [24]. Patients requiring vasopressors who were induced using etomidate should be strongly suspected of having adrenal insufficiency and should be treated empirically [24]. Many authors historically have raised concerns with the use of corticosteroids in the postoperative setting, due to the negative effects of corticosteroids on wound healing. However, the doses used in the postoperative setting are usually physiologic (not more than normal secretory levels), compared with large doses used when the negative wound healing effects were first described [20–29]. Additionally, the effects of corticosteroids are minimal when compared to the effects of persistent hypotension, shock, poor oxygen delivery, and acidosis that proceeds from untreated adrenal insufficiency. Considering that adrenal insufficiency is present in nearly 20% of ICU patients, it is important to attune ourselves to the diagnosis and treatment of this comorbidity, because the consequences of untreated adrenal insufficiency are disastrous [26–30].

2.3 Perioperative Risk Stratification

For the purposes of prognostication, the National Surgical Quality Improvement Project (NSQIP) calculator is an excellent, evidence-based tool to use, in real-time, with easily available data, to help families and patients weigh risks and benefits of emergency surgical intervention [6]. It has 21 variables that can be placed into an internet online interface and provide a reasonably accurate estimate of perioperative morbidity and mortality. As the scoring system requires a CPT code for which operative procedure was selected, there is no capability to estimate nonoperative risk [27]. Other scoring systems exist, including Goldman Cardiac Risk, Revised Cardiac Risk Index, APACHE series (II, III), SOFA, and POSSUM scores, to name a few. The ease of use and excellent r statistic for the NSQIP calculator make it more reliable and easy to utilize. The ability to quantify the risks of surgery, as with a reproducible score, makes the discussion of risks and benefits more straightforward and empiric [27].

Delaying emergent surgery in favor of perioperative risk stratification worsens outcomes [28]. In several studies, delay to pursue cardiac or other functional testing led to worsening of the initial surgical emergency. In the true emergency, perioperative testing should be minimized, as mentioned above, and except for active cardiac ischemia, dealt with after the acute emergency is addressed definitively [27, 28].

2.4 Cultural, Legal, and Social Factors in Operative Decision-Making

There are several cultural and societal factors that become immediately important in the emergency surgical patient. Initially, the discussion of a patient's end of life wishes and values regarding catastrophic medical conditions becomes of paramount importance when assessing a geriatric, or really any, patient with life-threatening illness or injury. The discussion of how, or if, to proceed is immediately apparent, and may need to occur with a surrogate if the patient herself or himself is incapacitated.

The discussion of end of life wishes centers around several factors, including patient factors, surrogate factors, provider factors, and system factors [29]. Patient factors include a willingness to document or communicate advance directives, the ability to locate important documents, including living wills and medical powers of attorney, and thorough discussions of wishes with surrogates [29]. Even in the face of terminal illness, caregivers and patients tend to feel unprepared for end of life discussions, and rely on vague or inaccurate assessments of likely patient outcome [30]. Surgeons feel as if they do not have adequate time to discuss the end of life issues, and that the issues tend not to be raised prior to critical or serious illnesses. When they do occur, the discussions are typically held in lawyers' offices, and the forms are boilerplate, leaving little room for individual expression of values and wishes [29, 30]. Patients and surrogates, therefore, feel that patients' wishes are unknown, may be misrepresented, or do not apply to the written instructions [30].

Surgeons can improve the communication with patient families through improving their own education, using available resources [30], and through involvement of palliative care specialists [29]. Surgeons can set realistic and open expectations for the operation, and discuss with family members who should be the point person for communication and surrogacy, if possible, before the operation begins and in the presence of the patient, whose wishes should be heard if possible [29]. Additionally, many patients and physicians misunderstand the role of palliative care consultation services [30]. Patients can be offered palliation even if they accept surgical intervention, to facilitate improved pain control, and agreement for that consultation preoperatively helps ameliorate some of the misunderstandings in the sometimes fraught postoperative state [30]. Standardized approaches and treatment pathways, including quantitative risk estimation (e.g., NSQIP) can also help to reduce rates of nonbeneficial surgery and intervention.

Incapacitated patients not in immediate life-threatening situations may need conservation, guardianship, or surrogates appointed through legal proceedings. Patients with chronic illnesses, including dementia and psychiatric impairment, may need court-appointed guardians or conservators to ensure that their rights, property, and wishes are being protected. The laws differ from state-to-state and country-to-country, so a comprehensive accounting of the policies and procedures is impractical; however, suffice to say that particular attention to the expressed wishes of the incapacitated, demented, or delirious patient is essential to providing care to the emergent surgical patient [31].

Finally, there is the legal question of elder abuse. Elder abuse is extremely difficult to determine, diagnose with any certainty, or to identify with a high degree of certainty. Several studies have estimated the rate of elder abuse at between 7.6% and 10%, although each study represents these rates as underestimates [32, 33]. Risk factors include younger age, female gender, dementia, functional impairment, and poor physical health, and the perpetrators are more often male, children or spouses, have a history of substance abuse or mental health problems of their own.

Diagnosis is particularly difficult. Geriatric patients may conceal their circumstances or be unable to articulate them. Injuries sustained may not be the result of abuse; elderly patients are more prone to falls, bruising, cuts and scrapes, malnutrition, injury, and may not remember events to give a correct accounting of the events. Patients with dementia may confabulate abuse allegations, or not, may confuse the perpetrators, or not, and may say one thing 1 day and another thing the next [33]. Cultural norms may dictate withholding information from the medical community and language barriers may make communication more difficult [32].

Assessment of abuse should be done alone with the patient and should be done, if possible, by persons with particular expertise in interviewing elder abuse patients. If suspected, a multiprofessional approach may be beneficial [32] and the physician may not have time for necessary activities, such as interviews of family members or home visits.

In the emergent surgical patient, these activities are complicated by the need for surrogacy for surgical consent, for family involvement in decision-making, and by the time constraints imposed by emergent surgical conditions. There are several different community organizations that may be of help, including district attorney offices, police department, adult protective services, centers for aging, home health agencies, and hospital resources [32]. Any or all of these can be marshaled if there is suspicion of elder abuse.

2.5 Conclusion

As the world's population ages, especially in developed nations, we come to be faced with the problem of patients at extremes of age with emergent surgical needs. To us, as disinterested strangers, these patients become one in a string of daily chores. They become another in a line of interruptions in our days. However, these patients are also the centers of someone's universe, a parent, aunt, uncle, sibling, and in emergent situations, the reality and gravity of a true threat to life can be overwhelming to family members. A physician who cares for geriatric patients with serious illness or injury has the same responsibilities as always, to shepherd families and patients through the decisions that need to be made, to offer clear and accurate information free of our own judgments and biases as much as possible, and to treat the patients the way they want to be treated in as much as those facts may be ascertained. This becomes difficult in emergency surgery, and unpacking the elements of the decisions can expose our own psychological baggage behind caring for elderly patients. Truth in representing the data, and separating it from opinion may be the

best course for the ethical treatment of geriatric patients, remembering that patient autonomy persists even at the extremes of age. With our long white coats comes great responsibility and power, power to clarify or obfuscate, to terrify or console, to facilitate or impede and the power to be accurate or to misrepresent. These powers should be wielded ethically and thoughtfully, as their impact may be much more profound in the geriatric patient.

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