ACS TQIP GERIATRIC TRAUMA MANAGEMENT GUIDELINES

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COMMITTEE ON TRAUMA®

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Table of Contents

Background and Introduction

Traumatic injury in the geriatric population is increasing in prevalence and is associated with higher mortality and complication rates compared with younger patients. An appreciation for the decreased physical reserve, presence of various comorbid diseases, and increased risk of elderly-specific complications such as delirium that are more common in elderly patients has prompted development of elderly-specific care protocols within the multidisciplinary trauma service model. The aim is to employ better risk assessment, adherence to key preventive strategies, active surveillance, and prompt recognition and treatment of complications when they occur to reduce mortality and morbidity in this patient population. This document serves to consolidate recommendations from existing guidelines to provide concise, evidence-based, expert panel rated lists of protocols and practices to improve trauma care among elderly patients.

Trauma Team Activation

Elderly patients can experience significant injury in spite of a relatively trivial mechanism. Because of altered baseline vital signs due to changes associated with aging, preexisting disease (for example, hypertension), or medications (for example, beta-blockers), the physiologic response to injury might differ from that seen in younger patients. Alterations in mentation may be attributed to dementia or delirium, leading to the potential for late recognition of shock or traumatic brain injury. These factors increase the risk for undertriage by both emergency medical services (EMS) and emergency department (ED) personnel. Undertriage of the elderly is associated with a two-fold increase in the risk of death. To mitigate late recognition of significant injuries, a lower threshold for trauma team activation should be used for elderly trauma patients. In many cases, this approach would require elevating the level of activation by one tier based on age.

- Ensure trauma team activation for all elderly injured patients meeting trauma criteria (first or second tier).

Initial Evaluation

The primary survey for the elderly is the same as for any injured patient, but the secondary survey should emphasize the following:

- Determine medications that affect initial evaluation and care.
  - Coumadin
  - Clopidogrel
  - Other anticoagulants
  - ASA
  - Beta blockers
  - ACE inhibitors
- Consider common, acute, nontraumatic events that could complicate the patient's presentation, including:
  - Acute coronary syndrome (EKG)
  - Hypovolemia/dehydration
  - Urinary tract infection
  - Pneumonia
  - Acute renal failure
  - Cerebrovascular event
  - Syncope
- Lab assessment:

  Hypoperfusion is often underappreciated in the elderly. Base deficit should be assessed expediently to identify those patients in occult shock who need resuscitation, abbreviated evaluation, and admission to an intensive care unit. The following panel of laboratory studies is suggested for all elderly patients with injury:
  - Lactic acid or blood gas (arterial or venous) for baseline base deficit
  - PT/PTT/INR
  - Renal function (BUN, Cr, estimated GFR)
  - Blood alcohol level
  - Urine toxicology screen
  - Serum electrolytes

- Imaging:

  Occult injuries are common in the elderly. Initial imaging should include liberal use of computed tomography (CT) scanning for blunt injury. While the liberal use of CT scan imaging has become controversial because of concerns of radiation exposure and cost, occult injuries are common in the elderly and radiation exposure is of minimal risk.

  - Imaging should include all CT scans needed to rule out injury in appropriate areas at risk.

- Anticoagulation assessment and reversal:

  The frequent use of warfarin, antiplatelet agents (for example, clopidogrel, aspirin), direct thrombin inhibitors (for example, dabigatran), and direct factor Xa inhibitors (for example, rivaroxaban) in the elderly puts them at higher risk for significant bleeding events, even in the context of minor injury. Additionally, with the exception of warfarin, where anticoagulant effect parallels the international normalized ratio (INR), an assessment of the level of anticoagulation is not possible with laboratory investigations that are routinely part of the initial evaluation of the injured patient. This field is changing rapidly, but the following general principles apply:

  - A normal INR should exclude the presence of significant levels of dabigatran or other novel anticoagulants in most, but not all, patients; however, note that the INR might be only minimally increased in the presence of therapeutic doses of dabigatran. Rivaroxaban increases the INR at therapeutic levels, but the effects are not equivalent to target levels of warfarin.
  - Partial thromboplastin time (PTT) might be slightly prolonged with dabigatran, depending on the instruments/reagents used for laboratory assessment. Rivaroxaban might cause mild PTT prolongations in most patients with therapeutic levels.
  - Other tests:
    - Thrombin time: Dabigatran increases the thrombin time (TT). A normal TT excludes Dabigatran; however, note that Rivaroxaban does not prolong the TT.
    - Thromboelastography (TEG): TEG is useful in identifying the presence of dabigatran or ribaroxaban effect. TEG will also identify the presence of effects of platelet inhibitors like clopidrogel.

- Anticoagulation reversal:

  This field and the availability of products for reversal are also changing rapidly. A protocol to rapid anticoagulation reversal is associated with improved outcomes in injured patients.

  - It is suggested that a rapid anticoagulation reversal protocol be developed in each center based on the availability of products, local costs, and preferences. In general, the following principles should be applied:
    - Warfarin reversal: While reversal of warfarin was typically managed using a combination of vitamin K and plasma in the past, the availability and assessment of newer prothrombin complex concentrates (PCC) have provided other options. PCCs available as four-factor concentrates (II, VII, IX, and X) can reverse the effects of warfarin rapidly and are considered the standard in most countries other than the U.S. At this time, only three-factor concentrates are available in the U.S. These PCCs lack factor VII and must either be given with plasma or rVIIa.
    - Dabigatran: There is no means of reversing dabigatran. While dialysis can be used, it is often not practical in the context of acute resuscitation. As dabigatran is an inhibitor of direct thrombin inhibitor, administration of plasma is not effective.
    - Rivaroxaban: Like dabigatran there is no agent that directly reverses the effects of this factor Xa inhibitor. However, early studies suggest that the effect might in part be reversed by PCCs.
    - Clopidrogel, aspirin: There are no agents that directly reverse the effects of these platelet antagonists. DDAVP or platelet transfusion can be considered in the face of significant bleeding.

Specialized Geriatric Inpatient Care

A proactive geriatric consultation is one in which an individual with expertise in the management of the geriatric patient (most often a geriatrician) evaluates a patient early following hospitalization and prior to complications developing. This evaluation includes a comprehensive geriatric assessment (CGA), which is a multidimensional, multidisciplinary diagnostic instrument designed to collect data on the medical, psychosocial, and functional capabilities and limitations of elderly patients. The information derived from this assessment assists in developing treatment and follow-up plans. In 22 randomized trials including more than 10,000 patients, a CGA followed by appropriate treatment and follow-up increases a patient's likelihood of being alive and in his or her own home at one year following discharge by 25 percent. In trauma, proactive geriatric consultation has been associated with fewer episodes of delirium, fewer in-hospital falls, lesser likelihood of discharge to a long-term care facility, and a shorter length of stay. An alternate approach is to concentrate care of the geriatric patient so that care pathways are developed and expertise accrues to benefit the patient. For example, Mangram et al developed a geriatric trauma service ("G-60 service") in which all patients age > 60 were admitted. This service worked in collaboration with a medical hospitalist, physiatrist, physical/occupational therapist, respiratory therapist, nursing supervisor with geriatric expertise, social worker, nutritionist, pharmacist, and a palliative care specialist. Implementation of this service was associated with a reduction in time to the operating room (OR), hospital and ICU length of stay, and rates of several complications.

- Develop criteria for early geriatric consultation and geriatric expertise on the multidisciplinary trauma care team.

Where limitations with geriatrician resources impede routine geriatric consultation, the following screening criteria may identify patients most likely to benefit from geriatric consultation. These criteria were adapted from the Identification of Seniors at Risk (ISAR) screening tool. A positive ISAR (>=2) has been associated with a greater likelihood of functional decline, nursing home admission, long-term hospitalization, or death.

- If the response to two or more of the following questions is "yes," geriatric consultation should be obtained:
  - Before you were injured, did you need someone to help you on a regular basis?
  - Since the injury, have you needed more help than usual to take care of yourself?
  - Have you been hospitalized for one or more nights during the past six months?
  - In general, do you have problems seeing well?
  - In general, do you have serious problems with your memory?
  - Do you take more than three different medications every day?

Geriatric trauma patients are at particular risk for medication-related adverse events.

- Establish past medication history.
  - Attempt to communicate with the patient's immediate family and physician.
  - Document the patient's complete medication list, including over-the-counter and complementary/alternative medication.
- Use the following geriatric medication prescribing recommendations:
  - Follow Beers Criteria. Use Beers Criteria in decision making about pharmacotherapy. See Appendix 1.
  - Discontinue nonessential medications.
  - Continue medications with withdrawal potential, including selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants, benzodiazepines, antipsychotics, monoamine oxidase inhibitors (MAOIs), beta blockers, clonidine, statins, and corticosteroids.
  - Continue β-blocker or start if indicated.
  - Continue statins when appropriate.
  - Adjust doses of medications for renal function based on glomerular filtration rate.

Effective pain management can be a central determinant of success in the drive to improve pulmonary and toilet functions, optimize mobility, and mitigate delirium.

- The following pain medication strategies are recommended:
  - Use elderly-appropriate medications and dose.
  - Avoid benzodiazepines.
  - Monitor use of narcotics; consider early implementation of patient-controlled analgesia.
  - Consider early use of nonnarcotics, including NSAIDs, adjuncts, and tramadol.
  - Epidural algesia may be preferable to other means for patients with multiple rib fractures to avoid respiratory failure.

It is important to obtain preinjury chronic medical conditions and functional status soon after admission. While it may not be possible to obtain this information immediately, it is imperative to do so as part of the tertiary survey to facilitate hospital care and discharge planning. The compilation of this information and the development of a subsequent care plan may be performed by a formal geriatrician consult or by adding personnel with geriatric expertise to the multidisciplinary trauma team. See Appendix 2.

- Establish past history of elderly-specific comorbidities, including:
  - Pulmonary disease
  - Chronic renal failure
  - Chronic anemia
  - Depression
  - Baseline cognitive impairment
  - Baseline functional impairment
  - Baseline frailty scores
  - Baseline nutritional status
  - Alcohol, tobacco, drug abuse or dependence (benzodiazepines, oxycodone)
  - Thyroid dysfunction
  - Glucose intolerance
  - Decubitus ulcer

Patient Decision-Making Capacity and Care Preferences

More than 40 percent of patients require decision making near the end of life, with 70 percent of those patients lacking decision-making capacity. Injured patients and their families are suddenly thrust into a situation where health and subsequent quality of life are placed in jeopardy. Unfortunately, decision making and treatment preferences may not have been established. The patient's current condition and prognosis should be clearly communicated to the patient and their family. Important decisions that will need to be made regarding treatment must be emphasized so that patient treatment preferences can be considered. Treatment burden and potential functional outcome play a large role in the decision-making process. In cases of impaired cognition, identification of the proxy decision maker is of importance, while realizing that surrogates may not always be fully aware of the patient's treatment preferences. Liberal use of palliative care services can help with complex decision making.

- Discuss with family, surrogates, and the health care team and document in the medical record the following:
  - Patient's priorities and preferences regarding treatment options (including operative and nonoperative alternatives)
  - Postinjury risks of complications, mortality, and temporary/permanent functional decline
  - Advance directives or living will and how these will affect initial care and life-sustaining preferences, including mechanical ventilation, cardiopulmonary resuscitation (CPR), hemodialysis, blood transfusion, permanent enteral feeding, and transition to comfort care should complications occur
  - Identify surrogate decision maker
  - Make liberal use of palliative care options
  - In appropriate setting, present hospice as a positive active treatment

- Hold a family meeting within 72 hours of admission to discuss goals of care.

  Delirium is common in elderly patients after injury and is associated with increased morbidity and mortality. It is important to assess the patient's baseline cognitive function, assess risk factors for delirium, and monitor for signs and symptoms of delirium on a daily basis. The Mini-Cog is a short assessment tool that can be used for this purpose. Knowledgeable informants, such as family, may need to assist in providing preinjury baseline status.

- Regularly evaluate and address delirium risk factors:
  - Cognitive impairment and dementia
  - Depression
  - Alcohol use
  - Polypharmacy and psychotropic medications
  - Poor nutrition
  - Hearing and vision impairment
- Regularly monitor for reversible causes of delirium:
  - Wake-sleep cycle disturbances and sleep deprivation
  - Immobilization
  - Hypoxia
  - Infection
  - Uncontrolled pain
  - Renal insufficiency, dehydration, and electrolyte abnormalities
  - Urinary retention or presence of urinary catheter
  - Fecal impaction or constipation
  - Use of restraints

The elderly may have limited reserve to tolerate changes in intravascular volume. It is important to prevent or correct occult hypovolemia as well as volume overload.

- Monitor the patient's fluid status with the following:
  - Daily fluid inputs and outputs
  - Daily weights
  - Consider central venous pressure monitoring
  - Consider noninvasive cardiac output in the ICU

Postoperative and in-hospital complications contribute to extended length of stay, functional outcome, and cost for the trauma patient. In traumatically injured patients, functional ability, including gait and fall risk, should be assessed as early as possible and compared with established baseline function. Early mobilization and the use of standardized care bundles can help prevent development of many iatrogenic complications.

- Protect patients from iatrogenic complications and functional decline:
  - Develop a plan for early mobilization. Ensure ambulation within 48 hours of admission.
  - Assess for fall risk and address.
  - Institute aspiration precautions:
    - Head of bed elevation at all times with repositioning.
    - Sitting upright while eating and two hours after completion of eating.
    - Evaluate for swallowing deficits.
  - Perform chest physical therapy by incentive spirometer or deep breathing exercises.
  - Place on bowel regimen if given opiates.
  - Perform screening for:
    - Presence for pressure ulcers with Braden or Norton scale within 24 hours of diagnosis.
    - Daily documentation of skin integrity.

Discharge

Traumatic injury is a sentinel event that can precipitate a trajectory of functional decline in older patients. Studies show that the majority (up to 88 percent) of seriously injured older patients fail to return to their previous level of independence and function, with many requiring long-term nursing home placement. In addition to medical comorbidities that accompany aging, psychosocial issues (for example, availability of a caregiver, home safety) complicate the hospital and postdischarge care of these patients. Despite the magnitude of the problem, little is known about how to improve functional outcomes of injured elderly.

- Begin developing a plan for transition to posthospital care or special unit care in the immediate postinjury period.
- Assess the following discharge planning issues early during hospitalization:
  - Home environment, social support, and possible needs for medical equipment and/or home health services
  - Patient acceptance/denial of nursing home or skilled nursing facility placement
- Provide the patient or caregiver with a written discharge document, including:
  - Discharge diagnosis
  - Medications and clear dosing instructions and possible reactions
  - Documentation of reconciliation between outpatient and inpatient medications
  - Directions for wound care
  - Instructions for diet (nutrition plan) and mobility
  - Needs for physical and occupational therapy
  - Contact information for the patient's continuity physician or clinic
  - Establish an appointment with continuity physician, specialty physicians, or clinic
  - Clear documentation of incidental findings that mandate follow-up
  - Documentation of follow-up appointment/telephone contact with the surgeon six weeks after surgery
  - Documentation of pending laboratory tests or diagnostic studies, if applicable
- Communicate the results of the hospitalization to the patient's primary care physician (PCP). Provide PCP with the discharge summary. Verbal communication with the PCP can be very helpful.
- Provide the receiving facility with a discharge summary prior to the patient's departure from the hospital. Verbal communication with the receiving facility can be very helpful.
- Arrange for a home health visit or follow-up phone call within one to three days of discharge to assess:
  - Pain control
  - Tolerance of food, liquids
  - Ability to ambulate
  - Mental status
  - Understanding of postdischarge instructions/medications

Appendix 1

Beers Criteria for Potentially Inappropriate Medication Use in Older Adults

2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults[1]				
Organ System/ Therapeutic Category/Drug(s)	**Rationale**	**Recommendation**	**Quality of Evidence**	**Strength of Recommendation**
Anticholinergics (excludes TCAs)				
First-generation antihistamines (as single agent or as part of combination products) • Brompheniramine • Carbinoxamine • Chlorpheniramine • Clemastine • Cyproheptadine • Dexbrompheniramine • Dexchlorpheniramine • Diphenhydramine (oral) • Doxylamine • Hydroxyzine • Promethazine • Triprolidine	Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; increased risk of confusion, dry mouth, constipation, and other anticholinergic effects/toxicity Use of diphenhydramine in special situations such as acute treatment of severe allergic reaction may be appropriate	Avoid	Hydroxyzine and promethazine: High All others: Moderate	Strong
Anti-Parkinson agents • Benztropine (oral) • Trihexyphenidyl	Not recommended for prevention of extrapyramidal symptoms with antipsychotics; more effective agents available for treatment of Parkinson disease	Avoid	Moderate	Strong
Antispasmodics • Belladonna alkaloids • Clidinium-chlordiazepoxide • Dicyclomine • Hyoscyamine • Propantheline • Scopolamine	Highly anticholinergic, uncertain effectiveness	Avoid except in short-term palliative care to decrease oral secretions	Moderate	Strong
Antithrombotics				
Dipyridamole, oral short-acting* (does not apply to the extended-release combination with aspirin)	May cause orthostatic hypotension; more effective alternatives available; IV form acceptable for use in cardiac stress testing	Avoid	Moderate	Strong
Ticlopidine*	Safer, effective alternatives available	Avoid	Moderate	Strong
Antiinfective				
Nitrofurantoin	Potential for pulmonary toxicity; safer alternatives available; lack of efficacy in patients with CrCl <60 mL/min due to inadequate drug concentration in the urine	Avoid for long-term suppression; avoid in patients with CrCl <60 mL/min	Moderate	Strong

2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults[1]				
Organ System/ Therapeutic Category/Drug(s)	**Rationale**	**Recommendation**	**Quality of Evidence**	**Strength of Recommendation**
Cardiovascular				
Alpha$_1$ blockers • Doxazosin • Prazosin • Terazosin	High risk of orthostatic hypotension; not recommended as routine treatment for hypertension; alternative agents have superior risk/benefit profile	Avoid use as an antihypertensive	Moderate	Strong
Alpha blockers, central • Clonidine • Guanabenz* • Guanfacine* • Methyldopa* • Reserpine (>0.1 mg/day)*	High risk of adverse CNS effects; may cause bradycardia and orthostatic hypotension; not recommended as routine treatment for hypertension	Avoid clonidine as a first-line antihypertensive Avoid others as listed	Low	Strong
Antiarrhythmic drugs (Class Ia, Ic, III) • Amiodarone • Dofetilide • Dronedarone • Flecainide • Ibutilide • Procainamide • Propafenone • Quinidine • Sotalol	Data suggest that rate control yields better balance of benefits and harms than rhythm control for most older adults Amiodarone is associated with multiple toxicities, including thyroid disease, pulmonary disorders, and QT interval prolongation	Avoid antiarrhythmic drugs as first-line treatment of atrial fibrillation	High	Strong
Disopyramide*	Disopyramide is a potent negative inotrope and therefore may induce heart failure in older adults; strongly anticholinergic; other antiarrhythmic drugs preferred	Avoid	Low	Strong
Dronedarone	Worse outcomes have been reported in patients taking dronedarone who have permanent atrial fibrillation or heart failure In general, rate control is preferred over rhythm control for atrial fibrillation	Avoid in patients with permanent atrial fibrillation or heart failure	Moderate	Strong
Digoxin >0.125 mg/day	In heart failure, higher dosages associated with no additional benefit and may increase risk of toxicity; decreased renal clearance may lead to increased risk of toxic effects	Avoid	Moderate	Strong
Nifedipine, immediate release*	Potential for hypotension; risk of precipitating myocardial ischemia	Avoid	High	Strong

2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults[1]				
Organ System/ Therapeutic Category/Drug(s)	**Rationale**	**Recommendation**	**Quality of Evidence**	**Strength of Recommendation**
Spironolactone >25 mg/day	In heart failure, the risk of hyperkalemia is higher in older adults if taking >25 mg/day	Avoid in patients with heart failure or with a CrCl <30 mL/min	Moderate	Strong
Central Nervous System				
Tertiary TCAs, alone or in combination: • Amitriptyline • Chlordiazepoxide-amitriptyline • Clomipramine • Doxepin >6 mg/day • Imipramine • Perphenazine-amitriptyline • Trimipramine	Highly anticholinergic, sedating, and causes orthostatic hypotension; the safety profile of low-dose doxepin (≤6 mg/day) is comparable to that of placebo	Avoid	High	Strong
Antipsychotics, first- (conventional) and second- (atypical) generation (see Table **First- and Second-Generation Antipsychotics** on page 15 for full list)	Increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia	Avoid use for behavioral problems of dementia unless nonpharmacologic options have failed and patient is threat to self or others	Moderate	Strong
Thioridazine Mesoridazine	Highly anticholinergic and greater risk of QT-interval prolongation	Avoid	Moderate	Strong
Barbiturates • Amobarbital* • Butabarbital* • Butalbital • Mephobarbital* • Pentobarbital* • Phenobarbital • Secobarbital*	High rate of physical dependence; tolerance to sleep benefits; greater risk of overdose at low dosages	Avoid	High	Strong

2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults[1]				
Organ System/ Therapeutic Category/Drug(s)	**Rationale**	**Recommendation**	**Quality of Evidence**	**Strength of Recommendation**
Benzodiazepines SHORT- AND INTERMEDIATE-ACTING: • Alprazolam • Estazolam • Lorazepam • Oxazepam • Temazepam • Triazolam LONG-ACTING: • Chlorazepate • Chlordiazepoxide • Chlordiazepoxide-amitriptyline • Clidinium-chlordiazepoxide • Clonazepam • Diazepam • Flurazepam • Quazepam	Older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents; in general, all benzodiazepines increase risk of cognitive impairment, delirium, falls, fractures, and motor vehicle accidents in older adults May be appropriate for seizure disorders, rapid eye movement sleep disorders, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, periprocedural anesthesia, end-of-life care	Avoid benzodiazepines (any type) for treatment of insomnia, agitation, or delirium	High	Strong
Chloral hydrate*	Tolerance occurs within 10 days and risk outweighs the benefits in light of overdose with doses only 3 times the recommended dose	Avoid	Low	Strong
Meprobamate	High rate of physical dependence; very sedating	Avoid	Moderate	Strong
Nonbenzodiazepine hypnotics • Eszopiclone • Zolpidem • Zaleplon	Benzodiazepine-receptor agonists that have adverse events similar to those of benzodiazepines in older adults (for example, delirium, falls, fractures); minimal improvement in sleep latency and duration	Avoid chronic use (>90 days)	Moderate	Strong
Ergot mesylates* Isoxsuprine*	Lack of efficacy	Avoid	High	Strong
Endocrine				
Androgens • Methyltestosterone* • Testosterone	Potential for cardiac problems and contraindicated in men with prostate cancer	Avoid unless indicated for moderate to severe hypogonadism	Moderate	Weak
Desiccated thyroid	Concerns about cardiac effects; safer alternatives available	Avoid	Low	Strong

2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults[1]				
Organ System/ Therapeutic Category/Drug(s)	**Rationale**	**Recommendation**	**Quality of Evidence**	**Strength of Recommendation**
Estrogens with or without progestins	Evidence of carcinogenic potential (breast and endometrium); lack of cardioprotective effect and cognitive protection in older women Evidence that vaginal estrogens for treatment of vaginal dryness is safe and effective in women with breast cancer, especially at dosages of estradiol <25 mcg twice weekly	Avoid oral and topical patch Topical vaginal cream: Acceptable to use low-dose intravaginal estrogen for the management of dyspareunia, lower urinary tract infections, and other vaginal symptoms	Oral and patch: High Topical: Moderate	Oral and patch: Strong Topical: Weak
Growth hormone	Impact on body composition is small and associated with edema, arthralgia, carpal tunnel syndrome, gynecomastia, impaired fasting glucose	Avoid, except as hormone replacement following pituitary gland removal	High	Strong
Insulin, sliding scale	Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting	Avoid	Moderate	Strong
Megestrol	Minimal effect on weight; increases risk of thrombotic events and possibly death in older adults	Avoid	Moderate	Strong
Sulfonylureas, long-duration • Chlorpropamide • Glyburide	Chlorpropamide: Prolonged half-life in older adults; can cause prolonged hypoglycemia; causes SIADH Glyburide: higher risk of severe prolonged hypoglycemia in older adults	Avoid	High	Strong
Gastrointestinal				
Metoclopramide	Can cause extrapyramidal effects including tardive dyskinesia; risk may be further increased in frail older adult.	Avoid, unless for gastroparesis	Moderate	Strong
Mineral oil, given orally	Potential for aspiration and adverse effects; safer alternatives available	Avoid	Moderate	Strong
Trimethobenzamide	One of the least effective antiemetic drugs; can cause extrapyramidal adverse effects	Avoid	Moderate	Strong
Pain Medications				
Meperidine	Not an effective oral analgesic in dosages commonly used; may cause neurotoxicity; safer alternatives available	Avoid	High	Strong

2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults[1]				
Organ System/ Therapeutic Category/Drug(s)	**Rationale**	**Recommendation**	**Quality of Evidence**	**Strength of Recommendation**
Non–COX-selective NSAIDs, oral • Aspirin >325 mg/day • Diclofenac • Diflunisal • Etodolac • Fenoprofen • Ibuprofen • Ketoprofen • Meclofenamate • Mefenamic acid • Meloxicam • Nabumetone • Naproxen • Oxaprozin • Piroxicam • Sulindac • Tolmetin	Increases risk of GI bleeding/ peptic ulcer disease in high-risk groups, including those >75 years old or taking oral or parenteral corticosteroids, anticoagulants, or antiplatelet agents; use of proton pump inhibitor or misoprostol reduces but does not eliminate risk; upper GI ulcers, gross bleeding, or perforation caused by NSAIDs occur in approximately 1% of patients treated for 3–6 months, and in about 2%–4% of patients treated for 1 year; these trends continue with longer duration of use	Avoid chronic use unless other alternatives are not effective and patient can take gastroprotective agent (proton-pump inhibitor or misoprostol)	All others: Moderate	Strong
Indomethacin Ketorolac, includes parenteral	Increases risk of GI bleeding/ peptic ulcer disease in high-risk groups (see above non–COX-selective NSAIDs) Of all the NSAIDs, indomethacin has most adverse effects	Avoid	Indomethacin: Moderate Ketorolac: High	Strong
Pentazocine*	Opioid analgesic that causes CNS adverse effects, including confusion and hallucinations, more commonly than other narcotic drugs; is also a mixed agonist and antagonist; safer alternatives available	Avoid	Low	Strong
• Skeletal muscle relaxants • Carisoprodol • Chlorzoxazone • Cyclobenzaprine • Metaxalone • Methocarbamol • Orphenadrine	Most muscle relaxants poorly tolerated by older adults because of anticholinergic adverse effects, sedation, increased risk of fractures; effectiveness at dosages tolerated by older adults is questionable.	Avoid	Moderate	Strong

*Infrequently used drugs

ABBREVIATIONS: ACEI, angiotensin converting-enzyme inhibitors; ARB, angiotensin receptor blockers; CNS, central nervous system; COX, cyclooxygenase; CrCl, creatinine clearance; GI, gastrointestinal; NSAIDs, nonsteroidal antiinflammatory drugs; SIADH, syndrome of inappropriate antidiuretic hormone secretion; TCAs, tricyclic antidepressants.

2012 AGS Beers Criteria for Potentially Inappropriate Medications to Be Used with Caution in Older Adults[1]				
Drug(s)	**Rationale**	**Recommendation**	**Quality of Evidence**	**Strength of Recommendation**
Aspirin for primary prevention of cardiac events	Lack of evidence of benefit versus risk in individuals ≥80 years old	Use with caution in adults ≥80 years old	Low	Weak
Dabigatran	Increased risk of bleeding compared with warfarin in adults ≥75 years old; lack of evidence for efficacy and safety in patients with CrCl <30 mL/min	Use with caution in adults ≥75 years old or if CrCl <30 mL/min	Moderate	Weak
Prasugrel	Increased risk of bleeding in older adults; risk may be offset by benefit in highest-risk older patients (for example, those with prior myocardial infarction or diabetes)	Use with caution in adults ≥75 years old	Moderate	Weak
Antipsychotics Carbamazepine Carboplatin Cisplatin Mirtazapine SNRIs SSRIs TCAs Vincristine	May exacerbate or cause SIADH or hyponatremia; need to monitor sodium level closely when starting or changing dosages in older adults due to increased risk	Use with caution	Moderate	Strong
Vasodilators	May exacerbate episodes of syncope in individuals with history of syncope	Use with caution	Moderate	Weak

ABBREVIATIONS: CrCl, creatinine clearance; SIADH, syndrome of inappropriate antidiuretic hormone secretion; SSRIs, selective serotonin reuptake inhibitors; SNRIs, serotonin-norepinephrine reuptake inhibitors; TCAs, tricyclic antidepressants.

First- and Second-Generation Antipsychotics[1]	
First-Generation (Conventional) Agents	Second-Generation (Atypical) Agents
• Chlorpromazine • Fluphenazine • Haloperidol • Loxapine • Molindone • Perphenazine • Pimozide • Promazine • Thioridazine • Thiothixene • Trifluoperazine • Triflupromazine	• Aripiprazole • Asenapine • Clozapine • Iloperidone • Lurasidone • Olanzapine • Paliperidone • Quetiapine • Risperidone • Ziprasidone

Drugs with Strong Anticholinergic Properties[1]

Antihistamines

- Brompheniramine
- Carbinoxamine
- Chlorpheniramine
- Clemastine
- Cyproheptadine
- Dimenhydrinate
- Diphenhydramine
- Hydroxyzine
- Loratadine
- Meclizine

Anti-Parkinson Agents

- Benztropine
- Trihexyphenidyl

Antidepressants

- Amitriptyline
- Amoxapine
- Clomipramine
- Desipramine
- Doxepin
- Imipramine
- Nortriptyline
- Paroxetine
- Protriptyline
- Trimipramine

Antipsychotics

- Chlorpromazine
- Clozapine
- Fluphenazine
- Loxapine
- Olanzapine
- Perphenazine
- Pimozide
- Prochlorperazine
- Promethazine
- Thioridazine
- Thiothixene
- Trifluoperazine

Antimuscarinics (Urinary Incontinence)

- Darifenacin
- Fesoterodine
- Flavoxate
- Oxybutynin
- Solifenacin
- Tolterodine
- Trospium

Antispasmodics

- Atropine products
- Belladonna alkaloids
- Dicyclomine
- Homatropine
- Hyoscyamine products
- Loperamide
- Propantheline
- Scopolamine

Appendix 2

Legally Relevant Criteria for Decision-Making Capacity and Approaches to Assessment of the Patient[2]				
Criterion	**Patient's Task**	**Physician's Assessment Approach**	**Questions for Clinical Assessment***	**Comments**
Communicate a choice	Clearly indicate preferred treatment option	Ask patient to indicate a treatment choice	Have you decided whether to follow your doctor's [or my] recommendation for treatment? Can you tell me what that decision is? [If no decision] What is making it hard for you to decide?	Frequent reversals of choice because of psychiatric or neurologic conditions may indicate lack of capacity
Understand the relevant information	Grasp the fundamental meaning of information communicated by physician	Encourage patient to paraphrase disclosed information regarding medical condition and treatment	Please tell me in your own words what your doctor [or I] told you about: • The problem with your health now • The recommended treatment • The possible benefits and risks (or discomforts) of the treatment • Any alternative treatments and their risks and benefits • The risks and benefits of no treatment	Information to be understood includes nature of patient's condition, nature and purpose of proposed treatment, possible benefits and risks of that treatment, and alternative approaches (including no treatment) and their benefits and risks
Appreciate the situation and its consequences	Acknowledge medical condition and likely consequences of treatment options	Ask patient to describe views of medical condition, proposed treatment, and likely outcomes	What do you believe is wrong with your health now? Do you believe that you need some kind of treatment? What is treatment likely to do for you? What makes you believe it will have that effect? What do you believe will happen if you are not treated? Why do you think your doctor has [or I have] recommended this treatment?	Courts have recognized that patients who do not acknowledge their illnesses (often referred to as "lack of insight") cannot make valid decisions about treatment Delusions or pathologic levels of distortion or denial are the most common causes of impairment
Reason about treatment options	Engage in a rational process of manipulating the relevant information	Ask patient to compare treatment options and consequences and to offer reasons for selection of option	How did you decide to accept or reject the recommended treatment? What makes [chosen option] better than [alternative option]?	This criterion focuses on the process by which a decision is reached, not the outcome of the patient's choice, since patients have the right to make "unreasonable" choices
* Patients' responses to these questions need not be verbal.				

Screening for Depression

Patient Health Questionnaire-2 (PHQ-2)[3]

1. *In the past 12 months, have you ever had a time when you felt sad, blue, depressed, or down for most of the time for at least two weeks?*
2. *In the past 12 months, have you ever had a time, lasting at least two weeks, when you didn't care about the things that you usually care about or when you didn't enjoy the things that you usually enjoy?*

Interpretation of PHQ-2

If the patient answers YES to either question, then further evaluation by a primary care physician, geriatrician, or mental health specialist is recommended.

NOTE: This screening test has not been validated in extremely frail elderly patients, those with severe concurrent medical illnesses, those who are suffering from medication side effects, or those with impaired communication skills.

Screening for Alcohol and Substance Abuse

Modified Version of CAGE[4-7]

Ask the patient the following four questions:

1. *Have you ever felt you should **C**ut down on your drinking or drug use?*
2. *Have people **A**nnoyed you by criticizing your drinking or drug use?*
3. *Have you ever felt bad or **G**uilty about your drinking or drug use?*
4. *Have you ever had a drink or drug first thing in the morning (**E**ye-opener) to steady your nerves or to get rid of a hangover?*

Interpretation of Modified CAGE

If YES to any of these questions, consider perioperative prophylaxis for withdrawal syndromes.

If operation can be delayed, consider referring motivated patients to substance abuse specialist for preoperative abstinence or medical detoxification.

Patients with alcohol use disorder should receive perioperative daily multivitamins (with folic acid) and high-dose oral or parental thiamine (100 mg).

Assessing Baseline and Current Functional Status in Ambulatory Patients

Short Simple Screening Test for Functional Assessment[8,9]

Ask the patient the following four questions:

1. *Can you get out of bed or chair yourself?*
2. *Can you dress and bathe yourself?*
3. *Can you make your own meals?*
4. *Can you do your own shopping?*

Interpretation of Functional Screening Test

If NO to any of these questions, more in-depth evaluation should be performed, including full screening of ADLs and IADLs.

Deficits should be documented and may prompt perioperative interventions (for example, referral to occupational therapy and/or physical therapy) and proactive discharge planning.

Assessing Gait and Mobility Impairment and Fall Risk in Ambulatory Patients[10-12]

Timed Up and Go Test (TUGT)

Patients should sit in a standard armchair with a line 10 feet in length in front of the chair. They should use standard footwear and walking aids and should not receive any assistance.

Have the patient perform the following commands:

1. *Rise from the chair (if possible, without using the armrests)*
2. *Walk to the line on the floor (10 feet)*
3. *Turn*
4. *Return to the chair*
5. *Sit down again*

Interpretation of TUGT

Any person demonstrating difficulty rising from the chair or requiring more than 15 seconds to complete the test is at high risk for falls. Consider preoperative referral to physical therapy for more detailed gait assessment.

Frailty Score: Operational Definition[13]

Criteria	Definition
Shrinkage	Unintentional weight loss ≥10 pounds in past year
Weakness	Decreased grip strength
Exhaustion	Self-reported poor energy and endurance
Low physical activity	Low weekly energy expenditure
Slowness	Slow walking

Interpretation of the Frailty Score

The patient receives 1 point for each criterion met.

0–1 = Not Frail
2–3 = Intermediate Frail (Pre-frail)
4–5 = Frail

Frail patients are at much higher risk of adverse health outcomes.

Intermediate frail patients are at elevated risk (less than frail ones) but are also at more than double the risk of becoming frail over 3 years.

Frailty Score[14-15]
Patient receives one point for each criterion (0–5)

Frailty Criteria	Definition
Weight loss	Unintentional weight loss ≥10 pounds in the past year.
Decreased grip strength (weakness)	Grip strength in the lowest 20th percentile by gender and BMI. Three trials are performed with a hand-held dynamometer and the average value is used.

Men

BMI	Kg Force
≤24	≤29
24.1–26	≤30
26.1–28	≤30
>28	≤32

Women

BMI	Kg Force
≤23	≤17
23.1–26	≤17.3
26.1–29	≤18
>29	≤21

Exhaustion	For the following two statements: 1. *"I felt that everything I did was an effort."* 2. *"I could not get going."* The patient is asked: "How often in the last week did you feel this way?" 0 = rarely or none of the time (<1 day) 1 = some or a little of the time (1–2 days) 2 = a moderate amount of the time (3–4 days) 3 = most of the time The criterion is met if patient answers 2 or 3 to either statement.
Low physical activity	Weekly energy expenditure, determined with the short version of the Minnesota Leisure Time Activities Questionnaire in the lowest 20th percentile by gender: Men: <383 kcal/week. Women: <270 kcal/week.
Slowed walking speed	Walking speed in the lowest 20th percentile by gender and height. Time is measured for a distance of 15 feet at normal pace. The average of three trials is used.

Men

Height	Time
≤173 cm	≥7 sec
>173 cm	≥6 sec

Women

Height	Time
≤159 cm	≥7 sec
>159 cm	≥6 sec

Screening for Severe Nutritional Risk[16]

Risk Factors for Severe Nutritional Risk

- BMI <18.5 kg/m^2
- Serum albumin <3.0 g/dL (with no evidence of hepatic or renal dysfunction)
- Unintentional weight loss >10%–15% within 6 months

Interpretation of Nutritional Screening

If YES to any above criterion, then the patient is at severe nutritional risk and should, if feasible, undergo a full nutritional assessment by a dietician to design a perioperative nutritional plan to address deficits.

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Appendices

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Expert Panel

H. Gil Cryer, MD, FACS (Chair)
Professor of Surgery, Trauma/Emergency Surgery and Critical Care Program, UCLA, Los Angeles, CA

J. Forrest Calland, MD, FACS
Assistant Professor of Surgery, University of Virginia Health System, Richmond, VA

Warren Chow, MD
James C. Thompson Geriatrics Surgical Fellow, American College of Surgeons, Chicago, IL

Matthew Davis, MD, FACS
Trauma Program Director, Scott and White Memorial Hospital, Temple, TX

Mark Hemmila, MD, FACS
Associate Professor of Surgery, University of Michigan Health Systems, Ann Arbor, MI

Rosemary Kozar, MD, FACS
Professor of Surgery and Chief of Trauma, Memorial Hermann Hospital, Houston, TX

Sheila Lopez
Director of Trauma Service, Memorial Hermann Hospital, Houston, TX

Alicia Mangram, MD, FACS
Medical Director of Trauma Services, John C. Lincoln Hospital, Phoenix, AZ

Gary Marshall, MD
Professor of Surgery, University of Pittsburg Medical Center, Pittsburg, PA

Avery B. Nathens, MD, FACS
Professor of Surgery, University of Toronto, Surgeon in Chief of Department of Surgery, Sunnybrook Hospital, Toronto, ON

Ronnie Rosenthal, MD
Professor of Surgery, Yale University, Chief of Surgery of VA Connecticut Healthcare System, West Haven, CT

Areti Tillou, MD, MSEd
Assistant Professor of Surgery David Geffen School of Medicine, UCLA, Los Angeles, CA

Camillia Wong, MD
Assistant Professor, University of Toronto, Geriatrician and Associate Scientist, St. Michael's Hospital, Toronto, ON

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