

Hospital Care for the Elderly



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Keywords geriatric, adverse drug reaction, frail

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Received June 28, 2013.
Revision received July 2, 2013.
Accepted after revision July 11, 2013.
Bangkok Med J 2013;6:86-103.
E-journal: <http://www.bangkokmedjournal.com>

Older adults are at disproportionate risk of becoming seriously ill and requiring hospital care, whether it is in an emergency department, on a medical or surgical ward, or in a critical-care unit. Adults aged 60 and above account for 35% of acute-care hospital admissions and nearly 50% of hospital expenditure for all adults.^{1,2} While many principles of acute hospital care are the same for all age groups, the elderly patient population is at increased risk of comorbidities and accompanying medications, functional decline and cognitive impairment. Therefore, there are several issues related to the hospital admission, stay and discharge that deserve specific attention when considering the care of the geriatric population. The care of hospitalized elders requires a systematic approach to the evaluation and management of commonly seen geriatric conditions and perhaps implementation of structural changes specifically designed to address the needs of an often medically complex and potentially vulnerable population.^{3,4}

Hospital Admission

Reason for Admission for Geriatric Patients

The major diagnoses for which older adults are hospitalized are related to chronic diseases, particularly cardiovascular and respiratory conditions. The five most common conditions, accounting for 24% of hospital admission diagnoses, are listed in Table 1. Also common and important to recognize, but less likely to be reported as the reason for admission, are conditions more likely to occur in older adults such as failure to thrive, falls, adverse drug effects, or change in mental status. In addition, older adults may be admitted with an atypical presentation of another condition, such as when change in mental status is due to urinary tract infection. Often the reported diagnosis for a hospitalized older patient may not fully capture the underlying reasons that necessitated the admission and does not explain the hospital course and subsequent health status of the patient. In addition to the primary problems that led to the admission, the effect of comorbid chronic diseases must be considered. Over 60% of elderly patients have two or more major chronic diseases. Comorbid chronic diseases have several consequences for the hospitalized elder and for the clinician. Multiple diseases often mean multiple outpatient physicians and multiple medications. Multiple medications, can result in confusion about medications, difficulty with medication reconciliation and drug adherence, and adverse drug events.⁵ In older adults, especially those 75 years and older, common conditions such as vision or hearing impairment, mobility impairment and fall risk, poor nutrition, incontinence, depression, cognitive impairment and functional impairment often occur in conjunction with the major chronic diseases that lead to the hospital admissions.

Conditions commonly seen in older patients are often labeled as **'geriatric'** and can contribute to the need for acute admission, and will substantially influence the hospital course and discharge plans. Cognitive impairment, one such geriatric condition, is a major risk for delirium, which is associated with longer hospital length of stay, greater functional disability and increased mortality following hospitalization.³

Admission screening

At the time of admission, much of the focus is on evaluation and management of a disease-specific, perhaps life-threatening illness. However, elderly patients should be screened for issues of importance in the care, particularly issues that are likely to affect the course, treatment and prognosis of the illness that precipitated the hospitalization.⁶

Medication reconciliation

Hospital admission is an important time for medication review. Clarification of the patient's medications, often prescribed by multiple physicians, and identification of potential adverse drug reactions (ADR) are two important aspects of medication review. ADR lead to one-third of the hospital admission in the elderly. Aging is not the only predictor of ADRs: polypharmacy is also an important factor. There are certain medications or classes of medication that have been identified by expert consensus panels as being high risk for ADRs in elderly patients; Tables 2-6 list the Beers criteria. These high risk medications such as sedatives, psychoactive drugs and analgesics should be avoided if possible.⁷

Identify Frailty

There are not precise definitions of frailty; many studies have shown that patients of advanced age, 80 and above or with functional impairments are the most vulnerable and should be considered **'frail'**. Frailty puts patients at risk for further functional and cognitive decline, delirium and prolonged hospital stay, increased costs and mortality. Identification of frailty at admission should alert the physician to the need to further evaluate for dementia and other geriatric conditions.³

Functional screen

Functional measures are strong predictors of mortality and contribute more to prognosis in hospitalized older patients than comorbid illness, disease severity and diagnosis. Assessing activities of daily living (ADLs) and instrumental activities of daily living (IADLs) are well-known measures of functional impairment. Any documented mobility of ADL impairment should trigger physical therapy and/or occupational therapy assessment and should signal the need to institute early mobilization.⁸

Dementia screening

Screening for dementia is particularly important in the elderly patient who is losing weight, noncompliant with medications and readmitted to the hospital. Impaired judgment can impact a patient's ability to make sensible health decisions. While diagnosis of dementia is based on DSM-IV criteria, two common screening tools are Mini-Mental Status Examination (Table 7) and the Mini-Cog Screening (Table 8). Impairments on either test should result in active planning for cognitive stimulation and comprehensive discharge planning.

Hospital Stay

Hospitalization presents many hazards for older patients. The elderly are at five times increased risk for iatrogenic complications during hospitalization. Older patients have an average 35% risk of functional decline during acute hospitalization. In addition, they are at increased risk for the development of delirium. Thus, considerable attention must be given to creating a systematic approach to preventing and treating common hospital complications in the geriatric population.

Common problems in hospitalized elderly patients

Delirium

Delirium is an acute confusional state marked by inattention and a fluctuating course. The confusion assessment method is frequently used to diagnose delirium (Table 9).⁹ The incidence of delirium in hospitalized older patients is as high as 50% and is associated with increased mortality and hospital length of stay. Delirium in elderly patients can be present atypically, such as in the hypoactive form where it often goes unrecognized by physicians and nurses. Many aspects of hospitalization promote delirium for the older patient. The change in environment is disruptive to the patient's daily routine. Pain, interruption of sleep patterns, and several classes of medications as listed in Beer's criteria are important risk factors for delirium. Effective measures to prevent delirium include orientation protocols, environmental modification, early mobilization, use of visual and hearing aids, adequate pain treatment and reduction in polypharmacy.

Immobility and Falls

Older hospitalized adults are at greater risk of falling due to the effects of acute illness along with unfamiliar environment and side effects of treatment. While all elderly patients are at risk for falling, the risk of falls increases with age. Multiple factors that can identify patients at the highest risk (Table 10).¹⁰ Several strategies can help prevent falls in the hospital setting, such as avoiding medications that might increase the fall

risk and close supervision with ambulation for patients who are at risk for fall. Time out of bed throughout the day should be encouraged in order to prevent orthostatic hypotension associated with prolonged immobility; intravenous lines and urinary catheters should be discontinued as early as possible.¹¹

Infections

Older patients have an increasing rate of nosocomial infections due to underlying health conditions, poor nutritional status and severity of illness. Atypical presentations are quite common, hence fever may not be present in older adults with active infection. Commonly seen infections in older hospitalized patients include:

Pneumonia - Hospital-acquired pneumonia (HAP) is pneumonia that occurs 48 hours or more after admission. The most significant risk factor for HAP is mechanical ventilation. Patient with advanced dementia, severe Parkinson's disease, or stroke, are also at high risk for aspiration pneumonia. Preventive measures include avoidance of acid-blocking medications, attention to oral hygiene, and feeding in an upright position.

Urinary Tract infections - Urinary tract infection associated with urinary catheters are the leading cause of secondary nosocomial bacteremia, which is associated with high mortality. The most effective strategies to reduce urinary infections are avoidance of unnecessary catheterization and catheter removal when this is no longer indicated.

Standard precautions are recommended in the care of all hospitalized patients to reduce the risk of infection transmission between patients and healthcare workers. Precautions include hand hygiene before and after every patient contact; use of gloves, gowns, and eye protection for situations in which there is exposure to body fluid.

Malnutrition

Poor nutrition for older hospitalized patients may result from several factors such as impaired cognition, poor appetite, restriction of movement, difficulty in self-feeding and restricted diet orders. In-patient assessment by a nutritionist can identify nutritional deficiencies in older patients, and combined with subsequent nutritional follow-up following discharge, may decrease mortality. In malnourished geriatric patients, providing liquid diet supplements may improve survival rates.¹²

Pressure Ulcers

Several host and environmental factors increase the risk of developing pressure ulcers during hospitalization in older patients, including poor nutritional status, incontinence, immobility and neurologic impairment.

Optimizing nutritional status and limiting the time spent in one position can help prevent pressure ulcers. Patients who are bed-bound should be repositioned at least every two hours and pressure-reducing products for patients at increased risk of ulcers should also be used.

Hospital-Wide Interventions

Although limitations in the physiologic reserve for older patients are largely not modifiable, there are several strategies that can improve outcomes for older adults when implemented on a hospital-wide basis.

Multidisciplinary team - Multidisciplinary teams strive to integrate all care providers into the daily assessment and plan of care for older patients. Including input from the attending physician, geriatrician, nursing staff, physical therapists and dietician, can enhance the quality of care provided to the complex, frail elderly patients. The benefits of multidisciplinary care have been demonstrated in shorter length of stays, lower rate of complications and reduced hospital cost.¹³⁻¹⁵

Since not all hospitals have the resources to provide specialized units for older patients, some programs have attempted to re-create the core elements of multidisciplinary care units for hospitalized older persons who are not located in a single unit. Some hospitals have combined hospitalist-directed care with mobile geriatric care teams to provide enhanced care to older patients throughout the hospital. In a trial comparing hospitalized patients age > 75 assigned to an intervention involving an interdisciplinary geriatric team or usual care, patients who were assigned the intervention were associated with a lower rate of adverse events, shorter hospital stays and better satisfaction.^{16,17}

Checklists and order sets - Checklists can improve the quality of care for older patients by integrating reminders into everyday care to ensure practice standards are met. Checklists can be tailored to remind staff about specific geriatric issues such as daily patient mobilization, read-dressing the need for catheters, and assessing for the presence of delirium.

Early mobilization programs - It is important to ensure that patients are mobilized early and often during their hospitalization. Mobilization can help prevent falls. Observational studies find that increased mobility in the hospital is associated with less functional decline during hospitalization and shorter lengths of stay.¹⁸⁻²⁰

Conclusion

Older adults represent a large and growing segment of hospitalized patients and are at high risk of complications

during hospitalization, including falls, delirium, adverse drug events, infections, and death. The assessment of older hospitalized adults should extend beyond the traditional history and physical to include: assessment of physical function and cognition; social support; living situation; as well as an evaluation for possible polypharmacy. Many

adverse outcomes encountered by older adults during hospitalization can be prevented. Some hospital-wide strategies are associated with improved outcomes for older adults, including care involving multidisciplinary teams, checklists, and early mobilization programs.

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Appendix

Table 1: Most frequent conditions causing hospitalization among older patients, 2003.

Rank	Principle diagnosis	% of all hospitalizations in older adults
1	Heart failure	6.3
2	Pneumonia	5.8
3	Coronary atherosclerosis	5.1
4	Cardiac dysthymias	3.7
5	Acute myocardial infarction	3.4

Source: AHRQ, Center for delivery, Organization and Markets, Healthcare cost and utilization project, Nationwide Inpatient sample 2003

Table 2: 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults.

Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
Anticholinergics (excludes TCAs)					
- Doxylamine - Hydroxyzine - Promethazine - Triprolidine	Use of diphenhydramine in special situations such as acute treatment of severe allergic reaction may be appropriate.				
Antiparkinson agents - Benzotropine (oral) - Trihexyphenidyl	Not recommended for prevention of extrapyramidal symptoms with antipsychotics; more effective agents available for treatment of Parkinson disease.	Avoid	Moderate	Strong	Rudolph 2008
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	Lechevallier-Michel 2005
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	De Schryver 2010 Dipyridamole Package Insert
Ticlopidine*	Safer, effective alternatives available.	Avoid	Moderate	Strong	Ticlopidine Package Insert
Anti-infective					
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	Felts 1971 Hardak 2010 Holmberg 1980
Cardiovascular					
Alpha1 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	ALLHAT 2000 Aronow 2011
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	Aronow 2011 Methyldopa Package Insert Reserpine Package Insert

Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
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	Roy 2008 Doyle 2009 Fuster 2006 Van Gelder 2002 Wann 2011a Wyse 2002
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	Fuster 2006 Disopyramide Package Insert
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	Connolly 2011 FDA Drug Safety 2011 Hohnloser 2009 Korber 2008 Dronedarone Package Insert – revised Dec 2011
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	Adams 2002 Ahmed 2007 Rathore 2003
Nifedipine, immediate release*	Potential for hypotension; risk of precipitating myocardial ischemia.	Avoid	High	Strong	Furberg 1995 Nifedipine Package Insert Pahor 1995 Psaty 1995a Psaty 1995b
Spirolactone >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	Juurlink 2004
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 cause orthostatic hypotension; the safety profile of low-dose doxepin (≤6 mg/day) is comparable to that of placebo.	Avoid	High	Strong	Coupland 2011 Nelson 2011 Scharf 2008

Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
Antipsychotics, first- (conventional) and second- (atypical) generation (see Table 5 for full list)	Increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia.	Avoid use for behavioral problems of dementia unless non-pharmacologic options have failed and patient is threat to self or others.	Moderate	Strong	Dore 2009 Maher 2011 Schneider 2005 Schneider 2006a Schneider 2006b Vigen 2011
Thioridazine Mesoridazine	Highly anticholinergic and greater risk of QT-interval prolongation.	Avoid	Moderate	Strong	Goldstein 1974 Ray 2001 Stollberger 2005
Barbiturates - Amobarbital* - Butobarbital* - Butalbital - Mephobarbital* - Pentobarbital* - Phenobarbital - Secobarbital*	High rate of physical dependence; tolerance to sleep benefits; greater risk of overdose at low dosages.	Avoid	High	Strong	Combo 2010 McLean 2000 Messina 2005
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	Allain 2005 Cotroneo 2007 Finkle 2011 Paterniti 2002
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	Bain 2006 Goldstein 1978 Miller 1979
Meprobamate	High rate of physical dependence; very sedating.	Avoid	Moderate	Strong	Keston 1974 Rhalimi 2009
Nonbenzodiazepine hypnotics • Eszopiclone • Zolpidem • Zaleplon	Benzodiazepine-receptor agonists that have adverse events similar to those of benzodiazepines in older adults (e.g., delirium, falls, fractures); minimal improvement in sleep latency and duration.	Avoid chronic use (>90 days)	Moderate	Strong	Allain 2005 Cotroneo 2007 Finkle 2011 McCrae 2007 Orriols 2011 Rhalimi 2009 Wang 2001b Yang 2011

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Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
Ergot mesylates* Isoxsuprine*	Lack of efficacy.	Avoid	High	Strong	Isoxsuprine Package Insert
<i>Endocrine</i>					
Androgens • Methyltestosterone* • Testosterone	Potential for cardiac problems and contra-indicated in men with prostate cancer.	Avoid unless indicated for moderate to severe hypogonadism.	Moderate	Weak	Basaria 2010 Jones 2011
Desiccated thyroid	Concerns about cardiac effects; safer alternatives available.	Avoid	Low	Strong	Baskin2002 Rees-Jones 1977 Rees-Jones 1980 Sawin 1978 Sawin 1989
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	Bath 2005 Cho 2005 Epp 2010 Hendrix 2005 Perrotta 2008 Sare 2008
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	Liu 2007
Insulin, sliding scale	Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting.	Avoid	Moderate	Strong	Queale 1997
Megestrol	Minimal effect on weight; increases risk of thrombotic events and possibly death in older adults.	Avoid	Moderate	Strong	Bodenner 2007 Reuben 2005 Simmons 2005 Yeh 2000
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	Clarke 1975 Gangji 2007 Shorr 1996

Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
Gastrointestinal					
Metoclopramide	Can cause extrapyramidal effects including tardive dyskinesia; risk may be further increased in frail older adults.	Avoid, unless for gastroparesis.	Moderate	Strong	Bateman 1985 Ganzini 1993 Miller 1989
Mineral oil, given orally	Potential for aspiration and adverse effects; safer alternatives available.	Avoid	Moderate	Strong	Marchiori 2010a Marchiori 2010b Meltzer 2006 Simmons 2007
Trimethobenzamide	One of the least effective antiemetic drugs; can cause extrapyramidal adverse effects.	Avoid	Moderate	Strong	Bardfeld 1966 Moertel 1963
Pain Medications					
Meperidine	Not an effective oral analgesic in dosages commonly used; may cause neurotoxicity; safer alternatives available.	Avoid	High	Strong	Kaiko 1982 Szeto 1977 Meperidine Package Insert
Non-COX-selective NSAIDs, oral • Aspirin > 325 mg/day • Diclofenac • Diflunisal • Etodolac • Fenoprofen • Ibuprofen • Ketoprofen • Meclofenamate • Mefenamic acid • Meloxicam • Nabumetone • Naproxen • Oxaprocin • 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	AGS Pain Guideline 2009 Langman 1994 Lanas 2006 Llorente Melero 2002 Pilotto 2003 Piper 1991
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	Onder 2004

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Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
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	AGS Pain Guideline 2009 Pentazocine Package Insert
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	Billups 2011 Rudolph 2008
<p>*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 anti-inflammatory drugs; SIADH, syndrome of inappropriate antidiuretic hormone secretion; TCAs, tricyclic antidepressants</p> <p><i>The primary target audience is the practicing clinician. The intentions of the criteria include: 1) improving the selection of prescription drugs by clinicians and patients; 2) evaluating patterns of drug use within populations; 3) educating clinicians and patients on proper drug usage; and 4) evaluating health-outcome, quality of care, cost, and utilization data.</i></p>					

Table 3: 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults Due to Drug-Disease or Drug-Syndrome Interactions That May Exacerbate the Disease or Syndrome.

Disease or Syndrome	Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
<i>Cardiovascular</i>						
Heart failure	NSAIDs and COX-2 inhibitors Nondihydropyridine CCBs (avoid only for systolic heart failure) • Diltiazem • Verapamil Pioglitazone, rosiglitazone Cilostazol Dronedarone	Potential to promote fluid retention and/or exacerbate heart failure.	Avoid	NSAIDs: moderate; CCBs: moderate; Thiazolidinediones (glitazones): high; Cilostazol: low; Dronedarone: moderate	Strong	Cilostazol Package Insert Connolly 2011 Dronedarone Package Insert – revised Dec2011 Heerdink 1998 Goldstein 1991 Jessup 2009 Korber 2009 Loke 2011 Pioglitazone Package Insert Rosiglitazone Package Insert
Syncope	Acetylcholinesterase inhibitors (AChEIs) Peripheral alpha blockers • Doxazosin • Prazosin • Terazosin Tertiary TCAs Chlorpromazine, thioridazine, and olanzapine	Increases risk of orthostatic hypotension or bradycardia.	Avoid	AChEIs and alpha blockers: high TCAs and antipsychotics: Moderate AChEIs and TCAs: strong	Alpha blockers and antipsychotics: weak	Bordier 2005 Davidson1989 French 2006 Gaggioli1997 Gill 2009 Kim 2011 Litvinenko 2008 Nickel 2008 Schneider 2006a Schneider 2006b Wild 2010
<i>Central Nervous System</i>						
Chronic seizures or epilepsy	Bupropion Chlorpromazine Clozapine Maprotiline Olanzapine Thioridazine Thiothixene Tramadol	Lowers seizure threshold; may be acceptable in patients with well-controlled seizures in whom alternative agents have not been effective.	Avoid	Moderate	Strong	Pisani 2002
Delirium	All TCAs Anticholinergics (see Table 6 for full list) Benzodiazepines Chlorpromazine Corticosteroids H2-receptor antagonist Meperidine Sedative hypnotics Thioridazine	Avoid in older adults with or at high risk of delirium because of inducing or worsening delirium in older adults; if discontinuing drugs used chronically, taper to avoid withdrawal symptoms.	Avoid	Moderate	Strong	Clegg 2011 Gaudreau 2005 Laurila 2008 Marcantonio 1994 Moore 1999 Morrison 2003 Ozbolt 2008 Panharipande 2006 Rudolph 2008 Stockl 2010

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Disease or Syndrome	Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
Dementia and cognitive impairment	Anticholinergics (see Table 6 for full list) Benzodiazepines H2-receptor antagonists Zolpidem Antipsychotics, chronic and as-needed use	Avoid due to adverse CNS effects. Avoid antipsychotics for behavioral problems of dementia unless non-pharmacologic options have failed and patient is a threat to themselves or others. Antipsychotics are associated increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia.	Avoid	High	Strong	Boustani 2007 Hanlon2004 Finkle 2011 Frey 2011 Patemiti 2002 Rasmussen 1999 Rudolph 2008 Schneider 2005 Schneider 2006a Schneider 2006b Seitz 2011 Vigen 2011 Wright 2009
History of falls or fractures	Anticonvulsants Antipsychotics Benzodiazepines Nonbenzodiazepine hypnotics • Eszopiclone • Zaleplon • Zolpidem TCAs/SSRIs	Ability to produce ataxia, impaired psychomotor function, syncope, and additional falls; shorter-acting benzodiazepines are not safer than long-acting ones.	Avoid unless safer alternatives are not available; avoid anticonvulsants except for seizure	High	Strong	Allain 2005 Berdot 2009 Deandrea 2010 Ensrud 2003 Hartikainen 2007 Jaibert 2010 Liperoti 2007 Mets 2010 Sterke 2008 Turner 2011 van der Hooff 2008 Vestergaard 2008 Wagner 2004 Wang 2001a Wang 2001b Zint 2010
Insomnia	Oral decongestants • Pseudoephedrine • Phenylephrine Stimulants • Amphetamine • Methylphenidate • Pemoline Theobromines • Theophylline • Caffeine	CNS stimulant effects	Avoid	Moderate	Strong	Foral 2011
Parkinson disease	All antipsychotics (see Table 5 for full list, except for quetiapine and clozapine) Antiemetics • Metoclopramide • Prochlorperazine • Promethazine	Dopamine receptor antagonists with potential to worsen parkinsonian symptoms. Quetiapine and clozapine appear to be less likely to precipitate worsening of Parkinson disease.	Avoid	Moderate	Strong	Bateman 1985 Dore 2009 Ganzini 1993 Morgan 2005 Thanvi 2009

Disease or Syndrome	Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
<i>Gastrointestinal</i>						
Chronic constipation	Oral antimuscarinics for urinary incontinence • Darifenacin • Fesoterodine • Oxybutynin (oral)	Ability to worsen constipation; agents for urinary incontinence: antimuscarinics overall differ in effectiveness	Avoid unless no other alternatives	For urinary incontinence: high All others: Moderate/low	Weak	Glass 2008 Meek 2011 Murray 1995 Perazella 1999 Schneider 2006 Sica 1989 Winkelmayr 2008
Urinary incontinence (all types) in women	Estrogen oral and transdermal (excludes intravaginal estrogen)	Aggravation of incontinence.	Avoid in women	High	Strong	Dew 2003 Epp 2010 Grodstein 2004 Hartmann 2009 Hendrix 2005 Perrotta 2008 Ruby 2010
Lower urinary tract symptoms, benign prostatic hyperplasia	Inhaled anticholinergic agents Strongly anticholinergic drugs, except antimuscarinics for urinary incontinence (see Table 9 for complete list).	May decrease urinary flow and cause urinary retention.	Avoid in men	Moderate	Inhaled agents: strong All others: weak	Afonso 2011 Athanasopoulos 2003 Barkin 2004 Blake-James 2006 Chapple 2005 Griebing 2009 Kaplan 2006 Kraus 2010 Malone-Lee 2001 Martin Merino 2009 Spigset 1999 Uher 2009 Verhamme 2008 Wuerstle 2011
Stress or mixed urinary incontinence	Alpha-blockers • Doxazosin • Prazosin • Terazosin	Aggravation of incontinence.	Avoid in women	Moderate	Strong	Marshall 1996 Ruby 2010
Abbreviations: CCBs, calcium channel blockers; AChEIs, acetylcholinesterase inhibitors; CNS, central nervous system; COX, cyclooxygenase; NSAIDs, nonsteroidal anti-inflammatory drugs; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants						
<i>The primary target audience is the practicing clinician. The intentions of the criteria include: 1) improving the selection of prescription drugs by clinicians and patients; 2) evaluating patterns of drug use within populations; 3) educating clinicians and patients on proper drug usage; and 4) evaluating health-outcome, quality of care, cost, and utilization data.</i>						

Hospital Care for the Elderly

Table 4: 2012 AGS Beers Criteria for Potentially Inappropriate Medications to Be Used with Caution in Older Adults.

Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
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	McQuaid 2006 Wolff 2009
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	Connolly 2009 Diener 2010 Eikelboom 2011 Legrand 2011 Wann 2011b Dabigatran Package Insert
Prasugrel	Increased risk of bleeding in older adults; risk may be offset by benefit in highest-risk older patients (eg, those with prior myocardial infarction or diabetes).	Use with caution in adults ≥ 75 years old.	Moderate	Weak	Hochholzer 2011 Wiviott 2007 Prasugrel Package Insert
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	Bouman 1998 Coupland 2011 Liamis 2008 Liu 1996
Vasodilators	May exacerbate episodes of syncope in individuals with history of syncope.	Use with caution.	Moderate	Weak	Davidson 1989 Gaggioli 1997

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

The primary target audience is the practicing clinician. The intentions of the criteria include: 1) improving the selection of prescription drugs by clinicians and patients; 2) evaluating patterns of drug use within populations; 3) educating clinicians and patients on proper drug usage; and 4) evaluating health-outcome, quality of care, cost, and utilization data.

Table 5: First- and Second-Generation Antipsychotics.

First-Generation (Conventional) Agents	Second-Generation (Atypical) Agents
Chlorpromazine	Aripiprazole
Fluphenazine	Asenapine
Haloperidol	Clozapine
Loxapine	Iloperidone
Molindone	Lurasidone
Perphenazine	Olanzapine
Pimozide	Paliperidone
Thioridazine	Quetiapine
Thiothixene	Risperidone
Trifluoperazine	Ziprasidone
Trifluoprazine	

Table 6: Drugs with Strong Anticholinergic Properties.

Antihistamines <ul style="list-style-type: none"> • Brompheniramine • Carbinoxamine • Chlorpheniramine • Clemastine • Cyproheptadine • Dimenhydrinate • Diphenhydramine • Hydroxyzine • Loratadin • Meclizine 	Antiparkinson agents <ul style="list-style-type: none"> • Benztropine • Trihexyphenidyl 	Skeletal Muscle Relaxants <ul style="list-style-type: none"> • Carisoprodol • Cyclobenzaprine • Orphenadrine • Tizanidine
Antidepressants <ul style="list-style-type: none"> • Amitriptyline • Amoxapine • Clomipramine • Desipramine • Doxepin • Imipramine • Nortriptyline • Paroxetine • Protriptyline • Trimipramine 	Antipsychotics <ul style="list-style-type: none"> • Chlorpromazine • Clozapine • Fluphenazine • Loxapine • Olanzapine • Perphenazine • Pimozide • Prochlorperazine • Promethazine • Thioridazine • Thiothixene • Trifluoperazine 	
Antimuscarinics (urinary incontinence) <ul style="list-style-type: none"> • Darifenacin • Fesoterodine • Flavoxate • Oxybutynin • Solifenacin • Tolterodine • Trospium 	Antispasmodics <ul style="list-style-type: none"> • Atropine products • Belladonna alkaloids • Dicyclomine • Homatropine • Hyoscyamine products • Loperamide • Propantheline • Scopolamine 	

Table 7: Mini-Mental State Examination.²¹

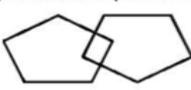
Mini-Mental State Examination (MMSE)		
Patient's Name: _____		Date: _____
<i>Instructions: Score one point for each correct response within each question or activity.</i>		
Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day? Month?"
5		"Where are we now? State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible.
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, ...) Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 
30		TOTAL

Table 8: Mini-Cog screening.²²

The Mini-Cog scoring algorithm. The Mini-Cog uses a three-item recall tests for memory and the intuitive clock-drawing test. The latter serves as an 'information distractor,' helping to clarify scores when the memory recall score is intermediate.

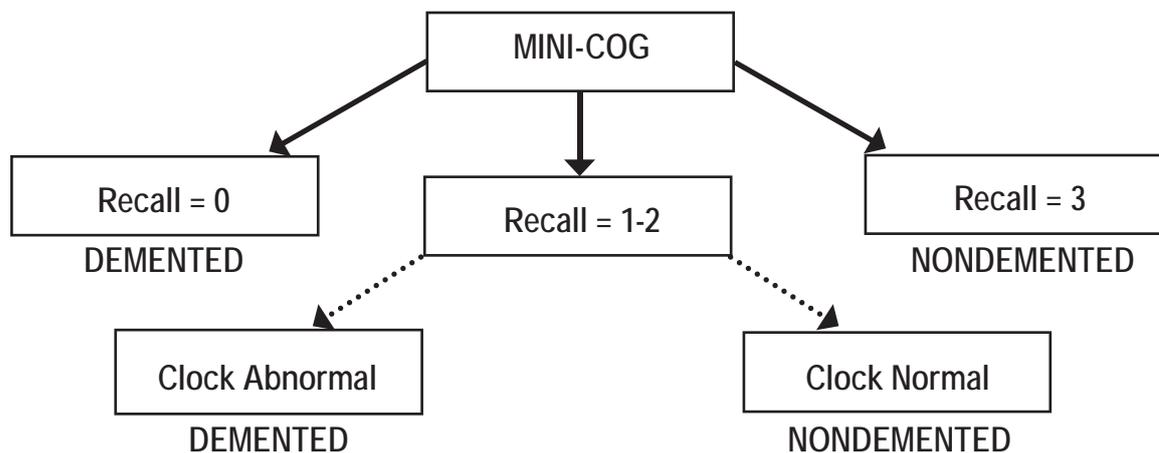


Table 9: Confusion Assessment Method (CAM) screening.²³

CONFUSION ASSESSMENT METHOD (CAM) SHORTENED VERSION WORKSHEET

EVALUATOR: _____ DATE: _____

1. ACUTE ONSET AND FLUCTUATING COURSE

- Is there evidence of an acute change in mental status from the patient's baseline? No _____ Yes _____

- Did the (abnormal) behavior fluctuate during the day, that is tend to come and go or increase and decrease in severity? No _____ Yes _____

2. INATTENTION

Did the patient have difficulty focusing attention, for example, being easily distractible or having difficulty keeping track of what was being said? No _____ Yes _____

3. DISORGANIZED THINKING

Was the patient's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject? No _____ Yes _____

4. ALTERED LEVEL OF CONSCIOUSNESS

Overall, how would you rate the patient's level of consciousness?

- Alert (normal)

- Vigilant (hyperalert)
- Lethargic (drowsy, easily aroused)
- Stupor (difficult to arouse)
- Coma (unarousable)

Do any checks appear in this box? No _____ Yes _____

If all items in BOX 1 are checked and at least one item in BOX 2 is checked a diagnosis of delirium is suggested.

Table 10: Fall risk factors and associated relative risk.²⁴

Risk factor	Mean relative risk ratio (range)
Muscle weakness	4.4 (1.5-10.3)
History of falls	3.0 (1.7-7.0)
Gait deficit	2.9 (1.3-5.6)
Balance deficit	2.9 (1.6-5.4)
Use of assistive device	2.6 (1.2-4.6)
Visual deficit	2.5 (1.6-3.5)
Arthritis	2.4 (1.9-2.9)
Impaired activities of daily living	2.3 (1.5-3.1)
Depression	2.2 (1.7-2.5)
Cognitive impairment	1.8 (1.0-2.3)
Age 80 and older	1.7 (1.1-2.5)