Risks of Hospitalization for Older Adults

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Patient Case

- 92 yo woman w/ DM, HTN, hyperlipidemia, CKD
  - Presentation: SOB, ?CP x5 days, weakness
- ED:
  - Tachypneic, diaphoretic, 173/98, rales to apices, JVP 16 cm
  - BNP 5764, creat 1.5
  - CXR: central pulmonary edema, bilateral pleural effusions, lower lobe atelectasis vs. pneumonia
  - EKG: SB at 59 bpm; 1 mm STE V1-V3 (relatively unchanged) new TW flattening

Patient Case (cont'd)

- Course
  - BP treated; lowered to 115/85
  - Cath (intubated): non-obstructive lesions (<50%)
  - CTA-PE protocol: non-occlusive, strand-like embolus straddling 2 segmental arterial branches of RUL → heparin
  - Coffee ground emesis → GI: needs endoscopy and colonoscopy

Patient Case (cont'd)

- Course
  - ECHO: EF~48%, mild global LV hypokinesis; diastolic dysfunction
  - BLE dopplers: no DVT
  - Pulmonary: PE false positive

Patient Case (cont'd)

- Course
  - Creatinine rise to 3.5 with oliguria
  - Groin AV fistula and pseudoaneurysm, treated with thrombin injection; → infected → multiple antibiotics
  - Day of discharge: fall
    - Intracranial bleed → burr hole, ventriculostomy
  - Worsening renal and neuro function → comfort care → SNF, expired

Objectives

- To increase awareness of risks associated with hospitalization for older persons
- To describe why older persons are especially susceptible to complications when hospitalized
- To describe approaches to preventing complications and optimizing patient safety and outcomes

Hazards of Hospitalization

- Bed rest
- Enforced dependency
- Diagnostic procedures
- Urinary catheters
- IV fluids
- Drugs

- Malnutrition
- Electrolyte abnormalities
- Nosocomial infection
- Falls
- Delirium
- Hospital discharge

Why are elders at risk?

- Normal aging changes
  - Therapeutic window separating benefit from harm narrows
  - Loss of responsiveness to stress
  - Increased sensitivity to environment
  - Diminished physiological reserve at level of organ system
    - ✓ Example: Decreased renal blood flow and glomerular filtration rate (interstitial fibrosis, abnormal glomeruli)

Atypical presentations identify elders at particular risk

- Symptoms not referable to the organ system with the problem
  - Fall as presentation for pneumonia
  - Delirium as presentation of acute MI
- Atypical presentations are a marker of frailty
- Atypical presentation, premorbid functional status, and functional decline on admission independently associated with adverse hospital outcomes (death, prolonged stay, NH placement, failure to recover premorbid functional status)

Jarrett PG et al. Arch Intern Med 1995;155:1060.

Overview of Topics for Today

- Risks of medical interventions
- Acute functional decline
- Delirium
- Falls

Cascade Iatrogenesis

- A related sequence of adverse events triggered by an initial medical intervention
- Occurs most frequently among
  - Oldest
  - Most functionally impaired
  - Those with a high severity of illness on admission
- A significant portion may be preventable with closer attention to initial assessment and documentation of functional status

Potts S et al. Qual Rev Bull 1993;19:199.
Lefevre F et al. Arch Intern Med 1992;152:2074.

Medical Interventions: Bottom Line

- Remember that every intervention has associated risks
- Carefully consider the necessity of every contemplated intervention for an elder in the hospital

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New Walking Dependence

- 1,181 community-dwelling adults ≥70 years hospitalized for medical illness and who walked independently prior to hospitalization
- 16.8% newly dependent in walking at discharge
  - >1/3 discharged without assistive device
  - 27% dependent in walking 3 months post-discharge
- Risk factors
  - Age >85
  - >4 comorbidities
  - Use of an assistive device prior to admission
  - IADL or ADL impairment prior to admission
- More likely to be discharged to SNF

Mahoney JE et al. J Gerontol 1998;53:M307.

New ADL Dependence

- 2,293 adults ≥70 years hospitalized, interviewed about ADL function (bathing, dressing, eating, transferring, toileting) at admission and at discharge
- >1/3 had worse ADL function at discharge than pre-illness baseline
- Advanced age associated with loss of ADL function and failure to recover during hospitalization (OR for ≥90 vs. 70-74 yr=3.4, 95% CI,1.9-6.1)

Covinsky KE et al. J Am Geriatr Soc 2003;51:451.

Hospital Admission Risk Profile (HARP)

Instrument to identify elders at risk of functional decline following hospitalization

– Age ≥75

– Abnormal Mini Mental Status Exam score

– Dependence in ≥2 IADLs prior to admission

Sager MA et al. J Am Geriatr Soc 1996;44:251.

Prevention of Acute Functional Decline

- Multicomponent interventions that include exercise (e.g., ACE units)
  - Early physical and occupational therapy
  - Early mobility
  - Attention to nutrition
- Positive effects
  - More likely to be discharged home
  - More likely to be able to perform ADLs at discharge
  - Decreased LOS (1 day) and total hospital costs

Landefeld CS et al. NEJM 1995;332:1338.
De Morton NA et al. Clin Rehabil 2007;21:3.

**Acute Functional Decline:
Bottom Line**

- Functional status is an important "vital sign" for hospitalized elders

- Preventive and rehabilitative efforts are particularly important for oldest old

Overview of Topics for Today

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- Falls

Definition of Delirium

- Acute confusional state
  - Acute onset and fluctuating course
  - Inattention is hallmark
  - Disorganized thinking
  - May have altered level of consciousness
    - Hypoactive to hyperactive

Inouye SK et al. NEJM 2006;354:1157.

Risk Factors for Delirium

- Age >65, M>F
- Dementia, prior stroke, prior delirium
- Poor functional status
- Visual or auditory impairment
- Poor nutrition or hydration
- Polypharmacy, certain medications
- Comorbidities
  - Severe illness, multiple problems, chronic liver or kidney disease, HIV

Inouye SK et al. NEJM 2006;354:1157.

Meds May Precipitate Delirium

- Medications with anticholinergic side effects
  - Antihistamines (e.g., Benadryl, Atarax)
    - Alternative: sarna lotion
  - Antiemetics (e.g., Compazine, Phenergan, Reglan)
    - Alternative: Zofran
  - Muscle relaxants (Flexeril, Robaxin)
- Benzodiazepines
  - Only use for true ETOH withdrawal, and decrease CIWA dose if patient is elderly

Consequences of Delirium

- Predicts longer hospital stay and discharge to nursing home
- Increases 12-month mortality
- Predicts worsening cognitive function and ADL decline
- Symptoms often persist post-discharge, for up to 12 months

Siddiqi N et al. Age and Ageing 2006
McCusker J et al. J Am Geriatr Soc 2003
McCusker J et al. Arch Intern Med 2002

Confusion Assessment Method (CAM)

Instrument to detect delirium in hospitalized persons

- Highly sensitive and specific
- Version for use in ICU

Inouye SK et al. Ann Intern Med 1990;113:941.

Prevention of Delirium

- Prevention more effective than treatment
  - Risk factor reduction strategy (Hospital Elder Life Program, or HELP): impaired cognition or orientation, sleep deprivation, immobility, sensory impairments, dehydration
  - Reduced number and duration of delirium episodes, but not recurrence or severity

Inouye SK et al. NEJM 1999;340:669.

Overview of Topics For Today

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- Delirium
- Falls

Definition of Hospital Fall

- Any unplanned descent to the floor
  - Includes acute events (stroke, syncope, seizure)

National Quality Forum (NQF) 2003.

Falls – An Important Safety Issue

- Most common inpatient accident (2-9 per 1,000 patient-days)

- 30% of inpatient falls result in injury — 4-6% are serious

- Lengthen stay and increase costs

Krause et al. J Gen Intern Med 2005;20:116.
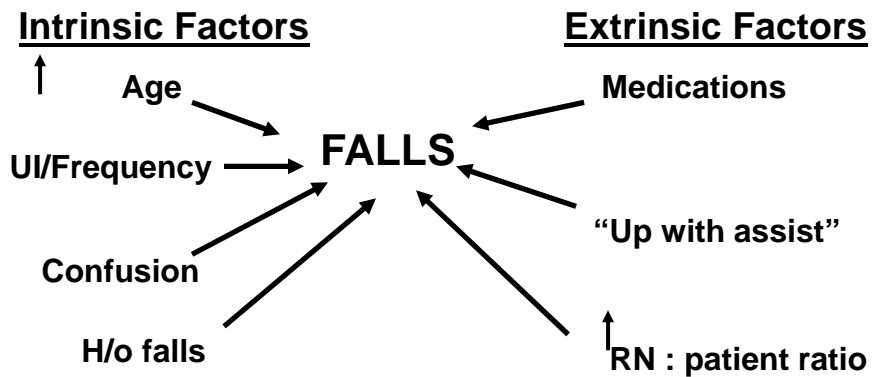
HItcho et al. J Gen Intern Med. 2004;19:732.

Falls – An Important Quality Issue

- Since 2008, Centers for Medicare & Medicaid Services (CMS) no longer reimburses fall-related injury care

- Falls may precipitate lawsuits

- Reducing inpatient falls is a National Patient Safety Goal (The Joint Commission) since 2005
  - 2-3 per 1,000 patient-days is a typical goal

When and where do falls occur?

- 80-90% unwitnessed
- 50-70% occur from bed (25%), chair, or transfers between bed and chair
- 10-20% occur in bathrooms
- No consistent pattern in relation to time of day

Inpatient Falls Occur Due to a Combination of Reasons

Intrinsic Factors

Age

UI/Frequency

Confusion

H/o falls

FALLS

Extrinsic Factors

Medications

"Up with assist"

RN : patient ratio

Krause et al. J Gen Intern Med 2005;20:116.
Oliver et al. Age Ageing 2004;33:122.

Risk Factors for Fall-Related Injuries

- Any injury
  - Increased age
  - Falls in bathroom or areas outside of patient's room
  - Unassisted fall

Krause et al. Infect Control Hosp Epidemiol 2007;28:544.

Risk Factors for Fall-Related Injuries

- Serious injury
  - A aged 85+ (or younger but frail)
  - B bones
  - C coagulation
  - S recent surgery

Can falls in hospital be predicted?

- Variety of structured tools available
  - (Morse, STRATIFY, Hendrich, Hopkins)
- These are different from "fall risk factor checklists"
- All risk prediction tools have limited utility for predicting which patients are likely to fall in hospital
- Nurse clinical judgment is as good as structured assessment

Haines et al. J Gerontol A 2007;62:664.

Multifactorial Interventions Reduce Inpatient Falls

- Multifactorial interventions

  - Reduce rate of falls by ~30% (4 trials, 6,478 patients)

  - Reduce risk of falling by ~25% (3 trials, 4,824 patients)

Cameron et al. Cochrane Database Syst Rev 2010; CD005465.

What is "Multifactorial" Intervention?

- Assess individual for his / her fall risk factors

- Address each risk factor identified

What about single interventions for preventing falls?

	Ineffective	Effective	Insufficient Evidence
Bedrails			X
Physical restraints	X		
Bed and chair alarms	X		
Low beds	X		
Exercise			X
Education alone	X		
Education + HP f/up		X	
Hip protectors			X
Floor material modification			X

What about single interventions for preventing falls?

	Ineffective	Effective	Insufficient Evidence
Increased observation by volunteers			X
Hourly rounding by staff			X
Medication review and adjustment		X	
Delirium prevention			X

What about single interventions for preventing falls?

	Ineffective	Effective	Insufficient Evidence
Continence promotion			X
Staff or family education			X
Management of dizziness, postural hypotension, or syncope/presyncope			X
Footwear modification			X
Correction of visual impairment			X

Preventing Inpatient Falls: Paradigm Shift

Old Paradigm
- Single discipline (nursing) responsible for risk assessment and management
- Interventions focus solely on environmental modifications

New Paradigm
- Role for multiple disciplines
- Communication about fall risk occurs among all team members and involves patient and family
- Interventions address patient-specific risk factors for falling and for fall injury

Rationale for Physician Role in Inpatient Fall Prevention

- Some interventions to reduce falls require a physician order
  - Medication changes
  - Physical therapy consult
  - Discontinuation of tethering devices (foleys, IVs, telemetry)
- One RCT of multifactorial fall prevention intervention that did not involve medical staff had a null result (Cumming et al, *BMJ*, 2008)

Implications for Practice

- Risk scores (from risk prediction tools) are not essential for successful fall prevention
- Patient-specific risk factors that are modifiable should be identified and addressed for all patients
- Education of staff and patients is likely important (necessary but not sufficient)
- Involving all team members, including medical staff, in discussion of risk and risk reduction measures, is essential

Summary

- Complications in hospital are more common among elderly
- Many complications are preventable

REVIEWS

Ten Ways to Improve the Care of Elderly Patients in the Hospital CME

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Hospitalists care for elderly patients daily, but few have specialized training in geriatric medicine. Elderly patients, and in particular the very old and the frail elderly, are at high risk of functional decline and iatrogenic complications during hospitalization. Other challenges in caring for this patient population include dosing medications safely, preventing delirium and accidental falls, and providing adequate pain control. Ways to improve the care of the hospitalized elderly patient include the following: screening for geriatric syndromes such as delirium, assessing functional status and maintaining mobility, and implementation of interventions that have been shown to prevent delirium, accidental falls, and acute functional decline in the hospital. This article addresses these issues with 10 evidence-based pearls developed to help hospitalists provide optimal care for this expanding population. *Journal of Hospital Medicine* 2011;6:351–357. © 2011 Society of Hospital Medicine

Recent studies of the growth of the hospitalist movement have confirmed that hospitalists are taking care of an increasing percentage of hospitalized older adults.[1,2] Unfortunately, few hospitalist groups have specific programs or protocols to address the special needs of older patients.[3,4] We were inspired by a "top 10" article written by nephrologists for primary care physicians to compile 10 evidence-based pearls that may be helpful to hospitalists caring for older persons.[5]

1. Many Health Conditions in Older Patients are Multifactorial and Require a Multifactorial Approach to Care

A geriatric syndrome is a multifactorial condition occurring primarily in frail elderly which is usually due to multiple contributing factors and results from an interaction between patient-specific impairments and situation-specific stressors.[6–8] Geriatric syndromes cannot be treated easily with a single intervention; the approach must target each modifiable risk factor. Table 1 illustrates for an example of how this approach differs from the traditional medical approach in the case of falls, a common geriatric syndrome. Hospitalists commonly encounter the geriatric syndromes that either lead to hospitalization, such as falls or dementia, or that can complicate a hospitalization for another condition, such as delirium, falls, or urinary incontinence. Two geriatric syndromes in particular,

delirium and falls, are associated with increased length of stay, increased healthcare costs, and substantial morbidity.[9,10] Multifactorial interventions such as the Hospital Elder Life Project (HELP) have been shown to prevent delirium and falls.[11–14] Studies of the HELP intervention demonstrated benefits on outcomes that are important to hospitalists, including shortened length of stay.[10,15] While implementing these interventions is not possible at every institution, it may be possible to implement some aspects in a targeted fashion (for example, early physical therapy and mobilization to decrease risk of delirium and falls) or to work with hospital administration to implement the larger interventions.

2. Screening Elderly Patients for the Presence of Common Geriatric Syndromes Can Improve Care

Comprehensive geriatric assessment, a process of multifactorial health evaluation of the older patient, is an important part of geriatric medicine and has been shown to reduce functional decline.[16] While comprehensive geriatric assessment may not be practical in the acute care setting, some basic principles and tools of geriatric assessment, namely screening for geriatric syndromes, can be helpful. Here is one efficient, evidence-based approach to screening hospitalized elderly patients for cognitive impairment and falls, and then using the results of screening to improve care:

Brief cognitive assessment using the Mini-Cog screening tool

Even with cognitive screening, it can sometimes be difficult to distinguish between dementia and delirium in an acutely ill person. However, knowing who is cognitively impaired on admission tells us who is likely to develop delirium and may need to be discharged to a supervised location, such as a nursing

TABLE 1. Comparison of Two Approaches to Geriatric Syndromes Using Falls as an Example

Traditional Medical Approach (Diagnosis and Treatment)	Geriatric Approach (Risk Factor Assessment and Reduction)	
Search for cause of falls (eg, syncope workup including echocardiogram, neurologic workup including imaging)	Search for cause of falls	
	Assess for risk factors and target interventions reduce or eliminate risk factors identified, eg:	
	Risk factor	Intervention
	Leg weakness	Strength training
	Falls when transferring	Training in use of assistive device for transfers
	Inadequate lighting at home	Home safety evaluation by physical therapist and installation of lights at home

NOTE: See Phelan et al.[8]

TABLE 2. Mini-Cog Screen for Dementia*

The Mini-Cog combines an uncued three-item recall test with a clock-drawing test (CDT) that serves as the recall distractor. The Mini-Cog can be administered in about three minutes, requires no special equipment, and is less influenced by level of education or language differences.

Administration

1. Make sure you have the patient's attention. Then instruct the patient to listen carefully to, repeat back to you, and remember (now and later) three unrelated words. You may present the same words up to 3 times if necessary.
2. Instruct the patient to draw the face of a clock, either on a blank sheet of paper, or on a sheet with the clock circle already drawn on the page. After the patient puts the numbers on the clock face, ask him or her to draw the hands to read a specific time (11:10 or 8:20 are most commonly used; however, other times that require use of both halves of the clock face may be effective). These instructions can be repeated, but no additional instructions should be given. If the patient cannot complete the CDT in three minutes or less, move on to the next step.
3. Ask the patient to repeat the three previously presented words.

Scoring

Give 1 point for each recalled word after the CDT distractor. Score 0–3 for recall.
Give 2 points for a normal CDT, and 0 points for an abnormal CDT. The CDT is considered normal if all numbers are depicted, once each, in the correct sequence and position around the circle, and the hands readably display the requested time. Do not count equal hand length as an error. Add the recall and CDT scores together to get the Mini-Cog score:

- 0–2 positive screen for dementia.
- 3–5 negative screen for dementia.

facility.[17,18] The Mini-Cog (shown in Table 2) is our preferred tool for cognitive screening, because it takes only 2–4 minutes to administer, has a sensitivity of 76% and specificity of 89% [similar to the Mini-Mental State Examination (MMSE)], and has been validated in a multiethnic, multilingual sample with low literacy.[19,20] The Mini-Cog has not been studied extensively in the inpatient setting, but one study did find that abnormal Mini-Cog scores correlated with the development of delirium among hospitalized elderly patients.[21] Other tools appropriate for brief cognitive screening of hospitalized patients include the MMSE, which is widely known but limited by copyright for clinical use and longer time needed for administration, and the Short Portable Mental Status Questionnaire (SPMSQ), which is entirely verbal and does not require that the patient write or draw.[22,23] A new tool, the "Sweet 16," which is also entirely verbal and takes about 2 minutes to administer, shows promise but has not been validated in the inpatient setting.[24]

Fall screen: "Have you fallen in the past year?" with more detailed inquiry for frequent fallers

An elderly patient with a history of falls is at high risk for falling while in the hospital. Interventions that target multiple risk factors appear to be effective in reducing risk and rate of falling.[25] Some aspects of these multifactorial interventions include environmental modifications such as low beds, high-impact floor mats, restraint removal, bedside posters and patient education materials, and exercise.[13,26] Medication review and reductions in medications that contribute to falls (psychoactive medications, diuretics, blood pressure agents) can also reduce fall risk.[13,14] Many experts recommend checking a 25-hydroxy vitamin D level for patients who come into the hospital for treatment of a fall-related injury, starting or continuing vitamin D and calcium supplementation for those with normal vitamin D levels, and starting aggressive vitamin D replacement with 50,000 units of oral ergocalciferol weekly for those with a level below 20 ng/mL. Vitamin D appears to play an important role in neuromuscular function as well as bone density.[27] Meta-analyses have demonstrated that vitamin D supplementation of 700–1,000 IU daily may reduce the risk of falls in the elderly by about 20%, that the effect is achieved in the short term (on the order of 2–5 months), and that the benefit persists for up to 36 months.[28,29]

3. Elderly Patients are at Risk for Functional Decline During Hospitalization and Measures Can Be Taken to Prevent This

A "cascade to dependency" has been described in which the effects of usual aging (eg, fragile skin) and hospitalization (eg, immobilization) interact with each other, often producing complications (eg, pressure ulcers) that can lead to the loss of the ability to live independently.[30] Functional decline during hospitalization is common and is associated with poor prognosis. In one study of elderly patients with new Activities of Daily Living (ADL) disability at discharge, over 40% were dead by 12 months after discharge, and only 30% had returned to baseline function.[31,32] Functional status may affect discharge planning, especially if the patient is not able to return safely to his or her previous living environment. Elderly patients are very vulnerable to new ADL dependency and loss of ambulatory ability as a result of a hospitalization.[33,34] The

initial evaluation of an elderly patient should always include an inquiry into the patient's functional abilities, including whether the patient requires assistance to perform self-care (ADL) activities or instrumental activities of daily living (IADLs), and who is available to help at home. We remember ADLs as those activities we learn as a young child (bathing, dressing, feeding, toileting, transfers) and IADLs as activities we learn when we leave our parents' home to live independently (shopping, cooking, laundry, housekeeping, managing money, using public transportation). Patients in assisted living facilities and adult family homes receive varying degrees of help with ADLs and IADLs, and no particular level of assistance can be assumed; assisted living residents may be at higher risk of functional decline during hospitalization than community-dwelling persons.[35]

Acute Care of Elderly (ACE) units have been shown to reduce functional disability and discharge to long-term care settings, with length of stay and hospital charges similar to that of usual care.[36] Most hospitals do not have ACE units, but implementing some components of the intervention, such as early physical and occupational therapy, early discharge planning, early mobility, and adequate nutrition may reduce functional disability. A Cochrane review found a small decrease in length of stay of about a day among elderly patients who participated in a structured exercise program, which could be extrapolated to support the usefulness of increased mobility and early physical therapy.[37]

4. Delirium is a Common but Serious Condition Among Hospitalized Elderly Patients and in Some Cases Can Be Prevented

The incidence of delirium appears to be as high as 60% in hospitalized elderly patients with multiple risk factors for this condition.[38,39] Delirium predicts longer hospital stay, increases likelihood of discharge to a skilled nursing facility, and is a marker for significant morbidity and mortality.[40–42] Cognitive screening, as discussed above, can help determine who is at risk for delirium, and the Confusion Assessment Method (CAM) is becoming more widely used as a bedside screening tool for detecting delirium.[43] Other important risk factors for delirium in addition to preexisting cognitive impairment include age over 65, prior delirium, polypharmacy, functional dependence, and sensory impairment.[44] A landmark randomized controlled trial by Sharon Inouye et al. showed that delirium can often be prevented in high-risk patients by ensuring frequent reorientation, maintenance of the patient's usual sleep-wake cycle, early mobilization, adequate nutrition and hydration, and regular use of sensory aids such as glasses and hearing aids.[11]

When delirium does occur despite preventive efforts, it should trigger a thorough investigation for an underlying cause. Common contributing factors to delirium in hospitalized patients include infections such as urinary tract infections or hospital-acquired pneumonia, pain, electrolyte abnormalities, cardiac ischemia, medication side effects, and urinary retention or constipation. Any psychoactive or anticholinergic medication can contribute to, or exacerbate, delirium; common culprits include diphenhydramine, benzodiazepines, and muscle relaxants.[44] Although one or more treatable underlying causes should always be sought, many cases of delirium in the hospital are multifactorial.

If pharmacologic treatment for delirium is necessary, low-dose haloperidol is the first-line agent, starting with 0.25 mg intravenously or 0.5 mg by mouth, nightly to twice a day. A recent systematic review supported the use of haloperidol as a first-line agent in the acute setting; second-generation antipsychotics are an alternative, but studies have shown no benefits of these agents over haloperidol in terms of safety or efficacy.[45] Physical restraints should be avoided in delirious patients, as they may actually worsen delirium and have not been proven to reduce falls or secondary injury.[46]

5. Treating Nondementia Illnesses in Hospitalized Elders With Dementia Requires Consideration of the Patient's Limited Life Expectancy and Cognitive Deficits

Elderly patients with dementia are frequently hospitalized for medical illness and pose special challenges to the hospitalist. Patients with dementia may not be able to accurately report symptoms and side effects of therapy, and may lack decisional capacity. The clinician should also carefully consider the benefits and burdens of a proposed therapy or diagnostic test, taking into account the patient's cognitive deficits and limited life expectancy.[47] The median postdiagnosis life expectancy of a patient with Alzheimer disease is about 4 years for men and about 6 years for women, with a range from about 2 to 9 years, according to population-based studies of incident Alzheimer dementia.[48,49] In a patient with early or mild dementia, the hospitalist may first need to establish whether the patient does indeed have dementia. It is also important to question family about how the patient is managing at home so that appropriate discharge plans can be made.

Any intervention such as surgery or intubation in a patient with dementia should be considered carefully in the context of the patient's dementia, keeping in mind the remaining life expectancy, increased risk for delirium after surgery, and potential difficulty with adherence to postoperative precautions or participation in rehabilitation. Invasive procedures such as mechanical ventilation or central line placement may not be indicated in patients with advanced dementia. In one prospective cohort study, patients with advanced dementia admitted to the hospital for hip fractures or pneumonia had much higher mortality than those without

TABLE 3. Elderly Patients' Increased Risk of Adverse Events During Hospitalization

Falls and fractures[58]
Nosocomial infections[59]
Delirium[44]
Surgical and postoperative complications[58]
Adverse drug events[56]
Pressure sores[56]

NOTE: Inouye[44]; Rothschild et al.[56]; Leape et al.[58]; Gross et al.[59]

TABLE 4. Medications to Avoid or Prescribe With Caution in the Elderly

Medication	Rationale
Benzodiazepines	Can contribute to delirium and falls.
Muscle relaxants	Anticholinergic side effects; sedating; can contribute to delirium.
Diphenhydramine	Very sedating; can contribute to delirium; do not use as a sleep aid, and use lowest possible dose when treating allergic reactions.
Nitrofurantoin	Can cause renal impairment.
Ketorolac	Can lead to gastrointestinal bleeds and renal impairment.
Ferrous sulfate in doses >325 mg/day	Can cause severe constipation; higher doses not well absorbed.
Digoxin in doses of >0.125 mg/day	Decreased renal clearance can increase risk of toxicity (higher doses acceptable for atrial arrythmias).
Amiodarone	Multiple toxicities; lack of proven efficacy in older adults.
Fluoxetine	Long half-life; can cause agitation and sleep disturbance.
Meperidine	Can cause seizures and contribute to delirium.
Doxazosin	Can cause hypotension and contribute to falls.

NOTE: Based on the 2003 Beers Criteria.[65]

dementia, despite having equal rates of procedures such as mechanical ventilation and central line placement.[50]

A common scenario in a patient with advanced dementia is the patient presenting with decreased intake and dysphagia; family and/or caregivers inquire about enteral tube feeding and/or long-term intravenous hydration. This situation requires a thoughtfully presented, informative discussion with the family about artificial feeding in advanced dementia. There is no evidence that artificial feeding improves outcomes, and a recent Cochrane systematic review found insufficient evidence to suggest that enteral tube feeding is beneficial in patients with dementia.[51–53] Instead, dementia patients at the end of their lives benefit from a palliative approach, which would include hand-feeding for comfort if the patient indicates hunger.[54]

6. Frail Elderly Patients are at High Risk for Iatrogenic Complications During Hospitalization

Frail elders are at increased risk for iatrogenic complications, including surgical- and procedure-related events, adverse drug events, nosocomial infections, pressure ulcers, and falls.[55–57] In the Harvard Medical Practice Study, a retrospective study of adverse events in 30,000 patients, those age 65 and over accounted for 27% of the hospitalized population but 43% of the adverse events. In this study, four types of adverse events occurred at least twice as often in older patients: fractures, falls, nontechnical postoperative complications, and adverse events related to noninvasive treatments.[58] The risk of hospital-acquired infection also rises dramatically with age; risk is ten times higher in patients over 70 than those aged 49 and under, with urinary tract infections and surgical site infections the most common.[59] The oldest, most seriously ill and most functionally impaired elderly patients are at particularly high risk of "cascade iatrogenesis," where one medical intervention triggers a series of adverse events.[60] Frail elderly patients are at greater risk for adverse events during hospitalization, and careful consideration of the need for all diagnostic tests and procedures may reduce risks. Table 3 lists the iatrogenic complications that disproportionately affect the elderly.

7. Pain Should Be Aggressively Identified and Appropriately Treated

Adequate treatment of pain in the elderly can improve functional status, mobility, and mood. Clinicians are understandably wary of prescribing opioids in the elderly, but undertreatment of pain is also common and in hospitalized patients can lead to delirium, delays in rehabilitation, and higher healthcare costs.[44,61] Acetaminophen is generally safe and is recommended as first-line therapy in most cases of pain. Nonsteroidal antiinflammatory drugs (NSAIDS) should be used with caution, as the risk of gastrointestinal toxicity increases with age; long-acting agents such as toradol should be avoided.[62] A study of adverse drug reactions causing hospitalization in elderly individuals implicated NSAIDs in 23.5% of cases.[63] If a patient has severe pain that limits functional capacity but does not respond to acetaminophen, it is reasonable to consider low-dose opioids. The 2009 American Geriatrics Society guidelines recommend that opioids be used for severe pain, especially when it limits functional capacity. Opioids should be given orally when possible and started at low doses (for example, 2.5 to 5 milligrams of oxycodone offered every 4 hours as needed). Either oxycodone or morphine can be used as a first-line, short-acting opioid, but morphine should be used cautiously in patients with renal insufficiency, as toxic metabolites are renally cleared. Methadone should be used very cautiously and ideally by clinicians experienced in its use because of its long and variable half-life. Serotonin-norepinephrine reuptake inhibitors such as duloxetine, and anticonvulsants such as gabapentin, can be helpful adjuncts for neuropathic pain; tricyclics should generally be avoided, because the elderly are particularly sensitive to the anticholinergic

side effects (ie, sedation, orthostatic hypotension, urinary retention, constipation) of these agents.[61] Nortriptyline, which has the least anticholinergic properties of this medication class, may be the best option if a tricyclic is desired.

8. Hospitalization Can Be an Opportunity for a Thorough Review and Reduction of Outpatient Medications in Collaboration With the Patient's Primary Care Provider

Adverse drug reactions (ADRs) are potentially life-threatening for all patients, but elderly individuals are disproportionately affected. It is estimated that 30% of hospital admissions of older patients are due to drug-related toxicity.[64] The Beers criteria provide expert consensus on drugs that should either be avoided or used cautiously in the elderly; we have highlighted some of the drugs on the Beers list that are relevant to the hospitalist in Table 4. Notable inclusions on the most recent Beers list include nitrofurantoin, ferrous sulfate at dosages greater than 325 mg per day, doxazosin, and fluoxetine.[65] Anticholinergics (such as oxybutynin) and cholinesterase inhibitors (such as donepezil) should not be used together, because the interaction makes them ineffective.

Many ADRs are caused by medications that are not on the Beers list but have narrow therapeutic windows, especially warfarin and insulin; digoxin, which is on the Beers list, is another common culprit in ADRs leading to emergency room visits.[66] Medications that are clearly causing ADRs should be discontinued, with the knowledge and input of the primary care provider, and with written documentation on the discharge summary and clear instructions to the patient. Even when a hospital admission is not a result of an ADR, it may provide an opportunity to review the patient's medication list, clarify that the patient is taking medications as directed by their primary care provider, and determine if the list contains medications where risks now outweigh benefits, in which case those medications should be discontinued. Studies have shown that elimination of medications that are associated with falls reduces the risk of future falls.[67] Adjustments to patient's medications should be made in close collaboration with the primary care provider and with a clinical pharmacist, if available.

9. Discharge Planning for an Elderly Patient Should Start Early, Be Comprehensive, and Involve the Patient and Caregivers

A successful discharge plan for an elderly patient must start early, take functional status into account, and perhaps most importantly, the planning process should involve the patient and family, if appropriate. One study of patients over 70 discharged from an urban, academic public hospital found that only 10% recalled receiving written discharge instructions, and only 53% who were prescribed a new medication actually had that medication at home.[68] Growing evidence suggests that older patients have poorer func-

tional health literacy regarding medications.[69] Care transitions are an active area of research, and multiple studies have shown lower rates of rehospitalization with comprehensive transitional care programs involving "transition coaches" or advance practice nurses providing home visits and follow-up telephone calls.[70,71] More research is needed in this area to develop simple, cost-effective care transitions programs. In the meantime, hospitalists can actively involve a multidisciplinary team (pharmacists and social workers, for example) early in the hospitalization, provide more "patient-friendly" discharge materials such as those available as part of the Society of Hospital Medicine's BOOST, and place targeted follow-up phone calls after discharge.[52,72–74] Ensuring that a frail elderly patient's primary care provider is aware of the hospitalization may be particularly important in avoiding postdischarge problems.[75]

10. Elderly Patients are Often Very Clear About Their Preferences for Treatment. Discussing This on Admission Can Help Clarify the Goals of the Hospitalization

The risks and benefits of any intervention being considered should be presented and discussed with the patient in the context of the likelihood of the intervention restoring an acceptable quality of life to the patient. Many common chronic conditions in the elderly such as Parkinson disease, congestive heart failure, and dementia are progressive and life-limiting. Qualitative studies confirm that elderly patients want to know the likelihood that a proposed intervention will help them return to their previous level of functioning or a level that is acceptable to them.[76,77] In one prospective cohort study, older age was found to correlate with a higher rate of withholding ventilatory support, dialysis, and surgery.[78] However, a more recent study has suggested that patient preferences are more dynamic, and that older patients will make decisions based on current health status rather than core values.[76] While families should be involved in the process of clarification of goals of care, the patients' own values should be elicited whenever possible, with bedside assessment of decision-making capacity to ensure that patients are allowed to speak for themselves if they possess decisional capacity for the decision at hand.[79]

Hospitalists should have a special approach to the elderly patient which takes into account the elder's increased vulnerability to iatrogenic complications and acute functional decline, the presence of geriatric syndromes, and individual preferences. Early assessment of an elderly patient's cognitive and physical functioning, level of pain, fall risk, and preferences for care are necessary for optimal inpatient care and may result in preserved function and a decrease in adverse events.

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