

WORKING P A P E R

Quality Indicators for Quality of Care During Hospitalization for Vulnerable Elder Persons

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**QUALITY INDICATORS FOR QUALITY OF CARE DURING HOSPITALIZATION
FOR VULNERABLE ELDER PERSONS**

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Introduction

Admission to the hospital is a near certainty during the lifetime of vulnerable elders. A hospital stay can be associated with serious declines in health and function and utilization of significant health care resources. This paper aims to describe quality of care indicators for vulnerable elders who are hospitalized. While many of the ACOVE conditions, such as congestive heart failure, pressure ulcers, and ischemic heart disease, contain indicators for the quality of hospital care associated with that condition, this paper focuses on general or inter-condition indicators of hospital quality of care.

Methods

The methods for developing these quality indicators, including literature review and expert panel consideration, are detailed in a preceding paper.(1) For hospitalization, the structured literature review identified 8,933 titles, from which abstracts and articles were identified that were relevant to this report. Based on the literature and the authors' expertise, 23 potential quality indicators were proposed.

Results

Of the 23 proposed indicators, 9 were judged valid by the expert panel process (see Quality Indicator table), two were merged into other indicators, and 12 were not accepted. The literature summaries that support each of the indicators judged to be valid by the expert panel process are described below.

Quality indicator #1:

Evaluation of the Vulnerable Elder at Hospital Admission

IF a vulnerable elder is admitted to the hospital for any acute or chronic illness or any surgical procedure, **THEN** the evaluation should include within 24 hours: (1) diagnoses, (2) pre-hospital and current medications, and (3) cognitive status, **BECAUSE** poor function in these domains predicts functional decline and poor post-hospital outcomes, which may be amenable to intervention.

Supporting evidence: Cognitive dysfunction and specific conditions and medications are associated with poor hospital outcomes, as indicated by increased morbidity, mortality, length of stay, discharge to assisted care rather than independent living, and cost. However, evidence that interventions, based on evaluation of these domains, can improve outcomes is either limited, non-existent, or confounded by multiple interventions. Some of the medical record documentation required by this indicator may also be useful in adjusting case mix to evaluate quality of care.

Most geriatric consultation,(2) geriatric special care unit studies (3,4,5,6) or hospital-wide geriatrics interventions (7) use a form of comprehensive evaluation and direct interventions on the dysfunction discovered. Thus, the multi-dimensional assessment may allow "targeting" of interventions to those most likely to benefit. The reasons that each of the elements is necessary are discussed below:

Diagnoses: The identification of past and current diagnoses is fundamental to medical treatment. Vulnerable elders often have several comorbidities that may affect the approach to hospital care.

Pre-hospital and current medications: In a retrospective review, adverse drug reactions occurred in 0.7% of hospitalized patients of all ages and represented 19.4% of all complications in those patients.(8) Over 50% of adverse events due to drug treatment were considered the result of negligence. An error in dose or method of use occurred in 42% of the cases, inappropriate use of a drug in 22%, and inadequate follow-up of therapy in 45% of cases. Daily prospective monitoring detected adverse drug events in 14.6% of hospitalized elderly patients and 54.2% of those events were judged preventable.(9) Adverse drug events were associated with an additional length of stay of 2.2 days (4.6 for preventable events) and an additional cost of \$2595 (\$4685).(10) As many as 10% of hospital admissions in the elderly may be due, at least in part, to adverse drug reactions.(11) Simple enumeration of the current and recent past medications is the first step in preventing interactions and adverse events.

Cognitive status: Risk of functional decline is predicted by increasing age, lower Mini-Mental Status Exam (MMSE) scores on admission, and lower functional status (measured as preadmission instrumental activities of daily living).(12) No direct evidence exists to demonstrate that a baseline mental status examination will improve the subsequent diagnosis and treatment of delirium. However, several reviews of delirium, as well as the relevant Agency for Health Care Policy and Research (AHCPR) guideline,(13) recommend a baseline cognitive status examination, based on the high incidence of delirium after medical or surgical admission to the hospital as well as the fact that the most important and difficult differential diagnosis of delirium is dementia. One prerequisite for a diagnosis of delirium is convincing evidence that a change has occurred from the baseline mental status. Since dementia is so common among vulnerable elders (both in the hospital and in nursing homes), the baseline assessment of cognitive status is essential. Finally, dementia is the most important predisposing risk factor for

delirium, even exceeding “age greater than 80” in predictive power, so compromised cognition is a serious warning sign of susceptibility to delirium during the hospitalization.

Difficulties with *emotion*, particularly depression and anxiety, and *hearing* (14) are common in hospitalized elderly patients and are treatable. Documentation concerning baseline emotional status and sensory function is advisable for hospitalized vulnerable elders, however the ACP-ASIM Task Force on Aging found quality indicators requiring such documentation to be infeasible.

Quality indicator #2:

Discharge Planning

IF a vulnerable elder enters the hospital, **THEN** discharge planning should begin within 48 hours, **BECAUSE** this process decreases readmissions and length of hospitalization.

Supporting evidence: Comprehensive discharge planning has been shown to reduce the rate of hospital readmission over the short term. The components of discharge planning vary greatly, and the specific components responsible for decreased readmission have not been identified. A randomized clinical trial of comprehensive discharge planning in patients over age 70 demonstrated a reduction in readmissions, primarily in the first 2 weeks (4% versus 16%).(15) This comprehensive discharge planning protocol included an initial in-hospital visit with assessment of the patient and caregiver within 24 hours of admission, interim in-hospital visits, a post-discharge visit and telephone availability for 2 weeks following discharge. For 12 weeks following discharge for cardiac diagnoses (congestive heart failure, angina, myocardial infarction, coronary artery bypass grafting or cardiac valve replacement), the readmission rate was 22% in the intervention group and 33% in the control group (95% CI for the difference -

26% to 4%). Hospital days and total costs were also reduced in the intervention group for the first six weeks after discharge but not between six to twelve weeks.

Quality Indicator #3:

Endocarditis Prevention

IF a vulnerable elder has valvular or congenital heart disease, intracardiac valvular prosthesis, hypertrophic cardiomyopathy, mitral valve prolapse with regurgitation, or previous episode of endocarditis and a high risk procedure is planned, **THEN** endocarditis prophylaxis should be given, **BECAUSE** prophylaxis helps prevent endocarditis.

Supporting evidence: There are no randomized controlled human trials of patients with underlying structural heart disease that assess the value of antibiotic prophylaxis in the prevention of infectious endocarditis following bacteremia-inducing procedures. It is unlikely that any such studies will ever be performed, as strong evidence from observational studies in humans regarding antibiotic use and procedure-induced bacteremia combined with experimental evidence from randomized studies of animal models of infective endocarditis have led the American Heart Association (AHA) and others to establish guidelines for antibiotic prophylaxis of endocarditis.(16) This indicator is satisfied if the AHA guidelines are followed.

A population-based case control study of 273 cases of community-acquired endocarditis reported that the incidence among non-I.V. drug users was 5.14 community residents per 100,000 person-years. The strongest risk factors for endocarditis following a high risk procedure were mitral valve prolapse, congenital heart disease, cardiac valve surgery, rheumatic fever and heart murmur (odds ratio of 16.7, 95% CI 7.4-37.4). Interestingly, only 38% of the patients were previously aware of their cardiac abnormalities.(17)

One case-control study has assessed the efficacy of antibiotic prophylaxis at preventing endocarditis after dental procedures. Eight cases of patients with previously known moderate or high-risk structural heart lesions whose first-time native-valve infective endocarditis occurred within 12 weeks of a dental procedure were compared with 24 controls matched with similar echocardiographically-proven lesions, dental procedures and age. The study reported a 91% protective efficacy of antibiotic prophylaxis (odds ratio=0.09, upper 95% CI 0.93).(18)

Conformity with the American Heart Association guidelines has been reported to be poor. In one study at a university hospital, between 1987-1990 just 22% of 131 eligible cases received prophylaxis in accordance with the guidelines (19). In 20% of the cases where prophylaxis was indicated none was given.

Quality indicator #4:

Deep Vein Thrombosis and Pulmonary Embolus Prevention

IF a hospitalized vulnerable elder is at very high risk for venous thrombosis, **THEN** the patient should have venous thromboembolism prophylaxis, **BECAUSE** very high risk patients have a 4 to 10% chance of clinical pulmonary embolus and a 1 to 5% chance of fatal pulmonary embolus, and prophylaxis is effective at reducing this risk.

Supporting evidence: Numerous randomized controlled trials and a meta-analysis have resulted in a consensus statement supporting the efficacy of appropriate prophylaxis to reduce the risk of thromboembolism. For this indicator, acceptable thromboembolism prophylaxis is defined as adjusted-dose heparin, low molecular weight heparin or warfarin, or low dose unfractionated heparin with intermittent pneumatic compression.

A consensus statement (20) from the American College of Chest Physicians rated the evidence in support of various methods of deep venous (and therefore pulmonary embolism) prophylaxis. Without prophylaxis, the very high risk group had a risk of 40 to 80% for calf vein thrombosis, 10 to 20% for proximal vein thrombosis, 4 to 10% for clinical pulmonary embolus, and 1 to 5% for fatal pulmonary embolus. Very high risk conditions were defined as hip fracture as well as all abdominal, pelvic or lower extremity surgeries above the shin, except laparoscopic surgeries, and patients with prior venous thromboembolism or hypercoagulable states. The relative risk reductions for acceptable regimens of prophylaxis were 60 to 72%. These findings are supported by other systematic reviews.(21, 22) In comparison, low dose unfractionated heparin alone was effective (e.g. 39% risk reduction in studies of patients receiving total hip replacements) but inferior to the acceptable regimens above. Pulmonary embolism, the sequelae of deep vein thrombosis is a potentially lethal disease, and compliance with suggested prophylaxis is low.(23)

Quality indicator #5:

Stress Ulcer Prevention

IF a hospitalized vulnerable elder has peptic stress ulcer risk factors, **THEN** the patient should receive prophylaxis with either a histamine-2 receptor antagonist (H₂-blocker), sucralfate, or a proton pump inhibitor (PPI), **BECAUSE** prophylaxis decreases the risk of gastrointestinal bleeding.

Supporting evidence: Stress related gastric hemorrhage occurs in 5 to 10% of ICU patients, with a mortality rate of more than 30%. Risk factors for stress ulcers include respiratory failure (mechanical ventilation >48 hours) and coagulopathy (platelet count < 50,000/ml, international

normalized ratio > 1.5, partial thromboplastin time > 2.0 times control). The efficacy of medications to prevent stress related gastric hemorrhage is about 50%. Antacids, H₂-blockers, PPIs, and sucralfate have all been used for stress ulcer prophylaxis, but the drug of choice is unclear.

In a prospective multicenter cohort study of 2252 patients, 1.5% (95% CI = 1.0 to 2.1%) had clinically important bleeding.(24) Univariate analysis showed that respiratory failure, coagulopathy, hypotension, sepsis, hepatic failure, renal failure, enteral feeding, glucocorticoid administration, organ transplantation and anticoagulant therapy were significant predictors of bleeding. Multiple regression analysis showed that respiratory failure (odds ratio 15.6) and coagulopathy (odds ratio 4.3) were the only statistically significant risk factors. Mortality was 48.5% in the group with bleeding and 9.1% in the group without bleeding.

A number of randomized clinical trials have evaluated medications to prevent stress ulcers and there have been several meta-analyses summarizing these studies.(25-30) A meta-analysis of 16 prospective trials (total N=2133) reported that prophylaxis with either cimetidine or antacids against clinically overt stress ulcer bleeding in patients at increased risk is equivalent and superior to placebo (stress ulcer rate of 2.7%, 3.3%, and 15%, respectively)(25). A subsequent meta-analysis reviewed 63 randomized trials (30) and reported that prophylaxis with H₂-blockers decreased the incidence of both overt gastrointestinal bleeding (odds ratio=0.58; CI 0.42-0.79) and clinically important bleeding (odds ratio=0.44; CI 0.22-0.88). Sucralfate decreased overt bleeding in fewer studies (odds ratio=0.58; CI 0.34-0.99), but its effect on clinically important bleeding has been inadequately studied. A trend toward decreased overt bleeding was seen with antacids (odds ratio=0.66; CI 0.37-1.17). In direct comparisons, H₂-blockers appear to be superior to antacids (risk ratio=0.56; CI 0.37-0.84) for overt bleeding. The

efficacy of sucralfate appeared similar to both antacids and H₂-blockers, calling into question the optimal choice of drug.

The latter meta-analysis also reported that use of sucralfate may be associated with fewer cases of pneumonia and with lower mortality than use of H₂-blockers, but this was not supported by two subsequent randomized clinical trials comparing the two. One of these trials reported no difference between sucralfate and cimetidine (31), while the other reported ranitidine to be more effective than sucralfate (odds ratio 0.44, 95% CI 0.21-0.92) and that ranitidine was not associated with increased ventilator-associated pneumonia or mortality.(32) Little evaluation of the efficacy of PPIs for this indication has been carried out. Moreover, the proportion of subjects who were “vulnerable elders” in the above studies and meta analyses could not be determined.

Quality indicator #6:

Competency for Informed Consent

IF a vulnerable elder is to have an inpatient or outpatient elective surgery, **THEN** there should be medical record documentation of the patient’s ability to understand risks, benefits, and consequences of the proposed surgical operation before the operative consent form is presented for signature, **BECAUSE** the operative consent is valid only if patients have decision making capacity when it is granted.

Supporting evidence: Patient autonomy is a basic tenet of medical care in the U.S. Informed consent implies the ability to understand the risks, benefits, and consequences of the proposed operation. If delirium or dementia are sufficient to prevent comprehension of the risks,

benefits, and consequences of a proposed procedure, meaningful consent to the procedure cannot be given.

In a study of 84 elderly persons with delirium during their hospital stay, receiving 173 medical or surgical procedures, 19% had no consent documented, 20% used surrogate consent, 4% had cognitive assessments documented, 1% had legal consults documented, and none had an assessment of competency/decisional capacity documented.(33) Surrogates were used in 47% of cases with substantial impairment and in 4% of cases with near normal mental status near the time of consent. Surrogate decision makers should be sought to participate in the consent process if the patient lacks the capacity to consent.

Quality indicator #7:

Cardiac Evaluation Prior to Vascular Surgery

IF a vulnerable elder enters the hospital for non-emergent peripheral revascularization or aortic abdominal aneurysm repair, **THEN** a cardiac stress test should be performed, if not performed in the prior year, **BECAUSE** ischemic heart disease is common in such patients and the mortality risk of the peripheral revascularization is decreased by coronary revascularization first.

Supporting evidence: Patients with severe peripheral vascular disease or aortic abdominal aneurysm (AAA) are at high risk for coronary artery disease even without prior cardiac history or symptoms. Detection of significant coronary disease allows revascularization of the heart to precede the AAA repair or peripheral revascularization and may reduce morbidity and mortality. An ejection fraction of <50% by radionuclide ventriculography, ventricular wall motion

abnormalities, history of cigarette smoking and diabetes significantly diminish overall survival after revascularization of the extremity.(34)

Stress-based cardiac tests have a high negative predictive value (near 100%) but a low positive predictive value (13-36%) for cardiac complications (including death) following AAA repair or peripheral revascularization (see Table 1). Dipyridamole-scintigraphy has also been tested for its ability to predict outcome of peripheral revascularization. In 54 patients with a history of chest pain, prior myocardial infarction or abnormal rest ECG, evaluated prior to AAA repair or peripheral revascularization, scintigraphy showed thallium redistribution abnormalities in 41%.(37) Eleven percent of the original group received cardiac catheterization based on the dipyridamole-thallium imaging, and 30% underwent vascular surgery without further cardiac evaluation. All of those undergoing cardiac catheterization had severe multivessel coronary artery disease. Half of those who underwent vascular surgery without prior cardiac intervention had cardiac events (unstable angina, acute myocardial infarction or cardiac death). Coronary artery bypass grafting was performed in 4 of the 6 patients with severe multivessel coronary artery disease and none of those had adverse cardiac events following subsequent peripheral vascular disease. Those without evidence of redistribution abnormalities (normal or persistent defects) had no cardiac ischemic events. The degree of positivity of the dipyridamole-scintigraphy is likely important, but interpretation varies from site to site.(38, 40)

Coronary angiography of 42 consecutive aortic aneurysm repair patients showed 86% had significant coronary artery disease (48% triple- vessel or left main).(41) All 20 of the patients (non-randomized) with left main or triple vessel disease (8 with ejection fraction less than 50%) underwent myocardial revascularization 7 to 10 days prior to aneurysmectomy. Perioperative myocardial infarction and mortality rates were zero following either surgery.

Historical data suggest AAA perioperative mortality of 1 to 10% with myocardial infarction causing 20 to 45% of deaths. An ejection fraction of less than 50% and ventricular wall motion abnormalities predict an increased risk of death for three years following vascular surgery. (34) Identification and treatment of significant coronary artery disease is likely to have significant benefits beyond the immediate perioperative period.

Quality indicator #8:

Evaluation of Fever

IF a hospitalized vulnerable elder has a new fever ($T > 38.5^{\circ}\text{C}/101.3^{\circ}\text{F}$), **THEN** there should be documentation that a physician examination was performed within 4 hours (or fever evaluation performed within the last 48 hours or an alternative explanation for the fever documented in the chart), **BECAUSE** prompt evaluation leads to prompt treatment, which reduces complications.

Supporting evidence: Fever has a high sensitivity for prediction of bacteremia and possibly other serious infections. While further information is needed to identify the cause/site of infection, early diagnosis permits prompt initiation of treatment, which can improve outcome. This diagnostic evaluation can be performed by a physician or his/her designee.

Fever of 38.5°C (101.3°F) or higher has a higher sensitivity (74%) than other clinical signs, identified risk factors or biologic signs for prediction of bacteremia(42). Unfortunately, the specificity of fever is low (27%), and additional data are needed for diagnosis and treatment. In a prospective study, statistically significant risk factors for bacteremia included shock (risk ratio=7.1), bladder catheter removal (risk ratio=5.9), rigors (shaking chills) (risk ratio=4.7), total polymorphonuclear leukocyte band count greater than or equal to $1500/\text{mm}^3$ (risk ratio=4.2),

lymphocyte count less than or equal to 1000/mm³ (risk ratio=3.74), and fever over 38.5°C (101.3°F) (risk ratio=2.5, risk ratio=7.5 if bacteremia is community acquired). The presence of two or more of these six risk factors has a positive predictive value of 83% for bacteremia.

Bacteremic urinary tract infections may present clinically with confusion (30%), cough (27%), dyspnea (27%) or new urinary symptoms (20%).(43) The nonspecific nature of these symptoms indicates that evaluation of the urine should be included in all evaluations of fever.

While the threshold for “fever” was set at 38.5°C (101.3°F) for this quality indicator, it is important to realize that older adults frequently have lower basal body temperatures and blunted fever responses compared to younger adults.(44,45) It has been advocated that in elders, the definition of “fever” be a rise of 1 degree celsius above basal temperature or a threshold of 37.8 °C (100.0°F). It should also be noted that some elders with systemic infections manifest hypothermia.

Quality indicator #9:

Delirium Evaluation

IF a hospitalized vulnerable elder has a definite or suspected diagnosis of delirium, **THEN** an evaluation for potentially precipitating factors must be undertaken and identified causes treated, **BECAUSE** delirium is associated with a poor short-term and long-term prognosis, and eliminating the precipitating cause(s) is an essential part of the treatment.

Supporting evidence: The key diagnostic characteristics of delirium are acute onset, fluctuating course, inattention, disorganized thinking, and altered level of consciousness.(46) In elders, vulnerable or not, delirium is more commonly associated with hypoactivity than with agitation.(47) Delirium is a prominent risk factor for prolonged hospital stay, increased cost,

functional decline, higher institutionalization and readmission rates, and both in-hospital and subsequent mortality.(48,49,50,51) Delirium is not simply an accompaniment to adverse outcomes but an independent risk factor. (52) Delirium has high prevalence and incidence, is often undiagnosed, and is prognostically serious and potentially preventable in nearly half of patients.(47)

No direct evidence exists from clinical trials that a search for precipitating factors and subsequent treatment will improve outcomes in patients with delirium. However, the evidence is strong that many factors associated with delirium can be treated effectively. Delirium results primarily from an interaction of predisposing and precipitating factors.(53,54) The characteristics of elderly hospitalized patients that are associated with the subsequent occurrence of delirium are summarized in Table 3. Since delirium is often merely the presenting clinical picture of a serious illness, treating the underlying cause (e.g. pneumonia, CHF, diabetes, dehydration) is mandatory on its own merits. Thus, the question of whether the treatment helps the delirium is moot, although a strong consensus exists that the most important step in the treatment of delirium is indeed the successful treatment of one or more precipitating causes.(53,54,66,67,68). Since these indicators were developed, a multicomponent intervention to address important risk factors for delirium was found to reduce the incidence of delirium 34% (odds ratio 0.6, CI 0.39-0.92).(47)

Discussion

This project investigated the relationship between processes and outcomes of care and aimed to develop explicit criteria to evaluate the quality of care of elderly individuals during hospitalization. Eight indicators were judged sufficiently valid for use as measures of the quality

of hospital care for the vulnerable elderly. These indicators can potentially serve as a basis to compare the care provided by different health care delivery systems and for comparing change in care over time.

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Table 1: Cardiac evaluation prior to vascular surgery

Test	Positive test %	Positive predictive value	Negative test %	Negative predictive value
ECG-monitored treadmill (35)	24% ischemia	14% (death due to acute myocardial infarction within 14 days)	76%	100%
Dobutamine echocardiography (36)	36%	19% perioperative cardiac events	64%	100%
Dipyridamole scintigraphy (37)	33% thallium redistribution	50% post operative cardiac ischemic events	67%	100%
Dipyridamole scintigraphy (38)	28% abnormal in all projections	50% nonfatal cardiac complications	31% normal	100%
Dipyridamole scintigraphy (39)	13%- 2 or more non-reversible defects	37% (congestive heart failure also significant)	41% normal	100%

Table 2: Quality indicators judged by the expert panel as not valid for the assessment of care for hospitalized vulnerable elders.

												Reviews	
References	Number of Occurrences	Williams et al.(63)	Schor et al.(62)	Rockwood(61)	Pompei et al.(60)	O'Keefe & Lavan(59)	Marcantonio et al.(58)	Inouye et al.(47,57)	Gustafson et al.(56)	Francis et al.(48)	Foreman(55)	Elie et al.(64)	Liptzin(65)
Risk Factors**													
Dementia	9	•	•	•	•	•	•	•	•	•		•	•
Severe illness/ co-morbidity	6			•	•	•		•	•	•		•	•
Age	5	•	•	•			•		•			•	•
Medications	5		•					•	•	•	•	•	•
Dehydration/electrolyte disorders	4						•	•		•	•	•	
Functional deficiency	3	•					•					•	
Azotemia	3					•				•	•		
Alcoholism	2				•		•					•	•
Depression	2				•				•			•	
Infection/fever	2		•							•			
Vision impairment	1							•				•	
Iatrogenic events	1							•				•	

Table 2 (continued): Quality indicators judged by the expert panel as not valid for the assessment of care for hospitalized vulnerable elders.

												Reviews	
												Elie et al.(64)	Liptzin(65)
												Number of Occurrences	
												Williams et al.(63)	
												Schor et al.(62)	•
												Rockwood(61)	
												Pompei et al.(60)	
												O'Keefe & Lavan(59)	
												Marcantonio et al.(58)	
												Inouye et al.(47,57)	•
												Gustafson et al.(56)	
												Francis et al.(48)	
												Foreman(55)	•
References													
Risk Factors**													
Male gender												1	
Malnutrition												1	
Nonelective admission												1	
Restraints												1	
Urinary catheter												1	
Weak social supports												1	

*Included are all prospective cohort studies in which multivariate analysis (or, in one case, discriminant analysis) was performed to identify independent risk factors for delirium, which are indicated by dots.

** Risk factors are not separated on the basis of whether they are predisposing (generally synonymous with "present on admission") or precipitating (generally occurring after admission). This separation was made by Inouye et al(47,57). and by some reviewers, but it seems rather arbitrary and there is considerable overlap (e.g., a urinary tract infection or malnutrition may be present on admission or may develop later).