

Geriatric Syndromes in Elderly Patients Admitted to an Inpatient Cardiology Ward

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BACKGROUND: Older adults make up an increasing proportion of patients hospitalized with cardiovascular disease. Such patients often have multiple coexisting geriatric syndromes that may affect management and outcomes and are frequently underdiagnosed and untreated.

OBJECTIVES: To determine the prevalence of geriatric syndromes and incidence of selected adverse events in hospitalized elderly patients with cardiovascular disease.

DESIGN: A prospective cohort study.

SETTING: Urban academic medical center.

PATIENTS: One hundred patients at least 70 years old with cardiovascular disease hospitalized on a cardiology ward.

MEASUREMENTS: Standard geriatric screens were administered to assess mood, function, and cognitive status. Patients were followed prospectively for adverse events such as falls, urinary tract infection (UTI), and use of restraints.

RESULTS: The mean age of the patients was 79.2 ± 5.5 years, 61% were female, 68% were white, and mean length of stay was 7 days. Geriatric syndromes were prevalent and included functional impairment (35% dependent in ≥ 1 activity of daily living), cognitive impairment (19% with abnormal results on the Short Blessed Test), and polypharmacy. Thirty-seven percent of patients were prescribed a potentially inappropriate medication on admission or discharge. Patients receiving a Foley catheter were at increased risk for UTI.

CONCLUSIONS: These findings suggest that geriatric syndromes are prevalent among older patients hospitalized for cardiovascular disease. Further study is needed to determine if interventions designed to increase recognition and treatment of these syndromes can improve outcomes in this patient population. *Journal of Hospital Medicine* 2007;2:394–400. © 2007 Society of Hospital Medicine.

KEYWORDS: geriatric cardiology, geriatric syndromes, elderly.

Utilizing hospitalist physicians as the primary providers of inpatient care is a rapidly growing trend. In the United States the number of hospitalists now approaches 12,000 and may reach 30,000 by 2010.¹ Simultaneously, by 2030 the proportion of adults aged 65 and older will have more than doubled to make up 20% of the U.S. population. Currently, patients aged 65 and older account for approximately 49% of hospital days.² Congestive heart failure is the most common discharge diagnosis and cardiovascular disease is the leading cause of death of these older adults.³ Given current trends in aging demographics, hospitalists can expect an increasing proportion of their practices to consist of frail older adults with cardiovascular disease.

Hospitalization for any acute illness predisposes elderly patients to increased disability.⁴ Studies have demonstrated that underrecognition of geriatric syndromes is common and contrib-

The authors thank Valerie Emory for her invaluable assistance in collecting data for this study.

Supported by a grant from the Barnes-Jewish Hospital Foundation (St. Louis, MO).

utes to hospitalized older adults having poor outcomes.^{5,6,7} Between 35% and 50% of elderly patients will experience functional decline while hospitalized,^{4,8} and up to 50% will develop hospital-acquired delirium.⁶ The risk of experiencing an iatrogenic event while hospitalized is 2-fold higher for older adults than for those younger than age 65.^{7,9} These adverse outcomes lead to longer length of stay (LOS), higher hospital costs, and, for patients able to live at home prior to admission, increased risk of temporary or permanent institutionalization.^{10,11}

The objective of this study was to characterize a population of acutely ill older adults with known cardiovascular disease admitted to a specialty cardiac ward, to determine the prevalence of geriatric syndromes (ie, functional impairment, cognitive impairment, depression, polypharmacy), and to record the incidence of hospital-acquired adverse events (urinary tract infection, falls, use of restraints). We hypothesized that these syndromes would be prevalent and underrecognized by the patients' physicians.

METHODS

At Barnes-Jewish Hospital, an academic medical center in St. Louis, Missouri, patients hospitalized for an acute cardiovascular disorder are preferentially admitted to a cardiac ward with a cardiologist as the attending physician. We conducted a prospective cohort study of 100 patients aged 70 and older admitted to the cardiac ward between January and December of 2003. Participation in the study was not offered to patients who were nonverbal, non-English-speaking, or unavailable for screening because of being hospitalized on weekends, holidays, or other days when the research nurse was not available. Participants provided written informed consent. If a patient did not demonstrate an understanding of his or her role in the study, a surrogate decision maker was identified who provided consent in addition to the patient's assent. If a surrogate decision maker was not present, the patient was not enrolled in the study. In addition, patients could decline to continue participating in the study at any time. The institutional review board of the Human Studies Committee at Washington University School of Medicine approved this study.

Data Collection

A trained research nurse administered the following geriatric screening questionnaires: (1) the Katz Index of basic activities of daily living (ADLs)¹²; (2) the Vulnerable Elders Survey (VES)¹³; (3) the Short Blessed Test of Orientation, Memory, and Concentration (SBT)¹⁴; (4) the Clock Completion Test (CCT)¹⁵; and (5) the 15-item Yesavage Geriatric Depression Scale (GDS).¹⁶ The Katz Index (score range 6-18) assesses the performance of 6 basic ADLs (bathing, continence, dressing, feeding, toileting, and transferring) based on a report by the patient or a collateral source about the patient's level of dependence. Performance of each activity is rated on a scale from 1 (completely dependent) to 3 (completely independent). For this study, patients were considered dependent in any activity if the performance score was less than 3. The Vulnerable Elders Survey (score range 0-10) utilizes patient age and self-reported health and functional status to identify frail older adults. A VES score of 3 or greater correlates with a 4-fold increased risk of death or functional decline over a 2-year period. Cognition was assessed with the Short Blessed Test of Orientation, Memory, and Concentration and the Clock Completion Test. The Short Blessed Test score ranges from 0 to 28, with a score of 9 or greater indicating increasing severity of cognitive impairment. The Clock Completion Test is scored by evaluating whether the digits in the 4 quadrants of a predrawn circle are accurately placed. The CCT score can range from 0 to 7, with a score of 4 or more indicating cognitive impairment. The 15-item Geriatric Depression Scale was administered to screen for depressive symptoms. The GDS score can range from 0 to 15, with a score of 6 or more indicating increasing severity of depressive symptoms.

Demographic, psychosocial, and medical data were abstracted by review of patients' hospital records (A.R., C.L.). Medical data obtained from the medical charts included medical diagnoses, number and classes of medications prescribed, and physician documentation of prior or newly diagnosed geriatric syndromes. These geriatric syndromes included dementia, delirium, depression, falls, malnutrition/weight loss, pressure sores, osteoporosis and/or hip fracture, urinary incontinence, and polypharmacy (≥ 4 routine medications). A patient was recorded as having documented dementia and/or delirium if the terms *dementia*, *memory loss*,

cognitive impairment, delirium/delirious, confusion, mental status change, or similar were recorded in physician notes. Admission and discharge orders were reviewed for classes of medications cited in Beers criteria as potentially inappropriate medications for older adults.¹⁷ For this study, these “high-risk” medications included benzodiazepines, diphenhydramine, propoxyphene, hypnotics, anticholinergic/antidopaminergic medications, and tricyclic antidepressants. Patients’ medical charts were reviewed for adverse events such as falls and development of pressure sores or use of restraints. A patient was recorded as having a urinary tract infection (UTI) if a physician documented a UTI in the medical record at any time during hospitalization.

Statistical Analysis

Descriptive statistics were generated using SPSS version 12.0. For continuous measures, values were dichotomized for analytic purposes using standard cutoff scores. Fisher’s exact test was used to compare the UTI rate of patients who received a Foley catheter with that of those who did not.

A *P* value < .05 was considered statistically significant.

RESULTS

Sample Characteristics

Descriptive characteristics for the population are summarized in Table 1. The mean age of the patients was 79.2 ± 5.5 years. The sample was predominantly female and white and had an average stay of 7 days on the cardiac ward. Most patients were admitted for management of heart failure, an arrhythmia, acute myocardial infarction, or angina. Twelve patients had a history of cardiovascular disease (CVD) but were admitted for a noncardiovascular complaint. Only 4 patients did not have a history of CVD.

Functional Status and Geriatric Syndromes

Forty-one percent of patients had a history of 2 or more geriatric syndromes, as documented in their medical record (Table 2). Thirty-five percent of patients were dependent in at least 1 basic ADL, and 85% had a VES score that indicated an increased risk of functional decline and mortality over the next 2 years. Only 6% of all patients had dementia and only 9% had delirium documented by their physicians in the medical record. Abnormal cognition as detected by screening tests was prevalent. Screening showed that 19% of the patients who

TABLE 1
Description of Patients (n = 100)

| Patient characteristic | |
|---|------------|
| Age, years (mean ± SD) | 79.2 ± 5.5 |
| Sex (% female) | 61% |
| Race (% white) | 68% |
| Percent admitted to cardiac ward from: | |
| Home | 69% |
| Outside hospital | 21% |
| Nursing home/skilled nursing facility | 8% |
| ICU | 2% |
| Discharged home from cardiac ward (%) | 84% |
| Length of hospital stay (days), mean ± SD | 7.4 ± 5.9 |
| Length of cardiac ward stay (days), mean ± SD | 7.0 ± 5.5 |
| Died during hospitalization (%) | 3% |
| Admitting diagnoses as determined by ICD9 codes (%) | |
| Heart failure | 23% |
| Arrhythmia | 19% |
| Acute myocardial infarction | 10% |
| Chest pain/stable or unstable angina | 10% |
| Coronary artery disease | 9% |
| Syncope | 6% |
| Other cardiovascular diagnoses* | 7% |
| Noncardiovascular diagnoses in patients with history of CVD [†] | 12% |
| Noncardiovascular diagnoses in patients without history of CVD [‡] | 4% |
| Comorbidities (%) [§] | |
| Hypertension | 83% |
| Coronary artery disease | 67% |
| History of CABG and/or percutaneous intervention | 54% |
| Hyperlipidemia | 53% |
| Atrial fibrillation | 50% |
| Heart failure | 46% |
| Myocardial infarction | 38% |
| Diabetes mellitus | 37% |
| Chronic renal insufficiency | 29% |
| Stroke or transient ischemic attack | 25% |
| Chronic obstructive pulmonary disease | 23% |

CVD, cardiovascular disease.

*Other cardiovascular diagnoses included: ischemic bowel, hypertensive renal disease, cardiac arrest, hypotension (3 patients), mitral valve stenosis.

[†]Noncardiovascular diagnoses in patients with a history of CVD included: herpes zoster, dehydration, acute renal failure, shortness of breath, dyspepsia, diarrhea, chest wall injury, pacemaker/AICD infection (2 patients), pacemaker battery change, pacemaker lead failure, hip fracture.

[‡]Noncardiovascular diagnoses in patients without a history of CVD included: COPD exacerbation, chemoembolization, thalassemia, abdominal pain.

[§]Present prior to admission or diagnosed during admission but not reason for admission.

completed the SBT and 59% of those who completed the CCT had cognitive impairment. Only 14% of patients with an abnormal CCT and 42% with an abnormal SBT had dementia and/or delirium documented in their hospital chart.

Polypharmacy was also prevalent. Patients had an average of 9 routine discharge medications, with 19% of patients prescribed at least 12 routine medications at discharge. Thirty-seven percent of pa-

TABLE 2
Functional Dependencies and Geriatric Syndromes

| | |
|---|------------|
| Katz Index of Basic Activities of Daily Living* (n = 100) | |
| Mean score ± SD (range 0-18) | 17.0 ± 1.9 |
| Dependent in ≥ 1 ADL (%) | 35% |
| Dependent in ≥ 2 ADLs (%) | 20% |
| Vulnerable Elders Survey† (n = 100) | |
| Mean score ± SD (range 0-10) | 4.6 ± 3.0 |
| Patients with score ≥ 3 (%) | 85% |
| Abnormal geriatric screens (%) | |
| Short Blessed Test score‡ ≥ 9 (n = 98) | 19% |
| Clock Construction Test score§ ≥ 4 (n = 95) | 59% |
| Geriatric Depression Scale score¶ ≥ 6 (n = 99) | 7% |
| Geriatric syndromes documented in cardiology physician notes (%) | |
| Polypharmacy | 95% |
| Depression | 18% |
| History of a prior fall | 17% |
| Delirium | 9% |
| Dementia | 6% |
| Other¶ | 21% |
| Patients with ≥ 2 geriatric syndromes | 41% |
| Polypharmacy | |
| Routine medications (range 0-17) on admission, (n = 100), mean ± SD | 8.2 ± 3.2 |
| Routine medications (range 3-17) at discharge, (n = 97), mean ± SD | 9.0 ± 3.0 |
| Patients taking ≥ 12 routine medications on admission (%) | 15% |
| Patients taking ≥ 12 routine medications at discharge (%) | 19% |
| Patients with ≥ 1 potentially inappropriate medication# ordered on admission or discharge, routine or PRN (%) | 37% |

ADL, activity of daily living.

*Katz Index of ADLs assesses bathing, continence, dressing, feeding, toileting, and transferring; the lower the Katz Index score (range 0-18), the higher the level of dependence.

†VES score ≥ 3 correlates with a 4-fold increased risk death or functional decline over a 2-year period compared with those with a score < 3.

‡SBT score ≥ 9 indicates cognitive impairment.

§CCT score ≥ 4 indicates cognitive impairment.

¶ GDS score ≥ 6 indicates depressive symptoms.

#Weight loss/malnutrition, prior pressure sore, urinary incontinence, osteoporosis and/or hip fracture.

¶Potentially inappropriate medications included: benzodiazepines, diphenhydramine, propoxyphene, hypnotics, anticholinergic/antidopaminergic medications, and tricyclic antidepressants.

tients were prescribed at least 1 high-risk medication. Of the 6 patients prescribed a tricyclic antidepressant, 3 had a history of atrial fibrillation/flutter, and 4 had a history of coronary artery disease.

Adverse Events

Thirty-eight of the 100 patients in the study received a Foley catheter during hospitalization (Table 3). These patients were significantly more likely to have a UTI during their hospitalization than those who did not have a catheter placed (risk ratio 6.0, 95% CI 1.8-20, $P = .002$). Other adverse events

were rare. Three patients experienced a fall while hospitalized, and 1 patient was restrained (soft limb restraint applied to left upper extremity).

DISCUSSION

The goal of this pilot study was to determine the prevalence of geriatric syndromes and the incidence of selected adverse events in hospitalized older patients with cardiovascular disease. We are unaware of another study documenting these syndromes specifically in hospitalized elderly patients with cardiovascular disease. We found that geriatric syndromes were prevalent in this patient population and often unrecognized by physicians. In 1 study of hospitalized frail elderly cardiovascular patients with long hospital stays, physician failure to recognize poor functional status on admission was an independent predictor of patients experiencing a preventable iatrogenic event.⁷ Brown et al. documented the prevalence and impact of poor mobility in hospitalized adults aged 70 and older. In this study, low mobility was associated with increased risk of further decline in ADL performance, institutionalization, and death; however, it was common for these patients to have bed rest orders (33%), usually without medical indication (60%), indicating underrecognition of functional impairment by attending physicians.¹⁸ The proportion of our patients with dependence in at least 1 ADL (35%) and/or at increased risk of functional decline and death based on VES scores (85%) indicates that our patients were already experiencing significant disability at the time of admission, yet these disabilities were rarely documented in the medical record.

In addition to physical frailty, elderly patients with cardiovascular disease may be at increased risk of cognitive impairment. The ongoing Cognitive and Emotional Health Project survey of 36 large cohort studies noted shared risk factors for cardiovascular disease and cognitive impairment in older

TABLE 3
Foley Use and Urinary Tract Infection

| | Developed a UTI (n) | Did not develop a UTI (n) | Risk ratio* (95% confidence interval) |
|------------------|---------------------|---------------------------|---------------------------------------|
| Received a Foley | | | |
| Yes | 11 | 27 | 6.0 (1.8-20) |
| No | 3 | 59 | $P = .002$ (Fisher's exact test) |

*Risk ratio of being diagnosed with a urinary tract infection (UTI) if received a Foley.

adults.¹⁹ In our study abnormal scores were found for 19% and 59% of the patients who completed the SBT and the CCT, respectively. Several factors may explain the difference in the proportion of patients scoring abnormally on these 2 cognitive screens. We did not measure the visual acuity of our participants, so the number of patients with an abnormal CCT (which relies more on visual cues than the SBT does) may overrepresent the true prevalence of cognitive impairment in our sample. Also, the CCT is a more sensitive indicator of impairments in the visuospatial and executive function domains of cognition than is the SBT and is more likely to be abnormal in vascular dementia.²⁰ Thus, differences in the SBT and CCT scores in our sample may also reflect a higher proportion of patients with a vascular component to their dementia. However, even the number of patients with an abnormal SBT score likely underrepresents the prevalence of underlying cognitive impairment in this sample because of selection bias introduced in obtaining informed consent (ie, the most cognitively impaired patients and/or those deemed to not have decision-making capacity were excluded or were more likely to decline participation in this study). Consistent with the results of studies of other inpatient populations, cognitive impairment (dementia and/or delirium) was documented in our patients' medical charts far less frequently than detected by either cognitive screen.^{5,21} Patients with unrecognized dementia are at increased risk for incident delirium during hospitalization.⁶

Another common geriatric syndrome in patients with cardiovascular disease is polypharmacy. According to current guidelines, heart failure and coronary artery disease each require multiple medications for optimal therapy. Our patient population were prescribed an average of 9 routine medications at discharge, with nearly 20% prescribed 12 or more routine medications (in addition to as-needed medications). In comparison, a cohort of hospitalized elderly oncology patients were prescribed an average of 6 routine medications at discharge.²² Thirty-seven percent of the patients in our study had at least 1 potentially inappropriate medication ordered on admission or at discharge. Although this study was not able to monitor prospectively for adverse drug events, the potential for harm from drug prescribing is substantial in this sample of frail older adult patients. This remains a fruitful area for research.

Thirty-eight percent of patients in our study

received a Foley catheter and were therefore at increased risk of developing a UTI. We did not document the indications for catheterization in this patient population. Studies indicate that up to 20% of urinary catheters are placed without a specific medical indication²³ and that hospitalized older adults receiving unwarranted urinary catheterization are at increased risk of prolonged length of stay and death.²⁴

Interventions that increase recognition of geriatric syndromes have been shown to improve the outcomes of hospitalized older adults. The Hospital Elder Life Program demonstrated a 40% reduction in hospital-acquired delirium in patients aged 70 and older by enhancing recognition and management of geriatric syndromes such as cognitive impairment, immobility, visual/hearing impairment, and polypharmacy.^{6,8} Other studies have demonstrated that use of inappropriate medications in hospitalized older adults can be reduced with non-pharmacologic and physician-education interventions.^{25,26} In a broader effort to address multiple geriatric syndromes simultaneously, Acute Care for Elders (ACE) Units have been developed in medical centers worldwide. The ACE Unit model of care emphasizes patient-centered care, nurse-driven prevention protocols, frequent interdisciplinary team rounds addressing geriatric syndromes, and discharge planning beginning the day of admission. Studies evaluating outcomes in patients admitted to an ACE Unit have found preservation of physical functioning and independence in ADLs,^{27,28} reduced LOS,²¹ improved patient and provider satisfaction,²⁹ and reduced rates of restraint use,^{29,30} institutionalization,^{27,29} and mortality.³¹ This model should be considered for older adults admitted to a cardiac ward. However, other care models could include utilization of inpatient geriatric consultation, hiring a gerontological nurse specialist, or educational programs focused on recognizing and managing geriatric syndromes and designed for the physicians and nurses who care for these patients.

Our study had several limitations. The sample size and number of serious adverse outcomes were small. We did not have adequate power to detect clinically significant differences in length of stay between patients with and without selected geriatric syndromes (0.5 days). The process of informed consent likely selected for a greater number of cognitively intact and fewer depressed patients. The results of the ADL screens may be limited because they were mostly based on patient self-report of

functional status without informant corroboration. Specifically, self-report may overestimate functional status.

Despite these limitations, we found that functional dependence and geriatric syndromes were prevalent in older cardiovascular patients and that these conditions were rarely documented by the attending physicians or house staff. Over the next decades, an increasing proportion of older adults will be admitted and cared for by hospitalist physicians. Interventions utilizing comprehensive geriatric assessments and interdisciplinary models of care could assist hospitalists in recognizing and managing geriatric syndromes in their frail elderly patients. Future studies are needed to confirm the prevalence of geriatric syndromes and to evaluate the impact of an interdisciplinary model of care on clinical outcomes in hospitalized elderly cardiovascular patients.

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Received 28 September 2006; revision received 30 March 2007; accepted 22 April 2007.

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