

# Impact and Recognition of Cognitive Impairment Among Hospitalized Elders

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**BACKGROUND:** Older adults are predisposed to developing cognitive deficits. This increases their vulnerability for adverse health outcomes when hospitalized.

**OBJECTIVE:** To determine the prevalence and impact of cognitive impairment (CI) among hospitalized elders based on recognition by ICD-coding versus screening done on admission.

**DESIGN:** Observational cohort study.

**SETTING:** Urban public hospital in Indianapolis.

**PATIENTS:** 997 patients age 65 and older admitted to medical services between July 2006 and March 2008.

**MEASUREMENTS:** Impact of CI in terms of length of stay, survival, quality of care and prescribing practices. Cognition was assessed by the Short Portable Mental Status Questionnaire (SPMSQ).

**RESULTS:** 424 patients (43%) were cognitively impaired. Of those 424 patients with CI, 61% had not been recognized by ICD-9 coding. Those unrecognized were younger (mean age 76.1 vs. 79.1,  $P < 0.001$ ); had more comorbidity (mean Charlson index of 2.3 vs. 1.9,  $P = 0.03$ ), had less cognitive deficit (mean SPMSQ 6.3 vs. 3.4,  $P < 0.001$ ). Among elders with CI, 163 (38%) had at least one day of delirium during their hospital course. Patients with delirium stayed longer in the hospital (9.2 days vs. 5.9,  $P < 0.001$ ); were more likely to be discharged into institutional settings (75% vs. 31%,  $P < 0.001$ ) and more likely to receive tethers during their care (89% vs. 69%,  $P < 0.001$ ), and had higher mortality (9% vs. 4%,  $P = 0.09$ ).

**CONCLUSION:** Cognitive impairment, while common in hospitalized elders, is under-recognized, impacts care, and increases risk for adverse health outcomes. *Journal of Hospital Medicine* 2010;5:69–75. © 2010 Society of Hospital Medicine.

**KEYWORDS:** cognitive, impairment, delirium, hospital, older adults, recognition.

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In 2001, approximately 12.6 million individuals age 65 and older were discharged from American hospitals with an average length of stay of 5.8 days<sup>1</sup> and up to 66% of them suffered from cognitive impairment (CI).<sup>2–20</sup> CI in hospitalized older adults includes a variety of disorders ranging from mild cognitive deficit, delirium, to full-blown dementia. Dementia is a syndrome of decline in memory plus at least 1 other cognitive domain, such as language, visuospatial, or executive function sufficient to interfere with social or occupational functioning in an alert person.<sup>21</sup> Delirium is a disturbance of consciousness with reduced ability to focus, sustain, or shift attention that occurs over a short period of time and tends to fluctuate over the course of the day.<sup>22</sup> Mild CI without dementia is defined as the presence of a cognitive deficit in the absence of delirium that does not affect functional performance.<sup>23</sup>

Hospitalized older adults with CI are vulnerable to hospital complications, including delirium, physical restraints,

urinary catheters, and tethers.<sup>2,3,24–35</sup> The management of their medical or surgical illnesses requires avoiding certain medications with anticholinergic activities that might worsen cognition.<sup>36</sup> Furthermore, CI may delay diagnostic and therapeutic procedures, demand more time for informed consent-related issues, and result in difficulty in adherence to medical recommendations.<sup>37,38</sup> The special needs of hospitalized older adults with delirium and dementia has been shown to increase demands on nursing staff, risk of post-discharge institutionalization, length of stay, and health care costs.<sup>3–10,27,39–48</sup> We wanted to look specifically at CI because it often goes undetected<sup>49–51</sup> and can have a great impact on the hospital course of elders.

Screening for CI among hospitalized older adults has been considered to have potential benefit in hospital care of older adults.<sup>52</sup> Screening may lead to early detection by uncovering subtle symptoms not yet apparent to families or other caregivers who know the patient well but do not

notice small declines or changes in day-to-day functioning. Early recognition of CI may lead to early treatment and subsequently may delay progression of cognitive decline and improve health outcomes. Screening may enhance physician prescribing practices and reduce exposure to harmful medications among these vulnerable patients. Finally, delirium is an important prognostic indicator, and screening patients could provide invaluable information toward the overall clinical picture. Despite all of this, the current literature does not provide sufficient information to support the use of routine screening on admission.<sup>2-20,41,52-54</sup> Most of the published studies were conducted among elders who stayed in the hospital for more than 48 hours, missing data on the crucial first 48 hours of the hospital course.<sup>2-20,41,52-54</sup> These studies did not evaluate the impact of unrecognized CI on the hospital course and the majority of these studies were not conducted in the urban and lower socioeconomic status populations of elders that are the most vulnerable to bad health outcomes.<sup>2-20,41,52-54</sup> Finally, few studies evaluated the impact of delirium superimposed on CI on the hospital course and mortality of elders.<sup>2-20,41,52-54</sup>

With these details in mind, we wanted to explore the impact of CI recognition among patients age 65 years and older admitted to the medical services of an urban, public hospital in Indianapolis to determine the prevalence and the impact of recognized and unrecognized CI on the hospital course of these elders. Furthermore, we examined the role of delirium superimposed on these hospitalized elders with CI.

## Patients and Methods

The study was approved by the Indiana University Purdue University at Indianapolis Institutional Review Board (IRB).

### Study Setting and Population

The study was conducted on the inpatient general medicine service of Wishard Memorial Hospital (WMH). WMH is a 450-bed, university-affiliated, urban, public hospital that is staffed by Indiana University School of Medicine faculty and house staff. It serves a population of approximately 750,000 in Marion County.

### Inclusion and Exclusion Criteria

Patients were enrolled in the study based on the following criteria: (1) at least 65 years of age; (2) hospitalized on a medical ward; (3) able to speak English; and (4) have CI at the time of hospital admission (see below). Patients were excluded if they had previously enrolled in the study, were enrolled in another clinical study at the time of admission, or were aphasic or unresponsive at the time of screening.

### Cognitive Screening

CI was determined by the Short Portable Mental Status Questionnaire (SPMSQ),<sup>55,56</sup> chosen for its accuracy<sup>56</sup> and

the fact that it is entirely verbal in administration. In most cases, patients were followed and reassessed daily. Patients having 2 or more errors, indicating a score of 8 or less on the SPMSQ after adjusting for race and education were considered to have cognitive impairment. The SPMSQ is a brief 10-item screening test with a sensitivity of 86% and specificity 99.0% for dementia among medical inpatients.<sup>56</sup> At the time of cognitive screening, delirium was assessed by using the Confusion Assessment Method (CAM).<sup>22</sup> This was also done daily in most cases. The CAM<sup>22</sup> is a structured instrument that evaluates the 10 symptoms of delirium specified in the Diagnostic and Statistical Manual of Mental Disorders (DSM)-III-R: acute onset, fluctuating course, inattention, disorganized thinking, altered level of consciousness, disorientation, memory impairment, perceptual disturbances, psychomotor agitation or retardation, and sleep/wake disturbance. The CAM score is determined by examining the patient, investigating the chart and interviewing the nurse and/or a family member for: (1) acute and fluctuating changes in mental status, (2) inattention, (3) disorganized or incoherent thinking, and (4) altered level of consciousness. A CAM score is considered to be positive if the patient displays both (1) and (2) with at least one of (3) or (4). The CAM diagnosis of delirium was validated against the clinical judgment of a psychiatrist and found to have a sensitivity of 97% and a specificity of 92%.<sup>22</sup> A research assistant (RA) was trained for a period of 9 months by a physician as a rater to interview the patient and administer both the SPMSQ and the CAM at the time of admission and then every weekday. When feasible, the RA administered both the SPMSQ and the CAM within the first few hours of hospitalization, and then followed up with our patients each day. More than 70% of our initial cognitive screening occurred in the first 48 hours of hospital admission, and was repeated on a daily basis. In addition to cognitive assessment, the RA reported the presence or absence of Foley catheterization, physical restraints, and tethers during the cognitive assessment. Agreement was obtained from the general internal medicine group practice physicians both to participate in the study and to request screening for CI as part of the recognized admission standard of care among their hospitalized patients aged 65 years and older. The study coordinator was notified of all admissions for patients aged 65 or older by the hospital intranet e-mail and paging system. Admission notifications were sent by page and e-mail on an hourly basis from Monday through Friday, 8:00 AM through 5:00 PM. Those admissions occurring between the hours of 5:00 PM and 8:00 AM were sent during the next normal batch notification. Pages and e-mails for admissions occurring on Saturday and Sunday were sent on Monday morning at 8:00 AM.

### Regenstrief Medical Record System at WMH

The computerized Regenstrief Medical Record System (RMRS) is the primary instrument for processing data and

monitoring patient and physician activity for Wishard Health System.<sup>57,58</sup> The RMRS is a modular system, composed of Registration and Scheduling, Laboratory, and Pharmacy database modules. The Registration and Scheduling module is used to make all outpatient appointments for the office practices associated with Wishard Health System. The Laboratory module handles all data for all inpatient and outpatient laboratories. This module also produces all laboratory reports and data used for billing. In addition to laboratory data, this module stores coded results and full-text interpretations of all imaging studies and special procedures. The Pharmacy module contains information on medication orders captured by the computerized physician order enter (CPOE). The Database module stores all the above data by date in a fully-coded form. Thus, these data are readily retrievable for individual patients by healthcare providers using online terminals. Data for large numbers of patients are retrievable using a locally developed English-like language called CARE. Patients can be identified either by a certain restriction list (eg, the list of subjects in a study) or by clinical criteria. The RMRS also maintains a number of other databases including diagnoses, vital signs, results of laboratory tests and diagnostic tests, full-text discharge summaries, preventive health maneuvers, and detailed information on all inpatient and outpatient charges. It contains death certificate information from the Indiana State Board of Health for all registered patients who die in, or outside of, Indiana. Therefore, the RMRS collects and monitors a broad array of physician and patient activity, practice patterns, utilization, diagnostic test finding, and offers a wonderful array of outcome measures.

### Other Data Collections

Patient demographics such as age, gender, race, and education level were determined by the RMRS and by information obtained during the time of cognitive screening. Length of hospital stay and 30-day posthospitalization mortality were obtained from the RMRS. Comorbidity level was measured by reviewing the RMRS and determining each patient's Charlson comorbidity index total score.<sup>59,60</sup> This score was determined using International Statistical Classification of Diseases and Related Health Problems, 9th edition (ICD-9) codes gathered from 1 year prior to admission until the patient was discharged from the hospital. Anticholinergic medications were determined by using the Anticholinergic Cognitive Burden Scale,<sup>61</sup> an expert-based practical index. The scale was developed based on a review of all published studies from 1996 to 2007 that measured the anticholinergic activities of a drug and its association with cognitive function in older adults. The list of drugs reviewed was presented to an expert interdisciplinary panel that included geriatricians, geriatric pharmacists, geriatric psychiatrists, general physicians, geriatric nurses, and aging brain researchers. The panel categorized each medication into a possible or definite anticholinergic category based on the severity of its cognitive

**TABLE 1. Demographics of Elders Screened for Cognitive Impairment During Medical Admission to an Urban Hospital in Indianapolis**

Variable	n	%/Mean (SD)
Age (years), mean (SD)	997	74.8 (7.5)
Age ≥85 (%)	997	12.6
Female (%)	997	67.8
African American (%)	997	59.4
Education (years), mean (SD)	910	10.3 (2.8)
Education <12 years (%)	910	59.1
Screened within 48 hours of admission (%)	997	73.2
SPMSQ score at screening, mean (SD)	997	7.7 (2.8)
Cognitive impairment based on the SPMSQ score ≤8 (%)	997	42.5

Abbreviations: SD, standard deviation; SPMSQ, Short Portable Mental Status Questionnaire.

anticholinergic effects.<sup>61</sup> A patient who received at least 1 order of a possible or definite anticholinergic during their hospitalization was considered to be an anticholinergic user. Prior recognition of CI was determined by searching the RMRS for any ICD-9 code (see Appendix) indicative of dementia, Alzheimer disease, or delirium reported at hospital admission, discharge, or during an 1-year period prior to hospitalization for every patient enrolled in the study. Those patients with documented ICD-9 codes were felt recognized as having some form of cognitive impairment. Those who had a positive screen but no prior documentation according to ICD-9 coding, were said to have unrecognized CI.

### Analysis

Descriptive statistics were calculated, including percentages for binary categorical variables, and means and standard deviations for continuous variables. Comparisons between groups were based upon Fisher's Exact Tests for binary categorical variables and *t* tests for continuous variables. When controlling for covariates such as age, gender, race, Charlson comorbidity index, and SPMSQ at screening, group comparisons were made by using logistic regression for binary categorical variables and multiple regression for continuous variables. Since the distributions of length of stay and Charlson comorbidity index were skewed, all statistical tests comparing them across groups were actually performed on their log-transformed values.

### Results

#### The Prevalence and Recognition of CI

Table 1 describes the demographic characteristic of our study population, which is a reflection of the public and urban nature of our target hospital. Our study assessed the cognitive status of 997 older adults usually (>70% of the time) within 48 hours of their admission to the medical ward of this urban hospital between July of 2006 and March 2008 (see Table 1) and found that 43% of these elders had evidence of CI as determined by a SPMSQ score of 8 points

**TABLE 2. Comparison Between Patients With Documented CI and Those with Undocumented CI**

	CI Documented	CI Undocumented	P Value	P Value*
n (%)	165 (39)	259 (61)	n/a	
Age, mean (SD)	79.1 (7.9)	76.1 (8.0)	<0.001	
Female (%)	68.5	64.5	0.40	
African American (%)	68.5	53.7	<0.01	
SPMSQ at screen, mean (SD)	3.4 (2.7)	6.3 (2.1)	<0.001	
Charlson comorbidity index, mean (SD)	1.9 (1.9)	2.3 (2.1)	0.03	
Length of hospital stay, mean (SD)	6.7 (5.1)	7.5 (7.1)	0.49	0.59
Survived at 30 days postdischarge (%)	95.2	93.4	0.53	0.25
Discharged home (%)	31.5	45.2	0.01	0.74
Readmission within 30 days after discharge home (%)	19.2	18.8	0.99	0.66
Incidence of delirium (%)	26.7	20.6	0.52	0.99
Observed with Foley catheter (%)	43.6	27.4	<0.001	0.61
Observed with physical restraint (%)	1.8	1.5	0.99	0.31
Observed with tethers (%)	81.8	73.8	0.06	0.58
With at least 1 Ach (%)	83.6	90.7	0.03	0.22
Possible Ach (%)	81.2	88.4	0.05	0.31
Definite Ach (%)	32.7	33.2	0.99	0.64

**Abbreviations:** Ach, anticholinergics; CI, cognitive impairment; n/a, not applicable; SD, standard deviation; SPMSQ, Short Portable Mental Status Questionnaire.

\* *P* value after adjusting for age, gender, race, Charlson comorbidity index, and SPMSQ at screen.

or less. However, 61% of the 424 cognitively impaired elders were not documented or recognized by the electronic medical record system to have cognitive deficit.

### The Impact of Unrecognized CI on the Hospital Course

As expected, hospitalized elders with documented CI were older (mean age 79.1 years vs. 76.1 years;  $P < 0.001$ ) and had worse cognitive function upon screening than those with unrecognized CI (mean SPMSQ 3.4 points vs. 6.3;  $P < 0.001$ ). Furthermore, CI recognition was influenced by the elders' race and comorbidity (Table 2); a higher percentage of elders with documented CI were African American (69% vs. 54%;  $P = 0.003$ ) and had less comorbidity (mean Charlson index 1.9 vs. 2.3;  $P = 0.03$ ). After adjusting for age, gender, race, comorbidity, and cognitive function at screening, our study found no differences between elders with previously recognized CI and those with unrecognized CI in regard to the length of hospital stay (6.7 days vs. 7.5 days;  $P = 0.59$ ), 30-day posthospital mortality (4.8% vs. 6.6%;  $P > 0.2$ ), home discharge (32% vs. 45%;  $P > 0.7$ ), hospital readmission (19.2% vs. 18.8%;  $P > 0.6$ ), delirium incidence (27% vs. 21%;  $P > 0.9$ ), and physical restraints (1.8% vs. 1.5%;  $P > 0.4$ ). We also found that elders with undocumented CI were not more likely to receive definite anticholinergics (33.2% vs. 32.7%;  $P > 0.9$ ).

### The Impact of Delirium on the Hospital Course of Elders with CI

Among the 424 hospitalized elders with CI, 163 (38%) had delirium at least once during their hospital course and 24% had delirium on the day of hospital discharge. In compari-

son to elders who had CI but not delirium during their hospitalization (Table 3), those with at least 1 day of delirium had a higher 30-day posthospitalization mortality risk (8.6% vs. 4.2%;  $P = 0.09$ ), stayed in the hospital 3.3 additional days (9.2 days vs. 5.9 days;  $P < 0.001$ ), were less likely to be discharged home (25% vs. 49%;  $P < 0.001$ ), were more likely to receive a Foley catheterization (52% vs. 23%;  $P < 0.001$ ), more likely to be physically restrained (4% vs. 0%;  $P < 0.01$ ), and more likely to receive tethers during their care (89% vs. 69%;  $P < 0.001$ ). There was no statistically significant difference between the 2 groups in terms of 30-day hospital readmission rates or in their use of definite anticholinergics (Table 3).

### Discussion

Our study found that in an urban, public hospital, acute or preexisting CI affects more than one-third of hospitalized elders admitted to general medical services. Unfortunately, our hospital system does not currently recognize the majority of these vulnerable patients. Our study also found that delirium affects more than one-third of hospitalized elders with CI during their hospital course. Delirium complicates hospital care by prolonging length of stay and decreasing the probability of surviving and getting discharged home. It leads to high use of Foley catheterization, physical restraints, and tethers.

The high prevalence of CI with and without delirium in our cohort is within the rates reported previously in the literature. It is estimated that the prevalence of CI in hospitalized older adults ranges from 14% to 66%, depending on the method used to measure cognition, the definition of CI, and

**TABLE 3. Demographic and Hospital Course of Cognitively Impaired Elders With and Without Delirium**

	Delirium+*	Delirium–	P value
n (%)	163 (38)	261 (62)	n/a
Age, mean (SD)	78.4 (8.5)	76.5 (7.8)	0.02
Female (%)	60.1	69.7	0.05
African American (%)	64.4	56.3	0.10
Charlson comorbidity index, mean (SD)	1.8 (1.9)	2.3 (2.1)	0.01
Length of hospital stay, mean (SD)	9.2 (7.9)	5.9 (4.9)	<0.001
Survived at 30-day postdischarge (%)	91.4	95.8	0.09
Discharged home (%)	24.5	49.4	<0.001
Readmission within 30 days after discharge home (%)	22.5	17.8	0.50
Observed with Foley catheter (%)	51.5	22.6	<0.001
Observed with physical restraint (%)	4.3	0.0	<0.01
Observed with tethers (%)	89.0	69.4	<0.001
With at least 1 anticholinergic (%)	83.4	90.8	0.03
Possible anticholinergic (%)	80.4	88.9	0.02
Definite anticholinergic (%)	36.8	30.7	0.20

**Abbreviations:** n/a, not applicable; SD, standard deviation.

\* Subjects with at least 1 hospital day with delirium.

the type of hospital ward (surgical, medical, and geriatric units).<sup>2–20</sup> One particular study that used a similar cognitive assessment method reported higher prevalence rates for both CI and delirium.<sup>11</sup> The study randomly evaluated a sample of 201 patients age 65 and over who were hospitalized for a medical illness and found that 56% of the cohort suffered from CI and among those with CI, 47% had delirium.<sup>11</sup> The difference between this finding and our study is most likely due to our sampling technique; more than 70% of our cognitive screening occurred in the first 48 hours of hospital admission whereas the Australian study, in similar enrollment criteria to all of the published studies in this area, excluded patients who were discharged within 48 hours of admission. We believe, however, that by including the first 48 hours of admission in our design, our study provides a more generalizable reflection of the actual acute care experience.

The impact of delirium on the course of hospital care found in our study supports some of the findings from previous studies conducted in the past 2 decades.<sup>5,6,11</sup> Despite 2 decades of clinical research, delirium continues to increase mortality, hospital stays, and posthospital institutionalization.

We were surprised to find that patients suffering from delirium continue to receive at least 1 definite anticholinergic medication. Such medications are considered inappropriate among patients with any form of cognitive impairment.<sup>36,62</sup> Although the impact of anticholinergic medications on hospitalized outcomes is less well-described, their use has been suspected to negatively impact long-term outcomes of cognitive impairment.<sup>61,63</sup> Our study found no difference in the use of anticholinergic medications between those with CI who experienced delirium and those who did not; however, the total burden of anticholinergic medication was not

assessed in a quantitative manner. It is still unknown if certain anticholinergic medications or a cumulative effect of anticholinergic medications may impact cognitive or health-related outcomes in a vulnerable older population with CI.

Although our study reported for the first time in a systematic way the rate of undocumented CI among hospitalized elders found to have CI on admission, we found no impact of such underrecognition on the length of hospital stay, mortality, discharge location, and delirium occurrence. Although the use of anticholinergic medications is not recommended for patients with any form of CI, our results indicate that a significant number of patients with cognitive impairment continue to receive inappropriate medications. CI recognition in the elderly was not shown to have a statistically significant affect on length of stay, cost, or mortality.

Our study has some limitations. First of all, we did not determine the underlying types of CI such as Alzheimer disease, vascular dementia, mild cognitive impairment, or reversible etiology other than delirium. Such a categorization requires posthospital assessment, which was not included in our study design. Second, our delirium incidence rate and delirium impact on hospital outcomes might be very conservative and may underestimate its true prevalence and correlation due to our data collection methods. Despite the fluctuating nature of delirium, our study was not designed to assess the presence of delirium every shift and tried to assess cognitive function on a daily basis throughout the patient's hospitalization. Therefore, the severity and duration of delirium could not be accurately assessed. Our reported rates of use of Foley catheterization, physical restraints, and tethers are also very conservative and we could not determine the appropriateness of these procedures. Our study was conducted in 1 public hospital in an

urban city with a higher percentage of African Americans. Thus, our sample is not a true representative sample. However, studies with significant representation of minority groups are not common in the research literature, especially in CI research; we hope to fulfill some of the gaps in the literature regarding the most vulnerable older American population. Finally, we were limited in our use of ICD-9 coding to determine if patients had previously been recognized by other providers as having CI. ICD-9 coding, while useful, is not perfect in identifying all of a patient's medical problems. Use of coding to determine whether a patient had been recognized as impaired also does not allow us to determine when the diagnosis was made.

In conclusion, our study evaluated cognitive impairment in hospitalized elders and found that in our cohort of 997 patients, 43% were cognitively impaired on admission. Of those with CI, 61% were not documented or recognized as impaired. We found no statistically significant difference between those with documented CI and those with undocumented CI in terms of length of stay, mortality, home discharge, readmission rates, incidence of delirium, or potential to receive anticholinergics or restraints. Among those with CI, 38% had delirium. Those with delirium experienced increased length of stay, decreased discharge to home, and increased use of Foley catheters and restraints.

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