Outcomes Associated With Delirium in Older Patients in Surgical ICUs*

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Background: **We previously noted that older adults admitted to surgical ICUs (SICUs) are at high risk for delirium. In the current study, we describe the association between the presence of delirium and complications in older SICU patients, and describe the association between delirium occurring in the SICU and functional ability and discharge placement for older patients.**
Methods: **Secondary analysis of prospective, observational, cohort study. Subjects were 114 consecutive patients ≥ 65 years old admitted to a surgical critical care service. All subjects underwent daily delirium and sedation/agitation screening during hospitalization. Outcomes prospectively recorded included SICU complication development, discharge location, and functional ability (as measured by the Katz activities of daily living instrument).**
Results: **Nearly one third of older adults (31.6%) admitted to an SICU had a complication during ICU stay. There was a strong association between SICU delirium and complication occurrence ($p = 0.001$). Complication occurrence preceded delirium diagnosis for 16 of 20 subjects. Subjects with delirium in the SICU were more likely to be discharged to a place other than home (61.3% vs 20.5%, $p < 0.0001$) and have greater functional decline (67.7% vs 43.6%, $p = 0.023$) than nondelirious subjects. After adjusting for covariates including severity of illness and mechanical ventilation use, delirium was found to be strongly and independently associated with greater odds of being discharged to a place other than home (odds ratio, 7.20; 95% confidence interval, 1.93 to 26.82).**
Conclusions: **Delirium in older surgical ICU patients is associated with complications and an increased likelihood of discharge to a place other than home.** ***(CHEST 2009; 135:18–25)***

Key words: aged; complications; critical care; delirium; discharge placement; functional status; intensive care; outcomes; surgery

Abbreviations: ADL = activities of daily living; APACHE = acute physiology and chronic health evaluation; CAM-ICU = Confusion Assessment Method for the ICU; CCI = Charlson comorbidity index; CI = confidence interval; HHC = home health care; IQCODE = Informant Questionnaire on Cognitive Decline in the Elderly; SICU = surgical ICU

Delirium is a potentially debilitating disorder experienced by many older adults admitted to ICUs. Often defined as *acute cognitive dysfunction*,[1] as many as 30 to 62%[2,3] of older patients have an episode of delirium during ICU stay. The elevated risk for delirium in the older critically ill population is thought to be due to both intrinsic and extrinsic factors, including preexisting cognitive impairment (dementia), depression, impairments in activities of daily living (ADL), severity of illness, outpatient use of benzodiazepines or narcotics, and a variety of physiologic abnormalities.[4] Once thought to be an "inconsequential" outcome of ICU care,[1] research suggests that delirium in this setting is associated with multiple unfavorable short-term and long-term outcomes including higher ICU and hospital costs,[5] longer ICU and hospital length of stay,[2,6–8] greater use of continuous sedation and physical restraints,[9] increased removal of catheters and self-extubation,[10] and higher ICU and hospital mortality rates.[6,11,12] Delirium is also an independent predictor of mortality at 6 months after hospital discharge in ICU patients receiving mechanical ventilation.[12]

Several factors, such as dementia and dependency for the performance of ADLs, are known to contribute to postoperative complications for older adults.[13]

Older adults are also more likely to have conditions affecting surgical utilization rates and outcomes, such as cancer diagnoses, malnutrition, and social isolation.[14] However, no studies to date have specifically examined the effect of delirium on outcomes of older adults admitted to surgical ICUs (SICUs). This is a significant gap, considering people > 65 years old comprise more than one half of the average general surgery practice,[14] consume nearly 60% of all ICU days,[15] and are one of the fastest-growing segments of the US population.

For this reason, we conducted a secondary analysis of a data set that was designed to examine the course of delirium in a cohort of older adults admitted to SICUs. Our first aim was to describe the association between the presence of delirium and complications in older SICU patients. Our second aim was to describe the association between delirium occurring in the SICU and older adults' posthospital functional ability and discharge placement. We hypothesized that there would be a positive association between delirium and SICU complications and that older adults with an episode of delirium during their SICU stay would have decreased functional ability at hospital discharge and would be more likely to be discharged to a place other than home when compared to older adults with no delirium.

Materials and Methods

Data for the current analyses were derived from a prospective, observational, cohort study that was designed to examine the course of delirium in older SICU patients. While the frequency and trajectory of mental status changes of this sample were described elsewhere,[2] none of the outcome data reported in the present study have been previously published. Study participants were recruited from SICUs at the Hospital of the University of Pennsylvania, a 700-bed, urban, teaching hospital. All consecutive patients ≥ 65 years old admitted to the surgical critical care service between August 27, 2004, and December 31, 2004, were considered for study inclusion. The University of Pennsylvania institutional review board approval of the study previously reported[2] included the further statistical analysis included in this article. Written informed consent was obtained from all patients, if capable, and their surrogates. In the event where a patient was not capable of providing informed consent, it was obtained from his/her surrogate and then later obtained when decisional capacity returned.

Enrollment criteria included age ≥ 65 years, English speaking, admitted to a SICU, and managed by the surgical critical care service. Participation also required the availability of a surrogate responder who maintained in-person or telephone contact exceeding 4 h/wk with the patient over the previous 5 years. Both the patient and his/her surrogate needed to agree to participate in the study within 24 to 48 h of SICU admission. Exclusion criteria defined *a priori* were recent (within 1 year) CNS injury (defined as head or spinal cord injury, neurosurgical procedure, or cerebral vascular accident); current or past treatment for specific Diagnosis and Statistical Manual of Mental Disorders IV axis 1 psychotic disorders; legal blindness; deafness; and, because of the frequent postoperative cognitive dysfunction associated with cardiopulmonary bypass, cardiothoracic surgery. Study enrollment flow is illustrated in Figure 1.

Structured interviews with all of the subjects' surrogates were conducted within 24 to 48 h of SICU admission to obtain information regarding demographic data, psychiatric history, preadmission visual, hearing and health status, and prior living arrangements. The use of home health care (HHC) services or any assistive device use to perform ADL was also recorded. The Katz ADL[16] index was used to formally assess the baseline functional ability with a reference point of 1 week prior to current hospitalization. The range of scores for the Katz ADL is 0 to 6, with higher scores reflecting higher levels of function. Subjects were screened for evidence of preexisting dementia with the use of the short form of the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE).[17] The short IQCODE requires informants to recall what their relative/family member's memory/intelligence was like 5 years ago and compare it to their present ability. It consists of 16 questions that are rated on a 5-point scale ranging from 1 (much improved) to 5 (much worse). A cut score of 3.31 achieves a balance of sensitivity (79%) and specificity (82%) for detecting dementia.[17]

Study personnel recorded the APACHE (acute physiology and chronic health evaluation) II scores,[18] admitting service, operative procedures, and also calculated their Charlson comorbidity index (CCI)[19] scores from the medical record. Mechanical ventilation use was recorded daily throughout the hospital stay. Complication occurrence in the SICU was detected by daily review of physician progress notes for 15 commonly encountered complications (*eg*, pneumonia, urinary tract infection, pulmonary emboli). Study personnel recorded if, and how many, complications the subjects' had each day during the SICU stay.

Subjects underwent daily sedation/agitation and delirium screening between the hours of 10:00 AM and 7:00 PM from study enrollment to hospital discharge. Interrater agreement for delirium and agitation/sedation status was obtained by having the two study personnel responsible for screenings perform their assessments together until 100% agreement on findings was obtained. Level of arousal was measured using the Richmond Agitation-Sedation Scale,[20,21] which rates a patient's level of agitation/sedation on a 10-point scale ranging from − 5 (unarousable, not responsive to voice or physical stimulation) to + 4 (combative). Delirium in the SICU was diagnosed with the Confusion Assessment Method for the ICU (CAM-ICU).[23,24] The CAM-ICU assesses four features of delirium: (1) acute onset or fluctuating course, (2) inattention, (3) disorganized thinking, and (4) altered level of consciousness.[22,23] To be diagnosed as delirious or

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