Published in final edited form as:

Ann Surg. 2020 October ; 272(4): 596–602. doi:10.1097/SLA.0000000000004377.

Socioeconomic Factors and Intensive Care Unit-Related Cognitive Impairment

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Abstract

Objective: We aimed to identify socioeconomic and clinical risk factors for post-intensive care unit (ICU)-related long-term cognitive impairment (LTCI).

Summary Background Data: After delirium during ICU stay, LTCI has been increasingly recognized, but without attention to socioeconomic factors.

Methods: We enrolled a prospective, multicenter cohort of ICU survivors with shock or respiratory failure from surgical and medical ICUs across 5 civilian and Veteran Affairs (VA) hospitals from 2010 to 2016. Our primary outcome was LTCI at 3- and 12 months post-hospital discharge defined by the Repeatable Battery for Assessment of Neuropsychological Symptoms

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The authors report no conflicts of interest.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.annalsofsurgery.com).

(RBANS) global score. Covariates adjusted using multivariable linear regression included age, sex, race, AHRQ socioeconomic index, Charlson comorbidity, Framingham stroke risk, Sequential Organ Failure Assessment, duration of coma, delirium, hypoxemia, sepsis, education level, hospital type, insurance status, discharge disposition, and ICU drug exposures.

Results: Of 1040 patients, 71% experienced delirium, and 47% and 41% of survivors had RBANS scores >1 standard deviation below normal at 3- and 12 months, respectively. Adjusted analysis indicated that delirium, non-White race, lower education, and civilian hospitals (as opposed to VA), were associated with at least a half standard deviation lower RBANS scores at 3- and 12 months ($P = 0.03$). Sex, AHRQ socioeconomic index, insurance status, and discharge disposition were not associated with RBANS scores.

Conclusions: Socioeconomic and clinical risk factors, such as race, education, hospital type, and delirium duration, were linked to worse PICS ICU-related LTCI. Further efforts may focus on improved identification of higher-risk groups to promote survivorship through emerging improvements in cognitive rehabilitation.

Keywords

cognition; cognitive impairment; critically ill; delirium; dementia; ICU; ICU delirium; intensive care unit; long-term cognitive impairment; LTCI; neuropsychological outcome; RBANS; SES; socioeconomic status

Health inequity in the United States persists across nearly every medical condition with worse outcomes for the poorest and most disadvantaged groups of society. Long-term sequelae of poor health and limited access to care introduce complexity at every level of health care, including across the critical care continuum. Disparate outcomes in critical illness due to race, socioeconomic status, and insurance status have been described despite perceived equal access due to disease severity.¹ Lacking insurance or receiving Medicaid alone is an independent predictor of both in-hospital and long-term mortality in critically ill patients.^{2–5} Higher mortality and hospitalization rates for black patients compared to White patients have been described in certain disease processes such as sepsis or acute respiratory distress syndrome (ARDS).^{6–8} This difference resolves in some studies when controlling for illness severity or insurance status.^{6–8} Variation in the quality of care provided to black patients is responsible for some of these disparities—even in the critically ill.^{9–13} National attention has focused on the importance of addressing these health disparities.^{14,15}

Long-term cognitive impairment (LTCI) following critical illness has well-documented, life-altering consequences for individuals and communities.^{16–18} LTCI is one manifestation of Post-intensive care syndrome. PICS is a constellation of symptoms that occurs after discharge from acute care hospitalization, including cognitive impairment, disabilities in activities of daily living, and mental health impairment.¹⁹ Risk factors for cognitive impairment include severe sepsis, often complicated by hypoxia, hypotension, sedative and analgesic medications, and especially delirium.^{20–22} Delirium, a prevalent organ dysfunction during critical illness, leads to higher risk of mortality, length of stay, higher costs, poor mental health, functional disability, and LTCI in survivors.^{21,23–26} Studies that have examined risk factors for cognitive impairment focus on inpatient characteristics, whereas

few studies have evaluated the effects of socioeconomic factors on cognitive dysfunction following critical illness.²⁷ Furthermore, there are little data evaluating the impact of health inequities on acute brain dysfunction in the intensive care unit or in the long-term sequelae of intensive care unit (ICU) survivorship.

In this study, we evaluated the impact of socioeconomic factors on ICU-related LTCI after critical illness. Our goal was to understand the effect of patient level factors, such as race, socioeconomic status, and health insurance status, as well as system level factors, such as hospital type and discharge disposition on cognitive function after critical illness.

METHODS

Description of Population

To assess the effects of socioeconomic status on LTCI post-ICU hospitalization, we used prospectively collected multicenter data from both civilian (Bringing to Light the Risk Factors and Incidence of Neuropsychological Dysfunction in Intensive Care Unit Survivors, BRAIN-ICU Study [NCT00392795](#)) and Veterans Affairs (VA) hospitals (Delirium and Dementia in Veterans Surviving ICU Care, MIND-ICU Study [NCT00400062](#)). This included 2 civilian sites, Vanderbilt University Medical Center and Saint Thomas Hospital, both in Nashville, Tennessee, and 3 VA hospitals—Tennessee Valley Healthcare System (Nashville, TN), George E. Wahlen Department of VA Medical Center in VA Salt Lake City Health Care System (Salt Lake City, UT), and Seattle Division of the VA Puget Sound Health Care System (Seattle, WA). Results from BRAIN-ICU and MIND-ICU have been previously published^{21,25,28,29}; however, the impact of socioeconomic factors on ICU-related LTCI has not previously been assessed.

Participants in these studies were enrolled from 2006 to 2010 across medical and surgical ICU settings from 2 civilian and 3 VA hospitals. Patients with cardiogenic shock, respiratory failure, or septic shock, were prospectively enrolled. Those with inability to participate in delirium assessments, preexisting cognitive deficits, stroke or neurologic injury, limited follow-up ability, and inability to obtain informed consent were excluded. Patients were assessed for baseline cognitive impairment using the short informant questionnaire on cognitive decline in the elderly (IQCODE) and subsequent clinical dementia rating (CDR), and were excluded from involvement in this cohort if they had scores correlating with severe baseline dementia. Similarly, patients with previous significant ICU admission within the past 2 months were excluded. To accurately participate in language-appropriate cognitive testing, only patients with English as their primary language were included. Patients were followed for up to 1 year post-hospitalization to assess for cognitive dysfunction with prospective data collection, as described previously.^{21,25,28,29}

Outcomes

Our primary outcome was cognitive impairment as assessed in post-discharge visits by trained professionals at 3 and 12 months using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) assessment, a validated neuropsychologic assessment that measures global cognition and sub domains of immediate memory, delayed memory,

and attention.³⁰ The population age-adjusted mean [$\pm$ standard deviation (SD)] for the RBANS global cognition score and for the individual domains is 100 ± 15 , on a scale ranging from 40 to 160, with lower scores indicating worse performance. Mean RBANS scores for individuals with mild dementia and Traumatic Brain Injury are 70 and 78, respectively.^{30,31} RBANS global cognition scores are considered “extremely low” if they are 70. In addition to RBANS domain scores, we evaluated Trails B executive function score as a secondary outcome of cognitive impairment. Trails B scores are age, sex, and education-adjusted with a standardized national mean of 50 ($\pm$ SD 10). To assess duration and presence of in-hospital delirium, we prospectively collected twice-daily Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) assessments.

Covariates

In addition to clinical risk factors previously described, our goal was to assess the impact of patient factors, including education, race, insurance and socioeconomic status, as well as hospital characteristics on cognitive impairment after critical illness. Insurance status was collected at the time of enrollment and categorized as private, Medicare, Medicaid, including dual eligible Medicare and Medicaid beneficiaries, or uninsured. For the VA population, we included Military insurance as well as any secondary insurance reported. We included patient demographic data, including age, sex, race, and level of education. To assess system-level factors, we categorized hospital type—whether civilian or Veterans Affairs—as well as binary post-ICU discharge disposition: either discharge to home or to an inpatient facility, such as a skilled nursing or inpatient rehabilitation facility.

As a comprehensive measure of socioeconomic status (SES), we geocoded a SES index score for each participant using a standardized, validated composite measure of socioeconomic status developed by the Agency for Healthcare Research and Quality (AHRQ) for Medicare beneficiaries. The SES index score is generated from census block group data focusing on 5 domains: occupation, income, wealth, education, and housing, as previously described.³² From the census block data, 7 variables of the 5 domains are assessed: percentage of persons in labor force (age 16 or older) who are unemployed (occupation), percentage of persons below the poverty level (income), median household income (income), median value of owner-occupied dwellings in block group (wealth), percentage of person 25 or older with less than a 12th grade education (education), percentage of person age 25 or older who have completed at least 4 years of college (education), and as a measure of crowding, percentage of households that average 1 persons per room (housing). The SES index is reported as a standardized value ranging from 0 to 100 with SES index scores in the second quartile ranging from 48 to 51 and third quartile scores range from 52 to 55.³² Each participant in our study had a geocoded AHRQ SES index generated from the address provided at the time of enrollment.

In our assessment, we prospectively collected measures of clinical risk and disease severity, such as comorbidities (Charlson comorbidity score, Framingham stroke risk), markers of critical illness such as Sequential Organ Failure Assessment (SOFA) score, duration of severe sepsis, presence of hypoxemia, presence of coma as assessed by Richmond Agitation-Sedation Scale (RASS), and sedative or analgesic medication doses administered in the ICU.

Statistical Analysis

We completed descriptive analysis of all baseline patient demographic and clinical variables. We included in our analysis all patients with at least partial cognitive outcomes at 3 or 12 months and used multiple imputations to account for missing covariates or outcomes in the population that participated in 3- or 12-month evaluation. Patients with missing outcomes data had small but potentially meaningful differences in baseline characteristics when compared with the complete outcomes group, so they were included after multiple imputations in an attempt to not bias our results, as previously described.^{21,25,28,29}

Building on previously published work,^{21,25,28,29} we replicated regression modeling approaches previously published to model long-term outcomes in the cohort with the addition of the socioeconomic and demographic variables described above. We performed multivariable linear regression to examine the association of patient characteristics, delirium duration, and described covariates with continuous RBANS global and subset scores, as well as Trails B scores separately at 3- and 12 months post-hospital discharge. Insurance status was assessed as private, government (including Medicare, Medicaid, or Military), and the uninsured. Restricted cubic splines were used to model continuous variables such as medication doses to allow for nonlinear associations. We performed subgroup analysis testing for interactions by study site (civilian vs VA) to assess difference in baseline characteristics between the hospital types. We used multivariable logistic regression to assess relationship of presence of delirium and patient sociodemographic characteristics. All analysis was conducted using R software, version 3.5.2.

RESULTS

Population Characteristics

Using the BRAIN-ICU and MIND-ICU cohorts, 1040 patients were included in our baseline analysis with 826 (78.9%) enrolled at 2 civilian sites, and 221 (21.1%) enrolled across 3 hospitals in the VA system. Of the 781 patients surviving to at least 3 months, 489 underwent outcomes assessment with 13.5% requiring imputation of partial outcomes (Appendix Table 1, <http://links.lww.com/SLA/C504>). Of the 624 patients surviving to 12 months post-ICU-discharge, 405 presented for 12-month evaluation with 9.9% requiring partial outcomes imputation. Our baseline, 3-month, and 12-month follow-up cohorts were predominantly White (91%, 89%, 90%, respectively). Median SES index was 49.8 [interquartile range (IQR) 47.3–52.8] in our baseline cohort and similar in our follow-up cohort. The majority of patients across all groups were privately insured (52%, 52%, 53%) with a median years of education of 12 (IQR 12–14 years), equivalent to a high school education. In our baseline cohort, 44% of patients (n = 462) patients were discharged home as compared to a facility (56%); however, patients who presented for 3- and 12-month cognitive evaluation were more likely to have been discharged home after index admission (64% and 65%, respectively, $P < 0.001$). More than 70% of patients experienced delirium during their ICU stay (n = 740) with a median duration of 4 days (IQR 2–7). Baseline demographic and clinical data for our in-hospital cohort, as well as our 3- and 12-month follow-up cohorts, can be found in Table 1. The proportion of our population recruited from

the VA was predominantly White, male, and older than our civilian population (Table 2, Appendix Table 2, <http://links.lww.com/SLA/C504>).

Characterizing Cognitive Impairment After Critical Illness in Our Population

Median RBANS global cognition score at 3-month follow-up was 80 (IQR 71–88) with one-quarter of patients (23%) characterized as extremely low (RBANS < 69) and another quarter (24%) characterized as borderline (RBANS 70–79) (Fig. 1). At 12 months, median RBANS score was 82 (IQR 72–90) with 20% (n = 74) considered extremely low and 21% (n = 78) borderline. Duration of delirium was associated with worse cognitive function at both 3 and 12 months ($P < 0.001$ and $P = 0.03$). Median executive function at 3 months was 41 (IQR 33–49) with persistent dysfunction at 12 months (median 43, IQR 35–51) (Appendix Table 3, <http://links.lww.com/SLA/C504> and Appendix Table 4, <http://links.lww.com/SLA/C504>).

The Impact of Patient Characteristics: Race, Insurance, Education, Socioeconomic Status, Age, and Sex

Non-White survivors had worse cognitive function at 3 and 12 months post-critical illness (both $P = 0.001$) as compared to White patients despite similar baseline level of education and SES index (Table 3). Non-White patients were more likely to have Medicaid insurance as compared to White patients (27.3% vs 15.1%, $P = 0.003$) and in our multivariable model, patients with public insurance (Medicaid, Medicaid + Medicare, Medicare alone or Military) and the uninsured had worse cognitive outcomes at 3 months ($P = 0.004$), but not at 12 months ($P = 0.2$). Impairment in executive function was also observed for publicly insured or uninsured individuals compared to those with private insurance at both 3 and 12 months ($P = 0.03$ and $P = 0.009$). A higher level of education was protective against cognitive dysfunction at both 3 and 12 months ($P < 0.001$ and $P < 0.001$). SES index and sex had no impact on cognitive function post-critical illness at 3 and 12 months (Tables 4 and 5).

System Characteristics: Hospital Type and Discharge Disposition

At the health systems level, patients receiving care at a VA hospital had improved cognitive outcomes at 3 and 12 months ($P < 0.001$ and $P < 0.001$) compared to civilian hospitals. After adjusting for interactions between hospital types and the sociodemographic characteristics, there was no significant difference in effect magnitude in our populations. When controlling for other factors, discharge disposition had no impact on the presence of LTCI at 3 or 12 months. However, in our logistic regression model, duration of delirium in days was associated with higher odds of being discharged to a facility (odds ratio 2.89, 95% confidence interval 1.88–4.45, $P < 0.001$).

DISCUSSION

This study of survivors of critical illness in civilian and veteran hospital cohorts demonstrated worse LTCI for non-White individuals and those with public insurance. Greater education levels and Veterans Affairs hospitals were associated with higher cognitive function at 3 and 12 months, whereas sex and socioeconomic index score had no impact on cognitive outcomes. As previously established, duration of delirium was associated with worse long-term cognitive outcomes and a greater likelihood of discharge to

an inpatient facility; however, when controlling for other factors, discharge to a facility was not associated with worse LTCI, although patients in our follow-up group were more likely to have been discharged home.

Socioeconomic status has been identified as an independent factor for overall health and mortality across a spectrum of patient populations and disease states and demonstrates an inverse relationship to all-cause mortality.^{33,34} Previous research on the role of socioeconomic status on the outcomes of critically ill patients has been limited with most disparities research focusing on racial differences. Black Americans with sepsis or in-hospital cardiac arrest have higher rates of chronic conditions such as renal insufficiency, CNS dysfunction, and diabetes, and in the case of in-hospital cardiac arrest, higher mortality rates compared to their White counterparts.^{35–38} Additionally, a smaller number of hospitals treat the majority of elderly black patients with variable outcomes in cardiovascular, surgical, and infectious quality measures.^{9–13,37,38} Race and economic disparities are closely aligned but do represent distinct risk factors for outcomes in critical illness.³⁹ Our study identified non-White race as a persistent risk factor for cognitive dysfunction, which may be explained by insurance status, as non-White individuals were more likely to have public insurance. Individuals without private insurance demonstrated greater impairment in global cognitive function at 3 months compared to those with private insurance and worse executive function at both 3 and 12 months. The limited research on socioeconomic status and critical illness has been variable.^{40–43} To our knowledge this is the first study to evaluate the role of economic disparities on the risk for LTCI following critical illness. Further work must explore the mechanism by which race and insurance status result in worse outcomes.

PICS-related cognitive outcomes after ICU survival are affected by patient educational attainment, which is intimately associated with socioeconomic status. In a recent study, socioeconomic status was not associated with clinical evidence of PICS at 3 and 12 months post-ICU discharge in survivors of critical illness.¹⁹ PICS manifestations in this cohort included cognitive dysfunction (assessed by RBANS) as well as evidence of ADL disability or depression.¹⁹ Notably, educational status ameliorated the risk of PICS at 3 and 12 months. Similarly, higher education levels have been associated with improved RBANS scores at 3- and 12 months post ICU discharge.²⁹ Higher educational attainment is also a surrogate for socioeconomic status. In our study, educational attainment was protective from cognitive impairment; however, baseline socioeconomic status measured by the AHRQ SES score had no relationship with global cognition and executive function post-discharge.

In our population, even after adjusting for patient characteristics and clinical outcomes, receiving care at a VA Hospital resulted in improved 1-year global cognition. Other studies have demonstrated improved adherence to guidelines at VA hospitals as compared to non-VA hospitals, especially during transitions to post-acute care among VA facilities.^{44,45} We explored the role of discharge facility, considering that veterans may have improved access to rehabilitative services through the VA system, however, this demonstrated no impact on cognitive outcomes. Future effort should evaluate the relationship between hospital setting and cognitive outcomes.

In addition to attempting to understand these associations, patients at high risk for LTCI should receive targeted efforts at prevention in the ICU. Comprehensive programs such as the ABCDEF bundle have been proven successful at reducing unfavorable outcomes—such as delirium—as well as improving survival and likelihood of being discharged home.^{46,47} These patient-centered programs can reduce the incidence of post-ICU syndrome and associated LTCI, and should be emphasized in high-risk individuals at increased risk for worse cognitive outcomes. Prevention of ICU-related LTCI remains essential as effective, targeted cognitive rehabilitation efforts continue to be uncovered.^{48,49}

Our study has important limitations. Despite originating across multiple care settings—including academic, Veterans' Affairs, and community-based hospitals—our study population is limited in socioeconomic and racial diversity, as well as the distribution of payer mix in our population. Additionally, aggregate geographic data, such as the AHRQ SES index score, does not always represent individual household level influences on overall health and subsequent outcomes,⁴² predisposing to overgeneralizations about an individual's social vulnerability. Similarly, the AHRQ SES index used in our cohort was developed for a Medicare populations,³² limiting its generalizability as the median age in our cohorts was below 65. Additionally, the narrow distribution of the SES index may limit the usefulness of its discrimination across our population. All individuals in the cohort spoke English as their primary language to be able participate in follow-up surveys and data collection, limiting the external validity of these findings to non-primary English speakers. Due to limited sample size, our assessment of discharge disposition was limited to a binary classification of discharge to home or to a facility (not home). Lastly, socioeconomic status and insurance status may be markers for an uncontrolled for exposure not captured in our multivariate model.

Our study is the first to demonstrate the risk of greater cognitive impairment after critical illness for non-white individuals and those with public or lack of insurance, and similarly, to demonstrate the protective effect of VA hospitals on cognitive dysfunction as compared to a civilian cohort. Future efforts should be made to understand the impact of race, insurance, and hospital setting on cognitive outcomes. Post-ICU interventions, such as neuropsychological support and cognitive rehabilitation, should be focused on high-risk, socially vulnerable populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding: NIH T32 CA106183-1 (Haddad), NIH T32 HL087738 (Mart), Arthur and Lisa Wheeler Critical Care Research Fund (Mart), Veterans Affairs Tennessee Valley Geriatric Research, Education and Clinical Center (EWE), VA Clinical Science Research and Development Service (PPP, EWE), R01 HL111111 (PPP, EWE, RC, MBP), Merit Review Grant from Department of Veterans Affairs (EWE, MBP), R01 AG027472 (Ely), R01 GM120484 (Patel), R01 AG058639 (Patel, Ely)

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FIGURE 1.
Categorization of Repeatable Battery for the Assessment of Neuropsychologic Status (RBANS) Global Cognition Score for ICU survivors at 3 months (n = 489).

TABLE 1.

Baseline Characteristics for ICU Cohort at Baseline and 3/12-Month Follow-Up

Characteristic	ICU Cohort (N = 1040)	Follow-Up at 3 mo (N = 489)	Follow-Up at 12 mo (N = 405)
Age, y			
Median	62	61	60
Interquartile range	53–72	52–70	51–69
Race			
White (%)	946 (91)	434 (89)	365 (90)
Black (%)	87 (8)	53 (11)	39 (10)
Male Sex (%)	627 (60)	300 (61)	244 (60)
Education year			
Median	12	12	12
Interquartile range	12–14	12–14	12–14
Socioeconomic Index			
Median	49.8	49.8	49.8
Interquartile range	47.3–52.8	47.3–52.5	47.4–52.7
Insurance status			
Private (%) [*]	542 (52)	256 (52)	213 (53)
Medicare (%)	187 (18)	75 (15)	62 (15)
Medicaid (%)	155 (15)	76 (16)	61 (15)
Military only (%)	113 (11)	60 (12)	45 (11)
Uninsured (%)	43 (4)	22 (5)	39 (10)
Civilian hospital	826 (79)	384 (79)	321 (79)
Veterans Affairs Hospital (%)	221 (21)	105 (21)	84 (21)
Charlson comorbidity index			
Median	2	2	2
Interquartile range	1–4	1–4	1–3
APACHE [†] II Score at ICU admission			
Median	24	23	23
Interquartile range	18–30	17–29	17–29
Framingham stroke risk profile			
Median	10	10	9
Interquartile range	6–15	6–14	6–14
Modified SOFA [‡] at enrollment			
Median	9	9	8
Interquartile range	7–11	7–10	7–11
Delirium			
No. of patients (%)	740 (71)	340 (70)	279 (69)
No. of days			
Median	4	4	3
Interquartile range	2–7	2–7	2–7

Characteristic	ICU Cohort (N = 1040)	Follow-Up at 3 mo (N = 489)	Follow-Up at 12 mo (N = 405)
History of alcohol use (%)	229 (26)	119 (28)	99 (28)
History of psychiatric illness (%)	108 (11)	56 (12)	49 (12)
Discharge disposition			
Home (%)	462 (44)	315 (64)	264 (65)
Inpatient Facility (%)	578 (56)	174 (36)	141 (35)

A total of 1040 patients underwent in-hospital baseline evaluation; of these 489 participated 3-month evaluation with at least partial outcomes data available, and 405 participated in a 12-month evaluation; these 2 subsets of patients comprised our follow-up cohort.

* Includes patients with Private insurance and Medicare coverage.

[†] Acute Physiology and Chronic Health Evaluation.

[‡] Sequential Organ Failure Assessment.

[§] includes dual eligible beneficiaries enrolled in both Medicare and Medicaid.

TABLE 2.

Baseline Characteristics for ICU Cohort for Civilian and Veteran Populations (n = 1040)

Characteristic	Civilian Cohort (N = 821)	Veteran Cohort (N = 219)
Age, y		
Median	61	65
Interquartile range	51–71	60–76
Race (%)		
White	740 (90)	206 (94)
Black	77 (9)	10 (5)
Male sex (%)	420 (51)	207 (95)
Education year		
Median	12	12
Interquartile range	12–14	12–14
Socioeconomic Index		
Median	49.8	49.4
Interquartile range	47.5–52.8	46.8–52.8
Insurance status *		
Private (%) [†]	515 (63)	27 (12)
Medicare (%)	121 (15)	66 (30)
Medicaid (%)	142 (17)	13 (6)
Military only (%)	0 (0)	113 (52)
Uninsured	43 (5)	0 (0)
Charlson comorbidity index		
Median	2	3
Interquartile range	1–4	1–5
APACHE [‡] II Score at ICU admission		
Median	25	19
Interquartile range	19–31	15–24
Framingham stroke risk profile		
Median	9	12
Interquartile range	6–14	9–16
Modified SOFA [§] at enrolment		
Median	9	8
Interquartile range	7–12	6–9
Delirium		
No. of patients (%)	603 (74)	137 (63)
Number of days		
Median	4	5
Interquartile range	2–7	2–10
History of alcohol use (%)	164 (24)	65 (30)
History of psychiatric illness (%)	66 (8)	42 (20)

Characteristic	Civilian Cohort (N = 821)	Veteran Cohort (N = 219)
Discharge disposition		
Home (%)	355 (43)	107 (49)
Inpatient facility (%)	466 (57)	112 (51)

A total of 1040 patients underwent in-hospital baseline evaluation; 821 were recruited from the 2 civilian sites and 219 were recruited from 3 VA populations.

^{*} Includes secondary insurance designation for VA population as all patients recruited from the 3 VA sites had Military/VA insurance.

[†] Includes patients with Private insurance and Medicare coverage.

[‡] Acute Physiology and Chronic Health Evaluation.

[§] Sequential Organ Failure Assessment.

[¶] Includes dual eligible beneficiaries enrolled in both Medicare and Medicaid.

TABLE 3.

Descriptive Baseline Summary Characteristics by Race

Characteristic	White Race, N = 953	Non-White Race, N = 94
Education		
Median, y	12	12
IQR	12–14	12–14
SES Index Score [†]		
Median	49.8	51
IQR	47.3–52.8	47.2–52.9
Insurance status (%)		
Private [‡]	499 (58)	43 (49)
Medicare	169 (20)	18 (20)
Medicaid ^{§,*}	131 (15)	24 (27)
None	67 (8)	3 (3)
Missing	87	6
Hospital type (%)		
Civilian	745 (78)	81 (86)
Veteran	208 (22)	13 (14)

* $P < 0.05$.

[†] Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status Index Score.

[‡] Includes patients with Private insurance and Medicare coverage.

[§] Includes dual eligible beneficiaries enrolled in both Medicare and Medicaid.

TABLE 4.

Impact of Sociodemographic and Baseline Factors on Global Cognition^{*} at 3 Months in an Adjusted Model (n = 489)

Characteristic	Adjusted RBANS Global Score Difference	P
Delirium duration	-6.50	0.003
Age at enrollment	-3.01	0.065
Years of education	3.61	<0.001
Non-white race [†]	-6.01	<0.001
SES Index Score [‡]	0.10	0.76
Public insurance [§]	-3.84	0.004
Female sex [¶]	1.47	0.22
Veteran hospital type ^{//}	8.47	<0.001
Discharge to facility ^{***}	0.84	0.53

^{*} Based on Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Scores. Negative values correlate with worse global cognition (RBANS). The population age-adjusted mean ($\pm$ SD) for the RBANS global cognition score and for the individual domains is 100 ± 15 , on a scale ranging from 40 to 160, with lower scores indicating worse performance. All differences reported with 95% CI from multivariable linear regression. Each dichotomous variable is assessed for yes versus no. For each continuous variable the 75th percentile is assessed as compared to the 25th percentile. Continuous variables were modeled with the use of restricted cubic splines to allow for nonlinear associations between covariates and outcomes.

[†] Compared to white race.

[‡] Based on Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status Index Score.

[§] Medicare, Medicaid, Military, or Uninsured as compared to private insurance.

[¶] Compared to male sex.

^{//} Compared to civilian hospital.

^{***} Discharge to a facility, including another hospital, hospice, LTAC, nursing home, rehab facility, or other facility as compared to home.

TABLE 5.

Impact of Sociodemographic and Baseline Factors on Global Cognition^{*} at 12 Months in an Adjusted Model (N = 405)

Characteristic	Adjusted RBANS Global Score Difference	P
Delirium duration	-6.72	0.068
Age at enrollment, y	-4.11	0.087
Education, y	2.88	<0.001
Non-white race [†]	-7.11	0.001
SES Index Score [‡]	0.89	0.43
Public insurance [§]	-2.03	0.18
Female sex [¶]	0.34	0.81
Veteran hospital type ^{//}	7.85	<0.001
Discharge to facility ^{***}	0.11	0.95

^{*} Based on Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Scores. Negative values correlate with worse global cognition (RBANS). The population age-adjusted mean ($\pm$ SD) for the RBANS global cognition score and for the individual domains is 100 ± 15 , on a scale ranging from 40 to 160, with lower scores indicating worse performance. All differences reported with 95% CI from multivariable linear regression. Each dichotomous variable is assessed for yes versus no. For each continuous variable the 75th percentile is assessed as compared to the 25th percentile. Continuous variables were modeled with the use of restricted cubic splines to allow for nonlinear associations between covariates and outcomes.

[†] Compared to white race.

[‡] Based on Agency for Healthcare Research and Quality (AHRQ) Socioeconomic Status Index Score.

[§] Medicare, Medicaid, or Uninsured as compared to private insurance.

[¶] Compared to male sex.

^{//} Compared to civilian hospital.

^{***} Discharge to a facility, including another hospital, hospice, LTAC, nursing home, rehab facility, or other facility as compared to home.