Online Data Supplement

Pre-ICU Cognitive Status, Subsequent Disability, and New Nursing Home Admission among Critically Ill Older Adults

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Data Supplement

Additional details about abstraction of ICU data

When data were available from Medicare claims, ICU length of stay was based on the number of days billed in a critical care unit, and the presence of shock was obtained using the following International Classification of Diseases, Ninth Revision (ICD-9) codes: 785.50 (shock NOS), 785.51 (cardiogenic shock), 785.52 (septic shock), 785.59 (shock without trauma), 958.4, 995.4, 998.00 (postoperative shock, unspecified), 998.01 (postoperative shock, cardiogenic), 998.02 (postoperative shock, septic), and 998.09 (postoperative shock, other). To identify the need for mechanical ventilation, we included all observations with ICD-9 code 96.7x.(1) To ensure that we captured all observations that included mechanical ventilation, we then searched for ICD-9 codes indicating respiratory failure (518.5, 518.8x), respiratory dependence (V46.11), tracheostomy (31.1 and 31.29), and endotracheal tube insertion (96.04); for all ICU admissions that included one of these codes but not 96.7x, we performed a manual chart review to determine whether the patient required mechanical ventilation during their ICU admission. For participants in managed Medicare, ICU length of stay, the presence of shock, and the use of mechanical ventilation were abstracted from the medical record. Shock was classified as present according to the ICU physician's assessment. The need for mechanical ventilation was defined as the patient requiring intubation for respiratory failure or airway protection. Intubations for surgical procedures were excluded, except when the patient was unable to be weaned from the ventilator within 12 hours.

Table E1. Sensitivity of Associations between Pre-ICU Cognitive Status and Post-ICU Disability to Death of Participants during the 6 Months of Follow-Up

Imputational Approach	Minimal Impairment (24 ≤ MMSE ≤ 27)		Moderate Impairment (MMSE < 24)	
	Relative Risk[a] (95% CI)	*p*-value[b]	Relative Risk[a] (95% CI)	*p*-value[b]
Imputation of Missing Covariates for Complete Cases (Reported Results)	1.16 (1.02 – 1.32)	0.022	1.19 (1.04 - 1.36)	0.011
Outcomes of Decedents Imputed as MAR	1.17 (1.04 – 1.32)	0.009	1.18 (1.04 – 1.34)	0.011
NMAR: Missing Outcome Values of Decedents Set to Zero (minimum)[c]	1.17 (1.01 – 1.36)	0.042	1.20 (0.99 –1.44)	0.059
NMAR: Missing Outcome Values of Decedents Set to Seven (midpoint)[c]	1.17 (1.04 – 1.32)	0.011	1.16 (1.02 – 1.33)	0.026
NMAR: Missing Outcome Values of Decedents Set to Thirteen (maximum)[c]	1.18 (1.03 – 1.35)	0.016	1.16 (1.00 – 1.33)	0.046

Abbreviations: MMSE = Folstein Mini-Mental State Exam, CI = confidence interval, MAR = missing at random, NMAR = missing not at random

[a] Referent to MMSE ≥ 28
[b] From a multivariable negative binomial model with adjustment for age, sex, race, education, number of chronic conditions, disability count in the month prior to ICU admission, physical capabilities, mechanical ventilation, shock, and ICU length of stay.
[c] In all 3 NMAR imputations, the missing covariates of decedents were imputed as MAR.

Table E2. Sensitivity of Associations between Pre-ICU Cognitive Status and Incident Nursing Home Admission to Death of Participants during Hospitalization

Imputational Approach	Minimal Impairment (24 ≤ MMSE ≤ 27)		Moderate Impairment (MMSE < 24)	
	Odds Ratio (95% CI)[a]	*p*-value[b]	Odds Ratio (95% CI)[a]	*p*-value[b]
Imputation of Missing Covariates for Complete Cases (Reported Results)	1.64 (0.90 – 2.97)	0.106	2.48 (1.09 – 5.64)	0.030
Outcomes of Hospital Decedents Imputed as MAR	1.75 (0.95 – 3.23)	0.073	2.47 (1.15 – 5.31)	0.021
Missing Outcome of Hospital Decedents Imputed as NMAR (all values set to 0)	1.67 (0.95 –2.95)	0.077	2.07 (1.00 – 4.26)	0.049
Missing Outcome of Hospital Decedents Imputed as NMAR (all values set to 1)	1.56 (0.89 – 2.75)	0.120	2.33 (1.06 – 5.12)	0.035

Abbreviations: MMSE = mini-mental state exam, CI = confidence interval, MAR = missing at random, MNAR = missing not at random

[a] Referent to MMSE ≥ 28
[b] From a multivariable negative binomial model with adjustment for age, sex, race, education, number of chronic conditions, disability count in the month prior to ICU admission, physical capabilities, mechanical ventilation, shock, and ICU length of stay.
[c] In all NMAR imputations, the missing covariates of decedents were imputed as MAR.

References for Data Supplement

1.   Sjoding MW, Prescott HC, Wunsch H, Iwashyna TJ, Cooke CR. Longitudinal Changes in ICU Admissions Among Elderly Patients in the United States. Crit Care Med. 2016;44(7):1353-60. doi: 10.1097/ccm.0000000000001664. PubMed PMID: WOS:000378080400036.