



VANDERBILT UNIVERSITY
MEDICAL CENTER

Delirium and Long-Term Cognitive Impairment in ICU Survivors



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Disclosures:

- NIH and VA U.S. Federal Funding
- Abbott, Hospira, Orion
- Author of PAD Guidelines of SCCM 2013
- Chair of SCCM Delirium section for PAD
- Co-Chair of SCCM ICU Liberation project to aid world-wide implementation



FIFTH EDITION

Principles of Geriatric Medicine & Gerontology


William R. Hazzard

John P. Blass

Jeffrey B. Halter

Joseph G. Ouslander

Mary E. Tinetti



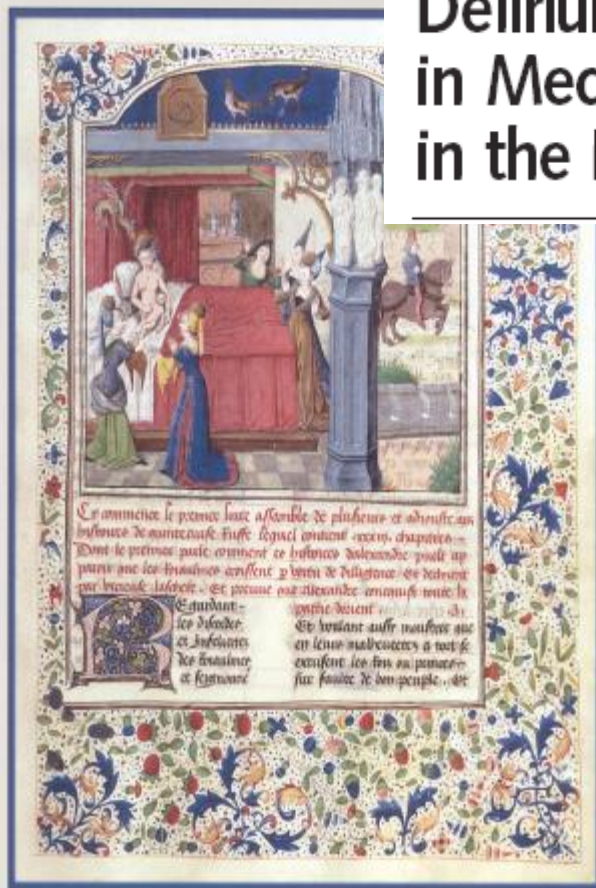
JAMA[®]

The Journal of the American Medical Association

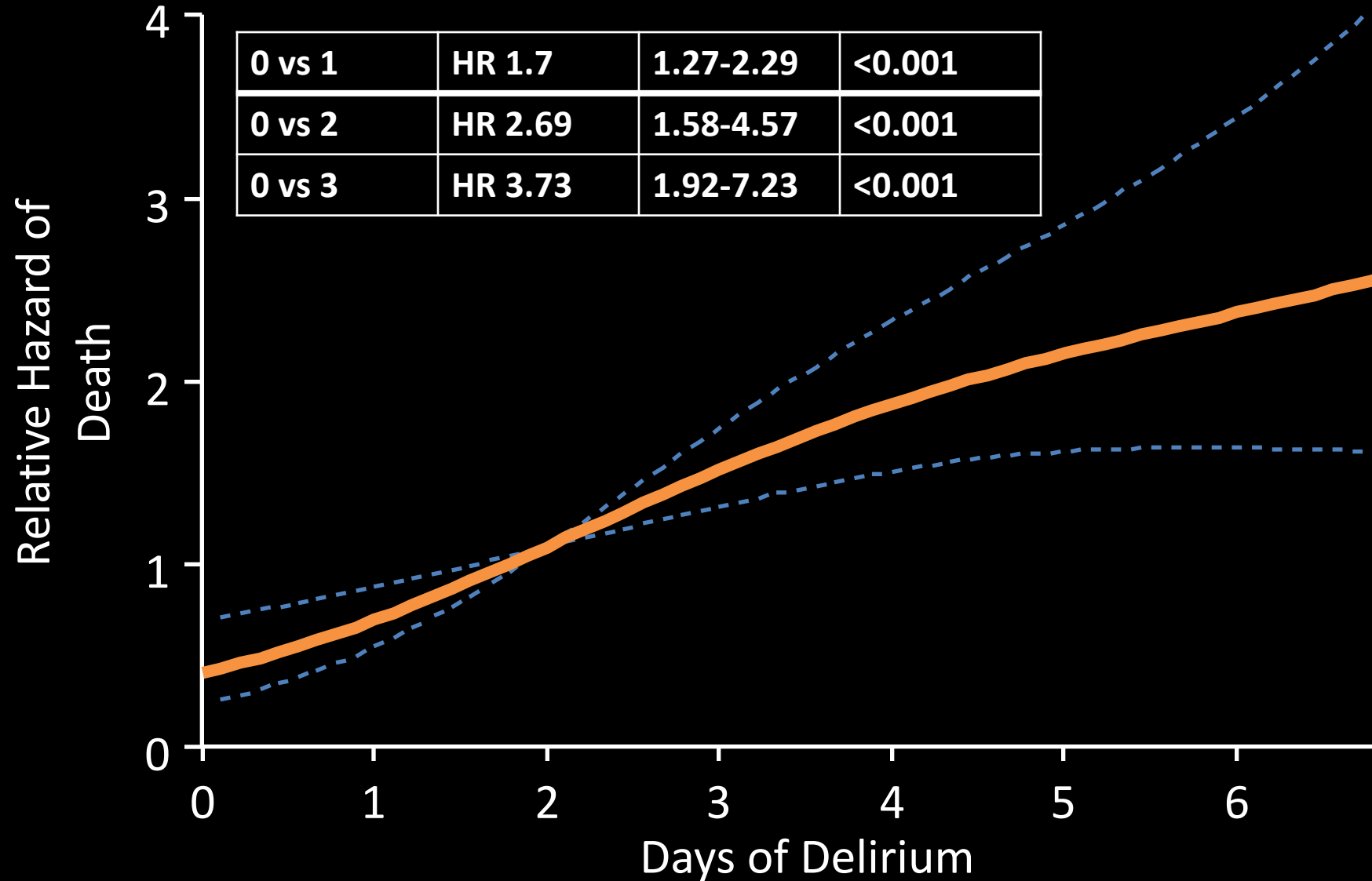
CARING FOR THE
CRITICALLY ILL PATIENT

Ely EW, JAMA 2004;291:1753-62

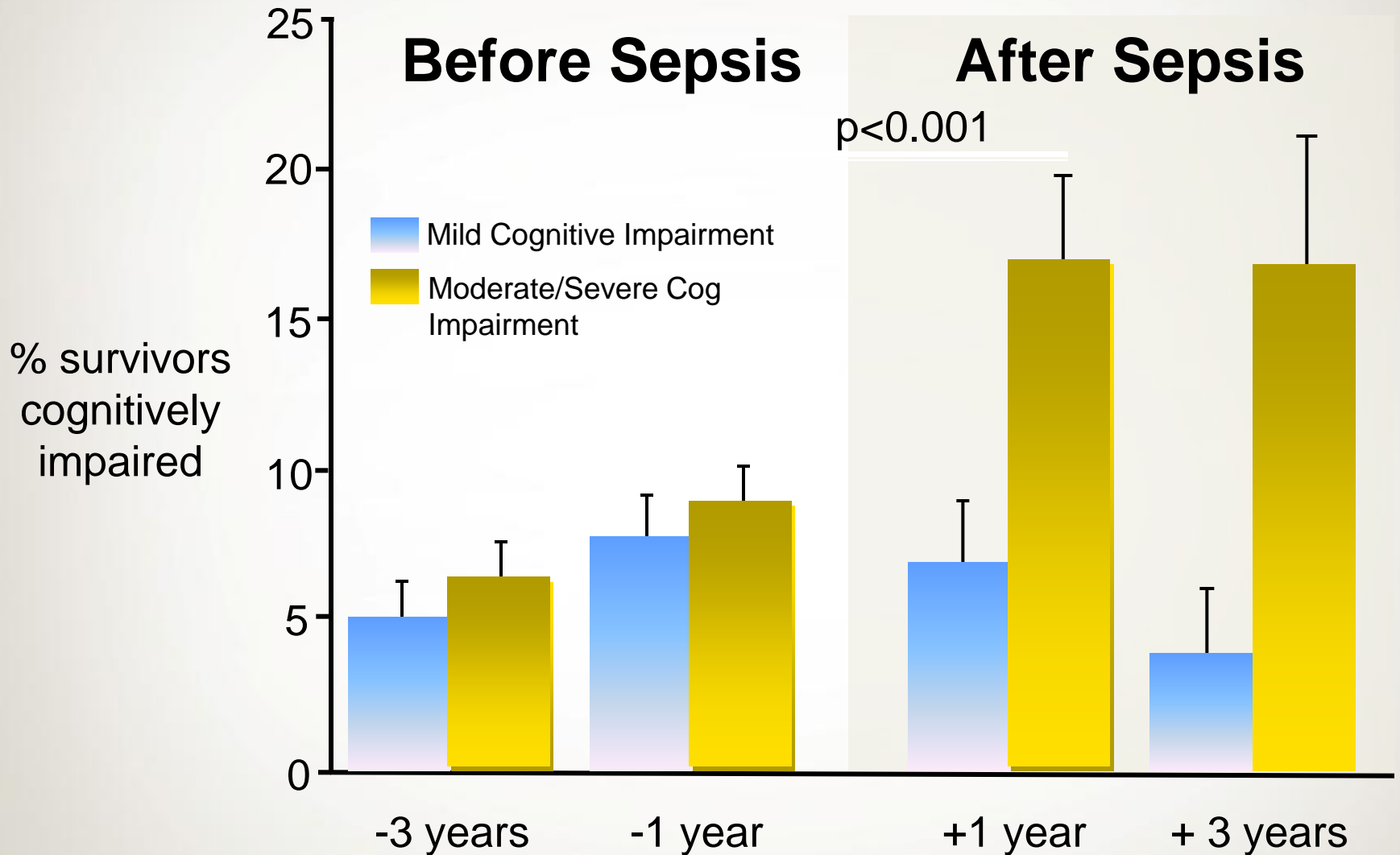
Delirium as a Predictor of Mortality in Mechanically Ventilated Patients in the Intensive Care Unit



Delirium Duration & Mortality



Cognitive Impairment: Sepsis



Delirium and Cognitive Decline

Delirium accelerates cognitive decline in Alzheimer disease

T.G. Fong, MD, PhD
R.N. Jones, ScD
P. Shi, PhD
E.R. Marcantonio, MD,
SM
L. Yap, PhD
J.L. Rudolph, MD
F.M. Yang, PhD
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S.K. Inouye, MD, MPH

ABSTRACT

Objective: To examine the impact of delirium on the trajectory of cognitive function in a cohort of patients with Alzheimer disease (AD).

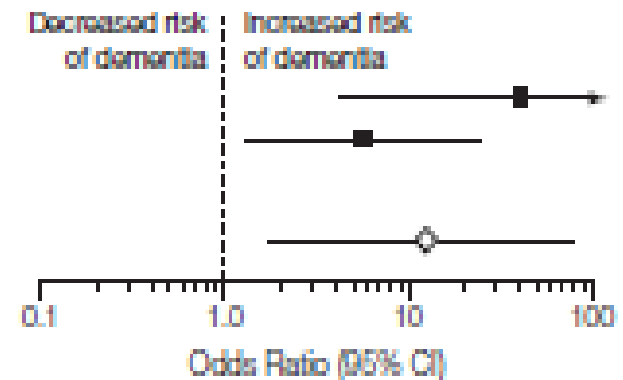
Methods: A secondary analysis of data collected from a large prospective cohort, the Massachusetts Alzheimer's Disease Research Center's patient registry, examined cognitive performance over time in patients who developed ($n = 72$) or did not develop ($n = 336$) delirium during the course of their illnesses. Cognitive performance was measured by change in score on the Information-Memory-Concentration (IMC) subtest of the Blessed Dementia Rating Scale. Delirium was identified using a previously validated chart review method. Using linear mixed regression models, rates of cognitive change were calculated, controlling for age, sex, education, comorbid

Delirium in Elderly Patients and the Risk of Postdischarge Mortality, Institutionalization, and Dementia: A Meta-analysis

Joost Witlox; Lisa S. M. Eurelings; Jos F. M. de Jonghe; et al.

JAMA. 2010;304(4):443-451 (doi:10.1001/jama.2010.1013)

Dementia		
Blokai et al, ²² 2008	41.20 (4.29-395.48)	40.0
Lundström et al, ⁵⁴ 2003	5.66 (1.34-24.00)	60.0
Heterogeneity: $I^2 = 52.4\%$; $P = .15$		
Random-effects model: $P = .009$	12.52 (1.86-84.21)	100

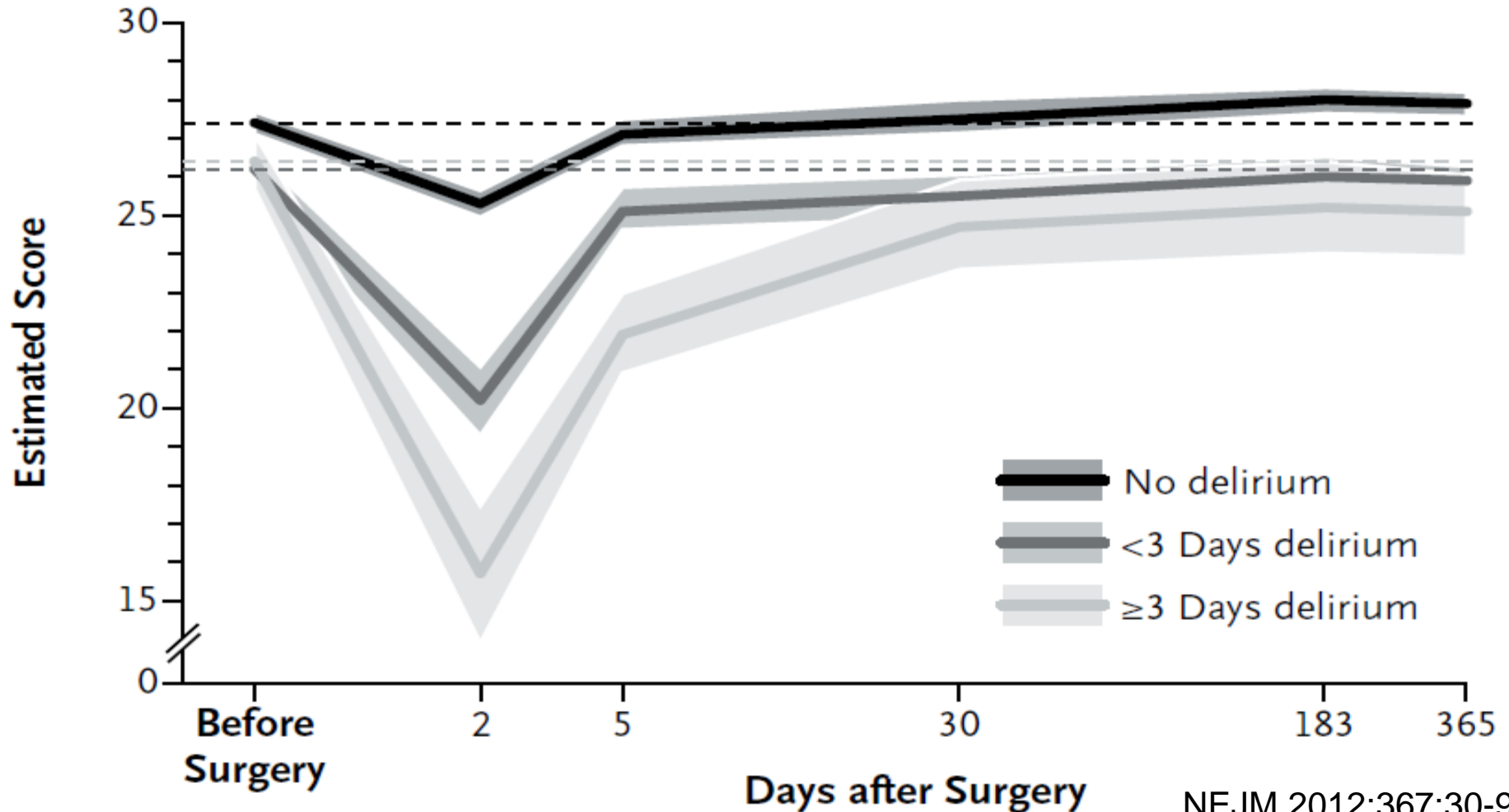


Analyses of the association between delirium and mortality, institutionalization, and dementia adjusted for age, sex, comorbid illness or illness severity, and baseline dementia. CI indicates confidence interval. Weighting was assigned according to the inverse of the variance. Hazard ratios and odds ratios larger than 1 indicate increased risk of mortality, institutionalization, or dementia among participants who experienced delirium.

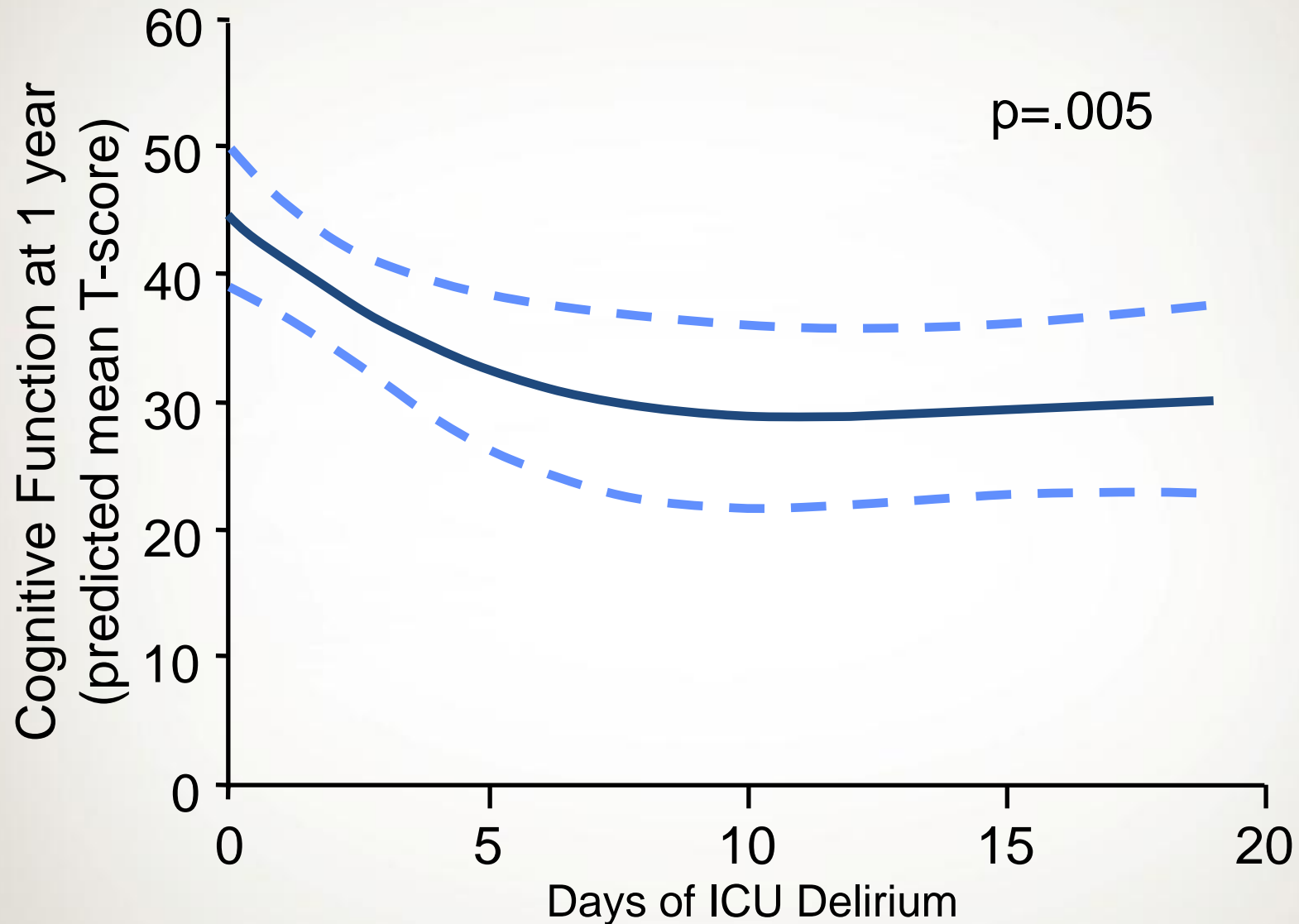
Cognitive Trajectories after Postoperative Delirium

Jane S. Saczynski, Ph.D., Edward R. Marcantonio, M.D., Lien Quach, M.P.H., M.S.,
Tamara G. Fong, M.D., Ph.D., Alden Gross, Ph.D., M.P.H.,
Sharon K. Inouye, M.D., M.P.H., and Richard N. Jones, Sc.D.

C Sensitivity Analysis with Duration of Delirium



Delirium and Long-Term Cognitive Outcomes



Bringing to light Risk factors And Incidence of Neuropsychological dysfunction in ICU survivors



BRAIN-ICU Hypothesis

- **We hypothesized that duration of delirium is a predictor of LTCl in patients at 3 and 12 months after ICU discharge.**
- **Primary purpose was to identify potentially modifiable risk factors of long-term cognitive impairment such as development of delirium and exposure to sedative medications.**

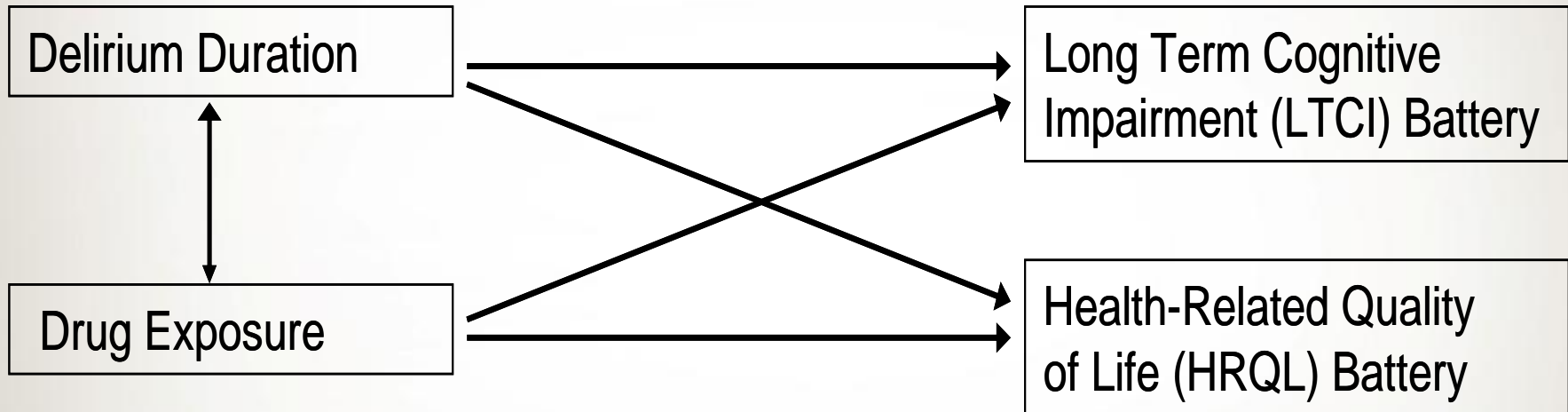
Patient enrollment

Time →

12-month follow-up

INDEPENDENT VARIABLES

DEPENDENT VARIABLES



ORIGINAL ARTICLE

Long-Term Cognitive Impairment after Critical Illness

P.P. Pandharipande, T.D. Girard, J.C. Jackson, A. Morandi, J.L. Thompson, B.T. Pun, N.E. Brummel, C.G. Hughes, E.E. Vasilevskis, A.K. Shintani, K.G. Moons, S.K. Geevarghese, A. Canonico, R.O. Hopkins, G.R. Bernard, R.S. Dittus, and E.W. Ely, for the BRAIN-ICU Study Investigators*

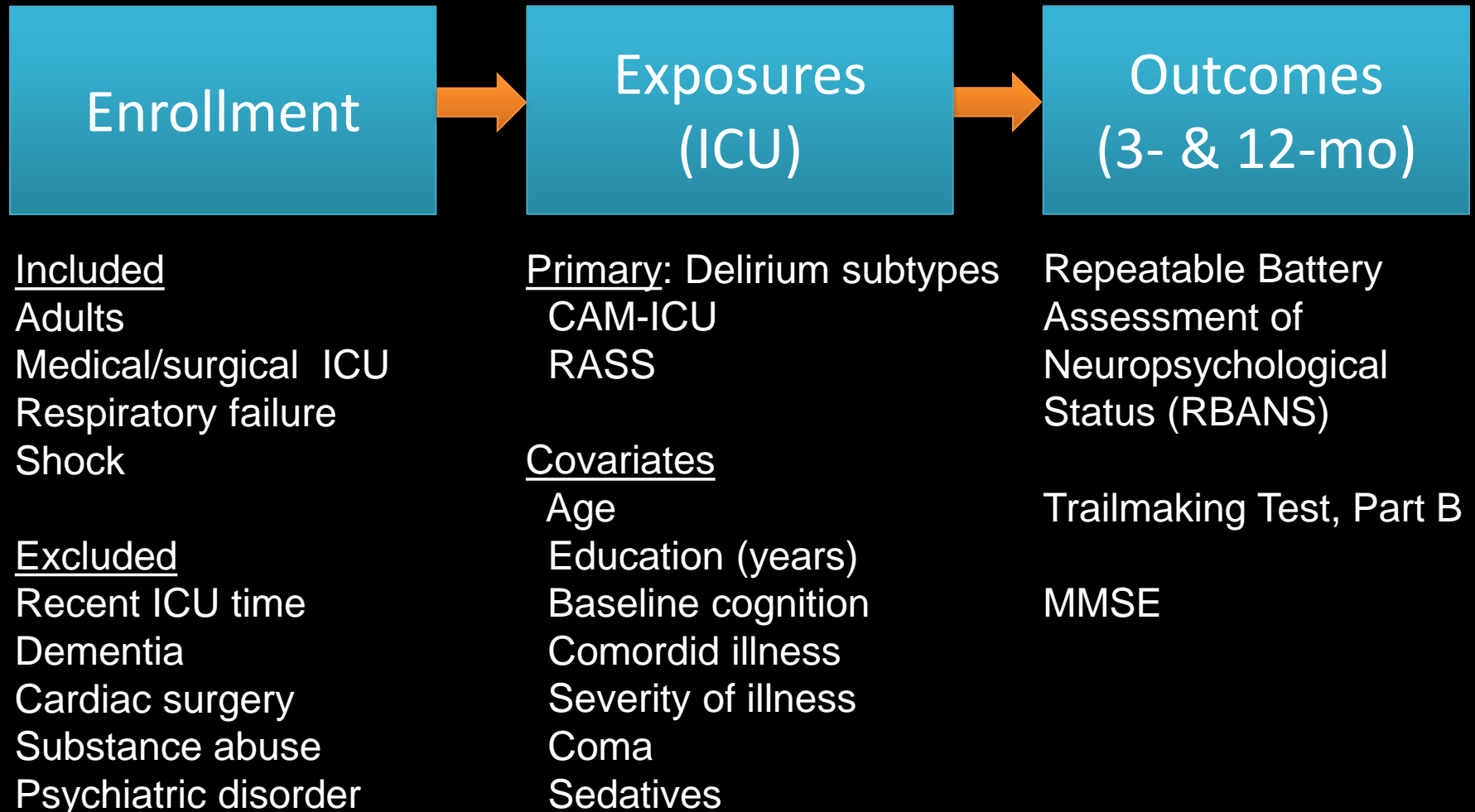
ABSTRACT

BACKGROUND

Survivors of critical illness often have a prolonged and disabling form of cognitive impairment that remains inadequately characterized.

Methods

Prospective Cohort Study

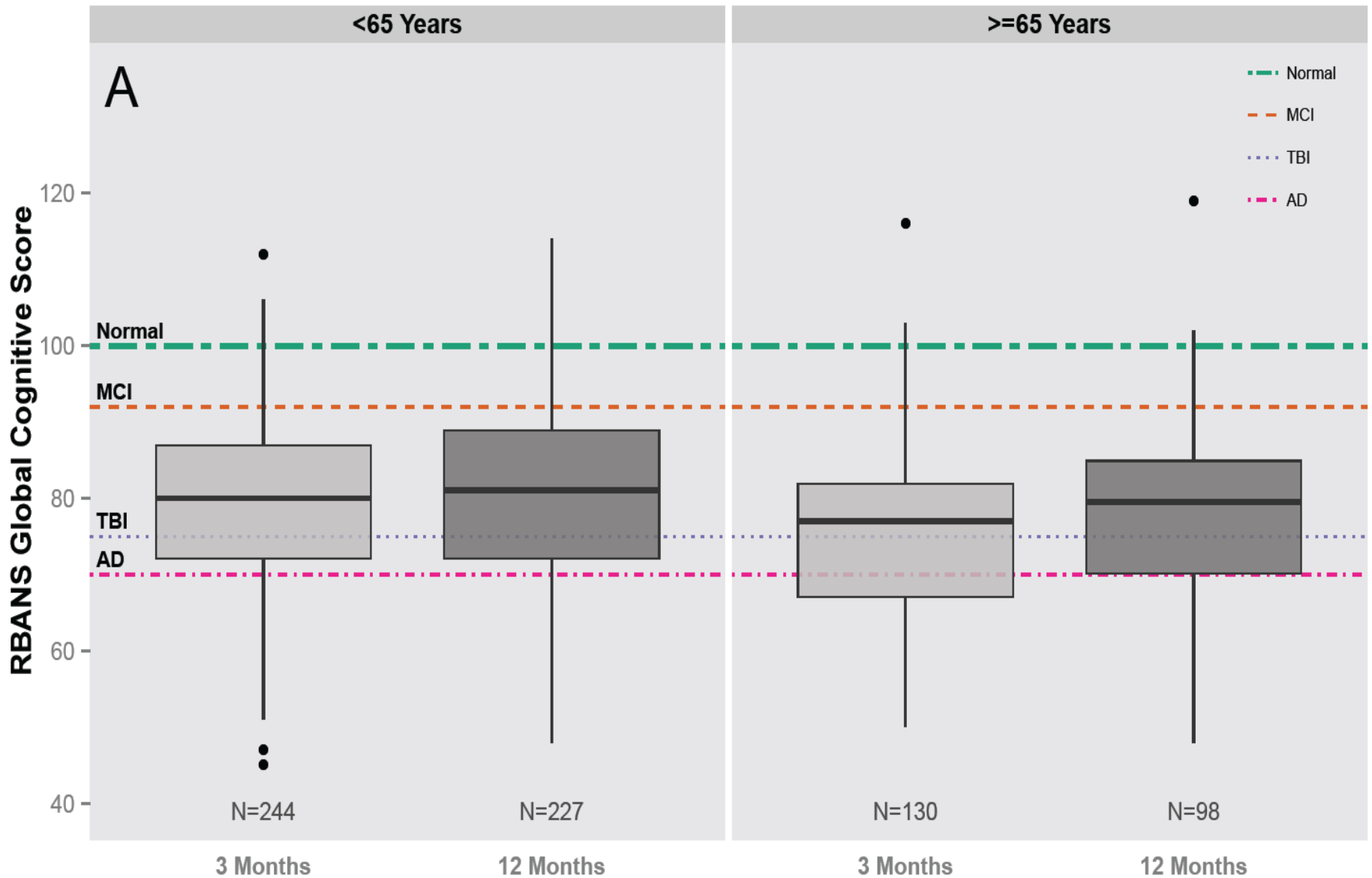


Baseline and Clinical Characteristics

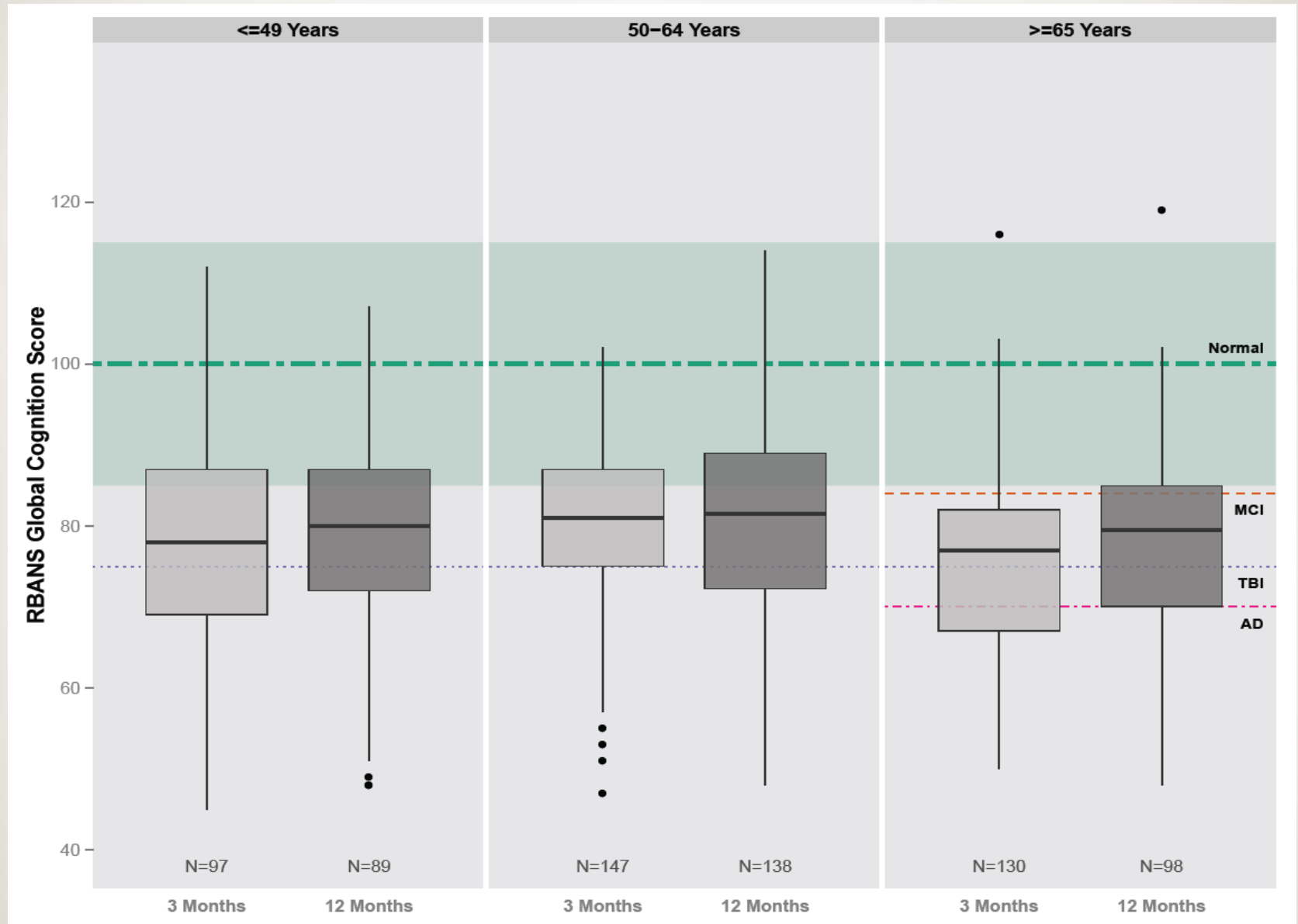
Characteristic	Hospital Cohort (N=821)	Follow-Up Cohort (N=467)
Age, years	61 [51-71]	59 [49-69]
Education, years	12 [12-14]	12 [12-14]
Cognitive impairment, %	6%	6%
APACHE II	25 [19-31]	24 [19-30]
Admission diagnoses, %		
Severe sepsis	30	30
Acute respiratory failure	16	15
Cardiac	17	17
Other	37	38
Mechanically ventilated		
Patients, %	74	75
Duration, days	3 [1-8]	2 [1-6]
Hospital length of stay, days	10 [6-17]	10 [6-18]

BRAIN-ICU Outcomes
Long-term cognitive impairment

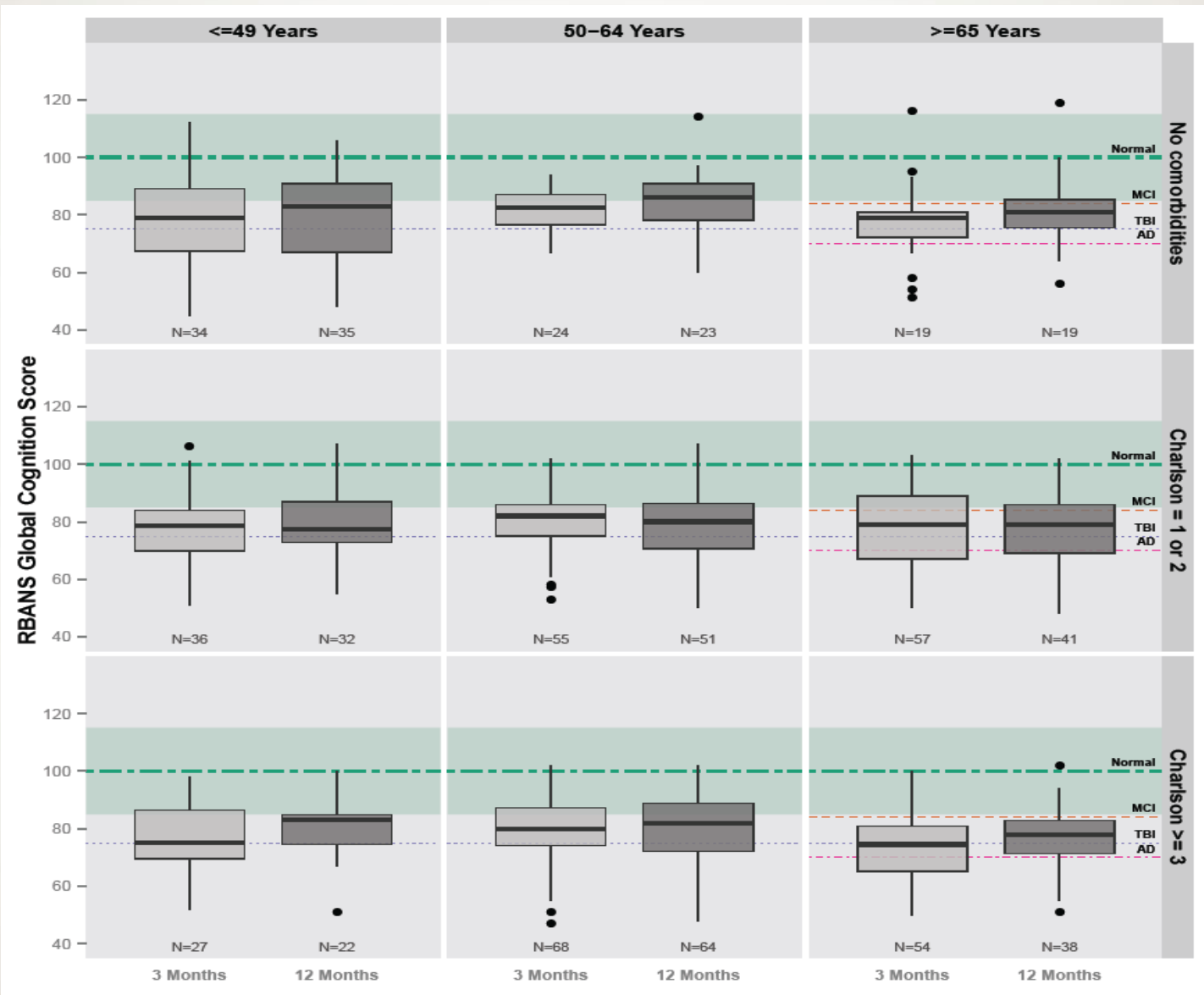
The Picture of Dementia Following ICU Care



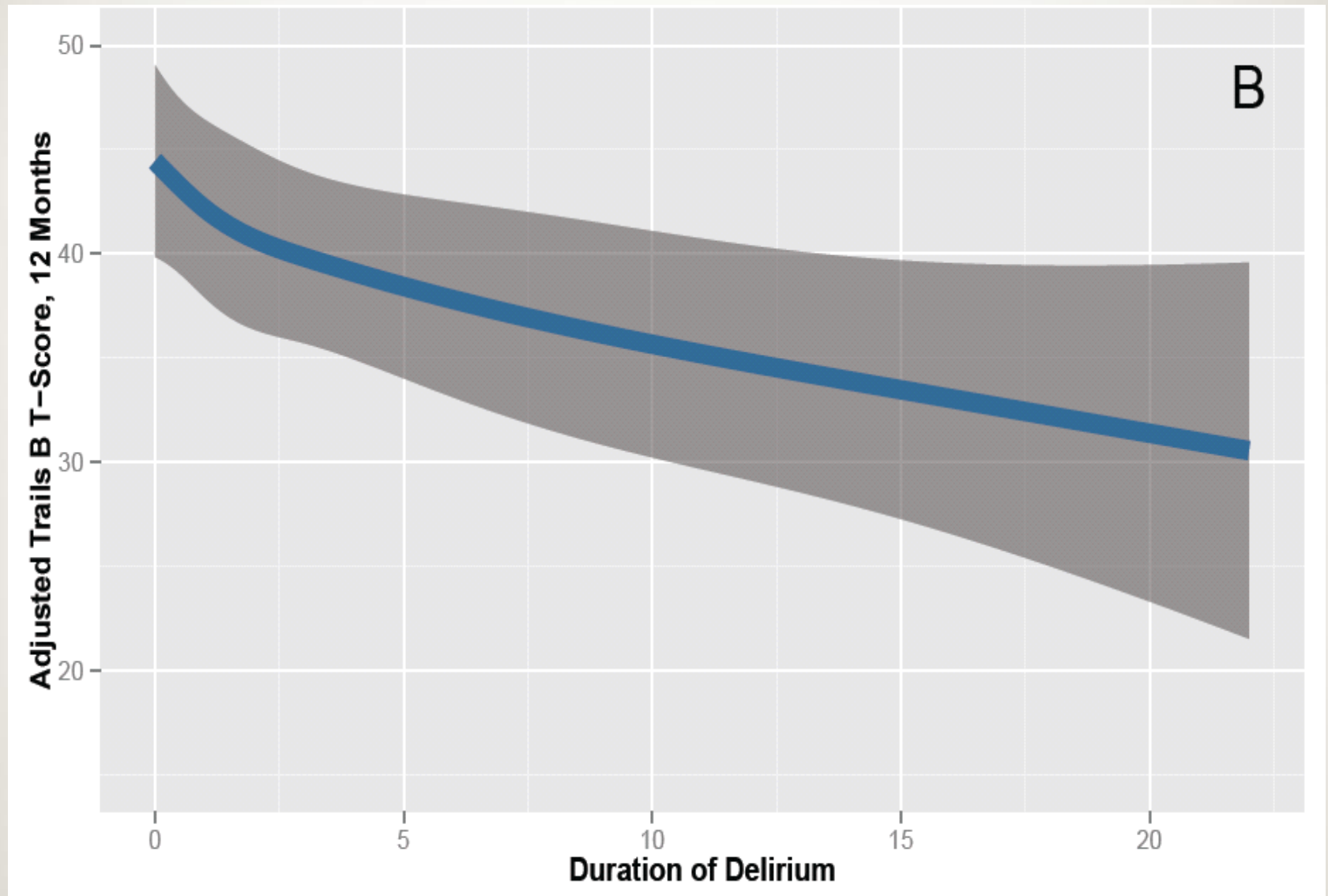
Global Cognitive Scores by Age



Global Cognitive Scores by Age and Comorbidity



Delirium and Executive Function



Persistent cognitive impairment, hippocampal atrophy and EEG changes in sepsis survivors

Alexander Semmler,^{1,6} Catherine Nichols Widmann,¹ Thorsten Okulla,¹ Horst Urbach,² Markus Kaiser,^{3,7} Guido Widman,⁴ Florian Mormann,^{4,8} Julia Weide,¹ Klaus Fließbach,⁴ Andreas Hoeft,³ Frank Jessen,⁵ Christian Putensen,³ Michael T Heneka¹

- Bonn Germany, 2 center 6-24 month follow-up of 25 septic and 19 non-septic ICU survivors
- Sepsis survivors showed cognitive deficits in verbal learning and memory
- Significant reductions of hippocampal volume vs. controls
- More low frequency EEG activity indicating brain dysfunction

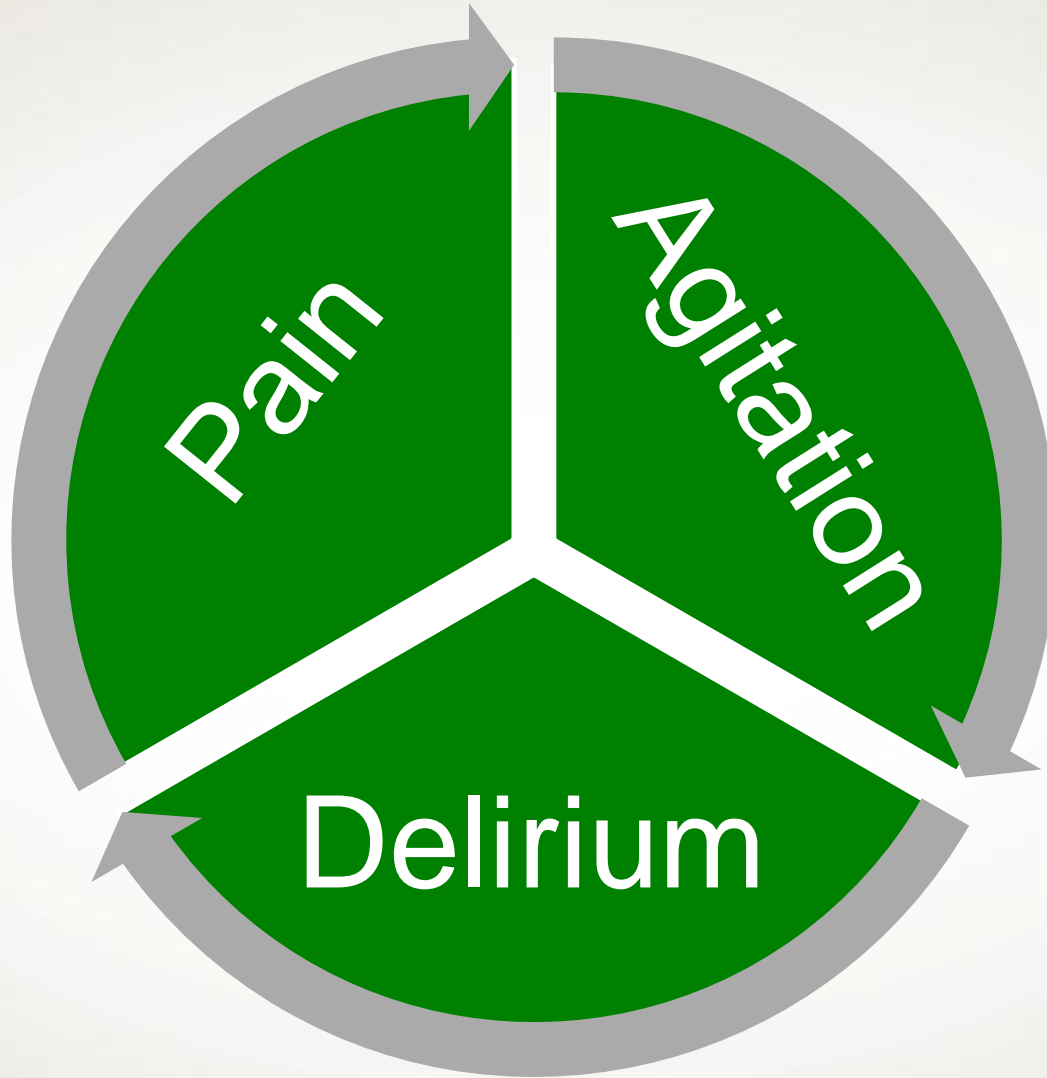
THE LANCET

Volume 372 · Number 9634 · Pages 177-262 · July 19-25, 2008

www.thelancet.com

“Dementia is perhaps the cruellest manifestation of ageing, inexorably melting away all that which makes us individual and human.”

See Editorial page 177



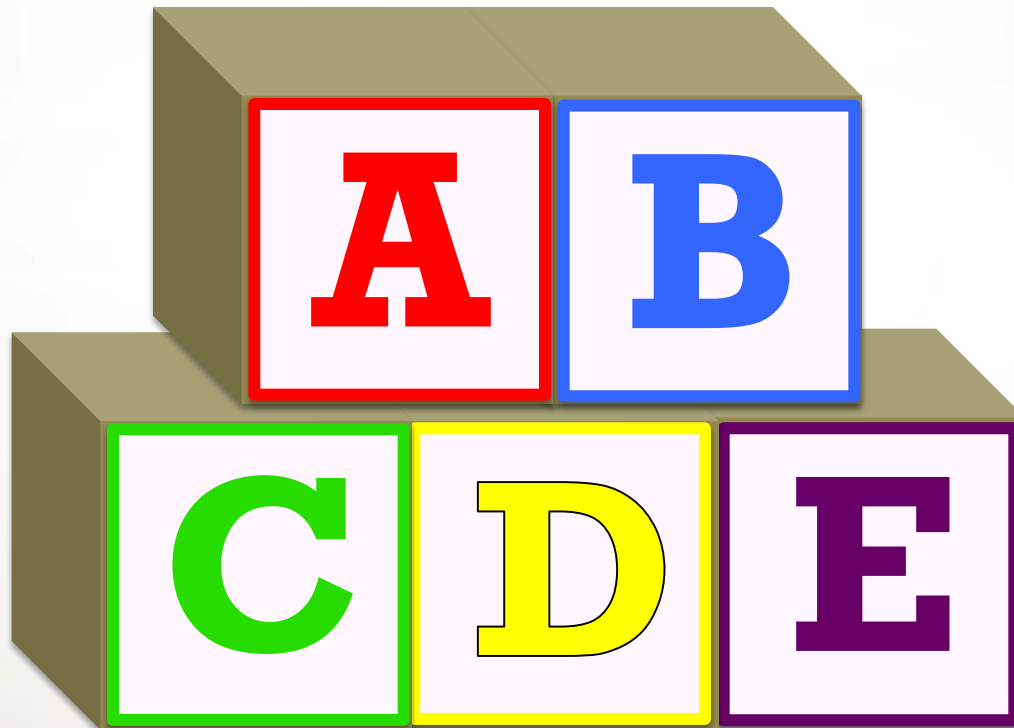


Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit

Juliana Barr, MD, FCCM¹; Gilles L. Fraser, PharmD, FCCMP²; Kathleen Pantillo, RN, PhD, FAAN, FCCM³; E. Wesley Ely, MD, MPH, FACP, FCCM⁴; Céline Gélinas, RN, PhD⁵; Joseph F. Dasta, MSc, FCCM, FCCP⁶; Judy E. Davidson, DNP, RN⁷; John W. Devlin, PharmD, FCCM, FCCP⁸; John P. Kress, MD⁹; Aaron M. Joffe, DO¹⁰; Douglas B. Coursin, MD¹¹; Daniel L. Herr, MD, MS, FCCM¹²; Avery Tung, MD¹³; Bryce R. H. Robinson, MD, FACS¹⁴; Dorrie K. Fontaine, PhD, RN, FAAN¹⁵; Michael A. Ramsay, MD¹⁶; Richard R. Riker, MD, FCCM¹⁷; Curtis N. Sessler, MD, FCCP, FCCM¹⁸; Brenda Pun, MSN, RN, ACNP¹⁹; Yoanna Skrobik, MD, FRCP²⁰; Roman Jaeschke, MD²¹

ABCDEs:

*Building blocks of managing
Pain, Agitation & Delirium*



““ I survived and that is the main thing. And I am so grateful to God that I survived and am now off all oxygen and consider myself all well except that I can't remember to take my medications...

-SB



The ICU Delirium and Cognitive Impairment Study Group at the Loveless Café, Nashville TN



icudelirium.org

RESEARCH DESIGNED TO TURN
MIRRORS INTO WINDOWS



ICU Delirium and Cognitive Impairment Study Group: selected local members

Pratik Pandharipande

Jim Jackson

Jin Han

Ed Vasilevskis

Chris Hughes

Alessandro Morandi

Paula Watson

Lorraine Ware

Gordon Bernard

Bob Dittus

Ted Speroff

Wes Ely

Leanne Boehm

Joyce Okahashi

Cayce Strength

Brenda Pun

Lauren Hardy

Amy Lipsey

Ryan Black

Jessica McCurley

Michael Santoro

Carrie Jones

Morgan Crawford

Mayur Patel

Tim Girard

John Gore

Baxter Rogers

Stephan Heckers

Cathy Fuchs

Heidi Smith

Ty Berutti

Brad Strohler

Elizabeth Card

Jennifer Thompson

Ayumi Shintani

Stephanie Hamilton