Post-ICU Strategies to Improve Cognitive Function after Critical Illness

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VANDERBILT
School of Nursing

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Disclosures
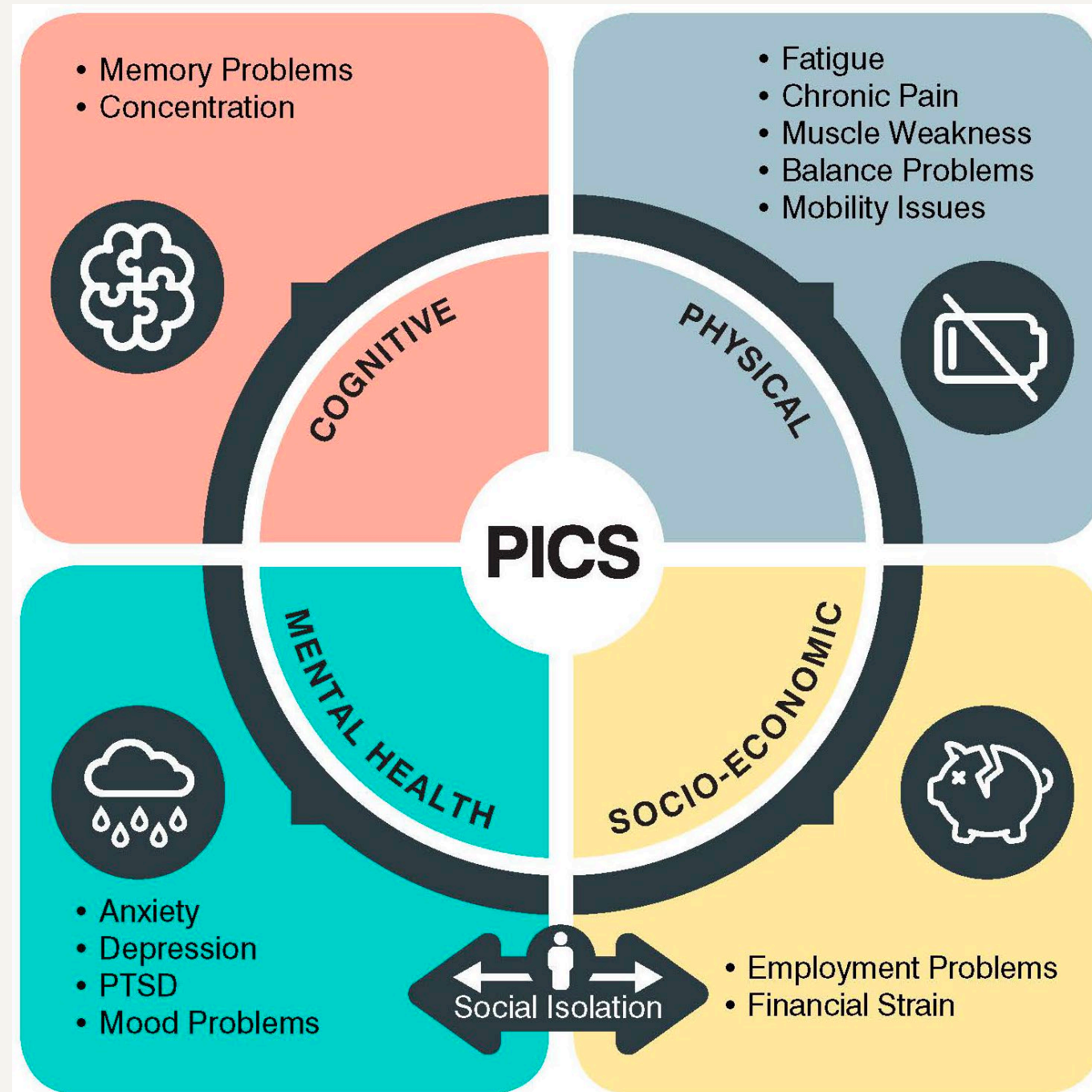
- Research Funding:
  - NIA

The evolving definition of PICS

"The term 'postintensive care syndrome' (PICS) was agreed on as the recommended term to describe **new or worsening impairments in physical, cognitive, or mental health status arising after critical illness and persisting beyond acute care hospitalization.**"
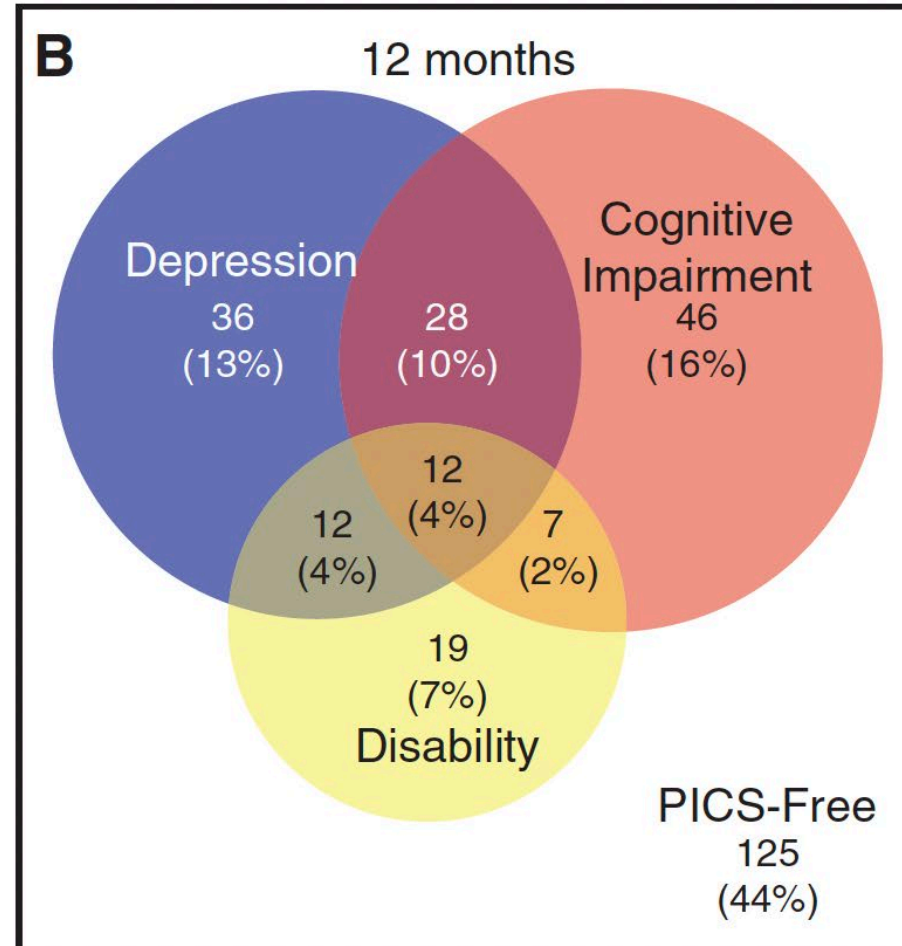

Needham D, et al. (2012) CCM; 40(2): 502-509

Post-Intensive Care Syndrome (PICS)

- Prevalence up to 50%
- Heterogenous manifestation
- Requires specialized assessment and care

Needham DM, et al. *Critical care medicine*. 2012;40(2):502-9.
Harvey MA, Davidson JE. *Critical care medicine*. 2016;44(2):381-5.
Yuan C, et al. (2021) PICS Concept Analysis *IJNS*; 114

One or more PICS problems are present in most ICU survivors.

37% with LTCI

32% with LTCI

Marra A, et al. (2018)   *CCM*; 46(9):1393-1401
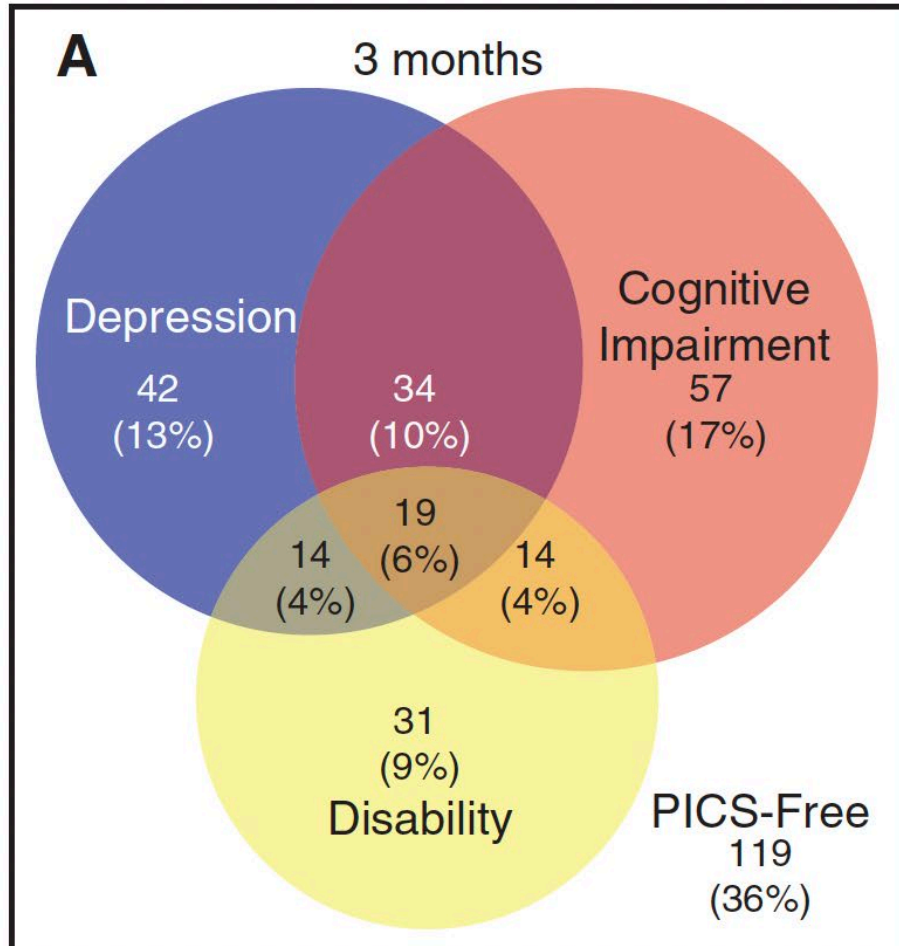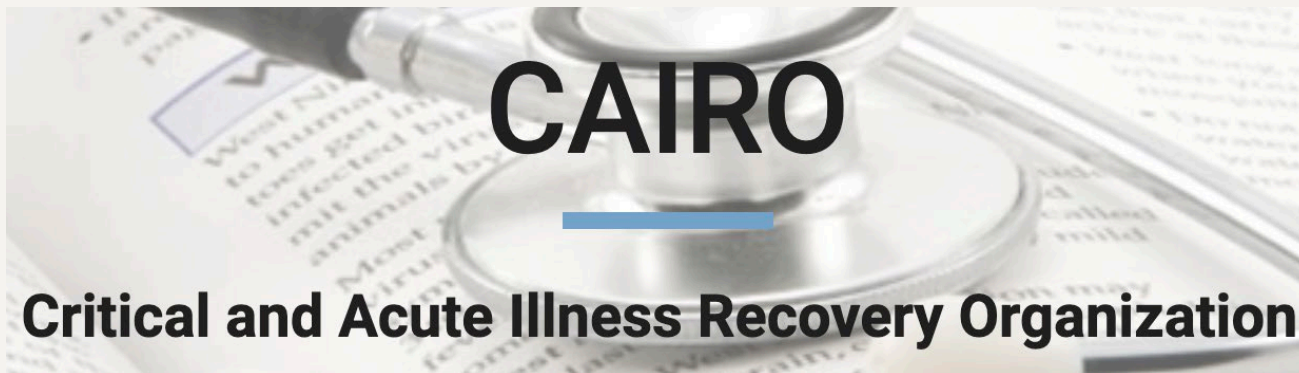
Establishment of Collaborative
& Research Priorities

SCCM consensus conference recommends to risk stratify who should be assessed for long-term impairments after critical illness

Statements Related to Post-Intensive Care Syndrome Prediction and Assessment	Agreement, %
Cognition	
Patients with preexisting cognitive impairment (recognized or not) before the ICU will have those problems afterward	92
Key risk factors for post-ICU cognitive impairment are delirium, benzodiazepines, sepsis, hypoxia, acute respiratory distress syndrome, and shock	80

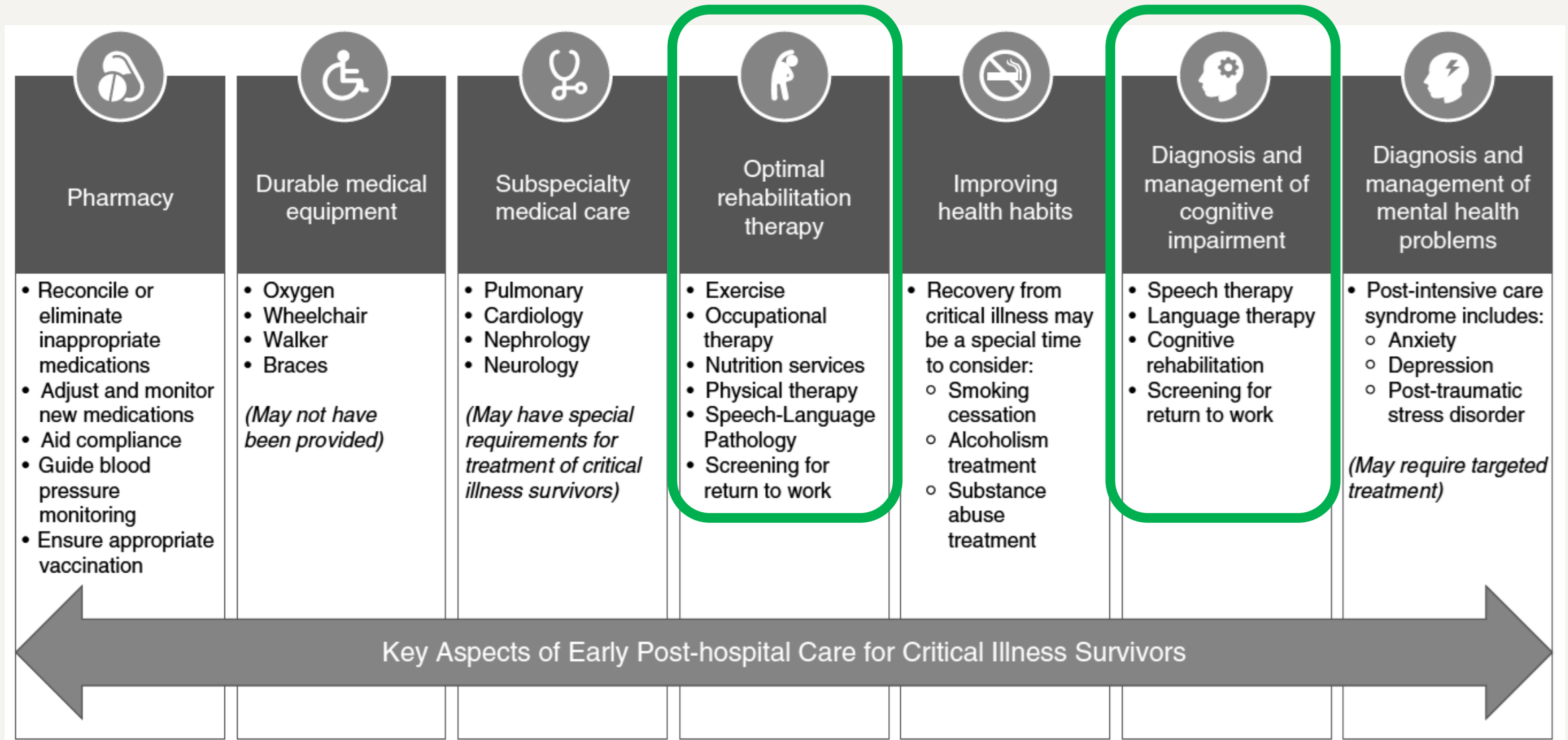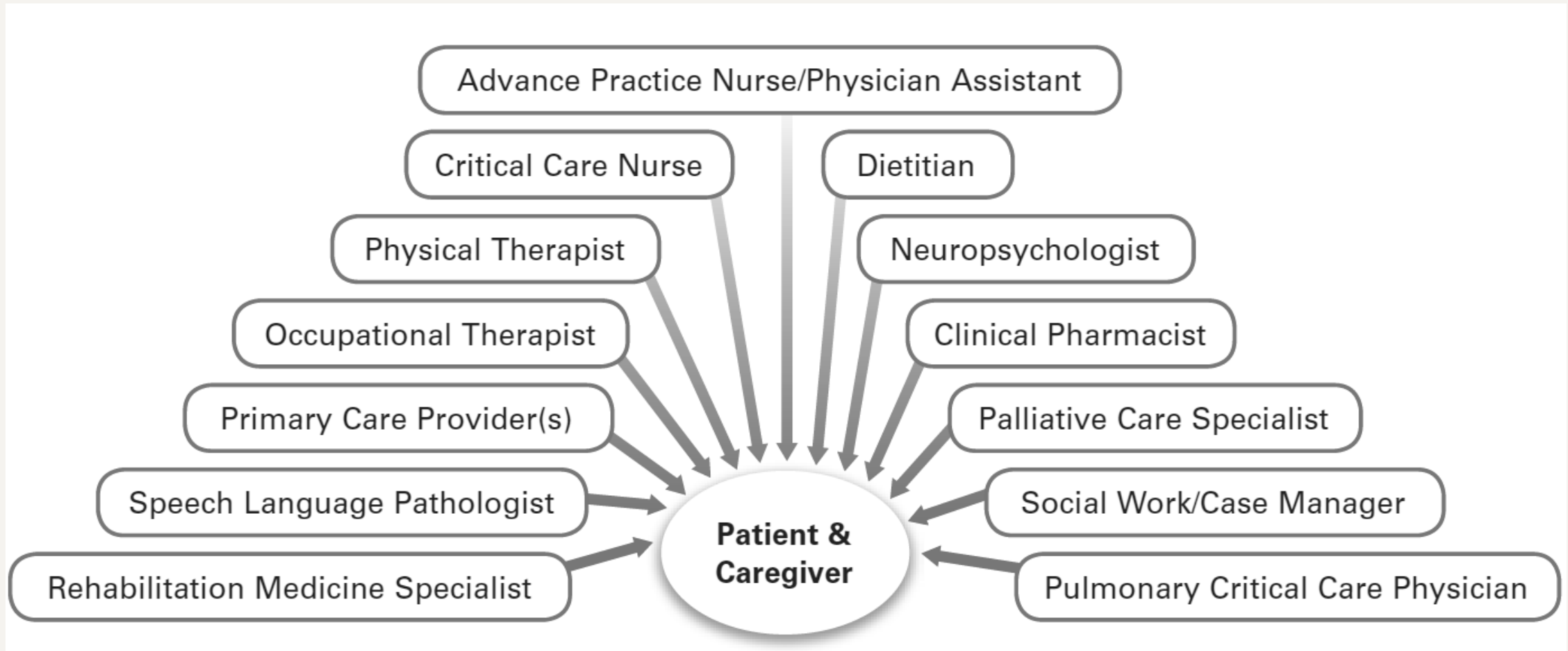| Domain	Screening Test	Comments	Recommendation
Cognition	Montreal Cognitive Assessment (MoCA) (54, 62–64)	Mild cognitive impairment defined as a score of 18–25, moderate as 10–17, and severe as less than 10	Strong

ICU Recovery Clinics

An intervention to help patients transition back to their normal lives and address any physical, cognitive, psychological, or social issues that may have arisen during their ICU stay.

ICU Recovery Clinic: Services

Pharmacy	Durable medical equipment	Subspecialty medical care	Optimal rehabilitation therapy	Improving health habits	Diagnosis and management of cognitive impairment	Diagnosis and management of mental health problems

• Reconcile or eliminate inappropriate medications
• Adjust and monitor new medications
• Aid compliance
• Guide blood pressure monitoring
• Ensure appropriate vaccination
	• Oxygen
	• Wheelchair
	• Walker
	• Braces
	
	(May not have been provided)
		• Pulmonary
		• Cardiology
		• Nephrology
		• Neurology
		
		(May have special requirements for treatment of critical illness survivors)
			• Exercise
			• Occupational therapy
			• Nutrition services
			• Physical therapy
			• Speech-Language Pathology
			• Screening for return to work
				• Recovery from critical illness may be a special time to consider:
				  ◦ Smoking cessation
				  ◦ Alcoholism treatment
				  ◦ Substance abuse treatment
					• Speech therapy
					• Language therapy
					• Cognitive rehabilitation
					• Screening for return to work
						• Post-intensive care syndrome includes:
						  ◦ Anxiety
						  ◦ Depression
						  ◦ Post-traumatic stress disorder
						
						(May require targeted treatment)

Key Aspects of Early Post-hospital Care for Critical Illness Survivors

ICU Recovery Clinic: People

Benefits of ICU-Recovery Clinic Participation

identify PICS

cognition

physical function

self-efficacy

short-term survival

quality of life

return to employment

Mayer KP, et al. *Critical care explorations.* 2020;2:e0206
Sevin CM, et al. *Journal of critical care.* 2018;46:141-8
McPeake J, et al. *PloS one.* 2017;12(11)
Khan BA, et al. *Am J Nursing.* 2015;115(3):24-31

ICU Recovery Clinic: Models

INPATIENT CONSULTATION

FACE-TO-FACE CONSULTATIONS
AT HOME OR IN A CLINIC

TELEPHONE CONSULTATIONS

Could be a combination of these.

Why don't patients attend ICU Recovery clinics?

Didn't know they had an appointment	Financial concerns	Transportation challenges	Distance to clinic
Rurality	Tracheostomy	> ICU days	> MV days
	Shock diagnosis	Older age	

Bakhru R, et al. (2019) *CCE;* 1:e0034
Mayer K, et al. (2020) *CCE; 2:e0206*
Boehm L, et al. (2022) *JICM;* 38(4)

Pilot Feasibility Trial

Methods

Design: Prospective RCT

Setting: Vanderbilt University Medical Center ICU Recovery Center

Sample: 45 patients with ARDS or sepsis with complete follow up

Analysis: fixed effect ANOVA models on post-treatment scores with study and age group as factors and baseline cognitive function as a covariate

# TelePORTPilot Feasibility Study Design (N=91)
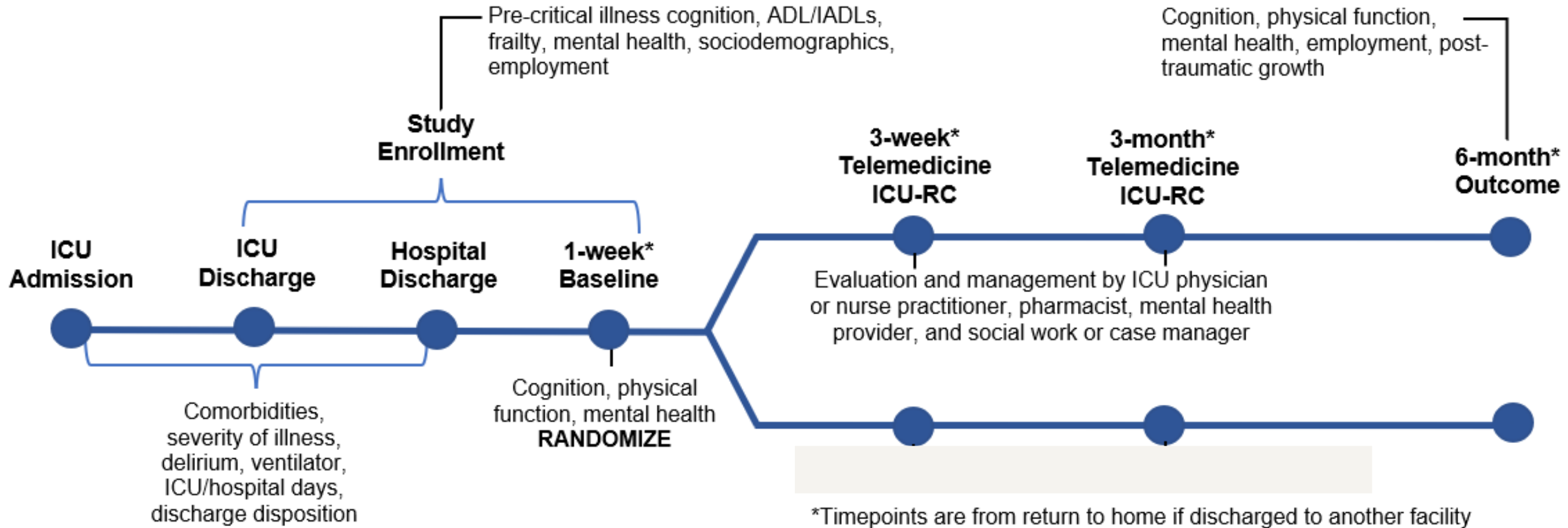
Results

Mean age:

patients = 49

caregivers=51

Mean days:

ICU = 3

hospital = 16

3-week visit length:

52 minutes

12-week visit length:

36 minutes

Older (≥45 years) recipients of the intervention demonstrated better cognitive outcomes than younger peers as compared to the control group.

Figure 3. Group by Age Effects for PROMIS Cognitive Measure at 6 Months
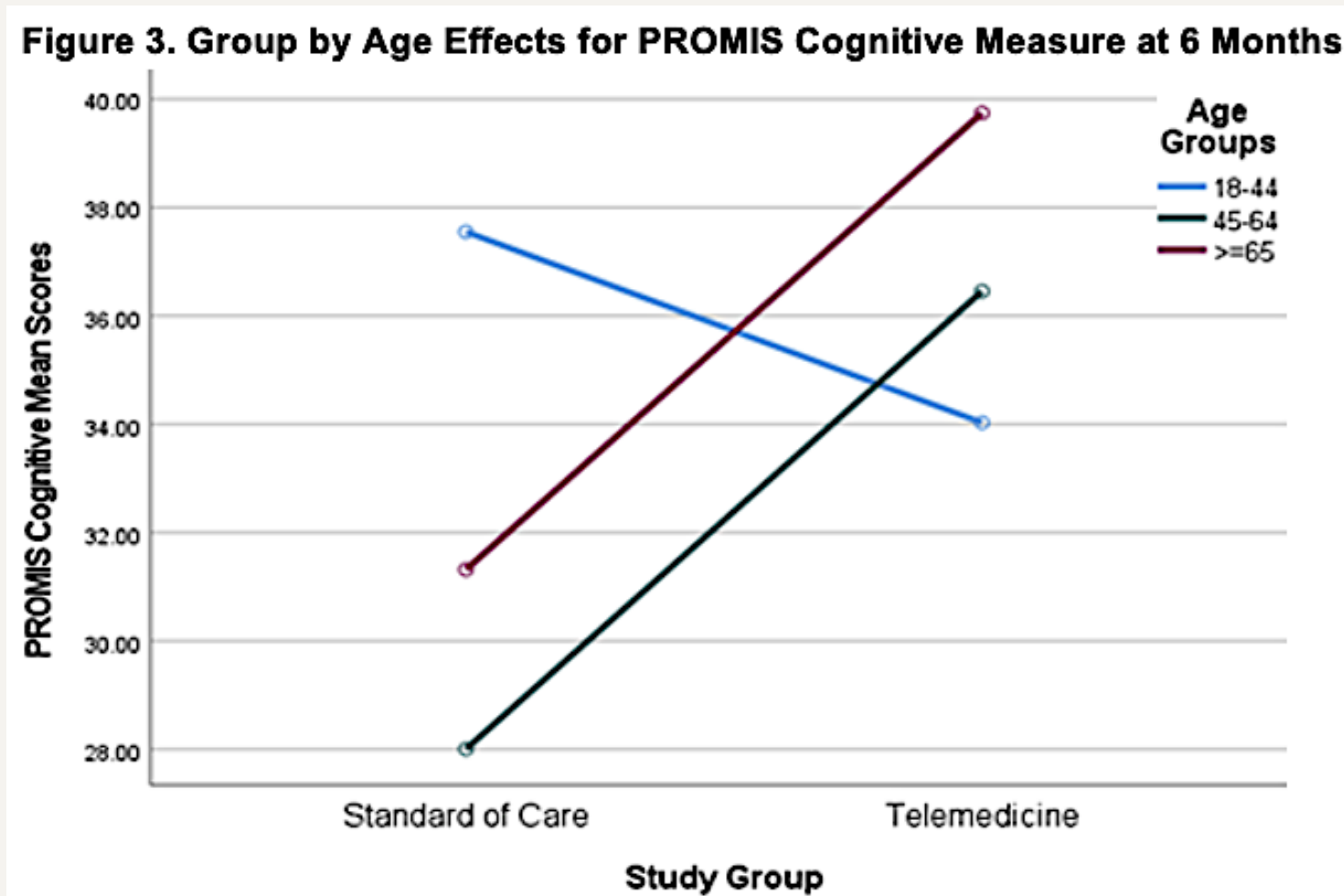
Telemedicine ICU Recovery Clinic Implementation

Scale (range 1 -5), mean	Telemedicine	Control
Acceptability • Meets my approval • Appealing to me • I like it • I welcome it	4.4	4.4
Appropriateness • Fitting • Suitable • Applicable • Good match	4.3	4.3
Feasibility • Implementable • Possible • Doable • Easy to use	4.3	4.4

Exploratory aim:

Assess the content of patient-provider dialogues in a telemedicine multidisciplinary ICU recovery clinic (ICU-RC).

Theme 1: Problem Identification

Health status

Medication management

Mental health and cognition

Healthcare access and navigation

Quality of life

Theme 2: Problem-Solving Strategies

Boehm LM, et al. (2023)   *Chest;* 163 (4)

TelePORT Multi - site RCT
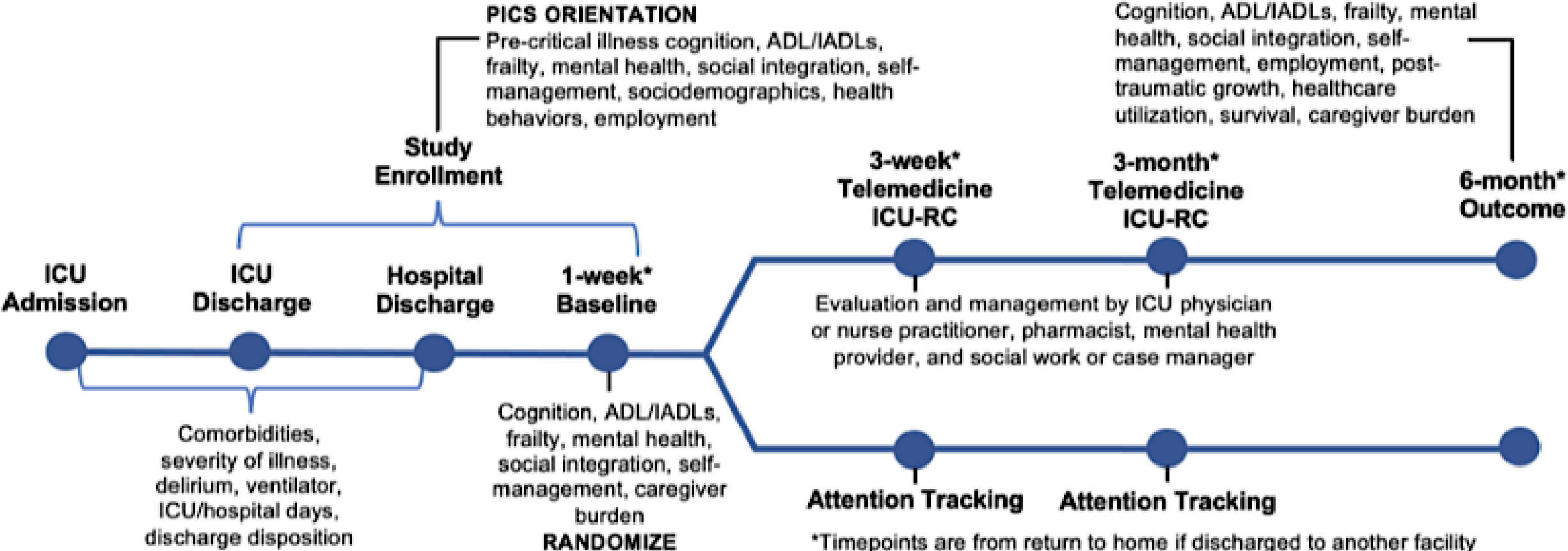
Cognitive Rehabilitation/Goal Management Training

A focused stepwise approach to rehabilitation of executive function by increasing goal -directed behavior and helping patients to learn to be reflective before making decisions and executing tasks and to achieve success in engaging complex tasks by breaking into manageable units.

A remotely delivered multicomponent rehab program for ICU survivors was feasible and possibly effective in improving cognitive performance and functional outcomes in 3 months.

**Table 2.** A comparison of preintervention and postintervention test performance

		Baseline			3-Month Follow-Up		
Test	N	Control (n = 8)	Intervention (n = 7)	p	Control (n = 8)	Intervention (n = 7)	p
Tower	15	7.5 (4.5–9.0)	8.0 (6.5–10.0)	.37	7.5 (4.0–8.5)	13.0 (11.5–14.0)	<.01
Timed Up and Go	15	15 (12–20)	18 (15–20)	.47	10.2 (9.2 –11.7)	9.0 (8.5–11.8)	.51
Katz Activities of Daily Living	15			.88			.78
Little/no dependency		75% (6)	71% (5)		75% (6)	100% (7)	
Moderate/severe dependency		25% (2)	29% (2)		25% (2)	0% (0)	
Functional Activities Questionnaire	15	7.0 (1.5–14.2)	0.0 (0.0–4.0)	.14	8.0 (6.0–11.8)	1.0 (0.0 –2.5)	.04
Activities Balance and Confidence Scale	15	54 (28–75)	68 (36–81)	.58	83 (38–91)	82 (78–89)	.35
Dysexecutive Questionnaire	15	27.0 (13.5–31.0)	13.0 (8.0–15.0)	.12	16.0(7.8–19.2)	8.0 (6.0–13.5)	.74
Mini-Mental State Examination	15	27.0 (22.5–28.2)	28.0 (25.0–29.0)	.54	26.5 (24.8–28.5)	30.0 (29.0–30.0)	.25

Jackson J, et al. (2012) *CCM;* 40:1088-1097

ICU survivors with cognitive impairment had significant improvement in neuropsychological domains with computerized cognitive rehabilitation (CCR).
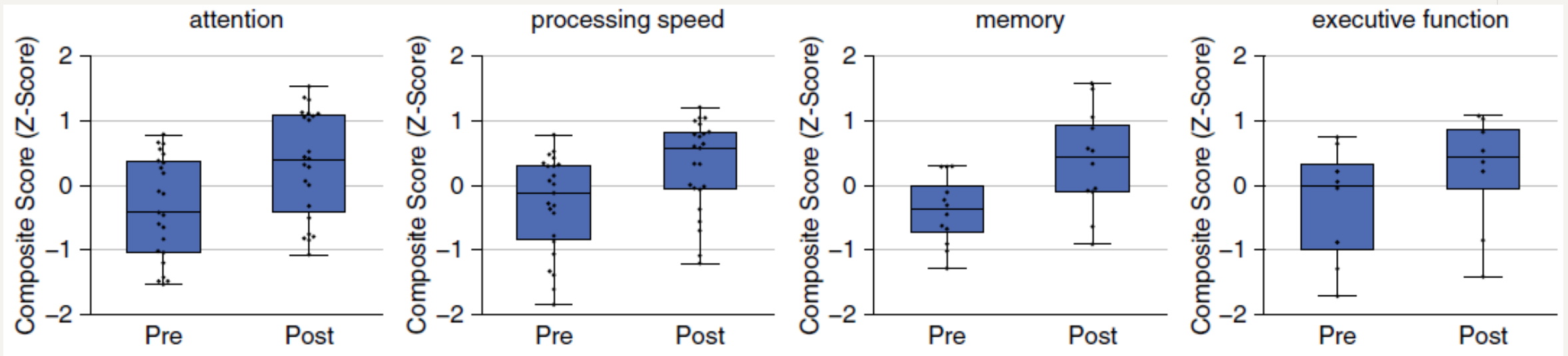
For all four cognitive domains, a statistically significant improvement *(p<0.01)* in performance was demonstrated as compared with baseline performance (n=24).

Jackson J, et al. (2018) *Annals ATS;* 15(7):887-891

Early cognitive rehabilitation training can improve cognitive impairment in critically ill patients.


Total MoCA Scores
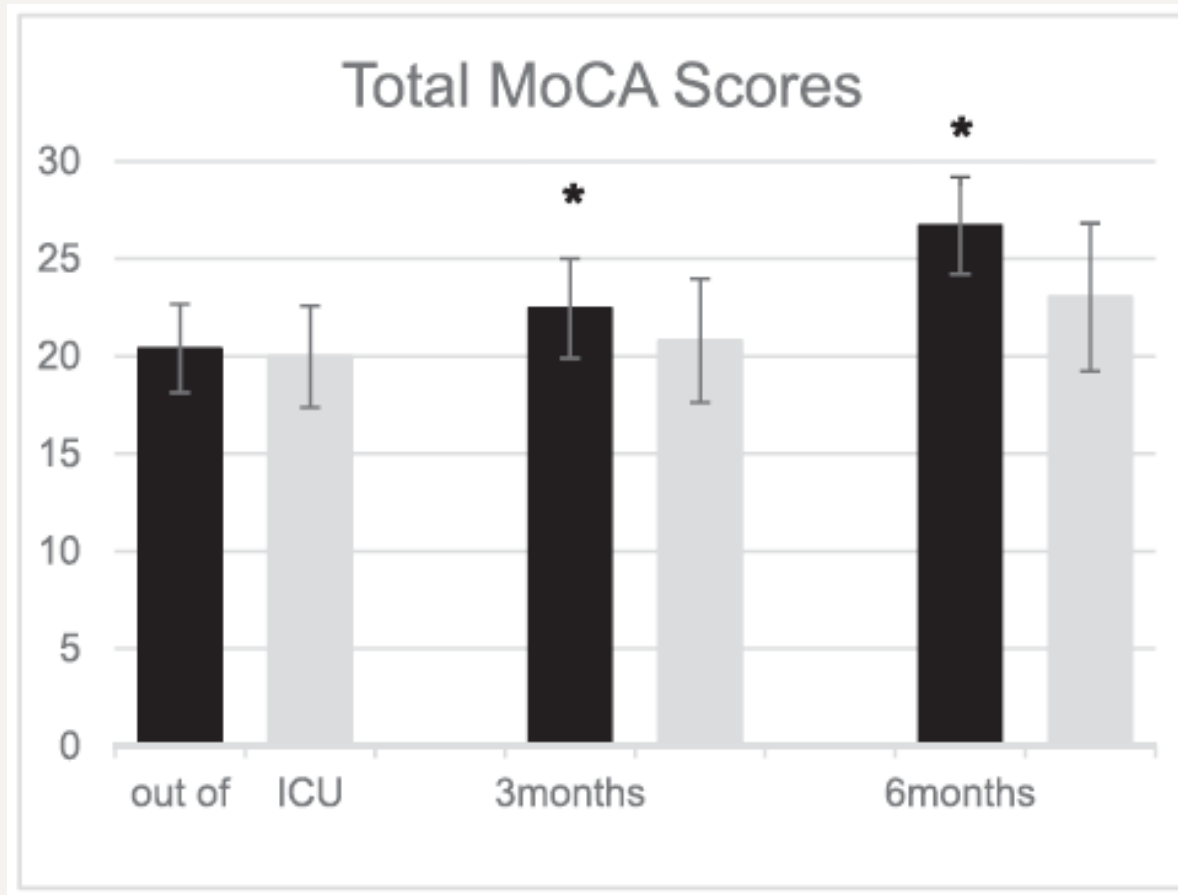
N=143

(72 control, 71 intervention)

control group, intervention group, *P < 0.05

Opportunities for technology to facilitate cognitive recovery after ICU…

- Therapeutic robots to engage in cognitive exercises

- Smart wearables/nearables

- Remote or web‑based cognitive rehabilitation

- AI health coach/cognitive rehabilitation

- E‑health platforms

- Recovery coordinators
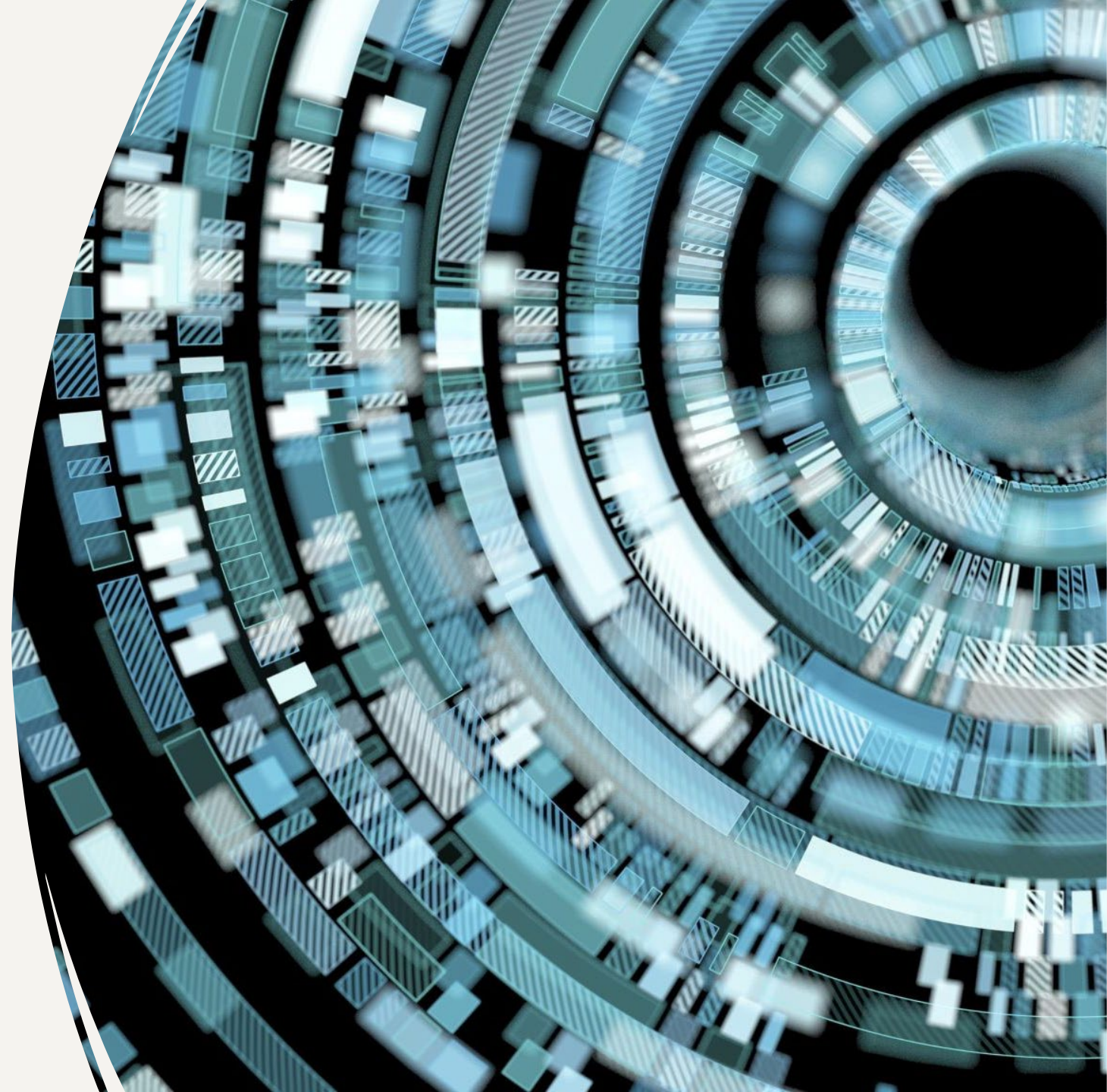
Future directions

Efficacy and effectiveness of cognitive and multidisciplinary interventions and mechanistic analysis on PICS outcomes (e.g., cognition)

Alternative delivery strategies to improve reach and access

Incorporation of implementation measures to understand fidelity, acceptability, adoption, sustainability

Cost-benefit analysis of interventions and test healthcare system models and technologies that accommodate intervention and early follow-up

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