Health is a state of “physical, mental, and social well-being” (1). Critical illness, by its nature, is a threat to all domains of health. Envision the innumerable patients laying in ICU beds across the world. As they fight serious illness, and their care teams rally to battle with them, their muscles atrophy. Their cognition falters. The fabric of their social well-being is torn apart.

Days (or weeks) later, those who survive will emerge from the hospital, in varied states of disability, to continue their recovery. What is the long-term fate of these survivors? Will their health—their physical, mental, and social well-being—be restored to live and thrive? Does long-term recovery vary by the type of serious illness that warrants ICU admission?

These and other fundamental questions have troubled us since Dr. Ramona Hopkins and colleagues published the experience of 55 adult patients admitted to medical and surgical ICU settings in a multicenter, longitudinal, prospective cohort study. The study enrolled adults admitted to medical and surgical ICUs from four hospitals in the Netherlands. Patients, or their proxies, completed baseline health questionnaires before elective surgery or during urgent surgical or medical ICU admissions. The investigators then obtained follow-up measures 1 year after ICU admission. Assessments obtained in the pre-ICU and post-ICU period included measurement of frailty, fatigue, anxiety, depression, cognition, and quality of life. New or worsened physical function and post-traumatic stress symptoms were assessed at 1-year follow-up.

Of 3,320 patients who completed the baseline questionnaire, 2,345 (71%) completed the 1-year questionnaire. Most patients had an elective surgical admission (60%), whereas the remainder experienced medical (28%) or urgent surgical (12%) admissions.
Importantly, most patients completed the baseline questionnaire—75% of medical patients, 71% of urgent surgical patients, and 92% of elective surgical patients.

At 1 year, 43% of the elective surgical, 58% of the medical, and 64% of the urgent surgical patients had at least one new impairment in physical function, mental health, or cognition. The authors detailed a number of new or worsened physical impairments at 1 year post-ICU, ranging from weakness—the most common impairment—to uncommon symptoms such as loss of smell and swallowing difficulties. As may be expected, poorer pre-ICU health (e.g., anxiety, fatigue) was associated with an increased risk of long-term impairments. Conversely, consistent with recent work by Marra and colleagues (10), higher education level was associated with decreased risk of new physical, mental, or cognitive health problems.

The trajectory of impairments differed by type of admission, as did the ability to return to work. Specifically, urgent surgical patients experienced more new impairments across all PICS domains when compared with elective surgical patients, who actually experienced an improvement in physical and mental health on average. Among those employed, 34% of the elective surgical, 43% of the medical, and 54% of the urgent surgical patients were unable to return to full employment.

An important limitation of the study was the administration of baseline questionnaires during the ICU stay (by either patients or proxies), increasing the potential for recall bias. In addition, approximately 30% of patients were lost to follow-up. The loss to follow-up in a study of this nature may lead to overly optimistic estimates of recovery, as patients with severe impairments may be less likely to respond.

We must now consider how these lessons from Geense and colleagues can help us reduce the burden of long-term impairments and restore health after the ICU. Fortunately, opportunities to preserve health exist across the spectrum of care (Table 1). For example, the striking contrast between outcomes after elective and urgent surgical ICU admissions raises questions of whether timely ambulatory care referral paired with access to care might preempt the development of urgent surgical indications. As for medical critical illness, a large claims-based study found that up to 15.8% of ICU survivors by reducing the development of critical illness.

During ICU admission, beyond prioritizing the implementation of the ABCDEF bundle, the findings from Geense and colleagues harmonize well with recommendations from the Society of Critical Care Medicine’s international consensus conference (12, 13). As summarized in Table 1, the consensus statement recommends the practice of functional reconciliation, coupled with serial, screening assessments to inform post–acute care referral and identify and rehabilitate new impairments after discharge. The recommended screening tools include many of the measures used in the current study, and provide an opportunity to standardize data across sites and studies. These include the Montreal Cognitive Assessment Test; Hospital Anxiety and Depression Scale; Impact of Event Scale-Revised (post-traumatic stress disorder); 6-minute-walk distance; and/or the EuroQol-5D-5L (health-related quality of life measure).

Health policy, and bundled payments, in particular, may serve as a catalyst to implement these recommendations. As post–acute care use (e.g., acute rehabilitation) varies by ICU type, future investigation is warranted to determine the optimal approach to rehabilitate identified
EDITORIALS

post-ICU impairments (14). Likewise, although conceptually appealing as a strategy to accelerate recovery, the value of post-ICU clinics and peer support groups for survivors requires further study (15).

In conclusion, the work by Geense and colleagues clarifies several fundamental questions of life after critical illness. By doing so, it lays the foundation toward a more coordinated health system designed to preserve and/or restore health through prevention of critical illness and more effective identification and rehabilitation of long-term impairments among survivors of critical illness.

Author disclosures are available with the text of this article at www.atsjournals.org.

Jason H. Maley, M.D.
Division of Pulmonary and Critical Care Medicine
Massachusetts General Hospital
Boston, Massachusetts
and
Center for Healthcare Delivery Science
Beth Israel Deaconess Medical Center
Boston, Massachusetts

Mark E. Mikkelsen, M.D., M.S.C.E.
Division of Pulmonary, Allergy, and Critical Care
University of Pennsylvania Perelman School of Medicine
Philadelphia, Pennsylvania

References

1. World Health Organization. WHO remains firmly committed to the principles set out in the preamble to the constitution. Geneva, Switzerland: WHO; 1946 [accessed 2021 Feb 4]. Available from: https://www.who.int/about/who-we-are/constitution.

2. Hopkins RO, Weaver LK, Pope D, Orme JF, Bigler ED, Larson-LOHR V. Neuropsychological sequelae and impaired health status in survivors of severe acute respiratory distress syndrome. Am J Respir Crit Care Med 1999;160:50–56.

3. Iwashyna TJ, Ely EW, Smith DM, Langa KM. Long-term cognitive impairment and functional disability among survivors of severe sepsis. JAMA 2010;304:1787–1794.

4. Pandharipande PP, Girard TD, Jackson JC, Morandi A, Thompson JL, Pun BT, et al.; BRAIN-ICU Study Investigators. Long-term cognitive impairment after critical illness. N Engl J Med 2013;369:1306–1316.

The Future of Highly Effective Modulator Therapy in Cystic Fibrosis

The success of highly effective modulator therapy (HEMT) in cystic fibrosis (CF) now illustrates two areas of deficiency: the lack of

This article is open access and distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives License 4.0 (https://creativecommons.org/licenses/by-nc-nd/4.0/). For commercial usage and reprints, please contact Diane Gern (dgern@thoracic.org).

Originally Published in Press as DOI: 10.1164/rcrm.202104-0850ED on April 26, 2021

HEMT for younger children and for approximately 10% of the CF population without a qualifying mutation.

Inflammation, infection, and structural changes in the CF lung start in infancy or the early preschool years (1). Computed tomography scans of the chest and lung clearance index measurements are abnormal early and are not clearly associated with infection (1). The cardinal pulmonary lesion in CF, bronchiectasis, can be detected on chest computed tomography in up to 30–40% of children with CF aged between 3 and 4 years old with airway dilatation and thickening reported as early as the first few months of life (1). Linked to early inflammation are poor growth and nutrition.