

## Assessing cognitive function in ICU survivors



New research from Canada demonstrates that a web-based patient-administered neurocognitive test battery can identify domain-specific cognitive impairment in critical illness survivors. Results show that web-based cognitive testing – i.e., Cambridge Brain Sciences (CBS) – is both feasible and able to detect subtle changes in cognitive domains similar to traditional paper-and-pencil tests.

Limitations of existing neurocognitive assessment tools have restricted cognitive testing in prior studies. Many of these tools require specially trained staff for test administration, take a long time to administer, and necessitate patients to attend testing sessions in person, which often excludes those who have limited mobility.

Unlike paper-based cognitive assessment tools, the web-based battery can be self-administered by patients from any location (ward, rehabilitation facility, home) after minimal instructions on logging in and starting the tests, obviating the need for patients to travel to hospital to be tested by specially trained staff. Given high prevalence of functional disability, post-traumatic stress disorder, and challenging travel logistics, remote web-based testing of cognition can provide a more patient-centred approach to monitoring cognition in ICU survivors.

Researchers from Western University in London, Ontario, Canada conducted a prospective observational study in two intensive care units (ICUs) at two tertiary care hospitals. Twenty non-delirious ICU patients who were mechanically ventilated for a minimum of 24 hours underwent cognitive testing using the CBS battery. The CBS consists of 12 cognitive tests that assess a broad range of cognitive abilities that can be categorised into three cognitive domains: reasoning skills, short-term memory, and verbal processing.

Patients underwent cognitive assessment while still in the ICU ( $n = 13$ ) or shortly after discharge to ward ( $n = 7$ ). Cognitive impairment on each test was defined as a raw score that was 1.5 or more standard deviations below age- and sex-matched norms from healthy controls. All patients were impaired on at least two tests and 18 patients were impaired on at least three tests. ICU patients had poorer performance on all three cognitive domains relative to healthy controls.

The CBS battery used in this study has been used to assess cognition in several large patient cohorts and has an established large normative database to enable sex- and age-matched comparisons of patients' performance to healthy controls. Furthermore, the CBS battery can be administered in the functional magnetic resonance imaging scanner, enabling mapping of cognitive results to neuroimaging data.

In this study, however, investigators identified battery length as a potential challenge to wider scale use of the CBS battery, which they believe can be addressed by shortening the battery length. Further studies using the CBS cognitive battery are needed to determine its feasibility in assessing cognition and cognitive recovery over time.

According to the research team, further optimisation of this web-based assessment tool for ICU patients may establish a novel frontier in ICU cognition research by enabling remote monitoring of cognitive recovery in critical illness survivors, correlation of cognitive scores with neuroimaging data to help identify underlying neural mechanisms, and objective assessment of outcomes associated with preventative, therapeutic, and rehabilitative interventions.

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