MONASH University

MONASH MEDICINE NURSING AND HEALTH SCIENCES

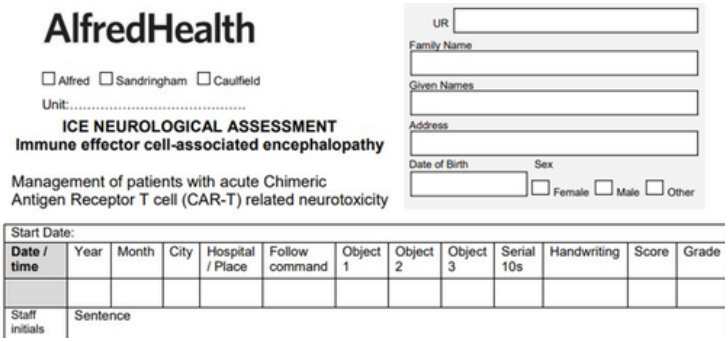
# 10-MINUTE COMPUTER TEST PREDICTS BRAIN TOXICITY BY UP TO 12 HOURS

## PLAIN LANGUAGE SUMMARY

Source: Kazzi, C., Darby, D., Wronski, M., Griffith, S., Ko, K. Y., Pearce, D., ... & Monif, M. (2026). A computerised cognitive test for immune effector cell-associated neurotoxicity syndrome in chimeric antigen receptor T-cell therapy recipients: a pilot study. Transplantation and Cellular Therapy. https://doi.org/10.1016/j.jtct.2026.02.059

### WHY DID WE DO THIS WORK? WHY IS IT IMPORTANT?

- Chimeric antigen receptor T-cell (CAR-T) therapy is a newly approved treatment for many blood cancers. It is also being tested for other conditions.
- It is a therapy where a person's own immune cells are processed in the lab so they can recognise and attack cancer cells. The engineered cells are injected back into the person.
- Chimeric antigen receptor T-cell therapy can be effective as a cancer treatment, but in some cases, it also has side effects.
- One of these side effects is toxicity in the brain.
- An early form of this brain toxicity can occur within the first two weeks after the cells are injected into the patient. This brain toxicity is called immune effector cell-associated neurotoxicity syndrome (ICANS).
- People can become confused and have difficulties with thinking, concentration, speaking, writing and remembering recent events.
- Brain toxicity can be mild or severe. Sometimes, it can be life-threatening. So, it is important to monitor for brain toxicity and treat it to prevent further damage.
- Doctors and nurses use a score known as the immune effector cell-associated encephalopathy or ICE score to help them monitor for brain toxicity. The score ranges from 0 to 10 and is determined from a brief set of questions (**Figure 1**).



AlfredHealth

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Unit:.....

**ICE NEUROLOGICAL ASSESSMENT**
**Immune effector cell-associated encephalopathy**

Management of patients with acute Chimeric Antigen Receptor T cell (CAR-T) related neurotoxicity

UR
Family Name
Given Names
Address
Date of Birth
Sex ☐ Female ☐ Male ☐ Other

| Start Date: | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Date / time** | Year | Month | City | Hospital / Place | Follow command | Object 1 | Object 2 | Object 3 | Serial 10s | Handwriting | Score | Grade |
| | | | | | | | | | | | | |
| Staff initials | Sentence | | | | | | | | | | | |

**Figure 1**. The ICE score.

- But research has shown that this ICE score can miss mild brain toxicity. For example, a person may have a perfect ICE score but still have underlying brain toxicity.
- So we need tools that can improve the ICE score for accurate diagnosis of brain toxicity.
- Our team decided to develop a 10-minute iPad test that measures attention and reaction time called CARTcog.
- CARTcog has three tasks: (1) Simple Reaction Time, (2) Complex Reaction Time, and (3) One Back Task. (**see Figure 2**).
- In the Simple Reaction Time and Choice Reaction Time, patients tap the iPad screen as quickly as they can when they see the target, depending on the colour of the target. In the One Back Task, patients tap the screen depending on whether the animals match the previous set of animals.
- This study looked to see if CARTcog can predict brain toxicity.

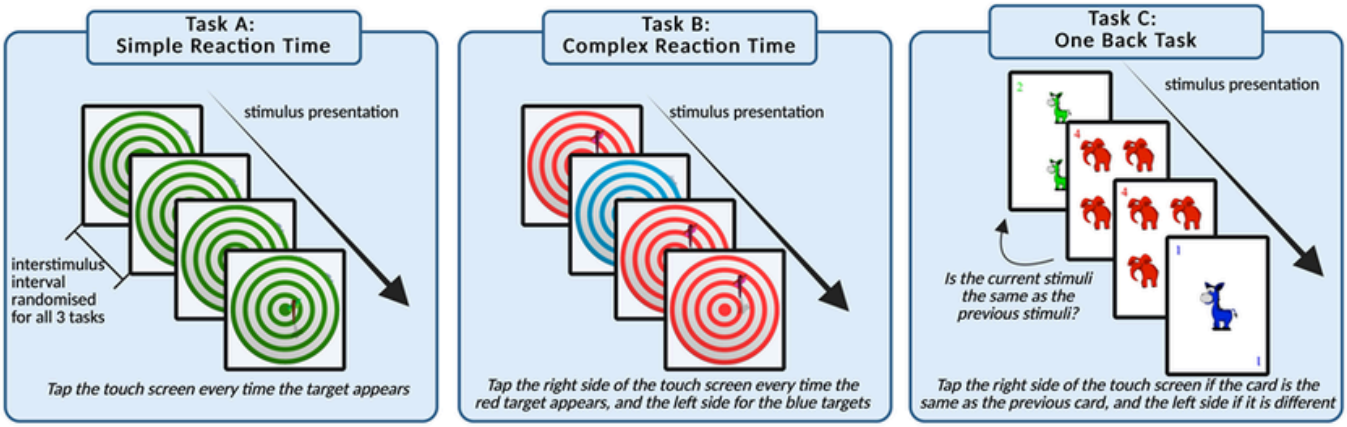


**Figure 2**. The 3 CARTcog Tasks

## WHAT DID WE DO?

- Patients who received CAR-T therapy at the Alfred Hospital completed CARTcog at least once a day (Monday to Friday) while they were staying at the hospital.
- Patients also completed the ICE score, which is the current score for brain toxicity used internationally.

## WHAT DID WE FIND?

- 89 patients completed 1,149 CARTcog tests and 5,347 ICE scores during their hospital stay.
- 30 patients out of 89 developed brain toxicity.
- Patients who developed brain toxicity performed poorly on the CARTcog test. They became slow and less accurate.
- Sometimes, patients did poorly on CARTcog several hours before they had brain toxicity, which gave doctors warning that brain toxicity was developing.

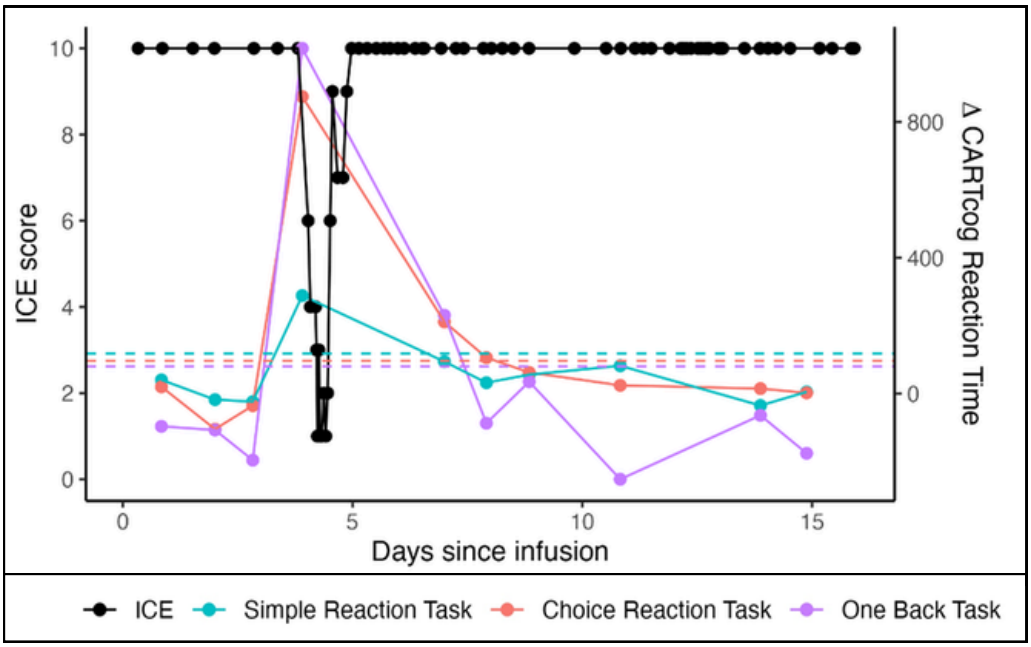


**Figure 3.** A patient's ICE scores in black and CARTcog scores in blue, red, and purple across the 15 days they were in hospital. An ICE score less than 10 means that the patient might have brain toxicity. When a patient is slow (higher number on the graph) on CARTcog, the ICE score shows that they have brain toxicity. This patient became slow on CARTcog a few hours before their ICE score showed brain toxicity.

## WHAT DO THESE FINDINGS MEAN?

CARTcog is a good test that can predict if someone will develop brain toxicity up to 12 hours in advance. This can give doctors and nurses a warning to prepare for brain toxicity and can also mean that patients get treated more quickly.

**Contact Us**
**A/Prof Mastura Monif**
Research Group Leader
Monash Medicine, Nursing and Health Sciences
E: neuroimmunologyresearch@monash.edu

**Visit**
monash.edu.au/more-information

*This plain language summary was written by Ms Christina Kazzi, Post-doctoral Research Fellow, Monash University, and Clinical Neuropsychologist, Alfred Hospital*
*Edited by Mr Michael Westworth, Consumer; Ms Lauren Melitsis, Study Coordinator; and A/Prof Mastura Monif, Head of Neuroimmunology, Neuroinflammation, and Neurooncology Lab, Monash University, and Head of Neuroimmunology Clinics, Alfred Hospital*