

# Traumatic Brain Injury Center of Excellence

## Podcast Transcript

### CUBIST S6E8: Decision-Making Tools for TBI Diagnosis in Austere Environments

EPISODE DETAILS	
PODCAST:	“Clinical Updates in Brain Injury Science Today [CUBIST]”
FEATURES:	<b>Host:</b> Dr. Don Marion <b>Interviews:</b> Amanda Gano
ARTICLE:	Validation of the Canadian CT Head Rule and the New Orleans Criteria for mild traumatic brain injury in Ethiopia
CONNECTION TO SERVICE MEMBERS:	The study discussed in this episode highlights tools that medical providers can use to make decisions about imaging after mild TBI in austere environments, where resources are limited, and medical evacuations are risky.
RUN TIME:	11:04

[music]

**Dr. Marion:** The views and opinions of findings and or devices discussed in this podcast are those of the host, subject matter experts, and or guests. Facts represented constitute our understanding as of the time of the podcast, whereas updated factual information may be developed. They should not be construed as pronouncing an official Department of Defense position, policy, decision or endorsement. Hi. Welcome to Clinical Updates in Brain Injury Science Today, or CUBIST. A podcast for health care providers about current research on traumatic brain injury, also known as TBI. This program is produced by the TBI Center of Excellence, or TBICoE. I'm your host today, Don Marion. I'll be speaking with Ms. Amanda Gano, a physician assistant and TBI subject matter expert at TBICoE. Amanda and I will discuss a study entitled, “Validation of the Canadian CT Head Rule and the New Orleans Criteria for mild traumatic brain injury in Ethiopia” by Yegeta Habte and colleagues and published in *World Neurotrauma* in April of 2023. Thanks for bringing this article to our attention, Amanda. What was the study about and why is it relevant to military medicine.

**Amanda:** Yeah. Hi Don. And you know, that's a good question. So, like, why is an article like this one about a low-middle income country like Ethiopia, even relevant to the military? And well, the answer is, that a lot of the different findings that we get from some of these articles can be translated into a military setting where service members are in an austere environment with limited resources. So, this study in particular is important because service members often need to make a really critical decision about when to send patients with TBI for imaging studies, and that oftentimes, in a deployed setting, requires a medical evacuation. So that's very different from when you're in an emergency department setting and you can just, kind of, wheel the patient down the hallway to the CT scanner. Military medical evacuations are really high-risk situations that involve a lot of moving parts, a lot of different people, resources, and have to consider a lot of different factors. So having these reliable decision-making tools to help guide providers in austere environments about whether or not a medevac is needed, is really important.

**Dr. Marion:** I agree. Amanda. So how was the study done?

**Amanda:** Don, this was a retrospective chart review of 193 patients in a teaching hospital in Ethiopia from December 2019 to July, 2022. The patients were 13 or older and presented with a Glasgow Coma scale of 13 to 15. This was done in a large hospital with one CT scanner. Patients were excluded if they had an incomplete medical record, if they didn't undergo a CT scan, or if they left against medical advice before a final disposition was determined. The investigators then determined from details of the medical record whether or not patients required neurosurgical intervention or if

# Traumatic Brain Injury Center of Excellence

## Podcast Transcript

they had a clinically important brain injury. So neurosurgical intervention was defined as either death within seven days secondary to head injury, need for a craniotomy, elevation of skull fracture, intracranial pressure monitoring, or intubation for TBI within seven days. Patients with clinically important TBI were defined as a patient with any acute traumatic lesion found on a head CT that would normally require admission to a hospital or need for neurosurgical follow-up. CT findings that were not considered within this category included the following: solitary contusion less than five millimeters in diameter, localized subarachnoid blood less than one-millimeter thick, subdural hematoma, less than four millimeters thick, isolated pneumocephalus, or closed depressed skull fracture, not through the inner table. All of these CT scans were read by a radiologist. The study team then determined whether or not the patients would have met the Canadian CT Head Rule criteria or the New Orleans criteria if they had been applied.

**Dr. Marion:** I guess I should have asked this earlier, Amanda, but what is the Canadian CT Head Rule and the New Orleans criteria?

**Amanda:** Yeah. So again, these are clinical decision-making tools that give providers criteria for whether or not a patient needs a CT scan. So, with the New Orleans criteria, a CT should be done if a patient had any of the following: a headache, any vomiting, an age of greater than 60 years, drug or alcohol intoxication, seizure, trauma visible above the clavicle, or short-term memory deficits. With the Canadian CT Head Rule, a patient should have a CT scan if they have a dangerous mechanism of injury like from a motor vehicle accident, vomiting greater than or equal to two times, an age of greater than 65, a GCS of less than 15 two hours from injury, any signs of basilar skull fracture, or concern for an open or depressed skull fracture, or amnesia for events 30 minutes before the injury.

**Dr. Marion:** Very quickly, what are signs of a basilar skull fracture?

**Amanda:** So, signs of a basilar skull fracture are things like raccoon eyes, or Ecchymosis, or bruising on the mastoid or behind the ears.

**Dr. Marion:** So also, I think the Canadian CT Head Rule recommends a CT for those who are on blood thinners like Coumadin or who have one or more seizures following the injury. Isn't that correct?

**Amanda:** Yep, that's correct too, Don.

**Dr. Marion:** Thanks, Amanda. So, what did they find?

**Amanda:** So, Don in 30% of patients in this cohort, 58 out of the 193, had abnormal CT scans and patients with GCS scores of 13 or 14 showed the highest rate of abnormal CT findings. When the Canadian CT Head Rule and New Orleans criteria were retrospectively applied, all of the patients who would have received a scan based on this criteria did receive scans. Fifty-six patients received scans who would not have received scans if the hospital had applied the Canadian CT Head Rule. Thirty-six patients received scans who would not have received scans if the New Orleans criteria were applied. There were no patients with abnormal CT scans that would've been missed based on the Canadian CT head rule and or the New Orleans criteria. So, in this cohort, both decision-making tools showed a 100% sensitivity for identifying clinically important TBI, need for neurosurgical intervention, or any abnormal CT findings. The Canadian CT Head Rule had a specificity of 42% for clinically important TBI and 33% for patients requiring neurosurgical intervention. The New Orleans criteria showed a specificity of 27% for clinically important TBI and 22% for patients requiring neurosurgical intervention. The authors also did a really interesting cost analysis to illustrate these findings, and they stated, and this is a quote directly from the article, "had these criteria been used in this cohort, a 20 to 30% reduction in imaging would've been seen with 56 CT scans that could have been foregone with the Canadian CT Head Rule," so 29% of the total cohort, "and 36 that could

# Traumatic Brain Injury Center of Excellence

## Podcast Transcript

have been foregone with the New Orleans criteria, 19% of the cohort. Monetarily these 36 to 56 scans are the equivalent of between one- and five-years' worth of wages for the average citizen in Ethiopia."

**Dr. Marion:** Amanda, I think it also is, however, to emphasize the low specificity of the Canadian CT Head Rule. Essentially this means that there were a lot of false positives. And in the military, in an austere environment, this could mean that service members would be unnecessarily evacuated, putting them in their transport team at risk. Isn't that correct?

**Amanda:** Yeah, that is true, Don. So, the specificity here was around 30 to 40% for both tools, which is similar to some of the other screening tools that we've talked about in past articles, so things that use blood plasma biomarkers to predict CT abnormalities. But the difference here is with the Canadian CT Head Rule or the New Orleans criteria, there's no additional equipment involved. So, it may be better suited for the military environment. And again, it is better to apply the criteria than to just kind of CT everyone and not apply the criteria.

**Dr. Marion:** So, what were the limitations of this study, do you think?

**Amanda:** You know, well Don, this was a relatively small cohort in a single institution, so the results are really not generalizable to patients who present to smaller health clinics and require a decision about transfer to a center with a CT scanner. Also, this was a retrospective chart review, so the data is really limited to what was documented in the medical record.

**Dr. Marion:** So, Amanda, what would you say are the key takeaways from this analysis?

**Amanda:** So, Don, the Canadian CT Head Rule and the New Orleans criteria are both well-validated and widely used clinical decision-making tools that help providers catch clinically important TBIs and also limit the overuse of CT scans. The TBI Center of Excellence uses a variation of the Canadian CT Head Rule in the Neuroimaging Following Mild TBI clinical recommendation. And this is designed for military medical providers. So, I think that this is an important tool that doesn't require any additional equipment or resources like the blood biomarkers do, and it's highly sensitive and reliable to help military providers make decisions about imaging after mild TBI.

**Dr. Marion:** I agree. I mean, I think that the clinical recommendations team at TBICoE is very well aware of the Canadian CT Head Rule. And from what we've seen it is certainly an important tool in our toolkit when evaluating people, especially in the austere environments. So, thanks, Amanda. That's all we have time for today. You can stay up to date on future episodes by subscribing to CUBIST on iTunes, SoundCloud, Stitcher, or wherever you listen to podcasts, where you can also find links to the articles we discuss and other relevant resources.

[music]

CUBIST is produced and edited by Vinnie White and was hosted today by me, Don Marion. It is a product of the Traumatic Brain Injury Center of Excellence, a branch of the Research Portfolio Management Division under the Research and Engineering Directorate of the Defense Health Agency and is led by Branch Chief Captain Scott Cota, Medical Corps, United States Navy. Thank you for listening to this episode.