



The HINTS exam is a skill emergency physicians need to learn, apply and master

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Received: 5 October 2022 / Accepted: 13 October 2022 / Published online: 24 October 2022

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Keywords HINTS Vertigo Dizziness Stroke

The survey study of Canadian emergency physicians published by Byworth and colleagues indicates that emergency physicians remain uncomfortable with the assessment of vertigo [1]. This is concerning! Vertigo is a very common emergency department complaint. The HINTS exam has been shown to be highly sensitive and specific for central causes of vertigo [2]. The most common central cause of vertigo is posterior circulation stroke or transient ischemic attack (TIA).

Continued reliance on CT/CTA in the investigation of patients with vertigo is likewise concerning. This is inappropriate for two reasons. First, CT/CTA is not indicated for patients who can be readily diagnosed with peripheral causes of vertigo, especially the subset with episodic, positionally triggered, isolated vertigo, as this clinical pattern is only rarely due to a problem with the brain or the circulation to the brain. Most such patients have an inner ear problem known as benign paroxysmal positional vertigo caused by

free-floating otolith particles. These patients can usually be cured at the bedside using particle repositioning procedures such as the Epley maneuver.

The second reason, it is inappropriate is because, even among those with new, continuous, persistent dizziness (so-called acute vestibular syndrome), a normal CT/CTA is falsely reassuring in about 2/3 of patients with a posterior circulation stroke/TIA [3]. Even MRI/MRA is not as sensitive as the HINTS exam. Byworth et al. demonstrated that modal risk tolerance for post-test probability of stroke is $\leq 1.2\%$ which is only slightly higher than a similar US-based survey with a response of $\leq 0.5\%$ [4]. It is disappointing that Canadian clinicians, like their US counterparts, state that they frequently use neuroimaging to rule out stroke. The post-test probability for stroke in acute vestibular syndrome patients is 22% after a negative CT and 6.5% after a negative MRI compared to after a peripheral (i.e., not-central) HINTS result which is 0.3% [5]. Hence, the HINTS exam is the assessment needed for those with acute, continuous dizziness/vertigo to rule out stroke.

Many physicians in this survey seemed unclear when to do the Dix-Hallpike maneuver versus the HINTS exam, versus neither. Indications for each are clear. Dix-Hallpike should be performed in patients without spontaneous nystagmus who have short episodes of vertigo triggered by specific head position changes and lasting 10 to 90 s with characteristic nystagmus during positional tests. By contrast, patients with continuous vertigo for hours (or days) with spontaneous nystagmus but without other neurological deficits are appropriate for HINTS assessment. Patients with other neurological deficits already clearly have a central cause and therefore need to be managed as such without need for HINTS.

Reassuringly, most patients with vertigo do not have a stroke [6, 7]. Most patients have episodic positionally triggered vertigo and do not require a HINTS exam or imaging.

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Likewise, patients with constant vertigo presenting with other neurological deficits need assessment for a central cause and again, do not need a HINTS exam. However, the subset of patients with spontaneous nystagmus with constant vertigo and no other deficits need a HINTS assessment, because an estimated 1 in 4 of these patients has a posterior circulation stroke that can be missed even by MRI [8].

Reassuringly this survey does point to a better understanding among emergency physicians who have had longer training periods and among younger physicians. Given that the HINTS exam has been validated for central causes since 2009, it is not surprising that older physicians may be less aware and less comfortable performing the HINTS exam. This is an example of the slow pace of knowledge translation of new medical evidence. This may be particularly true for psychomotor skills requiring instruction and feedback, such as the head impulse test (the first step of the 3-component HINTS exam). However, the notion that the testing has not been validated for use by emergency physicians is a poor excuse not to use the HINTS exam. Clearly the eye findings do not vary based on whether it is a neurologist or an emergency physician turning a patient's head or covering an eye, as long as both are appropriately trained (as recently demonstrated in a study using trained emergency physicians who had excellent diagnostic accuracy) [9]. Thus, more consistent training of emergency physicians to perform these maneuvers is what is needed, not further validation of the test.

While learning the HINTS exam may seem daunting, there are training videos which make this assessment straightforward. One of the authors of the Byworth paper has an easy to understand 9 min YouTube video which makes it very clear to know: (1) when to do HINTS, (2) how to do HINTS and (3) how to interpret HINTS findings The HINTS exam YouTube. Emergency physicians manage all sorts of problems. They can intubate unstable patients, reduce shoulder dislocations and put in chest tubes for pneumothorax. Surely, they can select appropriate patients who require a HINTS exam, perform a HINTS exam, and correctly interpret the HINTS findings.

Nevertheless, even with better education, there will likely be some clinicians who still lack confidence in their ability to apply the tests or interpret eye findings. For these individuals, one potential solution is portable video-oculography (VOG), which can be performed by emergency department technicians. VOG provides immediate feedback on the quality of head impulses by rejecting poorly performed tests, and interpretation of eye movement findings can either be performed by a consultant (e.g., via telemedicine) or over-read later by a consultant for quality assurance and feedback purposes, similar to the early days of electrocardiography or point-of-care ultrasound [10].

Even in this relatively small sample of emergency physicians who chose to respond to the survey, perhaps making it an overly optimistic assessment of Canadian emergency physicians' use and understanding of the HINTS exam, there is still much room for improvement. Nevertheless, the HINTS exam is a skill an emergency physician can learn and master. More systematic teaching is required to assist Canadian emergency physicians in knowing when to conduct a HINTS exam, how to perform the exam, and how to correctly interpret the findings. Learning might be further enhanced by adopting new technologies such as VOG. Acquiring this skill will improve care for patients with vertigo.

Declarations

Conflict of interest Dr. Newman-Toker conducts research related to diagnosis of dizziness and stroke, as well as diagnostic error. He serves as the principal investigator for multiple grants and contracts on these topics, including the NIH-sponsored AVERT clinical trial (NIDCD U01 DC013778, ClinicalTrials.gov #NCT02483429). Johns Hopkins has been loaned research equipment (video-oculography [VOG] systems) by two companies for use in Dr. Newman-Toker's research; one of these companies has also provided funding for research on diagnostic algorithm development related to dizziness, inner ear diseases, and stroke. Dr. Newman-Toker has no other financial interest in these or any other companies. Dr. Newman-Toker is an inventor on a provisional patent (US No. 62/883,373) for smartphone-based stroke diagnosis in patients with dizziness. He gives frequent academic lectures on these topics and occasionally serves as a medico-legal consultant for both plaintiff and defense in cases related to dizziness, stroke, and diagnostic error. Dr. Jeffrey Perry receives funding from a peer-reviewed Mid-Career Salary Support Award from the Heart and Stroke Foundation of Ontario.

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