

developed for management of SR-related concussions (SRC) are widely used for all concussion patients. This study aimed to identify whether there are clinically relevant differences in patient and injury characteristics between SRC and those occurring outside of SR activities. **Methods:** Adults (>17 years) presenting from April 2013 to April 2015 with a concussion to one of three EDs with Glasgow coma scale score ≥ 13 were recruited by on-site research assistants. Data on patient characteristics (i.e., age, sex, employment, lifestyle, relevant medical history), ED presentation (i.e., EMS arrival, hours since injury, CTAS, Glasgow Coma Scale score) and injury characteristics (i.e., activity leading to injury, loss of consciousness [LOC], signs and symptoms [scored using the Rivermead Post-Concussion Questionnaire], and health-related quality of life [from the 12-Item Short Form Health Survey [SF-12]) were collected from structured interviews and the ED chart. Dichotomous and categorical variables were compared using Fisher's exact test; continuous variables were compared using t-tests or Mann-Whitney tests, as appropriate. **Results:** In total, 248 patients were enrolled (47% male, median [IQR] age: 35 [23, 49]). Patients with SRC were younger (median: 23.5 years vs 35 years; $p < 0.001$), more likely to be a student (31% vs 8%; $p > 0.001$), and more likely to exercise regularly (89% vs 66%; $p = 0.001$). Patients with SRC were less likely to present during the daytime (66% vs. 77%; $p = 0.022$), less likely to have a history of mental health issues (18% vs 33%; $p = 0.011$) and had significantly higher median SF-12 physical components scores (55.5 [IQR: 51.4 to 57.8] vs. 53.5 [IQR: 45.5 to 56.7]; $p = 0.025$). All other characteristics were similar between the two groups. **Conclusion:** Although differences in demographics and lifestyle have been identified between patients sustaining a SRC and those concussed during other activities, injury characteristics, such as presentation acuity, proxies for severity, and signs and symptoms, were similar in both groups. Further analysis to assess whether the demographic and lifestyle differences affect clinical outcomes, such as time to symptom resolution, between these two groups is required to assess if sport-based treatment guidelines are appropriate for all patients.

Keywords: concussion, emergency department, mild traumatic brain injury

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Can the HINTS exam rule out stroke in those with vertigo? A systematic review and meta-analysis

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Introduction: Acute vestibular syndrome (AVS - vertigo, nystagmus, head motion intolerance, ataxia, and nausea/vomiting) is a subset of patients presenting with vertigo. They are most often due to benign vestibular neuritis but can be a sign of a vertebrobasilar stroke. The HINTS (head impulse test, nystagmus, positive test of skew) exam has been proposed as an extremely accurate bedside test to rule out stroke in those presenting with AVS. Is the HINTS exam compared to MRI sufficiently sensitive to rule out vertebrobasilar stroke in an adult population presenting to the emergency department with AVS. **Methods:** We searched in Pubmed, Medline, Embase, the Cochrane database, and relevant conference abstracts from 1968 to December 2018 and performed hand searches. No restrictions for language or study type were imposed. Relevant studies were reviewed and data was extracted by two independent reviewers. Gold standard in ruling out stroke was; Negative late acute (72 hrs-10d) cranial

MRI with DWI OR Negative early acute (0-72hrs) cranial MRI plus negative follow-up cranial MRI or clinical follow-up for TIA/stroke of ≥ 3 months. Included studies were prospective or retrospective with patients presenting with acute vestibular syndrome. Studies combined if low clinical and statistical heterogeneity. Study quality was assessed using the QUADAS tool. Random effects meta analysis using Revman 5 and SAS9.3 was performed. **Results:** 6 studies with 715 participants were included (QUADAS 12/14 SD 1.2). Average study length 5.3 years (STD 3.3 years). Prevalence of vertebrobasilar stroke ranged 9.3-76% (Mean 39.1% SD 17.1). The most common diagnosis were vertebrobasilar stroke (Mean 34.8% SD 17.1%), peripheral cause (Mean 30.9% SD 16%). Intra cerebral haemorrhage (Mean 2.2%, SD 0.5%). Neurologist/neuro ophthalmologist performed the exam in 5/6 studies. 1 study reported a kappa between emergency medicine physician and neurologist of 0.24-0.41. The HINTS exam had a sensitivity of 96% (CI 95% 0.92-0.98, I2-0%), Specificity 91.4% (CI 95% 64.5-98.4% I2 94%). Positive likelihood ratio 11.9 (CI 95% 2.9-48.8) and a negative likelihood ratio of 0.04 (CI 95% 0.01-0.14). **Conclusion:** The HINTS exam has excellent diagnostic accuracy for ruling out stroke when performed by a neurologist. The lack of ER proven diagnostic accuracy and high prevalence of serious diagnosis in those presenting with acute vestibular syndrome suggests care should be taken in ruling out central cause of dizziness in this population.

Keywords: head impulse test, nystagmus, positive test of skew (HINTS), vertigo

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Can clinical examination alone rule out a central cause for acute dizziness?

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Introduction: The vast majority of patients presenting with dizziness to the emergency department (ED) are due to a benign self-limiting process. However, up to 5% have a serious central neurological cause. Our goal was to assess the sensitivity of clinical exam for a central cause in adult patients presenting to the emergency department with dizziness. **Methods:** At a tertiary care ED we performed a medical records review (Sep 2014- Mar 2018) including adult patients with dizziness (vertigo, unsteady, lightheaded), excluding those with symptoms >14days, recent trauma, GCS < 15, hypotensive, or syncope/loss of consciousness. 5 trained reviewers used a standardized data collection sheet to extract data. Individual patient data were linked with the Institute of Clinical Evaluation Science (ICES) database. Our outcome was a central cause defined as: ischemic stroke (IS), transient ischemic attack (TIA), brain tumour, intra cerebral haemorrhage (ICH), or multiple sclerosis (MS) diagnosed on either neurology assessment, computed tomography, magnetic resonance imaging, or diagnostic codes related to central causes found within ICES. A sample size of 1,906 was calculated based on an expected prevalence of 3% with an 80% power and 95% confidence interval to detect an odds ratio greater than 2. Univariate analysis and logistic regression were performed. **Results:** 3,109 were identified and 2,307 patients included (mean 57 years SD ± 20 , Female 59.1%, Kappa 0.91). 62 central causes (IS 56.5%, TIA 14.5%, Tumour 11.3%, MS 9.7%, ICH 6.5%) of dizziness were identified. Imaging was performed in 945(42%) and neurology assessment in 42 (1.8%). ICES yielded no new diagnoses of a central cause for dizziness. Multivariate logistic regression found 11