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LETTER TO THE EDITOR

**Frontline providers harbor misconceptions about the bedside evaluation of dizzy patients**

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Sir,

We report herein the results of a preliminary study examining misconceptions among frontline healthcare providers regarding the diagnostic assessment of dizzy patients. We sought to determine generalist physicians' understanding of bedside findings in dizzy patients using a knowledge-based quiz and comparing them to specialists as a reference standard. Our results suggest that misconceptions are common. The most clinically relevant misconceptions were that: (a) dizziness worsened by head movement is benign, (b) gaze-evoked nystagmus is benign, and (c) episodic vertigo lasting 5–10 min is benign. Faulty information may be increasing misdiagnosis of dizzy patients and reducing patient safety in frontline healthcare settings. Educational initiatives merit consideration.

Dizziness is among the most common emergency department (ED) chief complaints and may indicate serious disease in up to about 30% of cases [1]. This includes that subset of patients over age 50 with new, isolated vertigo, who have caudal cerebellar infarction as a cause 25% of the time [2]. Distinguishing dangerous from benign illness requires recognition of subtle historical and physical diagnostic findings, since many patients with cerebellar infarction or transient ischemic attack (TIA) present a pseudo-labyrinthine clinical mimic [3,4]. An inability to recognize these bedside findings could be responsible for the high rate of misdiagnosis (35%) among cerebrovascular patients presenting to the ED with dizziness [5], and the fact that dizziness is the

symptom most commonly associated with a missed diagnosis of stroke in the ED [6].

Peripheral vestibular disorders (e.g. vestibular neuritis and benign paroxysmal positional vertigo – BPPV) account for roughly half of all cases among both unselected ED dizzy patients [1] and the subset of patients with rotatory vertigo [7]. Vestibular neuritis must be distinguished from caudal cerebellar infarction [8] and BPPV must be distinguished from TIA [3]. Although bedside techniques to distinguish peripheral from central vestibular disorders have been described previously by neuro-otologists [8,9], it is unclear to what extent these methods have been incorporated into the knowledge base of frontline healthcare providers.

We sought to determine whether bedside techniques commonly employed by neuro-otologists were familiar enough to emergency and other primary providers to help them identify cerebrovascular causes of dizziness. We hypothesized that misconceptions about the bedside evaluation of dizzy patients would be common.

We assessed dizziness knowledge in 28 frontline healthcare providers using an anonymous, 10-question true/false quiz. With IRB approval, we conducted an unmasked, retrospective analysis of the anonymous quiz data, and compared them to results obtained from 10 neuro-otologists. The study group comprised 14 primary care physicians (all attendings) and 14 emergency physicians (mixed residents and attendings) at two university teaching hospitals. The comparison group comprised 10 vestibular specialists (6 with primary training in

neurology, and 4 in otolaryngology) at 4 university teaching hospitals. None of the neuro-otologists polled had any part in designing the quiz or in data analysis.

Study group subjects were attending a lecture on the evaluation of dizzy patients, and completed the quiz before the lecture at their institution (1998 primary care physicians, 2000 emergency physicians); neuro-otologists were contacted via email to complete the quiz at a later date (2004). The instrument was a 10-question, true-false quiz about the clinical evaluation of dizzy patients (Table I). It was designed to assess bedside knowledge important to differentiation of benign, peripheral disorders (in particular, vestibular neuritis and BPPV), from their dangerous central mimics (in particular, stroke and TIA). Correct responses were derived from relevant medical literature.

All study group participants were given the same instructions. Three important clarifications were announced at each sitting: (1) 'peripheral cause' of vertigo meant 'peripheral (inner ear), as opposed to central (brain) cause' of vertigo; (2) 'persistent' vertigo referred to a patient who was still sick and

dizzy in front of the physician at the time of evaluation, as opposed to someone with 'brief' vertigo who had one or more transient spells before they reached medical attention; and (3) the 'Hallpike maneuver is 'the one where you throw the patient back on the bed,' and is also called the 'Dix-Hallpike,' 'Bárány,' or 'Nylen-Bárány' maneuver. Questions about the meaning of the terms 'occlusive ophthalmoscopy' and 'vertigo' were not answered. Study group subjects were given approximately 5–10 min to complete the quiz.

We calculated the percent correct responses for each participant across the 10 questions and for each question across study participants. Blank responses were not scored (17/280, 6%, all from the study group). We compared the lecture attendee results to 50% (score expected by guessing alone) with a binomial exact statistic. We also compared generalist to specialist responses with a Fisher's exact test (for each individual question) and non-parametric Wilcoxon rank sum test (for the aggregate comparison). Statistical analyses were conducted using SAS v9.1 (Cary, NC, USA). All *p* values were two-sided, with *p* < 0.05 considered statistically significant.

Table I. Performance of generalists versus vestibular specialists on 10 true/false questions about the bedside assessment of dizzy patients.

Question (correct answer)	Generalist* % correct (95% CI) <i>p</i> value <sup>†</sup>	Specialist* % correct (95% CI) <i>p</i> value <sup>‡</sup>
Questions 1–5: 'True or false: Likely to indicate a peripheral (as opposed to central) cause of PERSISTENT <sup>§</sup> vertigo.'		
1. Presence of new unilateral tinnitus. (True)	61% (41–78%) 0.34	90% (56–100%) 0.13
2. Head motion or change in position exacerbates dizziness. (False)	25% (11–45%) 0.01	80% (44–97%) 0.006
3. Horizontal nystagmus beating rightward in right gaze and leftward in left gaze. (False)	26% (11–46%) 0.02	100% (74–100%) <0.001
4. Hallpike (Bárány) maneuver produces nystagmus which was absent in primary gaze. (False)	8% (1–26%) <0.001	60% (26–88%) 0.003
5. Nystagmus present in primary gaze increases with occlusive ophthalmoscopy. (True)	22% (7–44%) 0.01	90% (56–100%) <0.001
Questions 6–10: 'True or false: General questions about vertigo/nystagmus.'		
6. 'True vertigo' refers particularly to a spinning sensation in the horizontal plane. (False)	18% (6–37%) <0.001	90% (56–100%) <0.001
7. When elicited, classic benign paroxysmal positioning nystagmus is vertical and torsional. (True)	31% (14–52%) 0.08	90% (56–100%) 0.002
8. Nausea with vomiting is a frequent concomitant of benign paroxysmal positioning vertigo. (False)	46% (28–66%) 0.85	70% (35–93%) 0.28
9. Nystagmus in a unilateral vestibulopathy is always most evident looking away from the lesion. (True)	42% (22–63%) 0.54	90% (56–100%) 0.02
10. A patient with several bouts of isolated vertigo lasting 5–10 minutes is most likely to have BPPV. (False)	23% (9–44%) 0.009	80% (44–97%) 0.006

The table shows the 10 quiz questions, with aggregate physician responses, by question. Generalists performed worse than expected by chance alone, and significantly worse than the specialist physician comparison group.

\*Generalists: Johns Hopkins Hospital emergency physicians (*n* = 14) and Massachusetts General Hospital primary care physicians (*n* = 14); Specialists: vestibular specialists at four university teaching hospitals (*n* = 10).

<sup>†</sup>*p* values in the Generalist column are for comparison of mean proportion of correct responses among Generalists relative to that expected by chance guessing alone (i.e. 50% correct responses) (binomial exact).

<sup>‡</sup>*p* values in the Specialist column are for a comparison of mean proportion of correct responses among Generalists vs Specialists (Fisher's exact test).

<sup>§</sup>Participants were instructed that 'persistent' vertigo referred to a patient who was still sick and dizzy in front of the physician at the time of evaluation, as opposed to someone with 'brief' vertigo who had one or more transient spells before they reached medical attention.

The mean individual score was 29% among 14 primary care physicians (range 0–70%, median 25%) and 31% among 14 emergency physicians (range 0–60%, median 30%). Aggregate data for frontline healthcare providers are shown in the histogram (Figure 1). There was a clear difference between generalist (mean 30%, range 0–70%, median 28%) and specialist (mean 83%, range 50–100%, median 90%) quiz performance ( $p < 0.001$ , Wilcoxon rank sum).

Analyzing by question (Table I), 9 of 10 questions were answered incorrectly by the majority of frontline providers. Comparing frontline provider responses to chance performance (i.e. 50% correct), 6 of 10 questions (nos 2, 3, 4, 5, 6, and 10) were answered correctly at rates significantly below that expected by guessing alone (8–26%,  $p < 0.001$  to  $p = 0.02$ ), implying misconceptions, rather than lack of knowledge. All but two questions (nos 1 and 8) were answered differently by generalists and specialists ( $p < 0.001$  to  $p = 0.02$ , Fisher's exact), and the ranges of correct responses by question were essentially non-overlapping between the two groups (8–61% vs 60–100%).

Our results suggest that misconceptions about the bedside approach to dizzy patients may be common among frontline healthcare providers. Such misconceptions could increase the risk of misdiagnosis and reduce patient safety.

Three of the most clinically relevant misconceptions about distinguishing peripheral from central causes of dizziness are described below. These misconceptions could place frontline providers at substantial risk of missing strokes and TIAs in the posterior cerebral circulation.

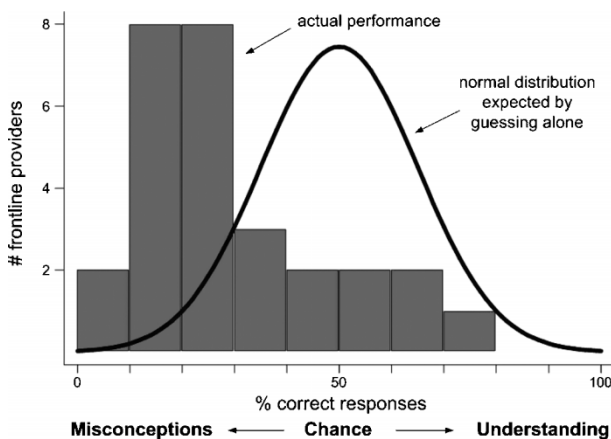


Figure 1. Distribution of generalist performance on a 10-question, true/false quiz about bedside assessment of dizzy patients, with reference to chance guessing. The distribution expected by guessing alone is also shown. The distribution of responses implies that generalists are misinformed, rather than uninformed.

- Misconception 1 – ‘Dizziness exacerbated by head motion or positional change indicates a peripheral cause of persistent vertigo.’ (Question no. 2)

If a patient with protracted, continuous vertigo feels worse when they move their head, it is a good indicator of a vestibular problem; however, it does not discriminate between a benign peripheral vestibular problem (e.g. vestibular neuritis) and a dangerous central one (e.g. cerebellar stroke) [9]. Generalists answered this question correctly only 25% of the time, compared with 80% for specialists ( $p = 0.006$ , Fisher's exact).

- Misconception 2 – ‘Horizontal nystagmus beating rightward in right gaze and leftward in left gaze indicates a peripheral cause of persistent vertigo.’ (Question no. 3)

Nystagmus that changes direction in different positions of gaze is most often central, not peripheral [8,10]. The particular pattern of nystagmus described in this question (gaze-evoked nystagmus) is prototypical of cerebellar disease. It can be seen in patients with acute cerebellar strokes whose presenting symptom is vertigo [2,11]. Generalists answered this question correctly only 26% of the time, compared with 100% for specialists ( $p < 0.001$ , Fisher's exact).

- Misconception 3 – ‘A patient with several bouts of isolated vertigo lasting 5–10 min is most likely to have BPPV.’ (Question no. 10)

Vertigo caused by BPPV almost always lasts less than 1 min and almost never longer than 2 min [12]; 5–10 min is a typical duration reported in patients suffering from TIAs in the posterior cerebral circulation [3]. Generalists answered this question correctly 23% of the time, compared with 80% for specialists ( $p = 0.006$ , Fisher's exact).

Limitations of our study include the small and potentially biased sample, retrospective design, and lack of prospective instrument validation. Despite these limitations, we believe the strength of the associations, consistency across disparate primary care groups, and differences between generalist and specialist performance all support our conclusions. Further study is necessary to confirm misconceptions in a larger sample, to determine potential sources of misinformation, and to explore the relationship between misinformation and the risk of actual misdiagnosis of ED dizzy patients. The neuro-otology community should consider ways to share

current best practices with generalist peers who assess dizzy patients in frontline healthcare settings.

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