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ORIGINAL RESEARCH

Construction and Validation of the Vestibular Screening Tool for Use in the Emergency Department and Acute Hospital Setting

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Abstract

Objectives: To construct a new vestibular screening tool to identify likely vestibular disorders and guide referral of dizzy patients presenting to hospital and to test the vestibular screening tool for construct and discriminative validity and reliability of physiotherapy assessors.

Design: Methodologic study.

Setting: Emergency and acute hospital wards of a metropolitan hospital.

Participants: Adults (N = 114) presenting to hospital with dizziness (mean age, 67.36±14.88y; 57% women).

Intervention: Not applicable.

Main Outcome Measures: Three vestibular screening tools (3, 4, and 5 items) were investigated. Physiotherapy vestibular diagnostic tests categorized patients as vestibular or nonvestibular patients. Subsets of patients were assessed twice by 2 physiotherapists (n = 20) and twice by the same physiotherapist (n = 30).

Results: Each of the vestibular screening tools had a good fit to the Rasch measurement model. Factor analysis demonstrated individual items loaded across 1 factor, confirming unidimensionality of the 3 vestibular screening tools, and Cronbach α determined internal consistency. The 4-item vestibular screening tool had the greatest area under the curve using receiver operator curve analysis (.894), with highest sensitivity (83%) and specificity (84%) for identifying vestibular disorders (cutoff value ≥4/8). Sensitivity of the 3- and 5-item versions was lower than the 4-item vestibular screening tool (80%). The 4-item vestibular screening tool scores showed high intrarater (κ item scores, .831−1; intraclass correlation coefficient [ICC] total, .988) and interrater (κ item scores, .578−.921; ICC total, .878) reliability.

Conclusions: The 4-item vestibular screening tool is a reliable, valid tool for screening dizzy patients presenting to hospital, with unidimensional construct validity, high sensitivity, and specificity for identifying likely vestibular disorders. The vestibular screening tool could be used clinically to streamline referrals of dizzy patients to vestibular clinics.

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The underdiagnosis and management of vestibular disorders in the emergency department (ED) of tertiary hospitals is a primary concern. Dizziness is a common presentation, accounting for 4% of ED visits.[1] Small systematic studies of ED patients suggest that 24% to 43% of those presenting with dizziness have a vestibular disorder, such as benign paroxysmal positional vertigo (BPPV) or acute vestibular neuritis,[1] but these disorders are often underdiagnosed.[1] This is concerning because these disorders have been linked with representations to hospital, increased incidence of falls, fall-related injuries (eg, wrist and hip fractures[1-3]), and increased costs.

Significant costs are associated with diagnosis of dizziness and vestibular disorders.[2-5] The challenge of interpreting clinical vestibular diagnostic bedside tests without additional training has

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been linked to underdiagnosis of vestibular disorders.[6,7] For nonemergency causes, assigning effective treatment to manage dizziness has the potential to improve overall public health care costs. Vestibular physiotherapists can determine the presence of many vestibular disorders via a comprehensive vestibular assessment and provide evidence-based interventions to reduce symptoms of dizziness and unsteadiness.[8] Particle repositioning maneuvers are effective BPPV treatment,[9] and vestibular rehabilitation has consistent evidence of effectiveness for vestibular disorders (eg, vestibular neuritis, unilateral and bilateral vestibular hypofunction, migraine vertigo, central vestibular causes).[8,10,11] Vestibular rehabilitation includes treatments (eg, canalith repositioning maneuvers) and exercises which facilitate vestibular adaption, habituation, and/or substitution.[12] In the event that clinical assessment identifies a condition not likely to respond to vestibular rehabilitation (eg, Meniere disease), referral to appropriate specialists can be made. Because vestibular physical therapists may provide efficient and cost-effective management of many nonemergent vestibular disorders, instruments that can screen for these conditions in the ED and hospital settings are needed. Therefore, screening dizzy patients in the ED setting for a vestibular disorder, but not the exclusion of central disorders, is the focus of this article.

There are currently no validated screening tools to assist clinicians in the acute hospital setting to identify patients with a likely vestibular disorder once more serious conditions have been ruled out. Head impulse, nystagmus type, test of skew (HINTS) is a clinical examination that assists with diagnosis of stroke in the acute setting.[13] Once stroke and other medical emergencies have been ruled out, HINTS does not assist with further management of these dizzy patients. The Dizziness Handicap Inventory (DHI) (25 items) evaluates dizziness impairment and vestibular dysfunction,[14] the DHI subscale (5 or 2 items) aims to screen for BPPV, and the Vestibular Rehabilitation Benefit Questionnaire (22 items) has demonstrated moderate responsiveness to vestibular rehabilitation in community contexts.[15] These questionnaires are too detailed to administer quickly in the acute hospital setting and have not been tested in the acute setting. Therefore, a short screening tool is required to identify those with a likely vestibular problem and to enable referral to vestibular physiotherapy.

This study aimed to develop a new tool (vestibular screening tool) for application in the acute hospital setting to screen for nonemergent vestibular disorders when patients present with dizziness and enable referral of appropriate patients to vestibular physiotherapy; to establish construct validity of the vestibular screening tool; to determine the discriminative validity of the vestibular screening tool for identifying vestibular disorders; and to demonstrate reliability of physiotherapy assessors administering the tool.

List of abbreviations:

AUC	**area under the curve**
BPPV	**benign paroxysmal positional vertigo**
DHI	**Dizziness Handicap Inventory**
ED	**emergency department**
HINTS	**head impulse nystagmus type test of skew**
ROC	**receiver operator curve**

Methods

Design

A methodologic study was undertaken. The Prince Charles Hospital and Australian Catholic University Research Ethics Committees approved the study.

Participants and setting

Patients (>18y) complaining of dizziness who presented to the ED of a metropolitan hospital were included. After triage, dizziness was the confirmed presenting complaint. Patients were excluded if a known cardiac condition or stroke requiring emergency medical management was the cause to their hospital presentation; if they were unable to provide informed consent (intoxication, mental disability, language barrier); or if recent injuries or musculoskeletal conditions limited diagnostic assessment. Participants gave written informed consent. Ethical approvals were gained by relevant institutions.

Outcome measure

Construction and piloting the vestibular screening tool

The construction of the vestibular screening tool involved a number of steps as illustrated in figure 1. A panel of experts was sought through a statewide vestibular rehabilitation group to determine the level of agreement (0−10) about the items included in the vestibular screening tool trial 2.[16]

Main study

The 5-item vestibular screening tool was the primary measure under investigation (table 1) and included 3 possible answers as modeled on the DHI: yes (2 points), sometimes (1 point), or no (0 point), with a total score (0−10) recorded for each patient. The item and total score were recorded.

A diagnostic vestibular assessment confirmed presence of a vestibular disorder. A comprehensive subjective examination, oculomotor examination (spontaneous nystagmus presence, smooth pursuit, gaze-evoked nystagmus, saccadic eye movements, skew deviation), vestibular ocular reflex tests (head impulse test, head shaking nystagmus), and positional testing (Hallpike-Dix test, supine roll test) were completed with use of video Frenzel equipment.[12] Demographic data recorded included sex, age, and self-reported falls in the last 12 months.

Protocol

Validation of the vestibular screening tool

The 5-item vestibular screening tool was administered verbally in the ED/acute hospital settings. A vestibular diagnostic assessment was completed while participants were in hospital or within 48 hours of discharge. Participants were grouped as either vestibular or nonvestibular disorder. Vestibular classification included ≥1 of the following: (1) positive Hallpike-Dix test (BPPV), supine roll test (BPPV), or head impulse test/video head impulse test (acute vestibular neuritis, unilateral/bilateral vestibular hypofunction)[17]; (2) episodic symptoms of fluctuant hearing loss, vertigo, tinnitus, or ear blockage confirmed by a specialist (Meniere disease)[17]; and (3) migraine headaches as per