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Original Research Article

Checklist approach to vertigo: audit of current practice in a tertiary referral center

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ABSTRACT

Background: Vertigo is a complex symptom which can be present in multiple conditions, some of which are life threatening. Diagnosing a patient with vertigo could sometimes be challenging and there is a need for a comprehensive, yet easily reproducible diagnostic model with emphasis on the red flag signs. A simple way to achieve this is a checklist. The aim of the study was to propose a diagnostic checklist for patients presenting with vertigo to an ENT clinic to aid diagnosis and prevent diagnostic errors.
Methods: A diagnostic checklist was used in all patients who presented with the symptom of vertigo, necessary tests were conducted and referrals were done when required.
Results: Out of eighty-five patients who presented with symptom of dizziness to ENT clinic, all patients received a definitive diagnosis treatment plan with the help of checklist.
Conclusions: Checklist is an effective way to ensure elaborate assessment of the patient with emphasis on the red flag signs. It is a very important tool to arrive at diagnosis and formulate treatment plan.

Keywords: Vertigo, Checklist, Diagnosis

INTRODUCTION

Vertigo is a common presentation to the Otorhinolaryngology clinic. The varied presentation and the multiple etiologies associated with this symptom make it a complex problem for an accurate diagnosis. Since dizziness is a common symptom of many systems (otology, neurology, cardiology) often with overlapping features, a multidisciplinary approach is needed to diagnose this problem. Some differential diagnoses are life-threatening and the 'red flag' signs need to be identified early for timely intervention.[1] There have been models of a multidisciplinary approach in vertigo management in different parts of the world.[2] However, a multidisciplinary approach is difficult to replicate due to time, resource constraints, and lack of local access to specialist expertise. This mandates the need for a comprehensive diagnostic model which should be quick and reproducible with emphasis on the red flag signs. A simple way to achieve this is a checklist.[3] Checklists are widely used in the aviation industry as a routine to avoid untoward incidents. Health care professionals have also adopted checklists in few areas like medical diagnosis, intensive care units, and in the operating rooms in the form of surgical safety checklists to avoid surgical errors.[3,4]

The aim of the study was to propose a diagnostic checklist for patients presenting with vertigo to an ENT clinic to aid diagnosis and prevent diagnostic errors.

METHODS

Ethical clearance

An audit was conducted in a tertiary care hospital between July 2019 and September 2019 (3 months) after obtaining institutional ethical board clearance. All patients walking into the ENT OPD at a tertiary care centre in Bangalore

with the clinical symptom of vertigo/ imbalance/dizziness/light headedness were included in the study. Eighty-five patients (45 male 40 female) were included in the study for 3 months. All the checklists were audited at the end of 3 months.

Study design

It was a retrospective study design.

Observations were tabulated in Microsoft excel.

Preparation of checklist

A comprehensive vertigo checklist was prepared by ENT and neurology teams. The checklist was created using a 3 round modified Delphi exercise involving two senior ENT surgeons and one neurologist to reach a consensus on what clinical parameters should be on the checklist and what symptoms and signs should be classed as red flag symptoms.[5] A further consensus was reached on what diagnoses should be on the checklist and what needs immediate referrals to appropriate specialties (Figure 1 and 2). The history sheet of the vertigo checklist is comprised of various questions that have to be checked by the clinician. The questions include the type of dizziness, duration, presence of any triggers, presence of hearing loss/tinnitus/ear discharge, neurologic and cardiologic history, trauma, migraine, and related medical history. Family history and medication history with special emphasis on psychiatric and neurologic medications. The questions are designed such that all the differential diagnoses of dizziness are covered and the red flag symptoms are highlighted in the checklist.

The next part has the examination section where all the important steps in the examination of a patient with vertigo are included. This includes otologic, neurotologic, neurologic examination, palpation of carotids, and check for orthostatic hypotension. This section too has the red flag signs highlighted. A clinical diagnosis can be made at this point and the necessary investigations are marked. The next page of the vertigo sheet has a comprehensive list of differential diagnoses with color-coding for common, important, and 'do not miss' diagnoses. Patients with symptoms and signs pointing to neurologic or cardiologic causes of dizziness are immediately referred to the concerned physician for further management.

Presenting Complaint:

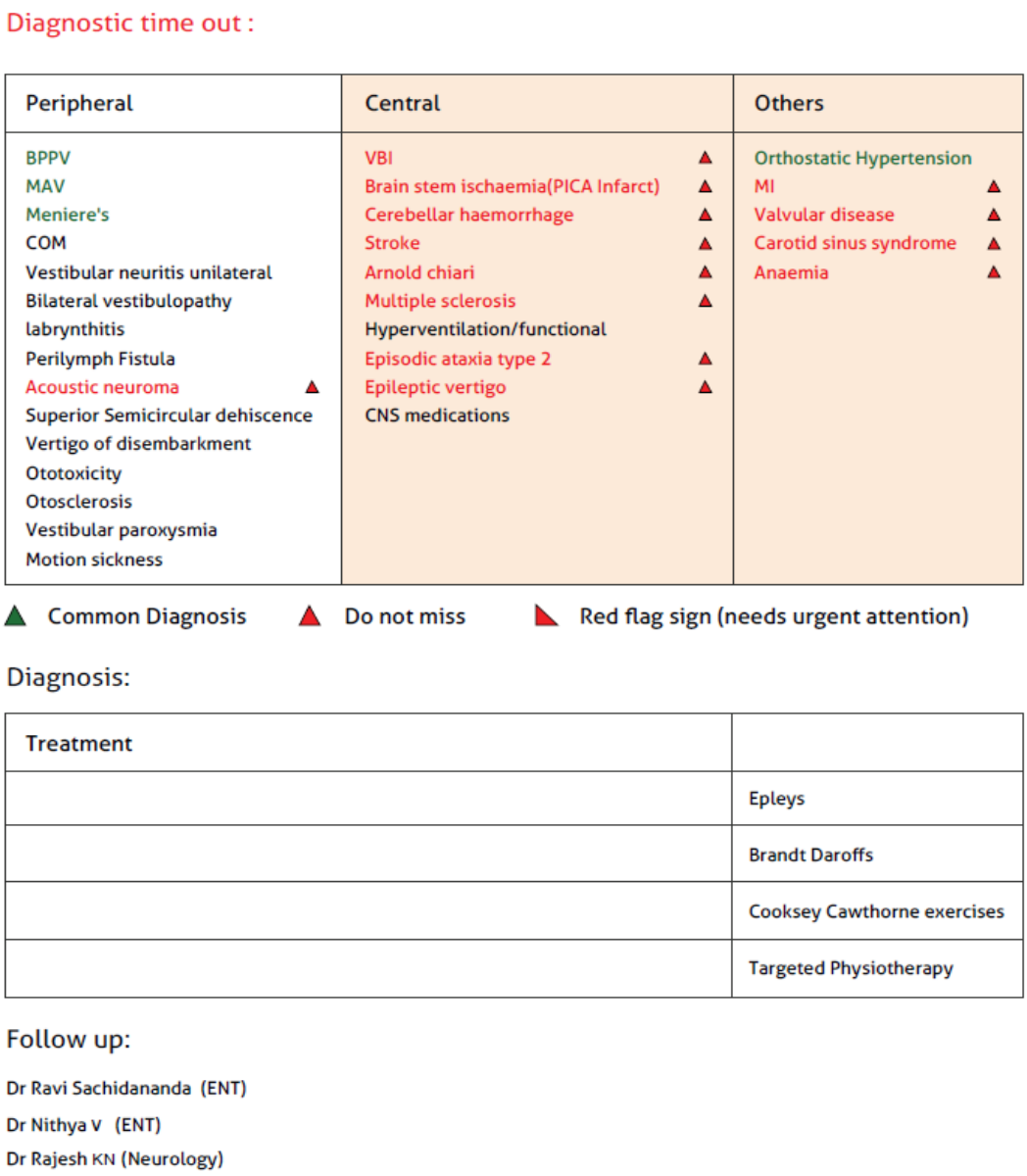
Peripheral		Central and others	
Vertigo (Rotatory) Imbalance light headedness Fainting	Duration : Seconds Hours Days Months (most important question)	Aura Headache Photophobia Phonophobia	Chest pain / SOB
Ear Discharge: Y/N	Any Triggers Position/travel/sound/Walking social situation/head turning	Nausea/Vomiting	Neurology : Sensory/Motor/ Cerebellar
Aural fullness :Y/N		Migrane	LOC
Hearing loss: Y/N			Vision disturbance
Tinnitus :Y/N		QOL : Dizziness Handicap inventory	Hypertension

Past medical history	Medications	Allergies
MRI (in all except BPPV)	psychiatric/anti epileptic medications Y/N	
Family history of migraine	alcohol	occupation

Examination: Ear :TM	Saccades Smooth Pursuit	Sensory Motor Cerebellar Gait abnormality
Tuning Fork	Nystagmus Dynamic Visual Acuity	
Nose/Throat		Romberg's
Fistula test		Fukuda stepping test
Hyperventilation		Eye
Dix Hallpike: Post Canal Lateral Canal Superior Canal Nystagmus		BP: Lying Standing CVS : murmurs / dysrhythmia Carotids:
Head Thrust/shake		

Audiometry : (all except BPPV)	Vestibular tests
MRI (in all except BPPV)	Calorics
CT Scan	Others

Figure 1: Page 1 of multidisciplinary vertigo clinic checklist.



Diagnostic time out :

Peripheral	Central	Others
BPPV	VBI ▲	Orthostatic Hypertension
MAV	Brain stem ischaemia(PICA Infarct) ▲	MI ▲
Meniere's	Cerebellar haemorrhage ▲	Valvular disease ▲
COM	Stroke ▲	Carotid sinus syndrome ▲
Vestibular neuritis unilateral	Arnold chiari ▲	Anaemia ▲
Bilateral vestibulopathy	Multiple sclerosis ▲	
labrynthitis	Hyperventilation/functional	
Perilymph Fistula	Episodic ataxia type 2 ▲	
Acoustic neuroma ▲	Epileptic vertigo ▲	
Superior Semicircular dehiscence	CNS medications	
Vertigo of disembarkment		
Ototoxicity		
Otosclerosis		
Vestibular paroxysmia		
Motion sickness		

▲ Common Diagnosis ▲ Do not miss ◣ Red flag sign (needs urgent attention)

Diagnosis:

Treatment	
	Epleys
	Brandt Daroffs
	Cooksey Cawthorne exercises
	Targeted Physiotherapy

Follow up:

Dr Ravi Sachidananda (ENT)

Dr Nithya V (ENT)

Dr Rajesh KN (Neurology)

Figure 2: Page 2 of multidisciplinary vertigo clinic checklist.

RESULTS

All patients received a definitive diagnosis and treatment plan. The most common diagnosis was and Benign paroxysmal positional vertigo (BPPV) of which most were posterior canal BPPV, 1 patient had lateral canal BPPV (Table 1). The next common diagnosis was migraine-associated vertigo. Most patients with migraine-associated vertigo had dizziness when moving from lying to sitting position during the Dix-Hallpike test. This is an interesting finding which needs further investigations to establish significance. The most common treatment modalities in our study were Epley's maneuver and anti-migraine treatment. All patients except BPPV underwent audiometry and Magnetic resonance imaging (MRI) of the brain and internal auditory meatus. The scan helped in the early diagnosis of stroke in 4 patients (Figure 3) and appropriate interventions were planned to contain the vascular event. 3 Patients with Meniere's received intratympanic gentamycin as they did not respond to conservative treatment.

Table 1: Distribution of diagnoses using the vertigo checklist.

Peripheral vertigo	N	Central and others	N
BPPV	24	PICA infarct	4
BPPV (lateral)	2	Gastrointestinal bleed	1
BPPV and MAV	1	Atrial fibrillation	1
MAV	23	Mitral regurgitation	1
Meniere's disease	6	Dysarrythmia	2
Vestibular neuritis	2	Orthostatic hypotension	15
Multifactorial dizziness	3		

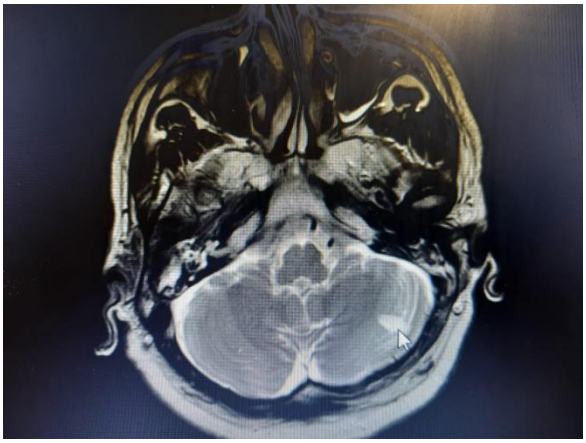


Figure 3: MRI in a patient with vertigo showing acute cerebellar infarct.

DISCUSSION

Synopsis of the key finding

The current audit emphasizes the need for diagnostic checklists in the management of vertigo and its utility in reducing serious errors in diagnosis. Diagnostic errors are common in medical practice, with a range of 12% to 15%.[5] Many of these go unnoticed but few of these errors may be fatal. Studies have been conducted to analyze the cause of errors in clinical decision-making.[6] The clinical decision-making process could be of two types, the first one is based on intuitive thinking which is rapid and happens at the subconscious level, the second one is based on analytical thinking and is slow and time-consuming.[7] The intuitive thinking process which is commonly used in clinical practice has its basis on clinical experience which leads to unconscious processing of clinical cues, recognition of patterns, and arriving at the diagnosis.[8] This method of clinical decision-making is extremely useful but prone to errors.

The utility of checklists in diagnosis

Checklists have been used widely in the Aviation industry.[4] There are different types of checklists for different situations in aircraft. Medicine has adopted similar checklists for different situations (for example WHO surgical safety checklist). The 'normal' checklist in aviation is followed routinely for all flights, this is similar to the normal safety checklist for medical equipment. The non-normal checklists are of two types; the emergency checklist where time is critical and non-emergent when time is not the concern but the complexity of the problem needs a checklist that serves as a flow chart to conclude. The checklist which is used as a part of advanced cardiac life support is an example of an emergency checklist in medicine. The non-emergency checklist is used in cases of a complex condition with several differential diagnoses. Here, the role of a checklist is to ensure that no diagnosis is missed.[9] The use of checklists in medicine is not new. A landmark paper by Haynes et al published in the New England journal of medicine aimed to study the role of a checklist in reducing surgical complications and mortality by using a 19 items checklist in the operation room.[10] The implementation of the checklist found that the complication rate reduced from 11% to 7% and the mortality rate dropped from 1.5% to 0.8%. The WHO surgical safety checklist has become a standard in operating rooms and has been implemented in hospitals across the world to reduce mortality and morbidity. A similar paper by Pronovost et al showed checklists reduced catheter-related bloodstream infection by up to 66 percent.[11]

The utility of checklists in diagnosis was demonstrated by Graber et al who studied the role of a checklist in making a diagnosis in the emergency room setting and found that checklists were accepted well by the physicians as it allowed the clinician to pause and reflect and to consider an alternate diagnosis before coming to conclusions.[12] Developing a checklist is an ongoing process, it needs to undergo modifications and improvisations.[13] Ely et al in their paper described the role of a checklist in reducing diagnostic errors.[14] They have described three types of checklists namely the general checklist for diagnosis, specific checklist, and differential diagnosis checklist. They have also outlined the different types of diagnostic errors and the role of a checklist in avoiding these errors. The common causes of error are attributed to the clinician's tendency to think of common diagnosis (availability), hook on to salient features in history too early (anchoring), close the decision-making process too early (premature closure), look for known patterns/prototypical manifestations and end the search once a provisional diagnosis is made (search satisfaction) to name a few. The checklist helps in breaking these tendencies by allowing the clinician to search with an open mind, reopen the thinking process even if the diagnosis seems to be straightforward, and consider alternate diagnoses before discharging the patient. The diagnostic process becomes more scientific and systematic and not reliant on memory or heuristics. The use of a checklist in vertigo diagnosis is a novel thought and it ensures that the clinical assessment is complete. It directs the clinician to ask and look for all associated symptoms and signs with a focus on the red flag ones even if the diagnosis sometimes looks straightforward at the outset. It gives scope for step-wise analysis of the symptom with decreased dependence on intuition.

The role of imaging in acute vertigo has been a topic of controversy, but there have been studies that emphasize the positive value of imaging.[15] Acute dizziness may be the only presenting symptom of stroke and it could be missed in the emergency room if the clinician doesn't look for it.[16] The common presenting symptoms in case of missed diagnosis of stroke are dizziness and headache.[17] Other etiologies presenting with dizziness could be neoplastic, vascular, inflammatory, traumatic, or anatomical variations which can be picked up by imaging.[18] In our study, except for patients with the definitive peripheral

cause of vertigo (BPPV), MRI was performed for most patients.

Comparison with other models of vertigo clinic

Vertigo is a complex symptom with multiple differential diagnoses.[19] The symptom itself could be described in different ways by patients and the differential diagnoses could range from physiological variations to life-threatening pathologies.[20,21] The tricky nature of this symptom makes it prone to misdiagnosis.[22] A thorough clinical history and physical examination are of utmost importance in evaluating a patient with vertigo.[23] Multidisciplinary dizziness clinics have been in practice for effective diagnosis of vertigo in different parts of the world.[24] Staibano et al studied results of a multidisciplinary dizziness clinic consisting of neurologists, otolaryngologists, nurse practitioners, audiologists, physiotherapists, and medical trainees and have suggested multidisciplinary care targetting acute and chronic conditions for appropriate diagnosis and treatment.[2] A paper by Trinidade et al audited results of a multidisciplinary balance clinic led by a consultant otologist.[25] They found that 97 percent of patients received a definitive diagnosis and management plans, the most common diagnoses being Migraine-associated vertigo (MAV) and BPPV. In our study too, the common diagnosis was BPPV and MAV and we were able to arrive at a definitive diagnosis and management plan for all patients using the checklist approach.

Limitations

There were a few limitations of a checklist. Checklists may lead to unnecessary diagnostic tests, may increase cognitive load and excessive reliance on a checklist may give a false sense of reassurance however, a study by Sibbald et al shows checklists do not increase the cognitive load on the physician but reduces diagnostic error.[26]

CONCLUSION

Vertigo is a complex symptom that needs thorough clinical evaluation to prevent misdiagnosis. The checklist is an effective way to ensure an elaborate assessment of the patient with an emphasis on the red flag signs. Checklists allow the clinician to take a diagnostic pause and think of differential diagnoses thereby reducing diagnostic errors.

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