Development of a Clinical Risk Score to Risk Stratify for a Serious Cause of Vertigo in Patients Presenting to the Emergency Department

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Study objective: Identify high-risk clinical characteristics for a serious cause of vertigo in patients presenting to the emergency department (ED).

Methods: Multicentre prospective cohort study over 3 years at three university-affiliated tertiary care EDs. Participants were patients presenting with vertigo, dizziness or imbalance. Main outcome measurement was an adjudicated serious diagnosis defined as stroke, transient ischemic attack, vertebral artery dissection or brain tumour.

Results: A total of 2,078 of 2,618 potentially eligible patients (79.4%) were enrolled (mean age 77.1 years; 59% women). Serious events occurred in 111 (5.3%) patients. We used logistic regression to create a 7-item prediction model: male, age over 65, hypertension, diabetes, motor/sensory deficits, cerebellar signs/symptoms and benign paroxysmal positional vertigo diagnosis (C-statistic 0.96, 95% confidence interval [CI] 0.92 to 0.98). The risk of a serious diagnosis ranged from 0% for a score of <5, 2.1% for a score of 5 to 8, and 41% for a score >8. Sensitivity for a serious diagnosis was 100% (95% CI, 97.1% to 100%) and specificity 72.1% (95% CI, 70.1% to 74%) for a score <5.

Conclusion: The Sudbury Vertigo Risk Score identifies the risk of a serious diagnosis as a cause of a patient's vertigo and if validated could assist physicians in guiding further investigation, consultation, and treatment decisions, improving resource utilization and reducing missed diagnoses. [Ann Emerg Med. 2025;85:122-131.]

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INTRODUCTION

Vertigo is a common and costly reason for emergency department (ED) visits. Studies have shown that patients use the terms dizziness, vertigo, and imbalance interchangeably to describe their symptoms of dizziness.[1] We use the term vertigo to encompass vertigo, imbalance, and dizziness.

It is the third most common reason for ED visits, resulting in significant resource utilization.[2-4] Of these patients, only 2% to 5% will have a serious cause for their vertigo. The most common serious causes of vertigo include stroke, transient ischemic attack (TIA), brain tumor, and vertebral artery dissection.

Patients presenting with vertigo have a higher rate of investigation and ED length of stay than nonvertigo patients.[5,6] A large proportion of vertigo patients (30% to 50%) undergo a computed tomographic (CT) scan of the head, 98% of which are negative.[7] Head CT is limited in investigating patients with acute stroke and TIA given its extremely low sensitivity (7% to 16%).[8] Despite a high investigation rate, a population cohort study found that patients discharged with a benign dizziness diagnosis had a 50-fold increased risk of being admitted to the hospital within 7 days with a stroke diagnosis compared to matched controls.[9]

Physicians lack validated clinical guidelines to help them make diagnostic and referral decisions for patients with vertigo. A lack of guidance contributes to the considerable variation in the investigation of patients with vertigo, with neuroimaging varying 8-fold between clinicians and admission rates ranging from 1% to 21% of patients.[10] Currently, no individual or combination of clinical features accurately rules out a serious cause of vertigo or identifies which patients are at high risk for such a cause.[11] This often

Editor's Capsule Summary

What is already known on this topic

Identifying serious causes of vertigo and dizziness in emergency department (ED) patients is a challenge.

What question this study addressed

Can we derive a risk score to identify vertigo or dizziness patients who have stroke, transient ischemic attack, or brain tumor within 30 days?

What this study adds to our knowledge

Among 2,078 patients from 3 EDs, 111 (5.3%) had serious outcomes. A risk score combining 7 variables had 72.1% specificity and 100% sensitivity for predicting these outcomes.

How this is relevant to clinical practice

This risk score is promising but requires validation and implementation efforts to assess the real effect in ED care.

leads to overuse of neuroimaging and prolonged ED stays for patients with benign dizziness as well as missed or delayed diagnosis of serious conditions like stroke.[12-14]

Our study objectives were to prospectively assess the clinical characteristics of patients presenting with vertigo to the ED and to derive a clinical risk score to identify high- and low-risk patients for a serious cause of their vertigo.

METHODS

Study Design

This prospective multicenter cohort study was conducted in the EDs of 3 university-affiliated urban Canadian tertiary care teaching hospitals from July 2019 to August 2022.

Study Population

We enrolled consecutive alert patients 18 years and older who presented to participating EDs with a chief complaint of acute vertigo, dizziness, or imbalance and were assessed by an emergency physician. Patients with symptom onset more than 14 days prior, head or neck trauma in the preceding 14 days, Glasgow Coma Scale score less than 15, systolic blood pressure less than 90 mm Hg, a syncopal episode in the preceding 14 days, or active cancer were excluded from the study. The research ethics board at each participating center approved the study without requiring written consent. Participants were informed that they might be contacted by telephone for follow-up, and verbal consent was obtained from such patients at telephone contact.

Data Collection

Attending emergency physicians or supervised residents in emergency medicine completed all assessments. Physicians completed data forms to identify the presence or absence of 67 clinical findings in consecutive patients with vertigo. Variables included characteristics of the current event, physical examination findings, and medical history provided by the patient.

Research staff collected data forms, verified data, confirmed eligibility, and recorded objective data from physician, nursing, consultant, triage, ambulance, follow-up neurologic consultations, and radiology reports. Objective data included age, sex, date of visit, and documented ED diagnosis. Information was sought from the study hospital's electronic medical records to identify subsequent ED visits, stroke/neurology clinic visits, and diagnostic imaging. For chart abstraction, a single trained reviewer at each stage abstracted data using a standardized data collection sheet. Chart abstractors underwent training (didactic session and 5 charts joint review) and testing (10 charts dual independent review). When testing resulted in a Kappa of >0.8 between the trainer and tester, they were validated for independent data abstraction. We conducted telephone follow-up calls at 7, 30, and 90 days to assess for subsequent stroke, TIAs, vertebral artery dissection, or brain tumor diagnoses. We used a previously validated tool, the Questionnaire for Verifying Stroke-Free Status, to assess for outcomes.[15] In addition, during the telephone follow-up call, patients were asked whether they were admitted to the hospital at any point after their initial ED visit. If they were, they were asked for what condition and which symptoms they had, the duration of their symptoms, date of symptom onset, and which side was affected (if applicable).

Study staff reviewed ED census reports to identify any possible missed patients. If the eligibility criteria did not exclude patients, they were deemed potential missed patients. Data were entered into a computerized database using Statistical Analysis System (SAS) software. Data management and study coordination were conducted at the Health Sciences North Research Institute.

Variables

We collected data on 43 different clinical variables. A priori, we identified clinically significant variables that were known to be associated with one or more of our outcomes, including age, sex, hypertension, previous stroke, diabetes, atrial fibrillation, motor/sensory deficits, diplopia, dysarthria, dysphagia, dysmetria, ataxia, and those that were likely to be negatively associated with a serious diagnosis

(benign paroxysmal positional vertigo, multiple episodes). These were candidate variables for the model. A scoping review and expert opinion informed the choice of these variables.

Outcome Measures

The primary outcome of a serious diagnosis was defined as a diagnosis of stroke, TIA, vertebral artery dissection, or brain tumor diagnosed in the ED or within 30 days of the initial assessment. Outcomes were defined as follows. Stroke (ischemic and hemorrhagic): rapidly developed clinical symptom(s) of focal (or occasionally global) disturbance of cerebral function lasting more than 24 hours or until death with no apparent nonvascular cause.[16] TIA: sudden, focal neurologic deficit lasting for less than 24 hours, presumed to be of vascular origin, and confined to an area of the brain or eye perfused by a specific artery.[16] Brain tumor: radiological evidence of an intracranial mass that another more likely diagnosis cannot explain that required intervention (medical or surgical) within 30 days of diagnosis. Vertebral artery dissection: radiological evidence of vertebral artery dissection, hematoma, or pseudoaneurysm.

Outcome Assessment: The primary outcome was assessed for all patients from a composite of sources, including site hospital records, autopsy reports at the site hospital, or patients who answered "yes" to at least one telephone follow-up question. An Adjudication Committee, blinded to the initial ED visit, reviewed all possible outcome events. The Adjudication Committee comprised 3 members: 1 stroke neurologist and 2 experienced emergency physicians. These assessors independently evaluated each possible outcome, and an event was considered to have occurred if at least 2 of the 3 physicians agreed. Secondary outcomes followed a similar process.

Data Analysis

Descriptive statistics were computed using frequencies and proportions for categoric variables and means and standard deviations for continuous variables.

Univariate and multivariate logistic regression analysis were used to assess the association between predictors and outcome. A multivariate logistic regression model was developed. We started with 14 candidate variables that a priori we had defined as clinically important. To reduce the number of candidate predictors (to satisfy the rule of 10 outcomes per candidate predictor), we chose to combine the variables diplopia, dysarthria, dysphagia, dysmetria, and ataxia into a single variable cerebellar deficits.[17] Therefore, we had 11 candidate predictors for our multivariate logistic regression model (age, sex, hypertension, previous stroke, diabetes, atrial fibrillation, motor/sensory deficits, cerebellar deficits, benign paroxysmal positional vertigo diagnosis, and multiple episodes). We then used an automated stepwise approach with an inclusion criteria of $P<.2$ and a staying criteria of $P<.01$. The final model included 7 predictors.

We assigned points to our final model predictors by dividing the beta coefficients of the predictors by the smallest of the beta coefficients and rounding the decimal quotients to the nearest integer. This was to simplify the calculation and increase usability. We calculated the total score for each patient.

Internal validation of the model was carried out with bootstrapping, in which we used 1,000 bootstrap samples sampled randomly with replacement. The optimism and optimism-correct C-statistic were calculated. We assessed the calibration of the model and score using a calibration slope between observed and predicted probabilities at each score category. Because of the small number of patients and events in the higher risk scores, we collapsed the scores above 14.

Where more than one variable data was missing from a patient, the patient was excluded from the analysis.

We assessed the effect of the score on resource utilization using the score level that would define a low-risk group with 0 serious diagnoses. To provide the most conservative estimate, we assumed no CT would be performed in the low-risk group, but every patient in the medium and high-risk groups would now undergo a CT. This is unlikely how the risk score would be used; therefore, this is an underestimation of the expected decrease in CT utilization.

All statistical analyses were performed using SAS software version 9.4.

Based on the method proposed by Riley et al,[18] we estimated a required sample size of 85 outcome events. This was based on the assumption of a shrinkage of 0.9, Cox-Snell R squared of 0.1, an outcome proportion rate between 0.02 and 0.05, and a model based on up to 20 predictors.

RESULTS

In this study, we enrolled 2,078 of 2,618 potentially eligible patients (79.4%). Table E1 (available at http://www.annemergmed.com) demonstrates the characteristics of the enrolled versus nonenrolled patients. There were 2 patients missing sex and age; they were excluded. We had

4 patients who were missing diastolic blood pressure (Figure 1). The mean age was 77.1 years, and 59% of participants were women. A CT head scan was performed in 643 (30.9%) patients, and a magnetic resonance imaging (MRI) scan was performed in 56 (2.5%) patients. There were 160 (7.7%) admitted to the hospital, and specialist consultation was requested (in emergency or as outpatient) for 234 (11.3%) patients. There were 111 (5.3%) serious diagnoses, including 99 cases of stroke (81.1%), 11 cases of TIAs (9.9%), 2 cases of vertebral artery dissection (1.8%), and 1 brain tumor (0.9%). Follow-up was complete for 80.4% of the cohort at 30 days.

Table 1 reports the characteristics of enrolled patients. Clinical features strongly correlated with having a serious cause of vertigo included sex, age more than 65 years, mean systolic blood pressure (157 mm Hg), previous stroke, previous TIA, hypertension, diabetes, dysphagia, diplopia, motor deficit, sensory deficit, ataxia, dysarthria, dysmetria, headache, unable to walk unaided, ongoing dizziness, dizziness lasting more than 2 minutes, or a single episode of dizziness. Multiple episodes; dizziness triggered by head turning, getting up, lying down, rolling over in bed, or a change in any position; and a clinical diagnosis of benign paroxysmal positional vertigo were negatively associated with a serious diagnosis.

Our multivariate analysis found 6 variables independently positively associated and one variable negatively associated with a serious diagnosis. The model had excellent discrimination (C-statistic of 0.972) (Figure 2), which remained unchanged when we adjusted for optimism (C-statistic of 0.969).

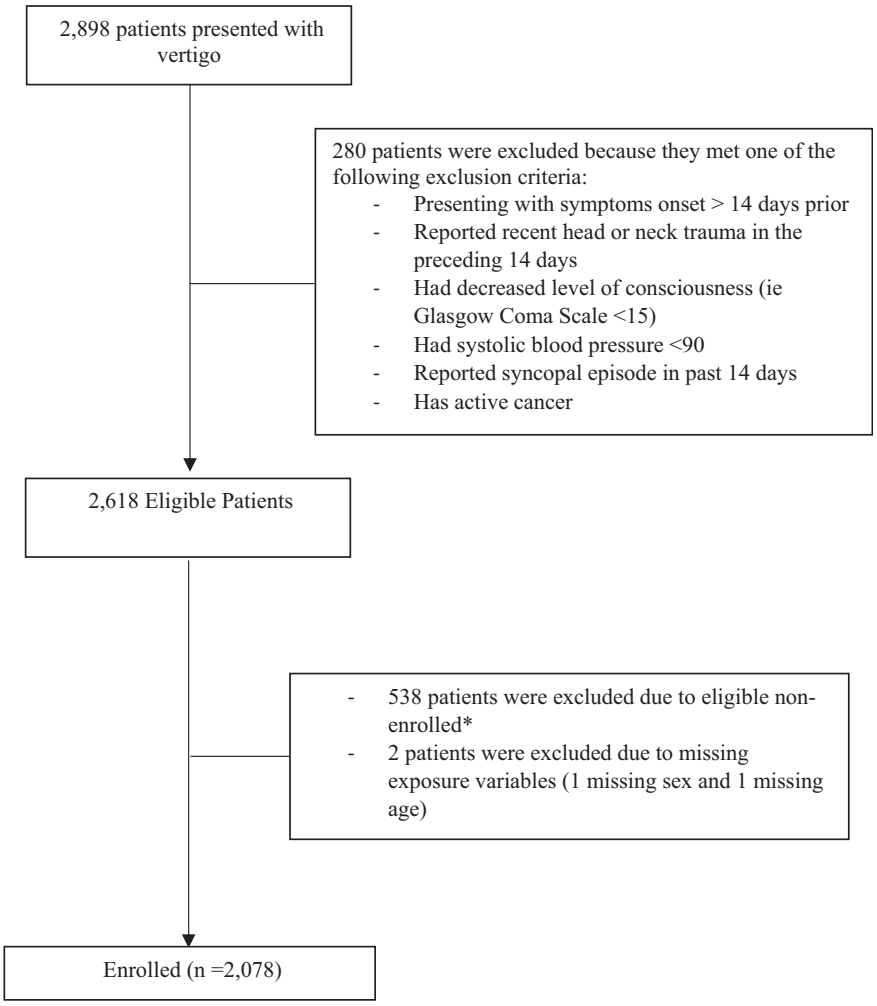

Figure 1. Flow diagram of the study cohort. *Eligible nonenrolled patients who met inclusion criteria but who were not successfully recruited.

Table 1. Baseline characteristics of patients presenting to emergency department with dizziness according to a serious diagnosis. Unadjusted and adjusted odds ratio with 95% confidence intervals.

Predictors*		Serious Diagnosis (n=2,078) Yes (n=111)	No (n=1,967)	Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)†
Sex (%), male		46 (58.6)	1,185 (39.8)	2.1 (1.5-3.2)	2.5 (1.4-4.3)
Age 65 or over		84 (75.7)	751 (38.2)	5.0 (3.2-7.9)	2.2 (1.2-4.0)
Mean pulse rate, bpm (SD)		79.89 (17.2)	79.03 (15.2)	-	-
Mean systolic blood pressure, mm Hg (SD)		156.1 (28.5)	138.30 (24.2)	-	-
Mean diastolic blood pressure, mm Hg (SD)‡		82.43 (14.7)	81.31 (12.0)	-	-
Past Medical History	Previous stroke	30 (27.0)	89 (4.5)	7.8 (4.9-12.5)	-
	Previous transient ischemic attack	9 (8.1)	51 (2.6)	3.3 (1.6-6.9)	-
	Hypertension	100 (90.1)	1,214 (61.7)	5.6 (3.0-10.6)	5.1 (2.2-11.9)
	Diabetes	34 (30.6)	254 (12.9)	3.0 (2.0-4.6)	1.9 (1.0-3.5)
	Atrial fibrillation	10 (9.0)	113 (5.7)	1.6 (0.8-3.2)	-
Neurologic Deficits	Dysphagia	6 (5.4)	9 (0.5)	12.4 (4.3-35.6)	-
	Diplopia	14 (12.6)	48 (2.4)	5.8 (3.1-10.8)	-
	Dysarthria	34 (30.6)	12 (0.6)	71.9 (35.9-144.3)	-
	Dysmetria	28 (25.2)	27 (1.4)	24.2 (13.7-43.0)	-
	Ataxia	61 (55.0)	151 (7.7)	14.7 (9.8-22.1)	-
	Cerebellar deficits (diplopia, dysarthria, dysphagia, dysmetria, ataxia)	96 (86.5)	207 (10)	54.4 (31-95.5)	40.0 (21.0-76.2)
	Motor deficit	45 (40.5)	28 (1.4)	47.2 (27.7-80.4)	-
	Sensory deficit	17 (15.3)	23 (1.2)	15.3 (7.9-29.6)	-
	Motor/sensory deficits	53 (47.7)	47 (2.4)	37.3 (23.3-59.8)	23.4 (11.5-47.3)
Symptoms	Nausea	46 (41.4)	941 (47.8)	0.8 (0.5-1.1)	-
	Vomiting	28 (25.2)	410 (20.8)	1.3 (0.8-2.0)	-
	Headache	40 (36.0)	536 (27.3)	1.5 (1.0-2.2)	-
	Neck pain or discomfort	3 (2.7)	126 (6.4)	0.4 (0.1-1.3)	-
	Facial eye pain	4 (3.6)	46 (2.3)	1.6 (0.6-4.4)	-
	Hearing loss	0	48 (2.4)	0.3 (0.00-1.3)	-
	Tinnitus	3 (2.7)	140 (7.1)	0.4 (0.1-1.2)	-
	Recent viral upper respiratory tract infection symptoms	4 (3.6)	111 (5.6)	0.6 (0.2-1.7)	-
	Unable to walk unaided	42 (37.8)	71 (3.6)	16.3 (10.4-25.5)	-
	Can walk more than 10 steps	17 (15.3)	434 (22.1)	0.6 (0.4-1.1)	-
	Nystagmus	14 (12.6)	177 (9.0)	1.5 (0.8-2.6)	-
Timing	Ongoing	69 (62.2)	625 (31.8)	3.5 (2.4-5.2)	-
	Gradual	12 (10.8)	347 (17.6)	0.6 (0.3-1.0)	-
	Abrupt	89 (80.2)	1,484 (75.4)	1.3 (0.8-2.1)	-
	More than 2 mins	88 (79.3)	1,033 (52.5)	3.5 (2.2-5.5)	-
Episodes	Single	82 (73.9)	757 (38.5)	4.5 (2.9-7.0)	-
	Multiple	23 (20.7)	1,173 (59.6)	0.2 (0.1-0.3)	-
Movement Triggers	Head turning	6 (5.4)	437 (22.2)	0.2 (0.1-0.5)	-
	Getting up	18 (16.2)	523 (26.6)	0.5 (0.3-0.9)	-
	Lying down	1 (0.9)	157 (8.0)	0.1 (0.02-0.8)	-
	Bending over	2 (1.8)	118 (6.0)	0.3 (0.1-1.2)	-
	Looking up	1 (0.9)	51 (2.6)	0.3 (0.1-2.5)	-
	Rolling over in bed	1 (0.9)	150 (7.6)	0.1 (0.02-0.8)	-
	Walking	10 (9.0)	138 (7.0)	1.3 (0.7-2.6)	-
	Any	6 (5.4)	278 (14.1)	0.4 (0.2-0.8)	-
	Persistent when still	6 (5.4)	151 (7.7)	0.7 (0.3-1.6)	-
BPPV diagnosis		1 (0.9)	450 (22.9)	0.03 (0.01-0.2)	0.1 (0.01-0.6)

BPPV, benign paroxysmal positional vertigo; *SD*, standard deviation.
*Comparing the presence of predictor to absence (using "no" as reference category).
†Adjusted for male, age >65, hypertension, diabetes, motor/sensory deficits, cerebellar deficits and BPPV diagnosis.
‡Frequency of missing in event group: 4 diastolic blood pressure.

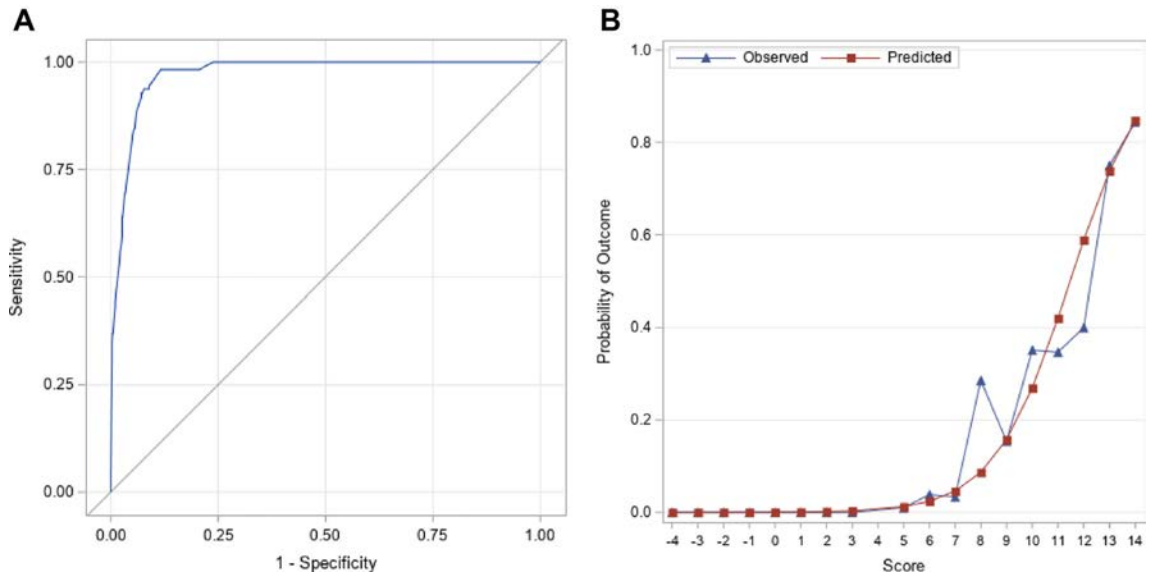

Figure 2. *A*, ROC curve of multivariate logistic regression model. *B*, Observed and predicted probabilities of a serious diagnosis by score.

Table 2 lists the 7 components of the Sudbury Vertigo Risk Score obtained from the clinical history and examination. The total score ranges from -4 to 17. Table E2 (available at http://www.annemergmed.com) shows the proportion of each variable at each risk score. The probability of a serious cause ranged from 0% for a score of <5, 2.1% for a score of 5 to 8, and 41% for a score >8 (Table 3). Our score showed good calibration between the observed and predicted probabilities of a serious diagnosis at each score category (Figure 2). For our primary outcome, a serious diagnosis, the sensitivity was 100% (95% CI 97-100%) and the specificity was 72.1% (95% CI 70.1% to 74%) for a score >4. Using a score of >4 to define a high-risk group that warrants further investigation would reduce CT use by 10%.

CT had a sensitivity of 45.9% (95% CI 36.8% to 55.2%) and a specificity 100% (95% CI 99% to 100%) for a serious outcome.

Table 2. Sudbury Vertigo Risk Score.

Predictor	Points
Stroke-risk factors	
Male	1
Age >65 y	1
Diabetes	1
Hypertension	3
Neurologic deficits	
Motor/sensory	5
Cerebellar*	6
BPPV diagnosis	−5

BPPV, benign paroxysmal positional vertigo.
*Diplopia, dysarthria, dysphagia, dysmetria, ataxia.

LIMITATIONS

We used the World Health Organization (WHO) definitions of stroke and TIA. These are clinical diagnoses mainly based on history and examination without the benefit of MRI to exclude small infarcts. This is consistent with current practice in most EDs.[19] However, it may overestimate the actual number of ischemic strokes by including stroke mimics.[19] These patients have stroke-like symptoms due to other etiologies. Given the lack of immediate MRI in our study centers for all these patients, we utilized the WHO definition.

Not all eligible patients were enrolled. We do not suspect any systematic reason for this other than the realities of conducting research in busy, tertiary care EDs. Our results may not be generalized to EDs in different settings (ie, rural, non-academic, or community). We did not have complete follow-up data for 19.6% of our cohort. None of these had neurologic deficits. Previous studies have identified the risk of a subsequent stroke in a population with isolated vertigo of <1%. However, we could have misclassified a patient with a serious diagnosis as a nonoutcome. This could artificially increase the reported sensitivity.

Table 3. Patients, serious outcomes and image findings at each score level of the Sudbury Vertigo Risk Score.

Risk Score	Risk of Event	n	All Events	Outcome				Outcome Positive on Computed Tomography	All Computed Tomography
				Stroke	Tumor	Vertebral Artery Dissection*	Transient Ischemic Attack		
−4	0%	76	0	0	0	0	0	0	4
−3	0%	65	0	0	0	0	0	0	5
−2	0%	6	0	0	0	0	0	0	2
−1	0%	74	0	0	0	0	0	0	9
0	0%	406	0	0	0	0	0	0	67
1	0%	254	0	0	0	0	0	0	48
2	0%	56	0	0	0	0	0	0	16
3	0%	198	0	0	0	0	0	0	49
4	0%	360	0	0	0	0	0	0	106
5	1%	197	2	2	0	1	0	2	67
6	4%	104	4	2	0	0	2	2	46
7	3%	30	1	0	0	0	1	0	22
8	29%	21	6	5	0	1	1	0	16
9	15%	39	6	6	0	0	0	2	24
10	35%	74	26	24	0	0	2	14	63
11	39%	49	17	14	0	0	3	8	39
12	40%	20	8	8	0	0	0	4	18
13	75%	4	3	3	0	0	0	2	4
14	50%	2	1	1	0	0	0	1	2
15	84%	19	16	15	1	0	0	13	18
16	84%	19	16	14	0	0	2	6	14
17	100%	5	5	5	0	0	0	3	4
Total	5%	2,078	111	99	1	2	11	57	643

*Both vertebral artery dissections resulted in a stroke; however, we only counted these patients under the diagnosis of vertebral artery dissection.

DISCUSSION

We derived a clinical risk score that can identify the risk for a serious diagnosis in a patient presenting with vertigo. Before this score can be used in clinical practice, it requires external validation. If successfully validated, the Sudbury Vertigo Risk Score could be used to aid in identifying the subset of patients at low risk who can be safely discharged without further investigation, referral, or admission and triage those at high risk for urgent testing and treatment. The risk score could potentially reduce unnecessary health care costs and prevent missed or delayed diagnosis of serious diagnoses.

Previous Studies

There are no clinical risk scores or decision aids with sufficient sensitivity to rule out a serious diagnosis in vertigo patients. In 2 surveys, emergency physicians reported needing a clinical risk score to help assess vertigo patients. They defined a required miss rate of <1%.[20,21] Six clinical decision aids/scores have been derived, all of which were subject to small sample sizes, a high risk of bias, or unacceptable accuracy.[22–26] The Head Impulse, Nystagmus, and Test of Skew (HINTS) examination incorporates 3 physician examination assessments: the head impulse test, nystagmus, and test of skew. However, it only applies to those presenting with acute vestibular syndrome (a subset of patients with constant vertigo, head motion intolerance, nystagmus, ataxia, and nausea/vomiting). Acute vestibular syndrome accounts for only 10% of those presenting with vertigo.[27,28] It has failed validation for use by emergency physicians, with sensitivity ranging from 66.7% to 85%.[27,28] The STANDING algorithm consists of the (1) discrimination between spontaneous and positional nystagmus, (2) evaluation of the nystagmus direction, (3) head impulse test, and (4) evaluation of equilibrium, the second and third of which are components of the HINTS examination.[23] On external validation, the

sensitivity was only 93.6%. This is likely related to the difficulty in performing its components, with all physicians rating confidence in assessing nystagmus and head impulse test as low.[20,29] The TriAGe+ score consists of 8 variables: triggers, atrial fibrillation, male, hypertension, brainstem or cerebellar dysfunction, focal weakness or speech impairment, dizziness and no history of vertigo.[24] External validation of this score yielded a sensitivity of 96.4%.[30]

The nomogram for stroke-risk assessment is based on sex, trigger, isolated symptoms, nausea, history of brief dizziness, high blood pressure, finger–nose test, and tandem gait assessment. In the derivation study with components assessed by a neurologist, it demonstrated a high diagnostic accuracy. Other clinical decision aids derived based on neurology-assessed clinical variables have failed prospective validation, with significantly lower diagnostic accuracy when performed by emergency physicians.[27,28,31] Through assessment of a case series of posterior circulation strokes, Yamada et al[22] decided on a 3-item checklist called the DEFENSIVE stroke scale that assesses sensory disturbance, ataxia, and visual deficit. Internal validation found a sensitivity of 100%. This retrospective study suffered from spectrum bias with a high percentage of serious outcomes (9.7%) in the cohort and had incomplete patient outcome assessment. Our cohort had a 5% prevalence of serious diagnosis; this is more representative of other ED studies on vertigo patients.[5,32,33]

Clinical Implications

If the Sudbury Vertigo Risk Score is successfully validated, it could be categorized into strata that dictate a course of action. This may include no further investigation for low-risk patients (eg, <1% risk of a serious diagnosis, score <5), further investigation for moderate risk if no alternative diagnosis (1% to 5%, score 5 to 8) and expedited or same-visit consultation and investigation for those at high risk (eg, >5%, score >8).

Over one-third of patients underwent CT. Using CT as a test to rule out a serious diagnosis is of limited benefit with a low sensitivity.[8] We found a sensitivity of 45.9% (95% CI 36.8% to 55.2%) in our cohort. This is higher than a recent systematic review by Shah et al.[8] They found a pooled sensitivity of 28.5% (95% CI 14.4% to 48.5%) and a specificity of 98.9% (95% CI 93.4% to 99.8%).[8,34,35] Not performing CT in those with a score <5 would reduce CT usage by >50%. However, this would be an overly optimistic estimate as the use of any such score would likely increase CT usage in those deemed to be at risk for a serious diagnosis. Even if all those with a score ≥5 were to undergo a CT, this would still decrease CT use by 10% and still identify all positive findings.

Strengths

We conducted a large prospective multicenter cohort study of patients with vertigo. Our study enrolled a representative sample of patients presenting with vertigo, addressing the spectrum bias seen in previous decision tool derivation studies. This study prospectively assessed history and examination findings to identify patients at high risk for a serious diagnosis. We also followed the methodological standards recommended for derivation studies for clinical decision rules.[36,37] These standards allow for a more reproducible way of deriving a risk score, resulting in a more robust tool than consensus-based risk scores. Our score used variables available to clinicians at the bedside. Our study primarily enrolled patients diagnosed by frontline emergency physicians, which allows our results to be highly generalizable. All physicians enrolling patients were well-trained, certified emergency medicine specialists, reducing classification bias. Our use of blinded Adjudication Committees to assess subsequent serious diagnoses provided a highly rigorous event classification.

In conclusion, the Sudbury Vertigo Risk Score identifies the risk of a serious diagnosis as a cause of a patient's vertigo. If validated, it could help guide physician investigation, consultation and treatment decisions, improving resource utilization and reducing missed diagnoses.

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