Dizziness Presentations in U.S. Emergency Departments, 1995–2004

Kevin A. Kerber MD, William J. Meurer MD, Brady T. West MA, A. Mark Fendrick MD

Abstract

Objectives: The objectives were to describe presentation characteristics and health care utilization information pertaining to dizziness presentations in U.S. emergency departments (EDs) from 1995 through 2004.

Methods: From the National Hospital Ambulatory Medical Care Survey (NHAMCS), patient visits to EDs for ''vertigo-dizziness'' were identified. Sample data were weighted to produce nationally representative estimates. Patient characteristics, diagnoses, and health care utilization information were obtained. Trends over time were assessed using weighted least squares regression analysis. Multivariable logistic regression analysis was used to control for the influence of age on the probability of a vertigo-dizziness visit during the study time period.

Results: Vertigo-dizziness presentations accounted for 2.5% (95% confidence interval [CI] = 2.4% to 2.6%) of all ED presentations during this 10-year period. From 1995 to 2004, the rate of visits for vertigo-dizziness increased by 37% and demonstrated a significant linear trend ($p < 0.001$). Even after adjusting for age (and other covariates), every increase in year was associated with increased odds of a vertigo-dizziness visit. At each visit, a median of 3.6 diagnostic or screening tests (95% CI = 3.2 to 4.1) were performed. Utilization of many tests increased over time ($p < 0.01$). The utilization of computerized tomography and magnetic resonance imaging (CT/MRI) increased 169% from 1995 to 2004, which was more than any other test. The rate of central nervous system diagnoses (e.g., cerebrovascular disease or brain tumor) did not increase over time.

Conclusions: In terms of number of visits and important utilization measures, the impact of dizziness presentations on EDs is substantial and increasing. CT/MRI utilization rates have increased more than any other test.

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Dizziness is one of the most common reasons that patients present to physician's offices, hospital outpatient departments, and emergency departments (EDs) in the United States.[1] Previous studies report important information about dizziness presentations to EDs,[2,3] but the findings from these studies are limited because of single-center designs or brief data collection periods or a focus on only a specific cause of dizziness. To our knowledge, no study to date has used a population-based sampling design and data collected over many years to determine details about dizziness in its broadest sense. Studying dizziness is important because medical decision-making begins with the symptom presentation. This type of study is necessary to determine basic ''real-world'' epidemiologic and health care utilization information that can bring new knowledge about the impact of dizziness and identify steps to optimizing patient care and health care utilization.

Our study sought to determine important information on the presentation of dizziness in the ED by analyzing 10 years of data collected annually as a part of the National Hospital Ambulatory Medical Care Survey (NHAMCS). Specifically, the study planned to describe presentation characteristics and health care utilization information about dizziness presentations, assess trends over time, and use this information to inform future research directions.

From the Department of Neurology (KAK, WJM), the Department of Otolaryngology (KAK), the Department of Emergency Medicine (WJM), and the Department of Internal Medicine (AMF), University of Michigan Health Systems, Ann Arbor, MI; and the Center for Statistical Consultation and Research (BTW) and the Department of Health Management and Policy (AMF), University of Michigan, Ann Arbor, MI.

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Address for correspondence and reprints: Kevin A. Kerber, MD; e-mail: kakerber@umich.edu.

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METHODS

Study Design

This study presents a secondary analysis of data collected for the NHAMCS for the 10-year period of 1995 to 2004.[4] All information contained in this database has been completely deidentified in accordance with the Health Insurance Portability and Accountability Act (HIPAA) and the data are publicly available. This study was determined to be exempt from review by the University of Michigan Institutional Review Board.

Study Setting and Population

Details of the procedures involved in NHAMCS data collection have been published elsewhere.[5] In brief, the NHAMCS is a cross-sectional, annual, four-stage probability sample of visits to randomly selected, noninstitutional, general, and short-stay hospitals in the United States with EDs or outpatient departments. The sample excludes federal, military, and Veterans' Affairs hospitals. Geographical primary sampling units are identified first, and then hospitals are selected within those primary sampling units. EDs are selected from those hospitals, and individual patient-visits from those EDs are systematically selected. Trained staff from the National Center for Health Care Statistics (NCHS) collect data from patient medical records using standardized collection forms during a randomly assigned 4-week data period for each of the sampled hospitals. Completed forms are reviewed at NCHS, where data abstraction and medical coding are performed.

Study Protocol

ED visits for ''dizziness'' were identified by using the variable ''patient's reason for visiting'' (RFV) the ED. The RFV variable was developed by the NCHS to code patients' main complaints or reasons for seeking care.[6] Each visit is allowed up to three RFVs. We selected patients with the RFV of ''vertigo-dizziness'' in any of the three RFV fields. The symptoms ''vertigo'' and ''dizziness'' are combined into the variable ''vertigo-dizziness'' in NHAMCS, so ''vertigo'' presentations cannot be separated from ''dizziness'' presentations. The 10-year period was chosen for this study to maximize the accuracy of estimates and enable the analysis of trends over time based on the independent cross-sectional samples in each year. For each vertigo-dizziness visit, we extracted key patient demographic information including age, gender, race, and ethnicity. We only included the variable ''patient's condition at the time of triage'' from 1997 to 2004 because the coding of this variable changed in 1997. The following codes are used to describe the patient's condition at the time of triage: emergent (need to be seen in less than 15 minutes), urgent (need to be seen in 15–60 minutes), semiurgent (need to be seen in 1–2 hours), nonurgent (need to be seen in 2–24 hours), and unknown/not recorded. Other accompanying RFVs were also extracted for analysis purposes.

Up to three discharge diagnoses were extracted based on coding using the International Classification of Diseases, Ninth revision, Clinical Modification (ICD-9-CM). Screening and diagnostic tests ordered or performed, length of stay, medications prescribed or provided (henceforth, medications prescribed), and disposition were also extracted for each qualifying ED visit. Computerized tomography (CT) and magnetic resonance imaging (MRI) are combined into a single variable, CT/MRI, by the NHAMCS.

Data Analysis

According to the complex multistage design of the annual NHAMCS sample, a sampling weight is computed for each visit by NCHS staff that takes all stages of sampling into account. Complete details about the weighting methodology used by NHAMCS can be found elsewhere.[4] This sampling weight is used to calculate unbiased, nationally representative visit-level estimates in each sample year and includes four basic components: inflation by reciprocals of selection probabilities, adjustment for nonresponse, population ratio adjustments, and weight smoothing. In 2004, for the first time, extra weights for nonresponding hospitals were shifted to responding hospitals in reporting periods within the same quarter of the year. The shift in nonresponse adjustment did not significantly affect any of the overall annual estimates. Estimated standard errors reflecting sampling variability in estimates due to the complex, multistage design of the NHAMCS sample in each year were computed using approximations based on Taylor Series Linearization in the SUDAAN software (Version 9.0, Research Triangle Institute, Research Triangle Park, NC). Additional data analyses and management were performed using the SAS software (Version 9.1.3, SAS Institute, Cary, NC), and because all analyses focused on the specific subclass of ED visits for vertigo-dizziness from the full NHAMCS sample, methods appropriate for subclass analyses were utilized in SUDAAN and SAS.[7]

The data analysis consisted of three parts: a descriptive analysis, a trend analysis, and multivariable logistic regression modeling. Weighted estimates of descriptive statistics (including proportions, rates, and medians) and their standard errors in addition to 95% confidence intervals for the descriptive parameters were calculated in SUDAAN, and estimated rates were calculated using methodology described by NCHS staff.[8] Because the codes for race were last updated in 2000, we only used data on race from 2000–2004 to summarize the distribution of race. Because some screening and diagnostic test categories have been added to the NHAMCS over the years, only data from years 2003 and 2004 were used to estimate the median number of tests at each visit. In addition, the medical screening exam and the mental status screening test were excluded from the NHAMCS list of screening and diagnostic tests.

Trends in the estimated rates of presentations to the ED for vertigo-dizziness per 1,000 ED visits and per 1,000 U.S. population[9,10] were analyzed using weighted least squares regression analyses, where the dependent variable was the estimated rate, the independent variable was the number of years since 1995, and the weight was the inverse of the standard error for a given rate estimate, meaning more precise estimates with lower standard errors would get more weight. Trends in recorded diagnoses were also assessed using

weighted least squares regression. Linear trends with $p < 0.05$ were considered as evidence of increasing rates.

Multivariable logistic regression modeling was used so that we could adjust for age when assessing the temporal pattern of vertigo-dizziness presentations over the 10-year period. The dependent variable in the model was an indicator of whether vertigo-dizziness was listed as a reason for the visit (1 = yes, 0 = no), and the subpopulation of all ED visits in the NHAMCS data set was analyzed. Independent variables in the model included year of the visit, age (modeled continuously), gender, and race. Race was categorized as white, African American, or other, so that information from all 10 years could be included. A separate multivariable logistic regression model was also used to adjust for age when assessing the temporal pattern of CT/MRI utilization for visits with vertigo-dizziness as a reason for visit. In this model, the dependent variable was an indicator of receiving CT/MRI (1 = yes, 0 = no), and the subpopulation of visits with vertigo-dizziness as a reason for the visit was analyzed. The independent variables included in this model were year of the visit, age, gender, and race.

RESULTS

Presentation information

Over the 10-year period included in this study, a total of 7,160 sampled visits for vertigo-dizziness were identified out of a total of 285,622 total sampled ED visits. This number represents an estimate of nearly 26 million ED visits for vertigo-dizziness in the United States. These numbers translate to a rate of 25.0 ED visits for vertigo-dizziness per 1,000 ED visits (95% confidence interval [CI] = 22.9 to 27.1). Equivalently, vertigo-dizziness visits account for about 2.5% (95% CI = 2.4% to 2.6%) of all ED visits. Table 1 presents additional estimated rates per 1,000 ED visits for various population subgroups. From 1995 to 2004, the rate of vertigo-dizziness visits increased by 37% (Figure 1). The weighted least squares regression analysis showed that the rate of increase over the study period was significant ($p < 0.001$). After stratifying by age group, increases in visits from 1995 to 2004 ranged from a 15% increase in those age 45–64 years to a 67% increase in those age ≥65 years. When trends were analyzed as rate of vertigo-dizziness presentation per 1,000 U.S. population, evidence of a similar significant linear trend ($p < 0.001$) was also demonstrated (Figure 2). The temporal increase in the prevalence of vertigo-dizziness presentations remained significant in the visit-level multivariable logistic regression model controlling for age and the other covariates. In this model, every 1-year increase was associated with a 2.0% increase in the odds of a vertigo-dizziness presentation (odds ratio [OR] = 1.02, 95% CI = 1.01 to 1.03).

The most common accompanying RFVs for the sampled vertigo-dizziness visits were nausea (12.9% of visits; 95% CI = 11.9% to 13.9%), headache (11.7% of visits; 95% CI = 10.7% to 12.6%), generalized weakness (10.7% of visits; 95% CI = 9.8% to 11.6%), vomiting (8.0% of visits; 95% CI = 7.1% to 8.9%), and shortness of breath (4.1% of visits, 95% CI = 3.5% to 4.6%). When vertigo-dizziness was the principal reason for the visit (i.e., RFV1), more than one-third (36.4%) of visits did not have any other RFV recorded.

The most common diagnoses recorded for the sampled vertigo-dizziness visits are shown in Figure 3. The nonspecific diagnosis of ''dizziness and giddiness'' (ICD-9-CM code 780.4) was recorded in more than one-fifth of all visits, making it by far the most common diagnosis. Cerebrovascular diagnoses were rarely recorded (3.9% of visits). No brain tumor (ICD-9-CM 191 or 192) or vertigo of central origin diagnosis (ICD-9-CM 386.2) was recorded at any sample visit over this 10-year period. The rate of cerebrovascular diagnoses (ICD-9-CM codes 430–437) did not demonstrate evidence of a significant linear increase. Likewise, rates of injury diagnoses (ICD-9-CM 800–959) did not demonstrate a significant linear increase. Trends in brain tumor diagnoses could not be analyzed because no sample visits for vertigo-dizziness over this 10-year period had a brain tumor diagnosis recorded.

Health Care Utilization

An estimated median 3.6 screening or diagnostic tests (95% CI = 3.2 to 4.1, years 2003 and 2004) were ordered or provided at each visit. An estimated 13.1% (95% CI = 11.0% to 15.3%) of visits for vertigo-dizziness had no tests ordered or provided. On the other hand, 10 or more tests were ordered or provided in approximately 14% (95% CI = 11% to 16%) of all visits. The most commonly ordered tests are listed in Table 2. Many tests (i.e., complete blood count [CBC], electrocardiogram [ECG], glucose, blood urea nitrogen, creatinine, chest x-ray, urinalysis, and CT/MRI) demonstrated a statistically significant ($p < 0.01$) increase in utilization over time. CT/MRI utilization increased 169% from 1995 to 2004, an increase greater than any other test. Although the rates of CT/MRI use were highest in those ≥65 years of age (38% of visits by 2004), those aged 20–44 years had the largest increase (281%) from 1995 to 2004 (Figure 4). After adjusting for age and the other covariates in the visit-level multivariable logistic regression model, every 1-year increase was associated a 14% increase in the odds of having a CT/MRI (OR = 1.14, 95% CI = 1.11 to 1.18) among those visiting EDs with vertigo-dizziness as a reason for the visit.

The estimated median length of stay in the ED for vertigo-dizziness visits was 3.0 hours (95% CI = 2.9 to 3.1, years 2001–2004). Median length of stay increased from 2.8 hours (95% CI = 2.7 to 3.2) in 2001 to 3.3 hours (95% CI = 3.1 to 3.4) in 2004. More than 20% (20.2%; 95% CI = 18.3% to 22.1%) of all visits for vertigo-dizziness resulted in a hospital admission. An estimated median of 0.8 medications (95% CI = 0.7 to 0.9, years 2001–2004) were prescribed at each visit. An estimated 27.6% of visits (95% CI = 25.4% to 29.9%) had no medications recorded. The most common medications prescribed were meclizine (15.2% of visits; 95% CI = 13.8% to 16.7%), promethazine (8.4% of visits, 95% CI = 7.1% to 9.7%), acetaminophen (6.5% of visits; 95% CI = 5.5% to 7.4%), normal saline (5.5% of visits; 95% CI = 4.3% to 6.6%), and aspirin (4.4% of visits; 95% CI = 3.4% to 5.5%).

Table 1
Demographic and Clinical Information for Vertigo-Dizziness Visits to the ED

Variable	*n*	Estimated Total ED Visits for Vertigo-Dizziness (in Thousands)	Estimated Total All ED Visits (in Thousands)	Rate per 1,000 ED Visits (95% CI)	Proportion (%) of ED Visits for Vertigo-Dizziness (95% CI)	Years Included
Overall	7,160	25,867	1,034,758	25.0 (22.9, 27.1)	—	1995–2004
Age groups (years)*						
≤19	628	2,380	300,530	7.9 (6.8, 9.0)	9.2 (8.3, 10.1)	1995–2004
20–44	2,570	9,469	401,286	23.6 (21.3, 25.9)	36.6 (35.1, 38.1)	
45–64	1,823	6,323	177,701	35.6 (32.2, 39.0)	24.4 (23.1, 25.7)	
65+	2,139	7,695	155,241	49.6 (44.7, 54.4)	29.7 (28.2, 31.3)	
Male	2,822	10,223	484,752	21.1 (19.2, 23.0)	39.5 (38.1, 41.0)	1995–2004
Race						
White	3,360	10,997	414,457	26.5 (24.3, 28.8)	76.3 (73.6, 79.0)	2000–2004
African American	986	2,922	118,683	24.6 (20.8, 28.4)	20.3 (17.7, 22.9)	
Asian	182	337	10,670	31.6 (22.2, 41.0)	2.3 (1.7, 3.0)	
Other	54	157	5,972	26.4 (13.0, 39.7)	1.1 (0.5, 1.6)	
Ethnicity						
Non-Hispanic	5,607	20,329	799,175	25.4 (23.2, 27.7)	78.6 (76.5, 80.6)	1995–2004
Hispanic	801	2,462	110,544	22.3 (19.1, 25.4)	9.5 (8.1, 10.9)	
Unknown	752	3,076	125,039	24.6 (19.7, 29.5)	11.9 (10.0, 13.8)	
Immediacy						
<15 minutes	1,266	4,551	150,484	30.2 (26.6, 33.9)	20.9 (18.9, 22.9)	1997–2004
15–60 minutes	2,357	8,080	279,363	28.9 (26.0, 31.8)	37.1 (35.0, 39.3)	
>1–2 hours	1,006	3,281	148,657	22.1 (19.0, 25.2)	15.1 (13.5, 16.6)	
>2–24 hours	346	1,296	88,333	14.7 (11.8, 17.6)	6.0 (4.9, 7.0)	
Unknown/no triage	1,219	4,559	181,029	25.2 (21.4, 29.0)	21.0 (18.4, 23.5)	

CI = confidence interval; ED = emergency department.
*Median age all visits, 47.4 years (95% CI = 46.2 to 48.6 years).

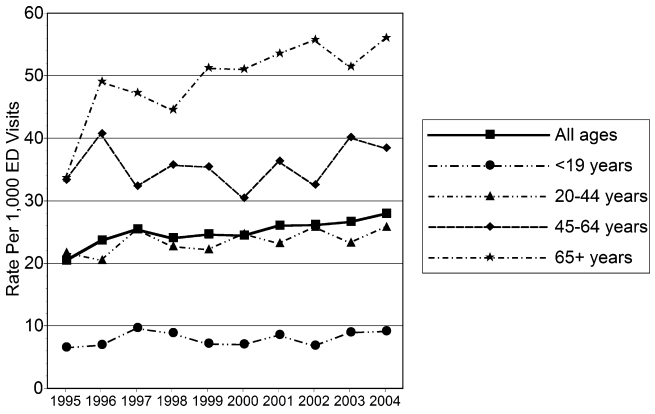


Figure 1. Rates of visits per 1,000 ED visits for vertigo-dizziness presentations to United States emergency departments (EDs), all ages and stratified by age group. A weighted least squares regression analysis showed a significant linear trend ($p < 0.001$).

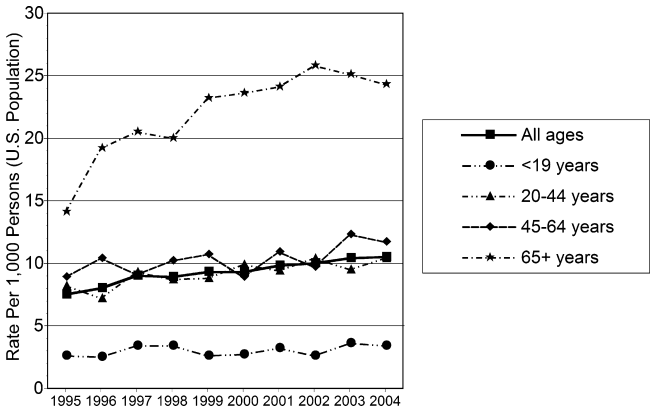
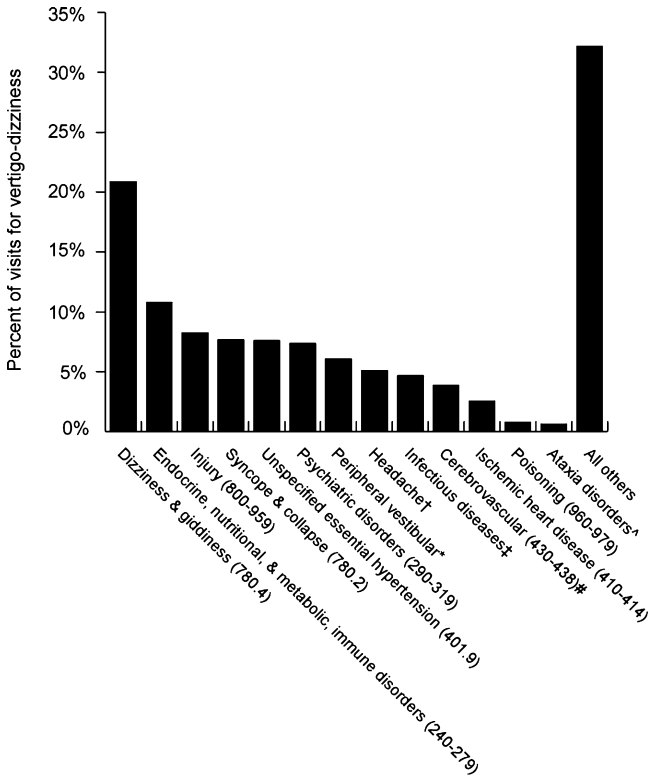


Figure 2. Rates of visits per 1,000 U.S. population for vertigo-dizziness presentations to U.S. emergency departments (EDs). A weighted least squares regression analysis showed a significant linear trend ($p < 0.001$).

DISCUSSION

The most important findings of this descriptive study are that 1) vertigo-dizziness presentations are increasing as a percent of all visits to U.S. EDs and 2) the use of CT/MRI in vertigo-dizziness presentations has dramatically increased over time. Previous analyses of NHAMCS data reveal that vertigo-dizziness is among the most common reasons that a patient presents to the ED.[1] The current study supplements that finding by showing that vertigo-dizziness presentations are also increasing as a rate per 1,000 ED visits per year. Simply based on this information alone, it can be concluded that vertigo-dizziness presentations have a substantial and growing impact on EDs. The reason for the increase—relative to all ED presentations—is not clear. Patients with dizziness may increasingly perceive the need for an ED evaluation. Indeed, individuals with acute-onset dizziness are now instructed by the American Stroke Association public education message to call 9-1-1 immediately.[11] Access to EDs has probably not improved over this time, but it is possible that outpatient physicians are increasingly instructing patients who call reporting dizziness to go to the ED. The aging of the population seems to be an important factor because the largest increase in rate of presentation was



*Peripheral vestibular diagnoses and ICD-9 codes: Meniere's disease, 386.00-386.04 (0.34%); Labyrinthitis, 386.30-386.35, 386.12 (4.5%); Benign paroxysmal positional vertigo, 386.11 (0.6%); Other & unspecified peripheral vertigo, 386.10, 386.19, 386.40-386.43, 386.48, 386.50-386.58, 386.8, 386.9 (0.7%).

†Headache ICD-9 codes: 346.00, 346.01, 346.10, 346.11, 346.20, 346.21, 346.80, 346.81, 346.90, 346.91.

‡Infectious disease diagnoses and ICD-9 codes: General infections, 001-139; otitis media, 382; mastoiditis, 383.

#Cerebrovascular diagnoses and ICD-9 codes: Subarachnoid hemorrhage, 430 (0.08%); Intracranial hemorrhage, 431 (0.14%); Other intracranial hemorrhage, 432 (0.13%); Ischemic stroke, 433, 434 (0.31%); Transient ischemic attack, 435 (1.8%); Ill-defined, 436, 437 (1.65%); Late effects of stroke, 438 (0.05%).

^Ataxia disorders ICD-9 codes: 331.89, 334, 781.2, 781.3.

Figure 3. Recorded diagnoses for vertigo-dizziness presentations, 1995–2004.

Table 2
Screening or Diagnostic Test Utilization for Vertigo-Dizziness Visits to the Emergency Department (ED)

Screening or Diagnostic Test	Percentage of ED Visits with Test (95% CI)	Year Included
CBC	55.8 (53.8, 57.8)	1997–2004
ECG	43.3 (41.6, 45.0)	1995–2004
Glucose	33.2 (30.3, 36.1)	2001–2004
BUN	32.6 (29.8, 35.5)	2001–2004
Creatinine	31.5 (28.6, 34.5)	2001–2004
Pulse oximetry	29.4 (27.5, 31.4)	1995–2004
Electrolytes	28.9 (25.1, 32.7)	2003–2004
Chest x-ray	24.9 (23.4, 26.4)	1995–2004
Urinalysis	22.0 (20.6, 23.5)	1995–2004
Cardiac monitor	18.0 (16.5, 19.5)	1995–2004
CT/MRI	16.7 (15.5, 17.9)	1995–2004

BUN = blood urea nitrogen; CBC = complete blood count; CI = confidence interval; CT/MRI = computerized tomography and magnetic resonance imaging; ECG = electrocardiogram.

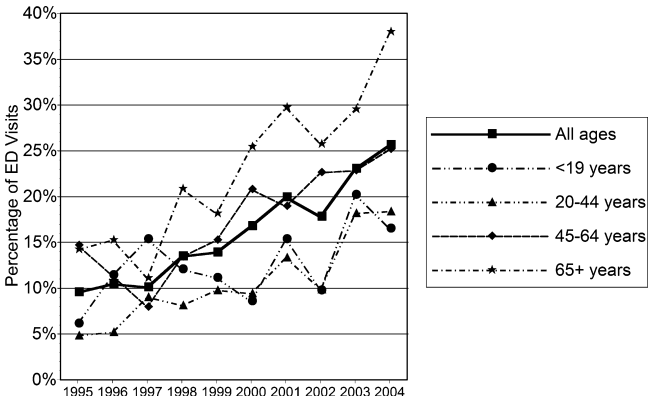


Figure 4. Percentage of vertigo-dizziness visits to the emergency department (ED) in which computerized tomography or magnetic resonance imaging (CT/MRI) was ordered or performed, all ages and stratified by age group. The overall trend and the trend for each age group, other than age ≤19 years, was significant ($p < 0.01$).

seen in the age group ≥65 years and because dizziness symptoms are strongly linked to increasing age.[12] However, vertigo-dizziness presentations have increased per 1,000 U.S. population. In addition, age did not explain the increase in the prevalence of dizziness presentations when its influence was assessed using the visit-level multivariable logistic regression model.

Screening and diagnostic tests are frequently ordered in patients who present to the ED for dizziness, but the contribution these tests make to patient care is not clear. This study shows that CT/MRI utilization has grown more rapidly than any other test in dizziness evaluations. Despite this finding, central nervous system diagnoses did not increase. These findings may stem from uncertainty in the clinical evaluation of dizziness presentations in general[13,14] and specifically from a widespread emphasis of dizziness as a stroke symptom. In addition to the public messages warning of stroke in acute dizziness,[11] the medical literature emphasizes dizziness as a stroke symptom as well.[15–18] One study suggests that stroke could even be the cause in 25% of acute ''isolated dizziness'' (i.e., dizziness without other central nervous system signs or symptom) presentations.[19] However, stroke was found to be a very rare cause of dizziness presentations to the ED in a population-based stroke surveillance study that used a method for validating stroke.[3] In that study, acute cerebrovascular causes were diagnosed in only 3.2% (53 of 1,666) of all dizziness presentations and in only 0.7% (9 of 1297) of those presenting with ''isolated dizziness.'' In the current analysis of NHAMCS data, we found that only 3.9% of patients presenting for vertigo-dizziness received a cerebrovascular diagnosis, with most of these diagnoses coded as the more vague categories of ''transient cerebral ischemia'' (ICD-9-CM code 435) or ''acute or ill-defined, cerebrovascular disease'' (ICD-9-CM codes 436, 437).

To the best of our knowledge, no study presents a validated method for discriminating dizziness caused by stroke from nonstroke causes at the bedside. As a result, frontline physicians may be increasingly using

imaging studies to make this critical distinction. However, this approach is problematic. Not only is stroke a rare cause of dizziness in the ED, but the sensitivity of CT for acute stroke is very low.[20–22] MRI—a more sensitive test for stroke—is not readily available or practical for routine ED use. Since CT/MRI has been shown to have a strong association with increased ED length of stay,[23] these tests may be increasing length of stay but making very little contribution to diagnosis or care.

In the steps to optimizing both patient care and health care utilization, this study identifies some important future research directions. A clinical decision rule assessing stroke risk could make an important contribution to optimizing neuroimaging utilization and patient care. The ideal clinical decision rule would help to determine which patients with dizziness need a neuroimaging study and which patients do not. Similar research approaches may be important for addressing utilization of other tests that were not further explored in this analysis. Perhaps most importantly, future research should evaluate how processes of care (i.e., what is done by physicians at the time of service) are linked to important outcomes so that emphasis can be placed on the processes that are proven to make a positive contribution. The importance of these future research directions is supported by the finding that dizziness presentations are substantial and increasing.

LIMITATIONS

To our knowledge, this was the largest study conducted to date of visits for dizziness in EDs and provides several important insights. Nonetheless, the study has some limitations that warrant mention. Medical record review studies such as NHAMCS are susceptible to certain types of error.[24] The NHAMCS study addresses these potential sources of error by using explicit protocols for case selection, specially trained abstractors, well-defined variables, and blinding of chart reviewers to hypotheses. In addition, quality control procedures are in place. The keying error rate for nonmedical items averages less than 1%; for items requiring medical coding, discrepancy rates average under 2%.[4] Health care providers contributing to the NHAMCS do not follow a protocol to categorize and record diagnoses, and no method is used to validate diagnoses that were recorded. In the NHAMCS data set, the symptom of ''vertigo'' cannot be analyzed separately from ''dizziness'' because these symptoms were classified into the single RFV code, vertigo-dizziness. It is unlikely that the use of additional dizziness symptom categories in NHAMCS would be more informative because physicians do not follow a protocol for documenting symptom type and also because dizziness symptoms are known to be unclear, inconsistent, and unreliable.[25] It is possible that CT/MRI utilization is increasing for reasons other than stroke screening purposes. We also searched for brain tumor and ''vertigo of central origin'' diagnoses, but found none over this study period. Injury may be another common reason for CT/MRI use in dizziness presentation, but the rate of injury diagnoses did not increase over time. Importantly, the NHAMCS study does not follow patients or determine outcomes. As a result, we can only speculate about how current care contributes to patient outcomes until we have more detailed research.

CONCLUSIONS

In terms of number of visits and important utilization measures, the impact of dizziness presentations on EDs is substantial and increasing. CT/MRI utilization rates have increased more than any other test.

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