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Diagnostic Indicators of Anxiety and Depression in Older Dizzy Patients in Primary Care

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ABSTRACT

Background: Dizzy patients with both psychological and physical symptoms tend to have high levels of disability and are at risk of remaining symptomatic and disabled. The objective of this study was to develop a prediction model for the presence of anxiety and/or depression in older dizzy patients in primary care. **Methods:** We performed a cross-sectional study among 415 older patients consulting their primary care physician for persistent dizziness. Participants underwent a standardized, comprehensive evaluation and completed self-administered questionnaires regarding anxiety and depression (PRIME-MD Patient Health Questionnaire [PHQ]) and dizziness-related disability (Dizziness Handicap Inventory). To determine the diagnostic indicators of anxiety and/or depression, we used multiple logistic regression analysis with ‘‘presence of Panic Disorder, Other Anxiety Disorder, or Major Depressive Disorder’’ as dependent variable. Potential diagnostic indicators included dizziness-related disability, patient characteristics (age, sex, history of anxiety, and history of depression), and dizziness characteristics (description of dizziness, provoking circumstances, associated symptoms, onset, frequency, duration, and avoidance of activities because of dizziness). **Results:** According to the PHQ, an anxiety and/or depressive disorder was present in 90 patients (22%), of whom 35 reported no medical history of anxiety or depression, nor current pharmacological treatment for these disorders. In the final model, dizziness-related disability, a history of depression, and accompanying fear were associated with an increased odd of anxiety and/or depression, whereas tinnitus and rotational dizziness were associated with a decreased odd of anxiety and/or depression. The model showed good calibration (Hosmer-Lemeshow P value of .46) and discrimination (adjusted area under the receiver operating characteristic curve [AUC] after bootstrapping of .82). **Conclusions:** Primary care physicians should consider the existence of anxiety and depression in older patients presenting with dizziness. After external validation, our model may contribute to better recognition and hence better management of anxiety and depression in older patients with dizziness in primary care.

INTRODUCTION

Dizziness is a common symptom, especially in older patients.

Thirty percent of the people older than 65 years experience dizziness in some form,¹⁻⁴ increasing to 50% in the very old (85y).² Almost 10% of persons aged 65 years or older visit their primary care physician at least once a year because of dizziness.

⁵ Dizziness can be caused by a wide range of conditions, including vestibular, cardiovascular, neurological, metabolic, and psychiatric diseases.⁶ Often, dizziness has more than one cause.⁷⁻⁹ In 15% to 40% of dizzy patients in primary care, psychiatric disorders, especially anxiety or depression, may play a causative or contributory role.⁸⁻¹¹ Compared to those without psychiatric disorders, dizzy patients with psychiatric disorders tend to have higher levels of self-perceived disability^{10,12,13} are more likely to remain symptomatic and disabled,¹⁴⁻¹⁶ and use more dizziness-related health care.¹⁷ Therefore, recognition of anxiety or depressive disorders in patients with dizziness is of great importance, especially because the number of patients with undetected anxiety or depression may be high,¹⁸⁻²¹ and these disorders can be treated effectively.^{22,23} Until now, only few studies have reported on indicators of anxiety or depression in a dizzy population.^{10,12,24,25} However, none of these studies included a population representative of patients seen in a primary care setting. The objective of this study was to develop a prediction model for the presence of anxiety and/or depression in older patients presenting with dizziness in primary care.

METHODS

Setting and Patients

Participants were recruited among consecutive patients seen by 45 primary care physicians in 24 family practices in the Netherlands. In all, 22 practices did form part of a research network, 2 practices did not form part of a research network but previously participated in primary care research. Patients aged 65 years or older consulting their primary care physician for dizziness that had been present for at least 2 weeks were invited to participate. Additionally, each month the electronic databases of all practices were searched retrospectively for any dizzy patients the primary care physicians had failed to invite (see Appendix A). These patients received a written invitation to participate in the study. We obtained written informed consent from all participants. Our definition of dizziness included a giddy or rotational sensation, loss of balance, feeling faint, light-headedness, instability or unsteadiness, a tendency to fall, or the sensation of everything turning black. Criteria for exclusion were the inability to speak Dutch or English, severe cognitive impairment, severe visual impairment, severe hearing impairment, or wheelchair dependency. Patients were enrolled from June 2006 to January 2008, and the study protocol was approved by the Medical Ethics Committee of the VU University Medical Center.

Presence of Anxiety or Depression

All patients were asked to complete the Anxiety and Mood module of the PRIME-MD Patient Health Questionnaire (PHQ), an instrument to establish the presence of psychiatric disorders based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria.^{26,27} Using the PHQ algorithm, we determined for each patient the presence or absence of the diagnoses panic disorder (PD), other anxiety disorder (OAD), and major depressive disorder (MDD).

The diagnostic algorithm for PD consists of 15 questions with 2 answer categories (yes or no) and is considered fulfilled if the answer to questions 3a-d is "yes" and if the answer to 4 or more of questions 4a-k is "yes."²⁷ The diagnostic algorithm for OAD consists of 7 questions with 2 answer categories (yes or no) and is considered fulfilled if the answer to question 5a is "yes" and if the answer to 3 or more of questions 5b-g is "yes."²⁷ The diagnostic algorithm for MDD consists of 9 questions with 4 answer categories (not at all, several days, more than half the days, and nearly every day) and is considered fulfilled if the answer to questions 2a and 2b and 5 or more of questions 2a-2i is at least "more than half the days" (question 2i is counted if present at all).²⁷ The diagnostic algorithms of the PHQ have been shown to have good criterion validity with reference to gold standard measures of mental disorders.²⁷⁻³⁰ Studied in primary care populations, sensitivity and specificity of the PHQ for PD were 75% to 81% and 96% to 99%, respectively.^{27,28} In a metaanalysis, Wittkamp et al reported pooled estimates of sensitivity and specificity of the PHQ for MDD in primary care populations were 80% and 92%, respectively.³¹ Studied in a dizzy population, sensitivity and specificity of the PHQ for any anxiety disorder (PD or OAD) were 94% and 95%; sensitivity and specificity of the PHQ for MDD were 69% and 94%, respectively.³² Until now, only few studies have examined the reliability of the PHQ, reporting moderate-to-high inter-rater reliability (any anxiety disorder: $k \frac{1}{4} .55-.83$; MDD: $k \frac{1}{4} .61-.65$),^{26,32} and moderate-to-satisfactory test-retest reliability (any anxiety disorder: $k \frac{1}{4} .51$; MDD: $k \frac{1}{4} .58-.69$).^{33,34} Potential Diagnostic Indicators

All participants underwent a standardized, comprehensive evaluation based on a set of diagnostic tests that we developed during an international Delphi procedure.^{35,36} We used a system for computer-assisted survey processing (Blaise 4.7) to create a standardized interview setting and to avoid missing data.

Potential diagnostic indicators included patient characteristics (age, sex, history of anxiety, and history of depression), and dizziness characteristics (description of dizziness, provoking circumstances, associated symptoms, onset, frequency, duration, and avoidance of activities because of dizziness). We also asked the participants to complete the Dizziness Handicap Inventory (DHI), a 25-item questionnaire with 3 answer categories (yes, sometimes, or no) developed to study self-perceived physical, emotional, and functional disability associated with dizziness.³⁷ Using the algorithm of the DHI, we calculated for each patient the total level of dizziness-related disability (maximum score of 100).³⁷ We wanted to develop a prediction model based on the first part of the diagnostic process, because during this part of the diagnostic process the clinician still has to decide on additional diagnostic “tools.” Therefore, we did not use the results of physical examination or additional diagnostic testing as a source for candidate diagnostic indicators.

Statistical Analysis

The data were analyzed in SPSS for Windows, version 15.0.1.

To develop a prediction model for the identification of anxiety and depression, we performed multiple logistic regression analysis with “presence (or absence) of PD, OAD, or MDD” as dependent variable. Prior to regression analysis, we assessed the univariable association between each indicator and the outcome with binary logistic regression analysis to reduce the number of potential diagnostic indicators. Variables were only entered into the multivariable regression model if the univariable P value was < .2. We tested continuous variables for linear association with the outcome, which revealed no nonlinear associations. In a subsequent backward elimination process (Wald test), we deleted variables from the initial model until only variables with a P value of < .157 (Akaike Information Criterion) were retained in the final model.³⁸

[FIGURE 1]

Performance of the model.

The reliability of the model was quantified with the Hosmer-Lemeshow goodness-of-fit statistics.

³⁹The calibration of the model was assessed by plotting the predicted probabilities against the observed frequencies of anxiety and/or depression.⁴⁰ For this assessment, patients were grouped into deciles according to their predicted probability.

The prevalence of the outcome measure within each decile equals the observed frequency. If the predicted probabilities and the observed frequencies are in agreement, the estimates are close to the diagonal.

The discriminative ability of the model (ie, its ability to distinguish dizzy patients with anxiety and/or depression from dizzy patients without anxiety and/or depression) was assessed by calculating the area under the receiver-operating characteristic curve (AUC). An AUC of 0.5 indicates no discrimination above chance, whereas an AUC of 1.0 indicates perfect discrimination.⁴⁰ Prediction models perform better in the development cohort than in other similar populations. After multiple logistic regression analysis, we used a bootstrapping procedure to adjust for this overoptimism in model performance.^{40,41} Bootstrap samples were drawn with replacement ($n = 500$) from the full data set and were used to compute an adjusted AUC. This adjusted AUC provides a more precise estimate of the performance of the model in similar, future patients. The bootstrapping procedure was performed in R statistical software, version 2.6.0.

RESULTS

During the study period, 415 patients underwent the standardized evaluation (Figure 1). Patient characteristics and results of the PHQ are summarized in Table 1. An anxiety and/or depressive disorder was present in 90 patients with dizziness (22%). Of these 90 patients, 35 patients reported no medical history of anxiety or depression, nor current pharmacological treatment for these disorders. An anxiety and depressive disorder was present in 21 patients (5%), of whom 6 reported no medical history of anxiety or depression, nor current pharmacological treatment for these disorders.

[TABLE 1]

Indicators of an Anxiety or Depressive Disorder

Table 2 summarizes the univariable associations of all potential diagnostic indicators with the outcome. After the backward elimination procedure, the multivariable model included 9 diagnostic indicators. In order to reduce the number of diagnostic indicators (and to improve the clinical usefulness of our model), we performed a second backward elimination procedure with a lower P value (<.02), which resulted in a final multivariable model including 5 diagnostic indicators (Table 3).

Dizziness-related disability (a higher score on the DHI) was associated with an increased odds of anxiety and/or depression, fear as an associated symptom during an episode of dizziness, and a history of depression. Tinnitus during an episode of dizziness, and dizziness described as a rotational sensation were associated with a decreased odd of anxiety and/or depression.

Using the model, the prior probability of 22% (90 of 415) of current anxiety and/or depression could be reduced to a posterior probability of at best 0.4% in people with low scores for all predictors (lowest value; low DHI score, no associated fear or history of depression, presence of tinnitus, and rotational dizziness) or 96% in people with high scores (highest value; high DHI score, presence of associated fear and history of depression, no tinnitus, and rotational dizziness).

Performance of the Model

According to the Hosmer-Lemeshow statistic, the reliability of the model was adequate (P value of .46). Figure 2 shows the calibration of the predictions. The predicted and observed probabilities are close to the 45_ line, demonstrating good calibration of the predictions by the model. The discriminative ability of the model was good (AUC¼0.83 [0.79-0.88]), also after adjustment for overoptimism (adjusted AUC ¼ 0.82; optimism ¼ 0.009).

DISCUSSION

Summary of Main Findings

In this cross-sectional study performed among consecutive dizzy primary care patients aged 65 or older, an anxiety and/or depressive disorder was present in 22% of the patients. In the final model, dizziness-related disability, fear as an associated symptom during an episode of dizziness, and a history of depression were associated with an increased odd of anxiety and/or depression. Tinnitus during an episode of dizziness and dizziness described as a rotational sensation were associated with a decreased odd of anxiety and/or depression. The model showed good calibration and discrimination (also after adjustment for overoptimism).

Comparison With Existing Literature

Until now, only few studies have reported on indicators of anxiety or depression in a dizzy population. However, none of these studies included a population representative of patients seen in a primary care setting.^{10,12,24,25} Moreover, no other study reported dizziness-related disability to be such a strong diagnostic indicator of anxiety or depression, although several studies did find an association between functional impairment and psychiatric disease.^{10,12,24}

[TABLE 2]

In 2 studies, it was found that dizziness provoked by hyperventilation was an independent predictor of psychiatric disease in patients with dizziness.^{10,25} We were not able to study this potential diagnostic indicator, because hyperventilation testing was not included in the standardized evaluation, as established by our expert panel.³⁵ Kroenke et al reported age below 40 years, related complaints of weakness or headaches, and dizziness provoked by standing to be independent predictors of psychiatric disorders in patients with dizziness.¹⁰ This different set of predictors may be the result of a difference in the age of the study population (mean age 62 years, range 20-85 years vs mean age 79 years, range 65-95 years) and a difference in the study setting (hospital vs family practice).

In a study performed among patients in a geriatric dizziness clinic, Sloane et al reported onset of dizziness by fatigue as a predictor of a psychiatric diagnosis.²⁵ Unfortunately, our standardized evaluation did not include the assessment of fatigue,³⁵ so we were unable to determine whether this could be an important indicator of anxiety or depression in our population.

[TABLE 3]

[FIGURE 2]

Our finding of tinnitus and rotational dizziness being associated with the absence of anxiety or depression may be explained by the fact that tinnitus and rotational dizziness are typically vestibular symptoms, that is dizzy patients with such symptoms have a high probability of a vestibular—and not psychiatric—cause of dizziness.⁴² In our study, approximately two fifths of the dizzy patients with an anxiety and/or depressive disorder according to the PHQ, and almost one third of the dizzy patients with both an anxiety and a depressive disorder reported no medical history of anxiety or depression, nor current pharmacological treatment for these disorders. Although it is tempting to conclude that our data suggest insufficient recognition of anxiety and depression by primary care physicians,¹⁸⁻²¹ we emphasize that the above definition (ie, “diagnosis of anxiety or depression according to the PHQ, but no reported history of anxiety or depression and no reported pharmacological treatment for anxiety or depression”) is a suboptimal measure for underdetection and lacks additional information, for example about underreporting, refusal of therapy, current nonpharmacological treatment, or false-positive diagnoses according to the PHQ.

Strengths and Limitations of This Study

To our knowledge, we are the first to develop a prediction model for the presence of anxiety and/or depression in older dizzy patients in primary care. One of the strengths of this study is the selection of the study population, which is highly representative of primary care. This is partly due to the monthly database search to identify all eligible patients, thus including also patients the primary care physicians had not invited.⁹ This procedure reduced the risk of recruiting a selective sample of patients. Another strength is the absence of missing values in a relatively large sample, limiting loss of statistical power and possible bias.⁴³ Some limitations of our study should be mentioned. First, the use of questionnaires to determine the presence of anxiety and/or depression—instead of gold standard clinical interviews for mental disorders—could be regarded a limitation. However, the operating characteristics of the PHQ for PD or OAD in a dizzy population are excellent (sensitivity 94%, specificity 95%, positive predictive value [PPV] 80%, and negative predictive value [NPV] 99%).³² The operating characteristics of the PHQ for MDD are only satisfactory, both in the primary care populations (pooled estimates of sensitivity and specificity 80%-81% and 92%, respectively)^{31,44} and in a dizzy population (sensitivity 69%, specificity 94%, PPV 73%, and NPV 94%).³² However, we accepted this, because the operating characteristics of the PHQ for MDD are still superior to those of several other instruments that are commonly used to assess depression, such as the PHQ-9 (cutoff score), the Hospital Anxiety and Depression Scale (HADS), and the WHO Well-Being Index 5 (WBI-5).^{29,30,45} Second, the number of cases in our study was relatively small compared to the number of potential predictors.

Although the exact sample size calculations for prediction models do not exist, the general rule is that for each candidate predictor there should be at least 10 events (1:10 rule).⁴⁶ We had 20 candidate predictors with 90 cases (ratio 1:5). When a limited number of positive cases are available, statistical methods such as bootstrapping can be used to estimate the potential effects of sampling variation on the predictive performance of a model.⁴⁶ The bootstrapping procedure only revealed a small reduction in the AUC (from 0.83 to 0.82; optimism 0.009), suggesting good internal validity of our final model. However, external validation in a new population is needed to confirm the performance of our model and its transportability to other populations of older dizzy primary care patients.⁴⁷ Finally, it could be argued that the use of the DHI is not feasible in daily clinical practice. However, completing the DHI takes relatively little time (approximately 10 minutes) and can be done prior to consultation.³⁷ Alternatively, clinicians can use a shorter version of the DHI (10 items instead of 25),⁴⁸ which has an almost equally strong association with the presence of anxiety and/or depression (additional analysis; results can be obtained from the corresponding author).

Implications for Clinical Practice and Further Research

Primary care physicians should consider the presence of anxiety and depression in older patients with dizziness, especially because patients with both psychological and physical symptoms tend to have a worse prognosis,¹⁴⁻¹⁶ and effective treatment is available.^{22,23} Hopefully, our prediction model will lead to a diagnostic decision rule that improves the recognition of anxiety and depression in older dizzy primary care patients. The necessary steps toward an applicable and useful decision rule include (1) external validation in a new dizzy population,⁴⁷ (2) development of a score chart to facilitate the calculation of an individual

patient's risk,⁴⁹ and, perhaps most importantly, (3) investigation of the ability of the decision rule to influence medical decision making and to improve relevant outcomes in older patients with dizziness.⁵⁰

CONCLUSION

In our final model, dizziness-related disability, a history of depression, and accompanying fear were associated with the presence of anxiety and/or depression in older dizzy patients in primary care, whereas tinnitus and rotational dizziness were associated with the absence of anxiety or depression. After external validation, our model may contribute to better recognition and management of anxiety and depression in older dizzy patients in primary care.

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AUTHORS' NOTE

HvdH and HvW obtained funding for the study. OM, JD, DvdW, GtR, FS, HvW, and HvdH were involved in the design of the study. OM performed the statistical analysis and wrote the original draft. All authors critically revised the draft with regard to important intellectual content and approved the final version.

Support

DECLARATION OF CONFLICTING INTERESTS

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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[APPENDIX A]

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TABLES AND FIGURES

Figure 1

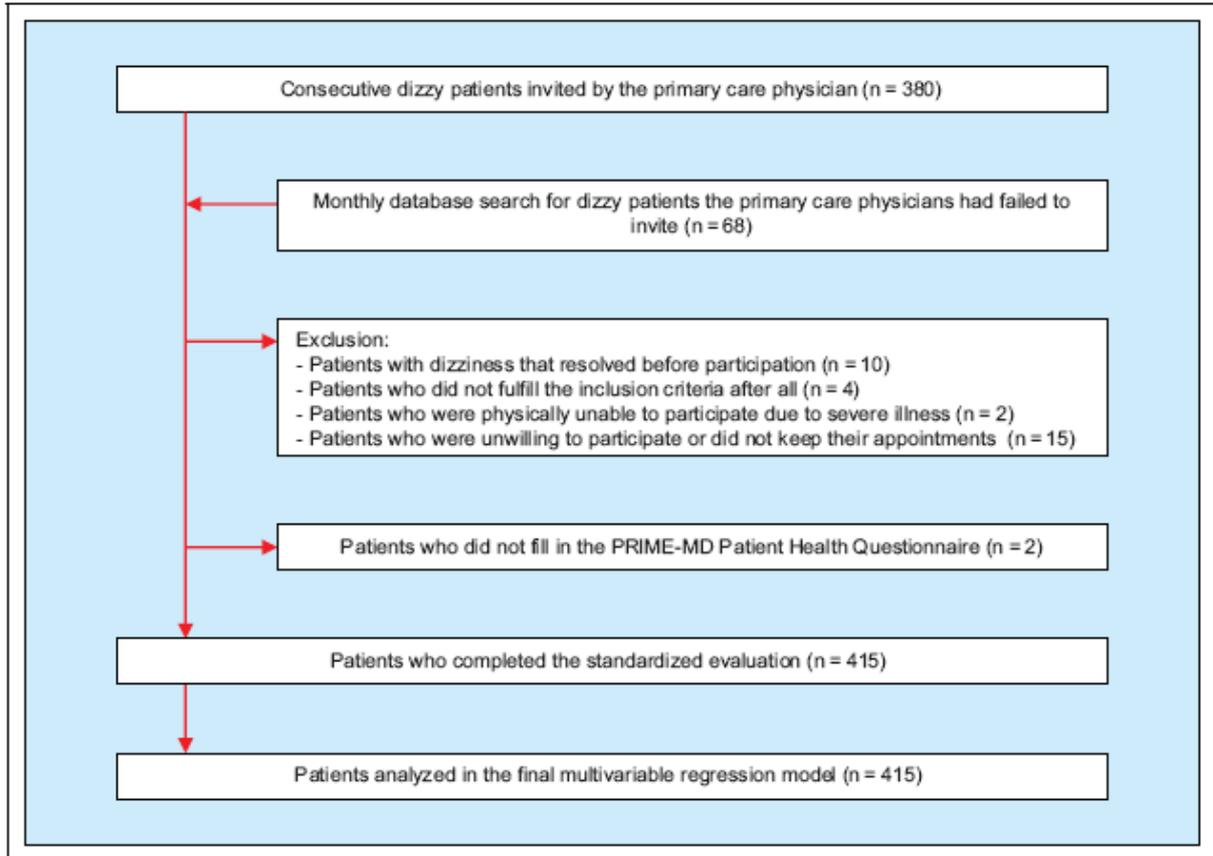


Figure 1. Flowchart of participants through the study.

Table 1

Table I. Patient Characteristics and Results of Psychiatric Testing of 415 Older Dizzy Primary Care Patients*

<i>Patient Characteristics</i>	
Gender, female	305 (73)
Age in years, mean \pm SD	78.5 \pm 7.2
Living situation	
Alone	252 (61)
Home for the elderly, or other institution	66 (16)
Ethnic background	
Dutch native	341 (82)
Western immigrant	44 (11)
Non-Western immigrant	30 (7)
Level of education	
Elementary school	117 (28)
High school	247 (60)
College/university	51 (12)
Drugs, total	
Number of drugs per patient, mean \pm SD	4.4 \pm 3.0
Major polypharmacy (patients using >5 drugs)	137 (33)
Medical history	
Number of chronic disorders, mean \pm SD	3.5 \pm 1.9
Cardiovascular disease	
Hypertension	237 (57)
Ischemic heart disease	109 (26)
Arrhythmia	94 (23)
Heart valve disease	57 (14)
Myocardial infarction	56 (13)
Ear, nose, and throat disease	
Benign paroxysmal positional dizziness	40 (10)
Ménière disease	27 (7)
Neurological disease	
Migraine	79 (19)
Cerebrovascular disease	65 (16)
Parkinson disease	7 (2)
Epilepsia	6 (1)
Locomotor disease	
Gonarthrosis	120 (29)
Coxarthrosis	78 (19)
Psychiatric disease	
Depressive disorder	101 (24)
Anxiety disorder	75 (18)
Other	
Cataract	198 (48)
Diabetes	76 (18)
Macular degeneration	27 (7)
<i>Psychiatric diagnosis according to the PRIME-MD PHQ</i>	
Anxiety disorder	
Panic disorder	19 (5)
Other anxiety disorder	39 (9)
Depressive disorder	
Major depressive disorder	53 (13)
Anxiety or depressive disorder (or both)	90 (22)
Anxiety and depressive disorder	21 (5)

Abbreviations: PHQ, Patient Health Questionnaire; SD, standard deviation.
* Values are the number (percentage) unless otherwise indicated.

Table 2

Table 2. Univariable Associations of Patient and Dizziness Characteristics With the Presence (or Absence) of an Anxiety and/or Depressive Disorder*

Variable	Anxiety and/or Depressive Disorder: YES [†] (n = 90)	Anxiety and/or Depressive Disorder: NO [†] (n = 325)	OR (95% CI) [‡]	P Value
A. Patient characteristics				
Age (years), mean \pm SD	80.0 \pm 6.9	78.1 \pm 7.2	1.04 (1.01-1.07)	.025
Female sex	72 (80)	233 (72)	1.6 (0.9-2.8)	.116
Anxiety disorder in medical history	28 (31)	47 (15)	2.7 (1.6-4.6)	<.001
Depressive disorder in medical history	36 (40)	65 (20)	2.7 (1.6-4.4)	<.001
B. Dizziness characteristics				
Description				
Light-headedness	55 (61)	192 (59)	1.1 (0.7-1.8)	.728
Rotational sensation	42 (47)	186 (57)	0.7 (0.4-1.0)	.076
Environment spinning	30 (33)	107 (33)	1.0 (0.6-1.7)	.942
Near faint	24 (27)	72 (22)	1.3 (0.7-2.2)	.370
Everything turning black	12 (13)	56 (17)	0.7 (0.4-1.4)	.378
Giddy	48 (53)	128 (39)	1.8 (1.1-2.8)	.019
Loss of balance	63 (70)	217 (67)	1.1 (0.7-1.9)	.563
Instability or unsteadiness	72 (80)	215 (66)	2.0 (1.2-3.6)	.013
Provoking circumstances of dizziness				
Standing still	36 (40)	62 (19)	2.8 (1.7-4.7)	<.001
Exercise	38 (42)	90 (28)	1.9 (1.2-3.1)	.009
Turning head	53 (59)	170 (52)	1.3 (0.8-2.1)	.269
Bending forward	63 (70)	190 (59)	1.7 (1.0-2.7)	.048
Looking up	51 (57)	163 (50)	1.3 (0.8-2.1)	.275
Strong emotions	26 (29)	53 (16)	2.1 (1.2-3.6)	.008
Getting up from a lying or sitting position	68 (76)	223 (69)	1.4 (0.8-2.4)	.204
Associated symptoms during the episode of dizziness				
Nausea	26 (29)	85 (26)	1.1 (0.7-1.9)	.604
Sweaty, pale, or clammy	23 (26)	67 (21)	1.3 (0.8-2.3)	.315
Hearing problems	5 (6)	19 (6)	0.9 (0.3-2.6)	.917
Tinnitus	5 (6)	37 (11)	0.5 (0.2-1.2)	.112
Palpitations or chest pain	19 (21)	39 (12)	2.0 (1.1-3.6)	.029
Dyspnoea	18 (20)	30 (9)	2.5 (1.3-4.7)	.006
Diplopia or difficulty with speaking/ swallowing	10 (11)	29 (9)	1.3 (0.6-2.7)	.530
Fear	33 (37)	50 (15)	3.2 (1.9-5.4)	<.001
Tendency to fall	64 (71)	143 (44)	3.1 (1.9-5.2)	<.001
Onset of dizziness: less than 1 month	1 (1)	28 (9)	0.1 (0.02-0.9)	.038
Frequency of dizziness: continuous	15 (17)	26 (8)	2.3 (1.2-4.6)	.017
Duration of dizziness episode: more than 60 seconds	60 (67)	167 (51)	1.9 (1.2-3.1)	.011
Score of Dizziness Handicap Inventory (0-100), mean \pm SD	51.8 \pm 18.0	32.0 \pm 18.2	1.06 (1.04-1.07)	<.001

* Values are the number (percentage) unless otherwise indicated.

[†] Diagnosis of "Panic Disorder, Other Anxiety Disorder, and/or Major Depressive Disorder," according to the PRIME-MD PHQ.

[‡] Binary logistic regression analysis.

Table 3

Table 3. Diagnostic Indicators of Anxiety and/or Depression in 415 Older Dizzy Primary Care Patients*

Indicator	B	Wald	OR	95% CI	P value
Patient characteristics					
Depressive disorder in medical history	0.884	8.7	2.4	1.3-4.3	.003
Dizziness characteristics					
Description of dizziness: rotational sensation	-0.757	6.9	0.5	0.3-0.8	.008
Associated symptom during episode of dizziness: tinnitus	-1.584	7.7	0.2	0.1-0.6	.005
Associated symptom during episode of dizziness: fear	1.027	10.4	2.8	1.5-5.2	.001
Score of Dizziness Handicap Inventory (0-100, in steps of 10)	0.583	52.5	1.8	1.5-2.1	<.001

Abbreviations: CI, confidence interval; OR, odds ratio.

* Dependent variable "diagnosis of Panic Disorder, Other Anxiety Disorder, or Major Depressive Disorder, according to the PRIME-MD Patient Health Questionnaire," AUC 0.83, CI = 0.79-0.88, adjusted AUC = 0.82, and optimism = 0.009.

Figure 2

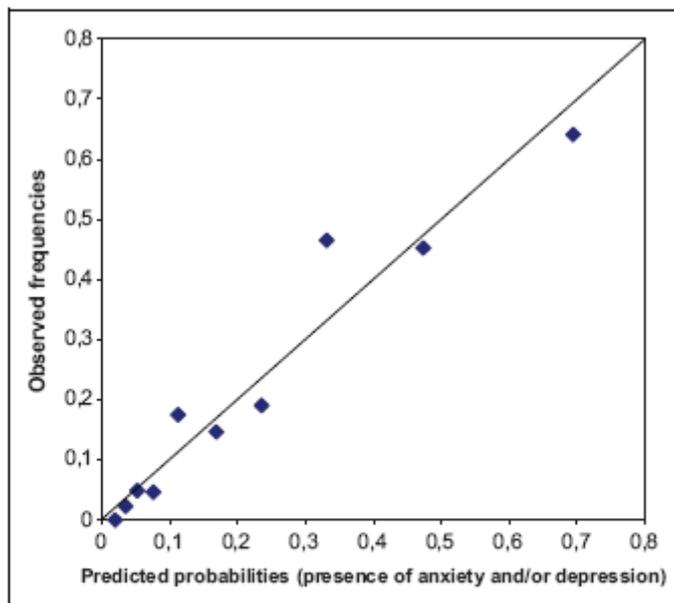


Figure 2. Calibration plot showing the observed frequencies versus the predicted probabilities for patients with anxiety and/or depression.

Appendix A

Table A1. Search Strategy Used in Electronic Databases for Identifying Dizzy Patients the Primary Care Physicians had Failed to Invite (15 search terms and 3 ICPC codes)

A. Search Terms	Symptom in Dutch	English translation	Dizziness subtype	Type of Sensation
1. draai ^a	- draaierig	- giddy/rotational sensation	I. Vertigo	A feeling that one or one's surroundings are moving
2. vertig ^a	- vertigo	- vertigo		
3. zweve ^a	- zweverig	- giddy		
4. collab ^a	- collaberen	- collapsing	II. Presyncope	A lightheaded, faint feeling, as though one were about to pass out
5. collaps ^a	- collaps	- collapse		
6. flauw ^a	- flauwte	- faint feeling		
7. licht in	- licht in het hoofd	- light-headedness		
8. onwel ^a	- onwelwording	- becoming unwell		
9. zwart voor	- zwart voor de ogen	- everything turning black		
10. evenwicht ^a	- evenwichtsstoornis	- loss of equilibrium	III. Disequilibrium	A sense of unsteadiness that is (1) primarily felt in the lower extremities, (2) most prominent when standing or walking, and (3) relieved by sitting or lying down
11. onvast ^a	- onvast (ter been)	- instability		
12. valnei ^a	- valneiging	- tendency to fall		
13. wankel ^a	- wankel (ter been)	- to be unsteady on one's legs		
14.dizz ^a	- dizzy	- dizzy	IV. No subtype	Dizziness not specified
15.duize ^a	- duizeligheid	- dizziness		
B. ICPC codes				
1. A06 Fainting/syncope				
2. H82 Vertiginous syndrome				
3. N17 Vertigo/dizziness				

Abbreviation: ICPC, International Classification of Primary Care.

^a Truncated search term.