

Specificity of early-career general practitioners' problem formulations in patients presenting with dizziness: a cross-sectional analysis

Jocelyn Ledger,¹ Amanda Tapley,^{1,2} Christopher Levi,^{3,4} Andrew Davey,^{1,2} Mieke van Driel,⁵ Elizabeth G Holliday,¹ Jean Ball,⁶ Alison Fielding,^{1,2} Neil Spike,^{7,8} Kristen FitzGerald,^{9,10} Parker Magin^{1,2}

To cite: Ledger J, Tapley A, Levi C, *et al.* Specificity of early-career general practitioners' problem formulations in patients presenting with dizziness: a cross-sectional analysis. *Fam Med Com Health* 2021;**9**:e001087. doi:10.1136/fmch-2021-001087

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/fmch-2021-001087>).

ABSTRACT

Objectives Dizziness is a common and challenging clinical presentation in general practice. Failure to determine specific aetiologies can lead to significant morbidity and mortality. We aimed to establish frequency and associations of general practitioner (GP) trainees' (registrars') specific vertigo provisional diagnoses and their non-specific symptomatic problem formulations.

Design A cross-sectional analysis of Registrar Clinical Encounters in Training (ReCEnT) cohort study data between 2010 and 2018. ReCEnT is an ongoing, prospective cohort study of registrars in general practice training in Australia. Data collection occurs once every 6 months midtraining term (for three terms) and entails recording details of 60 consecutive clinical consultations on hardcopy case report forms. The outcome factor was whether dizziness-related or vertigo-related presentations resulted in a specific vertigo provisional diagnosis versus a non-specific symptomatic problem formulation. Associations with patient, practice, registrar and consultation independent variables were assessed by univariate and multivariable logistic regression.

Setting Australian general practice training programme. The training is regionalised and delivered by regional training providers (RTPs) (2010–2015) and regional training organisations (RTOs) (2016–2018) across Australia (from five states and one territory).

Participants All general practice registrars enrolled with participating RTPs or RTOs undertaking GP training terms.

Results 2333 registrars (96% response rate) recorded 1734 new problems related to dizziness or vertigo. Of these, 546 (31.5%) involved a specific vertigo diagnosis and 1188 (68.5%) a non-specific symptom diagnosis. Variables associated with a non-specific symptom diagnosis on multivariable analysis were lower socioeconomic status of the practice location (OR 0.94 for each decile of disadvantage, 95% CIs 0.90 to 0.98) and longer consultation duration (OR 1.02, 95% CIs 1.00 to 1.04). A specific vertigo diagnosis was associated with performing a procedure (OR 0.52, 95% CIs 0.27 to 1.00), with some evidence for seeking information from a supervisor being associated with a non-specific symptom diagnosis (OR 1.39, 95% CIs 0.92 to 2.09; $p=0.12$).

Conclusions Australian GP registrars see dizzy patients as frequently as established GPs. The frequency and

KEY POINTS

QUESTION

⇒ This study sought to establish: (A) the proportion of vertigo/dizziness presentations to specialist general practitioner (GP) trainees that include a specific vertigo provisional diagnosis and that include a non-specific (symptom) problem formulation and (b) the associations of a specific vertigo provisional diagnosis being made (rather than a non-specific vertigo/dizziness problem formulation).

FINDING

⇒ Of vertigo/dizziness presentations, 32% involved a specific vertigo diagnosis and 69% a non-specific symptom diagnosis. A lower socioeconomic status of the practice location and longer consultation duration were both associated with a non-specific symptomatic problem formulation, rather than a specific vertigo provisional diagnosis, being made by GP trainees.

MEANING

⇒ Our findings are consistent with the acknowledged difficulty of making diagnoses in vertigo/dizziness presentations. Continuing emphasis on this area in GP training and encouragement of supervisor involvement in registrars' diagnostic processes is indicated.

associations of a non-specific diagnosis are consistent with the acknowledged difficulty of making diagnoses in vertigo/dizziness presentations. Continuing emphasis on this area in GP training and encouragement of supervisor involvement in registrars' diagnostic processes is indicated.

INTRODUCTION

Dizziness is a common presentation in general practice.^{1 2} Aetiologies of dizziness include vestibular/peripheral causes, cardiovascular or neurological disease, or psychogenic



© Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Dr Parker Magin;
parker.magin@newcastle.edu.au

reasons.³ There is a lack of consensus in internationally accepted and unified reference standards for the core aetiologies.³ A focused history is essential, in conjunction with clinical examination findings, in establishing a diagnosis.^{4–7}

Dizziness diagnoses range from benign and self-limiting to severe and potentially life-threatening.^{8–9} The impact of dizziness and vertigo on patients' quality of life can be profound, affecting their physical and mental health and ability to fulfil employment commitments.^{2 10–12} Specific diagnosis can facilitate measures to attenuate effects on quality of life. Determining the underlying cause can be difficult and complex but is vital.^{13–15} The most serious consequence of failure to establish the specific aetiology of vertigo and dizziness symptom presentations is the failure to manage a central cause of vertigo, such as vertebrobasilar stroke or transient ischaemic attack (TIA) leading to significant morbidity and mortality.^{15–17} Symptom analysis with recognition of accompanying neurological features and physical examination for positional nystagmus remain key aspects of assessment in differentiating central from peripheral vertigo.

Diagnosis and management of vertigo consumes significant medical resources with repeated primary and secondary care presentations, inconsistent prescribing patterns and unnecessary diagnostic procedures.^{13 14 18 19} This is compounded by frequently underdiagnosed and misdiagnosed presentations at a primary care level.¹³ Despite the inherent difficulties in diagnosis, it is accepted that common presentations of vestibular disturbances can be adequately diagnosed and managed in general practice without specialist referral.^{5 20–22} The general practitioner's (GP) approach to diagnosis and management, and their role as gate-keeper to secondary care, is important in reducing misdiagnosis and ensuring appropriate resource allocation.^{13 23}

There is limited evidence of vertigo and dizziness management in the general practice setting, with the majority of research conducted in emergency departments.^{13 24} It is recognised, though, that there is a need to improve educational approaches to acute vertigo care. A singular area for focus is early-career GPs' practice, including those in specialist GP training programmes. These are practitioners in the process of establishing practice patterns appropriate to the primary care setting. It is possible these patterns may persist into later practice.

This study aimed to establish the frequency of presentations that included a specific vertigo provisional diagnosis versus a non-specific (symptom) problem formulation in the practice of GP registrars (specialist GP trainees). We also sought to establish associations of specific vertigo provisional diagnoses rather than non-specific problem formulations being made in vertigo/dizziness presentations.

METHODS

This was an exploratory cross-sectional analysis of data from the Registrar Clinical Encounters in Training (ReCEnT) study. ReCEnT is an ongoing, prospective cohort study of registrars in general practice training. The ReCEnT study protocol is described in detail elsewhere.²⁵

Registrars from regional training providers (RTPs; 2010–2015) and regional training organisations (RTOs; 2016–2018) across Australia (New South Wales, Queensland, Victoria, South Australia, Tasmania and the Australian Capital Territory) were included. RTPs/RTOs were/are geographically defined not-for-profit GP education and training organisations. There was a change in Australian GP specialist vocational training in 2015–2016 from RTPs to RTOs. RTOs and RTPs operate in a similar manner but with different geographic boundaries (and a reduction from 17 to 9 organisations). Registrars collect data as part of their educational training requirements and are provided with individualised feedback reports to promote reflection on their clinical experiences.²⁶ Registrars may provide informed written consent for their ReCEnT data to be also used for research.

Initially, registrar education, work experience and demographics, plus the characteristics of their current place of practice are collected. Data collection occurs once every 6 months midtraining term (for three terms) and entails recording details of 60 consecutive clinical consultations on hardcopy case report forms. Data collection is designed to reflect a typical week in office-based general practice; it includes in-practice consultations excluding specialty clinics (such as immunisations and cervical screening) and excludes home visits and nursing home visits.

Outcome factor

The outcome factor was whether a dizziness-related or vertigo-related problem/diagnosis was a specific vertigo provisional diagnosis or a non-specific symptom/problem formulation. In ReCEnT, registrars are asked to provide the single most likely diagnosis for each problem dealt with. If they feel unable to provide a specific provisional diagnosis (eg, 'vestibular neuritis'), they are asked to be as specific as they can (in this example, 'vertigo'). Provisional diagnoses/problems are coded according to the International Classification of Primary Care, second edition (ICPC-2). Our outcome factor was defined by 23 ICPC-2 codes (see online supplemental material 1). Determination of ICPC-2 codes as being related to vertigo/dizziness and, then, classification of each of these as specific vertigo provisional diagnoses or as non-specific symptom/problem formulations was by a panel of one senior GP (PM) and one senior neurologist (CL).

Independent variables

Independent variables were related to patient, registrar, practice, consultation and consultation action factors.

Patient factors were patient age group, patient gender, identification as Aboriginal and/or Torres Strait Islander,

non-English speaking background (NESB) and patient/practice status (whether the patient was an existing patient, new to the registrar or new to the practice).

Registrar factors were gender, part-time or full-time status, term of registrar training and whether they obtained their primary medical degree in Australia or obtained it overseas.

Practice factors included size of practice (as determined by number of full-time equivalent GPs), bulk billing practice (does the practice routinely charge the patient no consultation fee), rurality (based on the Australian Standard Geographical Classification Remoteness Area classification), Socioeconomic Index for Area – Index of Relative Social Disadvantage (SEIFA-IRSD) decile (where 1 is the most disadvantaged and 10 the least disadvantaged), and RTP/RTO region.

Consultation factors were duration of consultation, number of problems/diagnoses addressed in each consultation and if the registrar sought information or assistance for diagnosis and/or management of the problem (if they consulted their supervisor and/or other sources of information).

The consultation action factors were if medication was prescribed, pathology or imaging ordered, referrals made, follow-up organised and if any learning goals were generated by the registrar.

Statistical analysis

Analysis was at the level of the individual problem/diagnosis and performed on data from 2010 to 2018, equivalent to 18 six monthly rounds of data collection.

Frequency of dizziness-related and vertigo-related problems/diagnoses and proportions of these problems/diagnoses that were a specific provisional diagnosis and that were a non-specific symptom/problem formulation were calculated with 95% CIs, adjusted for clustering of observations within registrars.

The analyses were restricted to new (first presentation) problems/diagnoses involving dizziness and vertigo (ie, our 23 adjudicated ICPC-2 codes). The primary analysis addressed the research question: what are the associations of seeing a patient and making a new specific vertigo diagnosis compared with a diagnosis/problem formulation of a new vertigo/dizziness symptom?

We performed a sensitivity analysis with the analysis confined to ICPC-2 codes entailing ‘true vertigo’ and excluding from the analysis ‘not-obviously-vertiginous dizziness’ (as determined by our expert panel). See [figure 1](#) for the flow chart of problems/diagnoses included in our primary and sensitivity analyses. The rationale for the primary and sensitivity analyses was the difficulty of eliciting and interpreting history and examination in vertiginous/dizzy presentations. In many instances vertiginous symptoms are subtle or difficult to differentiate or are difficult for patients to verbalise. Thus, it is likely that a proportion of true vertigo presentations have been coded as other presentations of dizziness. An inclusive primary

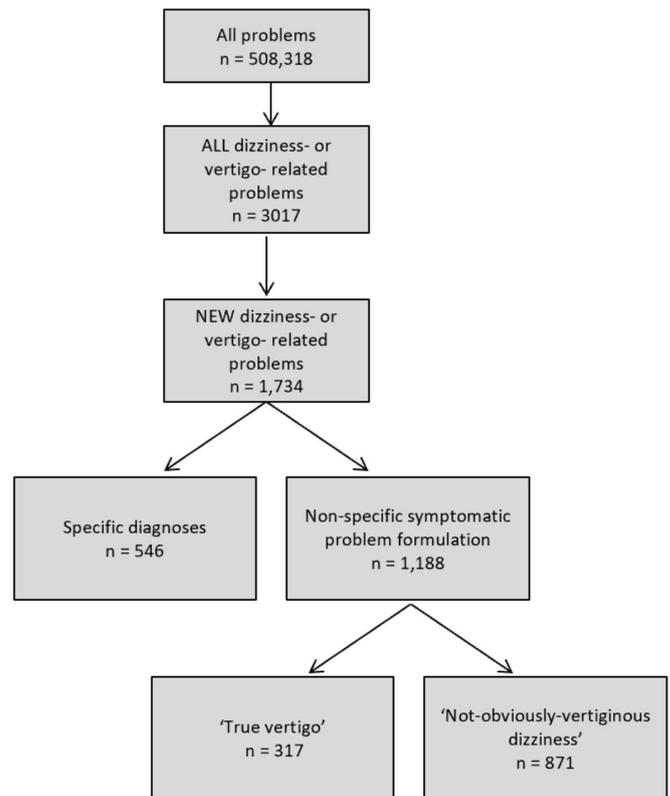


Figure 1 Flow chart of problems.

analysis with a restrictive sensitivity analysis addressed this inherent imprecision.

For both the primary and sensitivity analyses, univariate and multivariable logistic regression was conducted, within the generalised estimating equations framework to account for repeated measures within registrars. An exchangeable working correlation structure was assumed.

The multivariable regression was carried out as two models. In the first, ‘patient’, ‘registrar’, ‘practice’ and ‘consultation’ factors with $p < 0.20$ were entered in the model. In the second model, all these variables were entered in the model along with consultation action factors with $p < 0.20$. The rationale was that the first model provided evidence of associations of the diagnosis/problem formulation being made, unaffected by registrar actions taken as a result of the diagnosis/problem formulation made. The second model provided evidence of registrar actions taken, adjusted for the prior variables.

Covariates with a univariate $p < 0.2$ in univariate analysis were included in the multiple regression model, which was then assessed for model reduction. Covariates that were no longer significant (at $p < 0.2$) were tested for removal from the model and removed if any covariate in resulting model did not substantively change (by $> 10\%$). The Hosmer-Lemeshow test was used to assess model goodness of fit.

The sensitivity analysis was conducted in the same manner.

Table 1 Participating registrar and patient characteristics

Registrar variables (n=2333)		n (%)
Registrar gender	Male	866 (37.1)
Obtained primary medical degree overseas	Yes	447 (19.3)
Number of years worked in hospital prior to entering GP training	Mean±SD	3.4±3.4
Registrar round/practice variables (n=5470)		
Registrar age (years)	Mean±SD	32.5±6.3
Registrar works part time	Yes	1186 (22.4)
Registrar training term	Term 1	2191 (40.1)
	Term 2	1977 (36.1)
	Term 3	1302 (23.8)
Practice rurality/urbanicity	Major city	3279 (60.6)
	Inner regional	1406 (26.0)
	Outer regional, remote and very remote	725 (13.4)
Practice location Socio-economic status (SEIFA-IRSD index)	Mean±SD	5.4±2.8
Practice routinely bulk bills	Yes	1430 (26.4)
No. of GPs (FTE) working at the practice	1–4	1990 (37.7)
	5+	3289 (62.3)

FTE, full-time equivalent; GP, general practitioner; SEIFA-IRSD, Socioeconomic Index for Area – Index of Relative Social Disadvantage.

In post hoc analyses, the number per 100 problems/diagnoses of pathology and imaging tests ordered and procedures performed were calculated, and the duration of consultation was compared with that of consultations in the entire ReCEnT dataset (with Kruskal-Wallis rank test).

Statistical analyses were programmed using STATA V.14.1 and SAS V.9.4. P values <0.05 were considered statistically significant.

RESULTS

From 2010 to 2018, 2333 registrars (96% response rate) recorded details of 325 058 consultations and 508 318 individual problems/diagnoses. Registrar characteristics are presented in [table 1](#). Of all problems/diagnoses, 3017 (0.59% (95% CI 0.57 to 0.62)) were dizziness or vertigo related. Of these dizziness and vertigo problems, 1734 (0.34% (95% CI 0.32 to 0.36)) were new presentations. For our main outcome, 546 (31.5% (95% CI 29.2 to 33.9)) individual problem/diagnoses were new specific provisional diagnoses and 1188 (68.5% (95% CI 66.1 to 70.8)) were new non-specific symptomatic problem formulations.

The most common new specific vertiginous provisional diagnoses were benign paroxysmal positional vertigo (BPPV) (70%, n=381), labyrinthitis (13%, n=73) and vestibular neuritis/neuronitis (11%, n=50). The most common new non-specific symptomatic problem formulations were dizziness (41%, n=583), vertigo (27%, n=317) and light-headedness (19%, n=232).

Primary analysis

Characteristics associated with a new dizziness/vertigo problem/diagnosis being a specific vertigo provisional diagnosis or a non-specific symptomatic problem formulation are presented in [table 2](#).

Univariate and adjusted logistic regression models with primary outcome specific vertigo prognosis diagnosis versus a non-specific symptomatic problem formulation are presented in [table 3](#). On multivariable analysis, lower socioeconomic status of the practice location (OR 0.94 (95% CI 0.90 to 0.98)), longer consultation duration (by 2 min on unadjusted analysis) (1.02 (95% CI 1.00 to 1.03)), greater number of problems being addressed in the consultation (1.52 (95% CI 1.31 to 1.77)) and pathology (8.25 (95% CI 4.94 to 13.8)) and imaging (4.09 (95% CI 2.26 to 7.41)) being ordered were significantly associated with a non-specific symptomatic problem formulation. Seeking information from a non-supervisor source (0.39 (95% CI 0.28 to 0.53)), performing a procedure (0.49 (95% CI 0.28 to 0.85)) and prescribing medicine (0.32 (95% CI 0.24 to 0.43)) were significantly associated with the problem/diagnosis being a specific vertigo diagnosis. There was some evidence (p=0.12) for an association of seeking supervisor advice or assistance with the problem/diagnosis being a non-specific symptomatic problem formulation.

There were 1.69 pathology tests ordered per problem/diagnoses for a non-specific symptomatic problem formulation compared with 0.35 pathology tests per problem/diagnoses for a specific vertigo diagnosis. See [figure 2A](#) for pathology ordered and [figure 2B](#) for imaging ordered.

If a registrar performed a procedure during the consultation for a non-specific symptomatic problem formulation, 61% (n=36) involved performing a 12-lead ECG, 22% (n=13) were a BPPV manoeuvre and 7% (n=4, all prochlorperazine) an intramuscular injection. In contrast, for a specific vertiginous diagnosis, 88% (n=53) of recorded procedures involved a BPPV manoeuvre and 10% (n=6, five prochlorperazine, one metoclopramide) an intramuscular injection.

Mean consultation duration for specific diagnoses (22 min) and non-specific problem formulations (24 min) was significantly (p=0.001) greater than the mean across all ReCEnT consultations (19 min).

Sensitivity analysis

Of new non-specific symptomatic problem formulations, 317 (27%) were 'true vertigo' and 871 (73%) were 'not-obviously-vertiginous dizziness'. These 871 not-obviously-vertiginous dizziness presentations were excluded from our

Table 2 Characteristics associated with new non-specific symptomatic problem formulation compared with new specific vertigo diagnosis

Factor group	Variable	Class	Specific diagnosis, n (%)	Non-specific problem formulation, n (%)	P value*
Patient factors	Patient age group (years)	0–14	11 (2)	48 (4)	<0.001
		15–34	94 (18)	313 (27)	
		35–64	290 (54)	460 (40)	
		65–74	80 (15)	166 (14)	
		75+	58 (11)	176 (15)	
	Patient gender	Male	176 (33)	341 (30)	0.20
		Female	351 (67)	807 (70)	
	Aboriginal and/or Torres Strait Islander	No	509 (99)	1113 (99)	0.75
		Yes	4 (0.8)	9 (0.8)	
	Non-English-speaking background	No	474 (92)	995 (88)	0.019
Yes		42 (8)	133 (12)		
Patient/practice status	Existing patient	161 (30)	383 (33)	0.46	
	New to registrar	319 (60)	681 (59)		
	New to practice	52 (10)	97 (8)		
Registrar factors	Registrar gender	Male	229 (42)	412 (35)	0.012
		Female	317 (58)	776 (65)	
	Registrar full or part time	Part time	100 (19)	269 (23)	0.11
		Full time	424 (81)	886 (77)	
	Term	Term 1	218 (40)	466 (39)	0.31
		Term 2	189 (35)	457 (38)	
		Term 3	139 (25)	265 (22)	
	Obtained primary medical degree in Australia	No	118 (22)	199 (17)	0.041
		Yes	422 (78)	985 (83)	
Practice factors	Practice size†	Small	178 (34)	462 (40)	0.034
		Large	348 (66)	683 (60)	
	Practice routinely bulk bills	No	399 (74)	854 (73)	0.72
		Yes	140 (26)	318 (27)	
	Rurality	Major city	294 (55)	718 (61)	0.038
		Inner regional	171 (32)	298 (25)	
		Outer regional remote	74 (14)	156 (13)	
	Region	Region 1	124 (23)	273 (23)	0.95
		Region 2	37 (7)	75 (6)	
		Region 3	57 (10)	133 (11)	
Region 4		203 (37)	424 (36)		
Region 5		13 (2)	29 (2)		
Region 6		74 (14)	182 (15)		
Region 7		38 (7)	72 (6)		
SEIFA-IRSD index		mean (SD)	6 (3)	5 (3)	
Consultation factors	Sought help any source	None	351 (64)	885 (74)	<0.001

Continued

Table 2 Continued

Factor group	Variable	Class	Specific diagnosis, n (%)	Non-specific problem formulation, n (%)	P value*
		Supervisor	42 (8)	178 (15)	
		Other sources	153 (28)	125 (11)	
	Consultation duration	mean (SD)	22 (8)	24 (10)	<0.001
	Number of problems	mean (SD)	2 (1)	2 (1)	<0.001
Consultation action factors	Medication prescribed	No	214 (39)	913 (77)	<0.001
		Yes	332 (61)	275 (23)	
	Procedure performed	No	486 (89)	1132 (95)	<0.001
		Yes	60 (11)	56 (5)	
	Pathology ordered	No	521 (95)	777 (65)	<0.001
		Yes	25 (5)	411 (35)	
	Imaging ordered	No	527 (97)	955 (80)	<0.001
		Yes	19 (3)	233 (20)	
	Learning goals generated	No	333 (64)	772 (69)	0.025
		Yes	190 (36)	344 (31)	
	Follow-up ordered	None	270 (49)	428 (36)	<0.001
		GP appointment or phone	250 (46)	690 (58)	
		With someone else	26 (5)	70 (6)	
	Referral ordered	No	504 (92)	1081 (91)	0.33
		Yes	42 (8)	107 (9)	

*Frequencies of categorical variables compared between outcome categories using χ^2 tests. For continuous variables, means were compared using a t-test.
†Practice size defined as small if <5 full-time equivalent GPs.
GP, general practitioner; SEIFA-IRSD, Socioeconomic Index for Area – Index of Relative Social Disadvantage.

sensitivity analysis. For the sensitivity analysis outcome, 546 (63%) were a new specific vertigo diagnosis and 317 (37%) were a new non-specific vertigo symptomatic problem formulation.

Multivariable logistic regression models for the sensitivity analysis are presented in online supplemental material 2). Results were generally similar to the primary analysis, though p values for many associations were greater, and there were some discrepancies; notably, registrar gender and patient age were not included in the final model.

DISCUSSION

Summary of main findings and comparison with previous literature

To our knowledge, this is the first report of the clinical exposure of GP vocational trainees to vertigo-related problems/diagnoses.

There are, however, studies in established GPs. In Australia, GP registrars are seeing a similar proportion of dizziness and vertigo presentations as established GPs (0.59% vs 0.67%).²⁷ In a recent systematic review, Bösner *et al*³ determined that the prevalence of dizziness and vertigo significantly varied between primary care studies with a

range of 1.0%–15.5%. Grill *et al*²⁸ confirmed that irrespective of health system and nation, 2% of the adult population see primary care providers, predominately GPs, for vertigo annually.

Utilisation of additional sources of in-consultation information occurred for 36% of specific diagnoses and 26% of non-specific symptomatic problem formulations. This level of in-consultation information seeking is greater than for all problems/diagnoses by Australian GP trainees (15.4%).²⁹ The recourse to supervisor advice for 15% of non-specific symptomatic problem formulation is twice as frequently as registrars seek their supervisor's assistance for all problems/diagnoses (6.9%).²⁹ The level of support by other GPs and practice teams has been previously identified as a barrier to reaching a specific vertigo diagnosis.³⁰

Interpretation of findings

Duration and complexities of care

Consultation duration for non-specific presentations is significantly longer on univariate and multivariable analyses (by 2 min, unadjusted) than for specific provisional diagnosis consultations. An interpretation of the additional time may be in the inherent difficulty of making a diagnosis in presentations of vertigo/dizziness and the wide differential

Table 3 Associations with new non-specific symptomatic problem formulation (vs new specific vertigo diagnosis)

Factor group	Variable	Class	Univariate*		Adjusted*	
			OR (95% CI)	P value	OR (95% CI)	P value
Patient factors	Patient age group	0–14	1.28 (0.65 to 2.54)	0.47	1.28 (0.61 to 2.67)	0.51
		Comparator: 15–34	0.49 (0.38 to 0.64)	<0.001	0.51 (0.38 to 0.69)	<0.001
		65–74	0.67 (0.47 to 0.94)	0.022	0.69 (0.47 to 1.02)	0.066
		75+	0.93 (0.64 to 1.35)	0.70	0.95 (0.61 to 1.48)	0.82
	NESB*	Yes	1.54 (1.08 to 2.21)	0.019	1.30 (0.86 to 1.96)	0.21
Registrar factors	Registrar gender	Female	1.33 (1.06 to 1.66)	0.012	1.34 (1.03 to 1.74)	0.027
	Registrar FT or PT*	Part time	1.24 (0.96 to 1.60)	0.11	1.19 (0.88 to 1.61)	0.25
	Obtained primary medical degree in Australia	Yes	1.34 (1.01 to 1.77)	0.041	1.40 (0.99 to 2.00)	0.06
Practice factors	Practice size†	Small	1.27 (1.02 to 1.59)	0.034	1.17 (0.91 to 1.52)	0.22
	SEIFA-IRSD index		0.97 (0.93 to 1.00)	0.088	0.94 (0.90 to 0.98)	0.007
Consultation factors	Sought help any source	Other sources	0.32 (0.25 to 0.42)	<0.001	0.39 (0.28 to 0.53)	<0.001
	Comparator: none	Supervisor	1.58 (1.12 to 2.24)	0.01	1.39 (0.92 to 2.09)	0.12
	Consultation duration		1.03 (1.02 to 1.04)	<0.001	1.02 (1.00 to 1.03)	0.016
	Number of problems		1.68 (1.47 to 1.92)	<0.001	1.52 (1.31 to 1.77)	<0.001
Consultation action factors	Medication prescribed	Yes	0.20 (0.16 to 0.25)	<0.001	0.32 (0.24 to 0.43)	<0.001
	Procedure performed	Yes	0.41 (0.28 to 0.61)	<0.001	0.49 (0.28 to 0.85)	0.011
	Pathology ordered	Yes	10.5 (7.06 to 15.6)	<0.001	8.25 (4.94 to 13.8)	<0.001
	Imaging ordered	Yes	6.34 (4.03 to 9.99)	<0.001	4.09 (2.26 to 7.41)	<0.001
	Learning goals generated	Yes	0.77 (0.62 to 0.97)	0.025	0.95 (0.70 to 1.31)	0.76

*OR and p values from logistic regression models: univariate and multivariable logistic regression, respectively'.

†Practice size defined as small if <5 full-time equivalent GPs.

FT, full time; GPs, general practitioners; NESB, non-English speaking background; PT, part time; SEIFA-IRSD, Socioeconomic Index for Area – Index of Relative Social Disadvantage.

diagnoses.³ In presentations that are not straightforward (ie, without a readily apparent diagnosis), registrars may be performing detailed neurological, otological, psychological and cardiac histories and examinations in pursuing an elusive diagnosis. Furthermore, comparison with the shorter duration of non-vertigo/dizziness consultations suggests that vertigo/dizziness presentations are inherently complex or challenging.

We found addressing more problems/diagnoses in the index consultation and having a lower practice SEIFA-IRSD decile (ie, being in an area of greater socioeconomic disadvantage) to be associated with a non-specific diagnosis. Lower SES populations have greater levels of multimorbidity,³¹ have more complex medical issues and are vulnerable to suboptimal quality care.^{32–34} It may be that having additional problems to deal with concurrently in the index consultation and the greater complexity and multimorbidity that come with greater social disadvantage contribute to the difficulty of making a specific provisional diagnosis, at least in the initial consultation, for the dizziness/vertigo presentation. Our findings regarding accessing supervisor support (for non-specific diagnoses OR 1.39, though $p>0.05$) may reflect the increased level of support GP registrars receive

from their supervisors when needed and the importance of the supervisor role in helping registrars navigate the diagnostic uncertainty of vertigo/dizziness presentations.

Investigations and procedures

The range of pathology and imaging investigations ordered reflects the broad differential list for presentations of dizziness and vertigo. The relative lack of pathology tests ordered for specific vertigo diagnosis is likely driven by the significant proportion of BPPV presentations. The volume and diversity of investigations ordered for non-specific problem formulations suggests the registrars are not accepting of a continuing lack of specific vertigo diagnoses and may be appropriately investigating; in a majority of cases looking for a cardiac cause.

The reported use of a positioning manoeuvre for BPPV is far less frequent than the rate of BPPV diagnosis. While this may be due to the therapeutic manoeuvre being deferred to a later consultation, more likely it reflects registrars not using the therapeutic positioning manoeuvres (principally the Epley manoeuvre) in their practice.³⁵ A recent study from the Netherlands found that GPs underused the procedure due to lack of confidence and knowledge in

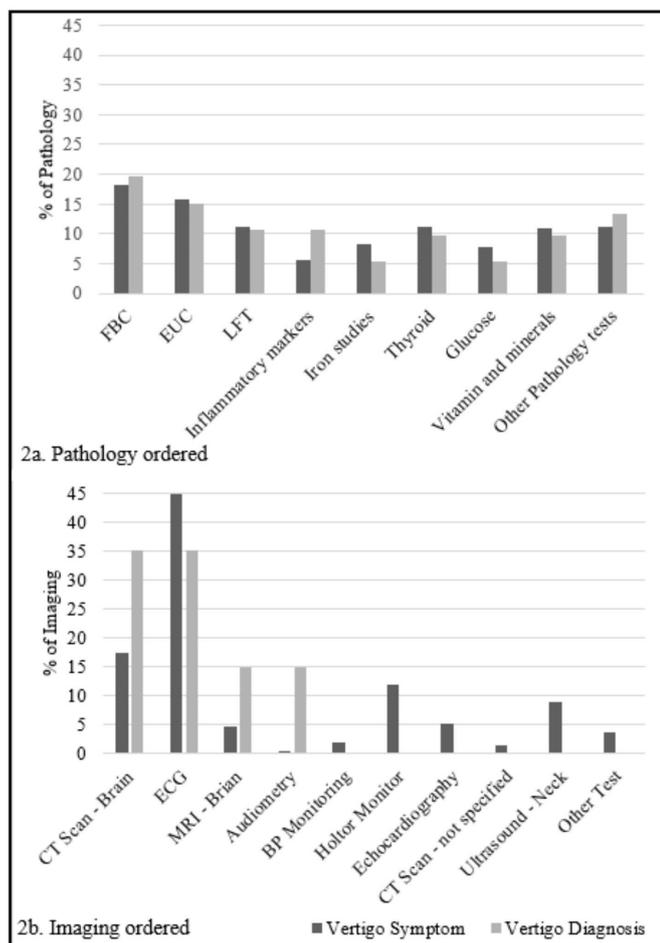


Figure 2 Investigations ordered by registrars. BP, blood pressure; FBC, full blood count; LFT, liver function test; UE, urea electrolytes creatinine.

performing the manoeuvre, and in a German study, only 10% of patients with BPPV were managed with positioning manoeuvres.^{35 36} Other studies showed that GP trainers (supervisors of registrars/trainees) were more likely to perform positioning manoeuvres than were GPs who did not supervise registrars/trainees,³⁵ and GPs who received training on the manoeuvres were easily able to incorporate them into their practice with good effect.^{28 37} We also found some instances of non-specific diagnoses that were managed with a positioning manoeuvre. Presumably, this reflects a relative lack of confidence in this potentially difficult diagnostic situation combined with a confidence of the manoeuvre being low risk.

Strengths and limitations

To our knowledge, ReCEnT is the largest study worldwide of general practice trainees. It includes registrars from a wide geographical area of Australia across urban, regional, rural and remote communities from five of the six Australian states plus one federal territory. For a study recruiting GPs, the response rate is particularly high.³⁸ There is strong generalisability of the study to GP vocational training across Australia, and our findings will have relevance to other countries with similar GP specialist vocational training

structures. The large sample size and independent variables collected enables a granular analysis of the associations of registrars' consultations with patients presenting with vertigo-related symptoms.

As this study is a cross-sectional analysis of patient consultations and as such our methodology cannot establish causality in the associations. In addition, we cannot provide information on contextual factors such as comorbidities or regular medications at index consultations, and we do not know the final diagnosis if made in later consultations.

Implications for primary care

The implications for practice and GP registrar education are predicated on this being recognised as a difficult clinical area and on the initial presentation being a narrow window of opportunity for diagnoses and management of medical emergencies (TIA, minor stroke and serious cardiac conditions). Registrars are appropriately calling on their supervisors for diagnostic purposes and are often doing investigations for non-specific problem presentations. This suggests registrars need the continued support of their supervisors and further exposure to these presentations in order to gain confidence in their management.

The relatively infrequent use of the Epley manoeuvre for BPPV suggests that specific training in its use is indicated in GP training. The likely lack of expertise in use of the Epley manoeuvre reflected in our findings also raises the issue of expertise in use of the related Dix-Hallpike manoeuvre as a diagnostic procedure. It may be that an increase in the proportion of specific vertigo diagnoses could be effected by better training in the Dix-Hallpike manoeuvre. A key consideration is that, if typical positioning nystagmus for BPPV is evident on Dix-Hallpike's manoeuvre, it is a relatively simple step to proceed directly to the Epley manoeuvre as a therapeutic intervention.

Implications for future research

This study adds to the epidemiological data for dizziness and vertigo in general practice. It would be beneficial to investigate the management of BPPV and its associations as a large proportion of vertiginous presentations and management were driven by this diagnosis.

CONCLUSIONS

GP registrars encounter presentations with dizziness/vertigo relatively frequently. In a majority of instances, a specific provisional diagnosis is not made at the first consultation. This is consistent with the accepted inherent difficulty in diagnosing these presentations. Given the utility in making specific rather than non-specific provisional diagnoses for dizziness/vertigo, and our findings regarding in-consultation sources of assistance, continuing emphasis on this as a learning area in GP vocational training and encouragement of supervisor real-time involvement in the diagnostic process are indicated.

Author affiliations

¹The University of Newcastle School of Medicine and Public Health, Callaghan, New South Wales, Australia

²NSW & ACT Research and Evaluation Unit, GP Synergy, Regional Training Organisation, Newcastle, New South Wales, Australia

³The Sydney Partnership for Health, Education, Research and Enterprise (SPHERE), Sydney, New South Wales, Australia

⁴Department of Neurology, John Hunter Hospital, Newcastle, New South Wales, Australia

⁵Primary Care Clinical Unit, The University of Queensland Faculty of Medicine, Brisbane, Queensland, Australia

⁶Clinical Research Design and Statistical Support Unit (CRDITSS), The University of Newcastle Hunter Medical Research Institute, New Lambton, New South Wales, Australia

⁷Eastern Victoria General Practice Training, Regional Training Organisation, Hawthorn, Victoria, Australia

⁸Department of General Practice and Primary Health Care, The University of Melbourne, Melbourne, Victoria, Australia

⁹General Practice Training Tasmania, Regional Training Organisation, Hobart, Tasmania, Australia

¹⁰University of Tasmania School of Medicine, Hobart, Tasmania, Australia

Contributors All authors contributed to the conception and design of study. JL and AT prepared the data set for analysis, and EGH and JB carried out the analysis. JL, AT, CL and PM completed the data interpretation. JL, AT and PM drafted the manuscript. All authors discussed, revised, critically appraised and approved the final manuscript. AT and PM supervised this project. PM is the guarantor.

Funding The Registrar Clinical Encounters in Training (ReCEnT) project was funded from 2010 to 2015 by the participating educational organisations: General Practice Training Valley to Coast, the Victorian Metropolitan Alliance, General Practice Training Tasmania, Adelaide to Outback GP Training Program and Tropical Medical Training, all of which were funded by the Australian Department of Health (DoH). From 2016 to 2019, ReCEnT was funded by a DoH commissioned research grant (no award/grant number) and supported by GP Synergy RTO. From 2019, ReCEnT is conducted by GP Synergy in collaboration with Eastern Victoria GP Training and General Practice Training Tasmania. GP Synergy, Eastern Victoria GP Training and General Practice Training Tasmania are funded by the DoH. JL was supported by a GP Synergy Medical Student Scholarship.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval The ReCEnT study has ethical approval from the University of Newcastle Human Research Ethics Committee Reference H-2009-0323.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. The data underlying this article cannot be shared publicly due to ethics requirements which protect the privacy of individuals that participated in the study.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

REFERENCES

- Sloane PD. Dizziness in primary care. results from the National ambulatory medical care survey. *J Fam Pract* 1989;29:33–8.
- Gopinath B, McMahon CM, Rochtchina E, *et al*. Dizziness and vertigo in an older population: the blue Mountains prospective cross-sectional study. *Clin Otolaryngol* 2009;34:552–6.
- Bösner S, Schwarm S, Grevenrath P, *et al*. Prevalence, aetiologies and prognosis of the symptom dizziness in primary care - a systematic review. *BMC Fam Pract* 2018;19:33.
- Weligampola MS, Bradshaw AP, Lechner C, *et al*. Bedside assessment of acute dizziness and vertigo. *Neurol Clin* 2015;33:551–64.
- Hanley K, O'Dowd T, Considine N. A systematic review of vertigo in primary care. *Br J Gen Pract* 2001;51:666–71.
- Edlow JA, Newman-Toker DE, Savitz SI. Diagnosis and initial management of cerebellar infarction. *Lancet Neurol* 2008;7:951–64.
- Tarnutzer AA, Berkowitz AL, Robinson KA, *et al*. Does my dizzy patient have a stroke? A systematic review of bedside diagnosis in acute vestibular syndrome. *CMAJ* 2011;183:E571–92.
- Sloane PD, Coeytaux RR, Beck RS, *et al*. Dizziness: state of the science. *Ann Intern Med* 2001;134:823–32.
- Neuhauser HK, Radtke A, von Brevern M, *et al*. Burden of dizziness and vertigo in the community. *Arch Intern Med* 2008;168:2118–24.
- Weidt S, Bruhl AB, Straumann D, *et al*. Health-related quality of life and emotional distress in patients with dizziness: a cross-sectional approach to disentangle their relationship. *BMC Health Serv Res* 2014;14:1–9.
- Benecke H, Agus S, Kuessner D, *et al*. The burden and impact of vertigo: findings from the revert patient registry. *Front Neurol* 2013;4:136.
- Wang X, Strobl R, Holle R, *et al*. Vertigo and dizziness cause considerable more health care resource use and costs: results from the KorA FF4 study. *J Neurol* 2019;266:2120–8.
- Grill E, Strupp M, Müller M, *et al*. Health services utilization of patients with vertigo in primary care: a retrospective cohort study. *J Neurol* 2014;261:1492–8.
- Anna-Janina S, Eva K, Amanda P. Barriers and facilitators for the management of vertigo: a qualitative study with primary care providers. *Implement Sci* 2018:1.
- Paul NLM, Simoni M, Rothwell PM. Transient isolated brainstem symptoms preceding posterior circulation stroke: a population-based study. *Lancet Neurol* 2013;12:65–71.
- Savitz SI, Caplan LR, Edlow JA. Pitfalls in the diagnosis of cerebellar infarction. *Acad Emerg Med* 2007;14:63–8.
- Coull AJ, Lovett JK, Rothwell PM. Population based study of early risk of stroke after transient ischaemic attack or minor stroke: implications for public education and organisation of services. *BMJ* 2004;328:326.
- Gandolfi MM, Reilly EK, Galatioto J, *et al*. Cost-Effective analysis of unilateral vestibular weakness investigation. *Otol Neurotol* 2015;36:277–81.
- Bird JC, Beynon GJ, Prevost AT, *et al*. An analysis of referral patterns for dizziness in the primary care setting. *Br J Gen Pract* 1998;48:1828–32.
- Dommaraju S, Perera E. An approach to vertigo in general practice. *Aust Fam Physician* 2016;45:190–4.
- Cranfield S, Mackenzie I, Gabbay M. Can GPs diagnose benign paroxysmal positional vertigo and does the Epley manoeuvre work in primary care? *Br J Gen Pract* 2010;60:698–9.
- Walther LE. Current diagnostic procedures for diagnosing vertigo and dizziness. *GMS Curr Top Otorhinolaryngol Head Neck Surg* 2017;16:Doc02.
- Royal Australian College of General Practitioners. General practice career guide, 2019. Available: <https://www.racgp.org.au/FSDEDEV/media/documents/Education/Students/A%20career%20in%20general%20practice/RACGP-General-practice-career-guide.PDF> [Accessed Nov 2019].
- Numata K, Shiga T, Omura K, *et al*. Comparison of acute vertigo diagnosis and treatment practices between Otolaryngologists and non-otolaryngologists: a multicenter scenario-based survey. *PLoS One* 2019;14:e0213196.
- Morgan S, Magin PJ, Henderson KM, *et al*. Study protocol: the registrar clinical encounters in training (recent) study. *BMC Fam Pract* 2012;13:50.
- Magin P, Morgan S, Henderson K. The registrars' clinical encounters in training (recent) project: educational and research aspects of documenting general practice trainees' clinical experience. *Aust Fam Physician* 2015;44:681–4.
- Britt H, Miller G, Henderson J. General practice activity in Australia 2015–16. In: *General practice series No. 40*. Sydney: Sydney University Press, 2016: 43–6.
- Grill E, Penger M, Kentala E. Health care utilization, prognosis and outcomes of vestibular disease in primary care settings: systematic review. *J Neurol* 2016;263 Suppl 1:S36–44.
- Magin P, Morgan S, Wearne S, *et al*. GP trainees' in-consultation information-seeking: associations with human, paper and electronic sources. *Fam Pract* 2015;32:525–32.



- 30 Stephan A-J, Kovacs E, Phillips A, *et al.* Barriers and facilitators for the management of vertigo: a qualitative study with primary care providers. *Implement Sci* 2018;13:25.
- 31 Pathirana TI, Jackson CA. Socioeconomic status and multimorbidity: a systematic review and meta-analysis. *Aust N Z J Public Health* 2018;42:186–94.
- 32 Vogeli C, Shields AE, Lee TA, *et al.* Multiple chronic conditions: prevalence, health consequences, and implications for quality, care management, and costs. *J Gen Intern Med* 2007;22 Suppl 3:391–5.
- 33 Uijen AA, van de Lisdonk EH. Multimorbidity in primary care: prevalence and trend over the last 20 years. *Eur J Gen Pract* 2008;14 Suppl 1:28–32.
- 34 Violán C, Foguet-Boreu Q, Roso-Llorach A, *et al.* Burden of multimorbidity, socioeconomic status and use of health services across stages of life in urban areas: a cross-sectional study. *BMC Public Health* 2014;14:530.
- 35 van Vugt VA, Diaz Nerio PM, van der Wouden JC, *et al.* Use of canalith repositioning manoeuvres and vestibular rehabilitation: a GP survey. *Scand J Prim Health Care* 2017;35:19–26.
- 36 von Brevem M, Radtke A, Lezius F, *et al.* Epidemiology of benign paroxysmal positional vertigo: a population based study. *J Neurol Neurosurg Psychiatry* 2007;78:710–5.
- 37 Hanley K, O' Dowd T. Symptoms of vertigo in general practice: a prospective study of diagnosis. *Br J Gen Pract* 2002;52:809–12.
- 38 Bonevski B, Magin P, Horton G, *et al.* Response rates in GP surveys - trialling two recruitment strategies. *Aust Fam Physician* 2011;40:427–30.

Appendix 1.**ICPC-2 Codes used in analysis classified by specific diagnosis verses non-specific diagnosis**

<i>Specific Diagnosis</i>	<i>ICPC-2 Code</i>	<i>Non-specific diagnosis</i>	<i>ICPC-2 Code</i>
Vertigo;benign positional	H82:013	Dizziness	N17:001
Labyrinthitis	H82:010	Vertigo	N17:009
Vestibular neuritis	H82:012	Lightheadedness	N17:011
Neuritis;vestibular	H82:014	Feeling;dizzy	N17:002
Disease;Menieres	H82:003	Disturbed;balance	N17:013
Cerebellar syndrome	N99:041	Unsteadiness	N29: 026
Disorder;vestibular system	H82:002	Funny turn	N17:015
Trauma;acoustic	H85:001	Feeling;faint	N17:014
Vertigo;Menieres	H82:008	Giddiness	N17:004
Cerebellar ataxia	N99:001	Loss (of);balance	N17:005
Disorder;labyrinth	H82:001	Loss (of);equilibrium	N17:012
Vertigo;otogenic	H82:009		

Supplementary material 2.**Sensitivity analysis: Associations with symptomatic problem formulation compared to new vertigo diagnosis.**

Factor group	Variable	Class	Univariate		Adjusted	
			OR [95% CI]	p	OR [95% CI]	p
Patient factors	Patient gender	Female	1.44 (1.06, 1.94)	0.0182	1.25 (0.89, 1.76)	0.1896
Registrar factors	Registrar FT or PT	Part-time	1.36 (0.97, 1.90)	0.0743	1.20 (0.83, 1.73)	0.3254
	Qualified as doctor in Australia	Yes	1.33 (0.90, 1.96)	0.1489	1.43 (0.89, 2.28)	0.1354
Practice factors	Rurality	Inner regional	0.71 (0.50, 1.00)	0.0530	0.85 (0.57, 1.25)	0.4027
	Comparator: Major city	Outer regional remote	1.09 (0.73, 1.65)	0.6721	1.34 (0.84, 2.13)	0.2159
Consultation factors	Sought help any source	Other sources	0.75 (0.54, 1.05)	0.0966	0.87 (0.60, 1.27)	0.4750
	Comparator None	Supervisor	2.24 (1.46, 3.44)	0.0002	2.28 (1.37, 3.81)	0.0015
	Consultation duration		1.03 (1.02, 1.05)	<.0001	1.02 (1.00, 1.04)	0.0418
	Number of problems		1.47 (1.26, 1.71)	<.0001	1.43 (1.20, 1.71)	<.0001
Consultation action factors	Procedure performed	Yes	0.57 (0.33, 1.01)	0.0545	0.52 (0.27, 1.00)	0.0493
	Imaging ordered	Yes	3.25 (2.00, 5.28)	<.0001	2.82 (1.54, 5.15)	0.0007
	Pathology ordered	Yes	2.86 (1.74, 4.70)	<.0001	1.87 (0.97, 3.63)	0.0627
	Follow-up ordered	GP appt or phone	1.53 (1.15, 2.03)	0.0036	1.38 (0.97, 1.94)	0.0710
	Comparator: None	With someone else	1.10 (0.56, 2.14)	0.7819	1.31 (0.59, 2.93)	0.5034