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Manuscript title: Referrals to dietitians/nutritionists – a cross-sectional analysis of Australian GP registrars' clinical practice

Running head: GP registrar referrals to dietitians/nutritionists

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Abstract

Aim: This study aimed to describe referral patterns of GP registrars to dietitians/nutritionists. There is a paucity of research regarding GP referral patterns to dietitians/nutritionists. Limited data shows increasing referrals from established GPs to dietitians/nutritionists. There is no data on GP registrar (trainee) referrals.

Methods: This was a cross-sectional analysis of data from the Registrar Clinical Encounters in Training (ReCEnT) study. ReCEnT is an ongoing, multicentre prospective cohort study of registrars which documents 60 consecutive consultations of each registrar in each of three 6-month GP training terms. The outcome factor in this analysis was a problem/diagnosis resulting in dietitian/nutritionist referral (2010-2015). Independent variables were related to registrar, patient, practice and consultation.

Results: A total of 1124 registrars contributed data from 145,708 consultations. Of 227,190 problems/diagnoses, 587 (0.26% [CI: 0.23-0.29]) resulted in dietitian/nutritionist referral. The most common problems/diagnoses referred related to overweight/obesity (27.1%) and Type 2 Diabetes (21.1%). Of referrals to a dietitian/nutritionist, 60.8% were for a chronic disease and 38.8% were related to a Chronic Disease Management plan. Dietitian/nutritionist referral was significantly associated with a number of independent

variables reflecting continuity of care, patient complexity, chronic disease, health equity and registrar engagement.

Conclusions: Established patients with chronic disease and complex care needs are more likely than other patients to be referred by registrars to dietitians/nutritionists. Nutrition behaviours are a major risk factor in chronic disease and we have found evidence for dietitian/nutritionist referrals representing one facet of engagement by registrars with patients' complex care needs.

Key words: chronic disease, education, graduate, general practice, medical, nutritionist, referral.

Introduction

Medical nutrition therapy is an important management tool for a number of acute and chronic conditions and dietitians are trained specifically in the field of applying nutrition therapy to medical conditions. Much dietetic input into acute disease management is undertaken in secondary care, mainly hospitals but dietetic involvement in chronic disease, especially lifestyle related chronic disease, is dealt with predominantly in the primary care sector.[1]

Nutrition and diet are widely acknowledged to be major factors in the prevention and treatment of chronic disease.[2] The increasing prevalence of chronic diseases has been recognised by the World Health Organisation (WHO) as a global health burden.[2] Chronic

diseases are common in Australia and are the leading cause of illness, disability and death, accounting for 90% of deaths in 2011.[3]

A study of established General Practitioners (GPs) in Australia found that approximately 40% of consultations included chronic disease management.[4] These GPs often encounter presentations of chronic disease where nutrition is a significant factor, with hypertension (8 per 100 consultations), diabetes (4 per 100 consultations) and lipid disorders (3 per 100 consultations) being among the most frequently managed conditions.[4] In addition to this, more than half of adult general practice patients are classed as overweight or obese.[5] As Australia's ageing population continues to grow, so too will the prevalence of chronic disease and the burden this places on health service provision.[6]

The GP consultation offers an opportunity to provide lifestyle modification advice and/or refer to allied health practitioners such as dietitians, podiatrists, physiotherapists and exercise physiologists. Data from established GPs in Australia found that almost 10% of all non-pharmacological clinical treatments were related to counselling or advice for nutrition/weight, and that this occurred in 3.8 per 100 consultations.[4] A review looking at the role of GPs and dietitians in patient nutrition management has identified a number of barriers to GPs providing nutrition education including limited nutrition training, a lack of knowledge and skills, lack of time, inadequate reimbursement and difficulty translating knowledge into practice.[7] A multidisciplinary approach to healthcare has shown to be an effective approach in improving patient health outcomes[8] and is routinely recommended internationally.[9-13] Furthermore, advice from dietitians has been found to be more effective

than advice from GPs in reducing blood cholesterol levels,[14] and the combined care of a GP and dietitian has been demonstrated to be more effective in addressing weight management and hypertension compared to individual GP or dietitian management.[15] Thus patterns of GP referral to dietitians to provide specialist nutrition counselling and education is of considerable clinical significance.

There is very little research regarding the referral patterns to dietitians/nutritionists from GPs. Limited data shows that the rate of referral from established GPs to dietitians/nutritionists has been increasing steadily over time,[16] coincident with an increase in the private practice dietetics workforce.[17]

GP registrars (vocational trainees in general practice) are a group of particular interest regarding dietetic referrals. They are entering practice and establishing future clinical behaviour at a time when the multidisciplinary team approach in general practice is becoming well-accepted. A study of Australian GP registrars found that, compared to their established GP colleagues, a considerably smaller proportion (30%) of consultations included a chronic disease.[18] However, there is no data on registrar dietetic referrals. This study aimed to fill this evidence gap and describe the referral patterns of GP registrars to dietitians/nutritionists. The Registrar Clinical Encounters in Training (ReCEnT) study of GP registrars' clinical practice provides a means of addressing this issue.

Methods

This was a cross-sectional analysis of data from the ReCEnT study. ReCEnT is an ongoing, multicentre prospective cohort study of GP registrars in five of the 17 Regional Training Providers (RTPs) that encompass the whole of Australia. Participating RTPs were in five of the six Australian states. Registrars in general practice training posts operate within an apprenticeship-like model (with access to advice and assistance when needed from a senior GP supervisor) but with considerable autonomy, including capacity to make referrals equivalent to their more experienced GP peers.

In ReCEnT, registrars document the nature and associations of their in-practice consultation-based clinical and educational experiences. The study protocol is described in detail elsewhere.[19] Briefly, registrar demographics and practice data are documented at the start of each data collection period (six-monthly for full-time registrars, twelve-monthly for part-time registrars). At approximately the mid-point of each of a registrar's three six-month (full-time equivalent) general practice training terms, registrars complete paper-based forms recording details of sixty consecutive consultations. These details include the patient demographics and clinical aspects of each consultation.

The outcome factor in this study was whether a problem/diagnosis resulted in referral to a dietitian/nutritionist. We defined referral to a dietitian or nutritionist as those referrals coded as International Classification of Primary Care, second edition classification system (ICPC-2 plus) codes D66 001 (Referral; dietitian/nutrition) and A66 016 (Referral; dietitian/nutritionist).

Registrar variables were: age, gender, training term, whether in full-time or part-time (less than 32 hours per week) training, place of primary medical qualification (Australia or international), and whether the registrar had worked at the practice in a previous term. The RTP with which the registrar trained was also an independent variable.

Practice variables recorded were: size (small practice considered <6 doctors) and whether the practice routinely bulk-bills (that is, government subsidy is accepted as full payment and there is no cost to the patient). Practice postcode was used to determine the Australian Standard Geographical Classification-Remoteness Area (ASGC-RA) classification to define the practice locations' degree of rurality (very remote, remote, outer regional, inner regional or major city location)[20] and Socioeconomic Index for Area (SEIFA) Index of Disadvantage.[21]

Patient variables recorded were: age, gender, Aboriginal or Torres Strait Islander status, non-English speaking background (NESB) status, the patient being new to the practice, and the patient being new to the registrar.

Consultation variables recorded were: duration, the nature and number of problems/diagnoses managed, and whether pathology or imaging tests were ordered, or follow-up arranged. Educational factors included whether the trainee sought advice or information during the consultation (from their supervisor or other resources, such as specialists, books or electronic resources), or generated learning goals.

Two further consultation variables recorded (but not included as independent variables in multivariable analyses) were billing and the problems/diagnoses managed in the

consultation. The means of billing (bulk-billing, private billing, etc.) and individual billing items (using Medicare Benefits Schedule (MBS) item numbers) were recorded. Problems/diagnoses were coded according to the International Classification of Primary Care, second edition classification system (ICPC-2 plus). Problems/diagnoses were also classified as being new or pre-existing, and as being a chronic disease (classified according to the methodology of O'Halloran et al)[22] or not. For descriptive purposes, individual ICPC-2 codes were grouped with clinically-congruent codes to create clinically meaningful categories of problems/diagnoses. The grouping was performed collaboratively by two members of the research team, a dietitian and a GP.

The analyses in this study used data from eleven collection periods during 2010-2015. Individual RTPs participated in three to eleven rounds of data collection depending on each RTP's date of commencement in the study.

The unit of analysis was the individual problem/diagnosis rather than the registrar consultation.

The proportion of problems/diagnoses resulting in a referral to a dietitian/nutritionist were calculated with 95% Confidence Intervals.

Initial univariate analyses of relationships between independent variables and the outcome were performed using chi-squared and Wilcoxon rank-sum for categorical and continuous variables, respectively.

To test associations of a problem/diagnosis being referred to a dietitian/nutritionist, simple and multiple logistic regression were used within a generalised estimating equation

(GEE) framework to account for the repeated measures within registrars. All variables with a p-value <0.2 and relevant effect size in the univariate analysis were included in the multiple regression models. Variables which had a small effect size and were no longer significant in the multivariate model were removed from the final model as long as removal of the variable did not change the resultant model.

In an ad hoc analysis the Odds Ratio for consultations resulting in referrals to dietitians/nutritionists being bulk-billed was calculated using simple logistic regression within a GEE framework.

Statistical analyses were completed using Stata 13.1. Variables were considered significant if the p-value was <0.05.

The ReCEnT project has approval from the University of Newcastle Human Research Ethics Committee, Reference H-2009-0323. Compliance with STROBE has been addressed separately.

Results

A total of 1124 registrars (response rate 95.7%) contributed data from 145,708 consultations to the analysis. The demographics of registrars and practices, and consultation variables are presented in Appendix I. Of 227,190 problems/diagnoses, 587 (0.26% [95% CI: 0.23-0.29]) resulted in referral to a dietitian/nutritionist.

The most common problems/diagnoses referred to a dietitian/nutritionist were related to Overweight/Obesity, Type 2 Diabetes/Pre-diabetes, Elevated Lipids and Gastro-

Intestinal Symptoms. The twelve most common problems/diagnoses referred to a dietitian/nutritionist are presented in Table 1. Of all referrals to a dietitian/nutritionist, 60.8% were for a chronic disease.

Of the referrals to a dietitian/nutritionist, 38.8% were related to a Chronic Disease Management plan (MBS items 721, 723, 732). Furthermore, 70.2% of consultations which resulted in referral to a dietitian/nutritionist were bulk-billed by the registrar and there was a significant association of referral to a dietitian/nutritionist and bulk-billing of the consultation.

Characteristics associated with referral to a dietitian/nutritionist are presented in Table 2. The multiple logistic regression models for referral to a dietitian/nutritionist are presented in Table 3. In the adjusted model, patient age (15-64 years) and being an existing patient of the registrar and of the practice were significantly associated with referral to a dietitian/nutritionist. There were no significant registrar variables associated with referral.

Practice variables associated with referral to a dietitian/nutritionist were smaller practice size and being a wholly bulk-billing practice.

Consultation variables associated with referral to a dietitian/nutritionist included longer consultation duration, more problems per consultation, ordering less imaging, ordering more pathology, and the problem/diagnosis being a chronic disease. Additionally, referral to a dietitian/nutritionist was significantly associated with the registrar organising in-practice follow-up and generating more learning goals.

Discussion

Registrar rates of referral to dietitians/nutritionists are comparable to those of established GPs, with registrars making 0.26 referrals per 100 problems (compared to 0.2 per 100 problems in established GPs) and 0.40 per 100 consultations (compared to 0.4 per 100 consultations in established GPs).[16]

A number of important considerations emerged from our results concerning continuity of care, patient complexity, registrar engagement, chronic disease and health equity.

The significant associations of a longer consultation time, chronic disease, more problems per consultation, ordering more pathology and the generation of registrar learning goals taken together are likely to reflect an increased medical complexity of the patients being referred to a dietitian/nutritionist. The significant association of registrars generating learning goals, as well as reflecting complexity, could also reflect the limited nutrition content of undergraduate and postgraduate medical education and training.[7] This finding supports the demonstrated barrier of a lack of nutrition knowledge preventing GPs from providing nutrition counselling.[7,23]

The significant associations of longer consultation time, organising in-practice follow-up and the patient having been seen previously by the registrar suggest an element of continuity of care between the registrar and patients referred to dietitians/nutritionists. The implication is that referrals to a dietitian/nutritionist are part of an ongoing engagement with the patient rather than an expedient 'triage' to the dietitian. The increased likelihood

of a registrar generating a learning goal when referring to a dietitian/nutritionist further demonstrates registrar engagement with the nutrition-related problem/diagnosis encountered during the consultation.

This level of registrar engagement has not always been evident in other ReCEnT analyses. Analyses of continuity of care in registrars' consultations, and of consultations with older patients and patients with chronic disease have suggested limited therapeutic engagement in these areas.[18,24,25] Our finding in this analysis of a non-significant trend for older patient age being associated with less dietitian/nutritionist referral than middle-aged patients (despite increasing diet-related morbidity with age [2]) may reflect a general lack of engagement with the management of older patients[18,24,25] being evident also in diet-related aspects of health.

The role of medical practitioners and dietitians/nutritionists in the management of the increasing burden of chronic disease is highlighted in multiple areas of the results. Over half (60.8%) of referrals were for a chronic disease, almost 40% of referrals related to a Chronic Disease Management (CDM) plan, and the top three reasons for referral were associated with overweight/obesity, Type 2 diabetes/Pre-diabetes or elevated lipid levels. Clinical guidelines for the management of overweight/obesity, diabetes and coronary heart disease either encourage or recommend referral to a dietitian in the multi-disciplinary management of these conditions both in Australia and internationally.[9-13,26-29] Our data do not allow us to assess what proportion of all patients with particular conditions receive referrals to dietitians/nutritionists at any point (that is, at consultations not recorded in our limited data

collection period, or referrals from non-GPs, or self-referrals). However, the total referrals for chronic disease (0.16%) may appear to be low given the high prevalence of Type 2 diabetes (12%),[30] Pre-diabetes (16%)[31] and overweight/obesity (63%)[32] in the Australian adult population. It is not clear, despite the suggestive referral patterns found in our analysis, whether dietitians/nutritionists are being involved to an optimal extent in the general practice management of these patients. Previous research of Australian GPs has identified perceived barriers to GPs making a referral to a dietitian including cost to the patient, accessibility of dietitian services, patient willingness to attend a dietetic consultation and whether the GP considers the patient capable of committing to dietary change.[23,33] These barriers may be contributing to what appear to be quite modest numbers of referrals found in our study.

Aspects of health equity with regard to dietitian/nutritionist referral were evident in our results with registrars in fully bulk billing practices more likely to refer, along with a large proportion of referrals being related to a CDM plan. Consultations which resulted in referral to a dietitian/nutritionist were more likely to be bulk-billed compared to those that did not refer. These factors assist individuals by reducing the cost associated with both the GP consultation and/or the dietitian/nutritionist consultation. In Australia, chronic disease is more common and of greater severity in lower socioeconomic populations.[3] Bulk billing and CDM plans provide greater access to health services which may not have been utilised by some patients due to the associated financial costs. A caveat to this interpretation,

however, is that the socioeconomic status of the area in which the practice is located was not associated with dietitian/nutritionist referral.

We also found that referrals to a dietitian/nutritionist were more likely to come from registrars working in smaller practices. We hypothesise that our finding may be due to smaller practices lacking support staff, e.g. practice nurses, diabetes educators/nurses, who are able to deliver general nutrition related services such as weight loss groups, general nutrition education and diabetes-specific education. The absence of these additional support staff may result in these services being delivered by a dietitian.

Our study had a number of strengths, including the large sample size (145,708 individual consultations), high response rate (95.7%),[34] generalisability of results (data collected from five of Australia's six states from practices located across all urban/rural classifications) and the large number of independent variables collected. To our knowledge, this is the first study to look at the patterns and associations of referrals to dietitians/nutritionists from GP registrars.

A limitation of the study is that, using the ICPC-2 coding system, we were unable to distinguish whether the referral was for a dietitian or nutritionist. However, we can infer from the high proportion of referrals associated with a CDM plan that a substantial number of referrals were in fact made to Accredited Practising Dietitians (APD) (as a dietitian must be a registered APD to obtain a Medicare Provider number which is required for billing a CDM plan visit). Also, the data does not indicate whether the referral was requested by the patient or initiated by the registrar, nor does it allow for us to know if the patient actually

used the referral to attend a dietitian/nutritionist consultation. We also do not know if a referral was not made because the patient declined the registrar's offer.

Implications of our findings are in the context of registrars being the frontline medical practitioners as overweight/obesity and diabetes progress towards epidemic proportions. Further education for GPs and registrars regarding the wide range of clinical conditions, including chronic diseases, which dietetic input can assist with is warranted, with the aim of increasing appropriate referrals and improving health outcomes. From a dietetics perspective, not only is it important to establish strong relationships with referring GPs[35] but to also recognise that, in the case of registrars, they are more likely to refer established patients with whom they have engaged with in practice. Effective multidisciplinary collaboration of GPs and dietitians/nutritionists is needed to facilitate appropriate referrals and further management.

There is scope for further research into the nature, rate and associations of referrals from GPs to dietitians/nutritionists that may inform this multidisciplinary collaboration. Additionally, qualitative enquiry could explore the issue of whether GP registrars experience similar barriers to collaboration with dietitians/nutritionists to those demonstrated in their established GP colleagues and associated educational implications.

In conclusion, our study provides evidence for registrars especially referring established patients with complex care needs to dietitians/nutritionists. Nutrition behaviours are a major risk factor in chronic disease and our evidence for dietitian/nutritionist referrals represents one facet of considerable engagement by

registrars with these patients' complex care needs. Monitoring of referral patterns assists with assessing strategies to align practice with evidence-based guidelines and enhance multidisciplinary collaboration.

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Conflict of interest

The authors have no conflicts of interest to declare.

Authorship

This study was conceived by KJM, PJM and AT. KJM, AT, MLvD, SM, ARD, KMH, NAS, RHK, NC and PJM contributed to data collection within the framework of the ReCEnT study. Statistical analyses were conducted by AT and KM. For the analysis presented in this paper KJM, PJM, AT and JFW were involved in the interpretations of the findings. This paper was drafted by KM, PJM and AT. All authors made contributions to and approved the final version.

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Appendix I Participating trainee, trainee-term and practice characteristics

Variable	**Class**	**n % (95%CI) or Mean ±SD**
Registrar variables (n=1124)		
Registrar gender	Female	746 66.4% (63.6-69.1)
Qualified as a doctor in Australia	Yes	889 79.9% (77.4-82.1)
Registrar age (years)	Mean± SD	32.4±6.3
Registrar-term^ and practice-term variables (n=2453)		
Registrar training term	Term 1	1033 42.1% (40.2-44.1)
	Term 2	766 31.2% (29.4-33.1)
	Term 3	654 26.7% (24.9-28.4)
Registrar worked at the practice previously	Yes	615 25.4% (23.7-27.2)
Registrar works fulltime	Yes	1860 77.6% (75.9-79.3)
Practice routinely bulk bills[#]	Yes	434 17.8% (16.3-19.4)
Number of GPs working at the practice	1-5	827 34.5% (32.7-36.5)
	6+	1567 65.5% (63.5-67.3)
Rurality of practice	Major City	1408 57.4% (55.4-59.3)
	Inner Regional	643 26.2% (24.5-28.0)
	Outer Regional, Remote or Very Remote	402 16.4% (15.0-17.9)
SEIFA* Index (decile) of practice	Mean ±SD	5.5±2.9

^ 'Registrar-term' means the number of individual terms undertaken by all Registrars

'Bulk bills' means no financial cost to the patient

* Socioeconomic Index for Area (SEIFA) Relative Index of Disadvantage

Table 1 The most common problems/diagnoses referred to a dietitian/nutritionist

Problem/Diagnoses	**Percentage of total problems referred**
Overweight and obesity	27.1
Type II Diabetes and Pre-Diabetes	21.1
Elevated Lipids	7.0
Gastro-Intestinal Symptoms	6.9
Cardiovascular Disease	3.4
Allergy/Intolerance including Coeliac Disease	3.1
Primary Prevention	2.8
Musculoskeletal disease/injury	2.4
Nutrient deficiency and anaemia	1.6
Fatty Liver	1.5
Polycystic Ovary Syndrome	1.5
Eating Disorders	1.3

Table 2 Characteristics associated with referral to dietitian/nutritionist *(n=227,190)*

		Referral to Dietitian/Nutritionist		
Variable	**Class**	**No (n=226,603)**	**Yes (n=587)**	**p**
Patient age	0-14	30,989 (99.9)	23 (0.1)	<0.001
	15-34	58,037 (99.7)	152 (0.3)	
	35-64	90,417 (99.7)	312 (0.3)	
	65+	43,698 (99.8)	92 (0.2)	
Patient gender	Male	81,858 (99.8)	199 (0.2)	0.23
	Female	138,751 (99.7)	379 (0.3)	
ATSI	No	211,044 (99.7)	3,103 (99.7)	0.65
	Yes	547 (0.3)	10 (0.3)	
NESB	No	200,616 (99.7)	518 (0.3)	0.74
	Yes	15,197 (99.7)	41 (0.3)	
Patient/practice status	Existing Patient	99,336 (99.6)	437 (0.4)	<0.001
	New to Registrar	109,789 (99.9)	119 (0.1)	
	New to Practice	15,003 (99.9)	19 (0.1)	
Registrar gender	Male	75,507 (99.8)	180 (0.2)	0.35
	Female	151,096 (99.7)	407 (0.3)	
Registrar FT or PT	Part Time	50,502 (99.7)	130 (0.3)	0.90
	Full Time	170,928 (99.7)	435 (0.3)	
Training term/post	Term1	97,289 (99.8)	234 (0.2)	0.22
	Term2	69,573 (99.7)	193 (0.3)	
	Term3	59,741 (99.7)	160 (0.3)	
Qualified as doctor in Australia	No	45,064 (99.7)	122 (0.3)	0.69
	Yes	179,464 (99.7)	463 (0.3)	
Worked at the practice before	No	166,418 (99.7)	435 (0.3)	0.92
	Yes	57,029 (99.7)	145 (0.3)	

Variable	Class	Referral to Dietitian/Nutritionist No (n=226,603)	Yes (n=587)	p
Practice size^	Small	77,809 (99.7)	237 (0.3)	0.035
	Large	143,411 (99.8)	331 (0.2)	
Practice routinely bulk bills	No	185,208 (99.8)	441 (0.2)	0.003
	Yes	40,242 (99.6)	142 (0.4)	
Rurality	Major City	130,200 (99.7)	344 (0.3)	0.97
	Inner Regional	59,017 (99.7)	149 (0.3)	
	Outer Regional / Remote / Very Remote	37,386 (99.7)	94 (0.3)	
RTP	1	61,373 (99.7)	192 (0.3)	0.67
	2	32,377 (99.8)	66 (0.2)	
	3	28,386 (99.9)	41 (0.1)	
	4	96,990 (99.7)	256 (0.3)	
	5	7,478 (99.6)	32 (0.4)	
Is Problem New	No	92,451 (99.6)	336 (0.4)	<0.001
	Yes	114,969 (99.8)	204 (0.2)	
Any Sources Used	No	191,982 (99.7)	487 (0.3)	0.54
	Yes	34,621 (99.7)	100 (0.3)	
Any Imaging Ordered	No	209,375 (99.7)	578 (0.3)	<0.001
	Yes	17,228 (99.9)	9 (0.1)	
Any Pathology Ordered	No	187,614 (99.7)	473 (0.3)	0.25
	Yes	38,989 (99.7)	114 (0.3)	
Any Learning Goals Generated	No	181,379 (99.8)	422 (0.2)	<0.001
	Yes	35,967 (99.6)	139 (0.4)	
Any Follow-up Organised	No	126,443 (99.8)	247 (0.2)	<0.001
	Yes	100,160 (99.7)	340 (0.3)	

		Referral to Dietitian/Nutritionist		
Variable	**Class**	**No (n=226,603)**	**Yes (n=587)**	**p**
Chronic Disease	No	177,815 (99.9%)	230 (0.1%)	<0.001
	Yes	48,385 (99.3%)	357 (0.7%)	
Registrar age	mean (SD)	32.6 (6.3)	32.5 (5.8)	0.70
SEIFA Decile	mean (SD)	5.4 (2.9)	5.1 (2.7)	0.11
Consultation Duration	mean (SD)	18.9 (9.9)	25.4 (12.2)	<0.001
Number of Problems	Mean (SD)	2.0 (1.0)	2.5 (1.0)	<0.001
Number of Pathology Tests Ordered	Mean (SD)	0.5 (1.5)	0.7 (1.9)	0.001

^ 'Practice size' - 'Small' refers to practices with five or less GPs and 'Large' refers to practices with six or more GPs

Table 3 Predictors of referring to a Dietitian/Nutritionist: Simple and multiple logistic regression

		Univariate		Adjusted	
Variable	**Class**	**OR (95% CI)**	**P**	**OR (95% CI)**	**P**
Patient age	15-34	3.41 (2.19-5.32)	<0.001	1.77 (1.08-2.89)	0.023
Referent: 0-14	35-64	4.44 (2.89-6.83)	<0.001	1.81 (1.12-2.93)	0.015
	65+	2.69 (1.69-4.27)	<0.001	0.79 (0.46-1.33)	0.37
Practice Bulk Bills	Yes	1.43 (1.13-1.80)	0.003	1.40 (1.11-1.75)	0.004
Patient/Practice Status	New to Practice	0.24 (0.19-0.30)	<0.001	0.31 (0.25-0.40)	<0.001
	New to Registrar	0.26 (0.16-0.42)	<0.001	0.24 (0.14-0.41)	<0.001
Practice Size	Large	0.80 (0.66-0.98)	0.035	0.82 (0.69-1.00)	0.048
Consultation Duration		1.04 (1.04-1.05)	<0.001	1.03 (1.02-1.04)	<0.001
Number of Problems		1.60 (1.48-1.74)	<0.001	1.27 (1.16-1.40)	<0.001
Imaging Ordered	Yes	0.17 (0.09-0.35)	<0.001	0.17 (0.08-0.36)	<0.001
Generated Learning Goal	Yes	1.65 (1.34-2.02)	<0.001	1.49 (1.12-1.85)	<0.001
Follow-up Organised	Yes	1.76 (1.48-2.09)	<0.001	1.27 (1.05-1.54)	0.015
Chronic Disease	Yes	5.67 (4.74-6.78)	<0.001	4.36 (3.55-5.36)	<0.001
Is New Problem	Yes	0.49 (0.41-0.59)	<0.001	0.97 (0.79-1.19)	0.80
Number of Pathology Tests Ordered		1.08 (1.03-1.22)	0.001	1.08 (1.03-1.14)	0.002

* Once the initial multivariable model was constructed, one covariate had a small effect size and was no longer significant so was tested for removal from the model. The removal of “SEIFA Decile” did not substantively alter the model so this covariate was not included in the final model.

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STUDY PROTOCOL Open Access

Study protocol: The registrar clinical encounters in training (ReCEnT) study

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Abstract

Background: Patient encounters are the core learning activity of Australian general practice (family practice) training. Exposure to patient demographics and presentations may vary from one general practice registrar (vocational trainee) to another. This can affect comprehensiveness of training. Currently, there is no mechanism to systematically capture the content of GP registrar consultations. The aim of the Registrar Clinical Encounters in Training (ReCEnT) study is to document longitudinally the nature and associations of consultation-based clinical and educational experiences of general practice registrars.

Methods/design: This is an ongoing prospective multi-site cohort study of general practice registrars' consultations, entailing paper-based recording of consultation data. The study setting is general practices affiliated with three geographically-based Australian general practice regional training providers. Registrars record details of 60 consecutive consultations. Data collected includes registrar demographics, details of the consultation, patient demographics, reasons for encounter and problems managed. Problems managed are coded with the International Classification of Primary Care (second edition) classification system. Additionally, registrars record educational factors related to the encounter. The study will follow the clinical exposure of each registrar six-monthly over the 18 months to two years (full-time equivalent) of their general practice training program.

Conclusions: The study will provide data on a range of factors (patient, registrar and consultation factors). This data will be used to inform a range of educational decisions as well as being used to answer educational research questions. We plan to use ReCEnT as a formative assessment tool for registrars and help identify and address educational needs. The study will facilitate program evaluation by the participating training providers and thus improve articulation of educational programs with practice experience. From the research point of view it will address an evidence gap – the in-practice clinical and educational experience of general practice trainees, determinants of these experiences, and the determinants of registrars' patterns of practice (for example, prescribing practice) over the course of their training.

Background

Consulting with patients is the core learning activity of general practice (family practice) training in Australia. Registrars (general practice vocational trainees) learn by the "apprenticeship model", seeing patients in the general practice setting under the supervision of accredited general practitioner (GP) supervisors. Ideally, the content of each registrar's clinical experience should include "common and significant conditions" [1] and be similar to that of non-trainee (established) Australian GPs, as reflected in the curricula of the Royal Australian College of General Practitioners (RACGP) [2] and the Australian College of Rural and Remote Medicine (ACRRM) [3]. Indeed, the development of sound clinical reasoning skills appears to be dependent on exposure to 'an adequate database' of clinical cases [4].

However, in real life, the curriculum "walks through the door", and anecdotally, the exposure to different patient demographics and presentations is highly variable between training practices and between one registrar and another. This variability is likely to have an impact on the comprehensiveness and quality of training.

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The content of clinical encounters in general practice have been described in studies from a number of countries [5-7], including the BEACH (Bettering the Evaluation and Care of Health) program in Australia [8]. Other Australian studies have specifically looked at patient encounters in the Aboriginal Medical Service context [9-11] and between urban and rural settings [12].

Reports of clinical encounters of registrars in general practice training are scarce. Despite the importance of the area both clinically and educationally, to date there have been no peer-reviewed publications on the content and nature of patient encounters with registrars in Australian general practice training.

The ReCEnT (Registrar Clinical Encounters in Training) study aims to longitudinally document the nature and associations of consultation-based clinical and educational experiences of general practice registrars. In particular, it aims to identify variability in the clinical exposure between individual registrars, and explore associations of such variability. It will also establish the determinants, including clinical and educational experiences during training, of registrars' patterns of practice (for example, prescribing practice) by the conclusion of their training.

Methods

Study design

The ReCEnT study is an ongoing prospective cohort study.

Study aims

The study aims to document multiple factors (registrar, practice, patient, encounter, clinical, educational) in registrars' clinical consultations and to establish associations of these factors. The study will establish determinants of a number of outcomes involving registrars' clinical and educational activity.

Initial broad hypotheses to be tested include, that

- The demographics of patients seen by GP registrars in consultations (including age, sex, socioeconomic status (SES), Indigenous status, language other than English spoken, measure of rurality of residence) and the patient diagnoses/problems managed in consultations, will be associated with registrar factors (including age, sex, language other than English spoken, country of graduation, prior medical experience) and practice factors (including size of practice, measure of rurality of location).
- Consultation factors (including duration of consultation, number of problems dealt with, medication prescribed, type of billing, pathology tests ordered, imaging studies ordered and referrals made, and occurrence of violence within the consultation) will be associated with the above patient, registrar and practice factors.
- Educational outcome factors (including recourse to advice from the registrars' supervisors or other senior clinicians, use of hard-copy or electronic sources of information, and generation of learning goals) will be associated with the above registrar, practice, and patient factors.

Setting

The Australian General Practice Training (AGPT) program is responsible for administering the vocational training for general practice in Australia [13]. This training is regionalised, with delivery of training devolved to seventeen regional training providers (RTPs) around the country. Individual RTPs co-ordinate registrar training and provide discrete educational activities. However, the majority of registrar training activities occur in general practices, accredited and supported by their local RTP, rather than RTP educational activities.

The AGPT involves a minimum of two years (full-time equivalent) training post hospital experience. Minimum requirements for completion of training are three 6-month terms in general practice, and a further 6-month term in general practice or another discipline.

This is a multi-site study. The setting of the study is the accredited practices of three RTPs. The individual RTPs encompass major city and inner regional [14] practices (in the state of New South Wales), major city practices (in Victoria) and inner and outer regional and remote practices (in Tasmania).

Participants

All registrars of the three participating RTPs who are undertaking general practice terms participate. As well, registrars training in community-based, non-general practice positions participate. These include posts in dermatology, family planning, community psychiatry and the Prevocational General Practice Placement Program (PGPPP), where doctors training in the hospital setting undergo a specific placement in general practice [15].

Recruitment

Registrars are recruited by direct contact at regular educational release workshops at the three participating RTPs. Participation in ReCEnT is part of registrars' training requirements. Registrars also have the option of consenting to their data being used for research purposes (via an 'opt-in' consent process for the research aspect of the project).

Data collected

Variables for which data is collected can be considered as the registrar, practice, patient, encounter, clinical, educational and occupational violence factors.

Registrar variables: Registrars' demographics, past educational and work experience and current training term as detailed in Additional file 1: Table S1.

Practice variables: Factors such as practice size, remoteness classification and socioeconomic status of the practice location as detailed in Additional file 1: Table S2.

Patient variables: Patient demographics and reasons for encounter (RFE) as per Additional file 1: Table S3.

Encounter variables: Factors such as date of consultation, consultation duration and type of billing as per Additional file 1: Table S4.

Clinical variables: Factors such as problems managed, procedures performed, investigations ordered and follow-up arranged as per Additional file 1: Table S5.

Educational variables: A range of educational factors related to the consultation as per Additional file 1: Table S6.

Exposure to violence: In addition, registrars will answer a question about exposure to violence during the consultation. If they have been exposed to violence, they will record details of the episode (nature of the violence as per the classification system of Tolhurst et al. [16] modified by Magin et al. [17], and the location and precipitants of the violence).

Data collection instrument

A paper-based data collection instrument was developed, based on the BEACH study tool and patient encounter tools from similar studies [5,6].

Data collection

Registrars undertake formal orientation and training in the ReCEnT study during a dedicated face-to-face orientation workshop. This comprises the background and rationale of the study and information on how to complete the patient encounter forms. Registrars who are unable to attend group workshops are given individual detailing on the project.

Registrars record the details of sixty consecutive patient encounters at the mid-point of their six month general practice training terms (for full-time registrars generally April and October). This represents approximately one week of consultations for a full-time first term registrar. Registrars record only consultations conducted in the general practice setting (that is, not those conducted in a nursing home, or on a home visit). Consultations conducted as part of a specialised clinic (e.g. immunisation or anticoagulation management) are also excluded.

Data coding

Data is entered into a Microsoft Access database. Data on reason for encounter, problems managed, investigations and referrals made are classified using the International Classification of Primary Care, second edition (ICPC2-plus) disease classification system [18].

Medication data is coded using the Anatomical Therapeutic Chemical (ATC) Classification system which has been maintained by the WHO (World Health Organisation) since the 1970s [19].

Data on procedures is coded using a list of procedures relevant to the Australian general practice context derived by means of a Delphi process prior to the study [20].

Data analysis

Simple descriptive statistics (mean, median, proportion, 95% confidence intervals, standard deviation etc.) will be used to describe the various registrar, practice, patient, encounter, clinical, educational and occupational violence parameters. Student t-tests (or non-parametric equivalent) or chi-square analyses, as appropriate, will be used to make univariate comparisons of registrar and practice groups on these outcomes. Further multivariable analyses of these outcomes will employ multiple linear regression or logistic regression as appropriate.

Random Effects modeling and Generalised Estimating Equations (GEE) adjusting for clustering at RTP, practice and registrar level will be employed in analysing changes over time in the relevant clinical and educational outcomes.

The Bonferroni adjustment will be made for multiple comparisons and multiple outcomes for those analyses in which it is appropriate.

Ethics

Ethics approval for the study was obtained from the Human Research Ethics Committee, University of Newcastle. Approval number: H-2009-0323.

Pilot study

A pilot was conducted in late 2009 in which 32 registrars from a single RTP returned patient encounter forms for 1919 consultations. Following data collection and entry, a questionnaire was completed by participating registrars eliciting opinions concerning all aspects of the process, especially the time taken to complete the data collection, effect of the data collection on clinical practice, difficulties with interpretation of the study instructions or difficulties in recording aspects of the consultation, and ease of use of the study data collection instrument. A focus group with five of the participating registrars was conducted to further explore the same issues. Based on this pilot study and qualitative evaluation a number of minor changes were made to the study data collection form and data collection processes.

Discussion

ReCEnT in the context of previous patient encounter studies and the use of logbooks in training

Australian vocational training programs across a number of disciplines employ log book systems to record details of (generally non-consecutive) clinical and procedural encounters e.g. psychiatry [21], medicine [22], and surgery [23]. However, there is no national requirement for completion of a patient log, or indeed any systematic recording of consultation details, in the Australian General Practice Training program.

Logbooks of non-consecutive patient encounters are unlikely to adequately reflect the breadth and composition of registrars' clinical experience. Studies of consecutive patient encounters are better suited to this objective. A British study from 1986 used a database of routinely collected consultation data to show that registrars (compared to GP principals) saw more children and fewer elderly patients, more patients with acute respiratory disorders, fewer patients presenting for preventive care and fewer patients with cardiovascular disorders [24]. There were also differences in prescribing and referral patterns. A more recent Dutch study using prospectively recorded consultation data described a number of factors that influenced clinical exposure, including trainee and practice issues [25].

Australian GPs have been periodically recording the nature and content of their consultations since the first national survey of morbidity in 1961 [26]. In 1990, the first large and comprehensive national survey of morbidity and its management in general practice (the Australian Morbidity and Treatment Survey, AMTS) was conducted [27]. The study was the first to use a stratified random sample of general practitioners and provided extensive information on the content of over 110,000 consultations in Australian general practice.

Since 1998, the BEACH (Bettering the Evaluation and Care of Health) program, coordinated by the Family Medicine Research Centre at the University of Sydney, has annually enrolled a random sample of 1000 GPs, each of whom prospectively records the details of 100 consecutive patient encounters [28].

However, none of these previous Australian studies have specifically looked at GP registrar activity and all have employed cross-sectional methodology.

The ReCEnT study differs from previous research into general practice clinical activity in a number of key areas. Firstly, it directly targets general practice registrars training in the Australian context. As a result, the study will have a specific focus on linking clinical exposure to educational needs. Furthermore, the ReCEnT study is longitudinal, following the clinical exposure and clinical practice of the same participants over at least 18 months and at least three data points. It will thus provide a description of temporal changes in registrars' clinical experiences and practice, and enable us to establish determinants of these experiences and of registrars' patterns of practice (for example, prescribing practice) over the course of their training.

This will also be the first general practice study to look at the educational aspects of routine clinical practice. Registrars are a particularly appropriate group in which to examine the effects of clinical experience and educational factors on clinical practice, having less established patterns of practice than more experienced GPs. The longitudinal nature of the study will enable us to make some inference regarding causality of such patterns of practice. The study will also provide a framework for trialing educational interventions in this early-career, educationally-receptive cohort (see below).

Choice of data collection methodology

Log books have been used in the undergraduate setting for many decades. These have comprised a wide variety of formats, including handheld (e.g. pocket-sized encounter cards [29]), optically scanned [30] and electronic (PDA [31], web-based [32]). Though electronic formats have become increasingly accessible, there is little evidence that this format improves accuracy or completeness of data collection [33].

The ReCEnT study employs a paper based, self-reported data collection system. Though this poses some limitations, there are practical reasons why this methodology was chosen.

Extraction of routinely collected electronic data from general practice settings for research purposes occurs routinely in many countries, including the UK and Netherlands [34,35]. However, due to the large and diverse variety of software packages in Australian general practice, efficient extraction of routinely collected electronic data is currently impossible. Furthermore, routinely recorded data in Australian general practice is also likely to be of relatively poor quality compared to deliberately collected records. There is evidence that data obtained specifically from encounter forms is more comprehensive and more reliably coded than that obtained from medical records in the Australian general practice setting [36]. Also, much of the study data would not be recorded routinely in clinical records, including the educational aspects (seeking of advice, formulating learning goals) and experience of occupational violence.

The self-reported method of data collection does pose a risk of reporting bias. However, we have attempted to minimise reporting bias in a number of ways. Registrars (and their practices and clinical supervisors) are educated extensively about the rationale for and procedures of the study. Practices 'rule off' consultation appointments in each session in which ReCEnT data collection takes place

as 'catch up' for the time involved in completion of data collection forms (which averages less than two minutes each form). The importance of recording consecutive (not selected) consultations is heavily emphasised.

Registrars are required to record the details of sixty consecutive patient encounters per general practice training term, equivalent to approximately one week of consultations for a full-time first term registrar. This figure was derived from a number of considerations. Primarily, we believe this is a reasonable balance between registrar acceptability (time taken to complete forms) and representativeness of clinical and educational exposure. The BEACH study requires participating GPs to record 100 encounters – however, qualified GPs have shorter consultations than registrars and less educational requirements built into their working week. A further consideration was that over the duration of vocational training, registrars will record a minimum of 180 patient encounters across three terms, with many recording further data in optional training terms (up to a total of 240).

Coding and classification

BEACH data is classified using the ICPC-2PLUS coding system, the international standard for classifying primary care data. The validity of this system has previously been demonstrated [37]. Furthermore, there is evidence of close convergence between GP and patient recording of reasons for encounter (RFE) and problems managed in a consultation [38] and the reliability of secondary coding of RFEs [39]. The ReCEnT study employs ICPC2-plus as a classification system, and therefore data will be comparable with that of the BEACH study.

The ATC medication database is the Australian standard for classifying medications at the generic level, and is a tool for medication utilisation research in many other countries [19]. The hierarchical structure of the classification system contains five levels which reflect the organ or body system on which the drug acts and its therapeutic, pharmacological and chemical characteristics.

Planned and potential applications of ReCEnT data

General practice clinical activity data has a vast range of realised and potential applications, including workforce planning [40,41], health service planning and policy development [42], quality improvement [43], monitoring of patient safety [44], population health and community need assessment [45-47], and educational planning and development. The latter is the explicit focus of the ReCEnT study and is arguably the least well explored in previous research.

Applications for the individual registrar learner

In relation to individual student education, logbooks have primarily been used as tools for reflection and feedback [48], and to measure achievement of educational objectives [49]. In addition to standard consultation data, log books have been used to track student-generated learning needs arising from the clinical encounter and apply these directly to education [50].

The patient encounter data from the ReCEnT study, as with undergraduates, acts as a mechanism for registrars' formative assessment, allowing them to reflect on their practice in comparison to peers and to other benchmarks. Registrars are given a feedback report after each round of data collection, detailing their individual data and comparing this to aggregate registrar data and their previous round data. Using this report, registrars are able to make broad observations about curriculum coverage (demographics, complexity, acuity, continuity) and identify gaps in clinical exposure. Identification of registrar exposure to specific clinical presentations is limited by the modest number of encounters documented, but broad observations about coverage e.g. Women's health, ENT etc. is possible. Learning needs or identified clinical gaps can then be addressed with a variety of educational interventions, for example self-directed study, targeted tutorials, planned clinical placements, and targeted patient booking.

Registrars are able to compare their individual data with indicators of best practice, for example for prescribing patterns, as well as reflect on any change in practice towards best practice benchmarks over training time. This process will also provide them with essential skills for life long learning.

Portfolios are widely used in general practice training and are effective in encouraging reflective learning [51]. However, there is no published literature on the use of a patient log to stimulate encounter-based learning needs in general practice training. Similarly, there is no literature on the use of a patient encounter log to compare registrar performance with indicators of evidence-based or best practice, for example, antibiotic prescribing rates [52]. The ReCEnT study aims to directly address these evidence gaps.

Applications for program evaluation and quality improvement

Patient encounter data has been used extensively by medical schools for program evaluation and curriculum review [33]. A key aspect of general practice training delivery is program evaluation and quality assurance and improvement. The RACGP vocational training standards state in their recommendations for quality improvement that the regional training provider (RTP) should provide evidence of the effectiveness of the educational processes employed [1].

The ReCEnT study data will provide information on curriculum coverage and registrar performance across

the registrar cohort. Patient encounter data will help identify differences in learning opportunities across different practices in the training region, as well as those across different models of service delivery, for example, private practices and Aboriginal Medical Services. This information will help tailor educational programs for individual registrars (as has been used in the undergraduate setting [53]), and allow better articulation of RTP educational release activities with practice experience.

Further potential applications of the study in relation to program evaluation are to evaluate the clinical exposure and fulfillment of specific learning goals within specific types of terms (for example, urban versus rural posts, and 'usual' general practice terms as opposed to extended skill posts, Family Planning, remediation terms etc.). As well, ReCEnT data will facilitate assessment of effectiveness of educational interventions, for example registrar practice before and after a workshop session.

In addition, patient encounter data can help support the teaching and supervision role of the GP supervisor. Aggregated clinical exposure and educational data can help identify the strengths and weaknesses of individual practices, and better inform practice-based teaching and other educational interventions e.g. targeted patient booking.

Within Australia, we believe that the generalisability of the study findings in relation to program evaluation will be high. The Australian general practice training program is a national program with closely prescribed (and enforced) procedures and standards across all Regional Training Providers.

Research applications The other major application of the ReCEnT study is that of research. The RACGP vocational training standards state in their recommendations for quality improvement that registrars should have the opportunity to undertake elective research [1]. The ReCEnT study will provide a platform for quality registrar research activities, and therefore build research capacity in general practice registrars. This is particularly the case with registrars wishing to undertake Academic Extended Skills posts (an optional component of vocational GP training in Australia).

As well as registrar-initiated research, the study is expected to be the vehicle for a diverse range of other research. In particular, the longitudinal methodology of the study will provide scope for enquiry in a number of areas.

The ReCEnT study will address a particular evidence gap – the clinical and educational experience of general practice trainees, the determinants of these experiences, and the determinants of registrars' patterns of practice (for example, prescribing behaviour) over the course of their training. Findings in these areas will inform general practice in Australia beyond the participating RTPs and will have implications for GP training programs internationally.

Similarly, establishing patterns of registrars' 'help- and advice-seeking' behaviour and its association with prescribing and other management decisions will inform models of supervision and teaching of 'problem-based' and 'self-directed' learning.

As well as these applications of the central descriptive study, ReCEnT provides a platform for trials of educational interventions. An example would be the effectiveness of an educational intervention promoting rational prescribing in producing desirable changes in registrars' prescribing practice.

Occupational violence is a major issue in general practice in Australia and internationally, with effects both on the individual and their provision of services to patients [54,55]. There is some evidence that GP registrars, particularly rural registrars, are at particular risk of occupational violence and its effects [56]. A major limitation of all previous research of this problem has been it's cross-sectional methodology, relying on GPs' recall of incidents. The ReCEnT study is the first prospective study of occupational violence in general practice.

Conclusion

The ReCEnT study will provide comprehensive information on the clinical exposure of Australian GP registrars. In addition, with its specific focus on educational needs, it will provide novel reflective and evaluative data for registrars and RTPs and will build the research capacity of GP registrars and Australian general practice.

Additional file

Additional file 1: Table S1. Registrar Variables. **Table S2.** Practice Variables. **Table S3.** Patient Variables. **Table S4.** Encounter Variables. **Table S5.** Clinical Variables. **Table S6.** Educational Variables.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

SM and PM led the design of the study. SM led the writing of the manuscript. All other authors contributed to the study design and have all contributed to the final manuscript. All authors read and approved the final manuscript.

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