










ORIGINAL RESEARCH

Influence of rurality on general practitioner registrars' participation in their practice's after-hours roster: A cross-sectional study

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Abstract

Objective: To investigate whether practice rurality and rural training pathway are associated with general practitioner registrars' participation in their practice's after-hours care roster.

Design: A cross-sectional analysis of data (2017-2019) from the Registrar Clinical Encounters in Training study, an ongoing inception cohort study of Australian general practitioner registrars. The principal analyses used logistic regression.

Setting: Three national general practitioner regional training organisations across 3 Australian states.

Participants: General practitioner registrars in training within regional training organisations.

Main outcome measure: Involvement in practice after-hours care was indicated by a dichotomous response on a 6-monthly Registrar Clinical Encounters in Training study questionnaire item.

[Correction added on 10 May 2022, after first online publication: CAUL funding statement has been added.]

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Results: 1576 registrars provided 3158 observations (response rate 90.3%). Of these, 1574 (48.6% [95% confidence interval: 46.8-50.3]) involved registrars contributing to their practice's after-hours roster. In major cities, 40% of registrar terms involved contribution to their practice's after-hours roster; in regional and remote practices, 62% contributed to the after-hours roster. On multivariable analysis, both level of rurality of practice (odds ratio(OR) 1.75, $P = .007$; and OR 1.74, $P = .026$ for inner regional and outer regional/remote locations, respectively, versus major city) and rural training pathway of registrar (OR 1.65, $P = .008$) were significantly associated with more after-hours roster contribution. Other associations were registrars' later training stage, larger practices and practices not routinely bulk billing. Significant regional variability in after-hours care was identified (after adjusting for rurality).

Conclusion: These findings suggest that registrars working rurally and those training on the rural pathway are more often participating in practice after-hours rosters. This has workforce implications, and implications for the educational richness of registrars' training environment.

KEYWORDS

after-hours care, education, medical, graduate, family practice, physicians, primary care, rural health

1 | INTRODUCTION

After-hours primary medical care is an essential, yet often overlooked, component of the Australian health care system.¹ An effective after-hours primary health care system is critical for the cost-effective provision of urgent care. Specifically, an estimated 65% of emergency presentations occur between the hours of 8 PM and 5 AM, or on weekends.² After-hours general practitioner (GP) services, in hospitals, practices or deputising services, have been shown to reduce emergency department visits and in doing so cut health system costs.²⁻⁴ It has been asserted that, in the UK, increased pressure on the emergency department and wider health system can be partially attributed to a shortage of GPs engaging in after-hours work.⁵ This might also be so in regional, rural and remote (hereafter 'rural') Australia, where maldistribution of health care services (as well as physical distance) has been described as leading to reduced access to care compared with metropolitan areas.^{6,7} In rural settings, the lack of after-hours access to primary health care reflects, in part, a shortage of GPs.⁸⁻¹⁰ The provision of GP-led care has been described as the foundation of after-hours care, and facilitates rapid and cost-effective treatment for low-acuity presentations.¹

Considering the rich educational experience provided by rural clinical work,^{11,12} the contribution of after-hours work from the rural GP registrar (trainee) population is

What is already known on this subject:

- Regional general practitioners are more likely to conduct after-hours work than urban general practitioners
- After-hours care is important for both patient care and registrar education and training

What this study adds:

- General practitioner registrars in rural practices are significantly more likely to participate in their practice's after-hours roster than are urban registrars
- This rural-urban disparity is greater for registrars than has been shown in studies of established general practitioners

of particular interest. GP registrars comprise 13% of the Australian general practice workforce by headcount.^{13,14} Registrars' involvement in after-hours care is not only important in the provision of patient care but also provides an important learning opportunity, exposing registrars to a diverse range of presentations beyond those seen in routine office-based practice. Furthermore, and critically, an association has been demonstrated between

participation in after-hours primary care in Australian general practice vocational training and continued participation in after-hours care following attainment of fellowship as an independently practising GP (N Catzikiris, personal communication, 7 January 2021).

Given this association, and the importance of after-hours primary care to health system function, understanding the factors that determine whether registrars engage in after-hours work is important for meeting clinical demand in both rural and metropolitan settings. In this study, we sought to establish the proportion of GP registrars who contribute to their practice's after-hours roster, and to explore the associations of providing this after-hours service. We particularly aimed to establish the association with rurality of practice and with training pathway (rural or general).

2 | METHOD

This analysis was conducted on data from the Registrar Clinical Encounters in Training (ReCEnT) study.

2.1 | ReCEnT

Registrar Clinical Encounters in Training is an ongoing prospective cohort study of GP registrar consultations. It is a multisite study. During the period included in this analysis (2017-2019), participants in ReCEnT were GP registrars training with 3 of Australia's 9 regional training organisations (RTOs) across 3 states and the Australian Capital Territory. These RTOs are responsible for the training of 44% of Australian GP registrars.¹⁴ The ReCEnT methodology has been described in detail elsewhere.¹⁵ Registrars collect data once every 6-month (full-time equivalent) general practice-based training term, resulting in 3 data collection registrar rounds during their training period. The data are collected as part of the registrars' educational program, and individual written feedback is given to facilitate reflection on individual registrars' clinical and educational experiences.¹⁶ Informed consent might also be provided by registrars for their data to be also used for research purposes. Initial data collection involves demographic data and characteristics of the practice, and education and work experience of the registrars. Registrars then record the details of 60 consecutive clinical consultations. The collected data address a broad range of areas, but for this analysis, only data from the initial questionnaire (not the in-consultation data) were used.

2.2 | Study population

The study population included all registrars from participating RTOs who were in one of their first 3 (6-month full-time equivalent) general practice training terms.

2.3 | Outcome

The outcome of interest was a dichotomous response on an item in the 6-monthly pre-round questionnaire: 'Do you contribute to your current practice's after-hours care roster?'

2.4 | Study factors

The study factors were, firstly, training practice rurality (by ASGC-RA classification) and, secondly, the registrar's training pathway (rural versus general).

Our measure of rurality/urbanicity was based on the Australian Standard Geographical Classification Remoteness Area [ASGC-RA] classification of the practice location, derived from the practice's postcode.¹⁷ There were 3 levels for our analysis: major city, inner regional and outer regional/remote. The referent in multivariable analysis was major city.

The registrar's training pathway within the vocational training scheme was either rural or general pathway—while general pathway registrars can complete their general practice-based terms in rural or urban practices, the rural pathway entails a requirement to do all general practice training in rural practices.

2.4.1 | Independent variables

Independent variables related to registrar and practice.

Registrar factors were age (continuous), sex, part-time/full-time status, training term, whether the registrar had worked at the practice previously, whether the registrar qualified as a doctor in Australia, years worked at hospital prior to GP training and whether the registrar undertakes any non-GP medical work.

Practice factors were size of the practice (based on full-time equivalent (FTE) GPs, large practice includes 5 or more FTEs), bulk billing status (whether the practice routinely charged no consultation fee to the patient), Socio-Economic Indexes for Areas (SEIFA) index decile (SEIFA Relative Index of Disadvantage)¹⁸ and geographical region (RTO or RTO subregion).

2.5 | Statistical analysis

This was a cross-sectional analysis of data from the longitudinal ReCenT study.

Data from ReCenT rounds 17 to 21 (2017-2019) were included in the analysis.

Analysis was at the level of registrar.

The proportion of registrars contributing to their practice's after-hours roster was calculated with 95% confidence intervals (CIs).

Descriptive statistics included frequencies for categorical variables and mean with SD for continuous variables. The frequencies of categorical variables were compared between outcome categories using chi-squared tests for all variables. For continuous variables, means were compared using a *t* test.

2.5.1 | Simple and multiple logistic regression analyses

Univariate and multivariable regression analyses were conducted with outcome 'contributing to your practice's after-hours roster.' Logistic regression was used within the generalised estimating equation framework to account for repeated measures within registrars. Once the model with all variables of interest was fitted, model reduction was assessed. Variables that were no longer significant (at $P < .2$) in the multivariable model were tested for removal from the model. If the variable's removal did not substantively change the resulting model (defined as any covariate in the model having a change in the effect size (odds ratio) of greater than 10%), the variable was removed from the final model.

2.6 | Ethics approval

Ethics approval for the ReCenT project was obtained from the University Newcastle Human Research Ethics Committee (H-2009-0323).

3 | RESULTS

There were 3158 observations (i.e. registrar rounds) of 1576 registrars available for analysis (response rate 90.3%). [Table 1](#) shows the demographics of registrars and practices included in the analysis.

Of these observations, 1534 (48.6% [95% CI: 46.8-50.3]) involved the registrar participating in their practice's after-hours roster. In major cities, 40% of registrar terms

TABLE 1 Demographics of participating GP registrars and their practices

Registrar variables (n = 1576)	n (%)
Registrar sex	
Male	634 (40.5%)
Female	932 (59.5%)
Qualified as doctor in Australia	
Yes	1245 (79.1%)
No	329 (20.9%)
Years worked prior to GP training	
Mean ± SD	3.5 (3.2)
Pathway registrar enrolled in	
Rural	508 (32.8%)
General	1040 (67.2%)
College enrolled with	
RACGP	1496 (96.7%)
ACRRM	43 (2.8%)
Both	8 (0.5%)
Registrar round/practice variables (n = 3379)	
Registrar age (years)	
Mean ± SD	32.9 (6.4)
Registrar works full-time or part-time	
Full-time	2370 (76.0%)
Part-time	747 (24.0%)
Registrar training term	
Term 1	1162 (34.4%)
Term 2	1341 (39.7%)
Term 3	876 (25.9%)
Practice rurality	
Major city	2099 (62.2%)
Inner regional	978 (29.0%)
Outer regional	292 (8.7%)
Remote	7 (0.2%)
Practice Socio-Economic Indexes for Areas (SEIFA) index	
Mean ± SD	5.3 (2.8)
Practice routinely bulk bills	
Yes	2120 (62.9%)
No	1249 (37.1%)
Registrar worked at practice previously	
Yes	2598 (77.6%)
No	749 (22.4%)
Practice size ^a	
Small (1-5 GPs)	1341 (43.0%)
Large (6-10+ GPs)	1780 (57.0%)

^aDefined as how many general practitioners (GPs; full-time equivalents) work at this practice.

involved the registrar contributing to their practice's after-hours roster; in inner regional practices, 62% contributed to the after-hours roster, and in outer regional/remote practices, 63%.

3.1 | Characteristics associated with the provision of after-hours care

Characteristics associated with participation in their practice's after-hours roster are presented in Table 2. The results of univariate and multivariate regressions with outcome 'participation in the practice's after-hours care roster' are shown in Table 3.

3.1.1 | Rurality of practice and training pathway

On univariate analysis, rurality of practice location (ORs 2.29 [95% CI 1.90, 2.76] and 2.35 [95% CI 1.75, 3.16] for inner regional and outer regional/remote locations, respectively, compared with major city) was significantly associated with participation in the practice after-hours roster. The registrar training on the rural pathway was also significantly associated with participation in the practice after-hours roster (OR 2.42 [95% CI 2.02, 2.90]).

On multivariable analysis, contribution to the after-hours care roster was associated with the level of rurality of practice (inner regional OR 1.72 [95% CI 1.15, 2.58];

TABLE 2 Characteristics associated with provision of after-hours care

Factor group	Variable	Class	No	Yes	P-value
Registrar factors	Registrar sex	Male	649 (40%)	646 (42%)	.24
		Female	974 (60%)	887 (58%)	
	Registrar works full-time or part-time	Part-time	395 (25%)	350 (23%)	.97
		Full-time	1206 (75%)	1160 (77%)	
	Term	Term 1	605 (37%)	501 (33%)	.001
		Term 2	645 (40%)	605 (39%)	
		Term 3	374 (23%)	427 (28%)	
	Worked at practice previously	No	1287 (80%)	1094 (72%)	<.001
		Yes	324 (20%)	422 (28%)	
	Qualified as doctor in Australia	No	268 (17%)	345 (23%)	.001
		Yes	1354 (83%)	1187 (77%)	
	Pathway	Rural	370 (23%)	657 (43%)	<.001
		General	1239 (77%)	867 (57%)	
	Has other regular medical work	No	1352 (83%)	1225 (80%)	.047
Yes		272 (17%)	308 (20%)		
Registrar age	Mean (SD)	33 (6)	33 (6)	.32	
Years prior to GP training	Mean (SD)	3 (3)	4 (3)	.18	
Practice factors	Practice size ^a	Small	868 (54%)	466 (31%)	<.001
		Large	742 (46%)	1036 (69%)	
	Practice routinely bulk bills	No	832 (51%)	1072 (70%)	<.001
		Yes	788 (49%)	458 (30%)	
	Rurality	Major city	1169 (72%)	794 (52%)	<.001
		Inner regional	348 (21%)	560 (37%)	
		Outer regional/remote	107 (7%)	179 (12%)	
	Region	Region 1	193 (12%)	281 (18%)	<.001
		Region 2	90 (6%)	104 (7%)	
		Region 3	263 (16%)	497 (32%)	
		Region 4	725 (45%)	325 (21%)	
		Region 5	353 (22%)	326 (21%)	
	Socio-Economic Indexes for Areas (SEIFA) index	Mean (SD)	5 (3)	5 (3)	.21

^aDefined as how many general practitioners (GPs; full-time equivalents) work at this practice.

TABLE 3 Logistic regression models with outcome 'provision of after-hours care by registrar'

Factor group	Variable	Class	Univariate model		Adjusted model	
			OR (95% CI)	P-value	OR (95% CI)	P-value
Study factors	Practice rurality	Inner regional	2.29 (1.90, 2.76)	<.0001	1.75 (1.16, 2.62)	.007
	Referent: major city	Outer regional/ remote	2.35 (1.75, 3.16)	<.0001	1.74 (1.07, 2.83)	.026
	Registrar pathway	Rural	2.53 (2.10, 3.03)	<.0001	1.65 (1.14, 2.39)	.008
Registrar factors	Registrar sex	Female	0.90 (0.76, 1.07)	.2367	0.85 (0.71, 1.02)	.084
	Term	Term 2	1.15 (1.01, 1.31)	.0347	1.05 (0.86, 1.26)	.64
	Referent: Term 1	Term 3	1.37 (1.16, 1.62)	.0003	1.27 (1.03, 1.57)	.025
	Worked at practice previously	Yes	1.41 (1.23, 1.62)	<.0001	1.22 (0.99, 1.49)	.057
	Registrar age		1.01 (0.99, 1.02)	.3182	0.99 (0.97, 1.00)	.10
Practice factors	Practice size ^a	Small	0.42 (0.36, 0.49)	<.0001	0.48 (0.40, 0.56)	<.001
	Practice routinely bulk bills	Yes	0.51 (0.44, 0.59)	<.0001	0.76 (0.62, 0.92)	.005
	Region	Region 2	0.77 (0.51, 1.17)	.2281	0.44 (0.28, 0.71)	.001
	Referent: Region 1	Region 3	1.27 (0.97, 1.67)	.0864	1.71 (1.26, 2.33)	.001
		Region 4	0.31 (0.24, 0.40)	<.0001	0.65 (0.47, 0.90)	.009
	Region 5	0.62 (0.47, 0.81)	.0007	0.51 (0.37, 0.70)	<.001	

^aDefined as how many general practitioners (full-time equivalents) work at this practice.

outer regional/remote OR 1.77 [95% CI 1.09, 2.88], both compared with major city). Furthermore, registrars who had trained through the rural pathway were significantly more likely to participate in the practice's after-hours roster (OR 1.62 [95% CI 1.12, 2.33] compared with the general pathway).

3.1.2 | Other associations of participation in after-hours care

On multivariable analysis, participation in the practice after-hours roster was significantly less likely if the registrar worked in a small practice (OR 0.47 [95% CI 0.40, 0.55]) or in a practice that routinely bulk bills all patients (OR 0.75 [95% CI 0.62, 0.91]).

There was significant regional variability in registrars contributing to their practices' after-hours roster, even when adjusted for other factors including practice rurality and registrars' training pathway (adjusted ORs of 0.44, 0.70, 0.54 and 1.89 compared with the referent region).

Registrars in Term 3 (their third 6-month training term) were more likely to participate in the practice after-hours roster (OR 1.24 [95% CI 1.01, 1.53]) compared with Term 1. Though not statistically significant, there was some evidence for female registrars being less likely to participate in the after-hours roster than for male registrars (OR 0.86 [95% CI 0.72, 1.02], $P = .087$).

4 | DISCUSSION

4.1 | Summary of main findings

Overall, we found registrars to participate in their practice's after-hours care roster in 48.6% of registrar terms. We found strong associations of after-hours care roster participation with registrars working in inner regional, and in outer regional/rural/remote practice locations, and with training in the rural pathway. Other associations included the training term, bulk billing status of the practice and practice size. There was also marked regional variability.

4.2 | Comparison with previous literature

Our finding that in 49% of training terms, registrars participated in after-hours rosters is higher than after-hours participation found in a previous study of Australian GPs (33%).¹⁹ This might reflect the greater proportion of registrars compared with established GPs who work in rural areas.²⁰

It has previously been found that established GPs in regional locations are more likely to work after-hours than are major city GPs (inner regional GPs work more than twice as likely, and outer regional GPs work more

than thrice as likely).¹⁹ An important context of this increased engagement with after-hours work is the role of regional GPs in hospital after-hours emergency departments.¹⁹ Studies as far back as 1990 have found country doctors to carry out after-hours work in emergency departments, in addition to their general practice responsibilities.²¹

The Australian and international literature has demonstrated an association of participation in after-hours care with male sex.^{19,22-24} We found some evidence ($P = .08$) that women are less likely to participate in practice after-hours rosters, with modest effect size (OR 0.85).

4.3 | Interpretation of findings

Our findings of association with rural location and rural training pathway might be due to higher clinical demand given the established shortage of GPs in regional/remote areas—that is a reflection of greater work demands in general. An overall greater workload for rural GPs in Australia has been found to apply to after-hours, on call and public hospital work.²⁵ Similarly, there is some evidence in international literature that rural physicians work more evening and night shifts than urban doctors, and have a higher workload in general.²⁶ Our finding might also reflect the environment in which major city registrars train—many with deputising services operating.²⁷

Our findings regarding associations with contribution to practice after-hours care rosters of our other independent variables (these not being the focus of our analyses) should be interpreted with caution. Yet, the association with more senior term likely reflects conservative approaches to patient safety of practices and RTOs. The association with larger practices likely reflects the capacity of the practice to staff after-hours rosters sustainably.

4.4 | Implications for educational practice

Exposure to home visits, including those carried out after-hours, has been shown to be valuable to learning in a survey of medical students, residents and registrars.²⁸ Undertaking after-hours work in addition to usual-hours practice might expose registrars to a broader range of presentations,²⁹ particularly rurally, where they have the opportunity to work in local hospitals.²⁵ A UK study of foundational year doctors and core medical trainees (postgraduate training) found that trainees reported after-hours work the ‘best setting for acute general medical

experience.’³⁰ Exposure to the diversity of after-hours care seems to be a foundation of rounded medical education and contributes to the richness of registrars’ educational experience.

If after-hours work is a valuable component of GP vocational training and education, our findings suggest rural registrars are at an advantage. Other research in this population has suggested that rural registrars have a particularly rich in-hours training experience.¹¹ The findings of this study reinforce the educational utility of rural GP training. But beyond this association, it is important to note that 38% of rural GP training terms do *not* involve the registrar contributing to practice after-hours rosters. There is considerable scope for regional training organisations, local hospitals and training practices to work together to find models for providing suitably supervised after-hours experience for registrars across the spectrum of rural health contexts.

For the 60% of major city GP registrar terms where registrars do not gain after-hours experience via contribution to practice after-hours care rosters, there is an even greater imperative for structural changes to facilitate registrars gaining this experience. The ubiquity of after-hours deputising services and the inherent difficulty in establishing appropriate supervisory arrangements, though, might be a significant barrier.

4.5 | Implications for future research

In seeking to better understand our findings, and to explore ways in which greater registrar engagement in after-hours care can be facilitated, qualitative enquiry is indicated. Barriers to after-hours engagement and how to address them should be explored. These barriers might be considerable. A study of rural GPs in Germany found out-of-hours work was a major stress for clinicians, and job satisfaction could be improved by decreasing after-hours work.²⁴

Interpretation of associations with independent variables apart from our 2 study factors should be guarded as these were not the focus of our analyses. These associations will require further study. It will be especially important to further explore the regional variability, beyond rurality, that we found in this study. The associations with practice size and bulk billing policy will also require further study.

4.6 | Strengths/limitations

The large size of the study and high response rate³¹ are strengths of this study. The generalisability of findings

is strong as we included data from 3 Australian states plus the Australian Capital Territory (training 44% of Australian GP registrars)¹⁴ and across a diverse range of practices and urban/rural localities.

A limitation of the study is our dichotomous outcome factor. There is no commonly understood definition for 'after-hours' work. In this situation, our questionnaire response accepted the pragmatic definition of 'after-hours' made by participating practices in framing their after-hours rosters. To have stipulated our own definition of after-hours would have caused confusion in responding if it did not align with a registrar's practice's roster.

Additionally, as our study is cross-sectional, we can hypothesise on possible reasons for the associations detected but cannot infer causality from our findings.

5 | CONCLUSION

Involvement of GP registrars in after-hours care is considered valuable both for better care of patients and for exposure of registrars to a rich and varied educational experience. Our findings indicate that registrars working rurally or training on the rural pathway are more likely to contribute to their practice's after-hours roster. Thus, a greater proportion of urban registrars are missing this valuable component of training. However, there also remains a significant proportion of rural registrars who do not contribute to practice after-hours rosters. Our findings might help inform training decisions for individual registrars, both rural and urban, as well as policy for regional training organisations, and increase registrar exposure to a valuable component of training.

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CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

TM: conceptualization; writing – original draft; writing – review & editing. AT: conceptualization; data curation; formal analysis; funding acquisition; investigation; writing – review & editing. AD: investigation; writing – review

& editing. EGH: formal analysis; writing – review & editing. AF: investigation; writing – review & editing. MvD: methodology; writing – review & editing. JB: formal analysis; writing – review & editing. NS: investigation; writing – review & editing. KF: investigation; writing – review & editing. SM: methodology; writing – review & editing. PM: conceptualization; funding acquisition; investigation; methodology; writing – review & editing.

DATA AVAILABILITY STATEMENT


The data underlying this article cannot be shared publicly due to ethics requirements, which protect the privacy of individuals who participated in the study.

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