

Prevalence and associations of prescribing of long-acting reversible contraception by general practitioner registrars: a secondary analysis of ReCEnT data

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ABSTRACT

Objective Long-acting reversible contraception (LARC) is the most effective form of contraception but use in Australia is low. Uptake of LARC prescribing by early-career general practitioners (GPs) has important implications for community reproductive health. We aimed to investigate the prevalence and associations of Australian GP registrars' LARC prescribing.

Methods A cross-sectional analysis of the Registrar Clinical Encounters in Training (ReCEnT) cohort study 2010–2017. GP registrars collected data on 60 consecutive consultations on three occasions during their training. The outcome factor was prescription of LARC (compared with non-LARC). A secondary analysis was performed with problems involving prescription of LARC (compared with other problems). Associations with patient, practice, registrar and consultation independent variables were assessed by univariate and multivariable logistic regression.

Results 1737 registrars recorded 5382 problems/diagnoses involving women aged 12–55 years in which contraception was prescribed. 1356 (25%) involved LARC. Significant multivariable associations of prescribing LARC included patient age (OR 2.85, 95% CI 3.17 to 3.74, for age 36–45 years compared with age 12–18 years), practice rurality - inner-regional (OR 1.47, 95% CI 1.22 to 1.79) and outer-regional/remote/very remote (OR 1.47 95% CI 1.15 to 1.87) compared with major cities, practices in areas of lower socioeconomic status (SES) (OR 0.93, 95% CI 0.91 to 0.96 for SES by decile), generating learning goals (OR 1.37, 95% CI 1.04 to 1.79), in-consultation assistance-seeking (OR 1.58, 95% CI 1.24 to 2.01), and the registrar having reproductive health-related

Key messages

- General practitioner (GP) registrars prescribe long-acting reversible contraception (LARC) methods more than has previously been estimated in established GPs in Australia.
- GP registrars seek more help and knowledge when LARC is prescribed, and those with reproductive health qualifications are more likely to prescribe LARC.
- Our findings suggest the role of GP education/training in increasing LARC use.

postgraduate qualifications (OR 1.33, 95% CI 1.01 to 1.76).

Conclusions The prevalence of LARC prescribing by Australian GP registrars is higher than has been previously estimated in established GPs. Postgraduate qualifications in reproductive health are associated with prescribing LARC. Prescribing practice differs according to rurality and relative socioeconomic disadvantage.

INTRODUCTION

Reproductive health choices are a human right and poor access to contraception is associated with poor health outcomes.¹ Two-thirds of Australian women of reproductive age use contraception.² However, over 50% of women will have an unplanned pregnancy³ and an estimated one in four pregnancies in Australia are terminated,⁴ which are among the highest rates in the developed world.⁵ Unintended

pregnancies not resulting in termination are associated with poorer infant and maternal outcomes affecting women's economic, physical, psychological and social outcomes.⁶

Long-acting reversible contraception (LARC) is defined as methods administered less frequently than monthly⁷ and includes implants, hormonal intrauterine devices (IUDs), non-hormonal IUDs and medroxyprogesterone injectables.^{7 8} LARC is the most effective form of contraception.⁹ A recent study showed that of women who experienced an unintended pregnancy while using contraception, 90% were using a non-LARC method.¹⁰

Despite well-documented advantages of LARC,⁸ oral contraception is the most commonly used method in Australia (33%).¹¹ Uptake of LARC is poor, with only 13% of Australian women using these methods.¹¹ In the UK, an estimated 12% of women aged 16–49 years use LARC methods,⁷ and in the USA this figure is 11.6% (although here injectables are not considered to be a LARC method).¹² Increasing uptake of LARC is currently a health priority in the UK^{7 13} and USA¹⁴ but there is no clear policy in Australia.¹

General practitioners (GPs) see 86.9% of the Australian population annually and play a critical role in contraception provision.¹⁵ Contraceptive problems are managed by Australian GPs at a rate of 6.1 per 100 consultations with reproductive-age women.⁸ Only 15% of contraceptive consultations in a 2011 Australian general practice study involved LARC, compared with 69% for the combined oral contraceptive pill (COCP).⁸ Little is known about GPs' contraception management. The practice behaviours of early-career GPs are an important indicator of future primary care provision.

Australia's health system is funded by both government and privately. 'Medicare' is a universal health insurance scheme which funds medical services, public hospitals and medicines (through the Pharmaceutical Benefits Scheme (PBS)). The Medicare Benefits Schedule (MBS) lists all the services for which doctors are remunerated. Australian General Practice Training (AGPT) involves 1 year in hospital followed by at least three 6-month terms in general practice. The AGPT includes registrars from both the Royal Australian College of General Practitioners (RACGP) and the Australian College of Rural and Remote Medicine (ACRRM). As postgraduate experience in obstetrics and gynaecology (O&G) is not a pre-requisite for training,¹⁶ some registrars may have little or no experience in reproductive health prior to entering training.

The prevalence and associations of Australian GP registrars' prescribing of LARC has not previously been reported. In this study we sought to establish the prevalence of LARC prescribing, the associations of prescribing LARC versus non-LARC methods, and the overall associations of LARC prescribing.

METHODS

Study design

This was a cross-sectional analysis of data from the Registrar Clinical Encounters in Training (ReCEnT) study.

ReCEnT – setting/participants/study materials

ReCEnT is an ongoing, multicentre, prospective cohort study of GP registrars. It was conducted in 2010–2015 in five of Australia's 17 regional training providers (RTPs) in five of the six Australian states and, from 2016 (after a major reorganisation of GP vocational training), in three of Australia's nine Regional Training Organisations (RTOs). RTPs and RTOs will hereafter be referred to as 'regions'.

ReCEnT documents the nature and associations of registrars' in-consultation clinical and educational experiences. Participation is a routine component of their educational programme.^{17 18} Registrars may also provide informed voluntary consent for their data to be used for research purposes. The study protocol is described in detail elsewhere.¹⁹ Registrars complete paper-based case report forms (CRFs) recording details of 60 consecutive consultations at approximately the midpoint of each of their three 6-month general practice training terms (part-time registrars participate 12-monthly). As data collection is intended to reflect a 'normal' week in general practice, consultations in specialised clinics (eg, vaccinations or cervical screening) are excluded. Only office-based (not home visits or nursing home visits) consultations are recorded. Registrar demographics and practice data are documented via questionnaires on training commencement or at the start of each collection period, as appropriate.

Outcome factor

The outcome factor for this analysis was prescription of LARC for problems/diagnoses related to contraception, as defined by relevant International Classification of Primary Care (ICPC-2) codes (see online supplementary appendix A). LARC was defined as the etonogestrel implant, levonorgestrel IUD, non-hormonal IUD, and medroxyprogesterone injection. Non-LARC was defined as all progesterone-only and combined contraceptive pills available in Australia and the vaginal ring (see online supplementary appendix B for Anatomic Therapeutic Chemical (ATC) codes). Barrier methods (condoms, female condoms, and diaphragm), and emergency contraception (oral or IUD) were not included. Barrier methods generally do not require GP-initiation and are not captured by our methodology. Emergency contraception is not considered as a regular prophylactic contraceptive method and was also excluded.

Independent variables

Independent variables related to registrar, practice, patient, consultation, or educational factors.

Registrar variables were age, gender, training term, whether in full-time or part-time (less than eight half-day clinical sessions per week) training, place of primary medical qualification (Australia or international), whether the registrar had previously worked at the practice, and reproductive health-related post-graduate qualifications (defined as completion of one or more of Certificate of Women's Health (CWH), Diploma of Royal Australian and New Zealand College of Obstetrics & Gynaecology (DRANZCOG) or Family Planning Association Australia (FPAA) National Certificate in Reproductive & Sexual Health).

Practice variables were practice size (small <6 doctors vs large ≥6 doctors) and billing policy (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) to define the practice locations' degree of rurality (very remote, remote, outer regional, inner regional or major city location) and Socioeconomic Index for Area (SEIFA) Index of Disadvantage (where low deciles represent lower level of disadvantage).

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

Consultation variables were duration (in minutes) and if the problem/diagnosis was new or pre-existing.

Educational factors were whether the registrar sought advice or information in-consultation (from their supervisor or other sources, such as specialists, books or electronic resources) or generated learning goals.

Problems/diagnoses are coded according to ICPC-2²⁰ and medications according to the ATC classification.²¹

Statistical methods

This was a cross-sectional analysis of data from the longitudinal ReCEnT study. Analysis was at the level of problem/diagnosis and was confined to problems/diagnoses in female patients aged 12–55 years inclusive, for 16 rounds of data collection from 2010 to 2017.

The proportion of problems/diagnoses for which LARC was prescribed was calculated, with 95% confidence intervals.

The primary analysis was a comparison of prescription of LARC versus prescription of non-LARC methods. This assessed associations of registrars prescribing LARC as a contraceptive method and was chosen to provide important information for formulating measures to increase LARC utilisation by early-career GPs. The secondary analysis was a comparison of problems/diagnoses involving prescription of LARC versus all other problems/diagnoses. This is of importance in vocational training in establishing how often registrars are gaining experience in prescribing LARC (as well as which registrars and in which circumstances).

For both primary and secondary analyses, the frequencies of categorical variables were compared between outcome categories using Chi-squared tests or Fisher's exact test, as appropriate. For continuous variables, means were compared using a t-test. Univariate and multivariable logistic regression was used within the generalised estimating equations (GEE) framework to account for clustering of repeated measures within registrars. An exchangeable working correlation structure was assumed. Covariates with a univariate p value <0.20 were considered for inclusion in the multiple regression model. Covariates with p values >0.20 in the multivariable model were removed from the final model if the covariate's removal did not substantively change the resulting model.

Analyses were programmed using STATA 14.0 (StataCorp, College Station, TX, USA) and SAS V9.4 (SAS Institute Inc., Cary, NC, USA). Predictors were considered statistically significant if the p value <0.05.

Ethics approval for ReCEnT is from the University of Newcastle Human Research and Ethics Committee (Reference H-2009–0323).

Patient and public involvement

Patients were not involved in the design, recruitment or conduct of this study. Feedback from participating registrars is considered in ReCEnT study design, and results are disseminated to them through training provider 'training updates'.

RESULTS

A total of 1737 individual registrars contributed 4073 registrar-rounds of data (response rate 96.1%). Demographics of participating registrars, practices and patients are presented in [table 1](#). These are comparable to the registrar population of Australia.²²

There were 84 821 consultations and 135 652 problems/diagnoses for female patients aged 12–55 years. Of these, 5382 problems/diagnoses (4.0%) involved contraceptive prescription, 1356 (25%, 95% CI 24.1% to 26.4%) of which were LARC prescriptions. For categories of LARC and non-LARC prescribed, see [table 2](#).

Primary analysis – association of prescribing LARC compared to non-LARC

Characteristics of LARC prescribing compared to non-LARC prescribing are presented in [table 3](#).

The univariate and multivariable associations of LARC prescribing are shown in [table 4](#).

In the multivariable model adjusted for other variables, prescribing of LARC versus non-LARC was associated with older age groups (OR 1.60–2.86) compared with 12–18 years. Registrars were less likely to prescribe LARC if the patient was new to the practice (OR 0.42, 95% CI 0.31 to 0.57) or new to the registrar (OR 0.53, 95% CI 0.45 to 0.63). Prescribing LARC was more likely if the registrar had a reproductive health-related

Table 1 Participating registrar, practice and patient characteristics 2010–2017

Variable	Class	Total (n (%))
Registrar variables (n=1737)		
Registrar gender	Male	623 (35.9)
	Female	1114 (64.1)
Qualified as doctor in Australia	No	302 (17.5)
	Yes	1423 (82.5)
Year of graduation (mean (SD))		2008 (5.3)
Postgraduate qualifications in women's health	No	1606 (93.5)
	Yes	112 (6.5)
Registrar round/practice variables (n=4073)		
Registrar age (mean (SD))		32.4 (6.1)
Registrar status	Part-time	885 (22.3)
	Full-time	3078 (77.7)
Term	1	1614 (39.6)
	2	1470 (36.1)
	3	989 (24.3)
Practice size	Small (1–5 GPs)	1428 (36.1)
	Large (6–10+ GPs)	2527 (63.9)
Practice routinely bulk bills*	No	3122 (77.7)
	Yes	895 (22.3)
Rurality	Major city	2443 (60.1)
	Inner regional	1024 (25.2)
	Outer regional/remote/very remote	595 (14.7)
SEIFA index (mean (SD))		5.6 (2.9)
Patient variables (n=84 821)		
Patient age group (years)	12–18	9748 (11.5)
	19–25	16 221 (19.1)
	26–35	22 750 (26.8)
	36–45	19 512 (23.0)
	46–55	16 600 (19.6)
Aboriginal or Torres Strait Islander	No	78 387 (98.2)
	Yes	1409 (1.8)
Non-English speaking background	No	74 244 (92.4)
	Yes	6119 (7.6)
Patient/practice status	Existing patient	34 359 (41.4)
	New to registrar	42 616 (51.3)
	New to practice	6074 (7.3)

Values are numbers and percentages unless stated otherwise.

*Bulk billing indicates that the patient has no out-of-pocket expenses in respect of their consultation.

GP, general practitioner; SEIFA, Socioeconomic Index for Area index of disadvantage.

postgraduate qualification (OR 1.33, 95%CI 1.01 to 1.76). Compared with major cities, inner regional (OR 1.47, 95%CI 1.22 to 1.79) and outer regional/remote/very remote (OR 1.47, 95%CI 1.15 to 1.87) practice locations were associated with LARC prescription. LARC prescription was associated with lower practice-location SEIFA decile (OR 0.93, 95%CI 0.91 to 0.96). LARC prescription was associated with significantly

Table 2 Types of long-acting reversible contraception (LARC) and non-LARC prescribed: Australian general practitioner registrars 2010–2017

Contraceptive	Prescribing frequency	Percentage (%)
Long-acting reversible contraception (LARC)	1420	24.00
Etonogestrel implant	526	8.89
Medroxyprogesterone injection	462	7.81
Levonorgestrel intrauterine system	428	7.23
Copper intrauterine device	4	0.07
Non-LARC	4496	76.00
Combined oral contraceptive pill	4134	69.88
Levonorgestrel and estrogen	2366	40.00
Cyproterone and estrogen	585	9.89
Drospirenone and estrogen	448	7.57
Levonorgestrel and ethinylestradiol	354	5.98
Norethisterone and estrogen	188	3.18
Drospirenone and ethinylestradiol	79	1.34
Norethisterone and ethinylestradiol	36	0.61
Desogestrel and estrogen	24	0.41
Nomegestrol and estrogen	22	0.37
Dienogest and ethinylestradiol	18	0.30
Desogestrel and ethinylestradiol	7	0.12
Gestodene and estrogen	5	0.08
Dienogest and estradiol	1	0.02
Gestodene and ethinylestradiol	1	0.02
Progestogen-only pill	318	5.38
Levonorgestrel	267	4.51
Norethisterone	51	0.86
Vaginal ring with progestogen and estrogen	44	0.74
Total	5916	100.00

LARC, long-acting reversible contraception.

longer consultation duration in minutes (OR 1.02, 95%CI 1.02 to 1.03), learning goals generated (OR 1.37, 95%CI 1.04 to 1.79) and information/assistance sought (OR 1.58, 95%CI 1.24 to 2.01). Of sources of information/assistance, 54% were electronic (see online supplementary appendix C), 25% were the registrars' supervisor (or delegate), 11% were books and 2% were specialists or other health professionals.

Secondary analysis – association of a problem/diagnosis involving prescription of LARC (compared to all other problems/diagnoses)

See online supplementary appendix D for characteristics and online supplementary appendix E for univariable and multivariable associations.

In the multivariable model, problems/diagnoses in women aged 46–55 years (OR 0.19, 95%CI 0.14 to 0.27) and 36–45 years (OR 0.73, 95%CI 0.60 to 0.90)

compared with ages 12–18 years, and in non-English speaking background patients (OR 0.71, 95% CI 0.53 to 0.94) were less likely to involve prescription of LARC. The registrar was more likely female if LARC was prescribed (OR 1.34, 95% CI 1.15 to 1.55). LARC prescription was associated with postgraduate reproductive health qualification (OR 1.32, 95% CI 1.09 to 1.61). LARC was prescribed significantly more frequently in inner regional (OR 1.5, 95% CI 1.29 to 1.75,) and outer regional/remote/very remote areas (OR 1.71, 95% CI 1.47 to 1.98) compared with major cities. The higher the socioeconomic status of the area, the less likely LARC was prescribed (OR 0.97, 95% CI 0.95 to 0.99 for SEIFA deciles). If LARC was prescribed, registrars were more likely to have sought information/advice compared with other problems/diagnoses (OR 1.31, 95% CI 1.12 to 1.52).

DISCUSSION

The prevalence of LARC prescribing by GP registrars in our study is higher than has previously been estimated for established GPs.⁸ Non-LARC methods, however, remain the most frequently prescribed contraception by Australian GP registrars. We identified multiple associations of LARC prescribing; most notably registrar completion of postgraduate qualifications (though the absolute number of these registrars was modest), increased generation of learning goals, increased seeking of information/advice and rurality of practice. We also found evidence supporting previous findings in established GPs that LARC is prescribed proportionately more in older women, and by female GPs compared with their male counterparts.⁸

These findings of relative underprescribing of LARC have important implications for GP training. It may be that formal training in LARC for registrars may lead to increased LARC prescribing. However, other barriers to increased LARC use such as patient perceptions, nurse training, MBS remuneration, insertion training, and maintaining skills all need to be addressed.⁵

The findings of associations with in-consultation information or advice-seeking, learning goal generation, and longer consultation, however, suggest that GP registrars find LARC prescribing more challenging than non-LARC methods. The need to refer for insertion may be a contributing factor. Training in LARC insertion is not universally included in GP registrar training and often requires additional training. Increased LARC prescribing by GP registrars who have completed postgraduate qualifications in reproductive health suggest that LARC prescribing increases with appropriate training.

The results also suggest differing patterns of contraception type prescribed according to geographical location and SEIFA index. This has implications for understanding contraception decision-making, and

Table 3 Characteristics associated with Australian general practitioner registrars' prescribing of long-acting reversible contraception (LARC) versus non-LARC 2010–2017

Variable	Class	Non-LARC (n (%))	LARC (n (%))	P value
Patient age group (years)	12–18	650 (16)	168 (12)	<0.001
	19–25	1570 (39)	382 (28)	
	26–35	1192 (30)	452 (33)	
	36–45	501 (12)	283 (21)	
	46–55	113 (3)	71 (5)	
Aboriginal or Torres Strait Islander	No	3758 (99)	1240 (97)	<0.001
	Yes	37 (1)	34 (3)	
Non-English speaking background	No	3695 (97)	1216 (94)	<0.001
	Yes	124 (3)	75 (6)	
Patient/practice status	Existing patient	992 (25)	546 (41)	<0.001
	New to registrar	2555 (65)	678 (51)	
	New to practice	391 (10)	112 (8)	
Registrar gender	Male	930 (23)	281 (21)	0.10
	Female	3096 (77)	1075 (79)	
Registrar status	Part-time	999 (25)	338 (26)	0.95
	Full-time	2933 (75)	972 (74)	
Term	1	1585 (39)	530 (39)	0.95
	2	1436 (36)	477 (35)	
	3	1005 (25)	349 (26)	
Qualified as doctor in Australia	No	632 (16)	232 (17)	0.21
	Yes	3374 (84)	1113 (83)	
Postgraduate qualifications	No	3664 (92)	1196 (89)	0.003
	Yes	321 (8)	145 (11)	
Practice size	Small	1176 (30)	475 (36)	0.001
	Large	2718 (70)	844 (64)	
Practice routinely bulk bills*	No	3083 (78)	1024 (77)	0.34
	Yes	895 (22)	313 (23)	
Rurality	Major city	2521 (63)	712 (53)	<0.001
	Inner regional	956 (24)	393 (29)	
	Outer regional/remote/very remote	536 (13)	250 (18)	
New problem seen	No	2602 (71)	551 (45)	<0.001
	Yes	1045 (29)	679 (55)	
Sought help any source	No	3665 (91)	1087 (80)	<0.001
	Yes	361 (9)	269 (20)	
Learning goals generated	No	3554 (92)	1077 (83)	<0.001
	Yes	325 (8)	213 (17)	
Registrar age (mean (SD))		32 (6)	32 (6)	0.48
Year of graduation (mean (SD))		2008 (5)	2008 (5)	0.60
SEIFA index (mean (SD))		6 (3)	5 (3)	<0.001
Consultation duration (mean (SD))		16 (9)	20 (11)	<0.001

Values are numbers and percentages unless stated otherwise.

*Bulk billing indicates that the patient has no out-of-pocket expenses in respect of their consultation. LARC, long-acting reversible contraception; SEIFA, Socioeconomic Index for Area index of disadvantage.

the training needs of registrars. It has previously been recognised that rural-located women are more likely to use LARC compared with city-living women both

Table 4 Associations of Australian general practitioner registrars' prescribing of long-acting reversible contraception (LARC) versus non-LARC 2010–2017: multivariable logistic regression

Factor group	Variable	Class	Univariate		Adjusted	
			OR (95% CI)	P value	OR (95% CI)	P value
Patient factors	Patient age group Referent: 12–18 years	19–25 years	0.94 (0.76 to 1.15)	0.54	1.16 (0.91 to 1.48)	0.22
		26–35 years	1.46 (1.19 to 1.79)	<0.001	1.65 (1.29 to 2.11)	<0.001
		36–45 years	2.17 (1.74 to 2.70)	<0.001	2.85 (2.17 to 3.74)	<0.001
		46–55 years	2.41 (1.71 to 3.40)	<0.001	2.86 (1.86 to 4.41)	<0.001
	Non-English speaking background	Yes	1.84 (1.34 to 2.52)	<0.001	1.16 (0.75 to 1.79)	0.50
	Patient/practice status	New to practice	0.52 (0.40 to 0.66)	<0.001	0.42 (0.31 to 0.57)	<0.001
		New to registrar	0.49 (0.43 to 0.56)	<0.001	0.53 (0.45 to 0.63)	<0.001
Registrar factors	Postgraduate qualifications	Yes	1.43 (1.13 to 1.82)	0.003	1.33 (1.01 to 1.76)	0.045
Practice factors	Rurality Referent: major city	Inner regional	1.46 (1.25 to 1.71)	<0.001	1.47 (1.22 to 1.79)	<0.001
		Outer regional/ remote/very remote	1.67 (1.39 to 2.01)	<0.001	1.47 (1.15 to 1.87)	0.002
	SEIFA index		0.91 (0.89 to 0.93)	<0.001	0.93 (0.91 to 0.96)	<0.001
Consultation factors	Consultation duration		1.04 (1.03 to 1.05)	<0.001	1.02 (1.02 to 1.03)	<0.001
	Learning goals generated	Yes	2.18 (1.80 to 2.65)	<0.001	1.37 (1.04 to 1.79)	0.024
	New problem seen	Yes	3.05 (2.65 to 3.52)	<0.001	2.55 (2.16 to 3.00)	<0.001
	Sought help any source	Yes	2.56 (2.16 to 3.04)	<0.001	1.58 (1.24 to 2.01)	<0.001

CI, confidence interval; OR, odds ratio; SEIFA, Socioeconomic Index for Area index of disadvantage.

in Australia and the USA.^{23 24} A number of explanations have been postulated for this difference including access and travel distances, differing patient needs and differing GP skill sets.^{23 25} Our finding that LARC prescribing is associated with women managed in practices in lower SEIFA index areas reflects previous findings that LARC is used more frequently by women who do not have a university qualification, and those working in manual, trade or service occupations.²³ However, further research is needed in understanding the factors at play, especially as living in a rural area and low SEIFA index is associated with higher rates of unintended pregnancy.²⁶

Strengths and limitations

A strength of this study is the use of a large dataset (5382 problems/diagnoses involving contraceptive prescription) of GP registrar consultations with the contemporaneous recording of a large number of covariates. This has allowed us to adjust our findings for a wide range of potential confounding factors. The high response rate and inclusion of data from training organisations in five of Australia's six states, including practices located from major cities to very remote classifications, are also strengths, providing good generalisability of findings to Australian GP registrars' practice.

A limitation of this research is that the data provide only a 'snap shot' at the consultation level. While we have detailed data on individual consultations, we do not have data on contextual factors such as comorbidities that were not addressed within the index

consultation but that may have influenced prescribing decisions, or on patient request. In addition, analysing the frequency of prescriptions does not give a true reflection of overall LARC use due to the varying prescribing intervals for the different methods (typically 3-yearly for implant, 5-yearly for IUD, 12 monthly for COCP, and 6-monthly for injection for PBS prescriptions). As such, our results will underestimate the true prevalence of LARC use compared with other methods. Furthermore, as our study is cross-sectional, we can hypothesise possible reasons for the associations found but cannot infer causality from our data.

Conclusions and implications

This research suggests that GP registrars prescribe non-LARC methods with greater frequency than LARC methods (though they prescribe LARC more frequently than established GPs) and that they find prescribing LARC challenging. Future research could explore whether introducing formal LARC training to GP registrars results in increased LARC prescribing, the barriers faced by GP registrars in prescribing LARC, and the reasons for geographical differences in LARC prescribing.

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Contributors PM, SM, MvD and KH were investigators on the initial ReCEnT study. RT devised the design of the substudy. AT, AD, KH, PM, KF and NS oversaw data collection. AT, EH and JH analysed the data. RT drafted the manuscript. PM supervised the study progress. SS provided intellectual input to the manuscript. All authors contributed to critical revision of the manuscript. All authors read and approved the manuscript prior to submission.

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REFERENCES

- 1 Trinh L, McGeechan K. Contraception. In: Trinh L, McGeechan K, Digiusto E, eds. *Reproductive & Sexual health in Australia*. Ashfield, Sydney: Family Planning New South Wales, 2013: 149–80.
- 2 Wilkins R, Warren D, Hahn M. Use of birth control measures in Australia. In: Wilkins R, Warren D, Hahn M, eds. *Families, incomes and jobs, volume 6: a statistical report on waves 1 to 8 of the household, income and labour dynamics in Australia survey*. Melbourne, Victoria: Melbourne Institute of Applied Economic and Social Research, 2011. https://melbourneinstitute.unimelb.edu.au/_data/assets/pdf_file/0020/2155502/hilda-statreport-2011.pdf
- 3 Marie Stopes International. Real choices: women, contraception and unplanned pregnancy. Melbourne, Victoria: Marie Stopes International, 2008. Available: <https://www.mariestopes.org.au/wp-content/uploads/Real-Choices-Key-Findings.pdf> [Accessed 11 Dec 2019].
- 4 Chan A, Sage LC. Estimating Australia's abortion rates 1985–2003. *Med J Aust* 2005;182:447–52.
- 5 Mazza D, Bateson D, Frearson M, et al. Current barriers and potential strategies to increase the use of long-acting reversible contraception (LARC) to reduce the rate of unintended pregnancies in Australia: an expert roundtable discussion. *Aust N Z J Obstet Gynaecol* 2017;57:206–12.
- 6 Gipson JD, Koenig MA, Hindin MJ. The effects of unintended pregnancy on infant, child, and parental health: a review of the literature. *Stud Fam Plann* 2008;39:18–38.
- 7 National Collaborating Centre for Women's and Children's Health (UK). *Long-acting reversible contraception: the effective and appropriate use of long-acting reversible contraception 2005*. London, UK: RCOG Press, 2019. <https://www.nice.org.uk/guidance/cg30/evidence/full-guideline-pdf-194840607>
- 8 Mazza D, Harrison C, Taft A, et al. Current contraceptive management in Australian general practice: an analysis of beach data. *Med J Aust* 2012;197:110–4.
- 9 Winner B, Peipert J, Zhao Q, et al. Effectiveness of long-acting reversible contraception. *N Engl J Med* 2012;336:1998–2007.
- 10 Taft AJ, Shankar M, Black KI, et al. Unintended and unwanted pregnancy in Australia: a cross-sectional, national random telephone survey of prevalence and outcomes. *Med J Aust* 2018;209:407–8.
- 11 Richters J, Fitzadam S, Yeung A, et al. Contraceptive practices among women: the second Australian study of health and relationships. *Contraception* 2016;94:548–55.
- 12 Kavanaugh ML, Jerman J, Finer LB. Changes in use of long-acting reversible contraceptive methods among U.S. women, 2009–2012. *Obstet Gynecol* 2015;126:917–27.
- 13 Mavranzouli I. The cost-effectiveness of long-acting reversible contraceptive methods in the UK: analysis based on a decision-analytic model developed for a National Institute for Health and Clinical Excellence (NICE) clinical practice guideline. *Hum Reprod* 2008;23:1338–45.
- 14 National Research Council. *Initial national priorities for comparative effectiveness research*. Washington, DC: National Academies Press, 2009.
- 15 Britt H, Miller G, Henderson J, et al. *General practice activity in Australia 2015–16*. Sydney, NSW: Sydney University Press, 2016.
- 16 Royal Australian College of General Practitioners (RACGP). *The Royal Australian College of General Practitioners standards for general practice training*. East Melbourne, Victoria: RACGP, 2017. <https://www.racgp.org.au/download/Documents/Standards/Standards-for-General-Practice-Training-Second-Edition-V4.pdf>
- 17 Magin P, Morgan S, Henderson K, et al. The Registrars' Clinical Encounters in Training (ReCEnT) project: educational and research aspects of documenting GP trainees' clinical experience. *Aust J Gen Pract* 2015;44:681–4.
- 18 Morgan S, Henderson K, Tapley A, et al. How we use patient encounter data for reflective learning in family medicine training. *Med Teach* 2015;37:897–900.
- 19 Morgan S, Magin PJ, Henderson KM, et al. Study protocol: the registrar clinical encounters in training (recent) study. *BMC Fam Pract* 2012;13:50.

- 20 Britt H. A new coding tool for computerised clinical systems in primary care - ICPC plus. *Aust Fam Physician* 1997;26:S79–82.
- 21 WHO Collaborative Centre for Drug Statistics Methodology. Anatomic therapeutic chemical classification, 2019. Available: http://www.whocc.no/use_of_atc_ddd [Accessed 11 Dec 2019].
- 22 Taylor R, Radloff A, Edwards D, *et al.* *Australian general practice training program: national report on the 2017 national registrar survey*. Canberra, ACT: Australian Government Department of Health, 2018. <http://web.archive.org/web/20180814021634/http://www.agpt.com.au/ArticleDocuments/324/Australian-General-Practice-Training-Program-%20National-report-on-the-2016-Registrar-Satisfaction-Survey.pdf.aspx>
- 23 Lucke JC, Herbert DL. Higher uptake of long-acting reversible and permanent methods of contraception by Australian women living in rural and remote areas. *Aust N Z J Public Health* 2014;38:112–6.
- 24 Tobar A, Lutfiyya MN, Mabasa Y, *et al.* Comparison of contraceptive choices of rural and urban us adults aged 18-55 years: an analysis of 2004 behavioral risk factor surveillance survey data. *Rural Remote Health* 2009;9:1186.
- 25 Mirza T, Kovacs GT, Kinfu Y. Serving rural Australia with reproductive health expertise. *Aust J Rural Health* 2001;9:241–5.
- 26 Rowe H, Holton S, Kirkman M, *et al.* Prevalence and distribution of unintended pregnancy: the understanding fertility management in Australia national survey. *Aust N Z J Public Health* 2016;40:104–9.

1 **Appendix A:**

2

3 ICPC-2 codes – Contraception related problem defined as:

4

? Pregnancy

Admin;GP management plan

Advice/education;Pap smear

Advice/education;Webster pack

Advice/education;contracept;F

Advice/education;pregnancy

Advice/education;reproductiv;F

Advice/education;sex

Advice/education;travel

Bleeding;breakthru(contracept)

Change (in);medication

Check up

Check up;IUCD

Check up;adult health;complete

Check up;gynaecological

Check up;postnatal

Check up;postpartum

Complication;implant(s)

Contraception;Depo progesteron

Contraception;F

Contraception;IUD

Contraception;OC pill

Contraception;implant

Contraception;injection

Contraception;other method

Contraception;postpartum

Contraception;vaginal ring

Counselling;family planning;F

Counselling;problem;reproduc

Encounter;other

Health maintenance

Insert;implant;contraception

Insertion;IUCD

Medication(s)

Medication;prevent

Medication;renew

Medication;renew;endoc/metabol

Medication;renew;genital;F

Medication;renew;reproductive

Medication;request

Medication;request;endoc/metab

Medication;request;genital;F

Medication;request;reproduct

Medications;reproductive
Missed;OC pill
Prescription(s)
Prescription;reproductive
Problem;IUCD
Problem;OCP
Problem;contraception
Progesterone only pill
Referral;family planning
Removal;IUCD
Remove;implant;contraception
Review;medication
Side-effect;medication
Unprotected sex; F

Appendix B:

The following ATC codes defined 'LARC':

G03AC08 – etonogestrel (contraceptive implant)
G03AC03 – levonorgestrel (IUD with progesterone)
G03AC06 – medroxyprogesterone (depot)
G02BA01 – plastic IUD
G02BA02 – plastic IUD with copper
G02BA03 – plastic IUD with progesterone

The following ATC codes defined 'non-LARC':

G03HB01 – cyproterone and estrogen (COCP)
G03AC03 – levonorgestrel (POP)
G03AC01 – norethisterone (POP)
G03AA07 – levonorgestrel and ethinylestradiol (COCP-fixed)
G03AB03 – levonorgestrel and ethinylestradiol (COCP – sequential)
G03AA14 – norgestrel and estradiol (COCP)
G03AA16 – dienogest and ethinylestradiol (COCP-fixed)
G03AB08 – dienogest and estradiol (COCP-sequential)
G03AA05 – norethisterone and ethinylestradiol (COCP-fixed)
G03AA10 – gestodene and ethinylestradiol (COCP – fixed)
G03AA12 – drospirenone and ethinylestradiol (COCP – fixed)
G03AA09 – desogestrel and ethinylestradiol (COCP-fixed)
G02BB01 – vaginal ring with progestogen and estrogen

Appendix C

Electronic sources utilised by GP registrars prescribing LARC

Source	Frequency	Percentage
Family Planning Organisation website	50	36.8
Australian Medicines Handbook	23	16.9
Australian Therapeutic Guidelines	20	14.7
Monthly Index of Medical Specialities (MIMS)	15	11.0
Drug company website	7	5.1
Royal Australian College of General Practitioners guidelines	5	3.7
Murtagh's General Practice Online	2	1.5
Practice Software	2	1.5
Royal Women's Hospital website	2	1.5
Health Pathways	2	1.5
Jean Hailes website	1	0.7
Pharmaceutical Benefits Scheme website	1	0.7
UpToDate	1	0.7
Other, unspecified	5	3.7

Appendix D

Characteristics associated with Australian GP Registrars' prescribing of LARC versus all other problems 2010-2017.

Variable	Class	No	Yes	p
Patient age group	12-18 years	13856 (10%)	168 (12%)	<0.001
	19-25 years	25559 (19%)	382 (28%)	
	26-35 years	35560 (26%)	452 (33%)	
	36-45 years	31054 (23%)	283 (21%)	
	46-55 years	28267 (21%)	71 (5%)	
Aboriginal or Torres Strait Islander	No	123927 (98%)	1240 (97%)	0.06
	Yes	2355 (2%)	34 (3%)	
NESB	No	117234 (92%)	1216 (94%)	0.02
	Yes	10004 (8%)	75 (6%)	
Patient/practice status	Existing patient	55958 (43%)	546 (41%)	0.21
	New to registrar	65678 (50%)	678 (51%)	
	New to practice	9774 (7%)	112 (8%)	
Registrar gender	Male	34368 (26%)	281 (21%)	<0.001
	Female	99928 (74%)	1075 (79%)	
Registrar FT or PT	Part-time	32437 (25%)	338 (26%)	0.50
	Full-time	98514 (75%)	972 (74%)	
Term	Term 1	54100 (40%)	530 (39%)	0.48
	Term 2	47784 (36%)	477 (35%)	
	Term 3	32412 (24%)	349 (26%)	
Qualified as doctor in Australia	No	20766 (16%)	232 (17%)	0.10
	Yes	112742 (84%)	1113 (83%)	
Post-grad qualifications	No	122085 (92%)	1196 (89%)	0.002
	Yes	11080 (8%)	145 (11%)	
Practice size	Small	44787 (34%)	475 (36%)	0.23
	Large	85710 (66%)	844 (64%)	
Practice routinely bulk bills	No	99807 (75%)	1024 (77%)	0.46
	Yes	32781 (25%)	313 (23%)	
Rurality	Major city	84858 (63%)	712 (53%)	<0.001
	Inner regional	31613 (24%)	393 (29%)	

Variable	Class	No	Yes	p
	Outer regional / remote / very remote	17503 (13%)	250 (18%)	
New problem seen	No	51936 (42%)	551 (45%)	0.07
	Yes	71594 (58%)	679 (55%)	
Sought help any source	No	113092 (84%)	1087 (80%)	<0.001
	Yes	21204 (16%)	269 (20%)	
Learning goals generated	No	106008 (83%)	1077 (83%)	0.50
	Yes	22197 (17%)	213 (17%)	
Registrar age	mean (SD)	32 (6)	32 (6)	0.17
Year of graduation	mean (SD)	2008 (5)	2008 (5)	0.64
SEIFA index	mean (SD)	6 (3)	5 (3)	<0.001
Consultation duration	mean (SD)	20 (10)	20 (11)	0.31

FT, full time, PT, part time

SEIFA, Socio-economic Indexes for Areas

NESB, Non-English speaking background

Bulk billing = no out of pocket expense to patient for consultation

Appendix E

Associations of Australian GP registrars' prescription of LARC versus all other problems 2010-2017 -univariate and multivariable logistic regression

Factor group	Variable	Class	Univariate		Adjusted	
			OR (95% CI)	p	OR (95% CI)	p
Patient factors	Patient age group	19-25 years	1.24 (1.02, 1.50)	0.0291	1.20 (0.98, 1.46)	0.080
		26-35 years	1.05 (0.87, 1.27)	0.5952	1.03 (0.85, 1.24)	0.80
		36-45 years	0.75 (0.62, 0.92)	0.0043	0.73 (0.60, 0.90)	0.003
		46-55 years	0.21 (0.16, 0.28)	<.0001	0.19 (0.14, 0.27)	<0.001
	NESB	Yes	0.74 (0.57, 0.95)	0.0198	0.71 (0.53, 0.94)	0.019
Registrar factors	Registrar age		0.99 (0.98, 1.00)	0.1706	0.99 (0.98, 1.00)	0.084
	Registrar gender	Female	1.31 (1.14, 1.51)	0.0001	1.34 (1.15, 1.55)	<0.001
	Post-grad qualifications	Yes	1.35 (1.11, 1.63)	0.0021	1.32 (1.09, 1.61)	0.005
Practice factors	Rurality	Inner regional	1.48 (1.29, 1.70)	<.0001	1.50 (1.29, 1.75)	<0.001
		Outer regional / remote / very remote	1.71 (1.47, 1.98)	<.0001	1.65 (1.38, 1.96)	<0.001
	SEIFA index		0.95 (0.93, 0.97)	<.0001	0.97 (0.95, 0.99)	0.007
Consultation factors	New problem seen	Yes	0.89 (0.79, 1.01)	0.0685	0.86 (0.76, 0.97)	0.014
	Sought help any source	Yes	1.34 (1.16, 1.53)	<.0001	1.31 (1.12, 1.52)	<0.001

SEIFA, Socio-economic Indexes for Areas

NESB, Non-English speaking background