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The Pattern of Opioid Management by Australian General Practice Trainees

Simon Holliday, BMed, FAChAM, FRACGP, FACRRM,[*,†] Simon Morgan, MPH&TM, FRACGP,[‡] Amanda Tapley, Biomedical Science(Hons),[‡] Adrian Dunlop, PhD, FAChAM,[*,†] Kim Henderson, BNurs, Grad Dip. Health Soc. Sci.,[‡] Mieke van Driel, PhD, FRACGP,[§] Neil Spike, MBBS, FRACGP,[¶,] Lawrie McArthur, MBBS, FRACGP,[††] Jean Ball, BMath, Grad Dip Med Stat,[‡‡] Chris Oldmeadow, PhD, BMathematics (Honours),[§§] and Parker Magin, PhD, FRACGP[*,‡]**

*School of Medicine and Public Health, Faculty of Health, University of Newcastle, Newcastle, NSW, Australia; [†]Drug and Alcohol Clinical Services, Hunter New England Local Health District, NSW, Australia; [‡]General Practice Training Valley to Coast, Mayfield, NSW, Australia; [§]Discipline of General Practice, School of Medicine, The University of Queensland, Brisbane, Queensland, Australia; [¶]Department of General Practice, The University of Melbourne, Victoria, Australia; [**]Director of Medical Education and Training, VMA General Practice Training, Melbourne, Victoria, Australia; [††]Director of Medical Education and Training, Adelaide to Outback GP Training, Adelaide, South Australia; [‡‡]Clinical Research Design, Information Technology and Statistical Support (CReDITSS), Hunter Medical Research Institute, Newcastle, NSW, Australia; [§§]Centre for Clinical Epidemiology and Biostatistics, University of Newcastle, Newcastle, NSW, Australia

Reprint requests to: Dr. Simon Mark Holliday, Albert St Medical Centre, 78 Albert St Taree NSW 2430 Taree, New South Wales 2430, Australia, Tel: +61 (0)2 6552 5533; Fax: +61 (0)2 6552 4249; Email: simon.holliday@albertstmc.com, Simon.Holliday@hnehealth.nsw.gov.au.

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Abbreviations: OST = Opioid Substitution Therapy; PNCP = Persistent Non-Cancer Pain; QUM = Quality Use of Medicines; PBS = Pharmaceutical Benefits Scheme; ReCEnT = Registrar (GP Trainee) Clinical Encounters in Training; MIMWOs = Medical Issue managed with opioids; ACSQHC = The Australian Commission on Safety and Quality in Health Care; RTPs = Regional Training Providers

Abstract

Objective. With escalating opioid prescribing come individual and public health harms. To inform quality improvement measures, understanding of opioid prescribing is essential. We aimed to establish consultation-level prevalence and associations of opioid prescribing.

Design. A cross-sectional secondary analysis from a longitudinal multisite cohort study of general practitioner (GP) vocational trainees: "Registrar Clinical Encounters in Training."

Setting. Four of Australia's seventeen GP Regional Training Providers, during 2010-13.

Subjects. GP trainees.

Methods. Practice and trainee demographic data were collected as well as patient, clinical and educational data of 60 consecutive consultations of each trainee, each training term. Outcome factors were any opioid analgesic prescription and initial opioid analgesic prescription for a specific problem for the first time.

Results. Overall, 645 trainees participated. Opioids comprised 4.3% prescriptions provided for 3.8% of patients. Most frequently prescribed were codeine (39.9%) and oxycodone (33.4%). Prescribing was for acute pain (29.3%), palliative care (2.6%) or other indications (68.1%). Most prescribing involved repeat prescriptions for pre-existing problems (62.7% of total). Other associations included older patients; prescriber and patient male gender; Aboriginal/Torres Strait Islander status; rural and disadvantaged locations; longer consultations; and generation of referrals, follow-up, and imaging requests. Opioid initiation was more likely for new patients with new problems, but otherwise associations were similar. Trainees rarely reported addiction risk-mitigation strategies.

Conclusions. Most opioids were prescribed as maintenance therapy for non-cancer pain. Demographic associations with opioid analgesic prescribing resemble those presenting for opioid dependency treatment. Our findings should inform measures by regulators and medical educators supporting multimodal pain management.

Key Words. Opioids; Analgesic; Pain Management; Primary Care; Quality of Health Care; Prescriptions; Persistent Pain; Risk Factors; Aboriginal and Torres Strait Islander

Background

Pleasure and pain have been improved or treated by opium for millennia. Still, opioid therapeutic use remains a conundrum [1–3]. Opioid management has evolved into several therapeutic models. Opioid Substitution Therapy (OST) is a highly structured and evidence based model of care to minimize harms from opioid dependency [4]. OST remains relatively inaccessible with few (2.1%) Australian doctors authorized to prescribe it [5,6]. Barriers to GPs becoming OST prescribers frequently include stigma, workload, lack of specialist support or perceived threat [7]. The specialty of palliative care developed a model of opioid analgesia based on self-titration and minimal monitoring [8]. The specialty of pain medicine adopted this model to address the under-treatment of chronic pain, regardless of etiology [2,9,10]. The Australian National Pain Strategy claims that less than 10% of Persistent Non-Cancer Pain (PNCP) patients, gain access to effective analgesia [11]. The strategy champions access to opioids for "legitimate users" [11]. Notwithstanding the evidence that opioid-related mortality is associated with different variables [10], the strategy proscribes their long term provision in the context of "predominantly psychological factors," "inappropriate" prescribing or "unsanctioned use" [11]. Such a judgement, reliant on a clinician's experience, prejudices and knowledge [1], may be especially problematic for "uninitiated prescribers due to the lack of a useful case definition for the various dependent states" [12]. Australian GPs report infrequently effecting such judgements [13], with associated barriers involving the beliefs and stigmatizing attitudes of clinicians and time pressures, similar as towards OST [7,14]. Financial and geographical barriers to accessing multidisciplinary pain management are also involved [11].

Concurrent with claims of under-treatment, opioid prescribing in Australia increased 15-fold between 1992 and 2012 [15]. During this time pharmaceutical opioids became the most common cause (69%) of accidental opioid overdoses, especially in older age groups [16]. An Australian study tested assertions that most prescribing was for PNCP [17] and found that only a minority of opioid prescribing was for "chronic" conditions 43.9%) or malignant neoplasms (3.5%) [18]. Whether opioid maintenance is indicated in PNCP is increasingly contested [12,19,20] with one recent guideline stating PNCP is currently not an evidence-based indication for long term analgesics [21]. Similarly, a systematic review by the United States Food and Drug Administration found no adequate or well-controlled studies of opioid use longer than 12 weeks [22].

A number of Australian studies have showed that opioid analgesics are frequently prescribed outside Pharmaceutical Benefits Scheme (PBS) subsidization criteria or prescribing guidelines [13,15,21,23,24]. Regulators have responded in various ways. Of disciplinary cases where doctors have been sanctioned by tribunals, 25% involve inappropriate prescribing, mainly drugs of dependency [25,26]. In the USA, the Centers for Disease Control and Prevention is currently establishing prescribing norms to identify and intervene in cases of patients or providers who fall outside these norms [27]. The Australian Commission on Safety and Quality in Health Care (ACSQHC) is similarly investigating mapping variations in opioid prescribing (Dr. Heather Buchan: director: personal communication 11/8/2014). Mapping such variations in opioid prescribing is predicated on detailed and reliable prescribing data. The ACSQHC has established the Quality Use of Medicines (QUM) framework to consider how pharmaceutical options are chosen by clinicians, which medicines are selected and whether the use of these medicines is both safe and effective [28].

To improve access to selected medications for specific indications, the Commonwealth Government provides Australian residents subsidies through the PBS. Data from the PBS is readily accessible to researchers but

significantly under-estimates prescribing. This is because it does not capture unsubsidized medications, any medications where the dispensed price is below the patient contribution (including many older and cheaper opioids) or "private" or inpatient prescriptions written outside the public community dispensing framework [29]. PBS-data also does not facilitate linkage to individual general practitioner (GP) or patient data [17,29].

Due to the limitations of PBS-level data, calls have been made for population based studies to explore individual level data and identify risky patterns of opioid prescribing particularly to disadvantaged populations [15,26,29,30]. Such studies would inform interventions to promote future QUM but frequently suffer from low GP response rates [31]. Such interventions must involve early-career GPs as they comprise largely "uninitiated" prescribers whose opioid prescribing has been identified as challenging [12] and less guideline concordant [13]. In this study of Australian GP trainees, we aim to map the prevalence, nature and associations of opioid analgesic prescribing by using contemporaneously recorded detailed individual GP trainee consultation data.

Methods

This analysis was conducted within the Registrar Clinical Encounters in Training (ReCEnT) project. ReCEnT is an ongoing multisite cohort study of GP trainees' (registrars') in-consultation clinical experience.

The Australian General Practice Training Program involves a minimum of three years training, of which at least three six-month Full Time Equivalent terms must be spent in general practice rather than hospital-based practice. The general practice component is delivered by 17 geographically defined Regional Training Providers (RTPs) and their affiliated training general practices and leads to Fellowship of either the Royal Australian College of General Practitioners and/or the Australian College of Rural and Remote Medicine. Though GP trainees have recourse to their supervisors for advice and support in an "apprenticeship-like model," they function as independent practitioners (including for prescribing). The trainees in the ReCEnT study are from four of Australia's seventeen RTPs spanning four of Australia's eight states and territories (New South Wales, Victoria, South Australia and Tasmania).

One state, Tasmania, commenced rolling-out a real-time prescription monitoring system in 2010, [32] and now approximately one third of Tasmanian general practices have requested it and have access to it (Clinical Associate Professor Adrian Reynolds: Tasmanian clinical director of alcohol and drug services: personal communication 8/4/2015). The study encompasses general practices across all rural-urban classifications from Major City to Very Remote [33].

The ReCEnT methodology has been described in detail elsewhere [34]. Briefly, GP trainees record the details of 60 consecutive clinical consultations with a paper-based encounter form at approximately the mid-point of each six-month general practice training term. As data collection is designed to reflect a "normal" week of general practice, consultations in specialized clinics (e.g., vaccinations) are excluded. Only office-based consultations, not home or nursing home visits, are included. Initial data collection involves demographic, education, work experience and current practice characteristics. The encounter form data encompasses four broad areas: patient demographics, diagnoses or problems managed (hereafter referred to as medical issues), management, and educational training aspects.

Data in the current analysis is from eight rounds of data collection, 2010-13 and was confined to patients 16 years of age or older reflecting the sparsity of research, specialist treatment centers and GP opioid analgesia prescribing for the younger demographic [11,18].

Outcome Factors

The primary outcome factor in this study was the prescription of an opioid for pain management. We selected these opioids using the "N02A" and "N01AH" codes from the N (nervous) section of International Anatomical Therapeutic Chemical [35]. We excluded opioids (codeine) used as cough suppressants (code "R05DA04") or used for addictive disorders (codes "NO7B A-C") a priori, as our primary focus was analgesia [35]. The secondary outcome factor was the "initial" prescription of an opioid for analgesia. A prescription was classified as "initial" when used for the first time for that specific medical issue (accepting that the medicine may have been used for that patient for a different medical issue). If a medicine was a continuation or repeat of previous therapy, (signifying historical as well as current prescribing decisions), it was classified as "continuing."

Independent Variables

Independent variables collected related to trainee, patient, practice, and consultation.

Trainee factors were age, gender, training term, country of medical qualification (Australia/international), and the number of half-days worked per week. Practice factors included practice size (number of full-time equivalent GPs), and if the practice routinely bulk-billed (i.e., the Commonwealth government completely reimburses a practitioner for the consultation leaving no financial cost to the patient). Postcode was used to define practice rurality/urbanicity using the Australian Standard Geographical Classification-Remoteness Area classification of the practice location [33] and the practice location's Socioeconomic Index for Area (SEIFA) Relative Index of Disadvantage [36]. Patient factors were age, gender, Aboriginal/Torres Strait Islander status, non-English speaking background and whether new to the practice or the trainee. Consultation factors were duration of consultation in minutes as estimated and recorded by the trainee, the number of medical issues managed, the ordering of imaging, the number of pathology tests ordered

Table 1 Participating trainee, trainee-term, and practice characteristics

Variable	Class	*n*% (95% CIs) or Mean (SD)
Trainee variables ($n = 645$)		
Trainee gender	Male	202 34.1% (30.4–37.8)
	Female	425 65.9% (62.2–69.6)
Pathway trainee enrolled in	General	494 77.0% (73.7–80.2)
	Rural	148 23.0% (19.8–26.3)
Qualified as a doctor in Australia	No	155 24.4% (21.1–27.8)
	Yes	480 75.6% (72.2–78.9)
Trainee age (years)	Mean (SD)	32.8 (6.6)
Trainee year of graduation	Mean (SD)	2005.1 (5.6)
Trainee-term or practice-term variables ($n = 1426$)		
Trainee training term	Term 1	557 39.1% (36.5–41.6)
	Term 2	488 34.2% (31.8–36.7)
	Term 3	306 21.5% (19.3–23.6)
	Term 4	75 5.3% (4.1–6.4)
Trainee worked at the practice previously	No	994 70.7% (68.3–73.0)
	Yes	413 29.3% (27.0–31.7)
Trainee works fulltime	No	302 21.7% (19.5–23.8)
	Yes	1091 78.3% (76.1–80.5)
Does the practice routinely bulk bill	No	1179 83.4% (81.5–85.4)
	Yes	234 16.6% (14.6–18.5)
Number of GPs working at the practice	1–4	454 32.5% (30.1–35.0)
	5–10+	941 67.5% (65.0–69.9)
Rurality of practice	Major city	827 58.0% (55.4–60.6)
	Inner regional	424 29.7% (27.4–32.1)
	Outer regional or remote	175 12.3% (10.6–14.0)
SEIFA*	Mean (SD)	5.4 (2.8)

* Socioeconomic Index for Area (SEIFA) relative index of disadvantage: lower deciles are relatively disadvantaged.

or whether a referral or scheduled follow-up was made. Educational factors included whether the trainee sought assistance during the consultation or generated learning goals for subsequent attention.

Registrars could code each problem as either **"**new" or "pre-existing." The former included initial episodes, exacerbations of recurrent problems, or any problems (regardless of duration) which were being managed for the first time. The medical issues nominated by the registrars were coded according to the International Classification of Primary Care (second edition) (ICPC-2 PLUS) system [37]. This is the international standard for classifying primary care data and the validity of this system has previously been demonstrated [38]. Individual diagnoses/problems are grouped in 17 Disease Chapters and further classified as process codes, symptoms/complaints, infections, neoplasms, injuries, congenital anomalies, and other diagnoses. Chronic diseases in our study were coded via a classification system derived from ICPC-2 [39]. We also manually reviewed all the coded diagnoses to identify those which related to palliative care or acute pain (taken to include: acute trauma; any injury classified by the trainee as "new"; or issues identified as preoperative or postoperative) with the remainder regarded as PNCP.

Statistical Analysis

This was a cross-sectional analysis of patient consultations from the longitudinal ReCEnT study. The unit of analysis for both primary and secondary outcomes was the individual medical issue rather than the individual consultation.

Percentages of trainees' medical issues managed with opioids (MIMWOs) were calculated, with 95% confidence intervals. To test associations of an opioid being prescribed, simple and multiple logistic regression were used within a generalized estimating equations (GEE) framework. GEE is a parameter estimation technique that accounts for the lack of independence in the data due to clustering from repeated measures from registrars. In GEEs a working correlation matrix is specified (i.e., a model for the within-cluster correlation) and this is used to re-estimate the regression parameters and standard errors. We have used the compound symmetry working correlation matrix, in this analysis; this assumes the same correlation parameter for all repeated measures, but these methods are robust to misspecification.

All independent variables (above) with a p value less than 0.20 and a relevant effect size in the univariate

Table 2 Opioids prescribed

Medication name	Frequency	Actual % of opioids (95% CI)
codeine combinations	1,145	39.05 (36.82–41.38)
oxycodone	1002	34.17 (32.09–36.36)
tramadol	337	11.49 (10.30–12.79)
buprenorphine	203	6.92 (6.00–7.94)
morphine	117	3.99 (3.30–4.78)
fentanyl	95	3.24 (2.62–3.96)
other*	33	1.13 (0.77–1.58)
Total	2,932	

* Other opioids include: dihydrocodeine, hydromorphone, pethidine.

analysis were included in the multiple regression model. 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 the variable's removal did not change the resultant model. The SEIFA variable was used as a continuous variable with 10 deciles. Consultation duration was also analyzed as a continuous variable. Linearity assumptions for the continuously modelled variables were assessed using graphical inspections of predicted probabilities over the range of the variables values. Odds ratios (ORs) were presented with 95% confidence intervals (CIs).

Two regression models were built (using all available data), the first with dependent variable "any opioid prescribed." This analysis included all medical issues. The dependent variable in the second model was "initial opioid prescribed." This analysis excluded MIMWOs where the prescription was **"**continuing." Statistical analyses used SAS v9.3. Correlates were considered statistically significant if the *P*-value was < 0.05.

Ethics Approval

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

Results

In all, there were 1,426 training term recording cycles (including details of 69,621 individual consultations, 112,890 medical issues and 68,582 medications prescribed) contributed to by 645 individual trainees (response rate 94.0%). The demographics of the participating trainees and practices are presented in Table 1.

Overall Findings

Opioids were prescribed in 2660 (3.8% of total) consultations and 2,675 (2.4% of total) medical issues, accounting for 2932 (4.3%) of all prescriptions. One, two or three opioids were provided in 91.1%, 8.5% and 0.5% of MIMWOs respectively. Specific opioids prescribed are presented in Table 2. Excluded from the statistical analysis were 38 OST scripts as were the 18,693 problems for those aged under 16 years which included 42 (0.22%) MIMWOs.

Opioids were prescribed for 372 individual ICPC-2 PLUS conditions. Our manual review of these found opioid analgesics were provided for acute, palliative and PNCP indications in 29.3%, 2.6%, and 67.7% of total MIMWOs, respectively. For PNCP, the most common MIMWOs was back complaints (609/22.8% of MIMWOs). Some (15/0.6% MIMWOs) opioid analgesics were provided for medical issues classified in terms of addiction rather than pain. Other diagnoses are presented in Table 3.

General Prescribing Associations

The univariate associations of a MIMWO are presented in Table 4 with the multivariate model presented in Table 5. In the adjusted model, variables associated with MIMWOs at the 5% significance threshold were:

Patient factors: Older age (OR: 1.9 CI: 1.7–2.2 & 1.8 CI: 1.6–2.1, respectively for 35–64 & 65+ compared to 16–34), male gender (OR: 1.2 CI: 1.1–1.3), and Aboriginal and Torres Strait Islander status (OR: 2.2 CI: 1.6–2.9).

Trainee factor: Male gender (OR: 1.2 CI: 1.6–2.9).

Practice factors: Outer regional, remote or very remote location (OR: 1.3 CI: 1.1–1.7) (as compared to major cities) and a lower SEIFA score (i.e., relative disadvantage) (OR: 0.97 for each decile increase CI: 0.950–0.998).

Consultation factors: new medical problems (OR: 0.4 CI: 0.36–0.44), "chronic" problems (OR: 0.6 CI: 0.5–0.7), ordering imaging (OR: 1.4 CI: 1.2–1.7),

Table 3 Ten most frequent medical issues for which opioids were prescribed

Medical issues ($n = 2675$)	Frequency	% (95% CI)
Back complaint	609	22.77 (21.19, 24.40)
Prescription: all	219	8.19 (7.18, 9.29)
Arthritis: all	198	7.4 (6.44, 8.46)
Pain: chronic	172	6.43 (5.53, 7.43)
Fracture	119	4.45 (3.70, 5.30)
Sprain/strain	74	2.77 (2.18, 3.46)
Migraine	58	2.17 (1.65, 2.79)
Pain: post-op	50	1.87 (1.39, 2.46)
Pain: shoulder	42	1.57 (1.13, 2.12)
Pain: knee	40	1.5 (1.07, 2.03)

Table 4 Univariate associations of independent variables with opioid prescriptions

		Opioid Prescribed		
Variable	Class	No ($n = 110215$)	Yes ($n = 2675$)	*P*
Patient Related Variables				
Age group	16–34	31552 (98.5%)	486 (1.5%)	*<0.0001*
	35–64	51828 (97.3%)	1464 (2.7%)	
	65+	24726 (97.3%)	688 (2.7%)	
Patient gender	Male	37655 (97.2%)	1099 (2.8%)	*<0.0001*
	Female	69551 (97.9%)	1504 (2.1%)	
Aboriginal and Torres Strait Islander	No	103467 (97.7%)	2477 (2.3%)	*<0.0001*
	Yes	1131 (95.0%)	60 (5.0%)	
Non-English speaking background	No	98361 (97.6%)	2424 (2.4%)	*0.0156*
	Yes	6889 (98.2%)	126 (1.8%)	
Patient/practice status	Returning patient	49957 (97.3%)	1380 (2.7%)	*<0.0001*
	New to registrar	50059 (97.9%)	1091 (2.1%)	
	New to practice	7013 (98.3%)	123 (1.7%)	
Trainee related variables				
Trainee gender	Male	36206 (97.1%)	1096 (2.9%)	*<0.0001*
	Female	74009 (97.9%)	1579 (2.1%)	
Qualified as doctor in Australia	No	26303 (97.3%)	733 (2.7%)	*0.0113*
	Yes	82157 (97.7%)	1893 (2.3%)	
Registrar age	mean (SD)	33 (6.7)	33 (6.7)	0.0986
Trainee working week	Part time	23975 (97.8%)	531 (2.2%)	0.1814
	Full time	83742 (97.6%)	2063 (2.4%)	
Training term	Term 1	44221 (97.8%)	995 (2.2%)	*0.0447*
	Term 2	36684 (97.5%)	959 (2.5%)	
	Term 3	23678 (97.6%)	575 (2.4%)	
	Term 4	5632 (97.5%)	146 (2.5%)	
Worked at the practice previously	No	76764 (97.8%)	1762 (2.2%)	*0.0146*
	Yes	31951 (97.4%)	868 (2.6%)	
Practice related variables				
Practice size	Small	36312 (97.6%)	903 (2.4%)	0.6857
	Large	71609 (97.7%)	1697 (2.3%)	
Practice routinely bulk bills	No	90876 (97.6%)	2204 (2.4%)	0.8739
	Yes	18420 (97.6%)	451 (2.4%)	
Rurality	Major city	63730 (97.9%)	1343 (2.1%)	*<0.0001*
	Inner regional	32714 (97.4%)	859 (2.6%)	
	Outer regional or Remote	13771 (96.7%)	473 (3.3%)	
Regional training provider	1	40305 (97.5%)	1019 (2.5%)	*0.0004*
	2	13047 (97.0%)	405 (3.0%)	
	3	11096 (97.5%)	288 (2.5%)	
	4	45767 (97.9%)	963 (2.1%)	
SEIFA	mean (SD)	5.3 (2.8)	4.9 (2.8)	*0.0006*
Consultation-related variables				
Consultation Duration	mean (SD)	19 (9.9)	19 (11)	0.0912
Number of medical issues	mean (SD)	2.1 (1.0)	1.7 (0.9)	*<0.0001*
New problem	No	57443 (96.8%)	1897 (3.2%)	*<0.0001*
	Yes	52772 (98.5%)	778 (1.5%)	
"Chronic" condition	No	82480 (97.5%)	2095 (2.5%)	*<0.0001*
	Yes	27385 (97.9%)	575 (2.1%)	
Sought help from any source	No	93860 (97.7%)	2243 (2.3%)	*0.0153*
	Yes	16355 (97.4%)	432 (2.6%)	
Imaging ordered	No	101634 (97.7%)	2347 (2.3%)	*<0.0001*
	Yes	8581 (96.3%)	328 (3.7%)	

Table 4 Continued

Variable	Class	Opioid Prescribed		
		No ($n = 110215$)	Yes ($n = 2675$)	P
Follow-up ordered	No	60385 (98.1%)	1191 (1.9%)	*<0.0001*
	Yes	49830 (97.1%)	1484 (2.9%)	
Learning goals	No	94771 (97.7%)	2280 (2.3%)	0.4024
	Yes	15444 (97.5%)	395 (2.5%)	
Referral ordered	No	96774 (97.8%)	2154 (2.2%)	*<0.0001*
	Yes	13441 (96.3%)	521 (3.7%)	
Number pathology	mean (SD)	0.6 (1.6)	0.2 (0.9)	*<0.0001*

* Numbers in columns may not add up to *n* because of missing data.

number of pathology tests ordered in the consultation (OR: 0.7 for each one ordered, CI: 0.67–0.79), rates of follow-up (OR: 1.5 CI: 1.4–1.7) and referral (OR: 1.4 CI: 1.2–1.5), consultation duration (by a statistically significant but clinically small amount) (OR: 1.02 CI: 1.017–1.027), and number of other diagnoses (OR: 0.6 for each extra diagnosis managed CI: 0.55–0.63).

The frequency of missing data was 5% for Aboriginal and Torres Strait Islander status, with lower frequencies for all other items justifying a complete-case analysis.

In terms of addiction-risk mitigation strategies, no trainee reported contacting a Prescription Monitoring Program and only two MIMWOs involved urine drug screens. There were no reports of trainees seeking authorization to comply with the various State regulations [5].

Initial Prescribing

Of opioids prescribed, 37.3% were **"**initial" prescriptions. The univariate and multivariate associations of an **"**initial" opioid prescription are presented in Supporting Information Tables 6 and 7. Most associations in the adjusted model remained as for the general prescribing analysis. Differences included associations losing statistical significance: patient gender, rurality, classification as "chronic," and SEIFA index. One association became statistically significant with more senior trainees (Term 2 versus Term 1) more likely to prescribe opioids (OR: 1.21 C.I. 1.02–1.44). There were two associations which were of opposite direction to general opioid prescribing and reached statistical significance. "Initial" opioids were more likely to be prescribed for a new problem rather than a pre-existing one (OR 1.17 C.I 1.01–1.36) and to a patient new to the registrar (OR 1.25 C.I 1.07–1.45).

Discussion

Overall Findings: Rates and Characteristics of Prescription

Our findings demonstrate GP trainees provided opioids predominantly as recurrent prescriptions for PNCP. However, the frequency of MIMWOs (2.4%), was a lower rate than in an Australian national study of established GPs (3.7%) [18]. This could possibly be a response to recent evidence indicating the relative benefits to harms of opioids in PNCP have been over-stated [12,19,21,40]. However, we found scant evidence trainees utilized any addiction-risk mitigation strategies as recommended in guidelines such as urinary drug screening, checking with a prescription monitoring scheme, or seeking authorization as per each state's regulations [21,30,32]. Additionally there were 15 instances of opioid analgesic prescribing for dependency indications.

Malignancy accounted for only 2.6% of MIMWOs in our study (compared to established GPs: 3.5% opioids prescribed [18]). The most frequent specific indication was for back complaints (22.8% MIMWOs versus more established GPs 27.1% opioids prescribed [18]). There is evidence clinicians are increasingly preferring opioid analgesics over nonopioids for back pain [41] despite a recent meta-analysis showing their long-term efficacy is unclear with rates of concurrent substance use disorders and aberrant opioid behaviors as high as 43% and 24%, respectively [40].

As with other studies [18,29], codeine was most frequently prescribed and tramadol the third most. Both rely on the CYP2D6 enzyme to convert into morphine or become active [42]. Because many people may have either ultra-rapid or nonexistent rates of CYP2D6 activity, providing a specific dose of either of these may equate to prescribing an unknown dose of morphine [42]. While low-dose codeine compounds may be purchased over-the-counter from pharmacists unmonitored by regulators [30], uncompounded codeine is a "Schedule 8" or a controlled prescription medicine. Between 5% and 20% of all prescribed codeine preparations have been found to be provided to patients identified as **"**prescription shoppers" [26]. Recent Australian entrants to OST for pharmaceutical dependency identify their primary drug of concern as oxycodone (51%) and codeine (28%) [43]. The second most commonly prescribed opioid, oxycodone has a relatively high abuse liability profile due to higher subjective attractiveness ratings and a lack of negative subjective effects [44]. Increased oxycodone prescribing is associated with opioid-related

Table 5 Logistic regression model of associations of opioid prescriptions

		Univariate		Adjusted	
Variable	Class	OR (95% CI)	*P*	OR (95% CI)	*P*
Age group	35–64	1.79 (1.61, 1.99)	*<0.0001*	1.90 (1.68, 2.15)	*<0.0001*
Referent: 16–34	65+	1.70 (1.49, 1.94)	*<0.0001*	1.80 (1.56, 2.08)	*<.0001*
Patient gender	Male	1.30 (1.19, 1.42)	*<0.0001*	1.19 (1.09, 1.31)	*0.0002*
Aboriginal and Torres Strait Islander	Yes	2.12 (1.63, 2.74)	*<0.0001*	2.19 (1.63, 2.94)	*<0.0001*
Non English speaking background	Yes	0.79 (0.65, 0.96)	*0.0156*	0.84 (0.67, 1.06)	0.1514
Trainee gender	Male	1.42 (1.26, 1.60)	*<0.0001*	1.18 (1.03, 1.36)	*0.0191*
Trainee age		1.01 (1.00, 1.01)	0.0986	0.99 (0.98, 1.00)	0.2311
Training term	Term 2	1.16 (1.04, 1.29)	*0.0068*	1.11 (0.97, 1.27)	0.1379
Referent: term 1	Term 3	1.11 (0.97, 1.26)	0.1364	1.06 (0.91, 1.24)	0.4464
	Term 4	1.17 (0.95, 1.44)	0.1406	1.16 (0.89, 1.52)	0.2729
Qualified as doctor in Australia	Yes	0.84 (0.73, 0.96)	*0.0113*	0.95 (0.81, 1.11)	0.5381
Worked at the practice previously	Yes	1.14 (1.03, 1.26)	*0.0146*	1.05 (0.92, 1.20)	0.4432
Rurality	Inner regional	1.20 (1.06, 1.35)	*0.0033*	1.14 (0.96, 1.36)	0.1438
Referent: Major city	Outer regional/ Remote/Very remote	1.61 (1.37, 1.89)	*<0.0001*	1.34 (1.07, 1.69)	*0.0116*
Regional training provider	2	1.24 (1.03, 1.50)	*0.0263*	1.11 (0.88, 1.41)	0.3914
Referent: 1	3	1.02 (0.84, 1.24)	0.8601	0.88 (0.69, 1.11)	0.2835
	4	0.84 (0.74, 0.97)	*0.0138*	0.95 (0.79, 1.14)	0.5980
SEIFA		0.97 (0.95, 0.99)	*0.0006*	0.97 (0.95, 1.00)	*0.0319*
Consultation duration		1.00 (1.00, 1.01)	0.0912	1.02 (1.02, 1.03)	*<0.0001*
Number of medical issues		0.61 (0.58, 0.65)	*<0 .0001*	0.59 (0.55, 0.63)	*<0.0001*
New problem	Yes	0.45 (0.41, 0.50)	*<0.0001*	0.40 (0.36, 0.44)	*<0.0001*
"Chronic" condition	Yes	0.80 (0.72, 0.89)	*<0.0001*	0.60 (0.53, 0.68)	*<0.0001*
Imaging ordered	Yes	1.66 (1.46, 1.88)	*<0.0001*	1.43 (1.24, 1.65)	*<0.0001*
Follow-up ordered	Yes	1.53 (1.41, 1.67)	*<0.0001*	1.54 (1.38, 1.71)	*<0.0001*
Referral ordered	Yes	1.74 (1.58, 1.92)	*<0.0001*	1.37 (1.22, 1.54)	*<0.0001*
Sought help from any source	Yes	1.14 (1.03, 1.27)	*0.0153*	0.95 (0.83, 1.08)	0.4135
Number pathology		0.74 (0.69, 0.79)	*<0.0001*	0.73 (0.67, 0.79)	*<0.0001*

mortality [10] leading to increased restrictions in some jurisdictions [44].

Associations of Overall Prescribing (Including Both Initial and Continuing Prescriptions)

The association of opioid prescribing with certain patient, prescriber and practice demographics in our study may be of concern. A systematic review found higher levels of opioid prescribing related to opioid-related harms including mortality [10]. A US analysis showed patient gender and race reliably influenced pain management decisions of almost half (45%) of US medical trainees [45]. Variations in opioid prescribing rates, in another US study, were found to relate more strongly to physician behaviors than either shifting demographics or disease incidence rates [20]. The importance of these findings is that rates of opioid prescribing are directly related to adverse outcomes.

Associations of increased trainee prescribing included patient older age, male gender, Aboriginal/Torres Strait Islander status, more rural location and lower socioeconomic location. These associations paralleled the demographics over-represented in OST programs [5], amongst opioid misusers [26,46], and increased opioid-related mortality [10]. The aged are particularly at risk of opioid-related toxicities such as falls, respiratory depression, delirium and sedation [15,23,24] . The association with older age in our study may have been more prominent if consultations in residential aged care facilities had been included; with an estimated 28.1% residents there taking regular opioids [23]. Our finding of males being prescribed more opioids has been shown in some previous studies [18,20,47]. It is said to reflect prescribers' subjective judgements due to social categorization [47]. We found that Aboriginal and Torres Strait Islander patients received more opioids. This may reflect a greater symptom burden [11]. Alternatively, US studies indicate race may influence analgesia decisions [3,45,48] especially those made by inexperienced doctors under cognitive stress [47]. But increased prescribing for Aboriginal and Torres Strait Islander patients may reflect increased opioid prescribing to lower

socioeconomic and more rural populations [29]. In the US, these latter groups have higher rates of self-reported pain, and higher rates of opioid analgesic misuse [46]. Such treatment disparities may reflect lack of access to health services of these groups and the relative expense and geographical inaccessibility of nonopioid or multidisciplinary pain management [11,21,26,46].

Opioids were mainly prescribed as repeat scripts for pre-existing medical issues to patients familiar to the practice. A review of the reasons clinicians fail to deprescribe identified four reasons why trainees may default to care-as-usual [49]: nonidentification of the medication as inappropriate; an inertia where continuing to prescribe seems less trouble (e.g., from withdrawal syndromes); hesitance about the management of pain (and its pharmaceuticals); and external factors example, time pressures and patient resistance [2,3,49]. Those on opioid maintenance for analgesia describe poorer physical function and higher psychological distress [29] and so trainees may feel intra-practice consensus is required prior to initiating a change in management. But deprescribing is difficult for most GPs with 89%, in an Australian survey, reporting never or only **"**occasionally" terminating opioids even when faced with aberrant opioid behaviors [13]. In a large US survey one year after the commencement of long-term opioid analgesia, only 7.5% patients had discontinued them and only 20% had done so when followed for up to 3.5 years [50]. The potential for adverse effects in continued prescribing is highlighted in another US study which showed that duration of opioid analgesia prescribing is strongly associated with risk of opioid use disorders [51]. Amongst Australian entrants to OST for pharmaceutical dependency, two thirds (66%) had initiated opioids for analgesia and 28% continued them for this reason [43].

The analysis indicates these **"**uninitiated" prescribers found MIMWOs problematic. The increased recourse to imaging may reflect attempts to ascertain the biophysical basis of the problem to judge the legitimacy of the patient's pain status or the opioid use [3,14]. The complex needs of patients on opioid analgesics are further indicated by increased rates of referral and follow-up and increased consultation duration despite a decreased number of medical issues addressed per consultation. Increased duration of consultations involving opioids has been found elsewhere, particularly when a pain patient is new to a doctor [52].

Differences in Associations of Overall Prescription versus "Initial" Prescription

An **"**initial" opioid script was more likely to be provided to patients not seen previously by the trainee, and to patients with new problems, some of whom may be **"**prescription shoppers." This suggests that for these new pain presentations that trainees may not first trial nonopioid or nonpharmacologic analgesia prior to the initiation of opioids, which is inconsistent with guidelines [17,21,24]. These findings suggest "independent" trainee opioid prescribing decisions for new presentations are made similarly to those made for "inherited" PNCP cases.

Strengths and Limitations

Strengths of the study include a large sample size from four states across all rural–urban classifications with a response rate singularly high for a GP consultation-level study [31] and with participant demographics broadly similar to those of Australian GP trainees overall [53]. The contemporaneous recording of detailed patient, prescriber, practice and consultation variables and the diagnostic indication for prescription and whether this diagnostic indication was a new medical issue, all linked to the individual prescription is a particular strength. As is our ability to ascertain all prescribed and recommended opioid medications, not only those that attract a PBS subsidy.

Limitations of this analysis include its cross-sectional "consultation snapshot" nature and lack of data on full medication regimens. Also, as a secondary analysis of an existing data set, we do not have data on some variables of particular relevance to this research question: patient mental health status, substance use history pain scores or dosages. This means our analysis does not allow assessment of appropriateness or quality of trainees' prescribing decisions, and could allow that any associations of opioid prescription were associations of patient pain per se.

Implications for Practice and Policy

The demographic (rather than strictly clinical) associations of opioid prescribing in our study raise important issues regarding opioid and pain management. Being older, male, or Aboriginal/Torres Strait Islander, and being from rural or remote and lower socioeconomic status locations were all associated with opioid prescription in adjusted models. These groups may thus be at disproportionate risk of poor pain management or opioid-related harms. High rates of prescribing are important determinants of rates of fatal overdose [10] and iatrogenic opioid dependency [54] and correlate with demographics over-represented on OST programs [5].

Our findings should inform educational interventions addressing barriers to and promoting guideline consistent opioid and pain management [13,14,54]. Our findings also indicate the need for more accessible non-opioid pain management services, especially for geographically isolated patients and socially marginalized groups.

Future Research

Prescribing habits start early on in a clinical career, so improving QUM starts with the education of those in training. Increasing awareness may reduce stigma and

unintentional bias [48] and reduce discomfort managing the complex and competing demands of pain and addiction management [1,8]. The trainee cohort study described in this paper provides a unique opportunity to trial an intervention in an educationally receptive cohort to promote multimodal pain management [34].

Conclusion

GP trainees have to traverse multiple divergent models of opioid prescribing [21] and our findings indicate that MIMWOs present particular challenges. Trainee GPs are prescribing predominantly for PNCP, an indication lacking evidence of effectiveness or safety [19]. In our study, in only a minority of cases were opioids prescribed for acute pain, terminal care or OST, the indications which are evidence-based. Along with the nonutilization of addiction risk-mitigation strategies, these findings suggest prescribing infrequently follows recommended guidelines [1,17,21,24]. Opioid maintenance for analgesia may be putting our patients at risk of toxicities including iatrogenic addiction. The prescribing associations with demographic, environmental, and geographic variables found in this study will inform QUM educational and policy interventions supporting safer opioid management.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Table 6 Univariate associations of independent variables with initial opioid prescriptions

Table 7 Logistic regression model of associations of initial opioid prescriptions