Research Paper

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Does brief chronic pain management education change opioid prescribing rates? A pragmatic trial in Australian early-career general practitioners

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Abstract

We aimed to evaluate the effect of pain education on opioid prescribing by early-career general practitioners. A brief training workshop was delivered to general practice registrars of a single regional training provider. The workshop significantly reduced "hypothetical" opioid prescribing (in response to paper-based vignettes) in an earlier evaluation. The effect of the training on "actual" prescribing was evaluated using a nonequivalent control group design nested within the Registrar Clinical Encounters in Training (ReCEnT) cohort study: 4 other regional training providers were controls. In ReCEnT, registrars record detailed data (including prescribing) during 60 consecutive consultations, on 3 occasions. Analysis was at the level of individual problem managed, with the primary outcome factor being prescription of an opioid analgesic and the secondary outcome being opioid initiation. Between 2010 and 2015, 168,528 problems were recorded by 849 registrars. Of these, 71% were recorded by registrars in the nontraining group. Eighty-two percentages were before training. Opioid analgesics were prescribed in 4382 (2.5%, 95% confidence interval [CI]: 2.40-2.63) problems, with 1665 of these (0.97%, 95% CI: 0.91-1.04) representing a new prescription. There was no relationship between the training and total prescribing after training (interaction odds ratio: 1.01; 95% CI: 0.75-1.35; *P* value 0.96). There was some evidence of a reduction in initial opioid prescriptions in the training group (interaction odds ratio: 0.74; 95% CI: 0.48-1.16; *P* value 0.19). This brief training package failed to increase overall opioid cessation. The inconsistency of these actual prescribing results with "hypothetical" prescribing behavior suggests that reducing opioid prescribing in chronic noncancer pain requires more than changing knowledge and attitudes.

Keywords: Education, Training, Trainees, General practitioner registrars, Primary care, Pain management, Chronic noncancer pain, Opioid analgesics, Deprescribing, Tapering, Universal precautions

1. Introduction

A 15-fold increase in opioid analgesic dispensing in Australia from 1992 to 2012 has been associated with escalating hospitalisations and deaths from nonheroin opioids.[10] US sales have nearly quadrupled since 1999, without any change in the prevalence of patient-reported pain.[12,16] By 2005, an estimated 3% to 4% US adults were prescribed long-term opioids, increasingly prescribed by primary care providers.[19] This occurred regardless of the absence of evidence showing that long-term opioids for chronic noncancer pain (CNCP) improve pain and function.[19] Opioids are usually prescribed for CNCP. A study of Australian general practitioners (GPs or family physicians) found that only a minority of opioid prescriptions were for either acute pain (29.3%), or cancer or end-of-life care (2.6%).[32] Chronic noncancer pain guides for GPs still extrapolate from palliative care strategies and research and warn that concern about opioid addiction threatens "safe and effective" pain treatment.[14] Contemporary CNCP guidelines now recommend against the use of opioids for first-line or routine care.[4,19] Mapping of opioid dispensing frequencies across the United States indicates a 3-fold variation[12] and across Australia a 10-fold variation.[7] Variations in prescribing along demographic indices, rather than clinical ones, may reflect differences in prescriber training, knowledge, and attitudes.[7]

Advocacy highlights education, incorporating universal precautions, as having a crucial role in improving opioid analgesic care;[1,19,25] however, the role of opioid deprescribing has not been emphasized. Undergraduate pain education in North

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America is considered to be in a "lacklustre" state: limited, disjointed,[37] or even conflicted by industry support.[47] Organisers of postgraduate education also may rely on industry funding to either defray registration costs or to increase profits.[8,49] There is considerable scepticism as to whether such provenance means the education is primarily designed to improve patient outcomes or to drive opioid consumption.[2,49]

In a systematic review of pain management education evaluations, only 7 studies involved GPs.[44] These studies predominantly used before and after outcome evaluations of participant knowledge and attitudes, as have similar training evaluations conducted subsequent to that systematic review.[2,50–52] Such evaluations provide low-quality evidence of efficacy with changes in knowledge and attitudes alone insufficient to change prescriber behaviour and improve patient care.[44] Calls have been made to better evaluate the effects of opioid prescribing educational interventions on "real-world practice behaviours".[2,44,50]

We aimed to address this evidence-practice and guideline-practice gap in a particularly relevant clinical group—GP registrars (vocational trainees). Given that GP registrars report relatively low levels of opioid guideline adherence,[30] and that prescribing patterns for other medicines by qualified GPs tend to persist,[9] this is an important group in which to attempt to influence CNCP care. We have previously demonstrated that a brief educational package delivered to GP registrars resulted in significant improvements in knowledge and competencies (as assessed by decreases in intended opioid prescribing for paper-based CNCP cases).[27] In the evaluation reported here, we aimed to objectively assess the effect of this educational package on the "real-world practice behaviour" of opioid prescribing.

2. Methods

2.1. Setting and participants

The Australian General Practice Training Program, until restructured at the end of 2015, provided GP training through 17 government-funded, not-for-profit, geographically defined regional training providers (RTPs). Our study population was GP registrars in 5 RTPs across 5 of Australia's 6 states, including all rural–urban classifications from major cities to very remote ones.[6,27] Registrar participants were in general practice-based training terms. Each of the 3 terms lasts 6 months, full-time equivalent, and are undertaken after at least 2 years full-time equivalent spent in hospital training. Registrars operate within an apprenticeship-like model with supervision from an experienced GP but with considerable scope for independent practice—including having prescribing rights for opioids identical to those of senior GPs.

2.2. Methodology

We used a nonequivalent control group design nested within an ongoing cohort study for our evaluation. A randomized control trial was not appropriate. A logistical constraint was that we were working with a limited number of large educational programs that use large group teaching (in most cases, whole-of-RTP). The educational content for training days may be inflexibly planned a year or more ahead of delivery. Furthermore, the registrars within individual RTPs share considerable educational and professional contact and, thus, contamination was likely if allocation to treatment or control group used smaller units of allocation.

2.3. The training activity

The training aimed to improve CNCP guideline adherence covering the transition to active self-management and safer pain management—the latter emphasising the noninitiation and deprescribing (tapering and/or cessation) of opioids and the use of opioid prescribing boundaries. It used a tripartite structure[36] of online prereading; a 90-minute face-to-face educational session conducted during a day-long educational release workshop; and access to postworkshop online resources.

A multidisciplinary group contributed to the preparation of the training activities. The group included a pain physician, 2 addiction physicians, a public health physician, a psychologist, and several GP medical educators.

2.3.1. Prereadings

Prereadings covered the history, science, and culture of opioid use in CNCP[28]; the integration of the principles of pain medicine and addiction medicine into CNCP management[29]; shared CNCP decision making[42]; and an introduction to motivational interviewing.[48]

2.3.2. The workshop session

content of the presentation is summarized in Box 1. Following the lead of Sullivan et al,[52] we developed four 2 to 3 minutes videoed vignettes. These aimed to increase immediacy, to illustrate negotiation skills and to enhance group dialogue. The vignettes involved an actor playing the CNCP patient and a GP trainee supervisor playing the new doctor at the practice introducing some universal precaution strategies. The first vignette involved the doctor, running late, meeting a patient for the first time. The patient was already being prescribed long-term opioids. The doctor was given numerous distracting issues to manage including a request for the routine repeat opioid prescription. The following 2 vignettes showed the patient-centered negotiation of functional goals, an opioid agreement, and the implementation of monitoring based on the 4 "A's" of Passik and Weinreb.[45] Things went awry when the doctor suggested a taper but the patient negotiated a dose escalation, stating his pain was undertreated. The fourth vignette revealed accumulating aberrant behaviors concluding with a shared decision for opioids to be gradually tapered and replaced by active multimodal care. Approximately, half the duration of the presentation involved the viewing or discussion of the vignettes by the audience. This was performed intentionally so registrars could reflect on their own clinical experience. They could share together and discuss with the presenters the challenges involved in identifying and managing such cases.

2.3.3. Postworkshop online resources

Registrars, including those absent from the presentation, were provided with links to the vignettes and clinical resources (Box 2 and Appendices 1 and 2, http://links.lww.com/PAIN/A356). We were unable, due to technical barriers, to identify the number of registrars who accessed the prereading or online resources, or assess how they used them.

The lead presenter of the educational session was both a GP supervisor of registrars and an addiction physician (S.M.H.). Other presenters were the directors of the regional public pain service (C.H.), and addiction service (A.J.D.). The training activity was delivered in a single RTP. The other 4 RTPs were the control group in our analyses. The workshop was delivered in June 2014.

Box 1. Presentation content.

(1) The history of opium and analgesia practice.
(2) The escalation in the West of opioid prescribing and associated harms, including diversion, overdose, and addiction.
(3) The neurophysiology of CNCP including neuroplasticity, central sensitization, and opioid-induced hyperalgesia.
(4) Guideline-concordant and patient-centered management of CNCP.
(5) Biopsychosocial assessment in CNCP including past and present psychiatric and substance use problems (rather than tool-based risk-stratification).
(6) Use of the 3-item "Pain average, interference with Enjoyment of life, and interference with General activity" (PEG) measurement scale.[34]
(7) The importance of multidisciplinary and multimodal CNCP management with appropriate referral to physiotherapy, psychology, pain specialists, or addiction treatment services.
(8) The nonpharmaceutical self-management management of CNCP.
(9) The nonopioid pharmaceutical management of CNCP.
(10) The lack of evidence supporting opioids in CNCP in terms of efficacy and safety.
(11) The practice, principles, and limitations of universal precautions if or when opioids are used in CNCP.
(12) Assessing and responding to emergence of aberrant behaviors.
(13) How "dose dumping" of long-acting opioid formulations may be caused.
(14) The option of prescribing naloxone rescue kits.
(15) Opioid deprescribing.

2.4. The registrars clinical encounters in training project

This analysis was conducted within the ReCEnT project, the methodology of which has been described in detail elsewhere.[38] Briefly, ReCEnT is an ongoing multisite cohort study of GP registrars' in-consultation clinical experience. At approximately the mid-point of each of three 6-month GP training term, records details of each trainee of 60 consecutive consultations, including diagnoses or problems (hereafter referred to as problems) managed and medications prescribed or recommended. The registrars complete questionnaires eliciting their demographic data and also, each term, concerning their current practice. Medications data collected in ReCEnT enable documentation of changes in registrars' prescribing over time. Its longitudinal nature permits a novel assessment tool for curriculum evaluation across the dissimilar RTPs.

2.5. 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 (ATC) Classification System.[53] 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.[53] 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 previously 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." Our data included the medication and route of administration, but not the dose or quantities. We confined data analysis to patients aged 16 years or older as per our previous ReCEnT analyses of variability in prescribing of opioids.[32]

Box 2. Additional resources provided to training participants.

Online resources including patient education videos and information sheets, and an example opioid patient agreement or contract (see online Appendix 1, http://links.lww.com/PAIN/A356).
An opioid conversion table from the Faculty of Pain Medicine (ANZCA).[22]
The Pain Intensity, Enjoyment of Life, General Activity (PEG) scale.[34]
Details about registration for the National Prescription Shopping Program.[18]
Details about NSW Ministry of Health regulatory requirements.[41]
A sign for the waiting room explaining practice opioid and benzodiazepine medication policy to patients.
A list of contact people from whom to seek advice.
Upcoming training opportunities in pain or addiction management.
See online supplementary material Appendices 1 and 2 for the resources and video links (available online at http://links.lww.com/PAIN/A356).

2.6. Independent variables

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

Trainee factors were age; sex; training term; country of medical qualification (Australia or other); RTP trained with; whether they had worked at the practice in a previous term; and full- or part-time status. Practice factors were practice size (number of full-time equivalent GPs); rurality (Australian Standard Geographical Classification-Remoteness Area classification)[6]; socioeconomic status of the practice location (using the Socio-Economic Indexes for Areas (SEIFA) rankings of relative socioeconomic advantage)[5]; and billing policy (does the practice routinely bulk-bill: ie, provide consultations with no direct cost to the patient). Patient factors were age; sex; Aboriginal or Torres Strait Islander status; non-English speaking background status; the patient being new to the practice; and the patient being new to the registrar. Consultation factors were duration of consultation in minutes as estimated and recorded by the trainee; the number of problems managed; whether the problem addressed was "new" or "preexisting;" whether the problem was coded as chronic or not according to a system derived from the International Classification of Primary Care (second edition) (ICPC-2 PLUS) system[43]; the ordering of imaging; the number of pathology tests ordered; whether a referral was made or whether scheduled follow-up was requested. Educational factors included whether the trainee sought information or advice during the consultation or generated learning goals for subsequent attention.

2.7. Statistical analysis

Data used in analyses were from Rounds 1 to 11 of the ReCEnT project, 2010 to 2015. Analyses were conducted at the level of individual problem rather than at the level of consultation. We calculated proportions for both the primary and secondary outcome factors, prescription of opioids, and initial prescription of opioids for pain management, respectively. Estimates included 95% confidence intervals (CIs), adjusted for clustering of patients within registrars.

The principle analyses used logistic regression with "prescribed any opioid" as the outcome factor in the primary analysis and "initiated an opioid" as the outcome factor in the secondary analysis.

Logistic regression was used within the generalized estimating equations (GEE) framework to account for repeated measures within registrars. An exchangeable correlation structure was assumed.

Covariates with a P value <0.20 and a relevant effect size in the univariate logistic regression analysis were included in the multiple regression model.

Covariates which had a small effect size and were no longer significant (at $P < 0.05$) in the multivariable model were tested for removal from the model. If the covariate's removal did not substantively change the resulting model, the covariate was removed from the final model.

The interaction term for treatment group and pre/posttraining timing of data collection was used to test the significance of a treatment effect of the training on opioid prescription. The main effect of the training group represents the relative odds of opioid prescribing in the training group vs controls, during the pretraining period. The main effect of the preterm or postterm represents the relative odds of opioid prescribing after training vs before training in controls. The interaction odds ratio (OR) shows the relative odds of opioid prescribing after vs before training in the training group, relative to controls. This term is necessary to interpret the association of treatment group with pre–post change. The null hypothesis is that this term equals zero, indicating no difference in the pre–post difference between controls and the training group. Deviation from zero indicates a differential effect in the training group compared with controls. Results with $P < 0.05$ were considered significant.

We analyzed the data on an "intention to treat" basis using data from registrars from the training RTP whether or not they attended the workshop, but in sensitivity analyses we also performed analyses on an "as-treated" basis (including only those training-RTP registrars who had attended the workshop). Analyses were programmed using STATA 13.1 and SAS V9.4.

2.8. Ethics approval

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

3. Results

Data for this analysis included 2127 registrar rounds of data collection with 849 registrars contributing. The demographics of registrars and registrar rounds in the training RTP and the control RTPs are presented in **Table 1**.

There were 103,565 consultations and 168,528 problems in patients aged 16 or older. The control group recorded 120,113 problems (71%) and the training group 48,415 problems (29%). There were 138,411 pretraining problems (82%) and 30,117 (18%) posttraining problems. Comparison of the 2 groups showed that the training group registrars were more frequently overseas-trained, were older, and practiced in lower socioeconomic areas. Training group registrars were also less likely to work in metropolitan areas or in bulk-billing practices (practices where there is no financial cost to the patient for the consultation). Of the 58 eligible registrars in the training RTP included in this analysis, 42 (70.7%) attended the workshop.

3.1. Primary analysis: prescription of opioid

Of these problems, 4325 (2.5%, 95% CI: 2.40-2.63) involved opioid prescription. The univariate associations (including control or training group and pre/posttraining timing) of a problem involving opioid prescription are presented in **Table 2**.

The results of univariate and multivariate logistic regression with outcome "prescribed an opioid" are presented in **Table 3**. The main effect (point) estimates indicate an estimated 7% greater opioid prescribing odds in the training group vs controls during the pretraining period, and an estimated 11% greater odds after vs before training in controls. The interaction OR is 1.01, indicating an estimated 1% greater relative increase in odds from

Table 1

Registrar and practice demographics by training group.

Registrars				
Characteristic	**Subgroup or mean (SD)**	**Control (n = 595), n (%)**	**Training (n = 254), n (%)**	***P***
Sex	Male	204 (34.3)	86 (33.9)	
	Female	391 (65.7)	168 (66.1)	0.904
Qualified as a doctor in Australia	No	109 (18.5)	71 (28.5)	
	Yes	481 (81.5)	178 (71.5)	0.001
Registrar rounds				
Characteristic	**Subgroup or mean (SD)**	**Control (n = 1536), n (%)**	**Training (n = 591), n (%)**	***P***
Working week	Part time	323 (21.5)	136 (23.7)	
	Full time	1182 (78.5)	438 (76.3)	0.273
Training term	Term 1	563 (36.5)	201 (34.0)	
	Term 2	512 (33.3)	204 (34.5)	
	Term 3	464 (30.2)	186 (31.5)	0.572
Registrar age, y	Mean (SD)	32.0 (6.1)	34.6 (6.9)	<0.001
Practices				
Characteristic	**Subgroup or mean (SD)**	**Control (n = 1536), n (%)**	**Training (n = 591), n (%)**	***P***
Rurality[5]	Major city	976 (63.5)	261 (44.2)	
	Inner regional	282 (18.4)	288 (48.7)	
	Outer regional/remote	278 (18.1)	42 (7.1)	<0.001
Routine bulk billing	No	1218 (79.9)	519 (88.3)	
	Yes	307 (20.1)	69 (11.7)	<0.001
Practice size	Small	498 (33.2)	200 (35.0)	
	Large	1004 (66.8)	372 (65.0)	0.436
SEIFA,[5]	Mean (SD)	5.5 (3.1)	4.8 (2.0)	<0.001

SEIFA Socio-Economic Indexes for Areas (higher deciles are relatively advantaged).

Table 2

Univariate associations of a problem involving opioid prescription.

Opioid prescribing				
Variable	**Class**	**No (n = 164,293), n (%)**	**Yes (n = 4235), n (%)**	***P***
Training group	Control	117,164 (71.3)	2949 (69.6)	0.1859
	Training	47,129 (28.7)	1286 (30.4)	
Before/after training	Before training	135,020 (82.2)	3391 (80.1)	0.0490
	After training	29,273 (17.8)	844 (19.9)	
Patient variables				
Age group	16-34	47,653 (29.5)	798 (19.1)	<0.0001
	35-64	76,633 (47.5)	2305 (55.2)	
	65+	37,114 (23.0)	1073 (25.7)	
Sex	Male	55,645 (34.8)	1709 (41.4)	<0.0001
	Female	104,222 (65.2)	2417 (58.6)	
Aboriginal or Torres Strait Islander status	No	153,171 (98.7)	3885 (97.4)	<0.0001
	Yes	1998 (1.3)	102 (2.6)	
Non-English speaking status	No	145,257 (92.9)	3787 (94.4)	0.0046
	Yes	11,098 (7.1)	226 (5.6)	
Patient/practice status	Existing patient	73,601 (46.0)	2141 (51.9)	<0.0001
	New to registrar	76,345 (47.7)	1794 (43.5)	
	New to practice	10,153 (6.3)	193 (4.7)	
Registrar variables				
Sex	Male	55,239 (33.6)	1742 (41.1)	<0.0001
	Female	109,054 (66.4)	2493 (58.9)	
Working week	Part-time	36,669 (22.8)	848 (20.6)	0.0192
	Full time	123,945 (77.2)	3259 (79.4)	
Training term	Term 1	60,521 (36.8)	1444 (34.1)	0.0049
	Term 2	53,996 (32.9)	1481 (35.0)	
	Term 3	49,776 (30.3)	1310 (30.9)	
Worked at practice previously	No	116,892 (72.1)	2875 (69.1)	0.0130
	Yes	45,130 (27.9)	1286 (30.9)	
Qualified as doctor in Australia	No	33,940 (20.9)	1025 (24.5)	0.0012
	Yes	128,742 (79.1)	3164 (75.5)	
Age	Mean (SD)	32.7 (6.4)	32.8 (6.3)	0.3231
Practice variables				
Size	Small	55,818 (34.8)	1544 (37.7)	0.0118
	Large	104,425 (65.2)	2553 (62.3)	
Rurality	Major city	94,907 (57.8)	2151 (50.8)	<0.0001
	Inner regional	44,119 (26.9)	1251 (29.5)	
	Outer regional/remote	25,267 (15.4)	833 (19.7)	
Regional training provider (RTP)	RTP 1	47,129 (28.7)	1286 (30.4)	0.0004
	RTP 2	23,314 (14.2)	697 (16.5)	
	RTP 3	20,027 (12.2)	545 (12.9)	
	RTP 4	70,559 (42.9)	1612 (38.1)	
	RTP 5	3264 (2.0)	95 (2.2)	
Practice routinely bulk bills	No	133,982 (82.0)	3476 (82.6)	0.4452
	Yes	29,333 (18.0)	733 (17.4)	
SEIFA	Mean (SD)	5.3 (2.9)	5.0 (2.8)	0.0005
Consultation variables				
New problem	No	71,946 (47.6)	2648 (68.1)	<0.0001
	Yes	79,318 (52.4)	1243 (31.9)	
Chronic problem	No	124,667 (75.9)	3359 (79.3)	<0.0001
	Yes	39,626 (24.1)	876 (20.7)	
Imaging ordered	No	151,215 (92.0)	3688 (87.1)	<0.0001
	Yes	13,078 (8.0)	547 (12.9)	
Follow-up ordered	No	90,138 (54.9)	1832 (43.3)	<0.0001
	Yes	74,155 (45.1)	2403 (56.7)	
Referral ordered	No	144,025 (87.7)	3456 (81.6)	<0.0001
	Yes	20,268 (12.3)	779 (18.4)	
Duration, min	Mean (SD)	19.1 (10.0)	19.2 (10.3)	0.1868
Number of problems	Mean (SD)	2.1 (1.0)	1.7 (0.9)	<0.0001
Number of pathology tests ordered	Mean (SD)	0.6 (1.6)	0.2 (0.9)	<0.0001

(*continued on next page*)

Table 2 (*continued*)

Opioid prescribing				
Variable	**Class**	**No (n = 164,293), n (%)**	**Yes (n = 4235), n (%)**	***P***
Educational variables				
Sought help any source	No	141,748 (86.3)	3560 (84.1)	<0.0001
	Yes	22,545 (13.7)	675 (15.9)	
Learning goals	No	119,425 (74.5)	3209 (77.3)	<0.0001
	Yes	40,817 (25.5)	943 (22.7)	

SEIFA, Socio-Economic Indexes for Areas.
* refers to the interaction term between Training group and intervention group (before or after), showing the relative odds of opioid prescribing after- vs before-training in the training group, relative to controls.

before to after training in the training group relative to controls, ie, approximately a 12% total increase from pre-to-post training in the training group. Neither the main effects nor the interaction term were significant, indicating no effect of the training on opioid prescription.

3.2. Secondary analysis: prescription of new opioid (initiation of opioid)

Of all problems (excluding those where a continuing prescription for opioid was made), 1613 (0.97%, 95% CI: 0.91-1.04) involved new opioid prescription. For this analysis, the control group recorded 118,326 problems (71%) and the training group 47,580 problems (29%). There were 136,304 pretraining problems (82%) and 29,602 (18%) posttraining problems. The univariate associations (including control or training group and pre/posttraining timing) of a problem involving new opioid prescription are presented in **Table 4**.

The results of logistic regression models with outcome "prescribed an opioid" are presented in **Table 5**. The interaction term for treatment group and pre/posttraining timing of data collection in the multivariate model had an estimated OR of 0.74

Table 3

Univariate and adjusted logistic regression for opioid prescribing.

Variable	Class	Univariate		Adjusted	
		OR (95% CI)	*P*	OR (95% CI)	*P*
Training variables					
Training group* before/after interaction	Training, after training			1.01 (0.75-1.35)	0.9604
Training group	Training	1.07 (0.97-1.19)	0.1859	1.37 (0.92-2.02)	0.1199
Before/after training	After training	1.11 (1.00-1.23)	0.0490	1.07 (0.92-1.24)	0.3659
Patient variables					
Age group	35-64	1.76 (1.62-1.91)	<0.0001	1.78 (1.61-1.97)	<0.0001
Referent: 16-34	65+	1.63 (1.47-1.80)	<0.0001	1.68 (1.50-1.89)	<0.0001
Sex	Female	0.78 (0.73-0.84)	<0.0001	0.86 (0.80-0.93)	0.0001
Aboriginal or Torres Strait Islander status	Yes	1.91 (1.54-2.37)	<0.0001	2.16 (1.71-2.73)	<0.0001
Non-English speaking status	Yes	0.80 (0.69-0.93)	0.0046	0.82 (0.69-0.99)	0.0343
Registrar variables					
Sex	Female	0.72 (0.66-0.80)	<0.0001	0.85 (0.77-0.95)	0.0045
Working week	Part-time	0.88 (0.80-0.98)	0.0192	0.93 (0.82-1.04)	0.2067
Training term	Term 2	1.15 (1.05-1.25)	0.0015	1.10 (0.99-1.22)	0.0813
Referent: term 1	Term 3	1.11 (1.01-1.22)	0.0286	1.05 (0.94-1.18)	0.3972
Practice variables					
Rurality	Inner regional	1.24 (1.12-1.37)	<0.0001	1.23 (1.08-1.40)	0.0015
Referent: major city	Outer regional/ remote	1.44 (1.28-1.62)	<0.0001	1.27 (1.07-1.51)	0.0063
Regional training provider (RTP)	RTP 2	1.13 (0.98-1.31)	0.1016	1.48 (1.01-2.15)	0.0427
	RTP 3	0.99 (0.84-1.16)	0.8792	1.22 (0.83-1.80)	0.3152
	RTP 4	0.84 (0.75-0.95)	0.0037	1.31 (0.88-1.93)	0.1791
Referent: RTP 1	RTP 5	1.06 (0.82-1.36)	0.6612	1.00 (1.00-1.00)	.
SEIFA		0.97 (0.96-0.99)	0.0005	0.97 (0.96-0.99)	0.0051
Consultation variables					
New problem	Yes	0.43 (0.40-0.47)	<0.0001	0.38 (0.35-0.41)	<0.0001
Chronic problem	Yes	0.80 (0.73-0.87)	<0.0001	0.58 (0.53-0.64)	<0.0001
Imaging ordered	Yes	1.71 (1.55-1.89)	<0.0001	1.62 (1.45-1.81)	<0.0001
Follow-up ordered	Yes	1.64 (1.53-1.75)	<0.0001	1.52 (1.39-1.65)	<0.0001
Referral ordered	Yes	1.60 (1.47-1.74)	<0.0001	1.21 (1.09-1.34)	0.0003
Consultation duration		1.00 (1.00-1.01)	0.1868	1.02 (1.02-1.02)	<0.0001
Number of problems		0.63 (0.60-0.66)	<0.0001	0.59 (0.56-0.62)	<0.0001
Number of pathology tests ordered		0.72 (0.68-0.77)	<0.0001	0.70 (0.65-0.75)	<0.0001
Educational variables					
Learning goals	Yes	0.84 (0.77-0.91)	<0.0001	0.84 (0.76-0.94)	0.0014

CI, confidence interval; OR, odds ratio; SEIFA, Socio-Economic Indexes for Areas.

Table 4

Univariate associations of a problem involving initial opioid prescription.

Variable	Class	Initial opioid prescribing		
		No (n = 164,293), n (%)	Yes (n = 1613), n (%)	*P*
Training variables				
Training group	Control	117,164 (71.3)	1162 (72.0)	0.6462
	Training	47,129 (28.7)	451 (28.0)	
Before/after training	Before training	135,020 (82.2)	1284 (79.6)	0.1433
	After training	29,273 (17.8)	329 (20.4)	
Patient variables				
Age group	16-34	47,653 (29.5)	402 (25.3)	<0.0001
	35-64	76,633 (47.5)	835 (52.5)	
	65+	37,114 (23.0)	352 (22.2)	
Sex	Male	55,645 (34.8)	624 (39.6)	0.0030
	Female	104,222 (65.2)	953 (60.4)	
Aboriginal or Torres Strait Islander status	No	153,171 (98.7)	1492 (97.8)	0.0013
	Yes	1998 (1.3)	34 (2.2)	
Non-English speaking status	No	145,257 (92.9)	1443 (93.9)	0.1109
	Yes	11,098 (7.1)	93 (6.1)	
Patient/practice status	Existing patient	73,601 (46.0)	632 (39.9)	<0.0001
	New to registrar	76,345 (47.7)	850 (53.7)	
	New to practice	10,153 (6.3)	100 (6.3)	
Registrar variables				
Sex	Male	55,239 (33.6)	704 (43.6)	<0.0001
	Female	109,054 (66.4)	909 (56.4)	
Working week	Part-time	36,669 (22.8)	317 (20.2)	0.1533
	Full-time	123,945 (77.2)	1252 (79.8)	
Training term	1	60,521 (36.8)	568 (35.2)	0.4045
	2	53,996 (32.9)	556 (34.5)	
	3	49,776 (30.3)	489 (30.3)	
Worked at practice previously	No	116,892 (72.1)	1141 (72.2)	0.8751
	Yes	45,130 (27.9)	440 (27.8)	
Qualified as doctor in Australia	No	33,940 (20.9)	378 (23.7)	0.0562
	Yes	128,742 (79.1)	1220 (76.3)	
Age	Mean (SD)	32.7 (6.4)	32.6 (6.1)	0.8834
Practice variables				
Size	Small	55,818 (34.8)	563 (36.0)	0.7032
	Large	104,425 (65.2)	1003 (64.0)	
Rurality	Major city	94,907 (57.8)	875 (54.2)	0.0434
	Inner regional	44,119 (26.9)	457 (28.3)	
	Outer regional/remote	25,267 (15.4)	281 (17.4)	
Regional training provider (RTP)	RTP 1	47,129 (28.7)	451 (28.0)	0.5814
	RTP 2	23,314 (14.2)	250 (15.5)	
	RTP 3	20,027 (12.2)	184 (11.4)	
	RTP 4	70,559 (42.9)	688 (42.7)	
	RTP 5	3264 (2.0)	40 (2.5)	
Practice routinely bulk bills	No	133,982 (82.0)	1304 (81.6)	0.6401
	Yes	29,333 (18.0)	295 (18.4)	
SEIFA	Mean (SD)	5.3 (2.9)	5.2 (2.9)	0.3362
Consultation variables				
Chronic problem	No	124,667 (75.9)	1299 (80.5)	<0.0001
	Yes	39,626 (24.1)	314 (19.5)	
Imaging ordered	No	151,215 (92.0)	1262 (78.2)	<0.0001
	Yes	13,078 (8.0)	351 (21.8)	
Follow-up ordered	No	90,138 (54.9)	649 (40.2)	<0.0001
	Yes	74,155 (45.1)	964 (59.8)	
Referral ordered	No	144,025 (87.7)	1258 (78.0)	<0.0001
	Yes	20,268 (12.3)	355 (22.0)	
Duration, min	Mean (SD)	19.1 (10.0)	20.3 (10.5)	<0.0001
Number of problems	Mean (SD)	2.1 (1.0)	1.5 (0.8)	<0.0001
Number of pathology tests ordered	Mean (SD)	0.6 (1.6)	0.3 (1.2)	<0.0001
Educational variables				
Sought help any source	No	141,748 (86.3)	1251 (77.6)	<0.0001
	Yes	22,545 (13.7)	362 (22.4)	
Learning goals	No	119,425 (74.5)	1174 (74.2)	0.7688
	Yes	40,817 (25.5)	408 (25.8)	

SEIFA, Socio-Economic Indexes for Areas.

Table 5

Univariate and adjusted logistic regression for initial opioid prescribing.

Variable	Class	Univariate		Adjusted	
		OR (95% CI)	*P*	OR (95% CI)	*P*
Training variables					
Training group* before/after interaction	Training, after training			0.74 (0.48-1.16)	0.1886
Training group	Training	0.97 (0.83-1.12)	0.6462	1.00 (0.84-1.19)	0.9890
Before/after training	After training	1.12 (0.96-1.32)	0.1433	1.24 (1.03-1.49)	0.0234
Patient variables					
Age group	35-64	1.30 (1.15-1.46)	<0.0001	1.46 (1.28-1.66)	<0.0001
Referent: 16-34	65+	1.11 (0.95-1.29)	0.1977	1.37 (1.16-1.62)	0.0002
Sex	Female	0.85 (0.77-0.95)	0.0030	0.92 (0.82-1.03)	0.1605
Aboriginal or Torres Strait Islander status	Yes	1.68 (1.22-2.30)	0.0013	1.96 (1.38-2.77)	0.0001
Non-English speaking status	Yes	0.83 (0.67-1.04)	0.1109	0.82 (0.65-1.05)	0.1138
Patient/practice status	New to pactice	1.14 (0.93-1.40)	0.2151	1.18 (0.94-1.48)	0.1649
Referent: existing patient	New to registrar	1.28 (1.15-1.42)	<0.0001	1.33 (1.18-1.50)	<0.0001
Registrar variables					
Sex	Female	0.65 (0.57-0.74)	<0.0001	0.76 (0.65-0.88)	0.0003
Practice variables					
Rurality	Inner regional	1.13 (0.98-1.30)	0.0872	1.15 (0.99-1.34)	0.0740
Referent: major city	Outer regional/remote	1.23 (1.03-1.47)	0.0237	1.19 (0.98-1.45)	0.0859
Consultations variables					
Chronic problem	Yes	0.77 (0.68-0.87)	<0.0001	0.79 (0.69-0.92)	0.0015
Imaging ordered	Yes	3.17 (2.79-3.59)	<0.0001	2.29 (1.98-2.64)	<0.0001
Follow-up ordered	Yes	1.86 (1.67-2.08)	<0.0001	1.50 (1.33-1.69)	<0.0001
Referral ordered	Yes	1.99 (1.77-2.24)	<0.0001	1.54 (1.35-1.77)	<0.0001
Duration, min		1.01 (1.01-1.02)	<0.0001	1.03 (1.02-1.03)	<0.0001
Number of problems		0.42 (0.39-0.46)	<0.0001	0.42 (0.38-0.46)	<0.0001
Number of pathology tests ordered		0.85 (0.81-0.90)	<0.0001	0.80 (0.76-0.85)	<0.0001
Educational variables					
Sought help any source	Yes	1.84 (1.62-2.09)	<0.0001	1.19 (1.04-1.37)	0.0144

CI, confidence interval; OR, odds ratio.

(95% CI: 0.48-1.16) and *P*-value of 0.19 suggesting some evidence of a positive treatment effect of the training on opioid prescription, albeit not statistically significant.

In sensitivity analyses on an "as-treated" basis (including only training-RTP registrars who attended the workshop session), there was little change in results. For prescription of any opioid, the interaction OR was 0.94 (95% CI: 0.66-1.34) with *P*-value 0.72; for prescription of new opioid, the interaction OR was 0.76 (95% CI: 0.45-1.30) with *P*-value 0.32. See Appendix 3 (http://links.lww.com/PAIN/A356) in the online supplementary material for the details of these analyses (available online at http://links.lww.com/PAIN/A356).

4. Discussion

There was no significant effect of the training activity on registrars' overall prescribing of opioids, which increased during the study but remained marginally below the rate of more experienced Australian GPs (4.2 per hundred problems 95% CI: 3.9-4.4).[11] Initiation of opioids was reduced with a clinically significant effect size (OR 0.74; 95% CI: 0.48-1.16; $P = 0.1886$). Although not statistically significant, the result's large effect size and wide CIs suggest the possibility of a type II error.

Previous opioid analgesia educational interventions in trainee doctors have involved US hospital residents and physicians.[51,52] In one study, the addition of 2-hour long face-to-face training sessions to the simple provision of an educational packet of written resources significantly improved self-reported quality of care and satisfaction in treating CNCP 2 months afterwards.[52] In another study, when compared with online access to 26 chapters of text-based CNCP guidelines and algorithms, 1 to 2 hours of internet-based training including communication skills improved self-reported knowledge and competence at 2 months.[51]

We have also conducted a concurrent questionnaire-based before and after evaluation of the training reported in this article, using clinical vignettes to elicit registrars' opioid prescribing intentions.[27] In this study, the proportion of registrars who thought that opioids were overprescribed in CNCP increased nonsignificantly from 74.5% to 83.0%. The proportion of registrars reporting initiation of opioids for a CNCP vignette reduced significantly from 74.5% to 51.1%. The proportion intending to deprescribe opioid maintenance for a CNCP vignette increased significantly from 80.4% to 95.7%.

Our interpretation of the discordant results of these concurrent "hypothetical" and "actual" prescribing studies of the same training activity is that the translation of changes in knowledge, attitude, and clinical judgement from a theoretical paper–based setting to actual practice is problematic. This translation may be more problematic for opioid deprescribing than it is for opioid noninitiation. Early-career doctors report managing CNCP seems like "torture" because of intimidation, humiliation, and threats of self-harm by patients.[13]

One barrier to deprescribing in CNCP is a failure to appreciate the importance of clinical context. After acute injury and in cancer pain and palliative care settings, evidence aligns with the compassionate desire of the physician to prescribe opioids and titrate to pain severity. General practitioners have been taught that the quality of CNCP care also equates to liberal prescription of

opioids and that "under-treatment" reflects "opioi-phobia."[14,25,35] To address "opioi-phobia," the recommended model of universal precautions promoted harm minimization principles adopted from the model of Opioid Substitution Therapy.[25] So, universal precautions may impede deprescribing by derailing registrars with revealed patient comorbidities. General practitioners describe inadequate time and resources, believing that restrictive prescribing should be reserved as appropriate punishment for patients feigning pain.[33] Physicians may stereotype patients on opioids as unwilling to change and, additionally, may fear how patients may respond to any suggested therapeutic redirection.[31,33] Patient-related barriers include their perceptions that their pain is based on objective findings and is ruining their life and function; they are not at risk of overdose or addiction; that opioids are "extremely helpful;" and that pain relief is the doctor's responsibility.[21,23] Patients may interpret a reluctance to represcribe as misguided, uncompassionate, or offensive.[8,23] As health service customers, patients may feel delegitimized and stigmatized, which, without shared decision making, may trigger conflict.[21,42] The distress or shame from a threatened or received complaint engenders more defensive medicine.[13,40]

Further barriers are particular to registrars. Their supervisors, senior colleagues, or specialists may have initiated or regularly prescribed the medication, and, seemingly, mandated their continuation. The resultant patient expectations and the pressure on the registrar to conform to their supervisor's approach, especially given registrars' apprenticeship status, were barriers to quality prescribing identified in our group's earlier work regarding antibiotic stewardship.[15] Registrars' relative transience at individual practices and lack of continuity of care may impart a nocebo effect, hindering the development of the trust that patients require to approve opioid withdrawal.[3,23,46]

Barriers to opioid noninitiation may be different to those for discontinuation. Registrars may have more self-perceived independence to postpone or avoid prescribing than to deprescribe medicines initiated by more senior clinicians. Pressures to initiate come from the desperation of patients seeking immediate pain relief and from a discomfort determining which patients are opioid dependent or at risk for dependency.[1,19,31,33]

4.1. Strengths and limitations

A strength of the study is that we conducted our analyses on an "Intention to Treat" (or "Intention to Educate") basis, which implies a robust evaluation of a real-world training activity. In addition, we included a large number of covariates in our analyses, allowing adjustment for multiple relevant potential confounding factors. For example, an examination of the demographic characteristics of the training-RTP registrars, compared with control group registrars, showed that the training-RTP registrars were disproportionally from rural and low-income areas. These demographics have been associated with higher opioid consumption and poorer prescriber opioid guideline adherence.[7,17,32] Thus, this is a source of potential confounding in comparisons of opioid prescribing of the 2 groups of registrars. We were able, however, to adjust for rurality and socioeconomic status in our multivariate analysis.

A further strength of the study is the workshop's brevity, important as RTPs and GPs have limited educational time allocations. However, we were unable to ascertain for how long the registrars used the prereadings or postworkshop resources or indeed if they did so at all.

Other limitations include the fact that our study entails tight linkage of prescribed medications with the indication for that prescription but cannot reliably distinguish between prescriptions for CNCP and prescriptions for acute pain or end-of-life pain. The inclusion of prescribing of opioids for acute or palliative pain in the outcome measure would attenuate the apparent effect of a training package specifically aimed at reducing prescribing of opioids for CNCP. This may have biased our results to the null. In addition, reductions of opioid dosage or quantities nominated for dispensing (positive outcomes) short of cessation were not identified by these data. A caveat to our findings is that registrars usually stay only 6 to 12 months at each practice location, potentially insufficient time for tapering and cessation.[4]

Although a nonrandomized trial cannot have the same strength of inference of causality as a randomized control trial, as we have outlined in our methods section such a trial was not appropriate for this evaluation. In these circumstances, and given the extensive recording of potential confounding variables recorded in ReCEnT and included in our analyses, a nonequivalent control group design nested within an ongoing cohort study is a robust methodology. It is possible that our study was underpowered in relation to our secondary outcome of opioid initiation (as apparent in the wide CIs around our estimate) increasing the chance of a type II error.

4.2. Implications for education, policy, and practice

Although this educational training activity did not increase deprescribing in this evaluation of actual practice, in our previous questionnaire-based pretraining and posttraining evaluation of this activity showed registrars reported intending to do so.[27] In terms of opioid initiation, despite the reduction of actual opioid initiation after our training activity (OR 0.74) being statistically nonsignificant, this actual reduction can be considered in the context of the statistically significant percentage reduction (23.4% absolute reduction and 31.4% relative reduction) in intended opioid initiation for a clinical CNCP vignette in the questionnaire-based pretraining and posttraining evaluation.[27] Pressures to conform to supervisors' prescribing patterns have been found to be a driver of nonevidence–based prescribing (of antibiotics) in this registrar population.[15] It is likely that similar pressures apply to prescription of opioids (especially continuing prescriptions). This may be a cause of the intended or actual opioid prescribing discrepancy. A shift (attributable to the training activity) to a practice pattern involving less actual prescribing of opioids for CNCP may eventually occur after registrars progress from their apprenticeship-like position to a posttraining role with greater effective independence and with greater personal continuity of patient care than they enjoy in their training environment.[46] With evidence suggesting that 18.3% of those initiating opioids for CNCP on long-term therapy at 12 months,[39] reducing initiation may delay or attenuate iatrogenic opioid-related harms.[19] Even a brief course of opioids has been associated with long-term disability after back injuries,[24] and in one preclinical study, prolonged neuropathic pain.[26] Thus, we suggest that the training package tested in this trial should inform future CNCP educational interventions. Such education may address potential barriers to better CNCP care by, for example, including role plays to prepare trainees for difficult opioid-related conversations.

It has been proposed that education programs such as the US Risk Evaluation and Mitigation Strategy (REMS) need to become mandatory for opioid prescribers or even linked to medical registration.[1] An important implication of our findings concerning both theoretical and actual prescribing is that education incorporating universal precautions alone may be insufficient to switch off the "opioid epidemic" or to threaten pharmaceutical company marketing strategies.[12,49] System change as well as practical, practice-level interventions may be needed to deliver

evidence-based service improvement and a reduction of disparities in pain treatment such as access to multidisciplinary nonpharmacological CNCP treatment. Regulatory responses vary between Australian states but generally focus on opioid abuse rather than the facilitation of nonpharmacological CNCP care or the minimization of opioid exposure per se. Regulators could prioritize pain management training (and its evaluation) at both undergraduate and postgraduate levels by amending health care standards and accreditation processes.[19,37] Other regulatory options include real-time online prescription monitoring systems; patient education resources; limiting the duration of opioid treatment for acute pain; remuneration cues; mandating prescribers document guideline implementation as part of the opioid approval or subsidization processes; and disciplinary actions for illegal or unethical prescribing.[7,19,20]

4.3. Implications for future research

Future CNCP education needs to facilitate a unified approach to the management of opioids, whether prescribed or illicit, and address opioid-related behaviors.[12,31] Chronic noncancer pain opioid prescription should be contrasted with opioid provision for active cancer treatment, palliative care, and end-of-life care, where ethical considerations prioritize short-term symptom management over potential harms.[19] Including supervisors and practice nurses in future education may facilitate a more supportive clinical environment.[1,32] Longer or repeated workshops or the inclusion of educational outreach visits, electronic prompts, with audits and feedback may also assist.[44] Rigorous evaluation of any such approach is indicated and should involve longer term follow-up to gauge any "delayed legacy" effect of intended prescribing translating to actual prescribing after training. Future pain education evaluations should look, as we have done, beyond reported changes in clinician knowledge, confidence, attitudes, and self-reported clinical practice and document change in actual practice.[2,44]

5. Conclusions

Despite GP registrars' clear intentions elicited through paper-based cases following our brief interactive training package, our current findings demonstrate that pain management is easier in theory than in "real-world practice." Registrars did not reduce their number of opioid prescriptions after training, reflecting the many barriers to deprescribing. In the future, those factors facilitating opioid-centric CNCP management will require coordinated attention by educators, health care funders, and regulators.

Conflict of interest statement

C. Hayes has undertaken sponsored consultancy and educational work with Mundipharma, Janssen, and Pfizer. The remaining authors have no conflicts of interest to declare.

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Appendix A. Supplemental Digital Content

Supplemental Digital Content associated with this article can be found online at http://links.lww.com/PAIN/A356.

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