Educating junior doctors and pharmacists to reduce discharge prescribing of opioids for surgical patients: a cluster randomised controlled trial

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The known: Opioid medications can cause harm and dependence, and inappropriate prescribing for patients after surgery or trauma, without planning for de-escalation, exposes them to the risk of chronic use.

The new: Delivery of a brief education module by an analgesic stewardship pharmacist to junior clinicians and pharmacists was followed by significantly reduced opioid prescribing for surgical patients at discharge, including prescribing of slow release formulations associated with greater risk.

The implications: Educating junior clinicians and pharmacists about appropriate analgesia prescribing for surgical and trauma patients is an effective tool for reducing the prescribing of slow release opioids.

Abstract

Objectives: To evaluate whether educating junior doctors and hospital pharmacists about analgesic prescribing improved discharge prescribing of opioids for opioid-naïve patients after surgical admissions.

Design: Cluster randomised controlled trial, undertaken during the first half of 2019.

Setting: The Alfred Hospital, a major Melbourne teaching hospital with 13 surgical units.

Participants: Opioid-naïve patients discharged from surgical units after a stay of at least 24 hours.

Intervention: Surgical units were randomised to the intervention or control arms. Interns, residents, and clinical pharmacists assigned to intervention arm units attended education sessions, presented by the hospital analgesic stewardship pharmacist, about appropriate analgesic prescribing for patients in hospital surgical units.

Main outcome measures: The patients prescribed slow release opioids on discharge from hospital during the baseline (1 February – 30 April 2018) and post-intervention periods (17 February – 30 April 2019).

Results: During the baseline period, 1369 intervention unit and 1014 control unit admissions were included in our analysis; during the evaluation period, 973 intervention unit and 706 control unit episodes were included. After adjusting for age, length of stay, pain score, acute pain service involvement, and use of immediate release opioids prior to admission, patients in the intervention group were prescribed slow release opioids at discharge less frequently than patients in the control group (adjusted odds ratio [aOR], 0.52; 95% CI, 0.35–0.77) and were more frequently discharged without any prescribed opioids following the intervention (aOR, 1.69; 95% CI, 1.24–2.30). Providing de-escalation plans was more frequent for intervention than control group patients prescribed slow release opioids on discharge post-intervention (OR, 2.36; 95% CI, 1.25–4.45).

Conclusions: Specific education for clinicians and pharmacists about appropriate analgesic prescribing for surgical patients is effective in reducing prescribing of opioids at discharge.

Trial registration: Australian New Zealand Clinical Trials Registry, ACTRN12618000876291 (prospective).

Three-quarters of surgical patients report moderate to severe pain after their procedures, and opioid medications are frequently prescribed as first line treatment.[1] Many patients continue to use opioids after leaving hospital; 49–92% of surgical patients in the United States and Canada are prescribed opioids on discharge.[1,2] Opioids can have adverse effects, including central nervous system depression and opioid-induced ventilatory impairment, and tolerance and hyperalgesia develop with sustained use.[3] Excessive use can be fatal; the annual number of opioid-related deaths in the US increased 345% between 2001 and 2016, to an estimated 47 600 in 2017.[4,5] In Australia, deaths caused by oxycodone, morphine and codeine increased 102% during 2006–2017, and deaths involving fentanyl, pethidine and tramadol increased 1000%.[6]

Acute opioid therapy can lead to chronic use.[7,8] It has been reported that patients prescribed opioids on discharge from surgical care are 44% more likely to be taking opioids one year later than those discharged without opioids.[9] The likelihood of long term opioid use after minor and major operations is similar.[2,10]

In the United States, the Centers for Disease Control and Prevention recommend not prescribing slow release opioids for people with acute pain, prescribing the lowest adequate opioid dose for patients with chronic pain and minimising the quantities supplied on discharge, and providing patients and general practitioners with documented post-discharge plans.[11] Nevertheless, prescribing patterns in the US are highly variable,[12] and a 2017 review found that only 6–59% of opioids supplied after surgery were used by patients, suggesting that they are overprescribed.[13] A review of post-operative prescribing for more than 18 000 surgical patients found that 45% of the 6548 who had not required opioids during the preceding 24 hours were prescribed opioids at discharge.[14]

Inadequate knowledge of appropriate analgesia is a problem for prescribers, particularly junior medical officers.[3,15,16] Education may optimise opioid prescribing, but most studies have evaluated physician satisfaction with education or knowledge acquisition rather than prescribing patterns.[17–19] Studies examining prescribing have focused on specific patient groups (eg, outpatients or patients with chronic pain), have evaluated limited selections of opioids, and have often not distinguished between slow and immediate release formulations or between opioid-naïve and opioid-tolerant patients, limiting the generalisability of their findings.[20–24]

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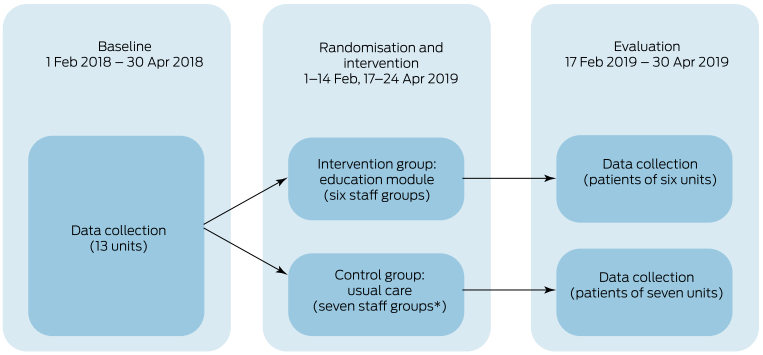
In our cluster randomised controlled trial, we examined whether educating junior doctors and pharmacists about analgesic prescribing improved discharge prescribing of opioids by reducing the prescribing of slow and immediate release opioids, the daily dose prescribed, and the quantity of opioids supplied to opioid-naïve surgical patients.

1 Timeline of study for evaluating the effect on prescribing of specific education for junior medical officers and pharmacists about appropriate analgesia



* Two units were combined for because some staff members worked in both units. ◆

Methods

Our pragmatic cluster randomised controlled trial was undertaken at the Alfred Hospital, a major teaching hospital in Melbourne. About 1000 patients are discharged home or to residential aged care from its 13 surgical units each month. Surgical units were allocated to the intervention or control arm by simple computer-supported randomisation; two units were combined during randomisation because some staff members worked in both units. The study was prospectively registered with the Australian New Zealand Clinical Trials Registry (ACTRN12618000876291, 23 May 2018). Major institutional changes (electronic record roll-out, building renovations) caused a four-month delay in implementing and evaluating the intervention, as well as a two-week shortening of the evaluation period, but the study otherwise adhered to the registered protocol. Prescribing records at the hospital changed from paper to electronic charts and discharge prescriptions during the period of the study.

Intervention and control groups

In the intervention arm, surgical interns, residents, and clinical pharmacists received single 30-minute face-to-face group education sessions delivered by the hospital analgesic stewardship pharmacist. The learning objectives included understanding pain assessment, the importance of multimodal analgesia, analgesia selection, and discharge and de-escalation plans, including communication with patients and general practitioners. Staff members were invited to attend, at their convenience, one of the ten sessions offered during 1–14 February 2019. Five additional sessions were offered during 17–24 April 2019 for pharmacists and interns newly rostered to the intervention units. Attendance was encouraged by senior unit staff but was not compulsory. All eligible clinicians received the presentation slides by email; no subsequent assessment was undertaken.

In the control arm, routine continuing education was provided to junior medical officers and pharmacy staff, but not the intervention-specific session. All staff members had access to institutional resources and hospital-approved guidelines, including the hospital guideline on pharmacological and non-pharmacological management of acute pain. Participating clinicians were not informed about the nature of the study; they were told that the education module would be provided in stages to staff in all surgical units.

Evaluation of prescribing

Discharge prescribing was evaluated during the 10-week period 17 February – 30 April 2019 and compared with prescribing during a three-month baseline period (1 February – 30 April 2018), to control for differences between prescribing in the surgical units assigned to the intervention and control arms (Box 1). Data were collected retrospectively from discharge summaries and electronic medical records. As it was impractical to evaluate prescribing by individual clinicians within units, surgical units were treated as clusters.

We analysed discharge opioid prescribing data for adult patients (aged 18 years or more) discharged home or to residential care after admission to surgical units for at least 24 hours, identified from discharge coding. Exclusion criteria included pre-admission use of immediate or slow release opioids (except *pro re nata* immediate release opioid use), opioid agonist therapy, transfer to another hospital or rehabilitation facility, and missing discharge documentation.

Other information collected included age, sex, substance use disorder, intravenous drug use, immediate release opioid use prior to surgical admission, hospital length of stay, surgical procedure, elective or emergency procedure, intensive care unit (ICU) admission, acute pain service or palliative care team involvement, and final Verbal Numerical Rating Scale (VNRS; scores range from 0, no pain, to 10, worst pain imaginable) score before discharge.

Primary and secondary outcomes

The primary outcome was the difference between the proportions of patients prescribed slow release opioids on discharge in 2018 and 2019 for each of the intervention and control arms (Box 1). An audit in March 2018 found that 47 of 197 opioid-naïve surgical patients (24%) had been prescribed slow release opioids on discharge. To detect a 5 percentage point change in prescribing in the intervention group, and allowing a 3 percentage point change in the control group (90% power; α = 0.05 [two-sided]), we calculated that 853 admissions per group were required.

Secondary outcomes were the prescribing of immediate release opioids on discharge, the proportion of patients discharged without opioid prescription, prescribed daily dose of slow release opioid (as oral morphine equivalent, calculated with the Faculty of Pain Medicine Opioid Calculator: www.opioidcalculator.com.au), quantity of opioid supplied on discharge (dose units), documented slow release opioid de-escalation plan, and non-opioid adjuvant prescribing. Dose units were tablets, capsules, and transdermal patches; for liquids, dose units were calculated from the prescribed dose and bottle size.

Outcome assessors were not blinded with respect to whether data were from intervention or control group participants.

Statistical analysis

We summarised patient characteristics as descriptive statistics. We assessed differences between groups in univariate analyses (Fisher exact or Mann–Whitney *U* tests). The normality of residuals for continuous outcomes was examined in Shapiro–Wilks tests and Q–Q plots to determine appropriate statistical analysis. Variables for which moderately statistically significant differences between groups ($P \leq 0.10$) were evident in the 2018 baseline data were included in stepwise multivariable models. Pain score and pre-admission immediate release opioid use were included as variables in all models as we expected they would be associated with discharge prescribing. Associations between the intervention and prescribing were assessed in mixed regression models (logistic and negative binomial), with interaction terms for study allocation and time period; odds ratios (ORs) and incident rate ratios (IRRs) are reported with 95% confidence intervals (CIs). Surgical units were included as random effects in all models to account for clustering. Intra-class correlation was calculated for the primary outcome to assess variability among participants within clusters. All analyses were performed in Stata/IC 15.0.

Ethics approval

The investigation was approved by the Human Research Ethics Committees of Alfred Health (reference, 226/18) and Monash University (reference, 13859); individual consent by clinicians and patients was not required.

Results

In the intervention arm, all invited clinical pharmacists attended education sessions (eight in February, six in April); four of eight interns and three of eight invited residents attended sessions in February, and four of eight invited interns in April.

During 1 February – 30 April 2018, 2383 of 2685 admissions were included in our analysis (intervention units, 1369; control units, 1014); during 17 February – 30 April 2019, 1679 of 1916 episodes were included (intervention units, 973; control units, 706) (Box 2).

For the included admissions during 1 February 2018 – 30 April 2018, differences between the intervention and control units were moderately statistically significant ($P \leq 0.10$) for age, sex, length of stay, surgical procedure, elective procedure, ICU admission, substance use disorder, pain score and acute pain service referral (Box 3); these variables were therefore included in our multivariate models, as was pre-admission immediate release opioid use.

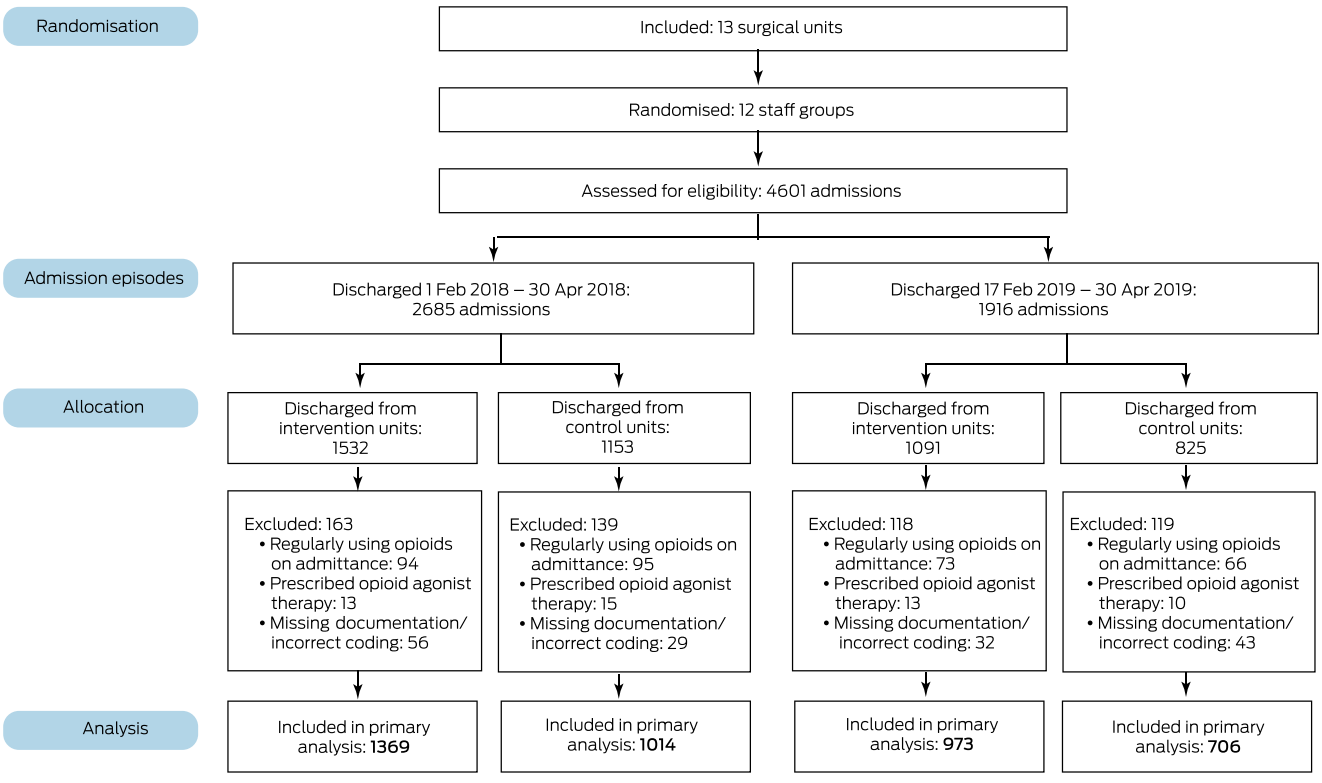
Primary outcome

The proportion of discharged patients prescribed slow release opioids during the 2019 evaluation period was lower than during the 2018 baseline period in both study arms: by 15.0 percentage points in the intervention group (2018, 395 of 1369 [28.8%]; 2019, 134 of 973 [13.8%]; $P < 0.001$) and 6.4 percentage points in the control group (2018, 231 of 1014 [22.8%]; 116 of 706 [16.4%]; $P = 0.001$) (Box 4).

Secondary outcomes

Patients in the intervention units were prescribed slow release opioids at discharge significantly less frequently than patients in the control units following the intervention, both before (OR, 0.61; 95% CI, 0.43–0.88) and after adjusting for age, length of stay, pain score, acute pain service involvement, and use of immediate release opioids *pro re nata* prior to admission (adjusted OR, 0.52; 95% CI, 0.35–0.77) (Box 5). The intra-class correlation was 0.25, suggesting moderate within-cluster variability.

2 Screening and evaluation of admissions for inclusion in our analysis



3 Characteristics of participants admitted to surgical units, 1 February 2018 – 30 April 2018, by study allocation

	Intervention surgical units	Control surgical units	*P*
Number of patients	1369	1014	
Age (years), median (IQR)	51 (34–66)	55 (36–70)	0.001
Sex (men)	759 (55%)	681 (67%)	< 0.001
Length of stay (days), median (IQR)	2.8 (1.6–5.2)	2.2 (1.3–5.0)	< 0.001
Surgical procedure	823 (60%)	843 (83%)	< 0.001
Surgical procedures that were elective	427 [52%]	470 [56%]	0.10
Intensive care unit admission	92 (7%)	15 (1%)	< 0.001
Substance use disorder	81 (6%)	32 (3%)	0.004
Intravenous drug use	10 (0.7%)	5 (0.5%)	0.28
Immediate release opioid use *pro re nata* prior to admission	109 (8%)	96 (9%)	0.21
Verbal numerical rating scale, mean (SD)	1.29 (2.02)	1.15 (1.94)	0.14
Acute pain service referral	111 (8%)	46 (4%)	< 0.001

IRQ = interquartile range; SD = standard deviation. ◆

4 Opioid prescribing on discharge of surgical patients during the baseline (1 February 2018 – 30 April 2018) and post-intervention periods (17 February 2019 – 30 April 2019), by study allocation

	Intervention group			Control group		
	2018	2019	*P*	2018	2019	P
Number of patients	1369	973		1014	706	
Slow release opioid	395 (28.8%)	134 (13.8%)	< 0.001	231 (22.8%)	116 (16.4%)	0.001
Oral morphine equivalent (mg), median (IQR)*	30 (15–30)	15 (15–30)	< 0.001	30 (15–30)	30 (15–30)	0.06
Dose units,† median (IQR)*	10 (8–14)	10 (6–14)	< 0.001	10 (10–14)	10 (6–14)	0.002
Immediate release opioid	749 (54.7%)	530 (54.5%)	0.93	538 (53.1%)	436 (61.8%)	< 0.001
Dose units,† median (IQR)‡	10 (5–10)	10 (5–10)	0.32	10 (10–15)	10 (6–10)	0.014
Total opioid quantity, dose units,† median (IQR)	5 (0–12)	4 (0–10)	0.001	5 (0–15)	6 (0–10)	0.40
No opioid	546 (39.9%)	437 (44.9%)	0.015	459 (45.2%)	267 (37.8%)	0.002

IQR = interquartile range. * Data for patients prescribed slow release opioids. † Tablets, capsules, transdermal patches; for liquids, dose units were calculated from the prescribed dose and bottle size. ‡ Data for patients prescribed immediate release opioids. ◆

For the intervention surgical units, the proportion of patients discharged without prescribed opioids was significantly greater in 2019 than in 2018 (44.9% *v* 39.9%; $P = 0.015$); the proportions prescribed immediate release opioids were similar (54.5% *v* 54.7%); and the median prescribed daily dose of slow release opioid (for patients prescribed slow release opioids) and median total opioid quantity supplied on discharge (all patients) were each lower. For the control surgical units, the proportion of patients prescribed immediate release opioids was greater in 2019 than in 2018 (61.8% *v* 53.1%; $P < 0.001$) and that of patients discharged without a prescribed opioid smaller (37.8% *v* 45.2%; $P = 0.002$); the median prescribed daily dose of slow release opioid was higher and the median opioid quantity supplied on discharge smaller in 2019 than in 2018 (Box 4). After adjusting for age, length of stay, pain score, acute pain service involvement, and use of immediate release opioids prior to admission, patients in the intervention group were more frequently discharged without any prescribed opioids following the intervention (aOR, 1.69; 95% CI, 1.24–2.30) (Box 6).

Among the 876 patients prescribed slow release opioids on discharge, the odds of being discharged with a documented de-escalation plan were greater for the intervention (2018, 215 of 395 [54%]; 2019, 93 of 134 [69%]) than the control group (2018, 163 of 231 [70%]; 2019, 77 of 116 [66%]) following the intervention (OR, 2.36; 95% CI, 1.25–4.45). No significant interaction effect was observed between time and study allocation, and the odds of being prescribed any non-opioid adjuvant medication (any adjuvant: OR, 0.94; 95% CI, 0.69–1.28) (Box 7).

Discussion

In our cluster randomised, controlled trial, the odds of surgical inpatients being prescribed opioid medications at discharge were

5 Prescribing of slow release opioids on discharge of surgical patients: univariate and multivariate analyses of 1720 control unit admissions and 2342 intervention unit admissions

Variable	Odds ratio (95% CI)	Adjusted odds ratio* (95% CI)
Intervention	1.09 (0.29–4.04)	1.01 (0.29–3.54)
Time	0.52 (0.39–0.69)	0.40 (0.30–0.55)
Intervention × time	0.61 (0.43–0.88)	0.52 (0.35–0.77)
Age, per year	0.99 (0.99–1.00)	0.99 (0.98–0.99)
Length of stay, per day	1.03 (1.02–1.04)	1.02 (1.01–1.03)
Verbal numerical pain score, per point	1.17 (1.13–1.21)	1.23 (1.18–1.28)
Acute pain service	6.39 (4.79–8.52)	7.17 (5.22–9.86)
Immediate release opioid use *pro re nata* prior to admission	1.54 (1.17–2.03)	1.41 (1.05–1.91)

* Adjusted for age, length of stay, pain score, acute pain service involvement, and use of immediate release opioids *pro re nata* prior to admission. Sex, surgical procedure, elective *v* emergency procedure, intensive care unit admission, and substance use disorder, were removed in a backwards stepwise procedure ($P > 0.10$). ◆

lower in 2019 than in 2018 in both the intervention and control arms of the study. The decline in the proportion of patients prescribed slow release opioids at discharge was greater for surgical units in which junior clinicians had received specific education about appropriate analgesia prescribing than in control surgical units.

Increased awareness of the harms associated with opioids and institutional strategies may have generally reduced opioid prescribing at the Alfred Hospital. The hospital did not introduce specific policy changes during the study period, but the publication in March 2018 by the Australian and New Zealand College of Anaesthetists of their *Position statement on the use of slow release opioid preparations in the treatment of acute pain* may have influenced prescribing.[25] Multivariate analysis identified that the odds of slow release opioid prescribing for patients from the intervention units were lower than for those from control units, and that the odds of patients in intervention group units not being prescribed any opioid medications on discharge were significantly greater than for patients in control units.

The control and intervention groups differed during the baseline period with regard to certain features, probably reflecting differences in casemix. Characteristics such as acute pain service referral significantly influenced opioid prescribing patterns; as pain management for patients referred to acute pain services is more difficult, these patients are more likely to need opioid analgesia at discharge. However, the odds of opioid prescribing were also lower for the intervention group in multivariate analyses after adjusting for acute pain service input.

The impact of education on slow release opioid prescribing at discharge has not previously been evaluated. A study of inpatient opioid use found that the proportion of patients receiving slow release opioids declined from 35% to 16% following an education intervention, and that of patients discharged without opioids increased from 9% to 13%.[21] Other studies have reported that prescribed daily opioid doses declined by one-half following educational interventions.[20,22] The reductions in our study were less pronounced, but the median baseline dose was lower (30 mg daily oral morphine equivalent) than in previous studies (150 mg,[20] 90 mg[21]). Similarly, the reductions in quantities supplied were not as pronounced as in previous studies,[20,22,24] but the baseline quantities were also lower in our study; this is unsurprising, as opioids are now prescribed in smaller

6 Prescribing of opioids on discharge of surgical patients: univariate and multivariate analyses of 1720 control unit admissions and 2342 intervention unit admissions

	Mixed regression models (logistic and negative binomial): interaction effect (intervention × time)	
Prescribing at discharge: categorical outcomes	**Univariate analysis: odds ratio (95% CI)**	**Multivariate analysis: adjusted odds ratio† (95% CI)**
Immediate release opioid prescribed	0.69 (0.53–0.89)	0.74 (0.54–1.00)
Excluding patients who used immediate release opioids *pro re nata* prior to admission	0.68 (0.52–0.90)	0.70 (0.51–0.96)
Both slow and immediate release opioids prescribed	0.69 (0.49–0.97)	0.67 (0.45–1.00)
Excluding patients who used immediate release opioid *pro re nata* prior to admission	0.63 (0.44–0.90)	0.64 (0.42–0.97)
No opioid prescribed	1.67 (1.29–2.16)	1.69 (1.24–2.30)
Prescribing at discharge: continuous outcomes:	**Incident rate ratio* (95% CI)**	**Adjusted incident rate ratio† (95% CI)**
Slow release oral morphine equivalent (mg)	0.57 (0.33–0.96)	0.58 (0.35–0.98)
Slow release quantity (dose units)‡	0.50 (0.32–0.79)	0.52 (0.33–0.81)
Immediate release quantity (dose units)‡	0.93 (0.74–1.17)	0.91 (0.73–1.14)
Total opioid quantity (dose units)‡	0.79 (0.63–0.99)	0.78 (0.62–0.97)

CI = confidence interval. * An incident rate ratio of 0.57, for example, indicates that the median amount prescribed to patients from intervention units was 57% of that for patients discharged from control units. † Adjusted for age, length of stay, pain score, acute pain service referral, and immediate release opioid use pro re nata prior to admission. ‡ Tablets, capsules, transdermal patches; for liquids, dose units were calculated from the prescribed dose and bottle size. ◆

7 Prescribing of non-opioid adjuvant medications on discharge of surgical patients: univariate analysis of 1720 control unit admissions and 2342 intervention unit admissions

Non-opioid adjuvant	Interaction effect (intervention × time): odds ratio (95% CI)
Any non-opioid adjuvant	0.94 (0.69–1.28)
Gabapentinoid	0.78 (0.47–1.28)
Non-steroidal anti-inflammatory drug	0.93 (0.70–1.24)
Paracetamol	0.90 (0.67–1.21)
Other	1.03 (0.37–2.83)

CI = confidence interval. ◆

quantities because of growing awareness of the potential harms and poor functional outcomes associated with their long term use. Nevertheless, we found that educational interventions can have a significant effect even when baseline opioid prescribing rates and quantities are low.

We found that the odds of a plan for slow release opioid de-escalation being included in discharge summaries were 2.4 times as high for patients from the intervention units as for those from control units following the intervention. Effective communication is crucial for ensuring the safe transfer of care after discharge, but omissions in the reporting of medication changes in hospital have also been described previously.[26]

We included all available opioid formulations in our evaluation of total daily oral morphine equivalents prescribed on discharge. Reducing the prescribing of one agent may be associated with increases in others; in one study, for example, tramadol and morphine prescribing increased following an education intervention in an emergency department that reduced pethidine use.[23] Opioid medications could be spared by providing non-opioid analgesics, but non-opioid analgesic prescribing patterns were not influenced by our intervention. Adjuvant prescribing may have already been appropriate, or optimising opioid-sparing strategies may need more emphasis in education.

We included patients with substance use disorders, but excluded those prescribed opioid agonist therapy. Patients treated in ICUs or undergoing emergency surgery have been excluded in previous studies, but we included these treatment variables in our multivariate analyses. We also included all surgical units at the hospital, whereas earlier studies have been restricted to single specialties or procedure categories, limiting the generalisability of their results. We found that education can be delivered with benefit across a range of surgical unit types.

Strengths and limitations

Our large sample size allows confidence in our findings. Because of organisational changes, the post-intervention period was reduced by two weeks, but the study was adequately powered to detect meaningful differences between the control and post-intervention periods in prescribing despite the lower number of episodes during the 2019 evaluation period than during the 2018 baseline period.

Cluster randomisation allowed comparisons of intervention and control arms within the baseline and post-intervention periods, controlling for changes in practice between the two periods. We mitigated the problem of differences in baseline variables between the two groups by undertaking multivariate analyses.

Education was delivered by an analgesic stewardship pharmacist, but could be delivered by another clinician experienced in peri-operative or pain medicine. We included clinical pharmacists in the intervention because of previous findings regarding their roles in medication management.[27] The Alfred Hospital has a seven-day unit-based clinical pharmacy service, and the impact of a similar intervention at institutions with more limited pharmacy services may be different. As doctors and pharmacists were educated together, it was not possible to separately evaluate the effect of the intervention on the two groups. The appropriateness of prescribing for individual patients was not assessed.

Clinicians were blinded to the purposes of the study to reduce observer bias. Diffusion of the educational message was possible, particularly if presentation slides were shared; this would have improved the control group outcomes. We could not control for the effect of clinicians working outside normal hours in units other than their home unit. Only about one-half of the invited doctors attended the education sessions, and we cannot estimate the potential effect of more complete attendance.

Conclusion

Providing brief education sessions for junior clinicians and clinical pharmacists was followed by significantly reduced opioid prescribing at discharge for opioid-naïve surgical patients, suggesting that education is an effective evidence-based strategy for optimising opioid prescribing in acute care. However, junior medical officers in teaching hospitals frequently rotate between specialties, and the value of the education module would depend on its regular delivery, which is time-consuming and perhaps unsustainable. Possible solutions include incorporating the module into orientation programs and offering it online. Future iterations of the intervention could include post-education assessment and personalised feedback. Longer term evaluation of outcomes is required, as is evaluation of the impact of the intervention on prescribing appropriateness.

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Competing interests: No relevant disclosures.

Data sharing statement: De-identified and aggregate data for this study may be made available upon request from the corresponding author. ■

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