Original Article

Opioid prescription at postoperative discharge: a retrospective observational cohort study

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Summary

Opioid misuse is now considered a major public health epidemic in North America, with substantial social and
financial consequences. As well as socio-economic and commercial drivers, modifiable risk-factors that have
resulted in this crisis have been identified. The purpose of this study was to identify whether, within England,
modifiable drivers for persistent postoperative opioid use were present. This was a retrospective cohort study of
practice at 14 National Health Service hospitals across England. Data were collected retrospectively and
validated for adult patients undergoing elective intermediate and major or complex major general surgical
procedures between 1 and 31 March 2019. Of the 509 patients enrolled from 14 centres, 499 were included in
the data analysis. In total, 31.5% (157/499) patients were in the intermediate surgery cohort and 68.5% (342/
499) were in the major or complex major surgery cohort, with 21.0% (33/157) and 21.6% (74/342) discharged
with opioid medicines to be taken at regular intervals, respectively. There were similar median oral morphine
equivalent doses prescribed at discharge. Of patients prescribed regular opioid medicines, 76.6% (82/107) had
a specified duration at discharge. However, 72.9% (78/107) had no written deprescribing advice on discharge.
Similarly, of patients prescribed 'when required' opioids, 59.6% (93/156) had a specified duration of their
prescription and 33.3% (52/156) were given written deprescribing advice. This study has identified a pattern of
poor prescribing practices, a lack of guidance and formal training at individual institutions and highlights
opportunities for improvement in opioid-prescribing practices within England.

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Introduction

Opioid misuse is now considered a major public
health epidemic in North America, with substantial

social and financial consequences [1–3]. In 2016, it
was estimated that the combined effect of the opioid
epidemic on healthcare, labour and criminal justice

costs in the USA was £67 billion ($92 billion, €75 billion) [3]. Up to 2017, there have been at least 600,000 deaths from prescribed opioids in the USA, and another 180,000 were predicted to occur by the end of 2020 [1]. In addition, up to 75% of heroin-dependent users started their addiction with the use of prescription opioids [4].

The causes of this healthcare crisis are multifactorial [2, 5–12]. As well as socio-economic and commercial drivers, a multitude of modifiable risk-factors have been previously reported [8, 9]. Some of these more significant risk-factors include the treatment of acute pain [6, 13]; the use of modified-release opioid formulations [10]; repeat or refill opioid prescriptions [10]; excessive prescription in terms of duration and quantity [5]; and opioid diversion or poor opioid disposal, given that up to 17% of non-medical users obtain opioids from diversion of prescriptions [14].

Opioid use and misuse are increasing in the UK [13, 15–17], and surgery has recently been identified as a risk-factor for persistent opioid use [13]. In 2015, opioids were prescribed to 5% of all patients on the Clinical Practice Research Datalink that includes 50 million patients across a network of general practices across the UK [17]. In 2012, 18% of the Scottish population were prescribed an opioid, with prescription rates varying according to regional and sociodemographic factors [16]. A study demonstrated that between 1998 and 2016, opioid prescriptions increased by 34% in England and the total oral morphine equivalency increased by 127% to 431 g per 1000 population per year [15]. Thus, as well as an increase in the number of opioid prescriptions, the dose of prescribed opioids consumed in the UK is also increasing. Consequently, the UK's Medicines and Healthcare products Regulatory Agency has released a drug safety update on strategies to mitigate the harm from opioid medicines and the risk of addiction [18]. This compliments international guidance which recommends that all patients discharged home with a newly prescribed opioid analgesic should receive advice on the duration of the course of opioids and that they should also receive written deprescribing advice [8]. However, no study has been undertaken so far on postoperative discharge prescribing practices in the UK, and the drivers for persistent postoperative opioid use in the UK remain under-investigated.

We performed a retrospective multicentre study to provide an overview of current practice in England on analgesic medicine prescribing at discharge after surgery, with the aim of determining whether modifiable drivers for subsequent persistent postoperative opioid use were present.

Methods

This was a retrospective observational cohort study of practice at 14 NHS hospitals across England (online Supporting Information Table S1). Data were collected retrospectively and validated for adult patients undergoing elective general surgical procedures between 1 and 31 March 2019.

The study was a service evaluation of current practice of postoperative opioid-prescribing at discharge; thus, there was no need for formal ethical approval or for obtaining informed consent. The study was prospectively registered and approved locally at each participating site under the supervision of a named consultant surgeon or anaesthetist. Project registration numbers for each of the 14 sites are listed in online Supporting Information Table S1. Audit information governance standards were adhered to in collating data. All data were anonymised and no patient-identifiable information was transferred between sites.

All bar one study site used a combination of digital and paper records for data collection (one study site was fully dependent on paper records). Patient identification and data collection were performed by teams at each individual site. These consisted of a consultant and trainee lead responsible for data verification, and a number of collaborators consisting of doctors of varying grades and specialist nurses trained in prescribing. Admission medicines were identified from either pre-operative proformas or medical clerking records. Discharge medicines were recorded from discharge prescriptions and discharge letters. Data were collected on consecutive patients meeting inclusion criteria.

Patients older than 16 years of age at the time of surgery were included if they were undergoing elective general surgery. Procedures were classified as 'intermediate' and 'major or complex major' according to the Bupa schedule of procedures [19]. Patients undergoing day-case surgery and emergency or re-operative surgery were not included as it was felt it would not be as easy to clearly identify all consecutive cases at each site, and that emergency patients were more likely to have a complicated surgical course which may impact their analgesic regimen.

Outcomes of interest included prescribed oral analgesia before index admission and detail on the prescription and type of postoperative analgesia at discharge, including dosage, frequency, duration and written evidence of deprescribing advice. Given emerging advice on compound analgesics and modified-release opioid preparations [20, 21], the number of patients prescribed these either as regular or when required, and the

evidence of dose duration and deprescribing advice were quantified. The oral morphine equivalent doses for opioid prescriptions at discharge were calculated using the electronic opioid calculator developed by the Faculty of Pain Medicine, Australian and New Zealand College of Anaesthetists [22]. Data were also collected through consultant and trainee site leads on institutional practices, policies, guidelines and training strategies for opioid prescription at discharge from each of the 14 participating sites.

Age at the time of surgery was categorised into three groups: 18–64; 65–74; and ≥ 75 years, to allow exploration of differences by World Health Organization definition of young (< 65 years) and elderly (≥ 65 years). Sex was recorded as male or female. Comorbidity was determined using the Charlson comorbidity index [23] and categorised as 0, 1–2 and ≥ 3. Information on additional pre-existing comorbidities including arthritides [24], malignancy and mental health disorders [25] which may be associated with regular analgesia prescription or addictive personalities were coded separately.

Length of stay was calculated from the date of admission to the recorded date of discharge. Medicine history including over the counter medicines was obtained. Analgesic medicines were coded as non-opioids; non-steroidal anti-inflammatory drugs; weak opioids; strong opioids; and analgesic adjuncts prescribed pre-operatively (before admission) and postoperatively (at discharge from hospital) (online Supporting Information Table S2). Data were collected on baseline patient baseline characteristics and details of surgery.

The pooled anonymised data from included sites were analysed using Stata V16 (StataCorp, College Station, TX, USA). Included patients were stratified by the magnitude of the surgical intervention into two cohorts: intermediate surgery cohort (all intermediate procedures) and major surgery cohort (which included participants undergoing either major or complex major surgery). Descriptive statistics were used to report the baseline characteristics of the intermediate and major surgery cohorts. Fisher's exact and Chi squared (χ^2) tests were used to compare categorical variables as appropriate. The Mann–Whitney U-test was used for within group comparisons and the Wilcoxon signed ranks test for comparisons between groups. Frequency and proportions were used to describe the number of patients prescribed pre-operative (before admission) and postoperative (at discharge) analgesia stratified by analgesia type. For each, data on dose duration for each analgesic medicine and whether deprescribing

advice was provided on the discharge prescription were quantified. Univariable and multivariable logistic regression models were used to explore factors that predicted opioid prescription at discharge. In all analyses, significance was set at the 95% level and differences were considered significant if the p value was < 0.05.

Results

We enrolled 509 patients from 14 centres. Ten patients were not included: nine died and one had missing paper medical records (online Supporting Information Figure S1), leaving 499 patients analysed. Each centre contributed a median (IQR [range]) 28 (22–42 [14–79]) patients. Baseline characteristics are summarised in Table 1.

One hundred and nine (69.4%) patients in the intermediate and 238 (69.6%) patients in the major or complex major surgery cohorts were not taking any analgesic medicines before admission for surgery. There was no difference in the number of patients prescribed pre-admission analgesia between the two cohorts (p = 0.971, Table 2).

Patients received various combinations of discharge medicines. These variations included type of medication, duration and whether to take 'when required' or at regular intervals. Of patients prescribed regular opioid medicines, 76.6% (82/107) had a specified duration documented at discharge. However, 72.9% (78/107) had no written deprescribing advice on discharge. Similarly, of patients prescribed 'when required' opioids, 59.6% (93/156) had a specified duration of their prescription and 33.3% (52/156) were given written deprescribing advice.

Variations in admission and discharge oral morphine equivalent doses in opioid naïve and opioid tolerant patients, along with a comparison between patients undergoing intermediate and major or complex major surgery are shown in Figure 1.

Only 15 patients were prescribed the combined preparation of co-codamol either as regular or 'when required' analgesia, all of whom were in the intermediate surgery group. Of these, 11 (73.3%) had specified prescription duration and four (26.7%) had deprescribing advice. Modified-release morphine sulphate was prescribed to 28 patients who were previously opioid naïve, of whom 10 (35.7%) had no prescription duration specified and 18 (64.3%) had no deprescribing advice given. Modified-release oxycodone was prescribed to 19 patients, 16 (84.2%) of whom had a duration of prescription specified and 10 (52.6%) had

Table 1 Patient baseline characteristics. Values are number (proportion).

	Total n = 499	Intermediate surgery n = 157	Major or complex major surgery n = 342	p value
Sex				
Female	230 (46.1%)	67 (42.7%)	163 (47.7%)	0.299
Male	269 (53.9%)	90 (57.3%)	179 (52.3%)	
Age				
18–64 y	244 (48.9%)	88 (56.1%)	156 (45.6%)	0.045
65–74 y	146 (29.3%)	44 (28.0%)	102 (29.8%)	
≥ 75 y	109 (21.8%)	25 (15.9%)	84 (24.6%)	
Charlson comorbidity index				
0	164 (32.9%)	80 (51.0%)	84 (24.6%)	< 0.001
1–2	198 (39.7%)	44 (28.0%)	154 (45.0%)	
≥ 3	137 (27.4%)	33 (21.0%)	104 (30.4%)	
Arthritis				
Yes	77 (15.4%)	23 (14.7%)	54 (15.8%)	0.743
No	422 (84.6%)	134 (85.3%)	288 (84.2%)	
Mental health diagnoses				
Yes	48 (9.6%)	20 (12.7%)	28 (8.2%)	
No	451 (90.4%)	137 (87.3%)	314 (91.8%)	0.109
Other (pain related)				
Yes	72 (14.4%)	34 (21.7%)	38 (11.1%)	0.002
No	427 (85.6%)	123 (78.3%)	304 (88.9%)	
Malignancy status				
Benign disease	254 (51.1%)	142 (90.4%)	112 (32.9%)	< 0.001
Cancer	243 (48.9%)	15 (9.6%)	228 (67.1%)	
Pre-operative analgesic medicines				
Regular medicines	152 (30.5%)	48 (30.6%)	104 (30.4%)	0.971
No medicines	347 (69.5%)	109 (69.4%)	238 (69.6%)	
Surgical approach				
Open	283 (56.7%)	115 (73.3%)	168 (49.1%)	< 0.001
Minimally invasive	216 (43.3%)	42 (26.7%)	174 (50.9%)	
Length of stay				
0–4 days	211 (42.3%)	105 (66.9%)	106 (31.0%)	
5–7 days	130 (26.0%)	23 (14.6%)	107 (31.3%)	
≥ 8 days	158 (31.7%)	29 (18.5%)	129 (37.7%)	< 0.001

deprescribing advice. Immediate-release oxycodone was prescribed 'when required' to 30 patients, of whom 22 (73.3%) had a specified duration and 17 (56.7%) had deprescribing advice (Table 3).

Patients aged ≥ 65 years were less likely to be discharged home on oral opioids than younger patients on both univariable and multivariable analysis (Table 4). None of the other variables analysed had a statistically significant impact on opioid prescriptions at discharge.

Institutional practices, policies, guidelines and training strategies for opioid prescription at discharge in the 14 centres are summarised in Table 5.

Discussion

This is the first study from England (and the UK) to examine opioid-prescribing practices at discharge after surgery, with the particular goal of determining whether modifiable drivers for subsequent persistent postoperative opioid use were present. Data were collected in March 2019, before the

Table 2 Pre-operative analgesic use. Oral morphine equivalent doses (OMED) are based on total number of patients on opioid medicines per category. Values are number (proportion) or median (IQR [range]).

|	Complexity of surgery			
	Intermediate surgery n = 157		Major or complex-major surgery n = 342	
Analgesic	Regular intervals	When required	Regular intervals	When required
Paracetamol	24 (15.3%)	10 (6.4%)	67 (19.6%)	25 (7.3%)
NSAID	8 (5.1%)	4 (2.6%)	10 (2.9%)	1 (0.3%)
Other adjuvants	25 (15.9%)	2 (1.3%)	29 (8.5%)	1 (0.3%)
Opioid	20 (12.7%)	13 (8.3%)	35 (10.2%)	21 (6.1%)
OMED; mg.day^{-1}	31 (16–35.5 [8–200])	16 (12–40 [4–70])	31 (16–45 [10–140])	31 (16–40 [4–80])

NSAID, non-steroidal anti-inflammatory drug.
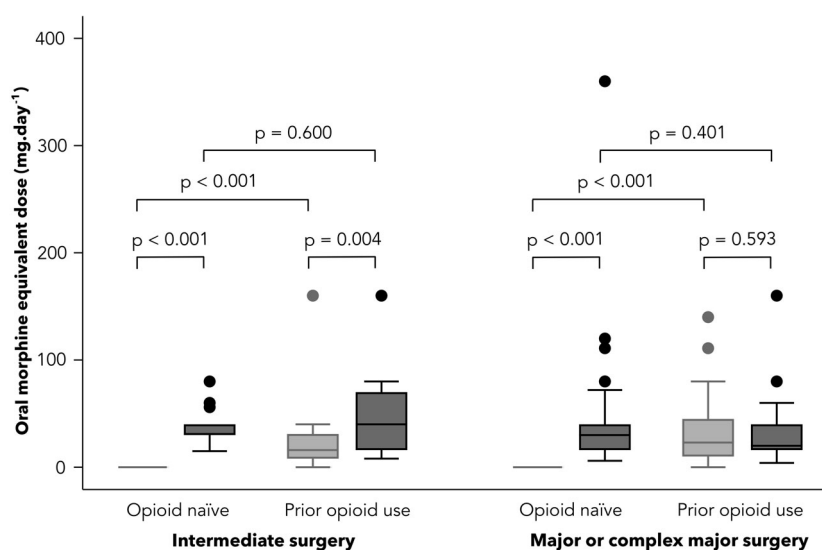
Figure 1 Box plot demonstrating variations in pre-admission ▢ and at discharge ▢ oral morphine equivalent doses in opioid naïve and opioid-tolerant patients undergoing intermediate and major or complex major surgery. Solid lines = medians, boxes = IQR, whiskers = range excluding outliers and dots = outliers.

publication of a study which demonstrated that surgery is a risk-factor for persistent postoperative opioid use in the UK [13]. This also predated international guidelines on the prevention of opioid-related harm in surgical patients [8, 26] and the drug safety update on opioids released by the Medicines and Healthcare products Regulatory Agency [18].

The data demonstrate that there were a number of recognised risk-factors (Box 1) in the prescribing habits of clinicians at discharge that could contribute to a large unused pool of opioids in the community. This reservoir of opioids in the community could then be available for opioid diversion, opioid misuse and predisposition to persistent postoperative opioid use and opioid-induced ventilatory impairment.

In the USA, the three most important modifiable risk-factors for persistent postoperative opioid use are the use of

modified-release opioids, long duration of initial prescriptions and repeat prescriptions [10]. The present study has demonstrated that these three factors were present in prescribing practices in England. Ten percent of previously opioid naïve patients were discharged with these medicines, 33.5% of patients prescribed opioids at discharge did not have a specified duration and 13 of the 14 centres did not inform general practitioners that the opioids should not become repeat prescriptions.

Moreover, transdermal fentanyl was also used occasionally. This is especially disconcerting as the summary of product characteristics of transdermal fentanyl explicitly states that postoperative pain is a contra-indication as "*there is no opportunity for dose titration during short-term use and because serious or life-threatening hypoventilation could result*" [27]. This stance is

Table 3 Analgesia prescribed at discharge. Oral morphine equivalent doses (OMED) are based on total number of patients on opioid medicines per category. Values are number (proportion) or median (IQR [range]).

| | Complexity of surgery | | | |
| | Intermediate surgery n = 157 | | Major or complex-major surgery n = 342 | |
Analgesic	**Regular intervals**	**When required**	**Regular intervals**	**When required**
Analgesia prescribed at discharge	75 (47.8%)	56 (35.7%)	182 (53.2%)	139 (40.6%)
Type of analgesic medicines				
Paracetamol	46 (29.3%)	18 (5.3%)	138 (40.4%)	52 (15.2%)
NSAID	10 (6.8%)	7 (4.5%)	13 (3.8%)	4 (1.2%)
Codeine or dihydrocodeine	9 (5.7%)	20 (12.7%)	25 (7.3%)	26 (7.6%)
Compound analgesics[a]	7 (4.5%)	8 (5.1%)	0	0
Other analgesic adjuncts	23 (14.6%)	2 (1.3%)	39 (11.4%)	0
Morphine sulphate oral solution	3 (1.9%)	10 (6.4%)	1 (0.3%)	38 (11.1%)
Tramadol	6 (3.8%)	8 (5.1%)	10 (2.9%)	19 (5.6%)
Immediate-release oxycodone	0	5 (3.2%)	0	25 (7.3%)
Modified-release morphine sulphate (all patients)	7 (4.5%)	5 (3.2%)	21 (6.1%)	6 (1.8%)
Modified-release morphine sulphate (opioid naïve patients)	5 (3.2%)	5 (3.2%)	13 (3.8%)	5 (1.5%)
Modified-release oxycodone (all patients)	4 (2.6%)	0	15 (4.4%)	0
Modified-release oxycodone (opioid naïve patients)	3 (1.9%)	0	15 (4.4%)	0
Transdermal fentanyl (all patients)	1 (0.6%)	0	2 (0.6%)	0
Transdermal fentanyl (opioid naïve patients)	1 (0.6%)	0	2 (0.6%)	0
Total modified-release preparations to opioid naïve patients[b]	9 (5.7%)	5 (3.2%)	30 (8.8%)	5 (1.5%)
Total on any opioids	33 (21.0%)	47 (29.9%)	74 (21.6%)	109 (31.9%)
OMED; mg.day^{-1}	31 (30–40 [8–160])	40 (30–90 [4–320])	30 (16–40 [4–360])	60 (40–150 [12–480])

NSAID, non-steroidal anti-inflammatory drug.
[a]Compound analgesics including co-codamol and co-dydramol.
[b]Total modified-release preparations of morphine, oxycodone, tramadol and fentanyl to opioid naïve patients.

reinforced by the recent drug safety update from the Medicines and Healthcare products Regulatory Agency [18]. Equally worrying was the use of 'when required' modified-release opioids. This is also explicitly discouraged in the summary of product characteristics of modified-release oral opioid preparations [28] and can only be considered as dangerous practice because of the lack of opportunity for dose titration [29].

The Medicines and Healthcare products Regulatory Agency now advises that before starting treatment with any opioid, a discussion should occur to agree a treatment strategy and plan for end of treatment with the patient in order to minimise the risk of dependence [18, 30]. This is now highlighted in the summary of product characteristics of all opioids [27, 28, 31]. The fact that the institutional data (Table 5) showed that hospitals did not have formal

guidelines for discharge analgesia, and that doctors had no formal training on discharge analgesia prescribing, coupled with the fact that the advice from the Medicines and Healthcare products Regulatory Agency was only published in September 2020 [18], suggests that patients would not have received this important weaning and deprescribing information.

The reverse pain ladder is increasingly being recommended as a concept to aid opioid weaning and deprescribing [8, 29, 32]. It utilises a stepwise reduction in analgesics, with 'when required' immediate-release opioids weaned first, and then finally stopping the regular simple analgesics (paracetamol and non-steroidal anti-inflammatory drugs). The data from the present study (Table 3) suggest that the reverse pain ladder was not being used to aid weaning of opioids. Furthermore, compound

Table 4 Logistic regression of opioid prescription at discharge. Values are OR or 95%CI.

	Unadjusted OR (n = 499)	95%CI	p value	Adjusted OR n = 499	95%CI	p value
Sex						
Female	1.00			1.00		
Male	0.82	0.58–1.17	0.272	0.79	0.530–1.170	0.236
Age (years)						
18–64	1.00			1.00		
65–74	0.42	0.27–0.64		0.34	0.210–0.540	
≥ 75	0.35	0.22–0.56	< 0.001	0.29	0.170–0.490	<0.001
Charlson comorbidity index						
0	1.00			1.00		
1–2	0.73	0.48–1.11		0.74	0.44–1.24	
≥ 3	0.70	0.44–1.10	0.218	0.84	0.45–1.55	0.846
Arthritis						
No	1.00			1.00		
Yes	0.93	0.57–1.52	0.769	1.00	0.59–1.72	0.991
Mental health issues						
No	1.00			1.00		
Yes	0.83	0.46–1.53	0.555	0.69	0.36–1.33	0.270
Malignancy status						
Benign disease	1.00			1.00		
Cancer	0.89	0.63–1.27	0.531	1.26	0.72–2.21	0.421
Pre-operative medicines				1.00		
Regular meds	1.00	0.94–2.03	0.096	1.43	0.94–2.19	0.094
No regular meds	1.38					
Type of surgery						
Intermediate	1.00			1.00		
Major or complex major	0.84	0.71–1.00	0.661	0.85	0.52–1.41	0.531
Surgical approach						
Open	1.00			1.00		
Minimally invasive	0.95	0.66–1.35	0.759	0.94	0.63–1.39	0.746
Length of stay; days						
0–4	1.00			1.00		
5–7 days	1.08	0.70–1.68		1.12	0.67–1.84	
≥ 8 days	1.38	0.91–2.09	0.302	1.54	0.95–2.49	0.089

analgesics were also being prescribed at discharge, both for regular and 'when required' use. The use of compound analgesic preparations that contain a simple analgesic (such as aspirin or paracetamol) with an opioid component reduce the scope for effective titration of the individual components [20]. Consequently, they hinder opioid deprescribing and are not recommended [8, 20].

Our data further highlight that the amount of opioids prescribed at discharge was not category-specific, as patients received similar amounts of opioid for open and minimally invasive procedures, and for intermediate and major or complex major procedures. The prescription of excess opioids can be considered as poor practice for two main reasons. It increases the risk of persistent postoperative opioid use in the patient [10] as well as the pool of opioids available in the community that can then be used illicitly through opioid diversion. This reservoir has been demonstrated to be a risk-factor in family and friends developing opioid misuse issues [8]. Unfortunately, in the hospitals studied there were no policies or guidelines to ensure patients are informed how to safely dispose of unused opioids.

Table 5 Site questionnaire responses. Values are number.

	Yes n = 14
Are there any formal guidelines for discharge analgesia at your trust/hospital site?	0
Do doctors/prescribers have any formal training on:	
a. Discharge analgesia prescribing?	0
b. Routine avoidance of discharge opioid analgesia prescription for > 7 days?	1
c. Routine avoidance of compound analgesics?	0
d. Routine avoidance of modified-release opioid preparations to previously opioid naïve patients?	2
e. Advising general practitioners to avoid repeat opioid prescriptions?	1
f. Pain management?	1
g. Deprescribing?	0
Are patients encouraged to purchase their own simple analgesia on discharge, rather than it being dispensed (e.g. paracetamol/ibuprofen)?	11
Are patients given advice on disposal of unused opioids?	0

With the increasing awareness of the dangers of post-discharge opioid misuse, there are now several national and international consensus guidelines with broadly similar recommendations [8, 26, 29, 33]. These include regular simple analgesics, limited duration immediate-release opioid to be titrated to promote mobilisation with a duration that is appropriate for the surgery and the dose appropriate for the patient's age, avoidance of modified-release formulations, strategies to prevent opioid diversion and the need to ensure patients are aware of the need to stop their opioids as well as safely disposing of unused opioids.

This multicentre study included 14 institutions of varying capacity across England, providing a representative sample of the breadth of clinical practice for prescribing analgesia at discharge after general surgical operations. Only patients undergoing intermediate and major or complex major surgery were included in order to capture those most likely to require opioid analgesia at discharge. However, the retrospective nature of this study and the restriction to case selection, may also have introduced bias as consecutive cases may not have been included. This was despite each site ensuring that 25% of their submitted data were verified locally. Additionally, the study only reflects prescription practice at discharge in general surgery and not the full spectrum of surgical specialties, especially those where pain management is central to both patient presentation and surgical outcome, such as orthopaedic

Box 1 Examples from the current study of good practice and deviation from national and international guidelines [8, 26].

Good practice

- Regular simple analgesics such as paracetamol and non-steroidal anti-inflammatory drugs
- Limited duration of 'when required' immediate-release opioid tablets
- Age-related dosing of opioids

Deviation from national and international guidelines

- The use of 'when required' simple analgesics rather than at regular intervals
- The use of modified-release opioid preparations in patients not previously on these medicines
- The use of compound analgesic preparations
- The use of immediate-release opioids at regular intervals rather than 'when required'
- Not stating the duration for which analgesics should be taken
- The use of transdermal fentanyl
- The lack of local opioid stewardship policies (duration; deprescribing advice; disposal of unused medicines; avoidance of repeat prescriptions)

surgery. Nonetheless, by identifying a pattern of poor prescribing practices and a lack of guidance and formal training at individual institutions, this study highlights opportunities for improvement in opioid-prescribing practices in England.

This study has demonstrated there were aspects of practice related to opioid prescribing at discharge that were haphazard and known to contribute to opioid misuse. It has also been demonstrated that there was a lack of guidance and formal training at individual institutions. Now that it is recognised that surgery is a risk-factor for persistent postoperative opioid use in the UK [13], there is an urgent need for organisations and clinicians to implement changes in practice to improve opioid stewardship to reduce the risk of opioid-related harm in adult surgical patients. Controlled drug accountable officers and controlled drugs local intelligence networks have statutory duties in promoting opioid stewardship [34] and they provide an ideal conduit to help implement the guidance of the Medicines and Healthcare products Regulatory Agency [18] and other aspects of opioid stewardship [35]. Nevertheless additional resources will be needed to implement and sustain opioid stewardship programmes [30].

Acknowledgements

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Appendix 1
OPiOiD Study Group

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Supporting Information

Additional supporting information may be found online via the journal website.

Table S1. Participating sites and audit registration details.
Table S2. Classification of analgesia.
Figure S1. STROBE diagram.