

## **Original Article**

### **Exploring Take Home Opioid Stewardship (ETHOS) in UK Postoperative Patients**

**Running header/short title:** Exploring Take Home Opioid Stewardship (ETHOS)

#### **Abstract**

##### **Background:**

Surgery is one of the most common indications for a patient's first opioid prescription, with some patients progressing to unintended long-term use. There is no current data from the United Kingdom on how much patients use of the opioid medication dispensed at discharge from hospital. This study investigates discharge opioid prescribing and usage following common surgical procedures.

##### **Methods:**

This cohort study was conducted at the xxxx NHS Foundation Trust and involved 20 of the most commonly performed adult surgical procedures. At least 20 patients per procedure were surveyed using a standardised telephone questionnaire 6-8 days after discharge to establish the amount of used and unused opioids. Opioid doses were converted to oral morphine equivalent (OME) for analysis.

##### **Results:**

The amount of opioid given to patients after all types of surgery far exceeded requirement, with often large variations in prescribing practices for the same procedures, most notably in trauma and orthopaedics.

For the cohort of 426 patients, a total of 55 080 mg OME was dispensed on discharge, with only 34.4% actually used by patients, leaving a total of 36 108.5mg OME unused in the community, risking inappropriate opioid use, overdose or diversion.

**Conclusions:**

Opioid overprescribing is common after surgery and represents waste, expense and risk to patients. There is a clear need to develop a procedure-specific evidence-base for discharge opioid prescribing, adopting an “enough but not too much” approach to ensure that patients have adequate analgesia to facilitate functional surgical recovery, but not more than is needed.

**Key words:**

Postoperative pain, opioid analgesics, patient discharge, overprescribing, opioid-related disorders.

**Introduction:**

Surgery is one of the most common indications for a patient’s first opioid prescription[1] with prescribing rates increasing, in contrast to the slight decreases seen in primary care,[2] making the postoperative period a key area to improve opioid safety and stewardship. Excessive postoperative opioid prescribing is a risk factor for persistent postoperative opioid use (PPOU) and the development of opioid use disorder, making surgery a key gateway to general opioid misuse. [3–5] The UK continues to contribute to the global prescription opioid epidemic, with the oral morphine equivalent (OME) dose of opioids prescribed in general practice increasing by 127% between 1998 and 2017.

[6,7] A decrease in primary care prescribing began in 2016, with a 30% fall in total opioid cost seen from 2015/2016 to 2021/22, but this effect now seems to have plateaued. [8] It is likely that prescribing actions in the postoperative period are a factor in perpetuating what has been seen in general practice, risking PPOU of around 7% (although figures vary with surgical and patient factors) in previously opioid naïve patients. [9] The observed increase in opioid prescribing over the last few decades has mainly focused on community-based healthcare, with less attention paid to the initiation of opioids by hospitals after surgery or trauma. The first UK study of opioid prescribing on discharge after surgery found poor prescribing practices, with a lack of guidance or training [10] but did not investigate how much opioid patients actually used after discharge. Over five million surgical procedures are performed annually in the UK [11] but, with no evidence-based national guidelines for discharge opioid prescriptions postoperatively, healthcare teams have had to rely on “best guess” estimates of opioid requirements. The European-led PROSPECT (procedure specific postoperative pain management) group provides procedure-specific guidance for immediate postoperative pain, but does not give guidance on discharge analgesia. [12] A recent study looking at discharge opioid use in 25 different countries included high, middle and low-income countries, but the heterogeneity of nation-specific opioid prescribing practices precludes any meaningful conclusions. [13] A US study by Hill [14] looking at moderate general surgical procedures found that 70% of opioid tablets dispensed on discharge following surgery went unused, with subsequent systematic reviews from the US and Canada corroborating this finding. [15,16] Collecting data on patient-reported consumption of opioids after various surgical procedures has subsequently allowed the development of accurate prescribing guidelines in the US. [17] However, given such large healthcare and cultural differences

between the US and the UK, these data cannot simply be transferred to the UK population. We therefore require our own country-specific and procedure-specific normative dataset to ensure relevance to our target population.

In this study we gather the first UK data on this topic, utilising patient data from the xxxx NHS Foundation Trust. We expanded the Hill protocol [14] to include 20 of the most commonly-performed surgical procedures at xxxx, collecting data via a telephone survey from at least 20 patients for each. We aimed to determine, for each procedure, how much opioid was used by patients in the week following discharge. We also sought to identify any differences in discharge prescribing practices between specialities.

This study aims to describe opioid prescriptions and opioid use following common surgical procedures with a view to informing future evidence-based guidelines for post-operative discharge opioid prescribing.

## **Methods**

This was a cohort study, approved by the Caldicott Guardian as a service evaluation, of patients undergoing surgery in a single tertiary centre between April 2023 and April 2024. Using hospital clinical coding, we identified 20 of the most commonly-performed procedures in adults for which opioids are usually prescribed. Patients often have telephone follow-ups from healthcare professionals in the Trust to improve post-discharge support so, during that time, all patients undergoing those operations were informed through the discharge summary that they may be contacted for follow-up. We then contacted consecutive patients by phone until we had data for a minimum of 20 patients per procedure. With no previous UK data on how much opioid postoperative patients take after discharge compared to how much was dispensed, it was felt that 20

patients for each procedure would identify if there were a discrepancy as a proof of concept, providing data on at least 400 patients. Patients were identified through the electronic patient record and medical coding searches in the following surgical specialities: trauma and orthopaedics, general, colorectal, hepatobiliary, renal, breast, obstetrics, cardiothoracic and neurosurgery. Patients were surveyed using a standardised telephone questionnaire (available as an appendix) between 6-8 days after hospital discharge to establish opioid consumption. This timescale was chosen as in 2022 our Trust moved to 7-day “to take out” (TTO) prescriptions for many opioids, in line with the NHS England National Patient Safety Improvement Programme,[18] so we decided to review how appropriate that might be. Further, it was felt that this relatively short timescale would reduce risk of recall bias. The standardised telephone script gave the patient the chance to opt out after a description of the purpose of the call.

The type and quantity of opioids dispensed was verified using the hospital discharge summary. During the telephone survey, patients were then asked to confirm the name and quantity of opioids they were discharged with and how much they had left. Both consumed and unused opioids were recorded and converted to oral morphine equivalent (OME) for analysis using the xxx opioid calculator, which allows for the input of multiple opioids and doses to provide a total figure. [19] This was to allow ease of comparison of opioid use postoperatively for each procedure, given the variety of opioid analgesia given. The OME is given as a total dosage over the first postoperative week, including the following totals: prescribed, taken by the patient, and left unused.

We also reviewed prescribing of non-opioid analgesia - paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) - both in hospital and on discharge.

Exclusion criteria included: patients under the age of 16, preoperative opioid use, no opioid prescription on discharge, communication difficulties, patients who had early postoperative complications and delayed discharge, and patients who we were unable to contact by phone after three attempts. While we did not plan to exclude patients with cognitive impairment, as we wanted to maintain inclusivity and could have collected data from a carer, we had no such patients in our cohort.

We used descriptive statistics to assess our data set – mean, median, and range - determining measures for both central tendency and dispersion of prescribing practices for each procedure.

## **Results**

A total of 426 postoperative patients were included in the study. The average age was 54.6 years old (range 18-88), with a gender split of 45.5% male and 54.5% female. We contacted 147 patients who had orthopaedic procedures including total hip replacement, total knee replacement, unicompartmental knee replacement, arthroscopy of knee, shoulder or hip, or open reduction internal fixation (ORIF) of the ankle. Twenty-three cardiac surgery patients underwent either aortic valve replacement or coronary artery bypass grafts. A total of 107 patients had general surgical procedures including laparoscopic cholecystectomy or appendectomy, incision and drainage of abscesses, open inguinal hernia repair, or colorectal resection, while 44 women underwent breast surgery. Other surgical procedures included nephrectomy (21 patients), liver resection (21), craniotomy (21), caesarean section (22), and thyroidectomy (20). Breast surgery and caesarean sections are denoted under Women's Health throughout, as all patients in our study for these procedures were women.

Opioids prescribed included: codeine, dihydrocodeine, morphine, tramadol and oxycodone, in varying preparations. The most frequently prescribed opioid was codeine, which was the sole opioid for 63% of patients. This incidence was higher – 76.2 to 100% - in non-orthopaedic procedures, with the exceptions of colorectal resection where tramadol was most frequently prescribed; cardiac surgery where codeine and tramadol were equally common; and caesarean sections where dihydrocodeine was exclusively dispensed. National guidelines [20] caution against the use of codeine in breast-feeding mothers, despite recent questions around that decision-making.[21] Patients undergoing orthopaedic surgery were prescribed more potent opioids, such as morphine and oxycodone, but no patients were prescribed modified-release opioids, as per national guidance.[22]

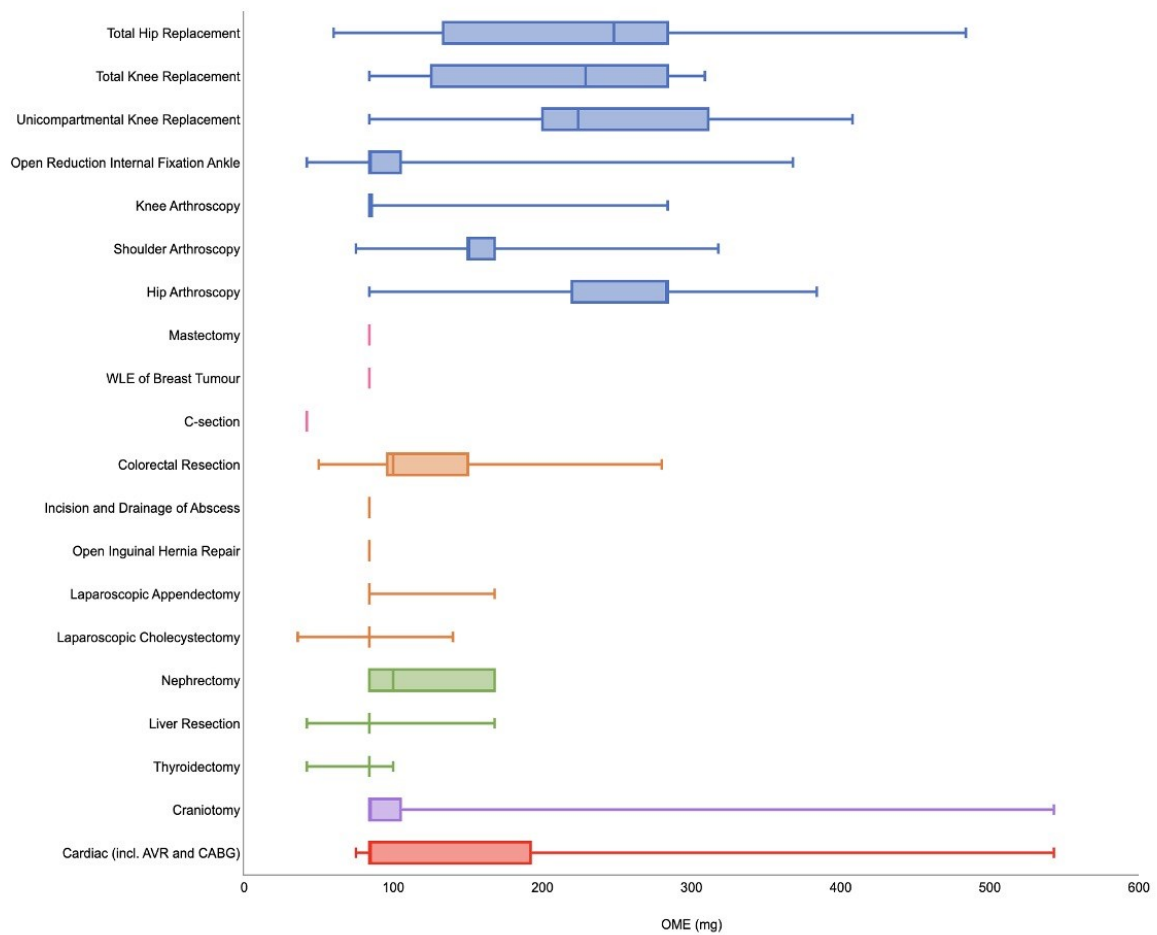
Table 1 shows the amount of opioid prescribed at discharge for each surgical procedure and the amount used by patients, with quantities expressed as total oral morphine equivalent, while variation in prescribing practices is demonstrated in figure 1. The median amount of opioid used versus amount unused per procedure is given in figure 2.

**Table 1: Amount of opioid prescribed at discharge and used over the first 7 days after hospital discharge. Doses given as oral morphine equivalent (OME).**

Procedure	Number of patients	Median prescribed [mg]	Range prescribed [mg]	Median used [mg]	Range used [mg]	Percentage used of total prescribed
<b>Orthopaedic Surgery</b>						
Total Hip Replacement	21	248	60-484	40	0-242	27.8%
Total Knee Replacement	20	229	84-309	104.5	0-254	51.4%
Unicompartmental Knee Replacement	21	224	84-408	96.5	0-203	50.3%
ORIF Ankle	21	84	42-368	78	0-368	63.5%
Knee Arthroscopy	21	84	84-284	30	0-219	39.2%
Shoulder Arthroscopy	22	150	75-318	25.5	0-225	29.6%
Hip Arthroscopy	21	284	84-384	36	0-216	23.2%
<b>Women's* Health</b>						
Mastectomy	22	84	84-84	0	0-42	7.5%
WLE Breast Tumour	22	84	84-84	1.5	0-84	18.8%
Caesarean Section	22	42	42-42	21	0-42	48.1%
<b>General Surgery</b>						
Colorectal Resection	21	100	50-280	30	0-150	30.4%
Incision and Drainage of Abscess	21	84	84-84	6	0-84	19.4%
Open Inguinal Hernia Repair	21	84	84-84	9	0-84	16.7%
Laparoscopic Appendectomy	21	84	84-168	15	0-84	26.6%
Laparoscopic Cholecystectomy	23	84	36-140	18	0-84	34.4%
<b>Other Surgery</b>						
Nephrectomy	21	100	84-168	12	0-102	27.4%
Liver Resection	21	84	42-168	42	0-168	56.6%
Thyroidectomy	20	84	42-100	6	0-72	17.1%
<b>Neurosurgery</b>						
Craniotomy	21	84	84-543	9	0-279	31.1%
<b>Cardiothoracic Surgery</b>						
CABG or AVR	23	84	75-543	54	0-537	59.5%
<b>Total</b>	<b>426</b>	<b>Prescribed</b>	<b>55080</b>	<b>Used</b>	<b>18971.5</b>	<b>34.4%</b>

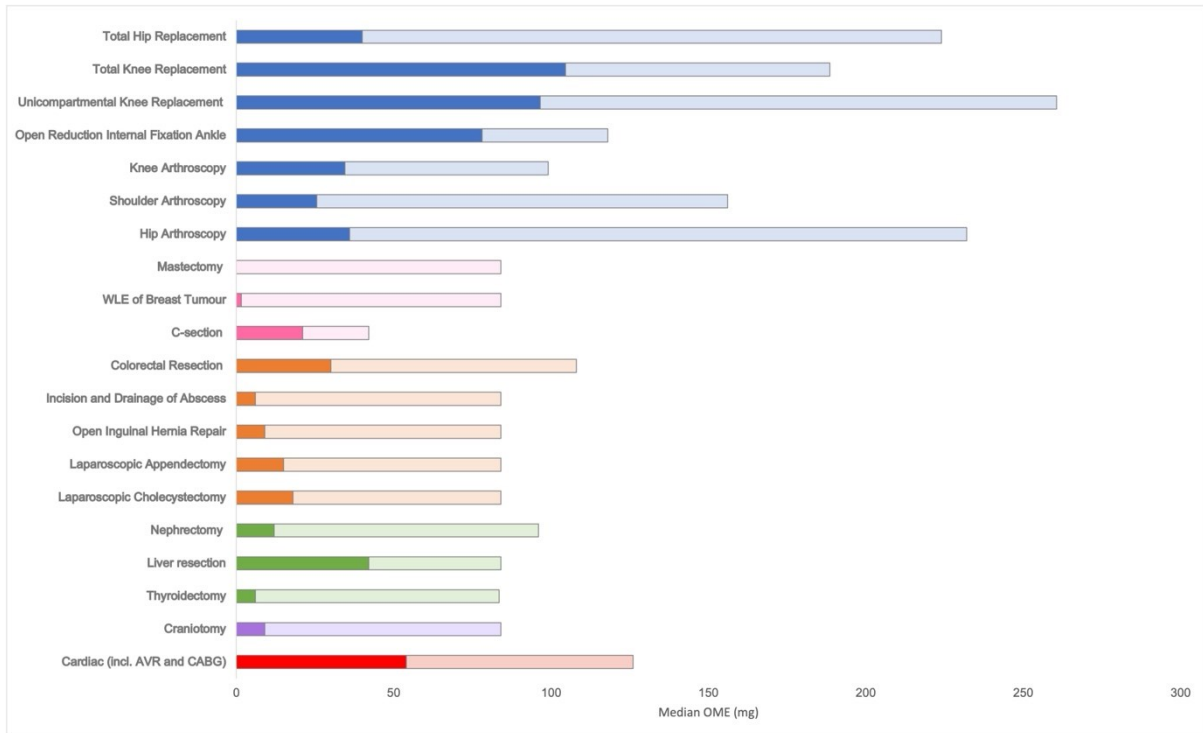
Abbreviations: ORIF = Open Reduction Internal Fixation; WLE = Wide Local Excision; CABG = Coronary Artery Bypass Graft; AVR = Aortic Valve Replacement.

**Figure 1: Box and Whisker Plot showing the range, interquartile range, and median OME (mg) of opioids prescribed for each procedure.**



Abbreviations: OME = Oral Morphine Equivalent; WLE = Wide Local Excision; C-section = Caesarean section; CABG = Coronary Artery Bypass Graft; AVR = Aortic Valve Replacement.

**Figure 2: Median amount of opioid used (dark colours) and opioid remaining (light colours) for each procedure at follow-up 6-8 days post discharge. Total dose is given as OME (mg).**



Abbreviations: OME = Oral Morphine Equivalent; WLE = Wide Local Excision; C-section = Caesarean section; CABG = Coronary Artery Bypass Graft; AVR = Aortic Valve Replacement.

Amount of opioid used

The top three procedures for the highest median OME used were all orthopaedic procedures: total knee replacement (104.5mg), unicompartmental knee replacement (96.5mg) and ORIF of ankle (78mg). Hip arthroscopy had a comparable median OME of 36mg used compared to total hip replacement at 40mg. Patients undergoing mastectomy used the least opioid with a median of 0mg OME.

Percentage of opioid used compared to that prescribed

The procedures where patients used the least amount of discharge opioids were breast surgery, thyroid surgery, hernia repair and incision and drainage of abscess. In each case, prescribing was very consistent (84 mg OME) reflecting a full pack of 28 codeine 30mg tablets, but less than 20% was used, representing significant overprescribing of opioids.

In contrast, ORIF of the ankle had the highest percentage of total prescribed OME used, with patients using 63.5% of the opioid medications they were prescribed on discharge.

#### Amount of opioid dispensed

Craniotomy patients had the largest range of OME dispensed, with some patients given no opioids and others dispensed 543mg OME. Caesarean section patients were dispensed the least opioid at 924mg for their whole cohort (22) while hip arthroscopy patients (21) were dispensed the most opioid at 5389mg. In total, the 426 patients were dispensed a total of 55 080mg OME with only 34.4% (18 971.5mg OME) being used in the first week after discharge, leaving 65.6% (36 108.5mg OME) unused in the community.

As this was a proof-of-concept cohort study, we did not collect descriptive data due to the relatively small sample sizes per procedure, nor did we look at prescriber characteristics beyond the fact that, in our hospital, discharge prescribing is usually left to foundation doctors. We collected data on hospital opioid use for inpatients but, with small numbers, were not able to interpret whether prescribers adapted discharge opioid prescriptions based on pre-discharge opioid use.

Seven patients had requested more opioid analgesia from their primary care doctor, while two patients stated that they planned to do so, having used the full amount of opioid dispensed. Their details are in table 2, with the cohort median OME used as a

comparator and, after further investigation, notes made of any factors that may have contributed to an increased need for analgesia, although interpretation is difficult without comparable full cohort data.

**Table 2: Details of patients who had requested (or planned to request) more opioids at day 7 post discharge.**

Procedure	Opioid dispensed	Amount dispensed	OME dispensed [mg]	Cohort median OME used [mg]	Notes
Laparoscopic appendectomy	Codeine	28 x 30mg	84	15	Wound infection a month after surgery
I&D perianal abscess	Codeine	28 x 30mg	84	6	Depression
Liver resection	Codeine	56 x 30mg	168	42	
Liver resection	Codeine	14 x 30mg	42	42	Mixed anxiety and depression
Liver resection	Tramadol	30 x 50mg	150	42	
Caesarean section	Dihydrocodeine	14 x 30mg	42	21	Pelvic girdle pain during pregnancy
Mastectomy	Codeine	28 x 30mg	84	0	Depression; previous shoulder pain
Unicompartmental knee replacement	Oramorph 10mg/5mL oral solution	100ml	200	96.5	Depression
ORIF ankle	Codeine	28 x 30mg	84	78	

Abbreviations: I&D = Incision and Drainage; ORIF = Open Reduction Internal Fixation

Patients were asked about side effects of opioids: 30.4% of patients experienced constipation, 12.8% described drowsiness, 7.7% suffered nausea, while 5.3% felt light- or fuzzy-headed.

As an inpatient, 97.2% of patients were prescribed paracetamol and 36.5% of patients were prescribed an NSAID. NSAID prescriptions were highest after caesarean section (86.4%) and lowest after cardiac procedures (0%). On discharge home, 87.4% of

patients were prescribed or recommended paracetamol, while 26.3% were prescribed or recommended NSAID. This is summarised for all procedures in table 3.

**Table 3: Percentage of patients prescribed opioid-sparing analgesia as an inpatient and on discharge.** \*\*over-the-counter purchase advised and documented.

Procedure	% Inpatient Paracetamol	% Inpatient NSAID	% Discharge Paracetamol	% Discharge NSAID
<b>Orthopaedic Surgery</b>				
Total Hip Replacement	100	57.1	95.2	42.9
Total Knee Replacement	95	40	100	25
Unicompartmental Knee Replacement	100	38.1	100	42.9
ORIF Ankle	90.5	33.3	90.5	19
Knee Arthroscopy	95.5	59.1	100	52.4
Shoulder Arthroscopy	95.5	68.2	100	68.2
Hip Arthroscopy	100	76.2	100	90.5
<b>Women's Health*</b>				
Mastectomy	100	22.7	100	4.6
WLE Breast Tumour	100	13.6	100	81.8
Caesarean Section	100	86.4	0**	0**
<b>General Surgery</b>				
Colorectal Resection	100	4.8	85.7	0
Incision and Drainage of Abscess	90.5	28.6	71.4	4.8
Open Inguinal Hernia Repair	100	61.9	47.6	14.3
Laparoscopic Appendectomy	95.2	47.6	95.2	9.5
Laparoscopic Cholecystectomy	91.7	45.8	95.7	21.7
<b>Other Surgery</b>				
Nephrectomy	100	14.3	90.5	33.3
Liver Resection	100	14.3	100	14.3
Thyroidectomy	100	10	90	0
<b>Neurosurgery</b>				
Craniotomy	100	4.5	90.5	0
<b>Cardiothoracic Surgery</b>				
CABG or AVR	91.3	0	95.7	0

Abbreviations: ORIF = Open Reduction Internal Fixation; WLE = Wide Local Excision; CABG = Coronary Artery Bypass Graft; AVR = Aortic Valve Replacement.

## **Discussion**

The major finding of this study is that the amount of opioid given to patients after all types of surgery far exceeds their use, with only 34.4% of discharge opioids being used by

patients in our cohort, leaving over 36 000mg OME unused. This finding is important given the strong associations between the quantity of opioid prescribed on discharge and the amount taken by patients. [3,23] Higher opioid use increases the risk of opioid-induced ventilatory impairment, PPOU and opioid dependence. [4,23] Quite apart from the risks to the patient and population, this represents a high level of waste, both financially and as a contribution to the high carbon footprint of the NHS. [24]

Our results follow the trends in excessive prescribing seen in the US and other countries, although their pattern of prescribing and choice of opioids differs from the UK. [14,25,26] In a comparison of discharge opioid prescribing in the USA, Canada and Sweden, patients in North America were seven times more likely to be dispensed an opioid after moderate surgery, with those in Canada and Sweden more likely to receive a weak opioid, compared to a strong opioid in the US. [25] These national differences illustrate the need for UK-specific evidence-based guidelines on postoperative take-home opioid prescribing.

We identified two main reasons for overprescribing:

- 1) **Large pack sizes of opioids exceed clinical need.** In the UK, the smallest commercially available pack size of 30mg codeine (the lowest codeine dose prescribed here) is 28 tablets, while that of morphine and oxycodone is 56 tablets. Most patients having non-orthopaedic surgery in our study received 28 tablets of 30mg codeine (84mg OME dose) but used far fewer than that prescribed. Some hospital pharmacies can manually split or reduce pack sizes, but this takes time and staffing, so is not an option in many hospitals, including our own. An official reduction in minimum pack size may improve safety but requires the engagement of both national bodies and drug companies. Following guidance

given in 2018, the Australian Therapeutic Goods Administration required opioid manufacturers to reduce pack sizes from 20 to 10 tablets, due to concerns of opioid harm [27].

- 2) **Variation in prescribing after many orthopaedic procedures.** We found an 8-fold difference in doses of discharge opioids for the same procedures in opioid-naïve patients. For all procedures, there was variation in both the drugs prescribed and their quantities. This finding was unexpected given that most orthopaedic procedures have Enhanced Recovery After Surgery (ERAS) protocols for postoperative analgesic prescribing. Updating ERAS protocols with guidance to include recommendations for discharge analgesia using an evidence-based approach could facilitate standardised management of postoperative pain.

Pain itself is complex, with patient factors including anxiety, expectation and previous opioid use combining with surgical factors to produce an individual experience. Opioid prescribing on discharge should reflect this, taking into account both the procedure and the amount of opioid used by a patient in hospital.[28] Our results show that patients used different amounts of opioid after different surgical procedures, so information on opioid use after specific procedures is needed to ensure adequate analgesia prescribed for good functional recovery, to avoid under-prescribing and leaving the patient in pain, against over-prescribing with the attendant risks. [29] Opioid stewardship should be a healthcare-wide endeavour, with all prescribers mindful of safe opioid prescribing, rather than a reliance solely on inpatient pain teams to provide oversight. [5]

This study set out to investigate the imbalance between discharge opioid prescribing and opioid use, with concern over how much opioid may be left unused in the community. The reasons that patients may stop taking opioids may include the reduction in severity

of pain, intolerance of opioid side effects, or a patient's reluctance to take medication. For some patients, particularly those who had undergone joint replacement, our assessment at one week following discharge would represent a snapshot of use, with further opioid requirement persisting beyond this time.[30]

Only 2% of our patient cohort requested more opioid from their primary care doctor, although we did not ask about the purchase of any additional over-the-counter medications. These patients may have been dispensed inadequate amounts of opioid, have developed surgical complications, or may be transitioning to chronic post-surgical pain, PPOU or opioid use disorder. In each case it is important to review the patient rather than simply initiate repeat prescriptions. Communication between secondary and primary care is vital to avoid unnecessary re-prescribing of opioids, and the normative data collected here would provide reassurance that their original prescription was in-keeping with what the majority of opioid-naïve patients require after the same procedure.

Multimodal analgesia uses a combination of medications or techniques to improve pain control and reduce opioid requirement. [31] Paracetamol and NSAIDs are central to this [32,33] but we found much variation in their prescription, both in hospital and at discharge, with low rates of NSAID prescribing generally. Some patients may have been advised to purchase over the counter formulations, which may not have been documented on discharge.

The paucity of NSAID prescribing may reflect an overcautious attitude by some surgeons to their use after surgery. Concerns over NSAIDs causing acute kidney injury, bleeding, poor bone union after fracture, anastomotic leak after bowel surgery, cardiac events or

gastrointestinal events are well-recognised, but risks have been found to be low in healthy patients taking a short postoperative course. [34–36]

While non-opioid analgesia is important, there remains a place for the judicious use of opioids after many types of surgery. Opioid-free analgesia has been suggested as the safest option, with a recent systematic review in the Lancet claiming that opioid prescribing at surgical discharge does not reduce pain but does increase adverse events. [37] The authors recognised that most of the publications they included were of minor, mainly dental, surgery; recorded pain only on the first postoperative day; and were of low quality. Concerns over the risks of opioids must lead us to use them wisely, not to stop using them for acute pain where they are most effective.

The discharge prescribing for these 426 patients resulted in over 36 000mg OME left unused in the community. None of the patients interviewed had safely disposed of any leftover opioids, despite many having finished taking them days previously. All patients contacted were reminded to take their remaining opioids to the pharmacy for safe disposal. Significant unused opioid in homes increases risks of PPOU, diversion, and poses a safety risk of accidental overdose for children and vulnerable adults. [28]

Improvements in discharge prescribing with a closer match between the amount of opioids prescribed and the amount used, better patient education before hospital discharge, as well as the provision of patient leaflets advising safe storage and safe disposal of excess opioids, [38] would all reduce the community stockpile of unused opioids.

There was significant variation in practice in orthopaedics. Orthopaedic procedures are painful, both due to the nature of the surgery and also the postoperative rehabilitation where early mobilisation of the operated limb is important for recovery. Many procedures

are performed as a day case, but length of stay varies greatly and is determined by medical and social factors. Discharge opioid requirement may be lower in patients with a greater length of stay, as opioid requirements decrease with time since surgery. Hip arthroscopy patients were discharged with the largest median dose of opioid, which may reflect the level of pain experienced following the procedure, the patient demographic, or that hip arthroscopy is a mostly day case procedure. There is also variation in anaesthetic technique between patients for orthopaedic procedures, with a combination of spinal, general anaesthesia, high volume local infiltration of anaesthesia, and a range of different blocks.

We limited our study to patients who were opioid naïve before surgery so excluded patients with preoperative opioid use to allow us to view all postoperative opioid use as relating to new postoperative prescribing. Further, opioid-tolerant patients have been shown to have more pain after surgery, more complex pain management, and a higher and more protracted opioid requirement.

### **Study Limitations and Future Directions:**

Our results represent a snapshot of opioid use at seven days post-discharge, where acute surgical pain had resolved for most patients. Some patients, such as those undergoing arthroplasty procedures, may continue to require opioids beyond the first week: this use was not captured and requires a longer follow-up period.

We investigated only those patients discharged with an opioid prescription, so may have missed patients discharged with no opioid for the same procedures. Although this is likely to represent a minority of patients, they would provide an important comparison and give context to the impact of overprescribing on a more complete level.

We did not take regional anaesthetic techniques into account when collecting our data, particularly applicable to orthopaedic procedures. The location and quality of a regional block may have an impact on short-term postoperative opioid requirement, and this may translate into take-home prescribing.

We recognise that 20 patients per group will not form a comprehensively representative sample for each operation, but have shown that, even with this sample size, overprescribing is common across all surgical procedures. The Michigan Surgical Quality Collaborative have suggested minimum sample sizes to adequately inform future prescribing for various surgical procedures. [39] We shall use this framework to inform our continued data collection, where the increased patient numbers will allow us to collect detailed patient characteristics to improve applicability to individual patient groups. Further, while our data represents the first of its kind in the UK and is an important initial step, no single population can be generalised to reflect that of the whole population, so we shall extend our protocol to collect data from more centres across the UK with differences in ethnicity, deprivation, language and communication differences to provide more representative normative data with which to develop procedure-specific prescribing guidance.

## **Conclusion**

ETHOS is the first study to show that current UK postoperative discharge opioid prescriptions are often far above the amount used by patients, producing a large community burden of unused opioids. National bodies and pharmaceutical companies can play their part by providing smaller opioid pack sizes to improve safety.

Our results demonstrate a need for robust post-discharge opioid prescribing guidelines, including multimodal analgesia, which could be applied nationally and be specific for each procedure, tailored to a UK population, and adapted as required for each individual patient's needs. Improved communication with primary care, with a clear plan on the discharge summary for procedure-specific analgesia, will protect against repeat or ongoing prescribing, although care must be taken that any reduction in post-discharge prescribing will not result in an increased burden on general practice, nor readmission to hospital.

Concern about an opioid overprescribing crisis could swing the opioid pendulum too far to the undertreatment of pain. Our study will help support the narrative of "enough but not too much". We must ensure that patients have enough analgesia to optimise their pain management and recovery back to full function, whilst balancing this against the associated opioid risks, and keeping our patients safe as our main priority – the ethos of opioid stewardship.

Word count: 3773

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