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Exploring a pharmacist-led, opioid medicines use review post-surgery: A prospective multicentre non-randomised, proof-of-concept study

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Abstract

Background

Opioids are commonly prescribed following surgery, yet prolonged use beyond the post-operative period increases the risk of dependence, adverse events, and persistent opioid use. Recent UK guidance emphasises early review and deprescribing, but practical strategies for implementation remain under-explored. This pragmatic study evaluated the feasibility of a clinical pharmacist-led medicines use review (MUR) to support early opioid de-escalation following surgical discharge in a high prescribing region of the UK.

Methods

A prospective, multicentre, cohort mixed methods feasibility study was conducted across six GP practices in Southeast England. Adults discharged from hospital with opioids (< 120 mg Morphine Milligram Equivalents per day) for acute post-surgical pain were recruited within 10 days of discharge. Participants received a pharmacist-led opioid-focused MUR, to support de-prescribing of opioids post-surgery. Follow-up reviews were conducted until opioids were discontinued or 90 days post-discharge. Outcomes included feasibility of recruitment, intervention delivery, prescribing practices, deprescribing pathways, patient experience, and indicative intervention costs.

Results

Twenty-three patients consented (mean age 60 years; 45.5% male). At baseline, 22.7% had already stopped opioids, while the majority (77.3%) engaged in deprescribing: 40.9% on rapid tapering, 27.3% gradual tapering, and 4.5% continuation at this first assessment. All patients discontinued opioid use within 31 days. Opioid prescribing at discharge was variable, with most receiving immediate-release formulations, though a minority were prescribed multiple opioids concurrently and one patient prolonged-release oxycodone, contrary to national guidance. Reported pain decreased over time, and quality-of-life scores showed modest improvements. Pharmacists delivered the intervention with minimal additional support, and patient satisfaction surveys indicated high acceptability. Recruitment was challenging due to difficulties identifying eligible patients in GP records and workforce capacity constraints.

Conclusions

Pharmacist-led MURs to support opioid deprescribing post-surgery are feasible, acceptable to patients, and deliverable at modest cost within primary care. However, variability in discharge prescribing, challenges in timely patient identification, and workforce pressures limit scalability. Larger, adequately

powered studies are required to establish clinical and cost-effectiveness, develop risk stratification tools, and explore system-level strategies for integration into routine post-operative care.

Trial Registration:

ClinicalTrials.gov, reference number: NCT06396663; retrospectively registered. Accessible at: https://clinicaltrials.gov/study/NCT06396663

Key message

1) What uncertainties existed regarding the feasibility?

It was uncertain whether:

- Post-surgical patients would require and benefit from medicines utilisation reviews to support appropriate opioid use and pain management
- Clinical pharmacists in general practice could identify and recruit eligible post-surgical patients in a timely manner
- Clinical pharmacists could be trained in opioid deprescribing and deliver structured medicine utilisation reviews alongside existing workloads
- The intervention could support safe deprescribing across varied and inconsistent surgical prescribing practices.

2) What are the key feasibility findings?

- The primary focus of this feasibility study was establishing the viability of the intervention and confirming the acceptability of the clinical pharmacist in a systematic assessment of pharmacist. Pharmacists successfully delivered the intervention with high autonomy and with high patient acceptability.
- All patients discontinued opioids within 31 days, with the intervention delivered at for an average cost of £61.05.
- Recruitment was limited largely due to challenge in timely patient identification and workforce capacity constraints.

3) What are the implications of the feasibility findings for the design of the main study?

- Future studies should incorporate automated systems for timely patient identification
- Consider risk stratification tools to target patients most at risk of prolonged opioid use
- Follow on studies should consider further implementation contexts around assessing scalability, availability and capacity given the variability in clinical pharmacy staffing in primary care.

- Future interventions should consider a system-wide approach including early interventions that promote and support patient self-management of opioid use.

Background

Opioids have long been the main stay for managing acute pain, particularly following a surgical procedure. While they are highly effective in providing short-term relief from severe pain, prolonged use beyond the immediate post-operative period carries significant risks. These risks include the potential for dependence, long-term use, and life-threatening complications such as opioid induced ventilatory impairment and overdose (1–2). In 2023, nearly half (46.8%) of the 5,448 recorded drug poisoning deaths in England and Wales involved opioids, corresponding to a rate of 6.2 deaths per 100,000 people (3). In the past two decades, the number of opioid prescriptions and the amount of opioid prescribed has doubled in the United Kingdom (UK) with a concomitant increase in opioid-related hospitalisations (4–5). In 2023–2024, around 39 million opioid prescriptions were dispensed in primary care in England, at a cost of ~£280 million, accounting for 60% of dependency-forming medications (benzodiazepine, z-drugs, pregabalin, gabapentin and antidepressants) (6).

Surgical patients are particularly vulnerable to over-prescribing, with many discharged with more opioids than necessary for their short-term pain management (7–8). Studies of post-surgical opioid use suggest that approximately 6–10% of previously opioid-naive patients go on to develop persistent post-operative opioid use following surgery, regardless of the procedure's invasiveness (8–9). The rise in opioid prescribing in UK primary care (particularly following surgery), and its association with a transition to long-term use, is a growing public health concern when more than 21 million procedures are performed in National Health Service (NHS) hospitals in a single year[1](4–5, 10). In response, the UK's Faculty of Pain Medicine, the Royal College of Anaesthetists, and other key professionals have developed new guidelines aimed at reducing peri-operative opioid prescribing, by rationalising and limiting the amount prescribed, and recommending the use of immediate-release, rather than prolonged-release formulations (11–12).

In addition to establishing robust opioid stewardship from the outset, it is equally important to ensure that opioids are continually monitored and deprescribed in a timely and structured manner to mitigate the risk of developing opioid tolerance, persistent post-operative opioid use and a range of adverse events associated with prolonged use, whilst ensuring a patient's post-surgical pain is managed appropriately (11). In this Pharmacist-led DE-eSCALation of opioids post-surgical dischargE (DESCALE) pragmatic cohort study, we aimed to assess the feasibility of clinical pharmacists based in GP practices delivering early medication use reviews (MURs) to patients prescribed opioids following surgical discharge from a single NHS hospital in a region known for opioid prescribing rates above the national average (13–14). Clinical pharmacists, trained in delivering structured MURs and with access to both discharge summaries and patient medical records are uniquely positioned to deliver timely opioid deprescribing interventions in the post-operative period (15–17). The study adapted an award winning, targeted high-dose opioid reduction programme approach of MURs by clinical pharmacists implemented

in 2021–2022, with the objective of testing feasibility of a similar MUR intervention in this new post-surgical setting (5, 18).

Methods

Study design and setting

A multicentre prospective cohort, pragmatic feasibility study, was conducted across six General Practitioner (GP) practices, in East Kent, England. The mixed methods study involved an MUR intervention delivered by clinical pharmacists employed by and based within these participating practices. No changes to the study design or participant eligibility criteria were made during the study.

Study objectives

This paper summarises the quantitative outcomes of this mixed methods study. The full study aims and objectives were as per Veale et al, 2024 and are summarised below:

- Test the feasibility of delivering an early opioid deprescribing intervention in primary care, led by trained clinical pharmacists.
    - Ascertain stakeholder acceptability of the intervention
    - Determination of the fidelity of an early opioid deprescribing intervention
    - led by trained clinical pharmacists in primary care and its potential role in
    - wider medicine's optimisation
    - Ascertain participant acceptability of the intervention
    - Apply a micro-costing approach to estimate the intervention costs
- To understand post-surgical opioid prescribing experiences including
- opioid use, long-term opioid use, participant pain and quality of life
- in the 3-month period post-surgery when discharged with an opioid
- prescription
- To ascertain per protocol feasibility to inform a future study or adoption
- of the protocol in the existing healthcare system

Full aims, objectives, outcomes measurements and sample size justification can be found in Supplementary Table 1.

Participants

Eligible participants were adults (≥ 18 years) identified from electronic discharge summaries or clinical letters through coded searches where this was possible or manually by GP practice staff. Those eligible had undergone surgery at a single NHS trust and discharged with opioid medication less than 120 mg morphine milligram equivalents per day (MME/day), taking it for the treatment of acute non-malignant post-surgical pain. Exclusion criteria included: age < 18 years; pre-operative opioid use exceeding 90 days; daily opioid dose > 120 mg MME/day; use for malignant pain; history of substance misuse; pregnancy or recent caesarean section; inability to provide informed consent at the time of the initial review.

Participant recruitment and consent

Eligible participants were identified through systematic searches of hospital discharge letters or GP practice records. These patients were contacted via text message or email by a study-trained professional from their GP practice. This initial communication included a brief overview of the study and a link to the Participant Information Leaflet. Within 48 hours of the invitation, either a practice staff team member or a study clinical pharmacist telephoned the patient to confirm eligibility, answer any questions, and offer a baseline MUR. Interested patients were then sent a secure link to an online consent form, which they were asked to complete prior to the scheduled MUR. Consent forms were checked and countersigned by the clinical pharmacist before the intervention commenced. All study documentation is available as supplementary material in Theron et al., 2025 (20)

Intervention

All participants received the intervention (non-randomised), consisting of an early opioid-focused MUR, designed to support pain management, and promote opioid de-escalation in patients discharged with opioids following a surgical procedure. Participants were offered a baseline MUR (delivered either in-person, via telephone, or video consultation) within 10 days of hospital discharge. During this consultation, the clinical pharmacist and patient jointly agreed through shared decision making, one of three opioid management pathways based on clinical presentation and preferences:

- **Pathway A**: Rapid opioid de-escalation, either through cessation or daily dose reductions of 10–50%.
- **Pathway B**: Gradual opioid tapering, with weekly dose reductions of 10–50%.
- **Pathway C**: No change in opioid regimen due to ongoing pain or clinical complexity.

Participants were followed up through scheduled MURs until either opioid use was discontinued, or the participant reached 90 days post-discharge, at which point they were classified as having transitioned to long-term opioid use and referred to specialist services. The study flowchart is provided in Fig. 1.

Further details on study procedures and the intervention protocol are available in Theron et al., 2025 (20). The primary aim of this proof-of-concept study was to assess the feasibility, acceptability, and fidelity of delivering this pharmacist-led intervention in a high opioid-prescribing region, to inform the intervention development and design of a future definitive clinical trial.

[Insert: Fig. 1: Study flow chart.]

Flowchart to show study procedures and interventions. Abbreviations: PIL – Patient Invitation Leaflet; GP – General Practitioner; MUR – Medication Use Review; EQ5D-5L – European Quality of Life 5 Dimension 5 Level survey. Image created with BioRender.com.

Sample size

We aimed to recruit around 80–100 participants over a 6-9-month period. Sensitivity power analyses conducted prior to the start of the study confirmed that the proposed number would be sufficient to detect statistically significant differences based on the expected effect size for quantitative data. This number was deemed sufficient to assess the study feasibility objectives which included quantitative and qualitative outcomes. In the absence of supporting literature for sample size estimation for single arm feasibility studies, this target aligned with the recommended sample size of 70 for external pilot randomised controlled trials and would allow for participant loss to follow-up (21). This was further supported by sensitivity power analyses conducted prior to the start of the study indicating that with the planned sample size, we should have been able to detect at least a moderate effect size of dz=.40 when using a repeated measures t-test (two tails, alpha=.05 and beta=.95). Only the quantitative outcomes are reported in this paper. Supplementary Table 1 indicates the full study aims and objectives as published in Veale et al, 2024 and provides added detailed on sample size details for each.

Sue to challenges with recruitment and delivery of the intervention (see Results and Discussion) the final sample size was lower than anticipated (n = 23), which limited the ability to conduct some of the quantitative planned analyses. This reduction in sample size did not affect the overall validity of the study as the sample size was sufficient for qualitative objectives, reporting separately to this article.
Ethical approval

Ethical approval for this study was obtained from the North-West Greater Manchester Central Research Ethics Committee (reference: 23/NW/0241). The study was conducted in accordance with the principles of the Declaration of Helsinki (22) and its subsequent revisions, as well as the UK Policy Framework for Health and Social Care Research (23).

Data collection

All data were collected prospectively by the GP practice clinical pharmacists or submitted directly by the participant through online forms. Upon enrolment, each consenting participant was assigned a unique de-identified study ID, which was used on all study documentation to maintain confidentiality. At

baseline, demographic data including age, sex, ethnicity, height, weight, smoking and alcohol status, and social deprivation index (based on postal code) was recorded. In addition, clinical and biopsychosocial information was collected and recorded on a structured case report form (CRF) by the pharmacist. These data included opioid type and dosage, nature of the surgical procedure, average pain score, previous opioid use, and relevant comorbidities. Participants also completed the EQ-5D-5L health-related quality of life questionnaire baseline to provide a standardised measure of functional health status.

At each follow-up appointment, a reduced dataset was captured. This included current pain levels, any changes in opioid or other pain-related medications, and participant-reported pain management status. At the final review, participants were again asked to complete the EQ-5D-5L and were invited to complete an anonymous, online participant experience questionnaire. This captured both quantitative and qualitative feedback on the acceptability and perceived impact of the intervention. The questionnaire included closed and open free text questions. Copies of data collection tools are available via Theron et al., 2025 (20) or via the study repository (DOI: 10.17605/OSF.IO/YV2CJ).

All participants were invited to undertake an interview following completion of the intervention to explore experiences, acceptability, and overall views on the intervention. Interviews were also conducted with health care professionals to explore the same aspects of the intervention and study. These qualitative data are not reported in this article.

Quantitative data analysis

Descriptive statistics were used to summarise participant characteristics, including age, sex, ethnicity, social deprivation index, comorbidities, types of surgery, opioid prescribing patterns (type, dose, formulation, duration), and pain scores. Categorical variables, including responses to closed-ended questionnaire items were reported as frequencies (n) and percentages (%). Continuous variables were expressed as means with standard deviations or medians with minimum and maximum values, depending on data distribution and sample numbers. Descriptive statistics were also used to assess feasibility outcomes including de-escalation pathway allocation, success rates of opioid deprescribing, proportion of participants classified as long-term (>90 days) users, attrition rates and completion of follow-up appointments. Reasons for loss to follow-up were also categorised and summarised. Due to lower than anticipated recruitment, comparative testing originally planned in the protocol (20) was reduced to comparison of quality-of-life scores at baseline and Day 14 visit using chi-squared test. Analyses was conducted using Microsoft excel (Microsoft 365 version) and IBM Corp (2021) IBM SPSS statistics for windows version 27.

For the costing of the intervention, a micro-costing approach was used to estimate the intervention cost focusing on pharmacist time, training and infrastructure requirements. Costs related to opioid and other analgesic prescriptions was not included due to small recruitment numbers and variability in prescribing found. Where possible, national unit cost data were applied to improve generalisability.

Patient and public involvement

Patient and public involvement was integral to the design, delivery, and interpretation of this study. Four National Institute for Health and Care Research (NIHR) Research Champions affiliated with Kent Community Health NHS Foundation Trust (KCHFT) were actively involved in reviewing the study protocol, co-developing the patient interview schedule, conducting participant interviews, and contributing to the thematic analysis of interview transcripts. This helped to ensure that the study design and interpretation remained grounded in the patient perspective.

In addition, two public contributors participated in monthly project management group meetings, providing regular oversight and feedback, during the study delivery. Two further public representatives, with lived experience of prescribed post-surgical opioids, participated in practice MURs for clinical pharmacist training and to allow for development and refinement, ensuring that the patient experience remained central to the intervention design.

Results

Study sample

Six GP practices across East Kent were initiated as recruitment sites, however, only two of the six actively enrolled patients. Across these two recruiting practices, three clinical pharmacists recruited 23 participants between 23rd January 2024 and 21st November 2024 (11 months). Due to lower-than-expected recruitment of participants, the study was concluded at a point that allowed for completion within the funding period. One participant was excluded due to improper consent procedures. A second participant withdrew after the baseline MUR, however, these data were retained and included in the analyses. The participant experience survey indicated that most of the participants (n=22) were identified and approached by the clinical pharmacists, with approaches by the GP and a call from the GP practice as other routes to recruitment (as per protocol).

To assess recruitment feasibility, the GP practice with the highest enrolment during the first six months was asked to provide screening data over a five-month period. Weekly automated searches of the practice medical records identified a total of 910 post-operative discharge patients (average of 65 per week: range 21-115) between 11 January to 15 May 2024 in a total of 31 individual weekly medical record searches. An average of two searches were performed per week (range: 1-5) taking an average of 43.2 minutes per week (range: 1- 85 minutes). From these initial automated searches, screening against criteria identified twenty-six patients (3.0%) who met the full eligibility criteria. Reasons for non-eligibility were not recorded in the screen from automated searches to get to this twenty-six identified due to practice burden. Of these twenty-six: five (17.9%) were excluded before contact as they were on higher opioid doses than 120 mg/day MME, were not prescribed opioids or had surgical reasons that made them ineligible; four (17.9%) were uncontactable; and seven (10.7%) declined participation. Reasons from declining participation included two (7.1%) who had ceased opioids due to side effects; two (7.1%) had already stopped opioids; and for three (3.6%) declined without giving a reason. Of the ten eligible

and interested in taking part, the majority (90%, 9 out of 10) went on to consent and take part in the study.

Table 1 represents demographic and behavioural characteristics of the final sample (n=22). Median age of participants was 60.3 years with 45.5% (n=10) male and the majority (95.4%, n=21) identifying as White British, higher than the white population recorded in Kent in the last population census of 88.6% (24). Education was varied, reflecting diverse socioeconomic backgrounds of the sample. Around a quarter of participants smoked or vaped with an average of 20 cigarettes/day. Alcohol use was reported by half of the participants averaging 6.6 units/week. As per the study eligibility criteria, none reported recreational drug use.

Table 1 – Study population

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Age	Mean age at consent (min-max)	60.3 (19-89)
Sex	Male (n, %)	10 (45.5)
Ethnicity	White British (n, %)	20 (90.9)
	Asian origin (n, %)	1 (4.5)
	Other, Celtic Scot	1 (4.5)
Education level	Secondary school up to 16 years.	5 (22.7)
	Higher or secondary or further education	10 (45.5)
	College or University	6 (27.3)
	Post-graduate degree (MSc or PhD)	1 (4.5)
Smoking status	Smoker (n, %)	5 (22.7)
	Cigarettes* per day (average, min-max)	20 (8-20)
Vaping status	Vaper alcohol	1 (4.5)
Alcohol consumption	Drinker	11 (50.0)
	Units per week, average (min-max)	6.6 (0**-14)
Recreational drugs	Currently using recreational drugs, n(%)	0 (0)

*Cigar smoking allocated as 4 cigarettes as 1 participant smoked cigars

**Occasional drinker

Surgery details

Most participants (n=17, 77.2%) underwent surgery on the same day as their hospital admission, with only one individual experiencing a prolonged wait of 19 days between admission and surgery. The average length of hospital admission was 2.8 days (range: 0-19 days), with most participants (n=20, 81.8%) discharged within 4 days of surgery.

Baseline MURs occurred on average 5.7 days post-discharge (range: 0-13 days). Self-reported pain scores measured on a 0-3 scale (0 = no pain, 3 = severe pain), indicated mild to moderate pain throughout. The mean post-surgical pain score recorded at discharge was 1.6, which increased slightly to 2.1 at baseline. By day 14, average pain scores had decreased to 1.1, and for two participants seen at day 31, scores were 0 and 1, suggesting resolution or substantial improvement in post-operative pain. Many participants underwent orthopaedic procedures (n=16, 72.7%), with the remainder receiving abdominal (n=3, 13.6%), arthroscopic (n=2, 9.1%) or curative cancer-related surgeries (namely mastectomy, n=1, 4.5%). Full details of surgical types and associated data can be found in Table 2.

Table 2 – Categorisation of participant surgery types

Type of surgery	Individual surgery details	Number of participants (n, %)
Orthopaedic	Knee replacement	16, 72.7%
	Right Hip Hemiarthroplasty	
	Open reduction internal fixation (ankle)	
	Finger surgery	
	Open reduction internal fixation	
	Hip replacement, n=4	
	Elbow olecranon fixation	
	Knee replacement, n=3	
	Right wrist Trapiziectomy	
	Right ankle open reduction and internal fixation	
	Decompression of lumber spine	
Abdominal	Appendectomy	3, 13.6%
	Cholecystectomy, n=2	
Arthroscopy – minimally invasive surgery	Left knee arthroscopy + Manipulation Under Anaesthesia	2, 9.1%
	Revision patella resurfacing Right Knee	
Curative cancer-related surgery	Right skin sparing Mastectomy, Axillary Lymph node clearance, Unilateral breast implant	1, 4.5%

Comorbidities

Three-quarters of participants (n=17, 77.3%) reported having at least one comorbidity, with the number of reported conditions ranging from zero (n=5, 21.7%) to four (n=1, 4.3%). The majority of participants (n=15, 68.2%) reported either one (n=9, 40.9%) or two (n=6, 27.3%) conditions. All individuals were receiving appropriate medication for their pre-existing conditions at the time of enrolment. Notably, five participants indicated that their co-morbidities contributed to their pain. A summary of co-morbidities reported can be found in Supplementary Table 2.

Prior opioid use

Half of the participants (n=11, 50.0%) reported previous opioid use, defined as having used opioid medication 90 days or more prior to their surgical procedure. Participants were not eligible if they had taken opioid medication for more than 90 days leading up to their surgery. The average time since last

opioid use was six years, with detailed drug and dosage information available for ten of these participants. The majority (n=9, 90.0%) had previously been prescribed co-codamol (codeine/paracetamol) in varying strengths (8/500 mg, 15/500 mg, and 30/500 mg). The median MME equivalent for these prescriptions was 36mg (IQR: 9.6-36 mg) and a median total prescribed MME of 268.8 mg (range: 120–1008 mg). Less commonly reported opioids included oxycodone (n=1, total MME per day of 315 mg, range: 262.5-420 mg), buprenorphine (n=1, total MME of 504 mg, range: 336-672 mg), morphine (n=1, total MME of 5600 mg) and tramadol (n=1, total MME of 120 mg). The average total prescribed opioid dose across the sample was 47.14 mg MME/day, with a range from 4.8 mg to 120 mg/day. Notably most participants had been prescribed doses at or below the 50 mg/day MME threshold, a level identified by the Centers for Disease Control and Prevention (CDC) as being associated with a lower risk of opioid-related adverse events (25).

Post-operative opioid prescribing

Opioid prescribing following surgery included four different opioid analgesics: co-codamol, codeine, oxycodone and Oromorph (oral morphine solution). Table 2 presents the median daily doses, which ranged from 20 mg to 240 mg per day, with treatment lasting between 3 and 14 days.

Most participants (n=18, 81.8%) received a single opioid medication. However, four participants (18.2%) were prescribed a combination of two or more opioids for postoperative pain. The three participants prescribed dual opioid medication included: co-codamol 30/500 mg in combination with Oromorph (total daily dose of 418mg MME for 7 days); Oxycodone tablets in two strengths (10 mg and 5 mg) with a combined daily dose of 120 mg MME over 7 days; co-codamol 30/500 mg and liquid oxycodone, with a combined daily dose of 90 mg MME, however duration was unknown due to incomplete data. The one participant receiving three opioids, consisted of both immediate-release and modified-release oxycodone formulations in addition to Oromorph, resulting in a total daily dose of 305 mg MME over a 5-day period. Although none of the discharge prescriptions appeared to exceed the exclusion threshold of 120 MME/day based on prescribed daily doses, our findings indicate that the total quantity of opioids issued enabled dosing well beyond this limit. This discrepancy between intended versus possible use highlights a critical gap in opioid safety measures where prescribing practices may unintentionally enable excessive dosing despite adherence to formal thresholds. These findings, though based on a small cohort, reinforce the high variability in post-surgical opioid prescribing and highlight the urgent need to standardise opioid prescribing in post-operative care.

Table 3: Post-surgical opioids prescribed to participants.

Drug name	Number of participants (n, %)	Median daily dose mg (min-max)	Median duration days (min-max)
Oxycodone tablets	5 (22.7)	20 (20-80)	5 (3-7)
Oxycodone liquid	2 (9.1)	33 (30-36)	3 (3-3)
Oromorph	2 (9.1)	300 (200-400)	6 (5-7)
Co-codamol 8/500	1 (4.6)	64 (*)	7 (*)
Co-codamol 30/500	6 (27.3)	240 (90-240)	7 (4-14)
Codeine	9 (40.1)	240 (120-360)	7 (3-14)

*only 1 participant received this drug, therefore no min and max values

Other non-opioid medications used post-surgery are summarised in Table 4. The majority of participants reported using paracetamol and/or ibuprofen for pain management over a 28-day period. In addition, a smaller number of participants reported using citalopram, escitalopram, gabapentin, mirtazapine, naproxen, pregabalin, and venlafaxine.

When stratified by surgery type, participants undergoing arthroscopy were prescribed the highest median total opioid dose, with a median of 58.7 mg/day MME (range: 36.4-81.0, n = 2). This was followed by participants undergoing orthopaedic surgery (median: 36.0 mg/day MME, range: 13.2-120.0; n = 16), abdominal surgery (median:18.0 mg/day MME, range: 13.5-36.0; n = 3) and cancer surgery (median: 4.8 mg/day MME, range: 4.8-4.8; n = 1).

Table 4: Non-opioid post-surgical medication use

Drug	**Number of participants** (n)	**Median daily dose (**mg)	**Maximum duration (**days)
None	5	N/A	N/A
Paracetamol	15	3500	28
Ibuprofen	5	920	28
Gabapentin	2	1200	28
Venlafaxine	2	150	28
Pregabalin	2	225	56
Citalopram	1	20	56
Escitalopram	1	5	28
Mirtazapine	1	30	28
Naproxen	1	1000	28

Quality of life

Median EQ-5D-5L Visual Analogue Scale (VAS) scores rating general health on the day of measurement (with 0 being worst health and 100 being best health) indicated a baseline median of 70 (range: 30-85; n = 22), increasing to 72.55 (range: 40-90; n = 12) at Day 14, suggesting a modest improvement in participants perceived health over time. Only two participants completed follow-ups at Day 31, reporting VAS scores of 60 and 90, both of which are considered improvements on the baseline score of 50. Table 5 presents EQ-5D-5L domain level scores for health, showing slight to moderate health issues at baseline that had improved by Day 14. However, due to the smaller than expected sample size and missing follow-up data for Day 14, statistical comparisons using a Pearson chi-squared test was not significant between timepoints (p=0.243, Cramer's V effect size of 0.215, a small-moderate effect size) and these findings should be considered exploratory and interpreted accordingly.

Table 5: Quality of Life scores of participants measured using the EQ-5D-5L instrument.

	Baseline (n=23)		Day 14 (n=13)	
	n	%	n	%
Mobility				
No problems	7	31.8	5	33.3
Slight problems	5	18.2	5	41.7
Moderate problems	7	31.8	2	16.7
Severe problems	4	18.2	1	8.3
Unable to walk about	0	0.0	0	0.0
Self-care				
No problems	5	18.2	5	33.3
Slight problems	11	50.0	6	50.0
Moderate problems	5	22.7	2	16.7
Severe problems	2	9.1	0	0.0
Unable to self-care	0	0.0	0	0.0
Usual activities				
No problems	5	18.2	3	16.7
Slight problems	6	27.3	6	50.0
Moderate problems	8	36.4	2	16.7
Severe problems	3	13.6	1	8.3
Unable to do usual activities	1	4.5	1	8.3
Pain/discomfort				
No pain	1	4.5	3	16.7
Slight pain	9	36.4	7	58.3
Moderate pain	8	36.4	3	25.0
Severe pain	5	22.7	0	0.0
Extreme pain	0	0.0	0	0.0
Anxiety/depression				
Not anxious/depressed	12	54.5	8	58.3
Slightly anxious/depressed	9	36.4	4	33.3

Moderately anxious/depressed	1	4.5	1	8.3
Severely anxious/depressed	1	4.5	0	0.0
Extremely anxious/depressed	0	0.0	0	0.0

Opioid use at baseline and deprescribing pathway allocation

At the baseline MUR assessment, conducted on average 6-days post-surgical discharge (range: 2 – 13 days), approximately one-quarter of participants (n=6, 27.3%) reported that their post-operative had resolved. In total, five participants (22.7%) had independently discontinued their opioid medication prior to the MUR and did not require further intervention. Pain scores for these five participants ranged from 0 to 3 (no pain to severe pain) immediately after surgery and 1-3 (mild to moderate pain) at the baseline visit. Two had a follow up at Day 14, reporting mild pain only. Among participants still taking opioids at the time of their baseline MUR (n=17, 77.3%), one-third (n=8, 36.4%) actively requested discontinuation of their opioid medication. Four of these participants (18.2%) cited intolerable side effects as the primary reason for discontinuation. Reported side effects included constipation, low blood pressure, dizziness, vivid dreams, and night sweats. Nearly half (n=9, 40.9%) opted for a rapid opioid tapering approach (Pathway A). A further six participants (27.3%) were supported through a more gradual tapering plan (Pathway B) and one participant (4.5%) was allocated to Pathway C, involving continued opioid use due to ongoing pain (Figure 2). Among those participants following Pathways A or B, the most common deprescribing rate was a 50% reduction per week (n=7, 50.0%). However, two participants underwent slower tapers, at 25% and 35% weekly reductions, respectively despite been assigned to Pathway A. One of these participants was taking a combination of analgesia and including oromorph (200mg/day for 5 days), oxycodone (70mg/day for 5 days), alongside other medication including naproxen, paracetamol and pregabalin, which may explain the slower tapering on Pathway A. However, the other participant at 25% tapering on rapid deescalation Pathway A received only co-codamol (80/500, 64mg/day for 7 days) alongside ibuprofen. In contrast, others on both Pathway A and B were recommended more rapid tapering rates, ranging from 66% to 100% weekly reductions. These inconsistencies suggest potential misclassification or misinterpretation of pathway criteria by clinical pharmacists, particularly in relation to tapering thresholds and documentation.

Only one participant (4.5%) required referral for additional support, in this case back to the GP, due to co-codamol-related side effects. Notably, no participants were flagged as being at elevated risk of serious opioid-related adverse events such as overdose or medication diversion during review.

Follow-up attendance and indicative intervention costs

Most participants (n=20, 87.0%) had a at least one follow-up appointment scheduled following their baseline MUR. In total, 19 follow-up consultations (82.6% of the total sample) were completed at Day 14. By Day 31, only two participants (8.7%) one assigned to Pathway B and the other to Pathway C required further follow-up. All participants had successfully discontinued opioid use within 31 days of discharge. The average contact time across the intervention was 53 minutes per participant (range: 23 to 94

minutes). Time spent per consultation was highest at the baseline appoint (mean of 37 minutes; range 5-88 minutes), followed by Day 14 (mean = 20 minutes; range 6-46 minutes) and Day 31 (mean = 13 minutes: range 6-20 minutes).

Indicative costs for staff time to deliver the intervention was estimated using NHS Agenda for Change Band 7 salary scales, equivalent to the cost of a specialist clinical pharmacist. Based on this, the average cost per participant was £61.05 (range: £26.45-£108.10). Room use and equipment costs were excluded as these would be absorbed within routine general practice operations. Estimated costs per consultation were as follows: Baseline: £42.92 (range: £5.75-£101.20); Day 14; £23.07 (range: £6.90 - £52.90) and Day 31: £14.95 (range: £6.90 - £23.00).

Feasibility and acceptability of Clinical Pharmacist-led MURs for opioid tapering

All participating clinical pharmacists received a one-hour training session delivered by the study leads, including a clinician with expertise in high-dose opioid de-escalation. Training was reported to be sufficient by those involved. Post-training and during study delivery, pharmacists contacted the study clinical lead for guidance on describing plans a total of two occasions across forty-two consultations conducted (7.1% of the time clinical pharmacists sought additional support). Other contacts were related to participant eligibility only prior to consent. In addition, on two occasions pharmacists consulted their supervising GP in relation to opioid prescription renewal. These limited contact points suggest a high degree of pharmacist autonomy in delivering the intervention after initial training. Of the documented MUR assessments, only one (2.4%) was reported by the pharmacist to have gone poorly. This was a Day 14 follow-up appointment, but no further detail was recorded despite follow-up requests. Findings from the participant satisfaction questionnaire further supported the acceptability of pharmacist-led MURs. All seven participant survey respondents reporting feeling confident in the pharmacist's expertise, comfortable during consultations, involved in decision-making around their medications, and satisfied with the opportunity to ask questions.

Participant Experience Survey

Following discharge from clinical pharmacist-led care, all study participants were invited to complete an online patient experience questionnaire. A total of seven participants responded, yielding a response rate of 31.8%. Among respondents, four (57.1%) were opioid-naive prior to surgery and reported some prior knowledge of opioid medicines and their associated risks, including addiction, constipation and sedation. Three respondents (two opioid-naive and one opioid-experienced) indicated that participating in the study had increased their knowledge and awareness of opioid safety and appropriate use. Most respondents (n=6, 85.7%) reported that they had not previously received an MUR before the study. When asked whether they would recommend an MUR service to others, three respondents (42.9%) answered "yes", three (42.9%) responded "maybe" and one participant (14.3%) indicated that they would be unlikely to recommend the service. The respondent who was unlikely to recommend the service also reported general dissatisfaction with the intervention, including appointment duration. In contrast, many participants (n=6, 85.7&) expressed satisfaction or neutrality regarding appointment duration.

Discussion

This study extends current evidence on opioid prescribing intervention to an under-explored setting: the immediate post-surgical period, a time when the risk of transitioning from short-term to long-term opioid use is well established (7-9). The study provides evidence that a pharmacist-led medicines use review (MUR) can be a practical, acceptable, and potentially cost-effective approach to support opioid deprescribing in the post-surgical period. Despite challenges with recruitment, participating pharmacists delivered the intervention with high degree of autonomy and required minimal additional clinical oversight. Most patients successfully tapered or discontinued opioid use within one month of discharge, with reported improvements in pain and function aligning with expected recovery trajectories. Patient feedback indicated high levels of satisfaction and trust in pharmacists' expertise, with particular appreciation for the structured opportunity to review and discuss pain management. Importantly, the intervention was delivered at relatively modest cost, suggesting the potential for integration within routine primary care pathways. Together, these findings provide proof-of-concept for a pharmacist-led deprescribing model contributing to opioid stewardship strategies in the UK.

However, several feasibility challenges emerged that may limit scalability without adaptation. Recruitment proved difficult, with many potentially eligible patients not contacted in time for an early review. This was due to variability across GP practices in the timely identification of post-surgical patients prescribed opioids, often relying on manual screening of clinical letters or electronic health records. More consistent coding of clinical data would enable automated or system-level approaches to identify eligible patients integrated into electronic health record systems. Alongside this, methods of risk-stratifying patients who might be most at risk of long-term opioid use, particularly opioid-naive patients would optimise a clinical pharmacist intervention (26-27). Alternatively, additional recruitment approaches including recruiting prior to surgery or prior to discharge might prove support recruitment in future studies.

This need to risk stratify patients was highlighted by the observation that many participants had already stopped taking opioids or had begun tapering opioid use independently by the time of baseline assessment. Therefore, future work should include early patient education on opioid use and self-tapering strategies, supported by accessible information and referral pathways (e.g., pharmacist-led medicines reviews) where needed. Promoting self-management with clearly advertised support options may become an integral component of risk-stratified deprescribing strategies in the future.

There were significant workforce capacity pressures that impacted feasibility and limited recruitment, posing challenges to the wider adoption and scalability of an intervention such as this (28). The clinical pharmacists delivering the intervention had to balance this alongside significant routine workload demands, GP practices that were unable to recruit tended to have limited clinical pharmacist capacity or a workforce structured in a way that restricted the provision of dedicated support at the individual practice level (29). These barriers are consistent with findings from other deprescribing initiatives, which highlights the importance of sufficient workforce capacity and for integrated referral (30). Such

pressures may intensify considering recent NHS policy changes, aiming to transition more care into community settings (31).

The study also found considerable variability in opioid prescribing at hospital discharge, including instances of prolonged-release opioid use, despite recent national guidance discouraging their use post-operatively. These inconsistencies across different surgical services complicates deprescribing efforts and reinforces the need for taking a system-level prescribing stewardship approach. While Enhanced Recovery After Surgery (ERAS) protocols in secondary care have demonstrated benefits in inpatient care, they should be expanded to incorporate post-discharge care strategies for opioid management (32). In line with current UK guideline recommendations for early review and tapering, this study demonstrates that pharmacists embedded in general practice are well positioned to operationalise these recommendations in practice. Systematic reviews have highlighted the value of pharmacists in supporting medicines safety across transitions of care (33) and this study adds to that evidence base. It also complements findings from UK programmes targeting high-dose opioid use in primary care, where structured pharmacist reviews have led to reductions in reduced long-term opioid use and and improved patient engagement with medicines optimisation (18).

Further, while most participants received short courses of immediate-release opioids post-surgery, a minority were prescribed multiple opioids concurrently and, in one case, prolonged-release oxycodone contrary to national guidance (34). This variation underscores the importance of consistent prescribing aligned with recommended standards to reduce unnecessary exposure and minimise the risk of long-term opioid use (35).

Future research should build on this proof-of-concept by addressing patient identification processes, developing and validating risk stratification tools to prioritise those most at risk of long-term opioid use, and explore digital or automated systems to facilitate timely referral to pharmacists. Larger, statistically powered trials are required to evaluate effectiveness across broader populations and a range of surgical procedures. Key outcomes should include long-term opioid use, patient-reported pain management, and health-related quality of life. Evaluation should consider implementation models at a system-wide level, including integration of pre-operative interventions to support patient self-management and to reduce the burden on post-discharge services.

Strengths and limitations

A key strength of this study was the utilisation of clinical pharmacists embedded within general practice teams to deliver the intervention. Pharmacists are highly trained in medicines optimisation and regularly conduct high-risk MURs, a service that is both recognised and trusted by the public. As part of a primary care team in a GP practice, and unlike community pharmacists, clinical pharmacists have access to patients' full medical histories, hospital discharge summaries and on-site GP support. This positions them to initiate early, structured deprescribing interventions, leveraging their expertise and seamless integration into primary care workflows. Key design limitations of the study included the lack of a priori progression criteria and a

small sample size despite higher targets within our a priori sample size proposed

. The small sample size restricts the statistical power to detect

meaningful differences or associations and the limited number of participants reduces the generalisability of the findings. These results should therefore be considered exploratory and hypothesis-generating, warranting further validation in a larger and adequately powered feasibility study including more ethnically and socioeconomically diverse populations. To highlight this, much of the study sample featured older adult populations. Although these populations may be more likely to undergo surgery related to complex conditions, this could create bias within our findings. Future studies should ensure representative recruitment of ages proportionally to the total population undergoing surgery at any one site to reduce risk of bias. Another key limitation of this study was the decision to cap eligibility at a maximum opioid dose of 120 mg / MME per day. While this threshold was set to minimise the risk associated with high-dose opioid deprescribing and complex tapering strategies within this feasibility trial, it significantly reduced the pool of eligible participants. Furthermore, by the time of the baseline MUR, typically conducted within 10 days of discharge, many participants had independently discontinued opioid use. Subsequent feasibility or pilot trials will need to consider raising the opioid ceiling to improve recruitment rates but more importantly to increase the applicability to post-surgical primary care populations.

Conclusions

This study shows that post-surgical prescribing of opioids is variable but aligned with current national guidance in the United Kingdom. Supporting patients with opioid deprescribing through a pharmacist-led medicines utilisation review is feasible and well aligned with the clinical pharmacist's role in primary care. However, timely identification of patients who have undergone surgery and been discharged with opioid medication is a key barrier. Improving patient identification processes and understanding which individuals are most likely to benefit from this type of intervention are essential next steps to prevent long-term use and inform future implementation.

Abbreviations

CRF
Clinical Report Form (for data collection)
EQ-5D-5L
Quality of Life validated questionnaire produced by EuroQOL
GP
General Practice or General Practitioner
mg
milligram
MME

Milligram Morphine Equivalents
MUR
Medicines Utilisation Review
n
number
NHS
National Health Service
UK
United Kingdom
VAS
Visual Analogue Scale

Declarations

Ethics approval and consent to participate:

This study was approved by the NHS Health Research Authority and North West- Greater Manchester Central NHS Research Ethics Committee (ref 321377). All participants provided informed consent prior to taking part in this study.

Consent for publication:

All participants consented to their use of data in anonymised form for this study and could opt in to use in future research.

Availability of data and materials:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. All freely accessible data is provided under CC0 licence at the following web address: OSF | Pharmacist-led DE-eSCALation of opioids post-surgical dischargE (DESCALE)

Competing interests:

The authors hold no conflicts of interest.

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Authors' Contributions:

Authors EV, JT, JH, MRR and BK designed the study and gained funding for its delivery. ES and RB delivered the study in line with the protocol written by EV, MRR, JH and JT. The data analysis was carried out by MRR with oversight from SH. Public advisors from the Kent Community NHS Foundation Trust Research Champions supported the decision making and analysis of the study. The article was drafted by MRR and EV with review and input into the final version by all authors.

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Footnotes

1. April 2023–2024

Figures

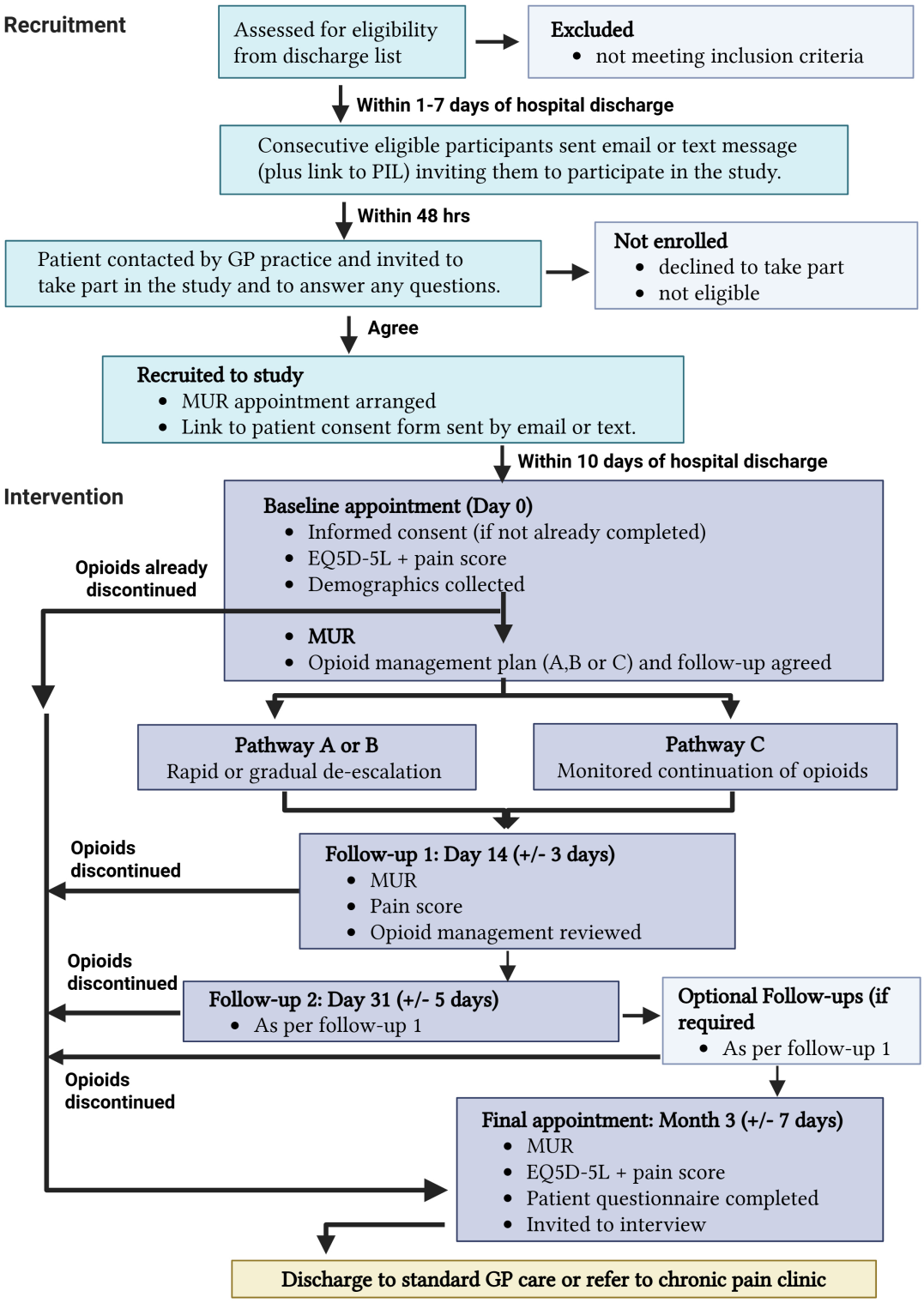


Figure 1

Study flow chart

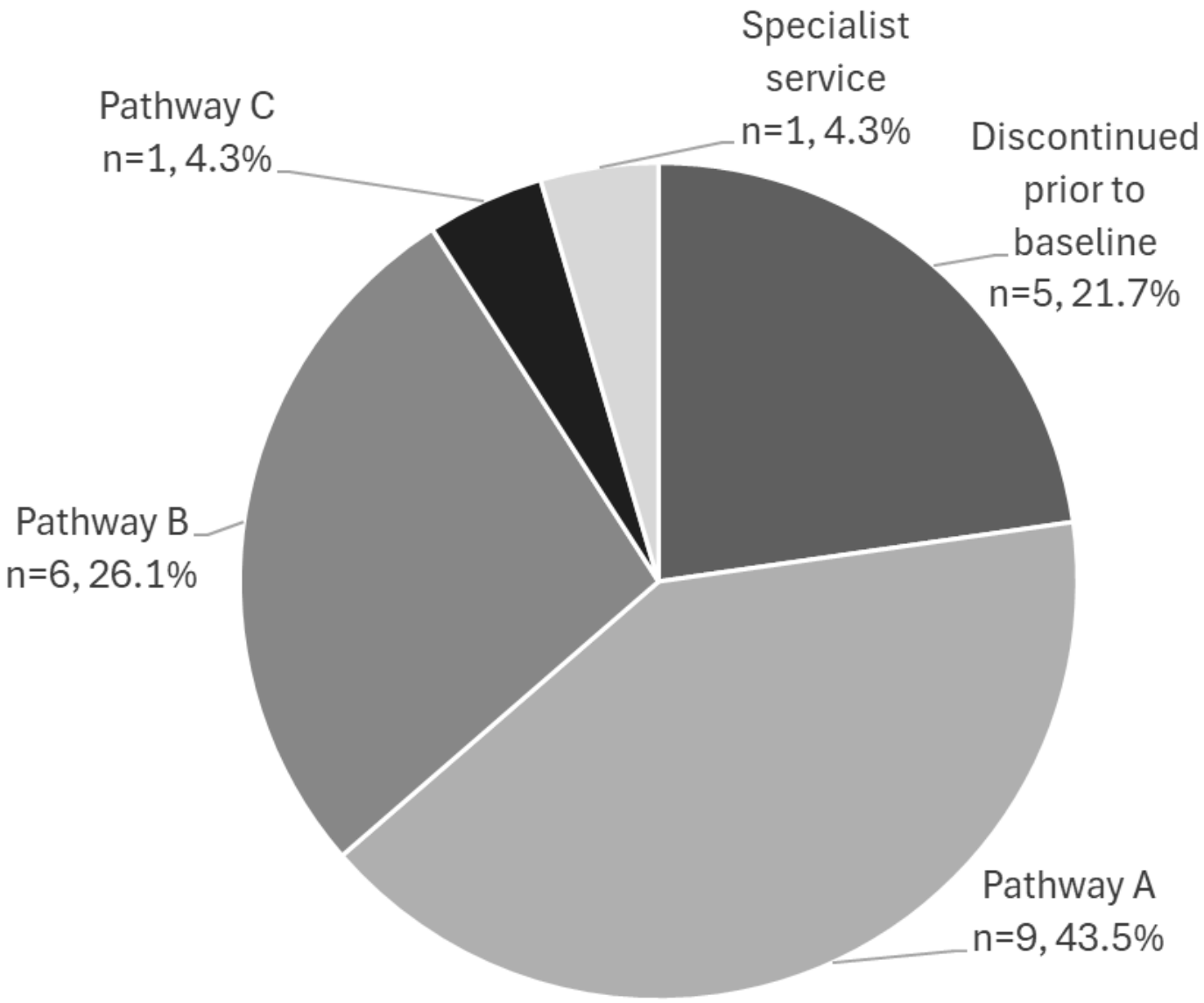


Figure 2

Deprescribing pathways followed by participants in discussion with a clinical pharmacist during the study.

Supplementary Files

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- Supplementarytable2comorbiditydata.docx
- CONSORTextensionPilotandFeasibilityTrialsChecklistDescale.docx
- SupplementaryTable1Summaryofstudyaimsandoutcomes4.6.26.docx