Evaluation of a Post-Discharge Pharmacist Opioid Review Following Total Knee Arthroplasty – A Pilot Study

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Abstract

Background

More than 70% of patients continue to use opioid medications 3-weeks following total knee arthroplasty (TKA). Post-discharge pharmacist reviews improve medication management, however it's effect on opioid usage is not known.

Aim

This study aimed to evaluate the impact of post-discharge pharmacist review on opioid use following TKA.

Methods

A pilot pre- and post-intervention study was undertaken on patients who had undergone a TKA and were supplied an opioid upon discharge from hospital. During the intervention, patients were contacted by a pharmacist approximately five days post-discharge to review analgesic usage, provide education and advice and communicate a plan to their general practitioner (GP). The primary endpoint was the percentage of patients taking opioids 3-weeks post-discharge. Secondary endpoints included:

· Percentage of patients obtaining an opioid refill;

· Patient satisfaction with opioid supply and the pharmacist review.

Results

Pre- and post-intervention, 65 and 44 patients were included, respectively. The percentage of patients taking opioids 3-weeks post-discharge declined from 72.3% to 29.6% ($p<0.001$) and the percentage requiring an opioid refill from their GP declined from 64.6% to 36.4% ($p<0.001$). More patients were satisfied with opioid supply during the intervention period (79.5% cf. 47.6%, $p=0.001$). 28 (63.6%) patients could recall the post-discharge pharmacist review, and all were either satisfied or extremely satisfied with the review.

Conclusion

Pharmacist-delivered post-discharge review reduced the percentage of patients taking opioids 3-weeks post-discharge following a TKA. This intervention has the potential to provide a more balanced approach to the management of hospital supplied opioids.

Impact Of Findings On Practice

- Post-discharge pharmacist opioid review may reduce opioid usage 3-weeks after discharge following total knee arthroplasty;

- Fewer patients who received a post-discharge pharmacist review required ongoing supply from their general practitioner;
- Post-discharge pharmacist opioid review may improve transitions of care when patients are discharged from hospital to the community.

Introduction

The opioid crisis has seen a rise in the number of opioid prescriptions with a subsequent increase in unintentional drug-related deaths [1, 2]. As a result, interventions have focused on reducing opioid availability in the community. Interventions have included regulatory and legislative changes, the introduction of institutional guidelines, pharmacist review of discharge prescriptions and use of educational strategies directed towards patients and prescribers [3-7]. A uniform reduction in the supply of opioids post-operatively may have adverse consequences on a subset of patients who may require them for an extended period, such as those undergoing major orthopedic surgery [8-10].

Studies in the United States (US) have shown that patients undergoing joint arthroplasty are often prescribed larger quantities of opioids compared to other surgical procedures [11, 12]. A study in our health service demonstrated that over 70% of patients who underwent a total knee arthroplasty (TKA) and were discharged with an opioid, were still taking them 3-weeks after hospital discharge.[10] Furthermore, over 70% of patients required a refill prescription from their general practitioner (GP), in addition to the opioids provided by the hospital at the time of discharge [10]. A follow-up study evaluating discharge summaries sent to GPs when surgical patients were discharged from hospital with an opioid found errors in opioid information (e.g. wrong dose, duration, quantity) in almost 25% of discharge summaries [13]. Only 13% of summaries contained a weaning schedule, a cease date or a plan for review (referred to as an opioid management plan). Of the GPs surveyed, 60% were dissatisfied or very dissatisfied with the opioid-related information provided [13]. These results highlight the urgent need to improve transitions of care when surgical patients are supplied with opioids upon hospital discharge.

Post-discharge pharmacist reviews may assist with transitions of care. An example of this is the hospital outreach medication review (HOMR) provided by pharmacists. HOMRs involve a pharmacist conducting a review of the patient's medication and medication management. Actual or potential medication related problems are communicated to the patient's GP. Patients targeted are often older, have multiple pre-existing co-morbidities, are taking multiple medications and may have disabilities that affect their ability to take their medications correctly (e.g. dexterity problems, impaired cognition, vision or hearing) [14]. These services have been demonstrated to improve medication knowledge, medication adherence and reduce hospital readmission in some high-risk patient groups [15, 16]. To date, no studies have evaluated the impact of post-discharge pharmacist reviews on opioid use.

Aim

The aim of this study was to evaluate the impact of a post-discharge review undertaken by a pharmacist via telephone, on opioid use following TKA.

Ethics approval

This study was approved by the Human Research Ethics Committee at the study health service.

Methods

A pre- and post-intervention study was undertaken at a 790-bed public health service in Melbourne, Australia over two time periods (December 2017 to July 2018 and January 2020 to July 2020). The intervention was introduced during a one-month run-in period (December 2019) prior to commencement of the post-intervention period. The methodology for the pre-intervention evaluation of usual care has been detailed elsewhere [10]. The methodology below focuses on the post-intervention period, but briefly outlines key details of the pre-intervention study.

Study Recruitment

All patients who had undergone a TKA and were supplied with an opioid upon discharge, were included in this study. Consecutive patients were invited to participate by the clinical pharmacist and were required to provide verbal consent. Patients' caregivers were also required to provide consent if they were responsible for the management of the patient's medications, as they would need to be interviewed. Patients were excluded if they required an interpreter, were readmitted to hospital within 3-weeks of hospital discharge or were unable to be contacted after three attempts.

Hospital Discharge Process – usual care

The hospital discharge process was identical in both the pre- and post-intervention periods. When patients were confirmed for discharge, a hospital prescription was electronically generated by the hospital medical officer (HMO) using Cerner Millennium. The prescription was given to the clinical pharmacist who undertook medication reconciliation and discussed the prescription with the patient, reviewing their pain control and opioid requirements. Any prescription changes proposed by the pharmacist were discussed with the HMO. The medications were then dispensed by the hospital pharmacy and provided to the patient along with medication education prior to discharge.

Post-discharge Pharmacist Review - intervention

The post-discharge pharmacist review was undertaken by one of three HOMR pharmacists employed by the health service. The HOMR pharmacists had between 15 to 30 years of experience. Intervention patients were contacted via telephone by the HOMR pharmacist approximately three to five days after hospital discharge. The pharmacist ascertained the current analgesics and how they were being used by the patient, and explored the use of any non-pharmacological management strategies. They provided education and advice to the patient about optimizing their analgesics (e.g. ensuring non-opioids such as

paracetamol were used at maximal doses), incorporation of non-pharmacological strategies, expectations about the duration of opioid use and when (if required) to review their analgesics with their GP. In addition, pharmacists could refer patients to the hospital's Peri-Operative Pain Management, Education and De-escalation (POPPMED) clinic if they felt that specialist review was required. The POPPMED clinic was serviced by an anesthetist and two specialist pain consultant nurses. Patients could also be referred to the clinic during their inpatient stay by HMOs and pharmacists if they were deemed to be at high risk for developing chronic opioid use. A written report outlining the patient's analgesic usage and recommendations made by the pharmacist was provided to the patient's GP (via facsimile) and scanned into the hospital medical record.

Patient Survey

During the pre- and post-intervention periods, patients or their carers underwent a telephone interview 3-weeks after hospital discharge. Interviews were conducted by a pharmacist not involved in the patient's care. The same questionnaire was used during the pre- and post-intervention periods, to allow comparison between the patient groups [10]. Information obtained from the interview included i) the name, dose and frequency of analgesics currently used, ii) whether refills had been obtained for opioids, iii) whether the patient felt they had an adequate supply of hospital provided opioids, and iv) the number of unused opioid pills remaining from the initial hospital supply. In addition, post-intervention patients were asked whether they recalled receiving a review from a pharmacist after hospital discharge and their level of satisfaction with the service on a scale of 1 to 5 (with 1 being extremely dissatisfied and 5 being extremely satisfied).

Opioid naïve patients who commenced on opioids in hospital and were still taking them at the 3-week post-discharge interview, were telephoned at 3-months after discharge to determine whether they were still taking opioids (and had therefore transitioned to prolonged use).

Data Collection

Patient demographics, length of hospital stay and documented past medical history (according to the admission notes) were obtained from the hospital's electronic medical record. The number and type of pre-admission medications were obtained from the hospital's Medication History on Admission Form completed by a clinical pharmacist. Patients were deemed to be opioid naïve if they were not taking any opioids immediately prior to their hospital admission (regular or *prn* ["as required"]). Analgesics and quantities supplied on discharge were obtained from the hospital pharmacy dispensing system. An analgesic was defined as any medication used to treat or prevent pain [17]. Between the pre- and post-intervention periods, ascorbic acid (to prevent complex regional pain syndrome) was removed from the orthopedic unit's pain management protocol and therefore data from the pre-intervention period was amended to exclude ascorbic acid use from these results. Analgesics with multiple forms were considered individually (e.g. short and long acting agents), whereas multiple strengths of the same medication in the same dose-form were considered as one. Opioids were converted to an analgesic equivalent dose of oxycodone and 5mg oxycodone was deemed equivalent to one opioid pill [17].

Reports prepared by the pharmacist were retrospectively reviewed by a study investigator (TT). A descriptive analysis was undertaken of the types of recommendations and advice provided by the pharmacist.

Endpoints

The primary endpoint of this study was the percentage of patients who were still taking opioids 3-weeks after hospital discharge. Secondary endpoints were:

- Number of hospital-supplied opioid pills remaining 3-weeks after discharge;
- Percentage of patients needing to obtain an opioid refill prescription from their GP;
- Percentage of patients who felt that they had adequate supplies of opioids upon hospital discharge;
- Percentage of opioid naïve patients who became chronic opioid users (continued usage beyond 3-months post-discharge);
- Percentage of patients who could recall having their medications reviewed by the pharmacist;
- Patient satisfaction with the post-discharge pharmacist review;
- Recommendations and advice provided by the pharmacist.

Sample Size Calculation

During the pre-intervention period, 63 patients underwent a TKA and were supplied with an opioid on discharge; 73.4% were still taking an opioid at 3 weeks post discharge.[9] If a clinically significant reduction in the percentage of TKA patients taking an opioid at 3 weeks is a one-third reduction (to 49.2%), then at least 62 patients were needed in each group (80% power, 2-sided alpha 0.05). We therefore aimed to recruit the same number of patients (n = 63) to the post-intervention group. This study was terminated early after only 44 patients were recruited, because elective surgery at the study hospitals was cancelled for a prolonged period due to the COVID-19 pandemic. A post-hoc power calculation whereby 29.5% of post-intervention patients were still taking an opioid at 3 weeks revealed that the study had 99.7% power (alpha 0.05) to detect a difference between the groups if one existed.

Statistical Analysis

Statistical analysis was undertaken using SPSS version 26 (IBM Corporation, Armonk, NY). Median and interquartile range (IQR) were used to describe non-normally distributed data, whereas the mean and standard deviation (SD) were used to describe normally distributed data. Chi-square test was used to compare differences in percentages. Student's *t* test was used to compare means, while Mann-Whitney *U* test was used to compare distributions of non-normally distributed data. A *p* value of less than 0.05 was considered to be statistically significant for all comparisons.

Results

In the pre-intervention period, 110 patients underwent a TKA and 47 were excluded (24 were not able to be consented, 10 declined to participate, 4 required an interpreter and 9 were lost to follow-up), such that 63

patients were able to be evaluated in this study. In the post-intervention period, there were 52 patients who underwent a TKA. Eight patients were excluded from the study (5 were not able to be contacted, 2 required an interpreter and 1 was readmitted) leaving a total of 44 patients included in the analysis. Due to the COVID-19 pandemic, elective surgery was cancelled which resulted in the study being terminated after 6 months. Baseline demographic characteristics for both periods are shown in Table 1. Patients recruited during the intervention had more medical conditions ($p = 0.031$) and were discharged with fewer opioid pills ($p = 0.001$). During the pre-intervention period, patients were discharged with more analgesics ($p < 0.001$), with greater use of pregabalin ($p < 0.001$).

Table 1
– Demographic characteristics

	Pre-intervention (n = 63)	Post-intervention (n = 44)
Age, years, median (IQR)	68 (62–74)	72.5 (64–79)
Male gender, n (%)	21 (33.3)	19 (43.2)
Length of stay, days, median (IQR)	4 (3–5)	4.5 (3–7)
Number of medical conditions, median (IQR)	4 (3–6)	5 (4–7)
Number of regular admission medications, median (IQR)	4 (3–8)	6 (4–9)
Opioid use pre-admission, n (%)	17 (27.0)	11 (25.0)
Type of analgesics prescribed on discharge, n (%)	61 (97.0)	43 (97.7)
Paracetamol	42 (66.7)	26 (59.1)
Oxycodone long-acting	58 (92.1)	35 (79.5)
Oxycodone short-acting	34 (54.0)	2 (4.5)
Pregabalin	12 (19.0)	4 (9.1)
Tapentadol long-acting	4 (10.0)	6 (13.6)
Tapentadol short-acting	8 (12.7)	3 (6.8)
NSAID	0 (0)	1 (0)
Tramadol long-acting	5 (7.9)	5 (11.4)
Tramadol short-acting	1 (2.0)	0 (0)
Buprenorphine patch		
Number of PRN doses of breakthrough opioids used in the 24 hours before discharge, median (IQR)	3 (2–4)	4 (2–5)
Number of analgesics prescribed on discharge, mean (SD)	3.6 (0.91)	2.8 (0.78)
Number of opioid pills supplied per patient, median (IQR)	35 (25–40)	20 (13.8–36.8)
SD = standard deviation, IQR = interquartile range		

In the post-intervention period, two patients were seen in the POPPMED clinic for ongoing management of their analgesics. One of these patients was no longer taking opioids at 3-weeks after discharge, whereas the other was still taking them. These patients were referred to the clinic during the inpatient admission and not following the post-discharge pharmacist review.

Primary endpoint

In the pre- and post-intervention periods respectively, 47/63 (73.4%) and 13/44 (29.5%) patients were still taking opioids 3-weeks after hospital discharge (difference in percentages 43.9%, $p < 0.001$).

Secondary endpoints

The median number of hospital-supplied opioid pills remaining 3-weeks after discharge was 0 in both pre- and post-intervention periods ($p = 0.527$). The percentage of patients who saw their GP to obtain further opioid prescriptions reduced from 72.6% in the pre-intervention group to 36.4% post-intervention (difference in percentages = 36.2%, $p < 0.001$). There were 33 patients who were opioid naïve prior to their TKA in the post-intervention period and none of these patients developed chronic opioid use. This is in contrast to 5.3% of the 46 opioid naïve patients in the pre-intervention period who developed chronic opioid use. During the post-intervention period, 35/44 (79.5%) patients reported that they had an adequate supply of their opioids, compared to 30/63 (47.6%) during the pre-intervention period (difference in percentages = 33.4%, $p = 0.001$).

At the 3-week interview, there were 28/44 (63.6%) post-intervention patients who recalled receiving a post-discharge telephone call from the pharmacist. Of these patients, 26/28 were extremely satisfied and the remaining 2/28 were satisfied with the service.

The pharmacists' written reports for 40 patients were reviewed with all providing an action and recommendation (4 reports were not available in the medical records). The pharmacist conducted the review with the patient a median of 3 days (IQR 2–4) following hospital discharge. There were 4 patients who required a follow-up review by the pharmacist after their initial review. Actions and recommendations provided by the pharmacist are summarized in Table 2.

Table 2
– Actions and recommendations made by the pharmacist following the post-discharge review

Actions and recommendations	Number of patients, n (%) (n = 40)
Provided education about the use of non-pharmacological pain management	8 (20.0)
Provision of education about the expected duration of opioid use	22 (55.0)
Recommendations related to opioid(s)	30 (75.0)
Continue current opioid plan	2 (5.0)
Dose escalation	12 (30.0)
Dose reduction	11 (27.5)
Cessation	
Optimization of non-opioid analgesics	9 (22.5)
Education and recommendations related to management of opioid-related adverse effects	7 (17.5)

Discussion

This study explored a novel use of the pharmacist in providing post-discharge follow-up care and education to patients following a TKA, and providing information and recommendations to patients' GPs in relation to their pain management plan. Patients who received a review by the pharmacist 3–5 days after discharge were less likely to be taking opioids 3-weeks after hospital discharge.

The pharmacist had the opportunity to review how patients were managing their analgesics and was able to provide recommendations to them on pharmacological and non-pharmacological strategies to improve overall pain management. Furthermore, the pharmacist was able to assess the patient's understanding of the opioid management plan and provide education on its anticipated duration of use to minimize the risk of these medications inadvertently being prescribed for a prolonged period [18]. Numerous studies have demonstrated the benefits that patient education can have on reducing opioid use and improving pain and functional outcomes [19, 5, 20]. Whilst our study did not evaluate pain or functional outcomes, more patients who received the post-discharge review were satisfied with the quantity of opioids supplied, despite being supplied smaller quantities compared with the pre-intervention period.

An important role of the pharmacist was to enhance communication of the patient's pain management plan to their GP and provide an assessment and recommendations related to opioid use in the week after discharge. Studies have shown that the hospital discharge summary provided to GPs is often inaccurate and lacks a detailed opioid management plan [13]. Without this information, GPs may inadvertently

continue prescribing opioids, which can consequently increase the risk of chronic opioid use [21, 10]. Whilst a comprehensive summary prepared by the pharmacist was provided to the GP, our study did not evaluate the effect that this had directly on GPs and therefore further studies are required to determine this. Our study did find that the percentage of patients who required a refill of their opioid prescriptions by their GP was significantly reduced in the post-intervention group.

Our study attempted to explore the utilization of the POPPMED clinic to manage patients at a higher risk of developing chronic opioid use. This was in response to feedback provided by GPs who found it difficult to manage some complex patients in the community [13]. Only two patients were reviewed in the POPPMED clinic and therefore evaluation of this service was not possible. It was also unlikely to have confounded the results for this reason. Future studies could develop defined referral criteria to target patients at risk of chronic use, that could aid the HOMR pharmacist in referring to this service.

There were several limitations to this study. There was an 18-month time lapse between the pre- and post-intervention periods. During this period in 2019, an organizational-wide prescribing guideline was implemented to assist in rationalizing opioid prescribing in surgical patients. This may have explained the significant difference in the number of opioid pills supplied to patients at hospital discharge during the post-intervention period. The impact this had on our results is difficult to predict; supplying fewer opioid pills may have reduced the risk of chronic use however it may also have resulted in an undersupply of opioids for patients who had painful surgeries such as arthroplasty, which would have led to a need for additional prescribing by the GP. We found that there was a reduction in the number of patients seeking ongoing supply from their GP despite a reduction in the number of pills provided by the hospital. This suggests that the reduction in opioid use at 3-weeks post discharge may be attributed to the pharmacy review and its focus on clarifying duration of opioid treatment and encouraging use of non-opioid analgesia and non-pharmacological interventions. Further studies are required to validate these findings, ideally using a controlled trial design. Our study was single-centered and only evaluated patients following TKA. This may affect the generalizability, as there are varying prescribing and dispensing practices across organizations, countries and even different surgical units. Further studies are required to fully evaluate the impact that this intervention could have in a range of settings. Finally, the sample size of this study was small and was impacted by the COVID-19 pandemic which resulted in cancellations to elective surgery. Nonetheless, a post-hoc power calculation indicated power in excess of 90% and the primary endpoint achieved statistical significance. However, larger studies are required to explore the effect on some of the secondary endpoints, such as the impact on development of chronic opioid use.

Conclusion

This pilot study found that fewer patients who received a post-discharge pharmacist review of their opioids, were taking them 3-weeks after discharge following a TKA. This intervention has the potential to provide a more balanced approach to the management of hospital-supplied opioids, however, larger studies are required to validate these findings.

Declarations

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Competing interests

The authors have no relevant financial or non-financial interests to disclose.

Author contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Tim Tran and James Ford. The first draft of the manuscript was written by Tim Tran and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript

Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval

This study was approved by the Human and Research Ethics Committee at Austin Health.

Consent to participate

Informed consent was obtained from all individual participants included in this study.

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