Impact of a Pharmacy-Led Pain Management Team on Adults in an Academic Medical Center

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ABSTRACT

Background: Pain is a major health problem affecting more than 15% of adults in the United States. In a multidisciplinary pain management team, pharmacists can optimize pharmacotherapy quality by ensuring safe and appropriate medication use.

Objective: Assess the impact of a pharmacy pain medication management service on pain-related outcomes in an adult inpatient population.

Methods: This retrospective study evaluated patients who were admitted from November 2009 through November 2011 and received a pharmacy pain consult. Patients were excluded if they left against medical advice, their care was assumed by palliative care, or they had no complaint of pain when seen by the pharmacist. The primary outcome was the difference between each patient's average pain score from pre-consult to post-consult. Secondary outcomes were difference between each patient's average pain score from pre-consult to pre-discharge, overall functional improvement, pharmacist interventions, and 14-day and 30-day readmissions.

Results: One hundred patients were included in the final analysis. Eight hundred twenty-one interventions were made by the clinical pharmacists. Patients displayed a significant reduction in their pre- and post-consult pain intensity scores on a 0 to 10 numerical rating scale (6.15 vs 3.25; $p < .001$). Likewise, a significant reduction in pain intensity scores was seen from pre-consult to pre-discharge (6.15 vs 3.6; $p < .001$). Overall functional improvement, specifically sleep, mobility, and appetite, was seen in 86.6% of patients.

Conclusions: Pain management is an area that provides opportunities for pharmacotherapy interventions. Pharmacists' involvement in pain management on an inpatient consult service had a positive impact on pain scores and improvement in functionality.

Key Words— acute pain, chronic pain, pain management, pharmacist

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Pain is a vital issue in health care affecting more than 15% of the adult population in the United States.¹ Inadequate pain management can be harmful to patients and contributes significantly to morbidity and a reduction in quality of life. Pain can interfere with daily activities, causing emotional

distress and affecting a patient's overall well-being.² It is a costly problem and leads to increased health care resource utilization. Many factors contribute to inadequate pain management, especially patients' reluctance to report pain and to use available analgesics.³ The most common barriers among physicians

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and nurses is inadequate knowledge about opioids and failure to adhere to pain management guidelines in daily practice.⁴

In managing pain, interdisciplinary collaboration among health care professionals is essential. An integrated pain management program ensures the best patient care by emphasizing the regular coordination of services.⁵ The aim of multidisciplinary pain management is not only to relieve pain, but also to restore the patients' ability to carry out activities of daily living while helping them develop strategies to cope with their pain.⁶ In a multidisciplinary pain management team, the pharmacist plays a unique role because of their understanding of pharmacology, pharmacokinetics, and therapeutic efficacy of analgesic medications.¹ Pharmacists have the opportunity to maintain and optimize the quality of pharmacotherapy by ensuring safe and appropriate use of medications for chronic and acute pain. In addition, clinical pharmacists, with their expertise in medications, can identify and address medication-related problems in the management of pain.⁷ Compared to physicians and nurses, there are limited studies designed to evaluate the impact of pharmacists on pain management. The aim of this study is to determine the impact of an inpatient pharmacy pain consult team on pain-related issues and readmission.

METHODS

Setting

At a large, academic county institution, an inpatient pharmacy pain medication management consult service was started as an adjunct for pain management for patients not seen by a palliative care or anesthetized interventional acute pain consult service (APS). Due to the large number of pain patients who needed medication adjustments, the APS and palliative care service were not able to manage every patient. As a result, the pharmacy pain management consult service was initiated for the hospitalist and medicine services in November 2009. This consult team (including trained clinical pharmacy specialists) is led by a residency-trained clinical pharmacy pain specialist who performs pain medication management consults and also rounds with the palliative care consult team. The consult for pharmacy pain services can be activated by any provider and includes a comprehensive initial assessment of the patient's pain, medication usage, side effects from pain medications, functional status, and any other factors that may influence the patient's pain control (eg, psychological, substance abuse history). The pharmacy pain team also makes

recommendations to consult other services or adjust non-pain medications used for the management of side effects related to the pain regimen.

Patients

This retrospective cohort study evaluated patients admitted from November 1, 2009 through November 1, 2011 who were seen by the pharmacy pain team for complaints of acute, chronic, and/or acute on chronic pain. According to the American Pain Society, acute pain is "the normal, predicted physiologic response to an adverse chemical, thermal, or mechanical stimulus...associated with surgery, trauma, or acute illness."^{8(p2051)} Acute pain is typically self-limited and resolves over days to weeks, but it can persist for 3 months as healing occurs. Chronic pain is described as pain without apparent biologic value that has persisted beyond the normal tissue healing time (usually taken to be 3 months or greater).⁹ Eligible patients were identified using a consultation database maintained by the institution's reporting warehouse. Patients who received at least one pharmacy pain consult visit and were older than 18 years were included in the study. The following patients were excluded: patients who left against medical advice, patients whose care was assumed by palliative care, and patients with no complaints of pain when seen by the pharmacist.

The following data were extracted from the electronic medical record (EMR) for patients meeting inclusion criteria: demographics, diagnosis, type of pain, indication for pain medications, current pain site, previous analgesics, numeric pain rating scores (0-10), adverse effects (eg, constipation, sedation, hypotension, and respiratory depression), functional status, number and types of pharmacy interventions made, and readmission rates. Average pain scores were calculated using nursing documentation 24 hours prior to pharmacist visit, 24 hours after the last pharmacist visit, and 24 hours prior to discharge. Other information was collected from the pharmacy consult notes written in each patient's EMR by the pharmacy pain consult service. Consult notes contained a brief history of the patient's pain, the patient's description of pain (location, quality, and duration), function (sleep, mobility, and appetite), previously used analgesics, current analgesics, total dose of oral morphine equivalents received in the previous 24 hours, side effects, and pain medication recommendations to the primary team. Previous pain medications prescribed and refill histories were extracted using the institution's outpatient pharmacy database.

Outcomes

The primary outcome was the change from baseline in each patient's average pain score after pharmacist intervention. Secondary outcomes were the difference between each patient's average pain score from pre-consult to pre-discharge, the number of interventions made by the pharmacy pain team, the median number of days patients were followed by the pharmacy pain team, overall functional improvement, percent of 14-day and 30-day readmissions, and opioid-specific adverse drug events reported.

Pre-discharge pain scores were evaluated to see whether a patient's pain relief was sustained throughout their entire hospital stay. Function was only evaluated in patients who had more than one pharmacy consult note in order to determine whether or not there was a change from baseline. Functional improvement was defined as improvements in sleep, mobility, and/or appetite reported by the patient. Opioid-specific adverse events were also reported by patients or identified by the pharmacist in the chart review and documented in consult notes. All interventions were documented in consult notes and categorized as pain-related or non-pain-related interventions. Pain-related interventions included decreasing or increasing pain medication dose, adding an opioid, adding a non-opioid agent, discontinuing an opioid, making an intravenous to oral (IV to PO) switch, and making specific discharge recommendations regarding titration/taper schedules. Non-pain-related interventions were primarily recommendations for treating side effects such as insomnia, pruritus, constipation, anxiety, and nausea/vomiting and recommendations for patients to be seen by other consult services (eg, psychiatry, psychology, or primary care provider referral). These interventions include antiemetics such as scheduled ondansetron for constant nausea and vomiting, non-benzodiazepine anxiolytics such as hydroxyzine, and bowel regimens including scheduled senna and docusate sodium to prevent constipation.

Statistical Analysis

Continuous baseline characteristics, including average pain scores, were described using medians and interquartile ranges. Categorical baseline variables were described using proportions. Change in average pain scores from pre-consult to post-consult was analyzed using a paired Wilcoxon signed-rank test. Secondary outcomes of pre-consult to pre-discharge were also analyzed using a paired Wilcoxon signed-rank test. A 2-sided alpha value of 0.05 was considered significant. Secondary and safety outcomes were described as proportions of the total cohort

using descriptive statistics. Data were analyzed using Statistical Analysis Software (SAS) version 9.2 (SAS Institute, Cary, NC). This study was approved by the University of Texas Southwestern Institutional Review Board and the institution's research department.

RESULTS

One hundred patient charts were randomly selected from the consultation database and included in the final analysis. The median age of patients was 43 years (interquartile range [IQR], 32 to 51), and 66% of patients were men. Forty-three percent of patients had a history of substance abuse, whereas only 22% of patients had a psychiatric history. The majority of patients reported acute pain, either alone or secondary to chronic pain, and the most common pain sites involved the back and abdomen. Eighty-eight percent of patients were on opioids prior to admission. Baseline characteristics are shown in Table 1.

Table 1. Baseline characteristics

Characteristics (N = 100)	
Median (range) age, years	43 (32-51)
Male sex, %	66
Race, %	
Caucasian	44
African American	35
Hispanic	20
Other	1
Payor ^a , %	
Parkland Health Plus	48
Medicaid	36
Medicare	13
Unfunded	12
Other	14
Primary team, %	
Hospitalist service	70
Medicine service	23
Other	7
History of substance abuse, %	43
Psychiatric history, %	22
Pain medications prior to admission ^b , %	
Opioids	88
Non-opioid adjuvant agents	47

^aPatients may have received coverage from more than one payor.

^bPatients may have been taking both opioids and non-opioid agents or neither.

Table 1. Baseline characteristics (continued)

Characteristics (N = 100)	
Other services consulted ^a , %	
Physical therapy	35
Occupational therapy	23
Psychiatry	19
Physical medicine & rehabilitation	7
Acute pain service	5
Palliative care	4
Other	73
Type of pain, %	
Acute pain secondary to chronic pain in same location	39
Acute pain	33
Chronic pain	19
Acute pain plus chronic pain in different locations	9
Pain location ^b , %	
Back/neck pain	28
Abdominal pain	28
Joint pain	17
Chest pain	14
Pain secondary to osteomyelitis/skin and soft tissue infection	13
Sickle cell crisis	10
Neuropathic pain	5
Headache	4
Phantom limb pain	4
Other	12

^aPatients may have been seen by multiple consult services.

^bPatients may have presented with more than one type of pain

There was a statistically significant decrease in average pain score from pre-consult to post-consult (6.15 vs 3.25; $p < .001$) (**Figure 1**). Pain relief was sustained throughout the entire hospital stay (6.15 vs 3.6; $p < .001$) (**Figure 1**).

Eight hundred twenty-one interventions were made by the pharmacists. **Figure 2** depicts the various types and number of pharmacist interventions made over the 2-year time span. Five hundred eighty-five interventions were categorized as pain-related, whereas the remaining 236 were non-pain-related interventions. Of the pain-related interventions, the most commonly seen recommendations were to add

opioids (24.3%) and non-opioid agents (14.9%) to the patient's pain regimen and to increase medication doses (18.5%). Non-pain-related interventions mainly consisted of recommendations for treating side effects, especially constipation (33%) and nausea/vomiting (19.5%).

The median number of days patients were followed by the pharmacy pain team was 3 days. Eighty-two patients had at least 2 consult notes, with 86.6% showing an overall improvement in function, specifically sleep, mobility, and appetite. Fourteen percent of patients were readmitted within 30 days due to worsening or unresolved pain (**Table 2**). In addition, 53% of patients reported opioid-related adverse drug events such as constipation, pruritus, and sedation (**Table 3**).

DISCUSSION

This retrospective cohort study evaluating the impact of a pharmacy pain medication management team suggests pharmacist involvement may be effective in reducing pain scores, ensuring safe and appropriate use of analgesics, and preventing pain-related hospital readmissions. Interventions made by pharmacists can optimize a patient's pain regimen as well as treat or prevent opioid-induced adverse drug events.

Previous studies have evaluated pharmacists' interventions in pain management; however, there are no other studies that have evaluated the impact of an inpatient pharmacy pain management consult service on patient pain scores and overall functioning. Andrews et al¹⁰ conducted a study describing the implementation and impact of a pharmacist-driven pain management service similar to ours, but specifically designed for patients with concomitant substance abuse disorders. The evolution of the pharmacist-driven consult service led to a significant decrease in opioid usage. The clinical outcomes from our study are consistent with previous studies. Lynn et al¹¹ conducted a study in which a pharmacist in a small community hospital reviewed medical charts of patients with pain scores of at least 4 who were receiving opioid analgesics. The pharmacist made interventions on 22 patients; of those patients, 64% expressed satisfaction about having their pain relieved. Two outpatient-based studies conducted by Bruhn et al¹² and Marra et al¹³ also showed statistically significant improvements in overall pain scores. Bruhn et al found significant improvements in overall chronic pain grades in patients receiving pharmacist

Figure 1. (A) Median pain scores for pre-consult versus post-consult. (B) Median pain scores for pre-consult and pre-discharge.

medication reviews with or without face-to-face pharmacist prescribing compared to those without pharmacist intervention. Marra et al found statistically significant improvements in both pain scores and in physical functioning in patients with knee osteoarthritis who received both education and pain medication recommendations from a pharmacist. Similar results were found in this study, when the patient served as his or her own control. The high acceptance rate of pharmacist interventions in this study may be a result of the pharmacists having direct contact with the primary team and entering the new orders themselves.

The implementation of a pharmacy pain consult service has been shown to benefit patients and has been a source of quality improvement. The pharmacy pain consult service has been provided at our institution for over 6 years and is becoming more and more popular. Physicians and medical residents seek the pharmacist's advice for patients on suboptimal pain regimens. Through education provided by pharmacists to patients, physicians, and nurses, pain regimens are optimized, medications are administered appropriately and in a timely manner, and opioid-related side effects are identified and treated.

Figure 2. (A) Pain-related and (B) non-pain-related interventions made by the pharmacy pain team.

This study has important limitations. First, this study was a retrospective observational trial. Inherent selection bias and confounding may affect estimates. However, this study is a hypothesis-generating study meant to describe an innovative pharmacy service. Second, since the primary outcome was based solely on nursing documented pain scores, results depended on the accuracy of documentation. Subjective pain scores and patient reports of improvements in mobility, appetite, and sleep documented in the consult notes were evaluated, because it was difficult to design this retrospective study to objectively measure patient's pain and function. Third, a few patients were only seen by the pharmacy pain consult team once, which made it difficult to assess pain relief especially if the patients were discharged the following day. Further research should be conducted with a larger sample size and eventually with a cost analysis of all the pharmacy interventions made. It would also be interesting

Table 2. Secondary clinical outcomes

Secondary clinical outcomes (N = 100)	
Median (range), number of days followed by pharmacy pain team	3 (2-6)
Overall function improvement (sleep, appetite, mobility) ^a , n (%)	71 (86.6)
Improvement in bowel function, %	58
Readmission, %	
14-day readmission	14
14-day readmission secondary to pain	8
30-day readmission	25
30-day readmission secondary to pain	14
Total number of interventions (N = 821)	
Pain related, n (%)	585 (71.2)
Non pain related, n (%)	236 (28.7)

^aOverall function improvement was evaluated in patients with at least two consult notes (N=82).

Table 3. Safety outcomes

Outcomes (N=100)	n
Adverse events ^a	53
Constipation	34
Sedation	14
Pruritus	9
Dizziness	7
Hypotension	3
Confusion	2
Respiratory depression	2

^aPatients may have reported more than one adverse drug event.

to incorporate a comparator group in order to see how this group of patients compares to those with the same types of pain but without a pharmacy consult.

CONCLUSION

The involvement of a pharmacy pain team in a patient's pain management led to significant decreases in average pain scores at both post-consult and pre-discharge. A substantial number of patients showed improvement in function, and several interventions were made by pharmacists to ensure the safe and appropriate use of medications. Interventions by a pharmacy pain team can improve patient outcomes and should be considered a good investment of resources by health systems.

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