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Educational case report

A preoperative interdisciplinary biopsychosocial opioid reduction program in patients on chronic opioid analgesia prior to spine surgery: A preliminary report and case series

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HIGHLIGHTS

- A biopsychosocial program was developed to taper opioids prior to spine surgery.
- Pain, psychosocial, and physical functioning improved despite the opioid dose being tapered.
- Overall, a preoperative opioid reduction program improves patient centred outcomes.

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ABSTRACT

Background: Spine surgery candidates are commonly treated with long-term opioid analgesia. However, chronic opioid analgesia is associated with poor pain control, psychological distress, decreased functional status and operative complications. Therefore, our medical centre piloted an outpatient biopsychosocial interdisciplinary opioid reduction program for spine surgery candidates on chronic opioid analgesia.
Methods: Our case series reviews the outcomes of the first 5 interdisciplinary program completers. Data was collected on admission to the program, preoperatively at completion of the program, and 1 month postoperatively. We recorded changes in pain interference scores, physical functioning, and symptoms of depression and anxiety as captured by the Patient-Reported Outcome Measurement Information System (PROMIS-29) Profile.
Results: The mean duration of the preoperative opioid reduction program was 6–7 weeks. The mean morphine equivalent daily dose (SD) decreased from 238.2 (226.9) mg on admission to 157.1 (161.0) mg preoperatively and 139.1 (84.0) mg one month postoperatively. Similarly, the mean pain interference score (SD) decreased from 72.4 (5.1) on admission to 66.5 (6.9) preoperatively and 67.7 (5.4) one month postoperatively. The preoperative opioid dose and pain interference scores decreased in all 5 patients, but one month postoperatively increased in one patient related to a surgical complication. Pre- and post-operative depression, anxiety and fatigue improved in all patients. Satisfaction with participation in social roles, sleep disturbances, and physical functioning improved in most patients.
Conclusions: Pre- and post-operative pain improved despite the opioid dose being tapered. These preliminary data suggest that a short-term outpatient preoperative interdisciplinary biopsychosocial opioid reduction program is safe, feasible, and improves patient-centred outcomes.
Implications: Our preliminary data support the rationale for expansion of the opioid reduction program; opioid use and pain should be evaluated in all surgical candidates. These findings need to be replicated in larger studies.

1. Introduction

Chronic nonmalignant pain negatively affects quality of life resulting in reduced physical, social and psychological wellbeing, and higher rates of health service utilization services [1,2]. In 2008,

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according to the Medical Expenditure Panel Survey, 100 million adults in the United States suffered with chronic pain, and the total cost to health care ranged from 261 to 300 billion dollars [3].

As a result of a confluence of societal factors, opioid analgesic prescriptions have increased in the United States [4], and between 5 million and 8 million Americans are prescribed opioids for chronic pain [5]. However, chronic opioid analgesia does not address the multidimensional subjective experience of pain, nor does it improve the physical or psychological components of pain [6,7]. Additionally, long term opioid analgesia is associated with serious harms including opioid induced hyperalgesia, poor pain control, depression, anxiety, overdose, abuse, addiction, and medication diversion [8].

Potential spine surgery candidates with back pain are often maintained on long term opioid regimens, despite the fact that chronic opioid analgesia is associated with worse surgical outcomes, poor pain control, psychological distress, and higher total health care costs [9,10]. Higher preoperative opioid doses are also correlated with decreased quality of life, increased disability, poorer overall health status, and increased postoperative narcotic use even 3–12 months post-spine surgery [9,11]; additionally every 100 mg increase in the preoperative morphine equivalent daily dose has been shown to increase the hospital length of stay (LOS) by 1.1 days [12]. Furthermore, depression, anxiety, and poor physical functioning are associated with increased pre- and post-operative narcotic use and pain [13,14], as well as worse patient reported outcomes even up to a year postoperatively [15]. Therefore, it follows that a preoperative opioid reduction program would improve pain, psychological distress, physical functioning, and operative outcomes.

Due to the limited efficacy of opioids for chronic pain, interdisciplinary and multidisciplinary biopsychosocial programs have been extensively studied in patients with spine related pain [16]. Multidisciplinary programs use knowledge from various disciplines whereas interdisciplinary programs coordinate and integrate various team approaches into a single treatment plan [17]. Biopsychosocial programs that integrate a combination of therapies, and improve physical, psychological, and social factors are more effective than standard of care (i.e. reassurance, advice, opioid analgesia) or physical treatments (i.e. heat therapy, aerobics, strengthening, and stretching exercises) to improve pain, and disability in patients with chronic back pain [16,18].

However, to our knowledge no published studies have assessed multi- or inter-disciplinary biopsychosocial treatment programs with the specific aim of reducing opioid doses in spine surgery candidates on chronic opioid analgesia prior to surgery. Therefore, we piloted a patient-centred interdisciplinary program in the spine centre to preoperatively reduce opioid doses, as well as to improve pain, psychological distress, and physical functioning in presurgical spine patients on a morphine equivalent dose (MED) >80 mg daily for at least 6 months. Our case series reviews the outcomes of the first 5 program completers.

2. Methods

The Cedars-Sinai Medical Center Institutional Review Board (IRB) approved this case series. Data was collected on admission to the program, preoperatively at program completion (the week of surgery), and postoperatively (one month post-surgery).

2.1. Pre-operative opioid reduction program

At the initial assessment, an internist, psychiatrist, pain-trained psychologist, and physical and occupational therapists performed independent evaluations and met as a team to discuss these assessments. Comprehensive tailored treatment plans were devised to taper opioid doses as well as to improve pain, functionality and psychological distress. Opioid doses were confirmed by patient history, chart review, and the California Prescription Drug Monitoring Program. The program was flexible in terms of total length of time, given differing surgery dates, but we aimed for twice-weekly clinic visits over the course of 6–8 weeks. Similarly, opioid taper regimens varied by patient but the goal was to taper the opioid dose by at least 10% per week. Psychotropic medications were added or adjusted as needed to treat co-morbid psychiatric disorders, and attempts were made to reduce benzodiazepines and other sedative medications as these also contribute to operative risks. Physical therapy (PT), occupational therapy (OT), as well as pain-focused cognitive behavioral therapy (CBT), were integral to the program. CBT training included pacing for pain, relaxation techniques, acceptance and commitment therapy (ACT) and mindfulness based cognitive behavioral therapy (MBCT). Physical therapy for pain management focused on education, exercise, manual therapy, heat modalities, and cold modalities. Goals of OT included functional goal setting, home exercise programs, safe body mechanics, and muscle tension reduction. Primary outcomes were measured with the Patient-Reported Outcome Measurement Information System (PROMIS-29). Patients successfully completed the preoperative opioid reduction program if they participated in all program modalities and made active attempts to reduce their opioid dose.

2.2. Patient-Reported Outcome Measurement Information System (PROMIS-29)

The PROMIS-29 is a well-validated and reliable self-report measure of overall well-being. The PROMIS-29 measures several domains: depression, anxiety, physical function, pain interference, fatigue, sleep disturbance, satisfaction with participation in social roles, and includes a pain intensity numeric rating scale (0–10). The raw scores for each domain are translated to a standardized *T*-score. For depression, anxiety, physical function, pain interference, and fatigue, a score of 50 is the average for the general population in the United States. For satisfaction with participation in social roles, and sleep disturbance, a score of 50 is the average of the calibration sample. A higher *T*-score reflects more of the concept being measured. For example, in anxiety, a *T*-score of 60 is one standard deviation (SD) worse than average but a *T*-score of 40 is one SD better than average. In physical function, a *T*-score of 60 is one SD better than average but a *T*-score of 40 is one SD worse than average [19]. The same clinic provider administered the PROMIS-29 profile to all program participants at all clinic visits.

3. Results

3.1. Clinical series

Patient 1 is a 65-year-old female with a history of generalized anxiety, benzodiazepine use disorder, hypothyroidism, and chronic back pain secondary to lumbar stenosis. The patient denied a history of other drug or alcohol misuse. Her medications included alprazolam, fluoxetine, gabapentin, levothyroxine, and oxycodone. The patient had been on oxycodone for 5 years for chronic back pain. Her procedure was a lumbar posterior decompression and spinal hardware placement at L4–5. She tolerated the surgery well and there were no complications. Her LOS was 4 days. She was enrolled in the program for 6 weeks, and completed 12 sessions. Her preoperative (40.5 mg) and one month postoperative (64.5 mg) daily MED were lower than on an admission to the program (150 mg). Pain interference decreased from 75.6 on admission to 69.7 pre- and

Table 1
Opioid dose and PROMIS-29 data on admission to the interdisciplinary program, preoperatively at program completion, and 1 month postoperatively for the 5 program completers.

	MED	Pain interference	Pain intensity	Depression	Anxiety	Sleep disturbance	Fatigue	Satisfaction with participation in social roles	Physical functioning
Admission	M = 238.2 Mdn = 150 SD = 226.9	M = 72.4 Mdn = 75.6 SD = 5.1	M = 7.6 Mdn = 7.0 SD = 1.8	M = 64.4 Mdn = 65.7 SD = 6.5	M = 66.8 Mdn = 69.3 SD = 9.7	M = 59.2 Mdn = 61.7 SD = 7.1	M = 65.8 Mdn = 64.6 SD = 7.5	M = 32.8 Mdn = 29 SD = 6.2	M = 31.9 Mdn = 32.1 SD = 5.6
Pre-operatively	M = 157.1 Mdn = 79 SD = 161.0	M = 66.5 Mdn = 69.7 SD = 6.9	M = 6.4 Mdn = 6.0 SD = 1.1	M = 56.6 Mdn = 57.3 SD = 5.3	M = 56.5 Mdn = 55.8 SD = 12.9	M = 55.5 Mdn = 56.1 SD = 7.0	M = 60.1 Mdn = 62.7 SD = 8.2	M = 35.4 Mdn = 33.6 SD = 9.4	M = 32.9 Mdn = 35.6 SD = 6.8
Post-operatively	M = 139.1 Mdn = 139 SD = 84.0	M = 67.7 Mdn = 66.6 SD = 5.4	M = 5.0 Mdn = 6.0 SD = 1.4	M = 53.8 Mdn = 51.8 SD = 5.5	M = 52.1 Mdn = 53.4 SD = 9.1	M = 55.2 Mdn = 50.5 SD = 9.0	M = 57.6 Mdn = 58.8 SD = 6.1	M = 39.4 Mdn = 38.8 SD = 10.7	M = 35.6 Mdn = 35.6 SD = 2.5

MED, morphine equivalent dose; M, mean; Mdn, median; SD, standard deviation.

one month post-operatively. Additionally, benzodiazepines were tapered along with her opioids. Depression, anxiety, and fatigue improved pre- and one month post-operatively. Sleep disturbance and physical functioning improved one month postoperatively. Satisfaction with participation in social roles improved preoperatively.

Patient 2 is a 40-year-old female with a past history of mood disorder unspecified, hypothyroidism, and chronic back pain secondary to lumbar kyphosis. Her medications included oxycodone, fentanyl patch, duloxetine, topiramate, and levothyroxine. The patient had no history of illicit drug use or alcohol misuse. She had been on opioids for 20 years for chronic back pain. Her procedure was an anterior posterior fusion at L4–5, and L5–S1. There were no surgical complications. Her LOS was 6 days. She was enrolled in the program for just under 7 weeks, and completed 11 sessions. Her daily MED decreased from 204 mg on admission to 168 mg pre- and one month post-operatively. Pain interference reduced from 75.6 on admission to 71.6 preoperatively and 65.2 one month post-operatively. Pre- and post-operative depression, anxiety, fatigue, and physical functioning improved. Satisfaction with participation in social roles improved one month postoperatively. Sleep disturbance improved preoperatively.

Patient 3 is a 71-year-old female with a history of major depressive disorder, generalized anxiety disorder and chronic back pain secondary to scoliosis. She had a history of alcohol use disorder, in remission for over 20 years. She denied a history of illicit drug use. Her medications included duloxetine, lorazepam, methocarbamol, oxycodone, and pregabalin. The patient had been on opioid analgesia for 5 years for chronic back pain. Her procedure was a T10 to pelvis posterior spinal fusion, and anterior lumbar interbody fusion at L4–5, L5–S1. She did have a surgical complication, an anterior graft split-out, and required an additional surgery. Her LOS was 16 days. She was enrolled in the program for 7 weeks prior to surgery, and completed 7 sessions. Her daily MED reduced from 81 mg on admission to 79 mg preoperatively but increased to 139 mg one month postoperatively. Similarly, pain interference decreased from 75.6 on admission to 71.6 preoperatively but increased to 75.6 one month postoperatively. She was able to taper lorazepam entirely by the end of the program. Depression, anxiety, fatigue, and physical functioning improved pre- and one month post-operatively even though the patient had operative complications. Satisfaction with participation in social roles role remained unchanged, and sleep disturbance improved one month postoperatively.

Patient 4 is a 64-year-old female with a history of bipolar disorder, and chronic back pain secondary to lumbar spinal stenosis. Her history included cocaine use disorder and alcohol use disorder, in remission for 20 years. Her medications included bupropion, gabapentin, lamotrigine, oxycodone, diazepam and carisoprodol. The patient had been on opioids for 10 years for chronic back pain. She was surgically treated with a L2–4 laminectomy, as well as a left L3–4, and right L2–3 transforaminal lumbar interbody fusion. There were no surgical complications. Her LOS was 8 days. She was enrolled in the program for 7 weeks, and completed 14 sessions. Her daily MED reduced from 120 mg on admission to 66 mg preoperatively and 60 mg one month postoperatively. Pain interference decreased from 63.8 on admission to 55.6 preoperatively, and 61.2 one month postoperatively. Additionally, she was able to taper and stop diazepam and carisoprodol. Depression, anxiety, fatigue, and satisfaction with participation in social roles improved pre- and one month post-operatively. Physical functioning decreased negligibly pre- and one month post-operatively. Sleep disturbance improved preoperatively.

Patient 5 is a 50-year-old male with a history of major depressive disorder, possible Attention deficit hyperactivity disorder, hepatitis C, and chronic back pain secondary to kyphosis, and cervical and thoracic disc degeneration. His medications included diazepam, dextroamphetamine, citalopram, clonidine, gabapentin, oxycodone, and testosterone replacement. Bupropion was added for his depression. He denied a history of illicit drug use or alcohol misuse but was misusing prescribed diazepam and dextroamphetamine. He had been on opioids for 10 years for chronic back pain. He was surgically treated with a T8–T11 posterior instrumentation and fusion with no complications. His LOS was 3 days. He was enrolled in the program for approximately 6 weeks and completed 11 sessions. The daily MED reduced from 636 mg on admission to 432 mg preoperatively and 264 mg one month postoperatively. Pain interference reduced from 71.6 on admission to 63.8 preoperatively and 66.6 one month postoperatively. Additionally, prior to the surgery he was able to taper off diazepam and dextroamphetamine. Depression, anxiety, sleep disturbance, fatigue and satisfaction with participation in social roles improved pre- and one month post-operatively. Physical functioning improved preoperatively.

3.2. Opioid reduction program outcomes

The mean (SD) number of completed appointments was 11 (2.5). The preoperative opioid dose and pain interference decreased in all 5 patients but one month postoperatively increased in patient 3, presumably due to recovery from the surgery. As described in Table 1, the mean daily MED on admission to the program was 238.2 mg, decreased to 157.1 mg preoperatively, and 139.1 mg one month postoperatively. Pain interference score decreased from a mean of 72.4 on admission to the program to 66.5 preoperatively and 67.7 one month postoperatively. The mean pain severity scores steadily decreased from a mean of 7.6 on admission to the program to 5.0 one month postoperatively. The mean subscale scores on depression, anxiety, physical function, fatigue, sleep disturbance, and satisfaction with participation in social roles steadily improved

(see Table 1). Pre- and post-operative depression, anxiety, and fatigue improved in all 5 patients. Satisfaction with participation in social roles, sleep disturbances, and physical functioning improved in most patients.

4. Discussion

To our knowledge, this is the first report of an interdisciplinary preoperative opioid reduction program designed and implemented in a major medical centre specifically for presurgical spine patients on chronic opioid analgesia. Limitations include the preliminary nature of the data. Additionally, statistical analysis was not possible due to the small number of patients, therefore the results can only be interpreted as trends.

Our pilot case series data suggest that a short-term semi-intensive interdisciplinary opioid reduction program can successfully reduce opioid dosages. Further, the cases we evaluated showed improved patient-centred outcomes including pain and psychological functioning, notwithstanding the prevalence of high-risk characteristics such as comorbid mood and substance use disorders. All the program completers had been maintained on opioids for chronic spine pain for 5 years or longer; nevertheless, in 4 out of the 5 patients, pre- and post-operative pain were lower than on admission to the program, despite the opioid dose being tapered. Chronic exposure to opioids may induce opioid-induced hyperalgesia (OIH), which is a state of nociceptive sensitization, and therefore tapering opioids improves pain by reducing sensitivity to noxious stimuli [20]. Additionally, four patients tolerated their surgery with no complications, but one patient had an anterior graft split out surgical complication and had a prolonged postoperative hospitalization. Despite this, she showed improvements in psychological and physical functioning. Similarly, all patients showed improvements in depression, anxiety and fatigue. Although, the opioid dose was tapered, satisfaction with participation in social roles, physical functioning, and sleep disturbances improved in most patients. It is also likely that improvements throughout the program and one month postoperatively were secondary to appropriately managing the biopsychosocial aspects of pain; pain is a multidimensional experience and improvements in psychological, physical, and social functioning probably reduced pain, which in turn improved the quality of life [2,21].

We did not assess the effect of each component of the interdisciplinary program on our outcomes but it is likely that the combined use of these modalities had a synergetic or additive effect. To date, preoperative interventions to improve outcomes in chronic pain patients undergoing spine surgery have focused on physical rehabilitation or non-opioid analgesia, with the data suggesting that each of these modalities improves surgical operative outcomes, pain, patient satisfaction, and reduces narcotic consumption [22,23].

In addition to reducing the opioid dose, benzodiazepines were also tapered. Benzodiazepine use in opioid-treated pain population appears to be higher than the general population [24], and patients may take benzodiazepines to enhance the effects of opioids for sedation, pain relief or intoxication [25]. Given that chronic benzodiazepine use is associated with increased morbidity and mortality [26] and commonly prescribed with opioids, a preoperative interdisciplinary pain program presents an opportune setting to mitigate other operative risks.

5. Conclusion

Overall, our experience suggests that a preoperative interdisciplinary opioid reduction program in spine surgery patients is feasible to implement, acceptable to patients, effective at reducing the opioid dose while managing pain in high-risk patients, and importantly improves patient-centred outcomes.

6. Implications

Our preliminary data support the rationale for expansion of the opioid reduction program. With a national focus on improving care, health and cost, opioid use should be evaluated in all potential operative candidates [27]. These findings need to be replicated in larger studies, and other effects such as the impact of such programs on total cost of care, should be studied. Importantly, future research needs to determine predictors of successful opioid reduction in diverse surgical populations within the context of a biopsychosocial framework.

Ethical issues

The Cedars-Sinai Medical Center Institutional Review Board (IRB) approved this retrospective chart review case series.

Conflicts of interest

The authors report no conflicts of interest concerning the materials or methods used in this study or the findings specified in this paper. There are no financial interests to disclose.

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