

Retrospective Review



Exploring the Role of Chronic Pain Clinics: Potential for Opioid Reduction

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Background: The management of chronic nonmalignant pain with high-dose opioids has partially contributed to the current opioid epidemic, with some responsibility shared by chronic pain clinics. Traditionally, both primary care providers and patients used chronic pain clinics as a source for continued medical management of patients on high-dose opioids, often resulting in tolerance and escalating doses. Although opioids continue to be an important component of the management of some chronic pain conditions, improvement in function and comfort must be documented. Pain clinics are ideally suited for reducing opioid usage while improving pain and function with the use of a multimodal approach to pain management. We assessed whether the application of multimodal treatment directed by pain specialists in a pain clinic provides for improved function and reduced dosages of opioid analgesics.

Objective: We evaluated the role of a pain clinic staffed by fellowship-trained pain physicians in reducing pain and opioid use in chronic nonmalignant pain patients.

Study Design: This study used a retrospective design.

Setting: The research took place in an outpatient pain clinic in a tertiary referral center/teaching hospital.

Methods: Of 1268 charts reviewed, 296 patients were on chronic opioids at the time of first evaluation. After a thorough evaluation, the patients were treated with nonopioid pharmacotherapy and interventional pain procedures as necessary. The data utilized from patients' latest follow-up visit included current pain level using the Numerical Rating Scale (NRS-11), opioid usage, and various functional parameters.

Results: NRS-11 scores decreased by 33.8% from 6.8 (\pm 0.1)/10 to 4.5 (\pm 0.2)/10. The pain frequency and number of pain episodes improved by 36.8 \pm 2 and 36.2 \pm 2.1, respectively. Additionally, the ability to sleep, work, and perform chores significantly improved. Total opioid use decreased by about 55.4% from 53.8 \pm 4 to about 24 \pm 2.8 MME/patient/day.

Limitation: This study is not a randomized prospective controlled study. The patients analyzed are still getting therapy and their pain status may change. Some opioids are underrepresented in the analyzed cohort. Finally, this study lacks in-depth stratification by type of pain, age, gender, and duration of opioid use.

Conclusion: Chronic pain clinics can play a pivotal role in reducing opioid usage while improving pain and function in patients on chronic opioids. We wish to emphasize the importance of allocating resources toward nonopioid treatments that may improve the function and well-being of patients.

Key words: Pain clinic, pain management, multimodal pain management, chronic pain, opioid reduction, improved pain, improved functional capacity.

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Over 100 million people in the United States suffer from chronic pain and many of them rely solely on high-dose opioids for management of their symptoms (1). In fact, the number of opioid prescriptions has skyrocketed over the past 15 years (2). Many factors have contributed to this opioid epidemic. They include, but are not limited to, changing attitude toward management of pain, "adequate" treatment of pain as a criterion for reimbursement, and incomplete understanding of long-term consequences of chronic high-dose opioid use (3,4). This reliance on opioids, and the lack of coverage and authorization for alternative treatments, has contributed to the opioid epidemic we are facing today.

Historically, pain clinics were utilized primarily when patients had already been started on chronic opioid therapy by primary care physicians or other specialists and standard dose escalations did not resolve patients' symptoms. The Food and Drug Administration reviewed all opioid prescriptions written in the United States between 2000 and 2009 and found that the majority of opioid prescriptions (26.7 and 15.4%, respectively) were issued by non-pain providers; anesthesiology and physical medicine and rehabilitation, the main specialties that manage pain, accounted for 3.2 and 2.7% of opioid prescriptions, respectively (5). Pain clinics were focused on interventional approaches to treating the symptoms, but for the most part, also continued chronic opioid therapy and escalated the doses as patients became tolerant or developed opioid-induced hyperalgesia. Some pain clinics also took the unfortunate and unethical route of "pill mills," a business model that has damaged perceptions of the pain management profession due to indiscriminate prescribing and dispensing of opioids to patients (6).

In light of the current opioid epidemic, pain clinics staffed by accredited fellowship-trained pain specialists can play a pivotal role in reversing the opioid epidemic. These physicians are uniquely positioned for this role, as they are trained in diagnosis of the pain generator and use of a multimodal approach toward pain management; they also typically see complex pain patients who are likely to become dependent on opioids if their pain is not treated adequately.

In this study, we conducted a retrospective analysis of all pain patients seen at the Banner University of Arizona Pain Clinic over a period of 1.5 years, focusing on their utilization of opioids at their first visit and at their latest follow-up visit, regardless of their underlying

pain condition. We also evaluated their current pain and improvement in quality of life.

METHODS

Selection and Description of Patients

This was a retrospective single-center study. All study protocols were approved by the Institutional Review Board at the University of Arizona. All patients reviewed were current patients with the chronic pain clinic at the Banner-University of Arizona Medical Center-South Campus from July 1st, 2014 to January 2016. A total of 1,268 patients' records were reviewed. After applying the exclusion criteria, 296 patients were included in the analysis. The average age was 58.6 ± 0.89 years old. More than half of the patients were women, totaling 59.4% (176 patients). Men represented 40.6% (120 patients). All data were obtained from the medical records of the pain clinic. Inclusion criteria were that patients must be 18 years of age or older with chronic opioid use. Patients with a history of terminal cancer or without at least one follow-up appointment by the time the study started were excluded from the study.

Approach to Pain Management

All patients analyzed underwent conventional pain management approaches. These approaches ranged from physical therapy to medical nonopioid management to interventional procedures, depending on the patient's needs and clinical scenario. We utilized several classes of nonopioid medications depending on the patient's conditions and contraindications. Some of the most common medication classes used were non-steroidal anti-inflammatory drugs, membrane stabilizers (gabapentin, pregabalin), tricyclic antidepressants, serotonin and norepinephrine reuptake inhibitors, topical local anesthetics, vitamin replacements, muscle relaxers, and anti-epileptics. Table 1 represents a partial list and indications of some common procedures used. All patients analyzed were men and women 18 years of age and older. The patients represented the most common types of chronic pain including headaches, migraines, neuropathic pain, arthritic pain, and abdominal pain.

Technical Information

All patients of the pain clinic at the Banner-University of Arizona are given a detailed written questionnaire at their first visit that gathers information about their health history and in-depth information about

Table 1. *Partial list of common interventional pain management techniques.*

Procedure	Indication
Physical therapy, yoga, acupuncture, cognitive behavioral therapy	Multiple pain conditions
Epidural steroid injections	Radicular pain
Medial branch blocks and radiofrequency ablation	Diagnosis and treatment for axial back and neck pain from spinal spondylosis
Peripheral nerve pulse radiofrequency neuromodulation	Longer term relief for pain origin localized to a peripheral mixed nerve
Joints and bursa steroid injections	Arthritic joints and inflamed bursa
Trigger point injections	Muscular and myofascial pain
Spinal cord stimulation	Failed back surgical syndrome, lumbar spondylosis, non-operative radicular pain, abdominal and pelvic pain, complex regional pain syndrome, peripheral ischemic neuropathy, anginal pain
Peripheral nerve stimulation	Occipital neuralgia, migraine, peripheral neuropathy
Intravenous lidocaine or ketamine infusion	Diffuse body pain such as in Dercum's disease
Chemodenervation with botulinum toxin A	Intractable migraine, muscle spasticity-evoked pain
8% capsaicin (Qutenza) patch	Post-herpetic neuralgia, peripheral neuropathy

their pain history, including the use of current pain medications. On follow-up visits, patients are given a modified brief pain intake form that asks them about changes in the intensity of their pain, frequency of pain, duration of pain, ability to fall and stay asleep, ability to work, ability to exercise, and ability to do chores. We use the Numeric Rating Scale (NRS-11), which ranges from 0 to 10. Zero indicates no pain; 10 indicates the worst possible pain imagined. The other criteria are graded from 0% to 100%. Zero percent indicates no improvement; 100% indicates complete improvement. We used the patients' own reports and cross-checked them with the State of Arizona prescription monitoring system and medical records from their prescribing providers in order to calculate their opioid use. We analyzed initial opioid use and opioid use during the patients' latest visit. All of these parameters are subjective in nature (except for the amount of opioid use).

We used an online opioid calculator (<http://clincalc.com/opioids>) to convert different opioids to morphine milligram equivalents (MME).

All data were obtained and analyzed by investigators who did not have access to the pain clinic or physical access to the patients.

Statistics

The statistical significance of differences between means was determined by parametric analysis of variance, followed by post hoc comparisons (Student–Newman–Keuls test) using Microsoft Excel. Differences were considered to be significant if $P < 0.05$. All data were

plotted in GraphPad Prism 6. Patients who were on 2 types of opioid were treated as 2 separate patients.

RESULTS

Changes in NRS-11, Pain Intensity, Frequency, and Duration of Pain Episodes

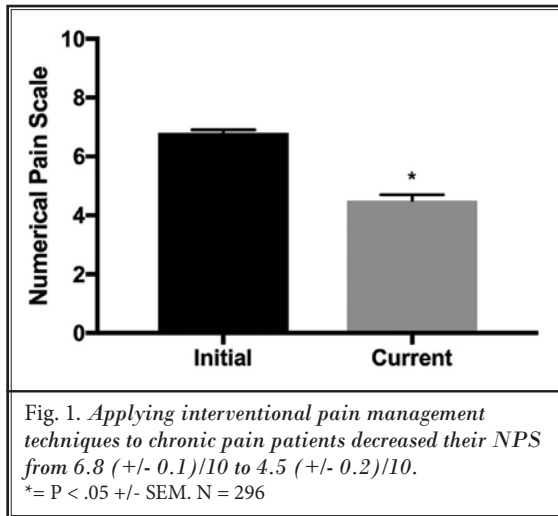
The NRS-11 is a scale from 0 to 10 where 0 is no pain and 10 is the worst imaginable pain. Patients are asked to choose a number from 0 to 10 to quantify their pain. It is a subjective measure reported by the patients. The average NRS-11 value for the analyzed patients during their first visit was $6.8 (\pm 0.1)/10$. At the time the data was gathered for analysis, the average NRS-11 score had dropped by 33.8% to $4.5 (\pm 0.2)/10$. The pain frequency and number of pain episodes improved by 36.8 ± 2 and 36.2 ± 2.1 , respectively (Figs. 1,2).

Change in Total Opioid Use

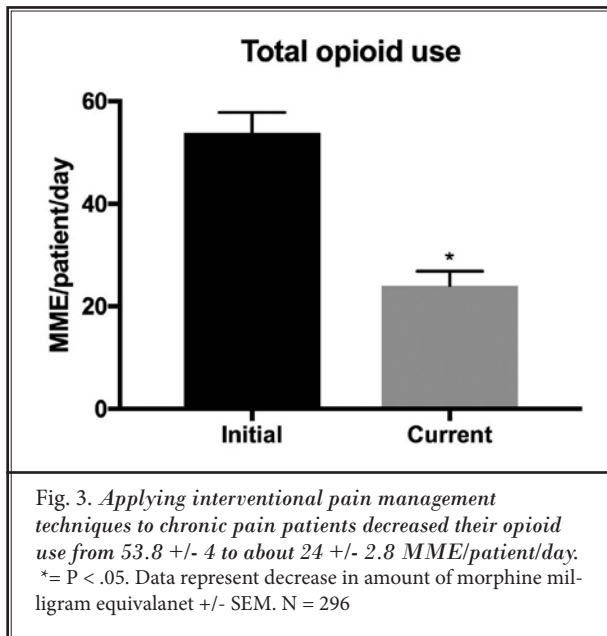
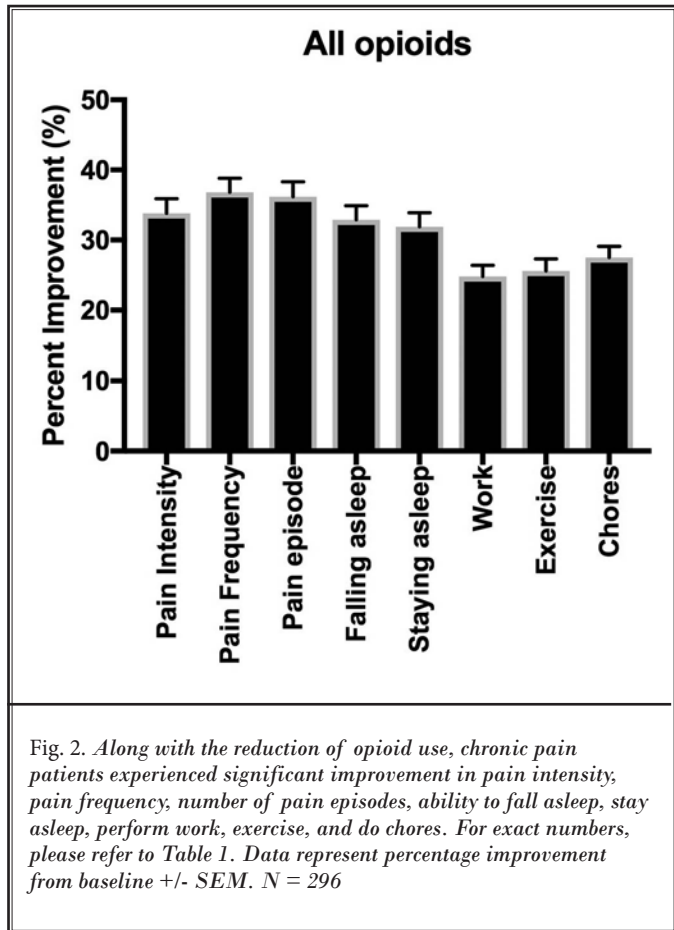
Patients analyzed were on different types of opioids. We initially converted different opioids to MMEs using an online opioid convertor (<http://clincalc.com/opioids>). The data demonstrated that the patients were able to reduce their total opioid use by about 55.4% from 53.8 ± 4 MME/patient/day to about 24 ± 2.8 MME/patient/day, on average (Fig. 3).

Changes in Other Quality of Life Measures

In addition to pain scores and intensities, we were



also interested in improving patients' quality of life and functional capacity. Overall, patients experienced improvements in all analyzed parameters. Table 2 represents all parameters analyzed and the improvements patients experienced in terms of pain intensity, pain frequency, number of pain episodes, ability to fall asleep, ability to stay asleep, ability to work, ability to exercise, and ability to perform chores based on the opioid used (Fig. 2).



Change in Opioid Use and Other Parameters for Individual Opioids

It has been reported that individual opioids may vary in their ability to produce tolerance and opioid-induced hyperalgesia. We wanted to evaluate if our patients' ability to reduce opioid use was dependent upon the type of opioid they were consuming, so we stratified patients by type of opioid use. With regard to improvement in pain seen with opioid reduction, the group that showed the most success in controlling pain was the oxycodone group, which experienced a 42.1% ± 2.7% reduction in pain intensity. Patients on hydro-morphone exhibited the least reduction in pain intensity, with 15.9% ± 8.6% pain reduction. After reducing their opioids, we evaluated changes in pain parameters along with other quality of life measures in patient groups separated by the type of opioid they were using. The most improvement in patients' ability to fall asleep and stay asleep was seen in the morphine group.

Table 2. Effects of different type of opioids on several parameters subjectively collected from chronic pain patients. Data are presented in percentage improvement (%) and SEM (\pm). Morphine n= 37, oxycodone n= 150, hydrocodone n= 92, oxycontin n= 4, hydromorphone n= 13, total n= 296.

Opioid	Pain Intensity		Pain Frequency		Pain Episode		Falling asleep		Staying asleep		Work		Exercise		Chores	
	%	\pm	%	\pm	%	\pm	%	\pm	%	\pm	%	\pm	%	\pm	%	\pm
All	33.8	2.1	36.8	2	36.2	2.1	32.9	2	31.9	2	24.8	1.6	25.6	1.7	27.5	1.6
Morphine	33.7	5.8	38	6	37.9	6.8	35.7	6.3	36.1	6.7	22.2	5.2	23.2	4.9	23.5	4.9
Oxycodone	42.1	2.7	38.1	2.8	38.3	2.8	31.6	2.7	31.9	2.6	25	3	27.1	2.4	27.8	2.3
Hydrocodone	37.9	3.4	36.2	3.8	33.1	3.7	35.5	3.6	31.6	3.6	26.4	3.2	25.6	2.9	29.7	3
Oxycontin	43.2	21.8	23.6	14	34.1	33	13.6	6.3	13.6	6.3	17	12	10.6	9.6	23.3	3.3
Hydromorphone	15.9	8.6	20.3	8.3	22.8	8.6	27.7	11.8	27.7	11.8	17.8	9.4	12.8	6.3	14.7	7

The most improvement in the ability to work and to perform chores was seen in the hydrocodone group. The ability to exercise was improved the most in the oxycodone group. The least improvement in terms of ability to fall asleep, stay asleep, work, or exercise was seen in the oxycontin group. Hydromorphone showed the least improvement in patients' ability to perform chores (Fig. 4 and Table 2).

DISCUSSION

In the present study, we evaluated the role of a pain clinic staffed by accredited pain fellowship-trained physicians in reducing opioid use and improving pain and quality of life in chronic pain patients. The results showed that regardless of the pain condition being treated, patients seen in our clinic were able to reduce their opioid consumption by greater than 50% while noticing improvement in their pain and quality of life. The greatest improvement was seen in patients on oxycodone; the least improvement was seen in patients on hydromorphone. In summary, interventional pain clinics are uniquely positioned to help patients by reducing opioid use and may play a critical role in addressing the national opioid epidemic.

It is also worth noting that this study represents a "work in progress." Some patients analyzed had only one follow-up appointment and have not had the chance to fully benefit from our multimodal pain approach. Thus, it is possible that ongoing analysis of some patients may result in further decreases in pain and opioid use.

We noticed that the patients using oxycodone experienced the most benefit in terms of pain control and improved quality of life after the opioid reduction.

On the other hand, patients on hydromorphone experienced the least improvement. There may be many reasons behind this observation. First, it is possible that this is due to patient selection bias, as many patients are started on oxycodone as a first line opioid agent and switched to hydromorphone when the patients become resistant to oxycodone. Thus, the patients on hydromorphone may be suffering from refractory pain. Second, oxycodone may be more effective in evoking opioid-induced hyperalgesia compared to hydromorphone, resulting in greater pain improvement after oxycodone dose reduction. Finally, this finding may be a result of small sample size in the hydromorphone group; if we were able to obtain data from a greater number of patients on hydromorphone, the difference from oxycodone may not be sustained.

Our study suggests that opioids are not always needed for the management of chronic nonmalignant pain. In that regard, our findings are in alignment with the conclusion of Krebs et al, who found that initiating opioid therapy for chronic pain was not superior to other interventions (7). In fact, some studies have even suggested that chronic opioid use may contribute to increased disability and lower functional capacity (8). Our study is also complementary to the Rome et al study, in which patients enrolled in a pain rehabilitation program at the Mayo Clinic experienced a significant decrease in their opioid use. In their elegant study, over 300 chronic nonmalignant pain patients were enrolled in a rehabilitation program that utilizes cognitive behavioral therapy (9).

Our study has several limitations. The patients analyzed are continuing to get therapy at the pain clinic. We are only able to present a snapshot in an otherwise

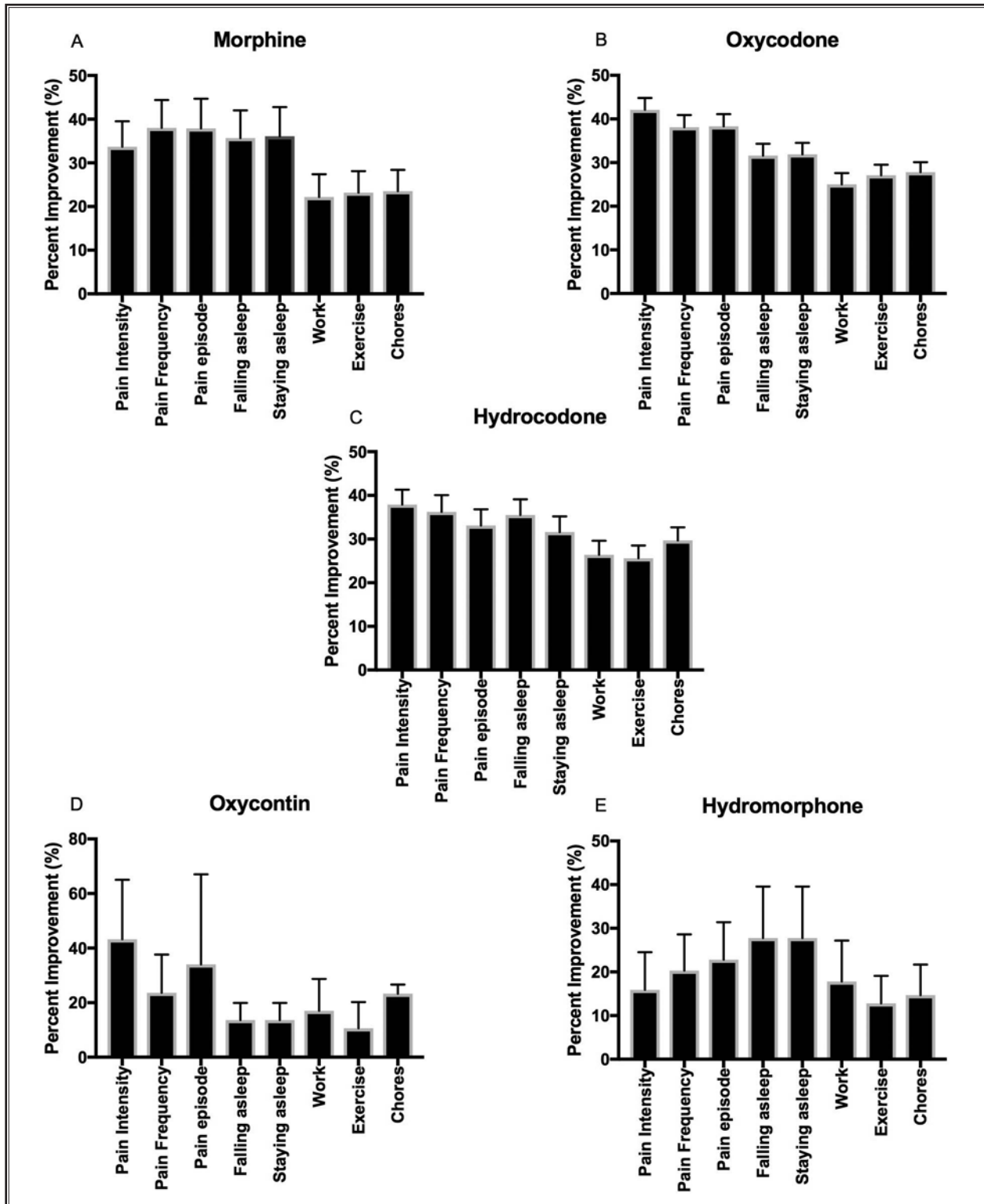


Fig. 4. Chronic pain patients experienced improvement in several aspects to a varying degree depending on their opioids. Patients on oxycodone experienced the most benefit. For exact numbers, please refer to Table 1. Data represent percentage improvement from baseline +/- SEM. Morphine n = 37, oxycodone n = 150, hydrocodone n = 92, oxycotin n = 4, hydromorphone n = 13.

dynamic and evolving situation. Patients on certain types of opioids are underrepresented in our analysis (e.g., oxycontin, n = 4; methadone, n = 0). It may turn out that the patients on these opioids are more or less likely to benefit from our approach. As we continue to collect data from the larger patient population, we hope to address this gap in knowledge. Given that this is a retrospective analysis, and given that a patient must have had at least one follow-up visit to be included in the analysis, our study may suffer from selection bias: patients who had no intention of following our multimodal approach targeted at reduction in opioid use might not have come back. Finally, our analysis lacks more in-depth stratification by type of pain, age, gender, duration of pain, and duration of opioid use. As we gather further data and increase the sample size, more detailed analysis will be possible.

Opioid misuse and overdose-related deaths have significantly increased over the years and have now caught the attention of media, politicians, and society at large (10). As one would expect, at first, opioids are begun as a way to manage acute or chronic pain. While the use of opioids for acute pain – including postsurgical pain – is necessary, their routine use in the management of non-cancer chronic pain has been questioned, especially given their lack of efficacy over the long term and the substantial increase in side effects (11). While the majority of opioid prescriptions are initiated by nonpain physicians, pain physicians write the most opioid prescriptions per physician, suggesting that one of the reasons patients are referred to pain clinics is to

continue or escalate their opioid use (12). We believe that there needs to be a rethinking of this approach. Finally, on many occasions, the services and therapies rendered to patients are largely dependent on the availability of specialists and on approval from their health insurance plans. Therefore, patients living in areas with limited resources, or with health insurance plans that do not readily cover chronic pain interventions, may be at an elevated risk of contributing to the opioid epidemic.

CONCLUSION

As evidenced by our data, the primary reason a patient should be referred to a pain clinic is to reduce their opioid use by identifying their pain generator and by using a multimodal treatment regimen that includes interventions targeted at the pain generator. Additionally, a multimodal approach to chronic pain management utilizing pain physicians, physical therapists, acupuncturists, psychologists, psychiatrists, and addiction medicine specialists would most likely lead to a more successful outcome in terms of pain and opioid reduction.

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