A Pharmacist-Assisted Initiative to Improve Chronic Pain Management and Reduce Opioid Use in Primary Care

Kailene Perry, PharmD, BCACP[1]; Susan Ferron, MD[1]; Nathan Norquist, MD[2]; Deborah M. Mullen, PhD[3]
[1]Health Partners Riverway Pain Clinic, Anoka, MN
[2]Health Partners Riverway Clinic, Coon Rapids, MN
[3]The University of Tennessee at Chattanooga, Gary W. Rollins College of Business, Management Department, Chattanooga, TN

Abstract

Background– *Since publication of the 2016 CDC Guideline for Prescribing Opioids for Chronic Pain, there have been growing concerns that providers, including those in primary care, are tapering opioids too quickly and without concomitant use of non-opioid strategies for pain, leading to inadequate pain management. As a result, in November 2022 the CDC published Clinical Practice Guidelines for Prescribing Opioids for Pain, emphasizing the importance of creating comprehensive care plans for pain management and developing a consensual plan between provider and patient when tapering opioids.*

Objective–*Determine the impact of a pharmacist-assisted approach aimed at helping primary care providers minimize opioid use while improving management of chronic, non-malignant pain (CNMP).*

Methods *– This quality improvement project focused on one primary care provider partnering with a pharmacist to reassess the management of patients on long-term opioid therapy (LTOT) for CNMP. The intervention included a letter informing patients of the provider's intent, pharmacist outreach to intervention patients, and pharmacist development of a patient registry, updated regularly with clinical data, recommendations, and outcomes for the provider to reference throughout the project. The intervention group was compared to patients prescribed opioids for CNMP by the remaining providers at the clinic who did not engage in the quality initiative.*

Results – *The intervention group had a mean effective daily morphine milligram equivalent (MME) reduction of 73.7% (17.2% control) after 18 months and 60% of patients discontinued opioids (14.3% control). In a subset of patients with functional assessment scores, 93.3% were either improved or unchanged, despite a 62.5% decrease in their mean effective daily MME. In both groups, one patient transferred care to a new provider.*

Conclusions *– With targeted recommendations and assistance from a pharmacist, a primary care provider can make significant progress in improving management of CNMP while reducing opioid prescribing.*

Keywords: opioids, primary care, pain, pharmacist

Background

In 2016, the Centers for Disease Control and Prevention (CDC) issued its Guideline for Prescribing Opioids for Chronic Pain (2016 CDC Guidelines).[1] The guideline advised minimization of opioid use for several reasons: 1) lack of evidence that long-term opioid therapy (LTOT) is beneficial for chronic, non-malignant pain (CNMP), 2) evidence that non-opioid strategies can improve management of CNMP and 3) the considerable risks associated with LTOT, including death.[1,2] These guidelines challenged providers' previous approaches to prescribing opioids, particularly those in primary care. A national survey collected in 2007-2008 reflected that 52% of patients in the United States with CNMP relied on their primary care provider for pain management,[3] and almost half of dispensed opioid prescriptions in 2012 were found to be ordered in primary care practices.[4]

Corresponding author: Kailene Perry, PharmD, BCACP
Health Partners Riverway Pain Clinic, Anoka, MN
Phone: 763-498-2406 (cell)
Email: kailene.perry@gmail.com

Opioid dispensing rates began declining after reaching a peak in 2012, but this decline accelerated in the two years following publication of the 2016 CDC Guidelines.[5] There is evidence this reduction has saved lives. Between 2013 and 2019, opioid dispensing rates per person decreased by 40%,[5] correlating with a 41.5% reduction in opioid deaths involving prescription opioids alone during the same time period.[6] Despite this favorable outcome, there have been growing concerns that misapplication of the guidelines has resulted in inappropriately rapid opioid tapering, abrupt discontinuation of LTOT, inadequate management of CNMP, and disruption in patient/provider relationships.[7,8] Largely as a result of these concerns, the CDC released a revision of the 2016 guidelines, entitled Clinical Practice Guidelines for Prescribing Opioids for Pain, in November of 2022 (2022 CDC Guidelines). The revisions have a stronger emphasis on the importance of shared decision-making between patient and provider, particularly regarding opioid tapering. They recognize that establishing a consensual taper rate can aid in the success of tapering. They also state that if consensus regarding tapering of opioids cannot be reached, the primary focus should shift to utilizing alternative strategies for pain management, with an intention to reconsider opioid tapering later when pain management is optimized.[9]

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A number of successful initiatives have focused on helping primary care providers navigate the challenges of managing CNMP and opioid prescribing,[10-13] but often require extensive time and/or resources. For example, a Veterans Affairs project implemented a chronic care model composed of three hours of training for clinicians, a full-time psychologist, weekly involvement of an internist specialized in management of CNMP, and a four-session workshop for patients.[10] Six Building Blocks is a model that involves system-wide changes in clinic flow and operations implemented over a 15-month period[11] and the Extension of Community Healthcare Outcomes (ECHO) program relies on consistent provider commitments to 1.5 hours of weekly educational programming that may be unrealistic for a provider in a busy practice.[12,13] In contrast to these initiatives, involving pharmacists in opioid prescribing can offer direct clinical support to primary care providers, without requiring workflow adjustments or large time commitments from providers.

Pharmacist involvement has been demonstrated to be effective through provider-referral for oversight of tapering[14, 15] but many primary care practices face financial obstacles to widespread implementation of this due, most notably, to health insurance providers like the Centers for Medicare and Medicaid Services (CMS) failing to consider clinical pharmacists billable providers.[16] Pharmacist involvement that does not require full oversight of tapering could be a more cost-effective approach. For example, proactive recommendations by pharmacists for opioid stewardship have been effective but have had variable results.[17-19] Since the 2016 CDC Guidelines, the climate for proactive assistance from pharmacists has changed, as there are many primary care providers who are motivated to reassess their care of CNMP and their concomitant prescribing of opioids, but feel they lack the necessary training or time to do so.[20]

In this paper we report the results of a quality-improvement project designed to improve management of CNMP in the primary care setting. By partnering a motivated primary care provider with a clinical pharmacist, we developed a relatively accessible strategy to minimize opioid use, improve management of CNMP, and maintain positive patient/provider relationships. It differs from previous projects in that it does not depend on operational changes in clinic systems or workflow. It was designed to maximize the efficiency of the available pharmacist's time to be replicated in clinic settings with variable degrees of pharmacy resources.

Methods

The intervention provider contacted the health care system's community pain clinic for assistance in reassessing their management of CNMP. The pain clinic partnered the provider with its pharmacist to implement an 18-month quality improvement project for the intervention group, which consisted of the provider's panel of patients on LTOT for CNMP. The control group consisted of all patients being prescribed LTOT for CNMP by the remaining 6 providers at the primary care clinic. These providers did not engage in the quality initiative. IRB review determined that this was a quality improvement project and thus exempt from IRB approval.

The intervention and control groups were identified through the healthcare system's provider-specific population health database. The database generated a report of patients on LTOT by using the following default criteria: patients ≥18 years of age for whom a provider at the clinic had prescribed 1) a long-acting opioid in the previous six months OR 2) ≥100 tablets of short-acting opioid medications within two of the three previous months OR 3) two or more prescriptions for short-acting opioids over a three-month period, for two consecutive three-month periods. The inclusion criteria for this database were the eligibility criteria used for the project. Exclusion criteria included any patient receiving opioids for acute pain, post-operative care, cancer-related pain, or palliative care. Through review of each patient's Electronic Medical Record (EMR), the pharmacist determined who was excluded from the project.

The pharmacist gathered background health and demographic information on all patients through chart reviews of the most recent visit prior to the start of the intervention**.** Effective daily morphine milligram equivalent (MME) was also determined for each patient and was calculated according to 2016 CDC Guidelines.[1,21] For the purposes of this paper, we define effective daily MME as the total MME in a prescription divided by the number of days between prescription release dates, as reflected in the EMR. We define the prescribed daily MME as MME/day according to the written directions on the prescription. The effective daily MME, in contrast to the prescribed daily MME, reflects the actual amount of opioids used by a patient in a given period, versus the maximum allotted MME/day based on the written directions. This corrects for early or late refilling of chronic opioid prescriptions and provides a more accurate reflection of a patient's use of opioids when prescriptions are written with "as needed" signeturs.

The pharmacist also tracked chronic pain diagnoses and indicators reflecting responsible opioid prescribing, including up-to-date urine toxicology screens, up-to-date opioid contracts, and whether naloxone was indicated and prescribed. Indications for naloxone at the time of the intervention included MME/day ≥50, concurrent prescription of benzodiazepines, and/or history of aberrant use of opioids, including overdose[1] (note that 2022 guidelines for naloxone use have been updated and now also include sleep disorders, engaging in an opioid taper, and recent incarceration[9]). The pharmacist entered all of the above baseline information into a Microsoft Excel spreadsheet that we refer to as the patient registry. The patient registry was updated throughout the project as noted below and was always available to the

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intervention provider and pharmacist via the healthcare system's shared drive.

The pharmacist further assisted the intervention provider in drafting a letter that was sent to intervention patients in December 2019. The letter explained the provider's intent to focus on non-opioid therapies for management of CNMP, his goal of minimizing opioid use, and summarized the risks of LTOT. It also encouraged patients to schedule an appointment to discuss their plan of care. Once letters were sent, the pharmacist contacted the intervention patients to discuss the contents of the letter and explore their questions and concerns.

The pharmacist also obtained a baseline pain assessment during these calls using the Pain, Enjoyment, and General Activity (PEG) scale. The PEG is a three-item questionnaire that is utilized to track chronic pain intensity and interference; a lower score indicates better pain management and significant improvement is defined as a decrease of three points or more (see Figure 1).[22] It can be self-administered or completed in a telemedicine patient interview.[23] The PEG was available in the healthcare system's EMR and used routinely at the community pain clinic, but the intervention clinic did not routinely use the PEG or any other questionnaire regarding pain intensity and/or interference prior to this project. The pharmacist reviewed patient care plans and made initial recommendations for referrals and/or adjunct non-opioid pharmacologic therapies to the intervention provider through a telephone visit encounter in the EMR.

During the 18-month follow-up period, the intervention provider engaged patients in care plans that included tapering of opioids, initiation or changes in non-opioid medications, and referrals for further evaluation and/or treatment of CNMP. Provider referrals included physical therapy and complementary care, interventional pain procedures, specialty referral for evaluation and treatment of pain, and referral to a community pain clinic for comprehensive pain management. It is important to note the community pain clinic assumed opioid prescribing after referral but co-managed the care plans of these patients with the intervention provider. The intervention provider reviewed, discussed, and supported these care plans with the referred patients as needed. All care plans were developed consensually with each patient.

On a quarterly basis, the pharmacist tracked these interventions, as well as changes in effective daily MME, in the patient registry. The patient registry was always available to the intervention provider and was formally reviewed with them three times during the study period, or once every 6 months. Plans for opioid tapering were not based upon protocols or predetermined rates. The pharmacist recommended that tapering could reasonably proceed no more quickly than the CDC recommended rate of 10% of the original daily MME/month,[24] as long as there was no evidence of aberrant use. Nevertheless, the rate of tapering was at the discretion of the intervention provider and was patient-specific, taking into consideration progress with pain management.

The intervention provider was encouraged to use the PEG during follow-up visits, but the development of a process to incorporate regular use of such an assessment was not part of this initiative. The Minnesota Prescription Monitoring Program (PMP) was reviewed routinely for all intervention patients to determine whether they were receiving controlled substances not reflected in the EMR. This ensured safe prescribing of opioids and assisted in determining whether patients had transferred care to other providers.

The intention of the project was to compare outcomes for the entire patient panels of both the intervention and control providers, including all patients who transferred care or engaged in referral-based care. Therefore, primary and secondary outcomes were analyzed for all patients in the intervention and control group who continued management for CNMP during the 18-month period. Primary outcomes compared the intervention and control groups in terms of the following: absolute change from initial effective daily MME to final effective daily MME, percent change in effective daily MME, number of patients who tapered but did not discontinue opioid use during the study period, and number of patients who discontinued opioids.

Absolute change in effective daily MME is calculated by taking the difference between the patient's effective daily MME at the start-date of the project and at the end-date of the project 18 months later. The percent change in effective daily MME is calculated by dividing that difference by the starting daily MME and multiplying by 100. We define tapering of opioids during the 18-month period as a decrease in both the effective daily MME and the prescribed daily MME at the end of the study period. We define discontinuation of opioids as the cessation of opioid prescriptions for at least 30 days following the completion date of the last opioid prescription.

Secondary outcomes compared the intervention and control group in terms of the following: 1) indicators reflecting responsible opioid prescribing, 2) use of non-opioid pharmacologic therapies, 3) referrals for adjunct evaluation and treatment of chronic pain and 4) patient retention. Changes in pain intensity and interference were also analyzed for a subset of the intervention group that completed at least two PEG measurements during the project. For each of these patients, change in PEG was correlated and compared to change in effective daily MME between the time of the first and last measurement.

Several additional analyses were conducted in an effort to compare the care of patients who underwent an opioid taper exclusively with the intervention provider versus those who were engaged with the community pain clinic. We compared them in terms of number of patients discontinuing opioids,

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patients continuing to taper, and those diagnosed with opioid use disorder (OUD). We also compared the tapering rates of each group. These results were not compared statistically due to relatively small numbers.

Taper rate was determined by taking a patient's absolute change in effective daily MME divided by the number of months over which tapering occurred, dividing this by the initial effective daily MME, and multiplying by 100. This determined the percentage of the initial effective daily MME that was tapered each month. The average taper rate for the intervention provider was then determined by averaging the tapering rates of all their patients. A similar process was completed for patients who were co-managed with pain providers at the community pain clinic, but the initial effective daily MME for pain providers was the effective daily MME at the time they assumed opioid prescribing.

Analyses include descriptive statistics (means and standard deviations for continuous variables and counts and percentages for categorical variables). Comparisons between groups at baseline utilize 2-sample t-tests for continuous variables (or Mann-Whitney-Wilcoxon when normality assumptions were not met), and continuity-corrected chi-square tests (or Fisher's Exact test where expected cell sizes were <5) for categorical variables. All testing is two-sided and p-values < 0.05 are considered statistically significant. All analyses were conducted in SAS v9.4.[25]

Results

There were initially 33 patients on LTOT for CNMP in the intervention group and 45 patients on LTOT for CNMP in the control group. In each group, three were excluded from final analysis due to a malignancy, a death, and a move out-of-state. We ultimately compared 30 patients in the intervention group with 42 patients in the control group.

Diagnoses for which opioids were prescribed, based upon the International Association for the Study of Pain (IASP) categories,[26] are summarized in Table 1. There were no statistically significant differences between the two groups regarding the total number of primary versus secondary pain diagnoses. Baseline data were similar between groups (Table 2) except for the percentage of patients that met 2016 CDC Guidelines[1] for the prescribing of naloxone (19.1% control vs 43.3% intervention; p-value <0.05).

The intervention group had a larger reduction in mean effective daily MME over the 18 months, decreasing by 18.2 milligrams of morphine or 73.7% compared to 2.0 milligrams of morphine or 17.2% in the control group (p-value <0.0001) (see Table 3). Sixty percent of patients in the intervention group (n=18) discontinued opioids compared to 14.3% in the control group (n=6; p-value = 0.001). Those in the intervention group did so from a higher starting effective daily MME (average 24.1 mg versus 8.6 mg). The intervention patients discontinued opioids longitudinally throughout the 18 months. This is depicted in Figure 2. By the end of the study period, 83.3% (n=25) of the intervention group had tapered or discontinued opioids compared to 28.6% (n=12) in the control group (p-value < 0.0001).

Significantly more patients in the intervention group were referred to a specialist for evaluation and treatment of pain (28.6% control vs 60.0% intervention; p-value < 0.02). Other secondary outcomes were similar between groups (Table 4). In both groups, naloxone prescribing and prescribing of non-opioid medications increased. Patients in the control group improved their use of contracts for opioid prescribing and the intervention provider improved his completion of routine urine toxicology screening. One of 30 patients (3.3%) in the intervention group and one of 42 patients (2.4%) in the control group transferred to a different primary care provider owing to the inability to come to a shared decision regarding opioid prescribing and were not tapering at 18 months.

There were ultimately 15 patients in the intervention group that completed initial and follow-up PEG assessments. Three patients had a significant improvement in their scores, 11 improved but not to a significant degree, and one was significantly worse (Table 5). This patient was encouraged to engage in comprehensive care for chronic pain but declined. The mean percent decrease in effective daily MME for this subset of patients between their first and last PEG scores was 62.5%.

Of the 30 patients in the intervention group, nine were referred to the community pain clinic for co-management of CNMP. Of these, 44.4% (n=4) discontinued opioids (three completed a taper and one was diagnosed with OUD and declined buprenorphine therapy), 44.4% (n=4) were still engaged in an opioid taper, and 11.1% (n=1) were not tapering.

The remaining 20 intervention patients continued management of CNMP exclusively with the intervention provider. Of these 20 patients, 70% (n=14) discontinued opioids longitudinally throughout the project in a similar pattern to the entire intervention group. This comparison is reflected in Figure 2. Three of these 14 patients completed a taper per the intervention provider's direction (average initial effective daily MME of 36.0 mg) and nine self-discontinued prior to the end of their planned taper (average initial effective daily MME of 8.6 mg). For the nine patients who self-discontinued opioids, four stopped requesting refills after the provider requested a follow-up visit offered via telemedicine and five stopped requesting refills despite adherence to their care plans. Opioid prescriptions for 2 of the 14 patients were discontinued due to the identification of OUD during the project (average initial effective daily MME of 69.7 mg); both patients were strongly encouraged to engage in treatment for OUD, including buprenorphine therapy, which they declined. The other 30% (n=6) of the intervention patients who tapered exclusively with

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the intervention provider were still using opioids at 18-months: three were continuing their planned opioid taper (average initial effective daily MME of 22.6 mg) and the intervention provider opted not to taper the three remaining patients (mean initial effective daily MME of 10.0 mg) due to a shared decision between the intervention provider and the patient.

During the time that patients were engaged in tapering of opioids, the average opioid taper rate by the intervention provider was 6.3% of initial effective daily MME per month versus 7.8% per month for the providers at the community pain clinic.

The pharmacist tracked their time and estimated they spent roughly 50 hours during the 18-month study period providing recommendations, conducting patient calls, and doing data collection/chart review for the intervention provider's patients. Of note, these 50 hours only include time spent in activities that involved the intervention patients. This excludes any time dedicated to formal assessment of the quality assurance project, including tracking of control patients or any data that was needed to provide context to the patient population for the purposes of this project.

Discussion

The results of this quality improvement project demonstrate the feasibility of achieving the joint goals of improving management of CNMP and reducing or eliminating prescribed opioids as part of that management. The project was initiated by a physician who had excellent patient rapport and a conviction that focusing on non-opioid strategies for CNMP could provide better pain control than LTOT. However, they initially felt they had neither the training nor the support to reassess their management of CNMP.

The key component of success for this project was having a pharmacist-champion as a dedicated resource. They assisted the provider by first engaging patients through a letter summarizing the reasons for reassessment of their care plans, contacting the intervention patients to begin the discussion and encourage a visit with their provider, and then developing a patient registry that the provider could reference. The patient registry added to this project's success because it gave the provider a tool to help track patient outcomes and progress. The project was successful at decreasing opioid use and reflected an overall improvement in the management of CNMP.

The overall improvement in PEG in this project was consistent with findings that pain can either remain unchanged or improve when opioid tapers are done appropriately.[27-29] Additionally, in contrast to a previous study,[8] patients chose to continue care with the intervention provider in all cases but one. Contributing factors to these results likely included the intervention provider's strong patient relationships and their confidence that management of CNMP can be improved with strategies that include minimization of opioid use, a strong focus on non-pharmacologic and non-opioid pharmacologic strategies for CNMP, and individualized tapering rates. These considerations support a strategy of identifying and targeting such providers for optimal use of pharmacy resources in replication of this project. In addition, completion of a successful pharmacist-assisted intervention could lead to the development of a provider-champion for their colleagues.

This intervention did not require system-wide changes in the provider's primary care clinic, changes to clinic workflow, or clinic visits with a pharmacist. Additionally, while utilizing a pain clinic was an available resource in this intervention, two-thirds of the intervention patients declined referral. Those who did utilize the pain clinic had similar taper rates and reduction in prescribed opioids to those who were exclusively managed by the intervention provider. These findings suggest that lack of access to a pain clinic, system-wide operational changes, and/or the presence of an on-site pharmacist should not necessarily be barriers for individual providers to reevaluate their patients on LTOT.

Three of 30 intervention patients were diagnosed with OUD during the 18-month intervention period, compared to none of the control patients, a difference that may be a result of the intervention provider's increased attention to the risks of LTOT for CNMP.[30]

In addition to the analysis of the intervention provider's entire panel of patients, we further described the outcomes of the 20 patients who continued exclusive management of CNMP with the intervention provider. Three of these 20 patients never underwent a taper and continued relatively low doses of opioids. This finding demonstrates the intervention provider's individualized approach which is encouraged in the 2016 and 2022 CDC Guidelines and focuses on risk/benefit assessments. Additionally, nine of these 20 patients self-discontinued opioids before the end of their planned taper. Through use of the Minnesota PMP, the intervention provider and pharmacist were able to confirm that these patients were not receiving opioids elsewhere and were satisfied in utilizing non-opioid strategies for management of their chronic pain. This suggests that there may be patients who use opioids with little to no benefit and only need the recommendation from their provider or pharmacist to minimize their use.

Although the engagement of the pharmacist was limited to the intervention provider, the intervention clinic was relatively small (seven total providers) and there was no attempt to conceal the activities of the project from the control providers. While the control providers were unaware that their opioid prescribing would be used as a comparison in the analysis of the project, the intervention provider spoke freely with some of his colleagues about the project. This may have influenced the control providers and could potentially explain the improvements seen in opioid tapering and adherence to opioid prescribing guidelines throughout the clinic during the time of

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the project. This can be seen as an added benefit to such an initiative.

Limitations

The average starting effective daily MME of the intervention group was lower than that reflected in other successful studies for opioid tapering.[28, 29] Specifically, no intervention patients had an effective daily MME >90 and the mean effective daily MME of patients who self-discontinued opioids was lower than those who followed their planned taper. A provider with a higher prescribed mean daily MME will likely have more challenges as they embark on opioid tapering.

The PEG assessments were only completed on 50% of the intervention patients due to inability of acquiring a follow-up measurement. While it is widely recommended that measurements of pain intensity and interference and/or risk/benefit analysis of opioid prescribing be used when prescribing LTOT,[1, 9, 31] it is recognized that they are not typically used in primary care.[32, 33] Identified barriers for providers include time constraints and lack of easy access to assessment tools.[34, 35] While the PEG was embedded in the healthcare system's EMR for this project, the intervention provider identified these same barriers. We did not develop a process to ensure use of formal measurements for this project and other healthcare systems may not have these assessments readily available in their EMRs.

Finally, as a pilot project, this initiative engaged just one provider with a manageable panel of patients on LTOT for CNMP. Further replications or comparisons with larger numbers of patients and providers would assist in generalizability of these results.

Conclusion

This intervention offers a straight-forward, pharmacist-driven approach to improving management of chronic pain while minimizing opioid use. It fosters patient-centered care for CNMP that is central to the November 2022 CDC Clinical Practice Guidelines for Prescribing Opioids for Pain. The pharmacist offered an efficient strategy of recommendations and feedback that did not necessitate system-wide changes, leadership support within the healthcare system, or additional educational engagement by the intervention provider. This makes the strategy widely available to pharmacists and primary care providers.

Unlike other pharmacy initiatives, this project targeted a motivated provider and capitalized on this provider's commitment to success. The provider was convinced that care according to CDC guidelines was appropriate for their patients on LTOT for CNMP, but felt they could not embed this into their practice without clinical assistance. The availability of the pharmacist in this project offered the intervention provider not only assistance in the management of their patients, but a sense of support for clinical situations as they arose.

The results of this project suggest several next steps. First, a pharmacist could develop a process for identification of motivated providers, either through a brief survey or through formal or informal meetings with primary care providers. Second, engagement with multiple motivated providers would likely increase the efficiency of the pharmacist's work, as the providers could provide additional support to each other. Finally, a pharmacist could assist with the development of a process within a provider's workflow to routinely complete a PEG or a similar assessment of pain intensity and interference with opioid prescribing.

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Table 1. Diagnoses per IASP Classification

	Control Group (n=42)	Intervention Group (n=30)
Chronic Primary Pain Diagnosis	n=8	n=3
Fibromyalgia	2	1
Chronic primary headache/orofacial pain	2	0
Chronic primary non-specific musculoskeletal pain	4	2
Chronic Secondary Pain Diagnosis	n=34	n=27
Chronic post-surgical or post-traumatic pain	9	10
Chronic neuropathic pain	5	4
Chronic secondary headache or orofacial pain	0	1
Chronic secondary visceral pain	1	2
Chronic secondary musculoskeletal pain	19	10

Table 2. Baseline Health and Demographic Data

	Control Group (n=42)	Intervention Group (n=30)	P-value*
Age in years, *mean (SD)*	*59.9 (13.2)*	*65.5 (9.8)*	0.0528 (T)
Gender, *n (%)*			0.9999 (C)
Female	*25 (59.5%)*	*17 (56.7%)*	
Male	*17 (40.5%)*	*13 (43.3%)*	
Most recent BMI, *mean (SD)*	*30.5 (7.4)*	*28.9 (6.0)*	0.3087 (T)
Most recent PHQ-9, *mean (SD)*	*6.5 (6.1)*	*5.4 (4.1)*	0.4335 (T)
Most recent GAD-7, *mean (SD)*	*9.0 (6.7)*	*9.6 (7.5)*	0.7915 (T)
Alcohol use, *n (%)*	*12 (28.6%)*	*15 (50.0%)*	0.1085 (C)
History of tobacco use, *n (%)*	*28 (66.7%)*	*20 (66.7%)*	0.9999 (C)
Current tobacco use, *n (%)*	*9 (21.3%)*	*12 (40.0%)*	0.1481 (C)
OSA, *n (%)*	*5 (11.9%)*	*7 (23.3%)*	0.2186 (F)
Treated for OSA, *n/N (%)*	*4/5 (80%)*	*4/7 (57.1%)*	0.5758 (F)
Currently taking benzodiazepine, *n (%)*	*5 (11.9%)*	*7 (23.3%)*	0.2186 (F)
Currently taking non-benzodiazepine hypnotic, *n (%)*	*5 (11.9%)*	*2 (6.7%)*	0.6915 (F)
Currently taking stimulant, *n (%)*	*0 (0%)*	*2 (6.7%)*	0.1702 (F)
History of illicit drug use, *n (%)*	*2 (4.8%)*	*2 (6.7%)*	0.9999 (F)
Naloxone indicated for patient, *n (%)*	*8 (19.1%)*	*13 (43.3%)*	0.0486 (C)
Naloxone prescribed for patients where naloxone is indicated, *n/N (%)*	*2/8 (25.0%)*	*5/13 (38.5%)*	0.6557 (F)
Current contract for opioid use on file, *n (%)*	*32 (76.2%)*	*28 (93.3%)*	0.0633 (F)
Current urine toxicology screen on file, *n (%)*	*30 (71.4%)*	*19 (63.3%)*	0.6384 (C)
Currently prescribed non-opioid medication for pain, *n (%)*	*23 (54.8%)*	*18 (60.0%)*	0.8406 (C)

***** P-values were derived from: 2-sample t-test (T); Continuity-adjusted chi square test (C); or Fisher's Exact test (F)

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Table 3. Effective MME Summaries by Group and Time

	Control Group (n=42)		Intervention Group (n=30)		P-value between groups at baseline	P-value between groups at 18 months
	Baseline	18 months	Baseline	18 months		
Effective MME, *mean (SD)*	*16.5 (14.2)*	*14.5 (14.5)*	*25.2 (22.2)*	*7.0 (13.2)*	0.1970 (M)	0.0009 (M)
Change in MME from baseline, *mean (SD)*		*-2.0 (5.9)*		*-18.2 (21.1)*		< 0.0001 (M)
Percent change in MME from baseline, *mean (SD)*		*-17.2% (43.4%)*		*-73.7% (36.4%)*		< 0.0001 (M)
Patients who discontinued opioids, n (%)		6 (14.3%)		18 (60%)		0.0001 (C)
Patients who discontinued opioids or are tapering, n (%)		12 (28.6%)		25 (83.3%)		< 0.0001 (F)

* P-values were derived from: Mann-Whitney-Wilcoxon test (M); or Fisher's Exact test (F); or Continuity-adjusted chi square test (C)

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Table 4. Secondary Outcomes by Group and Time Period

	Control Group (n=42)		Intervention Group (n=30)		P-value b/w groups at 18 months
	Baseline	18 Months	Baseline	18 Months	
Naloxone indicated for patient, *n (%)*	*8 (19.1%)*	*8 (19.1%)*	*13 (43.3%)*	*10 (33.3%)*	0.2695 (C)
Naloxone prescribed for patient when indicated, *n/N (%)*	*2/8 (25.0%)*	*4/8 (50.0%)*	*5/13 (38.5%)*	*6/10 (60.0%)*	0.9999 (F)
Contract for opioid use up-to-date, *n (%)*	*32 (76.2%)*	*33 (84.6%)*	*28 (93.3%)*	*27 (90.0%)*	0.7216 (F)
Urine toxicology screen up-to-date, *n (%)*	*30 (71.4%)*	*23 (59.0%)*	*19 (63.3%)*	*24 (80.0%)*	0.1102 (C)
Currently prescribed non-opioid pain medication, *n (%)*	*23 (54.8%)*	*29 (69.1%)*	*18 (60.0%)*	*23 (76.7%)*	0.6565 (C)
Referred for evaluation and treatment of chronic pain, *n (%)*	*N/A*	*12 (28.6%)*	*N/A*	*18 (60.0%)*	0.0153 (C)
Referred for interventional pain procedure, *n (%)*	*N/A*	*4 (9.5%)*	*N/A*	*1 (3.3%)*	0.3932 (F)
Transferred care to another provider, *n (%)*	*N/A*	*1 (2.4%)*	*N/A*	*1 (3.3%)*	Not calculated

***** P-values were derived from: Continuity-adjusted chi square test (C); or Fisher's Exact test (F)

Table 5. PEG scores

	Baseline PEG Obtained (n=15)	Final PEG Obtained (n=15)
PEG*, mean (SD); median*	*5.93 (1.76); 6.33*	*4.65 (2.72); 4.00*
Change in PEG from baseline, *mean (SD); median*		*-1.29 (1.98); -0.66*
MME, *mean (SD); median*	*27.88 (24.69); 19.85*	*12.77 (13.71); 7.50*
Change in MME from baseline, *mean (SD); median*		*-15.11 (17.84); -7.80*
Percent change in MME from baseline*, mean (SD*); *median*		*-62.5% (36.3%); -62.22%*
Individual patients' trend in PEG, n		
Improved (score decreased by ≥ 3)		3
No change (score changed +0.1 to -2.99)		11
Worsened (score increased by ≥ 0.11)		1

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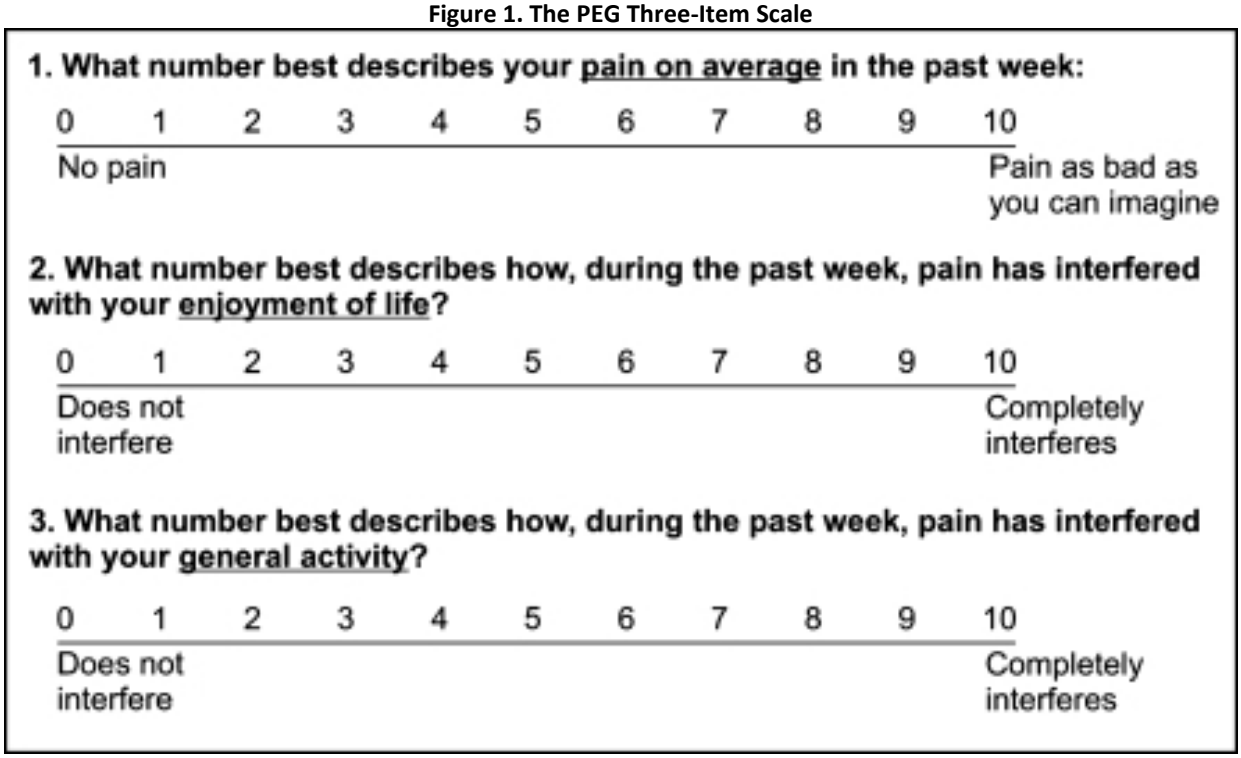
Figure 1. The PEG Three-Item Scale



***The average of the individual items scored is taken to get an overall PEG score (potential range 0–10).*

From Krebs EE, Lorenz KA, Bair MJ, et al. Development and initial validation of the PEG, a three-item scale assessing pain intensity and interference. *J Gen Intern Med*. 2009;24(6):733-738. doi:10.1007/s11606-009-0981-1

Figure 2. Patients in Intervention Group Continuing to Receive Opioids Over 18-Month Period