Chronic pain management in primary care can be difficult due to worries about drug abuse and the subjective nature of pain. Indeed, one study (of patients in rural Appalachia) found that more than a third reported non-medical use of OxyContin, methadone, hydrocodone, benzodiazepines, and marijuana in the prior 30 days. While the number of chronic pain patients abusing opioids is probably lower than providers perceive, it can be difficult for even seasoned providers to differentiate legitimate opioid use from substance abuse or pseudo-addiction, in which patients with undertreated pain appear to be drug-seeking. Difficulties prescribing treatment for chronic pain is further complicated in family medicine teaching programs where patients often see different resident physicians on different occasions.

A number of tools have been created to help identify patients in need of more optimal opioid medication management. Chabal and colleagues identified the following sentinel conditions that indicate inappropriate use of pain medications: (1) overwhelming focus on opioid issues beyond the third clinic session, (2) pattern of early refills or escalating doses despite no acute change in medical condition, (3) multiple telephone calls or visits regarding refills or problems associated with the opioid prescription, (4) lost, spilled, or stolen medication, and (5) documented supplemental sources for opioids.

We hypothesized that use of an insurance database could further assist in identifying patients with ineffective pain management, whether from addiction, using medication as a coping mechanism, pseudo-addiction, improper dosing, or an underlying psychiatric disorder. We describe a population of patients receiving opioids prescribed in an outpatient family medicine practice that includes a family medicine residency program.

From the Marquette Family Medicine Residency Program, Marquette, Mich (Drs Braker and Reese); Lakewood Family Healthcare, Lake Odessa, Mich (Dr Braker); Marquette General Hospital, Marquette, Mich (Dr Reese); Central Lakes Clinic, Crosby, Minn (Dr Card); and Department of Pediatrics and Human Development, Michigan State University College of Human Medicine, Marquette, Mich (Dr VanHowe).
ing patient medical records and prescriptions-filled data from the insurance company, we developed a model to predict patients in need of further management based on the number of opioid prescriptions filled.

**Methods**

**Subjects and Setting**

Family Care Doctors (FCD) is a large family medicine group in Marquette, Mich, a rural community with a population of 20,000 in a county with a population of 65,000, a state university with more than 9,000 students, and a referral hospital. The practice is staffed by 18 family medicine residents, six family medicine faculty, and five family medicine attending providers. In 2005, the practice had approximately 30,000 patient visits. Approximately 29% of patients were insured through Medicare, 16% through Medicaid, 5% self-pay, and the remainder from various other insurers. Faculty and attending physicians staff the regional substance abuse unit with the patients returning to their referring physician on discharge.

The Upper Peninsula Health Plan (UPHP), a Michigan Medicaid health maintenance organization (HMO), agreed to release payer information for patients of UPHP, including patient names, the number of prescriptions, and provider information for each patient receiving three or more prescriptions from two or more providers in the 6-month period of January through June 2003. We believed these inclusion criteria would catch a large percentage of the population of interest without being too inclusive.

Patients receiving opioid pharmacotherapy for short duration (less than a month), such as following surgery or an acute injury, and patients with a cancer diagnosis were excluded. Examination of payer data prior to the study also showed a natural separation in the population when opioids were prescribed for longer than a month. Prescribers outside of FCD, such an emergency department physicians and specialists, were included when tabulating the number of physicians prescribing opioids for a given patient.

**Chart Abstraction and Procedures**

Based on a literature search, which included a PubMed search using “opioid abuse,” “prescription drug abuse,” “narcotic abuse,” and “chronic pain,” while excluding “cancer” and “neoplasm” and followed by a search of lay materials using Google in 2004, multiple objective criteria for screening patient charts for evidence of ineffective pain management were identified. These criteria were pooled to create a chart-screening tool that could be used by staff with little or no medical training.

The data collected included: (1) sex, (2) age, (3) medical management agreement (MMA), (4) allergy to nonsteroidal anti-inflammatory drugs (NSAIDs), (5) history of substance abuse (as documented by urine toxicology screen, overdose, referral/admission to detoxification unit, signs of alcohol withdrawal, or listing in the problem list at the front of the chart), (6) pain site (including low back, diabetic neuropathy, spinal stenosis, facial pain, injury-related pain, degenerative joint disease, headache, and other), (7) proper prescription documentation in the chart (each prescription in the payer database from a FCD physician needed to be documented), (8) use of non-opioid analgesics in addition to opioid pain medication, (9) use of four or more different opioids during the 6-month period, (10) increasing doses of medication, (11) three or more messages regarding opioid medication, (12) request for early refill, (13) number of prescribers (treated as a continuous variable), (14) number of prescriptions for opioids, and (15) report of lost or stolen prescriptions.

A MMA is a pain management agreement that addresses conditions under which controlled substances will be prescribed to patients. If patients violate the terms of the agreement, they are no longer prescribed controlled substances by the practice.

Charts of patients identified in the UPHP database were reviewed by one of two family medicine residents. Because the data collected did not require interpretive judgments, interobserver variability was not assessed.

**Data Analysis**

Population percentages and their 95% confidence intervals were calculated. Likewise, the distributions and standard deviations of continuous variables were assessed. Continuous outcome variables were evaluated using linear regression analysis and the Satterthwaite method t test. Multivariate models were developed using stepwise regression using a threshold P value of 0.10. Dichotomous variables were compared using the Mantel-Haenszel Chi-Square and Fisher’s exact tests. Multivariate analysis was performed and receiver operating characteristic (ROC) curves were generated using logistic regression. All variables were examined as potential predictors. All calculations were performed using SAS, version 8.02 (SAS Institute, Cary, NC).

Using the data collected and the multivariate logistic regression model generated, we developed a score using the variable parameters in the model and determined its accuracy in predicting whether an individual patient received greater than six opioid prescriptions in a 6-month span. An ROC curve was generated for the score. These curves plot sensitivity against 1 minus specificity for each of the scores. If the area under the curve is 1.0, the model is a perfect prediction tool. An area under the curve of 0.5 is as accurate as chance alone. The point on the curve closest to the upper right hand corner is considered to have the best balance of sensitivity and specificity. The positive likelihood ratio
(sensitivity/(1-specificity) for this point can be calculated. A likelihood ratio of greater than 5 is considered diagnostically useful.

**Human Subjects Review**

The study protocol was approved by the Marquette General Hospital Institutional Review Board. There was no project-specific official business agreement between UPHP and FCD. UPHP assured HIPAA compliance.

**Results**

Sixty-one patients met the inclusion criteria. Their demographic characteristics are shown in Table 1. Seventy percent of the patients were female. Forty-one percent were between the ages of 20 and 35, and 76% were under age 50. Low back pain was the most common pain complaint, accounting for 61% of the patients in the study. More than one third (35%) of the patients had a history of substance abuse.

An MMA restricting the patient to one provider and one pharmacy was present in nine of the charts; 80% of these patients had a history of drug abuse. The nine patients with MMAs were more likely than those without MMAs to have increasing medication dosages (OR=7.3, 95% CI=1.6–34.2), six or more prescriptions (OR=7.4, 95% CI=0.8–63.5), 4.16 more prescriptions on average (95% CI=0.4–8.0), and receive care from 1.5 more providers (95% CI=0.3–2.8). Patients with a MMA were also more likely to have a history of substance abuse (OR=4.8, 95% CI=1.06–21.8).

Proper documentation of the prescriptions, when checked against the payer information, occurred in 55.4% of the patients. The number of prescriptions for opioids for a single patient in this 6-month period ranged from three to 28, with a mean of 8.4 (SD=5.5). Sixty-four percent of the patients had more than six prescriptions. The number of prescribers ranged from two to 10 with a mean of 3.7 (SD=1.8). The number of providers was positively correlated with prescription number ($\beta=1.16$, $r^2=0.15$, $t=3.17$, $P=0.002$) (Figure 1). Only two patients had four or more different types of opioid medications in the 6-month period, but they had on average 7.5 providers ($P=0.04$).

NSAID allergy was noted in 14.8% of patients. About half of patients used non-opioid analgesics (45.5%, 95% CI=32.3%–58.6%). Patients who used non-opioid analgesics had, on average, 3.2 fewer prescriptions (mean 6.5 versus 9.7, $t=2.60$, $P=0.01$) during the 6-month period. Conversely, patients who used opioids alone were four times as likely to have six or more prescriptions in the 6-month period (OR=4.3, 95% CI=1.4–13.2).

Frequent telephone messages regarding opioid medication (three or more messages) occurred in 13 patients (23%). These patients had on average two more prescriptions per 6 months than other patients ($P=0.04$), were 17 times more likely to request early refills (OR=17.6, 95% CI=2.9–105.2), and also were more likely to receive increasing doses of medication (OR=6.5, 95% CI=1.6–27.4).

Using a linear regression model, three variables were significantly correlated with the number of prescriptions (Table 2). A multivariate logistic regression model and ROC curve to predict whether a patient would fill more than six prescriptions in a 6-month period indicated that the area under the curve was 0.79 (Figure 2, Table 3). The point closest to the upper right hand corner of Figure 2 had a sensitivity of 0.82 (95% CI=0.68–0.96), a specificity of 0.70 (95%CI=0.53–0.88), and a positive likelihood ratio of 2.77.

**Discussion**

Chronic pain patients identified using the UPHP database were predominantly young women with back pain. Approximately one third had a substance abuse history, and most did not have an MMA. Frequent telephone messages were associated with increased numbers of prescriptions and increasing doses. Patients with higher numbers of opioid prescriptions were characterized by lack of non-narcotic medications, increasing doses of narcotics, and a greater number of providers.
We believe that use of information from insurers, such as the UPHP database, can be useful for providers. According to the DEA, the majority of states have active or planned prescription drug monitoring programs using information captured electronically at the point of sale.\textsuperscript{7,8} In Michigan, the Michigan Automated Pharmacy Program (MAPS) provides prescription-filled information to providers and pharmacies within 24 business hours. Accessing this information from a combination of sources could be used to identify patients in need of improved pain management.

During the time period of the study, FCD office policy mandated that patients receiving controlled substances on a chronic basis should have an MMA. We were thus surprised at the small number of agreements. Our MMA stipulates that the patient receive prescriptions from one provider once per month, filling them at only one pharmacy, and random urine testing may be performed. Possible explanations for the low number of MMAs and providers not adhering to terms of the MMA include forgetting to complete an MMA, patients seeing multiple providers, or the patient being prescribed opioids only during the short duration of the study. Since completion of the study, FCD has strengthened its policies and now requires that all patients receiving multiple opioids prescriptions agree to and sign an MMA; compliance is now nearly 100%.

The association between an MMA and an increased number of prescriptions was the opposite of what we expected. While aggressively moving toward an appropriate dose of medication will increase the number of prescriptions, we believe this association more likely reflects the difficulty in managing these patients, 80% of whom have a history of drug abuse, and may represent a selective group that providers have identified as more difficult to manage. The agreements were not successful in reducing the number of prescriptions, the number of providers, or the risk of dose escalation.

The association between using non-opioid analgesics with decreased numbers of opioid prescriptions suggests that either non-opioid agents are effective for pain management or that those interested in specifically procuring more opioids forgo the use of non-opioid analgesics. This is a question that requires further study. Alternatively, patients receiving non-opioids may have less pain requiring fewer opioid prescriptions.

The association between frequent telephone messages and increased prescriptions and doses,
which has been documented in other studies,\textsuperscript{4,6} could result from patients being titrated to an effective dose or a lack of responsiveness of the practice to a patient’s pain needs. We speculate that the most likely scenario is that those abusing or diverting opioids were attempting to secure additional medication. Further research is needed to verify our suspicions.

We were concerned by our finding that only 55% of the patients had proper chart documentation. Improper documentation coupled with providers refilling prescriptions for each other’s patients can result in medications being inappropriately prescribed. Consequently, errors can result in liability claims.\textsuperscript{9} Limiting a patient to only one provider and proper documentation could help address this issue.

Limitations

There were several limitations of this study. Reliance on payer data that only captures patient prescriptions for which reimbursement was sought would miss cash sales. Individuals intent on diverting opioids for sale or wishing to use the medication for non-medical reasons could pay cash to avoid discovery. Fortunately, these purchases can be monitored using pharmacy data but only as long as buyers use their own name.

A second weakness is that by using the criterion of three or more prescriptions from two or more providers in a 6-month period, we potentially oversampled a population with identified risk factors associated with problem drug use. Similarly, our inclusion criteria missed patients with ineffective pain management or opioid abuse who receive medication from only one provider. In addition, patients receiving more frequent prescriptions with smaller quantities or multiple prescriptions to titrate the proper dose would be included as patients potentially in need of more optimal care.

Our study is also limited in its generalizability to clinics that are not staffed by both residents and faculty. Residents have limited
and inconsistent clinic hours. Inexperienced residents, like others physicians new to any community, can be targets for drug-seeking patients as they are perceived as naïve, trusting, and easily manipulated. Continuity between patients and physicians is a persistent challenge and makes establishing and enforcing narcotic contracts difficult. This is true, however, for all family medicine teaching practices, and these data may be particularly relevant for teaching programs.

The relative small study size and the characteristics of a population treated by a family medicine residency program may also limit the usefulness of our predictive model. Modeling, by its nature, fits the data on which it is based. Since little study of this issue has taken place, the predictability and validity of our modeling needs to be assessed in other settings. The low positive likelihood ratio indicates that these factors are reasonable for screening but little else.

Finally, our faculty and attending physicians staff the regional substance abuse unit, so the practice attracts a disproportionate number of patients with substance abuse comorbidities.

Conclusions

This study was designed to provide a mechanism for identifying a population at risk. We have identified potential red flags to alert the provider and insurance company of a potential problem, the most important of which is when patients obtain opioid prescriptions in numbers that exceed the number expected. The cause of the problem may be inadequate pain relief, pseudo-addiction, diversion, or addiction.

Once the potential for a problem has been identified, it up to the providers to determine its cause and address the cause. The problem of inadequate pain control in the context of potential prescription opioid diversion and abuse is ongoing and can be quite frustrating to providers, pharmacists, and insurance companies alike.

Cooperation between insurance companies and providers may help detect patients at risk for ineffective pain management or opioid abuse. We believe that greater attention to implementation of MMAs, accurate chart documentation of narcotic prescriptions written, greater use of concurrent non-opioid medications, and monitoring for dose escalation at the practice level should be encouraged.

Corresponding Author: Address correspondence to Dr Van Howe, 413 E. Ohio Street, Marquette, MI 49855. 906-228-7454. vanhowe@miuplink.net.

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