INTRODUCTION

Chronic pain is a common problem encountered by primary care physicians and is associated with depression, unemployment, difficulty in personal relationships, impaired quality of life, and more frequent interactions with the healthcare system. A growing number of patients are receiving prescription opioids for treatment of chronic pain despite the lack of good evidence for long-term efficacy or improvement in functional status. In addition, the increase in opioid prescriptions for chronic pain has been associated with an increase in the abuse of these medications and an increase in the number of deaths from opioid overdose.

Some patients receiving prescription opioids exhibit aberrant medication-taking behaviors, which may or may not be associated with active substance use disorders. Aberrant behaviors include reporting lost or stolen medication, receiving opioids from other providers, escalation in dosage without physician consent, and running out of medication early; these behaviors are concerning but may not indicate addiction. Indicators of substance misuse, or behaviors or findings that may be more suggestive of addiction, include selling medication, positive urine drug testing, and overdose.

ABSTRACT

Objective: To compare rates of opioid prescribing, aberrant behaviors, and indicators of substance misuse in patients prescribed long-term opioids by resident physicians or attending physicians in a general internal medicine practice.

Design: Medical records of 333 patients who were prescribed opioids for at least three consecutive months were reviewed. Aberrant behaviors over a 2-year period were documented, including reporting lost or stolen medications or receiving opioids from more than one provider. Indicators of substance misuse were also recorded, including positive urine drug testing for illicit substances, addiction treatment, overdose, and altering prescriptions.

Results: An estimated 13.6 percent of the patients followed by residents had been prescribed opioids for three or more months; this was significantly higher than the rate for attendings (5.9 percent, p < 0.001). Patients followed by residents were more likely to have reported lost or stolen prescriptions or medication (25.7 percent vs 12.2 percent, p = 0.03) or to have received opioids from another provider (17.8 percent vs 7.6 percent, p = 0.008); they were also more likely to exhibit an indicator of substance misuse (24.8 percent vs 7.6 percent, p < 0.001). However, in multivariate analyses, aberrant behaviors and indicators of substance misuse were not significantly associated with having a resident physician.

Conclusions: Resident physicians at our institution are following a disproportionate number of patients on long-term opioids, many of whom exhibit aberrant behaviors and indicators of substance misuse. This underscores a need for better resident training and supervision to provide effective and safe care for patients with chronic pain.
Physicians-in-training may have even more challenges in treating patients with chronic pain and addressing aberrant behaviors and substance misuse. Internal medicine residents report a lack of preparation and confidence in managing chronic noncancer pain. Furthermore, having patients with chronic pain negatively impacts a resident’s view of his or her outpatient clinic experience and of primary care as a career choice.

At our institution, there was an impression among supervising attendings that residents were seeing a disproportionate number of patients on long-term opioids and that many of these patients were exhibiting behaviors that were concerning for opioid misuse. To investigate this further, we conducted a chart review to compare the rates of long-term opioid prescribing as well as the frequency of aberrant behaviors and indicators of substance misuse among patients on long-term opioids being treated by resident physicians as compared to patients being treated by attending physicians.

**METHODS**

The study was conducted in the General Internal Medicine practice at Johns Hopkins Bayview Medical Center in Baltimore, MD. In this practice, both attending general internal medicine physicians and internal medicine residents are primary care providers. Attending physicians and internal medicine residents share a common physical space and support staff. Nurses coordinate prescription refill requests and maintain a log of controlled substance prescriptions, which was created to monitor prescription refills. The combined practices use a standard controlled substance agreement; this agreement outlines expectations for patients receiving opioid prescriptions, including that they are to take their medications as prescribed, that they are responsible for the safekeeping of their medications, that they are not to obtain opioids from other providers, and that opioids could be discontinued for violations of the agreement. During this time period, other than the controlled substance agreement, there were no other specific policies in place regarding opioid prescribing or monitoring of patients receiving opioid prescriptions. UDT could be ordered at the discretion of the provider but was not performed regularly or outlined in the controlled substance agreement.

Patients who received at least one prescription for an opioid during 2007 were identified from the controlled substances log and after review of their medical records, were included if they received an opioid prescription for three or more consecutive months. Electronic and paper records were reviewed by two of the authors to identify the primary care practitioner and to collect demographic information, including age, gender, and type of insurance. We also recorded the primary diagnosis for which the patient was being treated with opioids, lifetime history of substance use disorders, current smoking, any documentation of an active psychiatric diagnosis, and types of opioids prescribed (short acting or long acting). Notes for all inpatient and outpatient encounters during a 2-year period were reviewed to see if any aberrant medication-taking behaviors were reported. Laboratory records were reviewed for UDT. Prescription refill requests were also reviewed to see if the patient reported lost or stolen medications or running out of medication early.

The primary outcome measures were prospectively divided into the following two categories: 1) aberrant behaviors and 2) indicators of substance misuse. We defined aberrant behaviors, or behaviors that are concerning but may not indicate an active substance use disorder, as 1) reporting lost or stolen medications, 2) reporting that medication ran out earlier than expected, and 3) receiving opioid medications from more than one provider concurrently (ie, from a provider outside the general medicine practice). We defined indicators of substance misuse, or behaviors or findings more suggestive of addiction or an active substance use disorder, as 1) reports of selling or sharing medications (by either the patient or others), 2) obtaining nonprescribed psychoactive medications from others, 3) forging or altering a controlled substance prescription, 4) reports of overdose or intoxication, 5) positive UDT for a nonprescribed opioid, stimulant or sedative, and 6) receiving substance abuse treatment (detoxification or entering opioid
The number of patients followed by a resident or attending physician was estimated through appointment records. The computer scheduling system does not assign patients to a particular physician; therefore, it could only provide data on the number of unique patients seen by each physician. The total number of unique patients seen by all physicians was higher than the total number of patients in the practice because patients who were seen by more than one physician were counted more than once. We sought to correct for this overcounting by estimating the number of patients seen by each physician type (resident or attending). We calculated the estimate by multiplying the total number of patients seen by all the physicians in one group (resident or attending) by the ratio of the total number of unique patients divided by the total number of patients seen by all the physicians in both groups (resident and attending). For example:

Total number of patients seen by all the resident physicians × (total number of unique patients ÷ total number of patients seen by all physicians in both groups) = estimated number of patients cared for by resident physician providers.

Bivariate analysis was used to analyze the association between provider type (resident or attending physician) and demographic factors, aberrant behaviors and indicators of substance misuse. Chi-square tests were used to analyze categorical variables and t-tests for continuous variables. Bivariate analysis and multivariate analysis were used to analyze factors that were associated with aberrant behaviors and indicators of substance misuse; for each, we analyzed the following independent variables: physician type, patient age ≤ 50, gender, insurance type (commercial or other), history of substance use disorder, current smoking, active psychiatric diagnosis, receiving short-acting opioids and back pain as the primary diagnosis. These variables were chosen based on hypothesized associations and previous research. For the multivariate analysis, we only included factors with a p value ≤ 0.1 on bivariate analysis. The multivariate models were further analyzed with the Hosmer and Lemeshow goodness-of-fit test. Analysis was performed using PASW software version 18 (SPSS Inc., Chicago, IL). This study was approved by the Johns Hopkins Institutional Review Board.

RESULTS

Prescribing rates

A total of 333 patients received three or more consecutive months of prescription opioids; 131 were followed by an attending physician and 202 by a resident physician. As mentioned earlier, the total number of unique patients seen by all physicians was higher than the total number of patients in the practice because patients who were seen by more than one physician were counted more than once. A total of 3,721 unique patients were seen in the combined practices in 2007 and the number of unique patients seen by each physician totaled 4,520; the ratio between these two numbers was 0.823. A total number of 1,809 unique patients were seen by the resident physician group, and a total number of 2,711 unique patients were seen by the attending physician group. Multiplying the total number of unique patients seen by each physician group (resident or attending) by the factor of 0.823 yielded an estimate of 1,489 patients followed by residents and 2,231 by attendings. Using these estimates, 13.6 percent of patients followed by a resident were prescribed long-term opioids compared with 5.9 percent of the attending patients; this difference was statistically significant (p < 0.001).

Demographic characteristics

Demographic characteristics of each patient group are given in Table 1. Patients followed by the residents were less likely to have commercial insurance and were more likely to have Medical Assistance, Medicare, or to be uninsured. Resident patients were significantly younger than those followed by an attending. Resident patients were more likely to have a lifetime history of a substance use disorder and to be current smokers. In addition, patients seeing resident physicians were more likely to receive short-acting opioids than patients seeing attending. There were no significant difference in the rates of pain-related diagnoses between the two groups, except for diffuse pain syndromes (fibromyalgia and inflammatory polyarthritis), which were more common in the attending panel. In both the groups, the most common diagnosis for patients receiving prescription opioids was back pain and less than 4 percent were receiving opioids for treatment of pain due to cancer.
Aberrant behaviors

Data on aberrant behaviors are provided in Table 2. Resident patients were more likely to have displayed a least one instance of aberrant behavior and to have reported lost or stolen prescription or medication; they were also more likely to have received opioids concurrently from an outside provider.

Indicators of substance misuse

Indicators of substance misuse were documented in 24.8 percent of resident patients and 7.6 percent of attending patients (p < 0.001). Data on rates of
specific indicators are provided in Table 2. Patients followed by residents were significantly more likely to have a positive urine drug test for a nonprescribed opioid, stimulant or sedative, and were more likely to have had a report of overdose or intoxication. Other specific indicators were also higher among patients followed by a resident, but the differences were not statistically significant. Of the 60 patients in the combined cohorts with an indicator of substance misuse, 39 (65.0 percent) also exhibited an aberrant behavior. During this 2-year period, opioids were discontinued due to concerns about abuse in 11.4 percent of the patients on long-term opioid therapy followed by a resident, compared with 4.6 percent of the patients followed by an attending (p = 0.045).

**Bivariate and multivariate analyses**

The results of the bivariate and multivariate analyses of factors associated with aberrant behaviors and indicators of substance misuse are given in Table 3; odds ratios are provided for the bivariate analyses and adjusted odds ratios for the multivariate analyses. In bivariate analyses, aberrant behaviors were significantly associated with a history of a substance use disorder, current smoking, age ≤ 50, chronic back pain, active psychiatric diagnosis, and being followed by a resident physician. In multivariate analyses, a history of a substance use disorder, current smoking, age ≤ 50, and back pain were still associated with aberrant behaviors, but being followed by a resident physician was no longer associated with these behaviors. Indicators of substance misuse were associated with a history of a substance use disorder, age ≤ 50, current smoking, being followed by a resident physician, active psychiatric diagnosis, and having no insurance or coverage other than commercial insurance on bivariate analysis. In multivariate analyses, only history of a substance use disorder, age ≤ 50, and active psychiatric diagnosis were still significantly associated with indicators of substance misuse; being followed by a resident physician was no longer significant. The Hosmer and Lemeshow goodness-of-fit test showed a p value of 0.087 for the aberrant behaviors and 0.694 for the indicators of substance misuse.

**DISCUSSION**

Our results highlight the challenges that residents face in dealing with patients on long-term opioid

<table>
<thead>
<tr>
<th>Table 2. Aberrant behaviors and indicators of substance misuse</th>
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<tbody>
<tr>
<td><strong>Attending (percent) (131)</strong></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Aberrant behaviors*</td>
</tr>
<tr>
<td>Lost or stolen medication or prescription</td>
</tr>
<tr>
<td>Receiving opioids from other providers</td>
</tr>
<tr>
<td>Run out of medication early</td>
</tr>
<tr>
<td>Indicators of substance misuse*</td>
</tr>
<tr>
<td>Positive UDT</td>
</tr>
<tr>
<td>Overdose or intoxication</td>
</tr>
<tr>
<td>Selling/sharing medication</td>
</tr>
<tr>
<td>Forging or altering prescription</td>
</tr>
<tr>
<td>Substance abuse treatment</td>
</tr>
<tr>
<td>Obtaining nonprescribed psychoactive medications from others</td>
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*Number of patients who exhibited one of these behaviors one or more times.
therapy. Patients followed by residents in our practice were more likely to be prescribed long-term opioids than those followed by attending physicians. Furthermore, among those prescribed long-term opioids, patients followed by resident physicians were more likely to have exhibited aberrant behaviors and indicators of substance misuse. Multivariate analyses suggest that these differences are largely due to the demographics of the patients seen by residents.

An estimated 13.6 percent of patients followed by the residents received opioids for three or more consecutive months; this was significantly higher than the estimated rates among patients followed by attendings (5.9 percent). There is limited data on rates of long-term opioid prescribing, but these rates are much higher than the rate of ~3 percent reported in a previous study performed at another academic practice that included residents and attendings, though their inclusion criteria were more restrictive than ours and their study was conducted almost 10 years ago.\(^3\)\(^2\) This may reflect differences in practices between the institutions, but it could also be due to differences in patient demographics or temporal changes in prescribing practices. The precision of our estimates is limited by our inability to gauge the exact number of patients in each panel; however, our method of estimating the panel size likely overestimated the size of the resident panel because residents provide more cross-coverage for each other and their patients are more likely to be counted more than once by our appointment system.

As we did not collect data on patients who were not prescribed opioids, we were not able to assess the reasons for the difference in prescribing rates between residents and attendings; however, there are a number of possible explanations. The most obvious is that this may simply reflect a higher prevalence of chronic pain among patients followed by residents. Patients with

<table>
<thead>
<tr>
<th>Factor</th>
<th>Aberrant drug behavior</th>
<th>Indicator of substance misuse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (CI)</td>
<td>p value</td>
</tr>
<tr>
<td>History of a substance use disorder</td>
<td>2.47 (1.54-4.00)</td>
<td>&lt;0.001</td>
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<tr>
<td>Current smoking</td>
<td>3.65 (2.23-5.96)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age ≤ 50</td>
<td>2.81 (1.78-4.42)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Receiving short-acting opioids</td>
<td>2.25 (0.88-5.80)</td>
<td>0.092</td>
</tr>
<tr>
<td>Back pain</td>
<td>1.64 (1.05-2.56)</td>
<td>0.031</td>
</tr>
<tr>
<td>Resident physician</td>
<td>1.59 (1.01-2.51)</td>
<td>0.047</td>
</tr>
<tr>
<td>Active psychiatric diagnosis</td>
<td>1.20 (0.77-1.88)</td>
<td>0.42</td>
</tr>
<tr>
<td>Male gender</td>
<td>1.20 (0.77-1.86)</td>
<td>0.432</td>
</tr>
<tr>
<td>Commercial insurance</td>
<td>0.68 (0.40-1.17)</td>
<td>0.167</td>
</tr>
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AOR: adjusted odds ratio; CI: 95% confidence interval; and OR: odds ratio.
private insurance were preferentially given appointments with attending physicians; therefore, the residents saw more patients with Medical Assistance or Medicare and we can presume higher rates of disability and chronic illness among their patients. This difference may also be at least partly due to the higher prevalence of substance use disorders and smoking among the resident patients; previous studies indicate that these are associated with receiving long-term opioid therapy.\textsuperscript{33,34} Finally, it may indicate an increased willingness to prescribe long-term opioids among residents; this is in contrast to a recent survey that found that attending physicians expressed a greater willingness to prescribed opioids for chronic pain than family medicine residents.\textsuperscript{1} In any case, the high prevalence of patients receiving long-term opioids underscores the importance of training and support for residents treating patients with chronic pain.\textsuperscript{27,28}

Our study also indicates that patients on long-term opioids followed by residents were more likely to exhibit aberrant behaviors and indicators of active substance abuse, including reporting lost or stolen medications, as well as experiencing overdose or intoxication. Multivariate analyses suggest that this difference is likely due to demographic differences, particularly the higher percentage of patients with a history of a substance use disorders and smoking followed by the residents. A number of other possible factors may contribute to the differences. It is possible that resident physicians were more vigilant for signs of misuse or better at documenting aberrant behaviors; however, a previous study suggests that residents do not monitor well for these behaviors.\textsuperscript{27} Moreover, many of these behaviors, such as reporting lost or stolen medications, were documented by the shared nursing staff who took messages for prescription refills. Another possible explanation for some of the differences is that the residents were inadequately treating their patients’ pain; this could have led to behaviors such as requesting early refills or seeking medication from other providers; however, this would not explain the higher rates of indicators such as drug overdose/intoxication. The higher rate of positive UDT for nonprescribed substances may simply reflect a higher rate of testing; we did not collect data on these rates. Nevertheless, the finding that these indicators are higher among the resident patients receiving opioid prescriptions suggests that resident physicians need improved systems and supervision for monitoring and follow-up of patients receiving opioids for chronic pain.

This study has several limitations. As previously mentioned, our analyses are based on estimates of the number of patients seen by residents and attending physicians. This study was performed in a single academic general internal medicine practice, so the findings may not be representative of other practices. It also analyzes the practice of a relatively small number of physicians and may have been affected by individual outliers. As our findings depend on documentation in the medical record, it is possible that the aberrant behaviors may be underreported or that we may not have captured all instances in our review. More importantly, we relied on indirect indicators of substance misuse and did not directly assess patients for substance use disorders. Although studies have shown an association between aberrant behaviors and substance use disorders,\textsuperscript{31,35-37} aberrant behaviors do not always indicate active abuse.\textsuperscript{20}

**CONCLUSION**

In conclusion, our study demonstrates high rates of long-term opioid prescribing among patients followed by internal medicine residents at our institution. Moreover, among patients prescribed long-term opioids, those followed by residents are more likely to exhibit behaviors suggestive of active substance misuse, although this difference appears to be primarily due to demographic differences in the patients seen by residents. Nevertheless, this underscores a need for additional resident training and supervision to provide effective and safe care for patients with chronic pain.

**ACKNOWLEDGMENTS**

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**REFERENCES**


