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# [TRAINING INDIANA'S FAMILY MEDICINE RESIDENTS TO ADDRESS THE PROBLEM OF PRESCRIPTION DRUG ABUSE]

Prescription drug abuse has been a growing problem in Indiana and around the nation for almost two decades. In recent years, prescription drug overdoses have pushed drug poisonings ahead of motor vehicle crashes as the leading cause of injury death. However, deaths due to overdoses of prescription drugs are only the tip of the iceberg when it comes to the much larger problem of abuse. This study has characterized prescription drug abuse in Indiana and taken an in-depth look at how it is and can be addressed both through organizational policies and state legislation. Opioid painkillers such as hydrocodone, oxycodone, and methadone are the most commonly abused prescription drugs, and most of these prescriptions are written by primary care physicians. Because more than 70% of Indiana's family medicine residents will remain in the state to practice medicine following the conclusion of their residencies, it is worthwhile to take a look at how these residents are being educated during their training. St. Vincent's Family Medicine Residency program in Indianapolis is one of several residency programs in Indiana training their residents on best practices of prescribing controlled substances. A review of residents' prescribing patterns before and after training on the subject went into effect showed significant reductions in the number of opioid painkillers being prescribed, and showed the same reductions for alprazolam, a benzodiazepine anxiolytic.

Prescription drug abuse has been a growing problem in the United States in general, and in Indiana in particular, for almost two decades (CDC, 2011a). In recent years, drug poisonings, of which those due to prescription drugs make up a large proportion, have overtaken motor-vehicle crashes as the leading injury cause of death (NCHS, 2011). This increase in deaths due to prescription drug abuse corresponds to a 300% increase in sales of opioid painkillers since 1999 (CDC, 2011a).

Health care practitioners know that many types of drugs may by abused, and that the current trend is strongly toward abuse of prescription painkillers, with the most commonly abused painkillers being opioids such as hydrocodone, oxycodone, and methadone. These drugs are responsible for more deaths annually than cocaine and heroin combined (CDC, 2011a). Sadly, emergency department visits due to pharmaceutical misuse or abuse have more than doubled since 2004 (SAMHSA, 2011a), and treatment admissions due to opiate abuse have more than quadrupled since 2000 (SAMHSA, 2011b)

In Indiana, the number of unintentional poisoning deaths nearly doubled between 2006 and 2009 (CDC, NCIPC, 2011b). The Youth Risk Behavior Survey (YRBS) tells us that greater than one in five Hoosier high-schoolers have misused prescription drugs without a doctor's prescription (CDC, 2011b). Opiate withdrawal in newborn babies has skyrocketed, as well. Twelve years ago, the average hospital encountered neonatal abstinence syndrome (NAS) once a year. Now, the average hospital is seeing it every week (Winchester, 2012). Based on the 2008 National Survey on Drug Use and Health results, 6% of Hoosiers 12 years and older reported non-medical use of painkillers compared to 4.9% in the U.S. (IUCHP, 2009). This excess prescription drug abuse in Indiana is statistically significant (IUCHP, 2009) indicating that while prevention efforts are sorely needed across the nation, they are especially needed in Indiana.

We see almost 700 deaths due to accidental drug poisonings every year in this state alone, with the highest number of deaths as of 2010 occurring in Marion County (104), Allen County (33), Madison County (31), Vanderburgh County (25), and Porter County (24). With almost 6.5 million people living in Indiana, that translates to more than 10 deaths due to accidental drug poisonings per 100,000 Hoosiers every year. Some of Indiana's 92 counties are seeing rates significantly higher than that, though, with the highest number of deaths per 100,000 occurring in Starke County (38.52), Blackford County (27.42), Greene County (25.63), Scott County (24.82), and Henry County (24.26). Maps illustrating the annual death rates and the current trends in these rates are located in Figure 1 and Figure 2 (ISDH, 2012).

While the number of deaths caused by abuse of these strong prescription painkillers is startling information all by itself, these deaths are only the tip of the iceberg when it comes to the larger epidemic of prescription drug abuse. Information provided by the CDC tells us that for every death from prescription painkiller abuse, there are 10 treatment admissions for painkiller abuse, 32 emergency department visits for misuse or abuse, 130 people who abuse or are dependent on these drugs, and 825 recreational users of prescription painkillers (CDC, NCIPC, 2011a).

Indiana's Attorney General Gregory Zoeller formed the Prescription Drug Abuse Task Force, consisting of members of the public and private sectors from all parts of Indiana, in 2012 to pursue solutions to the epidemic of prescription drug abuse while also making sure that patients for whom the benefits of prescription painkillers outweigh the very serious risks are able to receive the care they need. The Task Force has found many factors which may facilitate the problem. For example, improved law enforcement initiatives have been considered and undertaken by the Task Force's Enforcement Committee. Better and more seamless use of

Figure 1: Annual Death Rates Due to Prescription Drug Abuse in Indiana

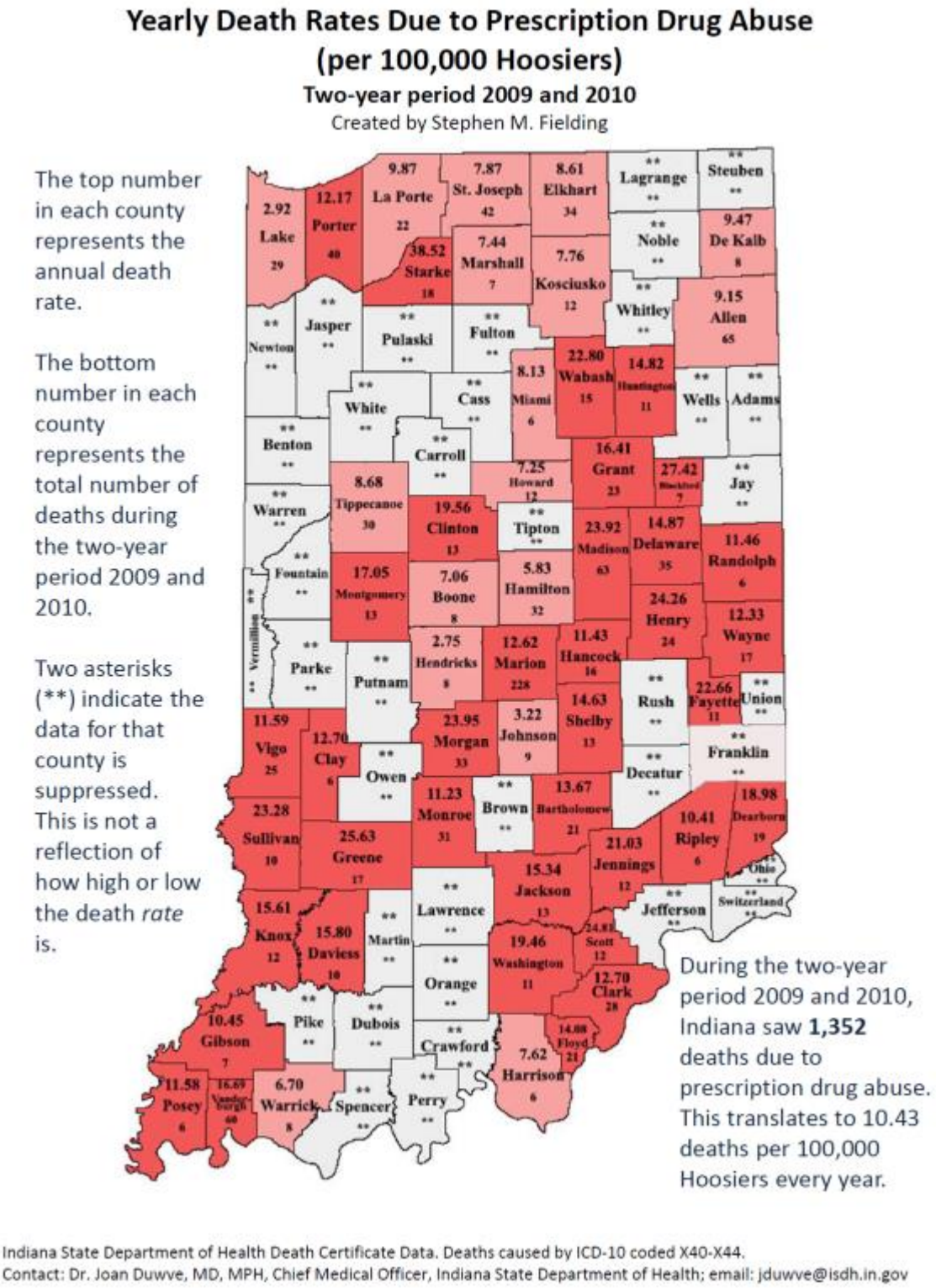
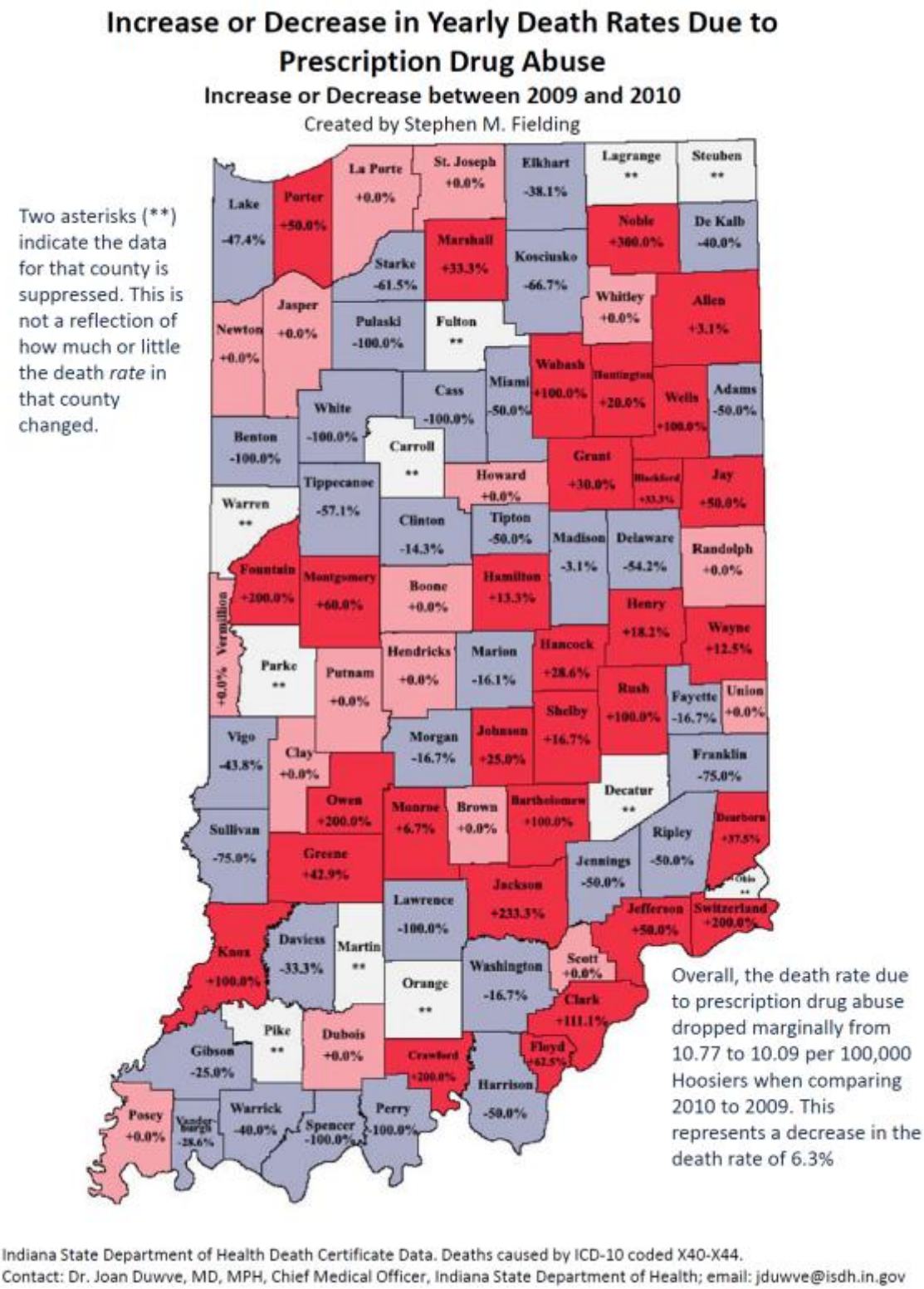


Figure 2: Trend in Annual Death Rates Due to Prescription Drug Abuse in Indiana




Indiana State Department of Health Death Certificate Data. Deaths caused by ICD-10 coded X40-X44.
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electronic medical records and prescription drug monitoring programs has been the work of the INSPECT Committee (INSPECT is Indiana's prescription drug monitoring program). Helping and encouraging the public to safely dispose of excess prescription drugs, and keeping them from being diverted, has been the work of the Take-Back Committee, and initiatives aimed at treating those with existing addiction and dependency problems have been the work of the Treatment Committee.

The Education Committee, though, has pursued an often underappreciated fact: that for every abuser there is an initial exposure to prescription drugs. This initial exposure is typically the result of a well-meaning provider writing a prescription, and not from obtaining these drugs illegally (Juurlink, Dhalla, & Nelson, 2011). This initial drug exposure most likely reflects a desire for compassionate care and patient satisfaction on the part of the physician.

It is also worth noting that most opioid prescriptions are written by primary care physicians (Juurlink, Dhalla, & Nelson, 2011). Many providers, though, are beginning to realize that with the epidemic of prescription drug abuse and the high risk of dependency and abuse associated with newer, stronger drugs, that patient satisfaction and sound medical care are not always synonymous (Juurlink, Dhalla, & Nelson, 2011).

Although anyone could potentially be at risk of prescription drug dependence and abuse, it is important for health care providers to understand there are several groups who are at greater risk. These include:

- Those who are on high daily doses of prescription painkillers, generally accepted to be above 120 milli-equivalents of morphine a day.
- Lower-income individuals.
- Those living in rural areas.

- Those receiving Medicaid, whose risk of death from an overdose of prescription painkillers is six times that of non-Medicaid individuals.
- Males, whose rates exceed female rates in almost every age group.
- Individuals between 45 and 54 years of age (CDC, 2011a).

It is often difficult for family medicine physicians to confidently discern between patients with a legitimate need for prescription painkillers and those with chemical-dependency issues or who simply want to experience the effects of the drug. Because 70% of Indiana's family medicine residents will stay in Indiana after completing their residencies (Duwve, 2012), the training of these residents to address the problem of prescription drug abuse is a top priority. A number of Indiana's 11 family medicine residency programs have already instituted training on the subject. This research project has looked primarily at the effects of such training instituted with the new residency year in 2010 at St. Vincent's Family Medicine Residency (SVFMR) program due to their unique position of having readily-accessible data for analysis of residents' prescribing habits. However, it should be noted that many of the other family medicine residency programs in Indiana are already addressing the problem of prescription drug abuse in one way or another.

## Research Questions

This research project has primarily addressed the following questions:

1. What is the nature of the training and guidance on appropriate controlled-substance prescribing to which family medicine residents at SVFMR are currently being exposed?
2. What effect has this training and guidance had on the prescribing habits of SVFMR residents?

3. What sort of guidance on appropriate controlled-substance prescribing is available elsewhere?
4. What additional recommendations might be incorporated into the training and guidance on appropriate controlled-substance prescribing for family medicine residents at SVFMR and elsewhere?

## Methods

Because this project looked at the issue of training family medicine residents to address prescription drug abuse from an epidemiological perspective and from a health policy and management perspective, a wide range of information was collected. In addition to the information already discussed in the introduction of this paper, information was collected regarding the training and guidance provided on this issue to SVFMR residents over the course of the last several years, the training and guidance recommendations being put together by the Attorney General's Prescription Drug Abuse Task Force, and the legislation currently occurring at the State level on this issue.

Information on SVFMR's past, present, and upcoming resident training and guidance was obtained from the Family Medicine Clinic Co-Director, Amy LaHood, M.D., M.P.H., while data on residents' prescribing patterns was obtained from the on-site pharmacy, at which a vast majority of patients fill their prescriptions. Both the family medicine clinic staffed by current SVFMR residents and the on-site pharmacy operate on a sliding fee scale which provides reduced rates for medical care and prescriptions to low-income patients. The vast majority of the family medicine clinic's patients take advantage of this sliding fee scale, so it is assumed that most of the clinic's

patients also fill their prescriptions at the on-site pharmacy, giving the data obtained from the pharmacy a great deal of internal validity.

Prescription information for all opioid painkillers and for alprazolam was obtained from a pharmacist at the on-site pharmacy, Wendy LeMasters, on a quarter-by-quarter basis from January 1, 2009 (the beginning of 2008-2009 Quarter 3) to December 31, 2012 (the end of 2012-2013 Quarter 2). The prescription data obtained from the pharmacy consisted of 13,897 prescriptions for opioids and for alprazolam filled during the time period under investigation. For these prescriptions, the following information was available: the quarter in which the prescription was written, the medication for which the prescription was written, the strength of the prescription in milligrams, the number of pills contained in the prescription, and the name of the provider writing the prescription.

Resident rosters were obtained from the Family Medicine Clinic Co-Director, and the names of all the family medicine residents active in the SVFMR program during the time period under investigation were recorded as in Table 1. First-year SVFMR residents attend orientation for the program at the end of June each year, and the residency year technically begins each July 1. On July 1 of the next year, residents graduate to the next year of residency, for a total of three years. During the 2008-2009 residency year, there were 19 active SVFMR residents; during 2009-2010, there were 22; during 2010-2011, there were 21; during 2011-2012, there were 22; during 2012-2013, there were 22. The total number of family medicine residents active in the SVFMR program during the entire timeframe of the study was 50. This information is also displayed in Table 1.

Table 1: Family Medicine Residents Active during the Timeframe of This Study

| SVFMR Residents Active between Quarter 3 of 2008-2009 and Quarter 2 of 2012-2013 |
|---|
| Resident |
| Aeschliman, Joseph S. |
| Albin, Tanna D. |
| Armey, Amanda M. |
| Brauchla, Elizabeth N. |

| Number of SVFMR Residents | |
|---|---|
| Time Period | |
| 2008-2009 | 19 |
| 2009-2010 | 22 |
| 2010-2011 | 21 |
| 2011-2012 | 22 |

Prescriptions written by family medicine residents were abstracted from this data, and all opioid painkiller prescriptions were converted to a standardized scale making comparisons between different opioids more relevant. Prescription data was then analyzed using SAS 9.3 for Windows 64-bit machines using an α-level of 0.05 for significance.

Some information was unavailable for this analysis. This unavailable data included patient identifiers for each prescription and the number of pills a patient was directed to take each day. Because patient identifiers were unavailable with the prescription data obtained from the on-site pharmacy, it was impossible to determine either how many total patients were prescribed each of these medications during the timeframe of the study or to demonstrate the amount of time between refills for any particular patient. Without knowing the number of pills a patient was directed to take each day, it remained impossible to determine what sort of daily dose each patient was on.

To aid in the comparison of dosages of different types of opioids to each other, physicians routinely make use of a measure called morphine milli-equivalents. Therefore, in order to find some meaning from the data that was available, each prescription was converted to a total number of milli-equivalents of morphine (mEq's) using the guidelines in place at SVFMR in the following manner. The strength of hydrocodone prescriptions in milligrams were multiplied by 1 to obtain the strength in morphine milli-equivalents. The strength of methadone prescriptions were multiplied by 4, the strength of morphine prescriptions were multiplied by 1, the strength of oxycodone prescriptions were multiplied by 1.5, and the strength of percocet prescriptions were multiplied by 1.5 as well.

Because information on the number of pills each patient was directed to take each day was unavailable, the assumption was made that prescribing patterns have not changed on average in

this regard during the timeframe of the study. This assumption allowed prescriptions to be compared on the basis of total number of milli-equivalents prescribed. For example, a prescription for 90, 40 mg pills of oxycodone was converted to 90 x 40 x 1.5 = a prescription of 5,400 mEq.

Alprazolam was included in this study not as a control, but because it, too, is a controlled substance which falls under the training and guidance family medicine residents at SVFMR receive. However, alprazolam is a benzodiazepine anxiolytic drug, not an opioid. Therefore, the strengths of alprazolam prescriptions were compared on the basis of total mg, not total mEq.

Lastly, patient volume information was collected for each of the clinics housed in St. Vincent's Max Simon Primary Care Center. The Primary Care Center includes the family medicine clinic and the on-site pharmacy, as well as an internal medicine clinic, a pediatrics clinic, and a women's health clinic. Patient volume data was abstracted for each quarter pertaining to the timeframe of this study for the family medicine clinic.

## Data

### Training and Guidance at the St. Vincent Family Medicine Residency Program

Up until the beginning of the new residency year in July 2010, family medicine residents had been advised to use their best clinical judgment in caring for patients requiring controlled substances. Without passing judgment on how residents had been approaching these patients before this time period, SVFMR residents began receiving training on a robust set of guidelines regarding appropriate prescribing practices for these patients in July 2010. The protocol on appropriate controlled substances prescribing is outlined below:

- Residents should not prescribe controlled substances to a patient at their initial consultation at the family medicine clinic if there is not sufficient and appropriate documentation from a previous provider substantiating the need for these medications.
- Residents should request a report from INSPECT on all patients at their initial consultation and before making any changes to their treatment plan.
- Residents should consult with an attending physician before prescribing a controlled substance, whether the prescription is the first or a refill.
- Residents should have any patient who will be prescribed controlled substances for greater than one month sign a controlled substance contract. The contract functions as a treatment agreement between the resident and the patient, and describes what will be expected from a patient who is prescribed controlled substances for a significant length of time. For example, the patient must agree to be seen by the physician periodically and submit to periodic urine drug screens.
- Residents should see any patients on controlled substances on a monthly basis until such a time as their condition is deemed stable, and every three months thereafter.
- Residents should conduct urine drug testing at least once a year for all patients taking controlled substances, and more often if there is any suspicion of additional drug use, prescription or otherwise, or of drug diversion.
- Residents should have patients bring all their prescriptions to each appointment so that they may be counted to detect possible drug misuse or diversion.

In May 2013, after the conclusion of this study, the SVFMR program's guidelines evolved further to include some more-recently-accepted best practices on prescribing controlled

substances. Some highlights of the additions and changes to SVFMR's guidelines put in place this year are outlined below:

- Residents are required to perform their own detailed medical history and physical exam on new patients in addition to reviewing previous medical records.
- Residents should measure the risk of substance abuse for each chronic pain patient using mental health metrics such as PHQ-2© or PHQ-9© (for depression) and GAD-7© (for anxiety) and addiction risk assessments such as the Opioid Risk Tool©, SOAPP©, or COMM©. Residents are strongly discouraged from prescribing controlled substances to any individual which is deemed to be high-risk. Additionally, such assessments should be conducted periodically as risk levels may change over time.
- Residents should set goals with patients that focus more on functions of daily living than on symptom relief. Oftentimes, a medication will not completely alleviate a symptom no matter what the dose, but even a low dose may allow the patient to get back to living their life the way they want to. Setting reasonable goals at the outset of a treatment plan will often lead to better outcomes and higher patient satisfaction.
- Residents should make use of non-opioid treatments initially, when possible.
- Residents may not prescribe more than a combined 100 mEq per day of opioid medications.
- Residents may not initiate a new treatment regimen that includes methadone.
- Residents may not prescribe short-acting benzodiazepines (e.g. for anxiety) for greater than one month.

**Indiana Senate Enrolled Act No. 246 – Controlled Substances**

Indiana Senate Bill 246, authored by State Senator Ron Grooms from District 46, was introduced on January 7, 2013 and signed into law by Governor Mike Pence on May 7, 2013, taking effect shortly thereafter as Public Law 185. The controlled substances portion of this legislation authorizes Indiana's Medical Licensing Board to adopt emergency rules before November 1, 2013 to address physician responsibilities regarding the prescribing of controlled substances in the State. Permanent rules must then be adopted by the Medical Licensing Board before November 1, 2013. These rules remain to be seen. However, the Medical Licensing Board is taking input from the Indiana Attorney General's Prescription Drug Abuse Task Force in the formation of these rules.

**Provider Toolkit under Development by the Prescription Drug Abuse Task Force**

Prior to the introduction of Senate Bill 246, the Education Committee of the Prescription Drug Abuse Task Force began developing a "Provider Toolkit" with input from health care providers from all corners of the State to provide a set of best practices to help guide providers as they work toward more sound management of patients with chronic non-cancer pain. The toolkit, entitled "First Do No Harm – The Indiana Health Care Providers Guide to the Safe, Effective Management of Chronic Non-Cancer Pain" has continued to be developed in collaboration with the Medical Licensing Board of Indiana. As a note, I was fortunate that through my internship experience at the Indiana State Department of Health I was able to attend several meetings of the Prescription Drug Abuse Task Force and had a good amount of input into the introduction portion of the Provider Toolkit.

**St. Vincent Family Medicine Residency Program Resident Prescription Data**

During the time period under study, SVFMR residents wrote a total of 1,909 prescriptions for opioid painkillers and an additional 127 prescriptions for alprazolam. Table 2 outlines for which medications these prescriptions were written, and shows the corresponding total number of patient visits during each time period.

## Results

The data set was first broken into quarters so that the same quarters could be compared in a year-over-year fashion. In order to determine the statistical tests needed to compare quarters to each other for the entire data set and for each medication type, each group in the data set was tested for the presence of a normal distribution using the Shapiro-Wilk test as shown in Table 3.

Next, the tests needed for comparison of the groups were determined in light of the previous normality results as shown in Table 4. The quarterly year-over-year comparisons of the data revealed several significant differences between the same quarters in different years for opioid painkillers in general and for a number of medication types in particular. The significant results are shown in Table 5. Any significant differences that include time periods after resident training began at the start of the 2010-2011 residency year are shown in red.

Table 2: Number of Prescriptions Broken down by Medication Type and Time Period

Number of Prescriptions During 1st Quarters

| Year | Medication Type | | | | | | | | | Patient Volume |
|---|---|---|---|---|---|---|---|---|---|---|
| | Opioids (All) | Hydrocodone | Methadone | Morphine (All) | Morphine IR | Morphine SR | Oxycodone (All) | Oxycodone IR | Oxycodone SR | Percocet | Alprazolam | |
| 2009-2010 | 147 | 85 | 4 | 18 | 2 | 16 | 22 | 4 | 18 | 18 | 21 | 4901 |
| 2010-2011 | 145 | 71 | 6 | 13 | 4 | 9 | 42 | 11 | 31 | 13 | 3 | 4802 |
| 2011-2012 | 97 | 42 | 1 | 15 | 5 | 10 | 27 | 6 | 21 | 12 | 2 | 4849 |
| 2012-2013 | 88 | 44 | 0 | 7 | 1 | 6 | 26 | 7 | 19 | 11 | 3 | 5100 |

Number of Prescriptions During 2nd Quarters

| Year | Medication Type | | | | | | | | | Patient Volume |
|---|---|---|---|---|---|---|---|---|---|---|
| | Opioids (All) | Hydrocodone | Methadone | Morphine (All) | Morphine IR | Morphine SR | Oxycodone (All) | Oxycodone IR | Oxycodone SR | Percocet | Alprazolam | |
| 2009-2010 | 157 | 92 | 5 | 15 | 3 | 12 | 25 | 7 | 18 | 20 | 15 | 4840 |
| 2010-2011 | 95 | 50 | 3 | 12 | 2 | 10 | 21 | 4 | 17 | 9 | 3 | 5234 |
| 2011-2012 | 119 | 69 | 1 | 12 | 7 | 5 | 23 | 7 | 16 | 14 | 5 | 5288 |
| 2012-2013 | 114 | 55 | 0 | 17 | 5 | 12 | 30 | 9 | 21 | 12 | 1 | 5011 |

Number of Prescriptions During 3rd Quarters

| Year | Medication Type | | | | | | | | | Patient Volume |
|---|---|---|---|---|---|---|---|---|---|---|
| | Opioids (All) | Hydrocodone | Methadone | Morphine (All) | Morphine IR | Morphine SR | Oxycodone (All) | Oxycodone IR | Oxycodone SR | Percocet | Alprazolam | |
| 2008-2009 | 95 | 42 | 2 | 9 | 3 | 6 | 22 | 5 | 17 | 20 | 18 | 4825 |
| 2009-2010 | 183 | 94 | 4 | 42 | 16 | 26 | 27 | 6 | 21 | 16 | 14 | 4975 |
| 2010-2011 | 110 | 65 | 3 | 16 | 6 | 10 | 35 | 7 | 28 | 11 | 2 | 4706 |
| 2011-2012 | 107 | 71 | 1 | 7 | 2 | 5 | 18 | 4 | 18 | 10 | 4 | 5457 |

Number of Prescriptions During 4th Quarters

| Year | Medication Type | | | | | | | | | Patient Volume |
|---|---|---|---|---|---|---|---|---|---|---|
| | Opioids (All) | Hydrocodone | Methadone | Morphine (All) | Morphine IR | Morphine SR | Oxycodone (All) | Oxycodone IR | Oxycodone SR | Percocet | Alprazolam | |
| 2008-2009 | 66 | 6 | 3 | 9 | 0 | 9 | 24 | 3 | 21 | 24 | 15 | 4676 |
| 2009-2010 | 169 | 76 | 4 | 32 | 12 | 20 | 42 | 15 | 27 | 15 | 14 | 4428 |
| 2010-2011 | 109 | 52 | 3 | 16 | 6 | 10 | 27 | 6 | 21 | 11 | 2 | 5287 |
| 2011-2012 | 108 | 56 | 0 | 13 | 0 | 13 | 29 | 5 | 24 | 10 | 5 | 5184 |

Table 3: Results of Shapiro-Wilk Tests for Normality

| | Shapiro-Wilk Test p-Values | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Medication Type** | **2008-2009_Q3** | **2008-2009_Q4** | **2009-2010_Q1** | **2009-2010_Q2** | **2009-2010_Q3** | **2009-2010_Q4** | **2010-2011_Q1** | **2010-2011_Q2** | **2010-2011_Q3** | **2010-2011_Q4** | **2011-2012_Q1** | **2011-2012_Q2** | **2011-2012_Q3** | **2011-2012_Q4** | **2012-2013_Q1** | **2012-2013_Q2** |
| Opioids (All) | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Hydrocodone | < 0.0001 | 0.2182 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0007 | < 0.0001 | < 0.0001 |
| Methadone | N = 2 | 0.4157 | 0.0239 | 0.1026 | 0.2470 | 0.2443 | 0.0034 | < 0.0001 | < 0.0001 | N = 3 | N = 1 | N = 1 | N = 1 | N = 0 | N = 0 | N = 0 |
| Morphine (All) | 0.0368 | 0.1796 | 0.0447 | 0.0210 | < 0.0001 | < 0.0001 | 0.1638 | 0.0840 | 0.0015 | 0.2014 | 0.0063 | 0.0188 | 0.0027 | 0.0160 | 0.1196 | 0.0095 |
| Morphine Immediate Release | 0.8428 | N = 0 | 1.0000 | < 0.0001 | < 0.0001 | < 0.0001 | 0.2242 | 1.0000 | 0.0040 | 0.0183 | 0.0435 | 0.2645 | N = 2 | N = 0 | N = 1 | < 0.0001 |
| Morphine Sustained Release | 0.3119 | 0.1796 | 0.0941 | 0.1205 | < 0.0001 | < 0.0001 | 0.2485 | 0.0806 | 0.0002 | 0.0507 | 0.1523 | 0.1502 | 0.0168 | 0.0160 | 0.0902 | 0.0177 |
| Oxycodone (All) | 0.0035 | < 0.0001 | < 0.0001 | 0.0021 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0003 | 0.0007 | 0.0067 | < 0.0001 | 0.0001 | < 0.0001 |
| Oxycodone Immediate Release | 0.1940 | 0.3631 | 0.0607 | 0.0052 | 0.1685 | 0.0002 | 0.0836 | 0.9719 | 0.3137 | 0.3491 | 0.1170 | 0.0979 | 0.2725 | 0.2710 | 0.9189 | 0.1925 |
| Oxycodone Sustained Release | 0.0038 | 0.0001 | < 0.0001 | 0.0020 | 0.0002 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | 0.0008 | 0.0032 | 0.0491 | 0.0684 | < 0.0001 | 0.0022 | 0.0002 |
| Percocet | 0.0610 | 0.0217 | 0.1396 | < 0.0001 | < 0.0001 | 0.0061 | 0.0468 | 0.0574 | < 0.0001 | 0.0040 | 0.0005 | 0.0019 | 0.1848 | 0.5651 | 0.0402 | 0.0764 |
| Alprazolam | 0.0056 | 0.0046 | 0.0054 | 0.0229 | 0.0268 | 0.1312 | 0.1783 | < 0.0001 | 1.0000 | 1.0000 | 1.0000 | 0.0146 | 0.0012 | 0.0168 | N = 3 | N = 1 |

Table 4: Tests Used for Comparison of Groups

| 1st Quarter Analyses | | |
|---|---|---|
| **Medication Type** | **Normal Distribution of Data in All Time Periods?** | **Tests Used for Comparisons** |
| **Opioids (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Hydrocodone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Methadone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Immediate Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Sustained Release** | Yes | ANOVA with Tukey's Studentized Range (HSD) Test |
| **Oxycodone (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone Immediate Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone Sustained Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Percocet** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Alprazolam** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |

| 2nd Quarter Analyses | | |
|---|---|---|
| **Medication Type** | **Normal Distribution of Data in All Time Periods?** | **Tests Used for Comparisons** |
| **Opioids (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Hydrocodone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Methadone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Immediate Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Sustained Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone Immediate Release** | Yes | ANOVA with Tukey's Studentized Range (HSD) Test |
| **Oxycodone Sustained Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Percocet** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Alprazolam** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |

| 3rd Quarter Analyses | | |
|---|---|---|
| **Medication Type** | **Normal Distribution of Data in All Time Periods?** | **Tests Used for Comparisons** |
| **Opioids (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Hydrocodone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Methadone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Immediate Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Sustained Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone Immediate Release** | Yes | ANOVA with Tukey's Studentized Range (HSD) Test |
| **Oxycodone Sustained Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Percocet** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Alprazolam** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |

| 4th Quarter Analyses | | |
|---|---|---|
| **Medication Type** | **Normal Distribution of Data in All Time Periods?** | **Tests Used for Comparisons** |
| **Opioids (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Hydrocodone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Methadone** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Immediate Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Morphine Sustained Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone (All)** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone Immediate Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Oxycodone Sustained Release** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Percocet** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |
| **Alprazolam** | No | Kruskal-Wallis Test with Subsequent Mann-Whitney U Tests |

Table 5: Comparisons Showing Significant Differences

| Summary of Comparisons Showing Significant Differences | | |
|---|---|---|
| **Medication Type** | **Quarter Comparisons Showing Significant Differences** | **Significant Differences** |
| **Opioids (All)** | 3rd Quarters<br>by Kruskal-Wallis Test (Chi-Square = 13.1451, DF = 3, p = 0.0043) | Between 2008-2009 and 2009-2010; mean *increased* from 1265.789 to 1541.831<br>by Mann-Whitney U Test (z = -2.7893, p = 0.0053)<br>Between 2008-2009 and 2010-2011; mean *increased* from 1265.789 to 1708.818<br>by Mann-Whitney U Test (z = -2.2441, p = 0.0248)<br>Between 2009-2010 and 2011-2012; mean *decreased* from 1541.831 to 1113.715<br>by Mann-Whitney U Test (z = -2.7874, p = 0.0053)<br>Between 2010-2011 and 2011-2012; mean *decreased* from 1708.818 to 1113.715<br>by Mann-Whitney U Test (z = -2.1970, p = 0.0280) |
| **Hydrocodone** | 3rd Quarters<br>by Kruskal-Wallis Test (Chi-Square = 16.4580, DF = 3, p = 0.0009) | Between 2008-2009 and 2009-2010; mean *increased* from 426.310 to 1078.404<br>by Mann-Whitney U Test (z = -2.9135, p = 0.0036)<br>Between 2009-2010 and 2010-2011; mean *decreased* from 1078.404 to 389.444<br>by Mann-Whitney U Test (z = -3.3335, p = 0.0009)<br>Between 2009-2010 and 2011-2012; mean *decreased* from 1078.404 to 442.817<br>by Mann-Whitney U Test (z = 2.8788, p = 0.0040) |
| | 4th Quarters<br>by Kruskal-Wallis Test (Chi-Square = 16.1877, DF = 3, p = 0.0010) | Between 2008-2009 and 2010-2011; mean *decreased* from 750.000 to 372.933<br>by Mann-Whitney U Test (z = 1.9761, p = 0.0481)<br>Between 2009-2010 and 2010-2011; mean *decreased* from 635.658 to 372.933<br>by Mann-Whitney U Test (z = -3.8317, p = 0.0001) |
| **Methadone** | 4th Quarters<br>by Kruskal-Wallis Test (Chi-Square = 6.4969, DF = 2, p = 0.0388) | Between 2009-2010 and 2010-2011; mean *increased* from 2510.000 to 21600.000<br>by Mann-Whitney U Test (z = 2.0376, p = 0.0416) |
| **Morphine (All)** | None | None |
| **Morphine Immediate Release** | None | None |
| **Morphine Sustained Release** | None | None |
| **Oxycodone (All)** | 3rd Quarters<br>by Kruskal-Wallis Test (Chi-Square = 9.3032, DF = 3, p = 0.0255) | Between 2008-2009 and 2011-2012; mean *increased* from 1028.864 to 3372.500<br>by Mann-Whitney U Test (z = 2.8353, p = 0.0046) |
| **Oxycodone Immediate Release** | None | None |
| **Oxycodone Sustained Release** | 3rd Quarters<br>by Kruskal-Wallis Test (Chi-Square = 12.3870, DF = 3, p = 0.0062) | Between 2008-2009 and 2011-2012; mean *increased* from 1185.882 to 4127.143<br>by Mann-Whitney U Test (z = 3.2044, p = 0.0014)<br>Between 2009-2010 and 2011-2012; mean *increased* from 2028.571 to 4127.143<br>by Mann-Whitney U Test (z = 2.3068, p = 0.0211)<br>Between 2010-2011 and 2011-2012; mean *increased* from 2880.000 to 4127.143<br>by Mann-Whitney U Test (z = 2.4102, p = 0.0159) |
| **Percocet** | None | None |
| **Alprazolam** | 1st Quarters<br>by Kruskal-Wallis Test (Chi-Square = 9.4628, DF = 3, p = 0.0237) | Between 2009-2010 and 2012-2013; mean *increased* from 38.857 to 90.000<br>by Mann-Whitney U Test (z = 2.2058, p = 0.0274) |
| | 4th Quarters<br>by Kruskal-Wallis Test (Chi-Square = 10.6802, DF = 3, p = 0.0136) | Between 2008-2009 and 2009-2010; mean *increased* from 43.000 to 81.321<br>by Mann-Whitney U Test (z = 2.0328, p = 0.0421)<br>Between 2008-2009 and 2010-2011; mean *decreased* from 43.000 to 3.500<br>by Mann-Whitney U Test (z = -2.1982, p = 0.0279)<br>Between 2009-2010 and 2010-2011; mean *decreased* from 81.321 to 3.500<br>by Mann-Whitney U Test (z = -2.0904, p = 0.0366)<br>Between 2009-2010 and 2011-2012; mean *decreased* from 81.321 to 28.650<br>by Mann-Whitney U Test (z = -1.9811, p = 0.0476) |

## Limitations

This study has a number of limitations:

Firstly, the pharmacy data did not include patient identifiers. Each data entry included only information on the time period of the prescription, the medication type, the number of mg of each pill, the number of pills dispensed, and the provider. If patient identifiers were available in this data set, further analysis could be conducted to determine the effects of increased resident training on the subject of prescription drug abuse and appropriate prescribing. Specifically, the amount of controlled substances each individual patient receives during any particular time period could have been calculated. Furthermore, any trends in the number of patients receiving the controlled substances under study could have been compared to trends in patient volumes during those time periods.

Secondly, the providers instructions regarding how many pills should be taken a day were unavailable. Therefore, a 30-pill prescription and a 90-pill prescription, for example, could not be discerned from each other on the basis of how many pills the patient was directed to take a day. To handle this limitation, the assumption was made that residents' prescribing habits, on the whole, have remained unchanged in this regard.

Thirdly, the data used for this analysis came from the on-site pharmacy at which a vast majority of SVFMR's patients fill their prescriptions. The exact proportion of patients filling their prescriptions at the on-site pharmacy was unknown. Furthermore, it was unknown how the patients that filled their prescriptions at this pharmacy compared to the relatively few patients who fill their prescriptions elsewhere. Two assumptions were made in this regard: 1) the vast majority of patients of the SVFMR family clinic fill their prescriptions at the on-site pharmacy, and 2) the

characteristics of these patients are the same as for those who fill their prescriptions elsewhere. The first assumption has been validated anecdotally, and makes sense in light of the fact that both the clinic and the pharmacy operate on a sliding fee scale and that most patients of the clinic utilize these reduced rates.

Lastly, it is unclear how the proportion of patients being treated for chronic pain at St. Vincent's family medicine clinic has changed over the last several years. For the purposes of this study, it has been assumed that the number of legitimate pain patients relative to the total patient volume has not changed.

In a future study of this kind, the first three limitations could be best addressed by obtaining the prescription data from INSPECT, Indiana's prescription drug monitoring program, rather than from an individual pharmacy. This, however, would require consent from the providers whose prescription data is being looked at, but could likely be obtained in such a way that patient names and identifiable information are omitted. Either way, institutional review board (IRB) approval would be needed. The last limitation could be addressed by obtaining a large enough random sample of patient charts from each time period under investigation and calculating the proportion of patients being treated for chronic pain.

## Conclusions

The resident training and guidance on appropriate controlled-substance prescribing at St. Vincent's Family Medicine Residency program, instituted with the start of the new residency year 2010-2011, has shown signs of successes. Assuming that the number of days for which each prescription was intended did not change on average, the amount of opioid painkillers being prescribed at a time decreased significantly during the 3rd quarter of 2011-2012. Particularly, there

was significant progress in reducing the amount of hydrocodone and alprazolam written at one time for several of the quarters included in the study. However, this trend did not extend to oxycodone or methadone. There were significant increases in the amount of these drugs being prescribed at one time.

It is reassuring to see that the raw numbers of prescriptions written for each type of controlled substance under study decreased over the last couple years even while patient volumes remained relatively steady. Although the data set used for this investigation did not allow for a more thorough investigation of the statistical significance of this decline, it appears that SVFMR residents are embracing the idea that medications such as opioid painkillers are only one of many treatment options to consider.

There has been significant improvement in reducing the amount of opioids and alprazolam being prescribed, and consistent application of these guidelines at SVFMR, along with continued evolution of the training and guidance recommendations, will likely result in further successes. From a public health perspective, this can only be a good thing for Indiana. Given that so many of Indiana's family medicine residents stay in the Hoosier State to practice following the conclusion of their residencies, training and guidance on appropriate controlled substance prescribing practices will contribute a great deal to the health and wellbeing of the entire State.

## Recommendations

Recommendations coming out of this project fall into two categories: recommendations for family medicine residency programs, and recommendations for future studies of this kind.

**For Family Medicine Residency Programs**

For family medicine residency programs, it is recommended to provide guidance and training to residents on par with what the SVFMR has provided in the most recent evolution of its controlled substance prescribing guidelines. Many of Indiana's family medicine residency programs already have similar guidelines, and these would be recommended for those who are still looking for a way to systematically address the problem of prescription drug abuse.

At the outset of this project, it was expected that training and guidance materials would be created and endorsed by the Indiana State Department of Health for distribution to Indiana's 11 family medicine residency programs in order to give them a place to start in developing guidelines that made sense for their organizations. However, with the more recent development of the Provider Toolkit being produced by the Education Committee of the Attorney General's Prescription Drug Abuse Task Force, and the signing into Law of Public Law 185, it is now recommended that Indiana's family medicine residency programs endorse and promote these sets of best practices for their organizations. Through collaboration with the groups responsible for the production of the Toolkit and the writing of the rules for the Medical Licensing Board, it appears that these will both be in line with the most current evolution of SVFMR's training and guidance. The SVFMR guidelines do go a step further than what these best practices do in regards to the maximum daily dose allowed to be prescribed by a resident in training. SVFMR's guidelines state that a resident may not prescribe more than 100 mEq per day of opioid painkillers due to the increased risk of death associated with higher daily dosages. While this research does not provide evidence backing up any particular maximum daily dosage, it would be prudent for family medicine residency programs to consider instituting a maximum daily dosage themselves.

**For Future Studies of This Kind**

For future studies of this kind, it is recommended to utilize INSPECT, Indiana's prescription drug monitoring program, as one primary source of data. The data obtained for this study likely captured most of SVFMR's pain patients, but other residency programs may not have such a readily-available, in-house, source of data. Also, the use of patient identifiers for each prescription, as well as information on the number of pills directed to be taken a day, would allow a much more thorough investigation of the effects of any change in training and guidance provided to residents.

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