

## OPIOIDS, SUBSTANCE ABUSE & ADDICTIONS SECTION

### Original Research Article

# Specialty of Prescribers Associated with Prescription Opioid Fatalities in Utah, 2002–2010

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#### Abstract

**Opioid adverse events are widespread, and deaths have been directly attributed to opioids prescribed by medical professionals. Little information exists on the amount of opioids various medical specialties prescribe and the opioid fatality rate that would be expected if prescription opioid-related deaths were independent of medical specialty.**

**Objective.** To compute the incidence of prescription opioid fatalities by medical specialty in Utah and to calculate the attributable risk (AR) of opioid fatality by medical specialty.

**Design.** Prevalence database study design linking the Utah Controlled Substance Database (CSD) for

prescribing data with the Utah Medical Examiner data to identify prescription opioid fatalities. AR were calculated for each medical specialty and year.

**Results.** Opioid prescriptions are common with 23,302,892 recorded in the CSD for 2002–2010, 0.64% of which were associated with a fatality. We attached specialty to 90.2% of opioid prescriptions. Family medicine and internal medicine physicians wrote the largest proportion of prescriptions (24.1% and 10.8%) and were associated with the greatest number of prescription opioid fatalities. The number of active prescriptions at time of death decreased each year. The AR of fatality by provider specialty varied each year with some specialties, such as pain medicine and anesthesiology, consistently associated with more fatalities per 1,000 opioid prescriptions than internal medicine physicians the same year.

**Conclusions.** Primary care providers were the most frequent prescribers and the most often associated with opioid fatalities and should be targeted for education about safe prescribing along with specialties that prescribe less frequently but are associated with a positive AR for opioid fatality.

**Key Words.** Opioids; Physician Performance

#### Introduction

Opioid adverse events are epidemic, and gathering data to establish effective preventive strategies is a priority in Utah and the United States [1–5]. Some states and organizations have promulgated prescribing guidelines in an effort to minimize opioid-related harm [6–11]. Education about safer prescribing practices can be a component of prevention strategies, but nonspecific educational modules may be less effective than information targeted to the prescribing of particular medical specialties.

Using administrative data from the Utah Controlled Substance Database (CSD), our state prescription monitoring program, and fatality data from the Utah Medical Examiner, we investigated the medical specialty of prescribers

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associated with fatalities compared with all opioid prescribing.

The objective was to describe the distribution of opioid prescribing and opioid fatalities by physician specialty and identify groups at higher risk of adverse events in order to target future interventions.

### Methods

This work was reviewed and approved by the Institutional Review Boards of the University of Utah and the Utah Department of Health.

#### *Description of the Data*

##### Medical Examiner Database

Utah has a statewide, centralized medical examiner that has statute mandated jurisdiction over all deaths thought to be drug related as well as sudden, unexpected, or unattended deaths. Deaths had to have been investigated by the medical examiner to be included in this analysis; therefore, not all decedents with active opioid prescriptions were included. The Medical Examiner database contains 113 variables including demographic information about the decedent, toxicological, laboratory, and autopsy examination results. Data from the final manner of death and cause of death fields were used to identify deaths in which opioid medications were listed among the causes of death. The determination of cause of death is made by an Office of the Medical Examiner pathologist based on the investigative information generated concerning the circumstances surrounding the death and the decedent's medical history, the findings at autopsy, and the toxicology results. For this analysis, prescription opioid fatalities (hereafter fatalities) were defined as deaths of accidental or undetermined intent for which prescription opioid medications were identified as a cause of death by the Medical Examiner.

##### CSD

The Utah CSD is a registry enacted by legislative mandate (Utah Code Section 57-37-7.5) to track all outpatient prescriptions for Schedule II–V drugs dispensed in Utah and by Utah providers. All retail, institutional, and mail order pharmacies in Utah that dispense prescriptions for Schedule II–V drugs are required to report; however, inpatient facilities are not required to submit data. The Division of Occupational and Professional Licensing within the Utah Department of Commerce maintains the CSD. Pharmacies report 17 variables to the CSD: pharmacy identification number, name, address, birth date, sex, date filled, prescription number, new/refill code, metric quantity of drug, days supply of drug, National Drug Code Number, prescriber identification number (Drug Enforcement Agency [DEA]), date the prescription was written, and number of refills authorized. The CSD lacks a master patient index or unique identifier. We created an algorithm that combines deterministic and probabilistic matching techniques to create a patient-level database of individual

prescription histories. The first, deterministic stage of the algorithm links exactly matched patient identifiers including name, sex, date of birth, and address. The subsequent probabilistic stages use the same data fields and evaluate closeness of match allowing for variation in each field.

Prescription writers are identified in the CSD by their DEA number which lacks specialty information. The National Provider Identifier (NPI) uniquely identifies covered health care providers and includes information on provider type (physician, dentist, etc.), category by national board certification (family medicine, surgery, etc.), and area of specialization (sports medicine, addiction, sleep, etc.). With the participation of the Utah Department of Health, we used the Utah Medicaid database which includes both NPI and DEA numbers to generate a crosswalk between DEA and NPI and attach provider specialty to the CSD records. Any DEA number that failed to link to an NPI was collected into a missing specialty category.

##### Calculation of Opioids Prescriptions by Medical Specialty

We analyzed the distribution of opioid prescribing by provider specialty for each year of data and for all years combined. For each specialty and year, we counted the total number of filled opioid prescriptions written by that specialty.

##### Assignment of Fatalities to Medical Specialties

We linked the patient-level prescription history in the CSD to patient-level records in the Utah Medical Examiner data to identify prescribers for fatalities. Using the linked dataset, we identified each opioid prescription active at the time of death—using a restrictive definition that, based upon the date filled, the days supply of drug would have included the date of death if used as prescribed—among decedents and the provider specialties for each. The majority of decedents had multiple active prescriptions at the time of death, and each fatality may be associated with multiple provider specialties. For example, a decedent with four active opioid prescriptions at time of death may have had prescriptions written by family medicine, internal medicine, orthopedic surgery, and pain medicine. The death would contribute to the fatality count (numerator of incidence) for each of these specialties. If the decedent had active prescriptions from multiple family medicine providers or multiple active prescriptions from the same family medicine provider then each prescription would count toward the tally for that specialty. This assignment strategy counts each fatality as associated with each provider that wrote a prescription still active at time of death, but fatalities are not being overreported or double-counted because we do not report numbers of deaths, only rates and attributable risks (AR) by specialty. For the common scenario in which a single decedent had multiple active prescriptions, it is not possible to determine which single prescription caused the death, and as such the fatality is attributed to all the providers of all active prescriptions at the time.

## Prescription Opioid Fatalities by Prescriber Specialty

Our primary outcome for this analysis was the AR of opioid fatality by medical specialty, measured as the incidence rate difference. We first calculated the incidence of opioid fatality as the ratio of number of prescriptions written by that specialty active at the time of an opioid fatality divided by the number of opioid prescriptions written by that specialty for each year. For the AR calculation, we used internal medicine physicians during the same year as the reference category, and all AR values are stated as incidence rates either higher (+AR) or lower (-AR) than internal medicine physicians that year. Internal medicine physicians were selected as the reference category because they accounted for a large proportion of prescribing and were in the middle of the range of incidence rates.

### Results

Prescriptions for opioid drugs are commonly written, and relatively few prescriptions are associated with fatalities. During the study period, only 0.64% of filled opioid prescriptions were associated with a fatality. The primary care specialties of family medicine and internal medicine wrote the highest numbers of opioid prescriptions captured in the Utah CSD and were associated with the highest numbers of fatalities (Table 1).

During the study years, there was a marked decrease in the incidence of fatality among all prescribers (Figure 1). Fatality by provider specialty maintained rank order within the context of the overall decrease with pain medicine consistently at the upper end of the distribution and dentistry at the lower end (Figure 1). The results for 2009 and 2010 are presented twice on the figure. On the primary axis (solid lines), these years are so compressed that the detail is obscured, so the same data are presented on the secondary axis (broken lines) as well so that the detail may

be observed. In 2002, there were 138 opioid fatalities with 22,330 prescriptions active at the time of death among 1,898,030 opioid prescriptions—an overall incidence of 11.8 prescriptions active among fatalities per 1,000 prescriptions. By 2010, the annual incidence was only 0.56 per 1,000 prescriptions (236 opioid fatalities with 1,459 active prescriptions at time of death among 2,585,712 opioid prescriptions).

The incidence of fatality and AR of specialty varied by medical specialty and year, but the AR rankings for high-prescribing specialties remained consistent (Table 2). Specialties including pain medicine and anesthesiology that write fewer opioid prescriptions than primary care had consistently positive AR values while other specialties such as dentists that write more opioid prescriptions were rarely associated with fatalities and had AR values that were consistently negative.

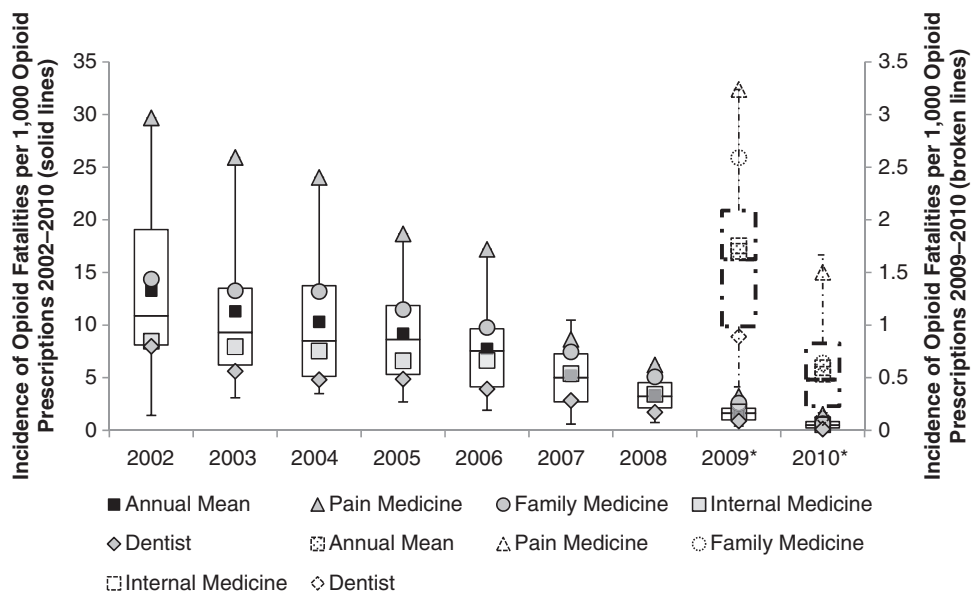
### Discussion

The majority of opioid prescriptions in Utah are written by primary care physicians followed by midlevel providers. Opioid drugs comprise 54.6% of all filled prescriptions in the CSD and can be used safely with only 0.64% of opioid prescriptions associated with a fatality.

Since the incidence rates for opioid fatalities changed dramatically for all specialties during the study time period (Figure 1), we additionally calculated a relative measure of AR using the incidence rate ratio and again used internal medicine physicians the same year as the referent category (Table 2). This relative measure of risk displayed less variability than the absolute measure of AR but with consistent interpretation. The same specialties with positive AR also had increased relative risk. These alternative

**Table 1** Opioid prescribing and incidence of fatalities by medical specialty of prescribers, Utah, 2002–2010

| Specialty                            | Opioid Prescribing |                               | Fatality                                 |                                |
|--------------------------------------|--------------------|-------------------------------|--|--------------------------------|
|                                      | # of Prescriptions | % of All Opioid Prescriptions | Prescriptions Associated with Fatalities | % of All Fatalities Associated |
| Pain medicine                        | 232,246            | 1.0                           | 2,735                                    | 2.0                            |
| Physical medicine and rehabilitation | 607,594            | 2.6                           | 6,105                                    | 4.6                            |
| Psychiatry and neurology             | 221,394            | 1.0                           | 2,015                                    | 1.5                            |
| Anesthesiology                       | 245,629            | 1.0                           | 1,961                                    | 1.5                            |
| Family medicine                      | 5,626,869          | 24.1                          | 40,107                                   | 30.2                           |
| Missing specialty                    | 1,927,060          | 9.8                           | 14,341                                   | 10.8                           |
| Emergency medicine                   | 1,498,069          | 6.4                           | 7,575                                    | 5.7                            |
| Podiatrist                           | 278,571            | 1.2                           | 1,384                                    | 1.0                            |
| Internal medicine                    | 2,508,085          | 10.8                          | 11,775                                   | 8.8                            |
| Orthopedic surgery                   | 1,502,771          | 6.4                           | 7,015                                    | 5.3                            |
| Dentist                              | 2,038,377          | 8.7                           | 6,534                                    | 4.9                            |
| Obstetrics and gynecology            | 644,763            | 2.8                           | 1,532                                    | 1.2                            |



**Figure 1** Incidence of opioid fatalities per 1,000 opioid prescriptions for all prescribers and selected specialties, Utah 2002–2010. \*Incidence rates for 2009 and 2010 presented on the primary (solid lines) axis are too compressed for detail to be visible. Hence, these data years are also presented on the secondary (broken lines) axis above the values for the primary axis so that readers may see that the variability remains even as the incidence has declined.

descriptions of the data provide different means of using the results for educational and advocacy purposes. A clinical audience may be more receptive to the AR measures, e.g., for every 1,000 opioid prescriptions he writes, an anesthesiologist is, on average, associated with 5.4 more opioid fatalities than an internal medicine physician. Regulatory or lay audiences may prefer the relative measure, e.g., for every 1,000 opioid prescriptions he writes, an anesthesiologist is, on average, associated with 2.0 times as many opioid fatalities as an internal medicine physician.

Given that most fatalities have more than one active prescription at the time of death, it is likely that fatalities with an opioid prescription from a medical specialist also have one or more existing or recent prescriptions from primary care providers. It is because of this situation that we elected to count every active prescription at the time of death to the prescribing specialties rather than selecting only the prescription closest in calendar time to the fatality. As more than one prescription likely contributed to the fatality, we attempted to avoid attributing fatalities only to the last provider, who might have been more likely a specialist. By calculating rates and ARs by provider specialty, we have attempted to mitigate the possible effect of patient type seen by specialty. It is not possible to control completely for the confounding bias caused by the relationship between likelihood of overdose within patient panels seen by or within specialties using administrative data such as the CSD, and this remains an area with potential for research. A future study that is able to include

medical history and diagnoses of patients using an electronic health record linked to a prescription monitoring program may be able to mitigate some of this bias.

Most states now have prescription monitoring programs available which providers can consult before prescribing to ascertain additional information beyond patient report of medications. Patient counseling can then be appropriately targeted to the situation. A different treatment modality could be selected if there are existing opioid prescriptions. The patient could be instructed to stop taking the previous prescription in the case of a medication switch, or counseled about safe concurrent use of multiple medications.

A strength of our analysis is that the CSD is a registry of all filled opioid prescriptions in Utah. Data have been continuously collected in this system since its inception in 1995. Our medical examiner investigation followed a consistent protocol throughout the study period, and we feel confident about the classifications of deaths.

This analysis is subject to a number of limitations. The CSD includes only outpatient prescriptions, so the impact of inpatient prescribing cannot be estimated from these data. Most fatalities with prescription opioids as a cause of death have outpatient prescriptions included in the CSD, so the additional impact of including inpatient prescribing would likely be small. There is some misclassification of practice area. Our strategy of attaching specialty using the NPI does not provide enough information to capture the

## Prescription Opioid Fatalities by Prescriber Specialty

**Table 2** Annual excess risk of opioid prescribing for selected medical specialties compared with internal medicine physicians, Utah 2002–2010

|                                      |            | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Mean |
|--------------------------------------|------------|------|------|------|------|------|------|------|------|------|------|
| Pain Medicine                        | Incidence  | 29.7 | 25.9 | 24.0 | 18.7 | 17.2 | 8.6  | 6.2  | 3.2  | 1.5  | 15.0 |
|                                      | Difference | 21.2 | 18.0 | 16.5 | 12.0 | 10.6 | 3.3  | 2.8  | 1.5  | 1.0  | 9.6  |
|                                      | Ratio      | 3.5  | 3.3  | 3.2  | 2.8  | 2.6  | 1.6  | 1.8  | 1.8  | 2.8  | 2.6  |
| Physical Medicine and Rehabilitation | Incidence  | 25.8 | 20.7 | 19.3 | 18.5 | 13.4 | 7.4  | 4.5  | 2.1  | 0.9  | 12.5 |
|                                      | Difference | 17.4 | 12.7 | 11.8 | 11.9 | 6.8  | 2.0  | 1.1  | 0.3  | 0.4  | 7.1  |
|                                      | Ratio      | 3.1  | 2.6  | 2.6  | 2.8  | 2.0  | 1.4  | 1.3  | 1.2  | 1.7  | 2.1  |
| Psychiatry and Neurology             | Incidence  | 21.5 | 23.8 | 18.0 | 12.0 | 9.3  | 6.4  | 4.5  | 1.9  | 1.7  | 11.0 |
|                                      | Difference | 13.0 | 15.8 | 10.4 | 5.4  | 2.6  | 1.0  | 1.1  | 0.2  | 1.1  | 5.6  |
|                                      | Ratio      | 2.5  | 3.0  | 2.4  | 1.8  | 1.4  | 1.2  | 1.3  | 1.1  | 3.1  | 2.0  |
| Anesthesiology                       | Incidence  | 22.8 | 13.3 | 13.2 | 13.7 | 13.7 | 10.5 | 5.4  | 3.2  | 1.5  | 10.8 |
|                                      | Difference | 14.4 | 5.4  | 5.6  | 7.0  | 7.1  | 5.1  | 2.0  | 1.4  | 0.9  | 5.4  |
|                                      | Ratio      | 2.7  | 1.7  | 1.7  | 2.1  | 2.1  | 1.9  | 1.6  | 1.8  | 2.8  | 2.0  |
| Family Medicine                      | Incidence  | 14.4 | 13.3 | 13.2 | 11.5 | 9.8  | 7.5  | 5.1  | 2.6  | 0.6  | 8.7  |
|                                      | Difference | 5.9  | 5.3  | 5.7  | 4.9  | 3.1  | 2.1  | 1.7  | 0.8  | 0.1  | 3.3  |
|                                      | Ratio      | 1.7  | 1.7  | 1.7  | 1.7  | 1.5  | 1.4  | 1.5  | 1.5  | 1.2  | 1.5  |
| Missing Specialty                    | Incidence  | 12.3 | 10.8 | 10.4 | 9.9  | 8.4  | 6.8  | 3.7  | 2.1  | 0.6  | 7.2  |
|                                      | Difference | 3.8  | 2.8  | 2.8  | 3.3  | 1.8  | 1.4  | 0.3  | 0.3  | 0.1  | 1.8  |
|                                      | Ratio      | 1.5  | 1.4  | 1.4  | 1.5  | 1.3  | 1.3  | 1.1  | 1.2  | 1.1  | 1.3  |
| Emergency Medicine                   | Incidence  | 11.5 | 9.8  | 8.7  | 7.4  | 5.8  | 3.9  | 3.0  | 1.4  | 0.4  | 5.8  |
|                                      | Difference | 3.0  | 1.8  | 1.1  | 0.8  | -0.9 | -1.5 | -0.4 | -0.4 | -0.1 | 0.4  |
|                                      | Ratio      | 1.4  | 1.2  | 1.1  | 1.1  | 0.9  | 0.7  | 0.9  | 0.8  | 0.8  | 1.0  |
| Podiatrist                           | Incidence  | 9.8  | 8.8  | 5.0  | 10.0 | 8.7  | 4.6  | 2.1  | 1.5  | 0.3  | 5.7  |
|                                      | Difference | 1.3  | 0.9  | -2.5 | 3.4  | 2.1  | -0.8 | -1.3 | -0.3 | -0.2 | 0.3  |
|                                      | Ratio      | 1.2  | 1.1  | 0.7  | 1.5  | 1.3  | 0.9  | 0.6  | 0.8  | 0.6  | 1.0  |
| Internal Medicine (reference)        | Incidence  | 8.5  | 8.0  | 7.5  | 6.6  | 6.6  | 5.4  | 3.4  | 1.8  | 0.5  | 5.4  |
|                                      | Difference | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
|                                      | Ratio      | 1.0  | 1.0  | 1.0  | 1.0  | 1.0  | 1.0  | 1.0  | 1.0  | 1.0  | 1.0  |
| Orthopedic Surgery                   | Incidence  | 8.8  | 8.8  | 8.3  | 6.8  | 5.6  | 3.6  | 2.7  | 1.3  | 0.3  | 5.1  |
|                                      | Difference | 0.3  | 0.8  | 0.8  | 0.2  | -1.1 | -1.8 | -0.7 | -0.5 | -0.2 | -0.2 |
|                                      | Ratio      | 1.0  | 1.1  | 1.1  | 1.0  | 0.8  | 0.7  | 0.8  | 0.7  | 0.5  | 0.9  |
| Dentist                              | Incidence  | 8.0  | 5.6  | 4.8  | 4.9  | 3.9  | 2.8  | 1.7  | 0.9  | 0.1  | 3.6  |
|                                      | Difference | -0.5 | -2.3 | -2.7 | -1.7 | -2.7 | -2.6 | -1.7 | -0.9 | -0.4 | -1.7 |
|                                      | Ratio      | 0.9  | 0.7  | 0.6  | 0.7  | 0.6  | 0.5  | 0.5  | 0.5  | 0.2  | 0.6  |
| Obstetrics and Gynecology            | Incidence  | 5.6  | 4.9  | 3.7  | 2.8  | 3.2  | 2.6  | 1.1  | 0.6  | 0.1  | 2.7  |
|                                      | Difference | -2.9 | -3.1 | -3.9 | -3.9 | -3.5 | -2.8 | -2.4 | -1.2 | -0.4 | -2.7 |
|                                      | Ratio      | 0.7  | 0.6  | 0.5  | 0.4  | 0.5  | 0.5  | 0.3  | 0.3  | 0.3  | 0.4  |

practice realm of midlevel providers such as physician assistants and nurse practitioners. These providers work in a variety of domains from primary care to emergency medicine and should properly have been assigned to these categories, but our data were limited to identifying their level of licensure, and hence, we elected not to report findings for midlevel providers. Our fatality data were limited to deaths reported to and investigated by the Medical Examiner. It is possible that during the time period, there were other deaths actually caused by prescription opioids which our classification system was unable to capture. By restricting the number of fatalities included to those investigated by the Medical Examiner,

we expect that our reported ARs are lower than the true values. We elected to include all deaths in which prescription opioids were determined to be a cause of death without analyzing the potential influence of illicit substances or alcohol. Each of these decedents had one or more active controlled substance prescriptions at the time of death, and the goal of our analysis was to describe the association of prescriptions by medical specialty with fatality while accounting for the overall prescribing by specialty.

The CSD is limited to information contained on prescription orders, so diagnosis or reason for prescription is not

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available, and we cannot control for the potential confounding related to reason for opioid use such as palliative care or acute injury.

Previous studies of opioid prescribing behavior have been limited to single specialties or practice area [12–15]. Our study is unique for its inclusion of all specialties and analysis of systematically collected administrative data rather than provider self-report.

The Utah Department of Health published clinical guidelines on prescribing opioids in 2010 [8]. Analysis of changes in prescribing practices following promulgation of the Guidelines in Utah is underway, and provider specialty will be evaluated as a potential confounding variable in that analysis.

## Conclusion

Although primary care providers are associated with the highest numbers of prescription-related fatalities, all providers must carefully consider each patient and possible alternatives to opioid prescription. Specialists such as pain medicine well trained in use of opioid medications are associated with opioid fatalities in excess of rates for internal medicine physicians. Concurrent prescription from multiple providers contributes to fatalities. Use of prescription monitoring program query tools may help prevent concurrent prescription and reduce fatalities.

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