Connecting Emrs With Washington’s Pdmp: Benefits Of Integration

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Abstract

The Washington State Prescription Drug Monitoring Program collects records of all prescriptions for controlled substances in the state. If medical professionals check the database before prescribing, they can make better prescribing decisions. They may identify multiple legitimate or illegitimate prescriptions that put the patient at risk of harmful drug interactions, or uncover other relevant information. Reducing drug diversion and “doctor shopping” helps address the opioid crisis, which is partly fueled by inappropriate prescribing.

New integration software makes it significantly faster for prescribers to check the database, but the cost of the software may forestall its purchase and use. This study set out to answer whether the benefits of this integration software – measured as the value of time saved by using a faster system, and any subsidies providers receive from using the software – outweigh the costs.

The results show that for an average provider organization with about 1,300 queriers, the benefits of purchasing integration software outweigh the costs, based on a 3-year estimated useful life of the software. For larger providers of over 50 queriers, this will tend to hold true, whereas for smaller providers, this does not hold true. If the state or another entity wanted to incentivize smaller providers to purchase this software – to reduce overdose deaths from prescription opioids, and other social costs of inappropriate prescribing – subsidies would need to create net benefits to the provider.

Keywords
Health Policy, Prescription Drug Monitoring Program, Electronic Medical Records, Integration software, Controlled substances, Opioid crisis
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**Provider interviews**

Kaiser Permanente: Rivka Klaff
Kitsap Medical Group: Michelle Mathiesen and Barbara Douglas
Providence Health System: Kirsten Halseth and Jamie Bockness
PTSO-WA: Eric Grendell and Bomy Yun
University of Washington: Karen Curtis and Thuan Le

**State interviews**

Alabama: Nancy Bishop   Maryland: Lindsey Ferris
Alaska: Debora Stovern   Nebraska: Kevin Borcher
Arizona: Doug Skvarla    Ohio: Bruce Reynolds
California: Kimberly Kirchmeyer   Oregon: Drew Simpson
Idaho: Teresa Anderson   South Carolina: Christie Frick
Kentucky: Dave Hopkins   Vermont: Hannah Herlihy

**Vendor interviews**

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**Other**

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Background

The Opioid Crisis

Opioids are the most-prescribed class of medication in the United States and the most-abused prescription drug. In Washington State in 2016, 446 people died from an overdose involving a prescription opioid, and the economic cost of the opioid crisis in Washington State was estimated at $9.2 billion (Senate Committee on Health, Education, Labor, and Pensions, 2018). One of many tools used to address the opioid crisis is the state’s Prescription Drug Monitoring Program (PDMP), a registry that tracks prescriptions for controlled substances.

Prescription Drug Monitoring Programs (PDMPs)

In the U.S., 49 states have a PDMP. Providers who query the PDMP to check a patient’s prescription records may identify multiple legitimate or illegitimate prescriptions that put the patient at risk of harmful drug interactions; they also may catch their DEA number being used illegally to forge prescriptions (Congressional Research Service, 2018; May, 2018). Reducing drug diversion and “doctor shopping” can reduce the harms of prescription opioid abuse. PDMP queries help providers to “first, do no harm” by avoiding inappropriate prescriptions.

PDMPs that follow best practices (described by Buchmueller and Carey, 2018; Simeone and Holland, 2006; Patrick et al., 2016) tend to be more likely to have the intended effects on reducing opioid misuse and diversion. For example, requiring providers to query the PDMP before prescribing is an effective policy. The Washington State PDMP has a goal of motivating providers to query the PDMP before every prescription of a controlled substance. Providers say they are more likely to query the PDMP when the process is streamlined by integration software.

However, the Washington PDMP will not integrate with the most commonly used integration software, because it does not encrypt the data during transmission. So alternative software options have been found, and DOH has been working with providers to inform them of their options and provide expertise to support them throughout the process of selecting and implementing integration software. DOH needs good information on costs and benefits of the software in order to advise providers. Providers want to know whether these software options are a worthwhile investment, and need a framework for
making decisions to invest in software. There is no existing research on this very specific topic, and more generally there is a need for this kind of decision-making framework for providers and for health departments for interoperability software options.

Integration of PDMPs with EMRs

Without integration, providers in Washington and other states must leave a patient’s EMR, open a web browser, and sign in to a website – Secure Access Washington (SAW) – to access PDMP data. With partial integration, providers have the ability to directly view PDMP data in a PDF or other static view, by clicking on a button, tab, or menu item in the EMR itself. Full, standards-based integration uses NCPDP 10.6, NCPDP 2017071, or other standards for health data, allowing an EMR to ingest the data. The provider can not only view PDMP data (as in partial integration), but also retain data in the EMR.

Full integration of health data registries can allow provider organizations to retain information like a patient’s prescription history from the PDMP within their own EMR, which gives them the opportunity to use the data for research and potentially improve healthcare long-term. Using consistent standards allows software to be replicable for other states and applications, according to a software vendor I interviewed: “We decided to integrate PDMPs to help clinicians better care for patients. Many states are now coming up with mandates to check the PDMP… Standards-based is the right thing to do. It can be replicated from state to state. …leveraging a standards-based solution can be replayed within the PDMP world and in other areas as well.”

Integration and increased querying of the PDMP are both occurring in Washington, meaning Washington is closer to the goal of having providers check the PDMP for each prescription.

Financial Incentives for Integration

**CMS Incentives.** As part of the American Recovery and Reinvestment Act of 2009, the Centers for Medicare and Medicaid Services offers financial incentives to providers for using EMRs to improve quality of care. Providers that meet Promoting Interoperability requirements receive payments. A portion of this money can be attributed to integrating with the PDMP.
**Other Incentives.** In addition to CMS incentives, HIDTA and other organizations might provide grants that could cover part of the costs of integration for providers in Washington. In other states, the state itself will cover some or all of the costs of the software.

**Costs of Integration**

**Costs to Providers.** The integration software itself may have upfront implementation costs and/or ongoing maintenance costs, paid to the software vendor (unless it is an in-house developed software). Providers must also devote staff time to implementing integration.

**Costs to Society.** People losing access to prescription drugs may turn to non-prescription drugs such as heroin. 4 in 5 new heroin users started out by misusing prescription opioids. New addiction may be prevented by reducing unnecessary prescriptions to patients who have not previously used opioids. Recent evidence is mixed as to whether PDMP use is associated with increases in heroin use. Addiction treatment accessibility can address demand for heroin, while law enforcement efforts can reduce supply (SAMHSA, 2013; Dowell et al., 2016; DOH, 2016; Compton et al., 2016; and NIH, 2016). Prescribers may hesitate to prescribe even for appropriate uses, or may not allow for refills, requiring more frequent office visits and higher costs; prescribers can continue to educate themselves to distinguish dependence from addiction. Patients may find loopholes/workarounds as PDMP use increases; the state PDMP may push drug diversion activities into neighboring states. DOH works to prevent this with interstate data sharing and interoperability (Congressional Research Service, 2018). A recent study has determined that in the short term, restricting access to prescription opioids would likely increase heroin overdose deaths, while in the long term it would likely reduce these deaths (Pitt et al., 2018).

While the state may want to consider costs to society of integration, individual providers may decide that the best interests of themselves and their patients are served by using integration software and prescribing opioids as judiciously as possible with the aid of PDMP information.

**Hypotheses**

This study set out to determine when the net benefits (measured as opportunity cost of time saved) of purchasing integration software are positive, for the mean average-sized provider organization in Washington, the mean small provider organization, and the mean large provider organization.
Answering this question can help providers in Washington to make these decisions, and potentially inform other states that are considering their software options. I hypothesized that the benefits outweigh the costs for the average provider organization, and that smaller provider organizations would be less able to bear the costs of integration.

Methods

Study Design

Provider organizations will choose to purchase this software if they feel it will enhance their practice and save enough time to pay for itself. While benefits to the providers of feeling enabled to provide high quality care are important, the quantifiable and immediate benefit of purchasing integration software is in saving time. Accessing the PDMP through the SAW website takes considerably longer than accessing through an integrated EMR, which is close to instantaneous. The time savings are thought of here as an opportunity cost of lost wages for the provider doing the querying. In addition, there are subsidies described below that use of integration software may contribute to.

Providers in Washington who use SAW will be willing to pay for the software when the benefits each year outweigh the costs (assuming a 3-year useful life of integration software, averaged out to give a value for 1 year):

**Monetized value of the time saved by using integrated software > cost of software**

\[
N \times S \times W \times T - C - I + G > 0
\]

*N: Mean number of queriers in organization. I used a list of provider organizations in Washington maintained by DOH. Although it is not a comprehensive list, it captures 125 provider organizations that participate in CMS Promoting Interoperability incentives. The list provides the number of clinics each*
provider organization has, and I went onto the websites of the different provider organizations to estimate how many employees they had who could access the PDMP. For example, the University of Washington system has about 30,000 professionals and about 348 clinics.

To estimate the number of queriers at each provider organization, for any organization with more than one clinic for which I did not have a source for estimating the number of queriers they would have, I multiplied the number of clinics in the organization by 100. For organizations with just one clinic, I multiplied by 10 to estimate the number of queriers. I then took the average number of queriers for all provider organizations, small provider organizations, and large provider organizations.

The ranges for small and large provider organizations are estimated as the plausible ranges with a cutoff at 50 between the two sizes.

**S: Mean number of SAW queries per querier per year.** To find the average number of queries per person per year made through SAW, I looked at the user report from the Department of Health for 2017. To find the SAW queriers in Washington State in 2017, I excluded any law enforcement, DOH, research, and other non-medical queriers. I also excluded queries from people licensed outside of Washington State (their addresses appeared to also be out of state). I excluded people who did not query at all in 2017, because this analysis only looks at those who do query and have a use for integration software. Medical professionals who do not query and/or are part of organizations that do not prescribe controlled substances are not relevant to the analysis. Other than these categories that were omitted from the analysis, the numbers used were for the entire population of SAW queriers in the state, not just a sample.

**W: Mean wage per second.** To estimate the average wage per second of a SAW querier in Washington State in 2017, I combined data from DOH and the Bureau of Labor Statistics. The DOH comprehensive query user report for SAW lists each healthcare professional, their license type, and the number of queries they made in 2017. The license types I included are for a wide range of healthcare professionals such as dentists, psychologists, veterinarians, etc. who are permitted to query the PDMP for patient records.

The BLS data for salaries of professionals in Washington State for 2017 lists categories of professionals such as pharmacists, nursing assistants, podiatrists, etc.
I created a crosswalk of DOH license types to BLS professions, included in the Appendix.

I added up all the queries made in 2017 by each category of profession in the DOH data, then translated that into a number of queries made in 2017 by each category of profession in the BLS categories.

I weighted the BLS salaries for each type of professional by the number of SAW queries made in 2017 by that type of professional. This made the average salary reflect the salaries of the kinds of medical professionals that make the most queries – to account for the fact that certain professions, like veterinarians, tend to make fewer queries. I came up with an estimated average salary for a professional querying SAW. This meant excluding categories of professionals who are permitted to query the PDMP but did not do so in 2017. I estimated the mean salary at $117,761 per year.

Then I estimated the mean number of hours worked each week by using survey results from the American Medical Association (AMA, 2014). The survey had 4,950 respondents, and I assumed for the sake of analysis that they all responded to the question about hours worked per week. The survey results were reported as ranges of hours worked, so I used the midpoints of each interval and an estimate for the lower and upper intervals (27.75, 45, 55.5, 65.5, 75.5, 92.25 hours) and weighted them by the number of respondents in each interval to get an estimate of mean hours worked per week.

To estimate the mean wage per second, I divided $117,761 by the mean hours worked per week as per the AMA, by 50 workweeks per year, and then by minutes and seconds.

**T: Mean seconds saved per integrated query.** To estimate seconds per query, I timed healthcare professionals in Washington querying SAW. (I timed 4 people, and 2 of them had usable times because the other 2 had expired accounts with SAW). Most SAW queries actually took considerably longer than the mean I used, because the providers forgot their password or their account expired. The estimate I used was a conservative estimate for the top of the range.

I subtracted the mean time for a query through an integrated system from the mean time for a query through SAW, to find the mean time saved. The 95% confidence interval for this value extended below 0 assuming a normal distribution, but I set the minimum value at 0.
C: Cost of software per year. Using a 3-year depreciation schedule, I averaged out the mean costs of the software over a 3-year period. To estimate the cost of software for the year, I interviewed 2 software vendors, 5 healthcare organizations, and 7 U.S. states to get general ranges for software costs. The costs include upfront costs of the software; maintenance costs of the software over time; and costs internal to the healthcare organization itself of paying their own staff to implement the new system. Given that 34 of the 125 provider organizations that participate in CMS Promoting Interoperability incentives are larger provider organizations with more than 1 clinic, I weighted the costs for larger vs. smaller clinics that ratio. The costs of the software, including license fees, installation costs, and annual maintenance costs, are depreciated over a standard software lifespan of 3 years (IRS 2013).

I: Mean implementation costs for in-house staff. The estimated costs were obtained through interviews. Using a 3-year depreciation schedule, I averaged out the mean upfront costs of the implementation of the software over a 3-year period. Given that 34 of the 125 provider organizations that participate in CMS Promoting Interoperability incentives are larger provider organizations with more than 1 clinic, I weighted the costs for larger vs. smaller clinics that ratio.

G: Subsidies and grants. There are some grants and subsidies that provider organizations can receive either to help purchase software or as an award for using the software. The most common grant is from a CMS program that provides financial incentives for using EMRs in certain ways to many provider organizations in Washington. There are other subsidies available in some cases, for example High Intensity Drug Trafficking Area program funding that is available to providers in specific locations. DOH works with providers to help them find the best deals.

As part of the American Recovery and Reinvestment Act of 2009, CMS offers financial incentives to providers for using EMRs to improve quality of care. Providers that meet Promoting Interoperability requirements receive payments. A portion of this money can be attributed to integrating with the PDMP. Starting in 2019, PDMP querying has been one of the factors that helps providers get these financial incentives (CMS-1694-F (2018), CMS-1693-P (2018)). In 2020, PDMP querying through the EMR will be worth 5 points out of 100. PDMP querying can also contribute to the measure called “Support Electronic Referral Loops by Receiving and Incorporating Health Information,” which involves synthesizing
information from multiple sources for medication reconciliation. This measure is worth 20 points out of 100; PDMP querying might be said to contribute a quarter of that, or about 5 points. PDMP querying can also contribute to the Support Electronic Referral Loops by Sending Health Information measure, which requires the provider to send an electronic summary of care to the patient. This measure is also worth 20 points out of 100; and PDMP querying might be said to contribute a quarter of that, about 5 points.

Altogether, if PDMP querying through the EMR contributes to an estimated 15 points out of 100, then integration will give the provider 15% of their PI incentive.

In Washington, there were 38,969 eligible professionals and 606 hospitals that received Promoting Interoperability incentives in the period from January 2011 to October 2018 (CMS Combined Medicare And Medicaid Payments by State, 2018). The eligible professionals received a combined total of $55 million in that time period, and the hospitals received $51 million. I divided those respective amounts by the number of eligible professionals (which I considered to be “small provider organizations”) and the number of hospitals (large provider organizations). Because provider organizations can in fact consist of multiple hospitals and eligible professionals, but it is not known which eligible professionals were in which organization at a single point in time and so they cannot be grouped into provider organizations, this is a conservative estimate of the amount of the subsidy. I then further divided those amounts to reach an estimate of the average subsidy for 1 year.

Study Population

Based on 11,908 medical professionals licensed in Washington State who queried the state’s Prescription Drug Monitoring Program in 2017 through SAW, I could count how many times each license type queried the PDMP that year and calculate the opportunity costs of the time they lost based on their wages, as taken from the Bureau of Labor Statistics estimates of wages for each type of profession in Washington (with a crosswalk between the BLS and DOH classifications of types of medical professionals).

The qualitative interviews gathered information from 2 software vendors, 5 healthcare organizations, and 7 U.S. states about PDMP integration with EMRs. I also conducted interviews with 10 states (some I had also interviewed about integration) about mandates.
The data I gathered from timing healthcare professionals in Washington were limited. I timed 4 people, and 2 of them had usable times because the other 2 had expired SAW accounts.

**Calculations**

Analysis was done in Excel. After I estimated values, ranges, and 95% confidence intervals for each variable in the cost-benefit equation - for average provider organizations, small provider organizations, and large provider organizations - I performed a deterministic sensitivity analysis to show how the results would vary if the mean for each independent variable were to vary within its given range, ceteris paribus.

**Results**

**Table 1. Estimated Values for Input Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Source</th>
<th>Point Estimate</th>
<th>Range</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Mean number of queriers in organization</td>
<td>From DOH contacts list</td>
<td>1,269</td>
<td>1 to 30,000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(10 for small providers; 4,491 for large providers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Mean number of SAW queries per querier per year</td>
<td>DOH data (comprehensive query user report)</td>
<td>137 per person / year</td>
<td>1 to 29,747</td>
<td>128 to 146</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(N = 11,808)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Mean wage per second, weighted by number of queriers</td>
<td>Mean wage for each profession: Bureau of Labor Statistics translated to DOH categories of professions</td>
<td>$117,761 annually</td>
<td>$30,410 to $251,210</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean hours worked: American Medical Association</td>
<td>52 hours/week, mean (and assuming 50 weeks / year)</td>
<td>10 to 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14% worked less than 40 hrs/wk; 36% from 40 to 50 hrs; 26% from 50 to 60 hrs; 13% from 61 to 70 hrs; 6% from 71 to 80 hrs; 5% 80 or more hrs</td>
<td>51.8 to 52.6</td>
</tr>
<tr>
<td>T</td>
<td>Average seconds saved per integrated query</td>
<td>Mean wage per second, weighted by number of queriers</td>
<td>Cost of software per year</td>
<td>Subsidies and grants</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>---------------------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Empirical timing of a SAW query</td>
<td>$0.0125</td>
<td>Interviews with providers, software vendors, states</td>
<td>Estimated from CMS data for Medicaid and Medicare Promoting Interoperability financial incentives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Empirical timing of an integrated query</td>
<td></td>
<td>$1,689 ($1,383 for small providers; $2,508 for large providers)</td>
<td>$402 per year ($210 for small providers; $12,690 for large providers)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time saved: difference</td>
<td>78.5 seconds $((42 + 115) / 2)$</td>
<td>$167 to $4,183 ($83 to $2,267 for small providers, $1,000 to $2,600 for large providers)</td>
<td>$0 to $3,609,378 ($0 to $18,000 for small providers; $0 to $3,609,378 for large providers)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>42 to 115 seconds $(N = 2)$</td>
<td>From interviews $13,238 ($5,088 for small providers; $21,389 for large providers)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.5 seconds $((0 + 5) / 2)$</td>
<td>$175 to $58,333 ($175 to $10,000 for small providers; $2,500 to $58,333 for large providers)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 5 seconds $(N = 2)$</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>37 to 115 seconds $(78.5 – 2.5)$</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 187</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Average Provider Organization

Using the mean values for these variables, the results of this equation are shown for 1 year for an average provider organization.

\[
\text{number of queriers} \times \text{average number of SAW queries per person per year} \times \text{average wage per second} \times \text{average seconds saved per integrated query} > \text{cost of software per year} + \text{implementation costs} - \text{grants}
\]
\[N \times S \times W \times T - C - I + G > 0\]

\[1,269 \times 137 \times .012 \times 76 - 1,689 - 13,238 + 402 = 151,424 > 0\]

The inequality is true. The net benefits of purchasing the software are positive. For the average provider organization, then, it would make sense to purchase the software.

A sensitivity analysis shows that if the number of queriers in the organization drops below 112, or if the number of queries per querier drops below 13, ceteris paribus, the net benefits of the software will be negative. For other variables, throughout their entire range, the net benefits of purchasing the software will be positive.

**Figure 1. Average Provider Organization: Deterministic Sensitivity Analysis**

This analysis assumes that the provider makes the same number of queries before purchasing integration software as after. However, if the provider were to make twice as many queries after purchasing integration software, this could be represented as doubling the time an integrated query takes; doubling this time from 2.5 to 5 seconds would change the time savings to only 73.5 seconds. Even in this circumstance, the net benefits would be positive. When the time difference between an integrated and SAW query drops below 7 seconds, the net benefits drop below 0. This would mean a provider would need to make about 29 times the number of queries after integration as before in order to negate the benefits of integration.

**Small Provider Organization**

Using the mean values for these variables, the results of this equation are shown for 1 year for a small provider organization.
The inequality is false. The net benefits of purchasing the software are negative. For the small provider organization, then, it would not make sense to purchase the software. However, if the state government or other entity were to offer a subsidy of more than $4,953 annually for the 3-year useful life of the software, the investment in the software would be worth making.

A sensitivity analysis shows that although having a higher-than-average number of queries per querier (or other factors contributing to lower cost or higher benefits) might make it worthwhile for a small provider organization to purchase integration software, the average small provider will not benefit:

Figure 2. Small Provider Organization: Deterministic Sensitivity Analysis

Large Provider Organization

Using the mean values for these variables, the results of this equation are shown for 1 year for a large provider organization.

The inequality is true. The net benefits of purchasing the software are positive. For the large provider organization, then, it would make sense to purchase the software.

A sensitivity analysis shows that purchasing integration software will always have a net benefit for a larger provider organization, unless the number of queriers in the organization is less than 86, or the number of queries per querier is less than 3:
Discussion

Benefits of Integration Software Outweigh Costs

For large and average provider organizations, purchasing integration software has greater benefits than costs, in terms of time saved for queriers. These findings hold true for the full ranges of values of the inputs, with the exception of number of queriers in the organization and number of queries per person per year. If either of these numbers fall too low, net benefits become negative.

For small provider organizations, net benefits are negative. A subsidy from the state government or other agency of about $5,000 annually for the 3-year useful life of the software would make the investment worthwhile.

Individual provider organizations

A provider organization interested in performing this analysis to determine the net benefits of purchasing integration software for their own specific circumstances could use their own parameter values in the equation. They would need the average salary of a querier, average queries per querier per year, number of queries in the organization, and so on for their own organization. For each provider organization in general, they will be willing to pay for integration software when the equation is true for their situation.
Benefits as Opportunity Cost

The time savings of integration are thought of here as an opportunity cost of lost wages for the provider doing the querying. This is a convenient format to use, as it translates into a dollar amount. However, in reality the dollar amount is an abstraction, because providers who have an integrated system may choose to make more queries now that each query takes less time, meaning they will not save as much time as they would if they were still making the same number of queries as they did through the website; and that the extra time that the provider has will be taken up with more work and more patients to earn money, rather than taken as leisure time and leaving the office 5 minutes earlier than they otherwise would. Additionally, querying the PDMP compared to not querying the PDMP may influence subsequent treatment choices, which could influence how much time the provider spends with the patient (for example, they might choose to “fire” a patient addicted to opioids, or alternatively invest a larger amount of time looking into treatment options for that patient rather than simply prescribing opioids).

Probability of Querying

The probability that a provider will query the PDMP can vary depending on whether they have an integrated system or not. Once integration software is purchased, the querier will find it easier to make queries, and may therefore make more of them. However, given that queries made through an integrated system are almost instantaneous with a single click, the model still predicts a time savings even if queries go up substantially. Assuming that all other input values remained the same, a provider would need to make about 29 times the number of queriers for the benefits of integration software to evaporate. Still, other factors, such as mandates to query the PDMP, new prescribing guidelines, and other innovations may affect this equation.

Delegation

Providers should also consider delegating their querying to the employees with the lowest salaries, given that their time will be less costly. However, the smallest providers for whom the software might be out of budget also will not have many employees to delegate to.
**Mandates**

As of the beginning of November 2018, mandates in Washington went into effect that require providers to query the PDMP under certain circumstances. If this increases the querying a provider does, the provider should consider this as part of the decision about whether to purchase integration software.

**Conclusion**

Overall, PDMPs nationwide continue to show great promise for improving prescribing practices, not just for opioids and other controlled substances, but also for all prescriptions. For example, the Nebraska PDMP keeps records of all types of prescriptions, simplifying medication reconciliation. This is easier for providers, safer for patients who will not be given conflicting prescriptions, and a step forward for EMRs overall. The evidence so far has shown benefits of PDMP querying, and of making querying easier through software solutions. The potential of integration software to improve use of PDMPs and other public health data registries, and for future applications to come, is exciting.
Sources


Appendix

Table 2. Crosswalk between DOH license types and BLS profession categories
I excluded queries from people licensed outside of Washington State (their addresses appeared to also be out of state). I excluded DOH license types that were non-medical, for example law enforcement, DOH employees, researchers. I also excluded DOH license types that did not make any queries in 2017: Athletic Trainer, Dental Community Resident, Dental Hygienists, Dental UW Resident Expanded Function, Dental Auxiliary, Marriage & Family Therapist, Medical Assistant Hemodialysis, Optometrist, Physician Fellowship, Podiatric Limited, X-Ray Technician.

<table>
<thead>
<tr>
<th>DOH License Types</th>
<th>BLS Professions</th>
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<tbody>
<tr>
<td>CM</td>
<td>Medical Assistant Certification</td>
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<tr>
<td>HT</td>
<td>Medical Assistant Hemodialysis</td>
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<td>IC</td>
<td>Medical Assistant Interim</td>
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<td>PC</td>
<td>Medical Assistant Phlebotomist</td>
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<td>MR</td>
<td>Medical Assistant Registration</td>
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<td>OA</td>
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<td>PA</td>
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<tr>
<td>VB</td>
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<td>IR</td>
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<td>CP</td>
<td>Chemical Dependency Professional</td>
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<td>LH</td>
<td>Mental Health Counselor</td>
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<td>Counselor Agency Affiliated</td>
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<td>NA</td>
<td>Nursing Assistant Registered</td>
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<td>LW</td>
<td>Social Worker Advanced</td>
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<td>Radiologic Technologist Certification</td>
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<td>PY</td>
<td>Psychiatrist License</td>
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