Using Pharmacy Claims to Measure Opioid Misuse and Prospectively Identify At-Risk Patients

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Background

- Approximately 46 people die per day in the U.S. from prescription opioid overdose according to the CDC[1]. This national crisis warrants action, including the preemptive identification of patients at risk of opioid misuse.

Objective

- Create an Opioid Misuse Index (OMI) from pharmacy claims designed to identify patients at risk of inappropriate opioid use (e.g., opioid abuse, overdose, illicit use).
- Create a predictive model that will prospectively identify patients at risk of opioid misuse using pharmacy claims data only.

Methods

- Study Sample
  - FFS Medicaid plan members who were continuously enrolled during the study timeframe, aged 18+, and prescribed an opioid medication
  - Excluded members on hospice
- Opioid Misuse Index (OMI)[2] – is a summation of indicators, and can range from 0 - 6
  - Pharmacy shopping = 3+ pharmacies for opioid fills
  - Prescriber shopping = 3+ opioid prescribers
  - Combined pharmacy & prescriber shopping
  - Average daily MME ≥ 50
  - Average daily MME ≥ 90
  - 30+ days of concurrent benzodiazepine & opioid use
- Independent Variables
  - Approximately 225 independent variables were derived from prescription drug claims, and included basic demographic information, therapeutic conditions, prescriber specialty, denied opioid claim count, opioid potentiator count, overlapping opioid fill count, and many more.
- Analytic Plan
  - Concurrent and predictive validity of the OMI were assessed using a sample of 14,619 Medicaid patients. Regression analyses were conducted where the OMI was used to predict concurrent and future medical outcomes (i.e., opioid overdose, opioid use disorder diagnosis, excessive emergency department [ED] visits).
  - Subsequently, independent variables were used to predict the OMI in a backwards stepwise linear regression analysis in a sample of 12,684 Medicaid members from several U.S. states to create a predictive model that identifies members at risk of opioid misuse. The model was cross validated using an independent sample composed of 5,316 members.

Combining indicators from Rx claims with predictive modeling allows for the **early identification of patients at-risk of opioid misuse** even when medical claims data are not available.

Results

OMI Validation

Concurrent Validity		
Outcome	Odds Ratio	p-value
Excessive ED Visits	1.60	≤ .001
Opioid use disorder diagnosis	1.82	≤ .001
Opioid overdose	1.85	≤ .001
Predictive Validity		
Excessive ED Visits	1.34	≤ .001
Opioid use disorder diagnosis	1.71	≤ .001
Opioid overdose	1.76	≤ .001

Predictive Model

A regression model predicting the OMI was developed with 20 predictors, R^2 = .39, and the linear correlation between the predicted OMI and the observed OMI was .63.

Independent Measures	β	*t*	*p*-value
Historic OMI	0.24	18.22	0.000
Continuous Use	0.14	13.57	0.000
Long acting opioid	0.11	9.21	0.000
High street value opioid	0.09	8.09	0.000
Concurrent Benzodiazepine use	0.11	12.32	0.000
Average daily MME	0.09	9.04	0.000
Average days overlap between opioid fills	0.04	3.21	0.001
Potentiator fill count	0.03	2.31	0.021
Fill count with max allowed overlap	0.04	3.26	0.001
Pharmacy count	0.03	3.03	0.002
Musculoskeletal Dx	0.03	3.01	0.003
Corticosteroid use	0.03	3.47	0.001
Vaccines	0.03	4.07	0.000
Prescriber risk	0.02	2.42	0.015
Insomnia Dx	0.02	1.91	0.057
Opioid prescribed by physicians assistant	0.02	2.29	0.022
Depression Dx	0.02	1.86	0.063
Antihistamine use	0.02	2.12	0.034
Opioid prescribed by surgical doctor	-0.02	-2.00	0.046
Infection Dx	0.01	1.70	0.088

Discussion

- A plethora of predictive models targeting opioid misuse have been developed, but to our knowledge the majority of these models utilize multiple data sources including medical claims. A limitation to these models is that there are many circumstances where these data sources are not available. However, by leveraging available data, pharmacy claims in this case, it may be possible to identify patterns that signal impending adverse outcomes.
- Behavioral mechanism associated with opioid misuse (e.g., doctor shopping, prescriber shopping, concurrent benzodiazepine use) can be used to identify patients at risk of a potential adverse medical outcome (e.g., opioid overdose, poor pain management leading to excessive ED utilization, or abuse leading to an opioid use disorder) and can be derived from pharmacy claims.[3]
- By incorporating the behavioral mechanisms (OMI) associated with opioid misuse into a predictive model as an outcome, at-risk patients can be identified prior to the occurrence of an adverse medical outcome thereby illuminating opportunities for preemptive clinical interventions.

Limitations

- The OMI has only been validated within a FFS Medicaid population and results may not generalize to other populations (e.g., commercial, Medicare).
- The OMI was theoretically, rather than empirically, derived, and additional indicators may increase the association between the index and target medical outcomes.
- The OMI has demonstrated concurrent and predictive validity in regard to specific medical outcomes, but may not be associated with other adverse opioid use outcomes.

Conclusion

- Pharmacy claims data can be used to prospectively identify patients at risk of opioid misuse with a fair level of accuracy. The OMI is a theory based index of opioid misuse that has demonstrated both a concurrent and prospective relationship to adverse medical events associated with opioid misuse. Additionally, the regression model developed to predict the OMI has demonstrated the ability to prospectively identify patients at risk of opioid misuse.

References

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