Predictors of Substance Use Disorders and Overdose Following Adolescent Trauma

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Why is the Adolescent Trauma Population Unique?

• **Injury** is one of the most common reasons **adolescents are prescribed opioids**

• Majority of people who develop SUD, are **exposed to addictive substances before adulthood**

• Previously we reported
  – Over a quarter receive **refills** for Rx opioids
  – 1 in 5 sustain opioid Rx use for a year
  – 1 in 8 have new opioid fills for **at least 4 years** after injury
  – 1 in 8 diagnosed with a substance use disorder
  – 1 in 10 **overdose** in the ED
  – Depression, PTSD, and chronic pain diagnosed in **less 10% of cases**
Study Rationale and Aims

• Mental health conditions are under-assessed after trauma and treatment is not always available

• Historically, patients have had more access to opioids than mental health services

• **STUDY AIM:** Determine if post-discharge opioid prescribing is predictive of developing a substance use disorder (SUD) or experiencing an overdose (OD) 5 years following hospital discharge
Study Design and Data Sources

• Retrospective cohort study
  – Ages 12-18, admitted for injury to either a pediatric or adult level 1 trauma center
  – Injured between 2011-2013
  – Examined post-discharge opioid prescribing and new mental health diagnoses for 5 years after injury

• Trauma registry data was linked to a regional health information exchange (HIE)
  – Extracted ICD-9/10 data on ED, outpatient, and inpatient visits across multiple health systems within the state
  – Rx data was provided by Surescripts and hospital-based pharmacies
# Study Variables

<table>
<thead>
<tr>
<th>Hospitalization</th>
<th>Follow-up Period</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trauma Registry Data</strong></td>
<td><strong>HIE Encounter Data – Dates Masked</strong></td>
</tr>
<tr>
<td>Demographics</td>
<td>New Diagnoses (ICD-9/10 codes)</td>
</tr>
<tr>
<td>• Age (12-15, 16-18)</td>
<td>• Substance Use Disorder</td>
</tr>
<tr>
<td>• Gender (Male, Female)</td>
<td>• Overdose</td>
</tr>
<tr>
<td>• Race (AA, White, other)</td>
<td>• Depression</td>
</tr>
<tr>
<td>• County (Rural, Urban)</td>
<td>• PTSD</td>
</tr>
<tr>
<td>• Insurance (Private, Medicaid, Self-Pay)</td>
<td></td>
</tr>
<tr>
<td><strong>Injury Characteristics</strong></td>
<td><strong>Surgical Procedures</strong></td>
</tr>
<tr>
<td>• ISS (&lt;15, 15 or greater)</td>
<td></td>
</tr>
<tr>
<td>• Mechanism (Blunt, Penetrating)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>HIE Pharmacy Data – Dates Provided</strong></th>
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</thead>
<tbody>
<tr>
<td>3 Months Outpatient Opioid Fills</td>
</tr>
<tr>
<td>6 Months Outpatient Opioid Fills</td>
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<tr>
<td>12 Months Outpatient Opioid Fills</td>
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<tr>
<td>24 Months Outpatient Opioid Fills</td>
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<tr>
<td>36 Months Outpatient Opioid Fills</td>
</tr>
<tr>
<td>48 Months Outpatient Opioid Fills</td>
</tr>
</tbody>
</table>

Release of identifiable data elements, such as dates, are restricted by some institutions contributing data to the HIE, as well as for certain types of mental health encounters. In these cases, the HIE data broker flagged cases with new Dx.
Analysis

• Sum of outpatient Rx opioids fills was calculated at 3, 6, 12, 24, 36, and 48 months

• Differences in mean number of Rx fills by patient characteristic was assessed using t-tests/ANOVA

• Logistic regression examined whether number of outpatient opioid fills increased likelihood of SUD and OD
  – Controlled for injury severity, mechanism, age, gender, race, insurance, surgery, rural/urban county of residence, depression and PTSD diagnoses
  – 12 separate regression models, one for each outcome and time point
Results: Cohort Characteristics

• 736 cases
  – Approximately half were 14 and younger
  – 70% White
  – 41% Rural
  – 75% Blunt injuries
  – 15% ISS 15 or greater
  – 84% Routine discharge
  – 36% Medicaid and 19.1% Self-pay

• Over 90% of cases were able to be linked to the HIE
  – 90.9% had prescription data (80% were outpatient Rx)
  – 90.8% had encounter data
Results: Mean Differences in Opioid Rx Fills

- Demographic and injury characteristics including **age, insurance status**, and **injury severity** differed in average number of Rx fills

- Patients with **SUD, OD, Chronic Pain, and Anxiety** had significantly higher mean opioid fills **throughout the follow-up period**

<table>
<thead>
<tr>
<th></th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
<th>24 Months</th>
<th>36 Months</th>
<th>48 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older Age</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.29</td>
</tr>
<tr>
<td>Medicaid</td>
<td>0.03</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Higher ISS</td>
<td>0.22</td>
<td>0.32</td>
<td>0.36</td>
<td>0.29</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SUD</td>
<td>0.17</td>
<td>0.17</td>
<td>0.21</td>
<td>-</td>
<td>0.48</td>
<td>0.64</td>
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<tr>
<td>OD</td>
<td>0.11</td>
<td>0.21</td>
<td>0.31</td>
<td>0.49</td>
<td>0.57</td>
<td>0.86</td>
</tr>
<tr>
<td>Depression</td>
<td>0.24</td>
<td>-</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>PTSD</td>
<td>-</td>
<td>0.74</td>
<td>0.72</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>Anxiety</td>
<td>-</td>
<td>0.01</td>
<td>0.07</td>
<td>-</td>
<td>-</td>
<td>0.52</td>
</tr>
<tr>
<td>Chronic Pain</td>
<td>0.10</td>
<td>0.11</td>
<td>-</td>
<td>-</td>
<td>0.61</td>
<td>1.26</td>
</tr>
</tbody>
</table>
Results: Adjusted Odds of SUD Dx and Total Opioid Rx Fills

- Each Rx filled in the first 3 months after injury increased likelihood of SUD diagnosis by over 55%

- Factors that increased the likelihood of SUD
  - Less severe injury
  - Surgery
  - Older age
  - Urban county
  - PTSD

- C statistic ranged from 0.782-0.792
Results: Adjusted Odds of Overdose by Total Opioid Rx Fills

- **Long-term prescribing** more predictive than short term prescribing
- **Factors that increased likelihood of OD**
  - Surgery
  - Medicaid
  - Urban county
  - Penetrating injury
  - Depression
- **C statistic ranged 0.841-0.854**
Conclusions

• Age, insurance status, injury severity, and mental health Dx associated with increased number of opioid fills

• Adjusted analyses indicated
  – Short-term opioid prescribing increases risk of developing SUD, as well as less severe injuries, surgery, and PTSD
  – Long-term opioid prescribing increases risk of OD, as well as surgery, Medicaid, urban residence, penetrating trauma, and depression
Thank You!