Implementation of a Multimodal Pain Management Protocol Does Not Increase Hospitalization Cost After Thoracic Surgery

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INTRODUCTION

- Opioid epidemic
  - 70,000 deaths in 2019
  - 70% involved prescription opioids
  - 40% of deaths involve legal prescriptions
- Overprescribing
  - > 50% more in the U.S. than the rest of the world
- No “safe” opioid exposure
  - 6% continued use at 1 year after 1 day’s prescription
  - 13.5% with 7 day prescriptions
- Wide variability for post-op pain control
  - No “safe” opioid exposure
  - Overprescribing
  - Opioid epidemic

STUDY AIM

To determine if implementing a non-narcotic MMPR as part of an evolving institutional ERAS protocol has an effect on hospital length of stay (LOS) or overall hospitalization cost in minimally invasive thoracic surgery patients

MATERIALS & METHODS

- Single-center retrospective review
- Institutional Society of Thoracic Surgeons, pharmacy, and nursing databases
- Minimally invasive lobectomies
- Opioid group (pre-MMPR protocol): Jan 2016 - Jan 2019
- MMPR group: Jan 2019 - Nov 2020
- Further ERAS initiatives added November 2020
- Standardized MMPR
  - Pre-op acacetaminophen & gabapentin
  - Intra-op Exparel® intercostal & serratus nerve blocks
  - Post-op scheduled acacetaminophen, gabapentin, mexthocebamol
  - Toradol added at provider’s discretion
  - Opioids prescribed at discharge if required consistently during admission

RESULTS

Table 1. Patient Demographics

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>MMPR Group (n = 102)</th>
<th>Opioid Group (n = 211)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>67 (9.7)</td>
<td>64 (9.3)</td>
<td>0.01</td>
</tr>
<tr>
<td>Race (%)</td>
<td>58 (57)</td>
<td>102 (48)</td>
<td>0.18</td>
</tr>
<tr>
<td>White</td>
<td>73 (72)</td>
<td>169 (80)</td>
<td>0.11</td>
</tr>
<tr>
<td>African American</td>
<td>29 (28)</td>
<td>40 (19)</td>
<td>0.08</td>
</tr>
<tr>
<td>Native American</td>
<td>0 (0)</td>
<td>1 (0.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>Other</td>
<td>0 (0)</td>
<td>1 (0.5)</td>
<td>1.00</td>
</tr>
<tr>
<td>Medicare Status (%)</td>
<td>63 (62)</td>
<td>117 (55)</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Table 2. Pain Outcomes

<table>
<thead>
<tr>
<th>Oral Opioid Use (%)</th>
<th>MMPR Group (n = 102)</th>
<th>Opioid Group (n = 211)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.1</td>
<td>95.3</td>
<td>&lt; 0.001</td>
<td></td>
</tr>
<tr>
<td>Mean MME (mg)</td>
<td>195</td>
<td>1218</td>
<td>0.018</td>
</tr>
<tr>
<td>Home Opioid Prescriptions (%)</td>
<td>38</td>
<td>93</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Pain Scores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Score (1-10)</td>
<td>2.9</td>
<td>4.0</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Time spent with score &lt; 6 (%)</td>
<td>87.1</td>
<td>77.1</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Time spent with score &lt; 3 (%)</td>
<td>56.5</td>
<td>42.0</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Table 3. Hospitalization Outcomes

<table>
<thead>
<tr>
<th>30-day Readmissions (%)</th>
<th>MMPR Group (n = 102)</th>
<th>Opioid Group (n = 211)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 (14)</td>
<td>21 (10)</td>
<td>0.58</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of stay (days)</th>
<th>MMPR Group (n = 102)</th>
<th>Opioid Group (n = 211)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2 (3.7)</td>
<td>5.2 (5.5)</td>
<td>0.10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hospitalization Cost ($)</th>
<th>MMPR Group (n = 102)</th>
<th>Opioid Group (n = 211)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>18,851.10 ($3,999.54)</td>
<td>20,988.32 ($24,194.28)</td>
<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION

- 81% of MMPR group received all 4 components (acetaminophen, gabapentin, methocarbamol, Exparel®)
  - Non-standardized/sporadic use in opioid group
  - No difference in 30 day readmissions
  - Including readmissions due to pain
  - Trend toward shorter hospital LOS by 1 full day
  - Trend toward cheaper hospitalization by $2,137.22
  - Multiple studies demonstrate clear benefit of ERAS for improved outcomes after thoracotomy
  - Less robust for video-assisted thoracoscopic surgery (VATS)
  - Consistent cost benefits
    - Cost of implementation balanced by savings generated in ERAS patients
    - $5,300 per VATS and $15,000 per thoracotomy patient
  - Patients taking home opioids pre-op
    - 3 in the MMPR group
    - Experienced improved pain control
    - Cannot determine appropriate cutoff for exclusion based on pre-op home opioid use
  - Cost of pain adjuncts
    - i.e. Exparel® frequently cited as too expensive for routine surgical use
    - May not have significant contribution to overall hospitalization cost vs offset by shortened LOS
  - Future studies
    - Cost subgroup analyses
    - Identify if MMPR and/or other ERAS initiatives are major contributors
    - Protocol expansion
    - Forget procedures
    - More extensive chest wall recoinstruction

REFERENCES


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