**Trauma Advanced Practice Providers Breathe**
**New Life into Chest Tube Management**

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**Introduction**

Injury to the chest, by either blunt or penetrating mechanism, is quite common in the trauma population. Treatment of pneumothorax and/or hemothorax often involves placement of thoracostomy tubes. In the past, management of these chest tubes has been based on experience in cardiothoracic surgery, which may not accurately reflect the pathology of traumatic injuries. Thus, there was considerable variability in chest tube management from provider to provider. Trauma Advanced Practice Providers (APP) created a chest tube management guideline utilizing evidence from trauma literature to facilitate consistency in care.

We hypothesized that implementation of a chest tube management guideline based on trauma literature would decrease variability in care, chest tube days, and number of chest x-rays without increasing complications.

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**Methods and Materials**

We performed a retrospective chart review of adult trauma patients admitted to Grant Medical Center who required placement of at least one chest tube and survived more than 24 hours. We compared one year prior to guideline creation (2016) to one year after full implementation of the APP created guideline (2018). Baseline characteristics, indication for chest tube, number of chest tube days, post-removal chest x-ray and chest tube related complications were recorded.

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**Results**

236 patients with 461 chest tubes were included in the pre-guideline group, compared to 208 patients with 376 chest tubes in the post-implementation cohort. The groups were similar in age, sex and chest AIS (p > 0.03). In order to focus on chest tubes managed by APPs following our guideline, patients who were admitted to critical care or went to the operating room were excluded from further analysis. There was a statistically significant decrease in chest tube days (4.1 vs 3.1, p < 0.03) and decrease in overall hospital length of stay (9.2 vs 7.0, p < 0.03). Additionally, there was a significant decline in utilization of post-removal chest x-rays, from 85.6% to 30.7% (p < 0.001). There was no difference in readmission rates (4.7% vs 3.4%, p = 0.49) nor the need for replacement chest tubes.

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**Chest Tube Management Guideline**

- **Clinical signs of air leak?**
  - Yes: CT to water seal for 24 hrs
  - No: CT to 20cc H2O suction for 24 hrs

- **Ongoing for > 72 hrs?**
  - Yes: Consider VATS
  - No: Continue drainage

- **Clinical signs of air leak?**
  - Yes: CT to water seal for 24 hrs
  - No: CT to 20cc H2O suction for 24 hrs

- **Output > 200 mL/24 hrs?**
  - Yes: Remove CT
  - No: Continue drainage

- **Mechanically ventilated?**
  - Yes: Consider imaging vs indwelling drain
  - No: Continue drainage

- **CT to water seal for 24 hrs**
  - Yes: Consider imaging vs indwelling drain
  - No: Continue drainage

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**Demographics**

<table>
<thead>
<tr>
<th></th>
<th>Pre-2016</th>
<th>Post-2018</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td># Chest Tubes</td>
<td>408</td>
<td>311</td>
<td>NA</td>
</tr>
<tr>
<td>Age</td>
<td>46.2</td>
<td>48.4</td>
<td>0.25</td>
</tr>
<tr>
<td>Sex</td>
<td>177 M (75.0%)</td>
<td>156 M (75.0%)</td>
<td>1.0</td>
</tr>
<tr>
<td>ISS</td>
<td>11/236 (4.7%)</td>
<td>7/208 (3.4%)</td>
<td>0.49</td>
</tr>
<tr>
<td>Readmission %</td>
<td>2012 Feb; 72 (2):422</td>
<td>2015 Feb; 78(2):391</td>
<td>0.07</td>
</tr>
<tr>
<td>Max Chest AIS</td>
<td>3.1</td>
<td>3.1</td>
<td>0.25</td>
</tr>
<tr>
<td>MOI (% Blunt)</td>
<td>166/236 (70.3%)</td>
<td>173/208 (83.2%)</td>
<td>0.0015</td>
</tr>
</tbody>
</table>

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**Multivariate Analysis Results**

<table>
<thead>
<tr>
<th>Predictor (of 6+ CT Days)</th>
<th>p-value (chi-square)</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 vs 2018</td>
<td>0.0004</td>
<td>2.2 (1.4, 3.5)</td>
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<tr>
<td>ISS</td>
<td>0.0077</td>
<td></td>
</tr>
<tr>
<td>Blunt vs Penetrating</td>
<td>0.0044</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.35 (NS)</td>
<td></td>
</tr>
<tr>
<td>Max Chest AIS</td>
<td>0.19 (NS)</td>
<td></td>
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</tbody>
</table>

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**Conclusions**

The creation and employment of a chest tube management guideline by Trauma Advanced Practice Providers improved patient care by decreasing chest tube days and hospital length of stay, as well as decreasing utilization of post-removal chest x-rays without increase in complications.

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**Selected References**


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