Use of Forced Vital Capacity to Triage Adolescents with Rib Fractures

Patrick C Bonasso, Rachel L Warner; Richard A Vaughan; James M Bardes, Daniel J Grabo, Alison M Wilson

2019 Pediatric Trauma Society
San Diego, CA
11.16.19
Disclosure

None
Background

Rib Fractures
- Alter respiratory physiology

Force Vital Capacity
- Easy, reproducible

Objectives

1) Evaluate admission FVC
- Triage tool for adolescents with rib fractures

2) Inpatient FVC trend
- LOS, Complications
RIB FRACTURE PRACTICE MANAGEMENT GUIDELINE

Rib Fracture

- FVC <1000
  - Admit ICU
  - Daily CXR
  - Total Sports Bed

- FVC 1000-1500
  - Admit Step Down
  - Consider pain consult for epidural catheter

- FVC >1500
  - Floor Admission
  - Or Observation

Multimodal pain control
10 year retrospective

FVC
- Admission
- Lowest
- Highest

Rib Fractures 105

Recorded aFVC 76

aFVC ≥ 1 68

Inpatient FVC <1 Group A: 9

No recorded aFVC 29

8 pts aFVC < 1

Inpatient FVC >1 Group B: 59
## Results

<table>
<thead>
<tr>
<th></th>
<th>Group A (n=9)</th>
<th>Group B (n=59)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>17.0</td>
<td>16.9</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>Rib Fractures</strong></td>
<td>3.4 (± 1.3)</td>
<td>2.2 (± 1.6)</td>
<td>0.043*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FVC</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Admission</em></td>
<td>1.3 (± 0.5)</td>
<td>2.0 (± 0.6)</td>
<td>0.006*</td>
</tr>
<tr>
<td><em>High</em></td>
<td>1.6 (± 0.5)</td>
<td>2.3 (± 0.6)</td>
<td>0.0003*</td>
</tr>
<tr>
<td><em>Low</em></td>
<td>0.8 (± 0.2)</td>
<td>1.7 (± 0.6)</td>
<td>0.00001*</td>
</tr>
<tr>
<td><strong>Injuries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sternal Fracture</td>
<td>2 (22.2%)</td>
<td>4 (6.7%)</td>
<td>0.043*</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>5 (55.6%)</td>
<td>28 (47.5%)</td>
<td>0.1767</td>
</tr>
<tr>
<td>Lung Contusion</td>
<td>3 (33.3%)</td>
<td>23 (38.9%)</td>
<td>0.7304</td>
</tr>
<tr>
<td><strong>Mean ISS (range)</strong></td>
<td>19.9 (9-30)</td>
<td>13.2 (2-36)</td>
<td>0.014*</td>
</tr>
</tbody>
</table>
### Discussion

<table>
<thead>
<tr>
<th></th>
<th>Group A (n=9)</th>
<th>Group B (n=59)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital LOS</td>
<td>5.3</td>
<td>2.8</td>
<td>0.049*</td>
</tr>
<tr>
<td>Mortality</td>
<td>0</td>
<td>0</td>
<td>n/a</td>
</tr>
<tr>
<td>Re-Admission</td>
<td>0</td>
<td>0</td>
<td>n/a</td>
</tr>
<tr>
<td>Upgrade to ICU</td>
<td>0</td>
<td>0</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Adolescents with a decrease in FVC <1
- Longer length of stay; Lower average FVC

No patient required ICU upgrade

FVC is an appropriate triage tool for adolescents with rib fractures