Recognizing Post-Op Distress

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First, Do No Harm
- Recognizing early symptoms and signs
- Putting the pieces together
- Case studies

Oxygen and CO2 Metabolism

Oxygen Transport Cycle
- Gas exchange — lungs
- Delivery of oxygen — cardiac output
- Consumption of oxygen — tissues

Adequate Oxygenation

Inadequate Oxygenation
Hypoxia and Hypoxemia

• Hypoxia
  – Low oxygen
    • Oxygen supply inadequate to meet tissue demands

• Hypoxemia
  – Low O₂ content in blood
    • Low oxygen saturation in the blood

Who’s at Risk for Hypoxemia?

• Patients with…
  – Airway compromise from secretions or swelling
  – Central or obstructive sleep apnea, either pre-existing or exacerbated by anesthesia.
  – Procedural sedation
    ✓ loss of protective reflexes
    ✓ depressed respiratory drive

Postoperative Hypoxemia

• Study of 214 postoperative patients
• All patients were receiving narcotic analgesia
• Monitored for 24 hrs

Occurrence of Postoperative Hypoxemia

Post midline abdominal surgery

• Study of 69 patients
• Total desaturations (SpO₂ < 90% and 88%) were recorded by RNs x 48 hr

• Results:
  • 9 hypoxemic events were charted by nurses
  • 1706 hypoxemic events on monitor
    – 1213 events <90%; 493 events <88%

Postoperative Hypoxemia
Post major abdominal and peripheral surgery

- Results
  - 3959 desaturation events obtained from monitor memory
  - 23 hypoxemic events noted in patient charts.


Who's at Risk for Hypoxemia?
- Elderly, pediatric and neonatal patients
  - Pulmonary reserve often decreased
- Obstetric patients
  - Diminished lung reserve
  - Pain during labor and delivery can induce changes in respirations
  - Response to epidural

Who's at Risk for Hypoxemia?
- Patients in non-critical care settings
  - General medical-surgical care floors
    - Increasing acuity
    - Patient assessment less frequent than ICU
    - Higher nurse-patient ratio than in ICU

Who's at Risk for Hypoxemia?
- Patients with acute or chronic cardiopulmonary disease
  - Heart failure or previous Myocardial infarction
  - COPD
- Technology-dependent patients
  - Oxygen-dependent
  - Ventilated
  - Tracheostomized

Hypoxemia: Consequences

<table>
<thead>
<tr>
<th>SpO2 &lt; 90%</th>
<th>Prostate</th>
<th>Hips</th>
<th>Knee</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Incidences</td>
<td>265</td>
<td>1510</td>
<td>2184</td>
</tr>
<tr>
<td>% of Patients</td>
<td>78</td>
<td>76</td>
<td>83</td>
</tr>
<tr>
<td>Avg. Duration</td>
<td>35.02</td>
<td>59.76</td>
<td>75.16</td>
</tr>
</tbody>
</table>

Consequences of Hypoxemia

• Physiological
• Morbidity
• Mortality
• Economic

Consequences of Hypoxemia
Physiological

• Impaired cerebral function
  – Short-term memory loss
  – Confusion
  – Cognitive dysfunction

Factors That Increase Risk:

Patient:
• Increased Acuity
• OSA
• Comorbidities

Clinician:
• Sleep Deprivation
• Charting Responsibilities
• Increased Nurse:patient ratios


Consequences of Hypoxemia
Physiological

• Myocardial ischemia
  – Dysrhythmia, usually fast rate
  – ST changes
• Compromised wound healing
• Decreased resistance to infections


Vanderbilt Data
Number of Calls 2010

RRT Calls-892
FIRST Calls-14
Code Calls-128

FACEBOOK
2010 Calls by Team

<table>
<thead>
<tr>
<th>Team</th>
<th>Calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVICU</td>
<td>126</td>
</tr>
<tr>
<td>MICU</td>
<td>438</td>
</tr>
<tr>
<td>SICU</td>
<td>441</td>
</tr>
</tbody>
</table>

Triggers for RRT in 2010

- Respiratory: 247
- Cardiac: 406
- Staff Concerned: 62
- Neurologic: 63
- Multiple Triggers: 96

2010 Triggers for RRT calls

<table>
<thead>
<tr>
<th>Trigger Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>247</td>
</tr>
<tr>
<td>Cardiac</td>
<td>406</td>
</tr>
<tr>
<td>Staff Concerned</td>
<td>62</td>
</tr>
<tr>
<td>Neurologic</td>
<td>63</td>
</tr>
<tr>
<td>Multiple Triggers</td>
<td>96</td>
</tr>
</tbody>
</table>

Disposition of Pt after RRT Call 2010

- Stayed on Home Unit: 625
- Transfer to Step-down: 41
- Transfer to ICU: 296

RRT vs. Non-ICU Stats per 1,000 discharges-all areas (older data)

Case #1:
- You are covering a 46yo surgical patient ~12 hour post-op.
- Patient has PCA, scheduled pain meds, and PRN pain meds, pain = 5/10

<table>
<thead>
<tr>
<th>Time</th>
<th>HR</th>
<th>BP</th>
<th>SpO2/2L</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>19:15</td>
<td>18</td>
<td>64</td>
<td>110/71</td>
<td>BNC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100%/2L BNC Drowsy but following Commands</td>
<td></td>
</tr>
<tr>
<td>21:00</td>
<td>14</td>
<td>78</td>
<td>105/50</td>
<td>BNC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>95%/2L BNC Drowsy</td>
<td></td>
</tr>
<tr>
<td>23:30</td>
<td>8</td>
<td>94</td>
<td>94/50</td>
<td>BNC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>80%/2L BNC Unresponsive</td>
<td></td>
</tr>
<tr>
<td>23:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Would open eyes and inhale once each time instructed to do so, would immediately go back to sleep. Rapid Response Called

Case #1:
- RRT called at 23:30
- Patient placed on NRB and given 2 doses of Narcan.
- Transferred to ICU
- Eventually discharged
Case #2:
- You are covering a general care surgical floor when you are notified about 53yo male, 24 hours post-op, who presents as follows:

<table>
<thead>
<tr>
<th>Time</th>
<th>RR</th>
<th>HR</th>
<th>BP</th>
<th>SpO2/O2</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00</td>
<td>25</td>
<td>120</td>
<td>120/65</td>
<td>&lt;90%/2L NC</td>
<td>Easily reoriented</td>
</tr>
<tr>
<td>22:15</td>
<td>28</td>
<td>126</td>
<td>&lt;90%/50%</td>
<td>Venturi mask</td>
<td>Confusion</td>
</tr>
<tr>
<td>24:00</td>
<td>35</td>
<td>130</td>
<td>110/60</td>
<td>40% CPAP/92%</td>
<td>Confused RRT called</td>
</tr>
</tbody>
</table>

- RRT called
- Patient transferred to ICU and set up on BiPAP and subsequently intubated after one hour.
- Patient discharged to home after ICU stay.

Case #3:
- Mr. T is a 52yo male with hx of hypertension, diabetes, pancreatic cancer, currently admitted with abdominal/back pain. A Pancreateoduodenectomy (Whipple) was done 3 days ago.

<table>
<thead>
<tr>
<th>Time</th>
<th>RR</th>
<th>HR</th>
<th>BP</th>
<th>SpO2/O2</th>
</tr>
</thead>
<tbody>
<tr>
<td>04:30</td>
<td>16</td>
<td>108</td>
<td>96/58</td>
<td>94%/2L</td>
</tr>
<tr>
<td>09:00</td>
<td>20</td>
<td>111</td>
<td>88/49</td>
<td>95% 4L</td>
</tr>
<tr>
<td>13:30</td>
<td>20</td>
<td>109</td>
<td>104/69</td>
<td>95% 6L</td>
</tr>
<tr>
<td>17:45</td>
<td>22</td>
<td>108</td>
<td>114/77</td>
<td>84% 6L</td>
</tr>
</tbody>
</table>

- Pt. c/o sudden dyspnea, changed to 50% venti mask, then NRB, 40mg Lasix given, physician at bedside
- 18:50 RRT called for low sats…
- Pt. was transferred to MICU where he was intubated upon arrival.

Case #4:
- You have a 63y/o morbidly obese female post laparoscopic gastric bypass. Following is first set of Vital Signs:

<table>
<thead>
<tr>
<th>Time</th>
<th>RR</th>
<th>HR</th>
<th>BP</th>
<th>SpO2/O2</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>20:30</td>
<td>18</td>
<td>95</td>
<td>103/61</td>
<td>97%/5L bnc</td>
<td>awake</td>
</tr>
<tr>
<td>20:45</td>
<td>SpO2 drops to 80% when patient falls asleep</td>
<td>SpO2 improves when patient is awake</td>
<td>Family member states that patient uses home CPAP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Patient discharged <48 hours after event
- An estimated 18 million Americans have sleep apnea
Case # 5:
80 yo male with COPD admitted for dyspnea and cough
Background/history: A-fib, hypertension, diabetes, home oxygen, home CPAP, OSA

<table>
<thead>
<tr>
<th>Time</th>
<th>RR</th>
<th>HR</th>
<th>BP</th>
<th>SpO2/O2</th>
</tr>
</thead>
<tbody>
<tr>
<td>20:30</td>
<td>26</td>
<td>115</td>
<td>182/102</td>
<td>96%/3L</td>
</tr>
<tr>
<td>00:43</td>
<td>26</td>
<td>130</td>
<td>192/108</td>
<td>92%/4L</td>
</tr>
<tr>
<td>03:00</td>
<td>24</td>
<td>108</td>
<td>152/100</td>
<td>95%/6L</td>
</tr>
<tr>
<td>06:20</td>
<td>35</td>
<td>113</td>
<td>182/100</td>
<td>90%/50%vm</td>
</tr>
</tbody>
</table>

Case #5:
• RRT called for low SpO2, labored breathing,
• ↑ HR
• Patient transferred to MICU
• RT to initiate BiPAP

Key Points:
• Trending Vital Signs
• Patients receiving sedation: not everyone reacts the same (tolerance)
• Certain comorbidities place patient at higher risk: age, weight, airway disease, cardiac disease, diabetes, etc.
• Home medications
• Consider intra-op trends/parameters

Questions???

Thank You!