Goals of the Conference

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Why define “respiratory compromise”?

• Respiratory illness is just another reason for hospitalization
• The care of patients who are worsening is obvious
• Existing “rescue systems” are already adequate
  – ICU
  – Rapid response teams
• My hospital won’t benefit by focusing on respiratory patients at risk of respiratory failure
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Survival of COPD patients in respiratory failure admitted to ICU

24.5% in-hospital mortality

Aspiration Pneumonia in Hospitalized Patients

Pulmonary embolism as a cause of inpatient death

Consecutive autopsies

- Fatal PE: 4%
- Other PE: 7%

Consecutive medical admits

- Died: PE: 6%
- Died: no PE: 10%

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IDSA/ATS criteria for CAP severity

• Minor criteria
  – Respiratory rate ≥30 breaths/min
  – PaO2/FiO2 ratio ≥250
  – Multilobar infiltrates
  – Confusion/disorientation
  – Uremia
  – Leukopenia
  – Thrombocytopenia
  – Hypothermia
  – Hypotension requiring aggressive fluid resuscitation

1. IDSA/ATS Guidelines for CAP in Adults
IDSA/ATS CAP criteria doesn’t work well for aspiration

Complications in respiratory patients might not be respiratory!

Mortality is worse if deterioration does not lead to change in care

Early intervention is best; but better late than never

Table 4. Multivariate analysis of the effect of admission into intensive care unit (ICU) on 30-day mortality, adjusting for interdepartmental differences in risk for mortality (Cox model)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Hazard Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of department on mortality</td>
<td>During early period (0–3 days)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ICU</td>
<td>0.262</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Specialized care unit</td>
<td>0.308</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Regular department (ref.)</td>
<td>1.000</td>
<td>(Ref.)</td>
</tr>
<tr>
<td></td>
<td>During late period (4–30 days)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ICU</td>
<td>1.083</td>
<td>.84</td>
</tr>
<tr>
<td></td>
<td>Specialized care unit</td>
<td>0.405</td>
<td>.005</td>
</tr>
<tr>
<td></td>
<td>Regular department (ref.)</td>
<td>1.000</td>
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ICU Admission Criteria: Respiratory

- Acute respiratory failure requiring ventilatory support
- Pulmonary emboli with hemodynamic instability
- Patients in an intermediate care unit who are demonstrating respiratory deterioration
- Need for nursing/respiratory care not available in lesser care areas such as floor / IMU
- Massive hemoptysis
- Respiratory failure with imminent intubation

Severe CAP

Severity scores and mortality

Table 5  SAPS II and pneumonia severity scores on hospital admission.\textsuperscript{a}

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Non-survivors at 28 d (N = 56)</th>
<th>Survivors at 28 d (N = 186)</th>
<th>Odds ratio or mean difference (95%CI)\textsuperscript{b}</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAPS II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAPS II, points</td>
<td>50.3 ± 15.7</td>
<td>33.2 ± 13.0</td>
<td>17.0 (12.9–21.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PSI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI, total points</td>
<td>153.7 ± 38.7</td>
<td>113.8 ± 38.8</td>
<td>39.9 (28.2–51.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PSI risk classes I, II and III</td>
<td>6 (10.7)</td>
<td>51 (27.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI risk classes IV and V</td>
<td>50 (89.3)</td>
<td>135 (72.6)</td>
<td>3.1 (1.3–7.8)</td>
<td>0.01</td>
</tr>
<tr>
<td>CURB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURB scores 1 and 2</td>
<td>24 (42.9)</td>
<td>144 (77.4)</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CURB scores 3 and 4</td>
<td>32 (57.1)</td>
<td>42 (22.6)</td>
<td>4.6 (2.4–8.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CURB 65</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURB 65 scores 1 and 2</td>
<td>18 (32.1)</td>
<td>123 (66.1)</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CURB 65 scores 3, 4 and 5</td>
<td>38 (67.9)</td>
<td>63 (33.9)</td>
<td>4.1 (2.1–7.8)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Data are expressed as no. (\%) or mean (SD).
\textsuperscript{b} Odds ratios are reported for mortality at 28 days and mean differences are reported for quantitative variables.

CURB-65

One point each for:

- **C**onfusion of new onset
- **U**rea nitrogen greater than 19 mg/dL
- **R**espiratory rate of 30 bpm or greater
- **S**ystolic BP < 90 mmHg or Diastolic BP < 60 mmHg
- age **65** or older

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Rapid Response Criteria

• Any staff member (nurse, physical therapist, respiratory therapist, physician) is worried about the patient

• Acute change in heart rate <40 or >130 bpm
• Acute change in systolic blood pressure <90 mmHg
• Acute change in respiratory rate <8 or >28 per min
• Acute change in saturation <90 percent despite O2
• Acute change in conscious state
• Acute change in urinary output to <50 ml in 4 hours

Institute for Healthcare Improvement.
http://www.ihi.org/resources/Pages/Changes/EstablishCriteriaforActivatingtheRapidResponseTeam.aspx
RRTs may not change mortality rates

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Hospital Risk-Adjusted Mortality Rates

Death rate for pneumonia patients

Why is this important?

Hide Graph

Effect of defining “pneumonia” to include “resp failure/sepsis”

Effect of defining “pneumonia” to include “resp failure/sepsis”

Effect of defining “pneumonia” to include “resp failure/sepsis”

Conclusions

• Respiratory illness hospitalizations can be high risk

• Respiratory patients deteriorate in a variety of ways

• Rescue systems neglect important signals

• Opportunity to benefit patients and hospitals
Presumption

- Compromise *temporally* precedes failure
Mortality from pulmonary embolism

Pulmonary Embolism

Severity

Stable pulmonary embolism

Right ventricular dysfunction

Massive pulmonary embolism

ICU admission criteria
COPD exacerbation

Severity

Stable COPD exacerbation

WOB >> reserve; Other complications

Hypercarbic respiratory failure

ICU admission criteria
Community acquired pneumonia

Severity

- Stable pneumonia
- Uncontrolled infection; Systemic deterioration
- Sepsis, ARDS severe hypoxemia

ICU admission criteria
Presumptions

• Compromise *temporally* precedes failure

• Respiratory compromises of different etiologies have important similarities
Respiratory Illness

Severity

ICU admission criteria

Stable respiratory illness

Respiratory Compromise

Respiratory Failure
Presumptions

• Compromise *temporally* precedes failure

• Respiratory compromises of different etiologies have important similarities
  – Or at least subgroups have similarities
Presumptions

• Compromise *temporally* precedes failure

• Respiratory compromises of different etiologies have important similarities
  – Or at least subgroups have similarities

• Data can be used to identify discrete clinical points at which special observation and interventions might be helpful.
Respiratory Illness

Severity

Stable respiratory illness

Respiratory Compromise

Respiratory Failure

ICU admission criteria

???????
Plan for day 1: Expert speakers

• Existing systems to rescue respiratory compromise
  – Peter Morris, MD

• Mechanistic categories of respiratory compromise
  – Neil MacIntyre, MD

• Examples of ways to identify specific respiratory compromise in some disease states
  – Peter Marshall, MD
Day 1 (cont): Small groups

• Small groups based on subsets
  
  – Control of breathing and airway protection (anesthesia, drugs, sleep)
  
  – Acute lung injury (sepsis, infection)
  
  – Obstruction and work of breathing (Asthma, COPD)
  
  – Cardiovascular (edema/CHF, pulmonary emboli)
Small groups

- COB, airway
  - Hess
  - Gay
  - Seckel
  - Gantt
  - Wong

- Acute lung injury
  - Morris, P
  - Hill
  - Sonnesso
  - Vender
  - Slesinger
Small groups

- Obstruction, WOB
  - MacIntyre
  - Mathers
  - Lamb
  - Doherty
  - Rosen

- Cardiovascular
  - Morris, T
  - Marshall
  - Balk
  - Lamberti
  - Chang
Small group tasks for day 1

• Tasks for day 1
  – Elect a spokesperson!
  – Create clinically meaningful definitions of respiratory compromise for each subset
  – Make “wish list” for data to identify respiratory compromise
Day 1: final speaker

• Current and future tools to provide data
  – Dean Hess, PhD, RRT
Discussion

• Open discussion in plenary room

• Dinner discussion
  – Special invitation to our industry partners
Day 2: small groups

Speculate

• Objective data and monitoring to identify respiratory compromise
• Role of (existing) non-conventional monitoring
• Therapies appropriate for resp compromise
• Data collection methods that don’t yet exist
• Promising therapeutic interventions
Day 2: reconvene

- Spokespersons discuss your findings
- Group discussion

- Governmental, Regulatory and Fiscal Considerations
  - James Mathers, MD

- Group discussion

- Lunch
Conclusion

• Summary of conference
• Wish list for 2016
• Plans for writing and publication*

*Writing committee still has room!
Thank you!