Pneumonia Severity Assessment

using predictive mortality tools for patients diagnosed with pneumonia on hospital admission

by: Natasha Kyte, MS IV
GE-NMF PCLP scholar
Background & Significance

• Each year pneumonia affects over 6 million Americans*

• The total annual health care cost to treat these patients is $8.4 billion*

• @ AltaMed:
  – In 2011, there were 226 hospital admissions due to pneumonia.
  – From January 2012 through May 2012, there were 96 hospital admissions due to pneumonia

Reference 2
Estimated cost of Avoidable admits
ALTAMED-ALTAOC-SBC-ALTCHLA
Jan 2009-August 2011
Auths admits by date of Service

- Bacterial Pneumonia: $1,400,000
- CHF: $800,000
- UTI: $600,000
- Perforated Appendix: $300,000
- COPD: $200,000
The question is ..... How many of these hospital admissions are avoidable?
# Introduction to Severity Assessment/Risk stratification tools

## Pneumonia Severity Index (PSI)
- Widely validated
- Proven to improve patient care
- Useful research tool
- Complex to calculate
- Underestimates severity in young people
- Does not predict need for ICU admission or other complications

## CURB65
- Widely validated
- Simple to calculate
- Underestimates severity in young people
- Does not predict need for ICU admission or other complications

Reference 4
Pneumonia Severity Index (PSI)

Confirmed diagnosis of community-acquired pneumonia

Calculate Pneumonia severity index (PSI)

Class I-II
- 0.1-0.7% 30-day mortality
  - Outpatient care

Class III
- 0.9-2.8% 30-day mortality
  - Oxygen saturations >92% on air:
    - yes: Outpatient care
    - No: inpatient care

Class IV-V
- 4-27% 30-day mortality
  - inpatient care

PSI CALCULATION- STEP 1
If patient is aged <50 years with none of the Co-morbid illnesses or clinical features listed below, assign to PSI class I. If aged >50 years or presence of 1 or more adverse features, proceed to step 2.

PSI CALCULATION- STEP 2
Demographics
- Age (1 point/year, -10 if female)
- Nursing home resident (10 points)

Co-morbid illnesses
- Neoplastic disease (30 points)
- Liver disease (20 points)
- Congestive heart failure (10 points)
- Cerebrovascular disease (10 points)
- Renal disease (10 points)

Clinical features
- Altered mental status (20 points)
- Pulse >125/min (10 points)
- Respiratory rate >30/min (20 points)
- Systolic blood pressure <90 mmHg (20 points)
- Temperature <35 or ≥40°C (15 points)

Laboratory results
- Arterial pH <7.35 (30 points)
- Urea >30 mg/dl (20 points)
- Sodium <30 mmol/L (20 points)
- Glucose ≥250 mg/dl (10 points)
- Haemtocrit <30% (10 points)
- PaO2 <60 mmHg (10 points)

Radiology
- Pleural effusion (10 points)

<70 points = Class II
71-90 points = Class III
91-130 points = Class IV
>130 points = Class V

Fig. 1. A typical protocol for the use of the pneumonia severity index to guide site of care decisions in community-acquired pneumonia.

Reference 1
Fig. 2. A typical protocol for use of CURB65 or CRB65 to guide site of care decisions in community-acquired pneumonia.
Milliman Criteria

• Hypoxia: O$_2$ sats <90% or pO$_2$ <60 or worsening chronic lung disease
• Outpatient management failure
• Complications of pneumonia (ie. Empyema)
• Appropriate diagnostic testing & tx unavailable
• Hemodynamic instability
• PSI class IV/V or CURB-65 score >3
• Immunocompromised
Research Project

• **Objective:** to compare tools used to measure pneumonia severity assessment to determine the appropriateness of patients admitted to hospital for pneumonia

• **Design:** Retrospective chart review

• **Setting:** White Memorial Medical Center (WMMC) is 353-bed not-for-profit, faith-based, teaching hospital that serves downtown Los Angeles and nearby communities.

• **Patients:** adults diagnosed with pneumonia upon admission to hospital from Jan 2012 – May 2012

• **Methodology:** hospital admission records for patients were reviewed to determine PSI, CURB65 & Milliman criteria for each patient.

• **Results:** (n=20)
  - low risk- PSI 60% CURB65 65% Milliman 30%
Results

![Out-patient results](chart1.png)

![In-patient results](chart2.png)
Discussion

• Limitations
  – Retrospective design is a disadvantage for data availability
  – Small sample size
  – only hospitalized patients in a single center were included
  – Assumed missing values
  – Assumed community acquired pneumonia for each pneumonia diagnosis
  – Patients admitted during non-peak season

• Future direction
  – Predictive biomarkers such as procalcitonin
Conclusion

• 6 out of 20 of the hospital admissions did not meet the Milliman criteria, these 6 make up the potentially avoidable hospital admissions for pneumonia.

• Using the Milliman criteria as the Gold Standard, PSI & CURB65 were sensitive, making them good screening tools. The sensitivity of PSI was 100% and CURB65 was 86%.
References:


Acknowledgements

• Dr. Desmond Lew
• Dr. Esquio Casillas
• Dr. Michael Rodriguez
• Dr. Martin Serota
• Dr. Albert Chang
• Ulysses Garcia
• Jeff Nguyen
• Bertha Carreno
• Esparanza Andrade
• GE-NMF PCLP
• SIU SOM library staff