THE OUTCOME OF HOSPITALIZED PATIENTS WITH COMMUNITY-ACQUIRED PNEUMONIA: HUSM EXPERIENCES

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HUSM

PRIMARY OBJECTIVE

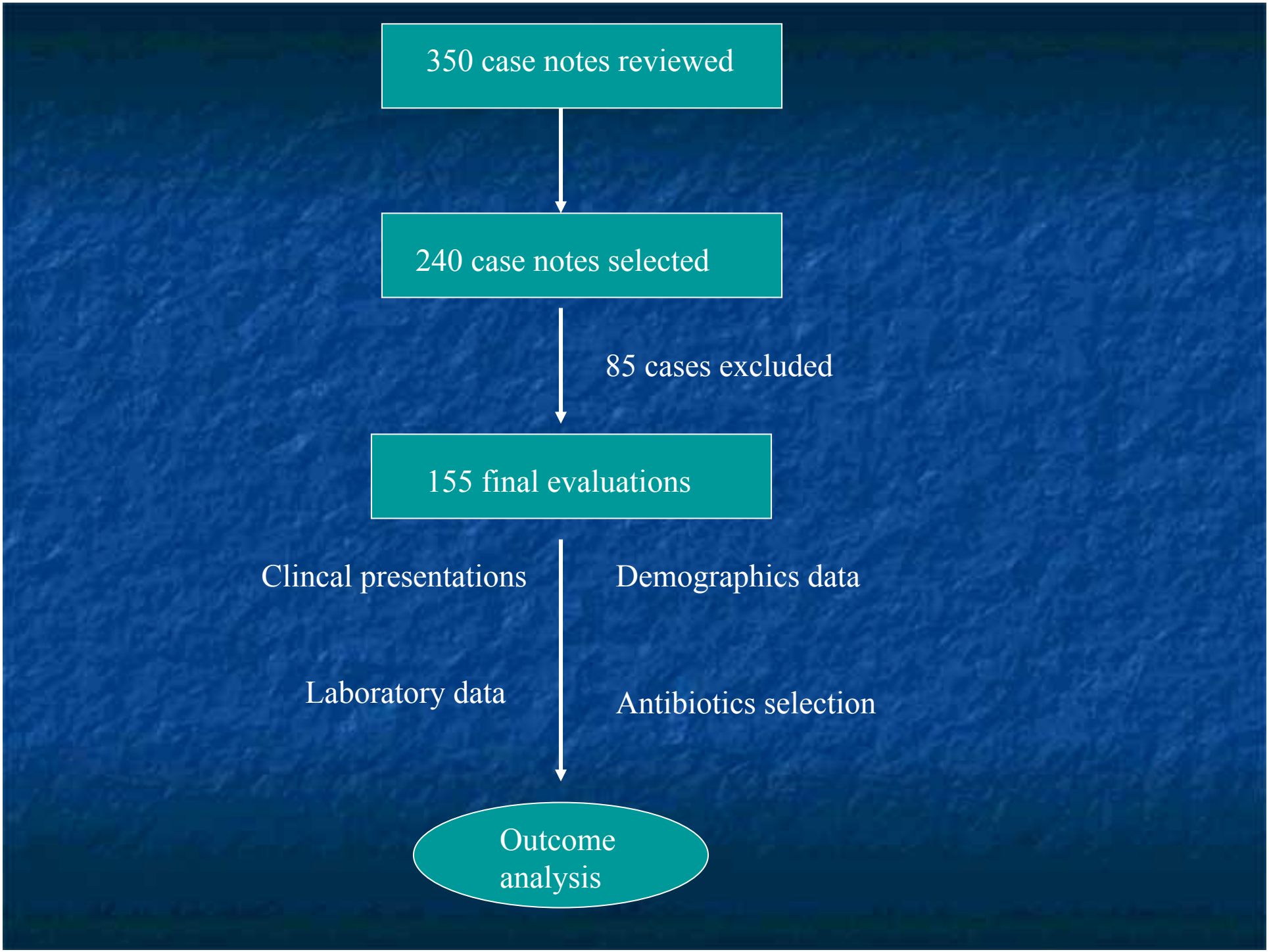
- **To study the outcome of patients with community-acquired pneumonia admitted to Hospital Universiti Sciences Malaysia**

SECONDARY OBJECTIVES

- To determine factors that influence the outcome of patients with community-acquired pneumonia
- To formulate a prognostic scoring index in predicting severe pneumonia requiring hospitalization
- To describe the pattern of community-acquired pneumonia requiring admission

METHODOLOGY

- **Study Design**
  - **Retrospective analysis**
- **Cohorts**
  - **155 patients selected from computer registry from record department, HUSM from January 2004 till December 2004 was studied.**


350 case notes reviewed
240 case notes selected
85 cases excluded
155 final evaluations
Clincal presentations
Demographics data
Laboratory data
Antibiotics selection
Outcome analysis

Inclusion Criteria

- All cases of CAP that need hospitalization
- CAP definition[1]
  - Symptoms of an acute lower respiratory tract illness
  - New focal chest signs on examination
  - At least one systemic features: fever, sweating
  - No other explanation for the illness, which is treated as CAP with antibiotics
  - All symptoms must be acquired in the community or present before hospitalization

[1]MacFarlane J. Thorax (2001);56:1-64

Exclusion Criteria

1. **Patients with diagnosis of**
   - **Pulmonary Tuberculosis**
   - **Nosocomial Pneumonia**
   - **Aspiration Pneumonia**
2. **Severe immunocompromised state patients**
   - **HIV patients**
   - **On Cytotoxic drugs**
3. **Patients with incomplete or missing data**

- **Primary Outcome Measures**
  - Mortality due to pneumonia during hospital stay

- **Sample size studied: 155 patients**
  - Initial predicted sample size using single proportion formula, n=162 patients; where Z=1.96(for 95% CI), precision=0.05 and p=0.12(12% mortality form Loh et al,2005)

Statistical Analysis

- Data was analyses using SPSS software version 12.0.1
- Continuous data was recorded as mean and standard deviation
- Categorical data was recorded as a percentage

Statistical Analysis

- **Univariate analysis**
  - For continuous data
    - Two-tailed independence t-test or
    - Mann-Whitney test
  - For categorical data
    - Chi-square (χ^2) test or
    - Fisher's exact test

- **Multivariate analysis**
  - Stepwise multiple logistic regression analysis was used to assess association between multiple variables.

RESULTS

UNIVARIATE ANALYSIS

Parameters	outcome		P value
	survived	died	
Age[years, mean(SD)]	61±18	65±11	0.156
>65 yrs(%)	80	20	0.834
<65 yrs(%)	81.3	18.7	
Gender (%)			
Female	58(78.4)	16(21.6)	0.495
Male	67(82.7)	14(17.3)	
Smoking history (%)			
Active	29(85.3)	5(14.7)	0.734
Non-smoker	96(79.3)	25(20.7)	

Parameters	Outcome		Total (%) or mean(SD)
	survived	died	
Concurrent Illness (%)			
Congestive Heart Failure	13.7	1.9	10.3
Cerebrovascular disease	2.6	5.1	7.7*
Neoplastic disease	1.9	5.1	7.0*
Hypertension	29	7.1	36.1
Renal disease	16.9	5.1	13.5*
Liver disease	2.6	0.64	3.2
Type 2 DM	15.5	6.4	21.9
COPD	15.5	3.9	19.4
IHD	20	5.8	25.8

* $p < 0.05$

Parameters	Outcome		Total (%) or mean(SD)
	survived	died	
Confusion(%)	12(38.7)	19(61.3)	20*
Resp. rate(mean,SD)	23±4.7	31±6.2	25±6*
Pulse rate(mean, SD)	99±16	116±15	103±17*
Temperature(mean,SD)	37.8±0.77	38.2±0.98	37.9±0.8
Blood pressure(%)			p<0.05
> 90/60 mmHg	111(86)	18(14)	
< 90/60 mmHg	14(53.8)	12(46.2)	
Systolic BP (mean,SD)	125±22	110±29	122±24*
Diastolic BP (mean,SD)	73±13	61±15	71±14*
P_aCO_2 (mean,SD)	34±7.5	34±13.8	
Hypoxaemia (%)			p<0.05
Absent	110(88.7)	14(11.3)	
Present	15(48.4)	16(51.6)	

*p<0.05

parameters	CAP outcome		Total % or Mean(SD)
	survived	died	
WCC (x10^3/L)	13.3±5.9	17±13.1	14.0(7.9)
Hemoglobin (g/dl)	10.3±2.6	11±1.8	10.9(2)
Urea (mmol/l)	8±5.8	14.6±11	6.7(4.8-12.3)*
RBS (mmol/l)	9.6±4.5	13.3±6.8	10.3(5.3)*
Albumin (g/dl)	33.6	29.9	35(29-36)*
ALT (mmo/l)	76.10	85.92	22(18-38)
CXR findings(%)			
Pleural effusion	11(78.6)	3(21.4)	12.9*
One lobe infiltrate	1(16.7)	5(83.3)	61.9*
Multilobe infiltrate	25(64.1)	14(35.9)	25.2*

* $p<0.05$

Parameters	CAP outcome		Total N(%) or Mean(SD)
	survived	died	
Empirical antibiotic(%)			
Monotherapy	62(89.9)	7(10.1)	(69)44.5
Combination	63(73.3)	23(26.7)	(86)55.5

$p<0.05$

Results

Multiple Logistic Regression analysis

Parameters (On admission)	WALD test	P value	Odd Ratio	95% CI	
				Lower	Upper
Important co-morbid	10.86	0.001	11.13	2.66	46.68
Confusion	17.99	0.001	18.72	4.84	72.44
Hypoxaemia	11.41	0.001	10.62	2.70	41.85
DBP ≤60 mmHg	8.45	0.004	1.07	1.02	1.12
RBS ≥13 mmol/l	6.12	0.013	0.89	0.81	0.98

Prediction severity versus outcome

Severity Model	Outcome		Total
	Died	Alived	
≥ 3 variables	21	6	27
< 3 variables	9	119	128
Total	30	125	155

$p<0.05$ (chi square test)

Severity assessment	n	RR (95% CI)	sensitivity	specificity	PPV	NPV
Model	155	46.3(14.9 -143.6)	0.70	0.95	0.78	0.93
MBTS rule(1)	251	36.5(5.0 - 268)	0.95	0.71	0.22	0.99

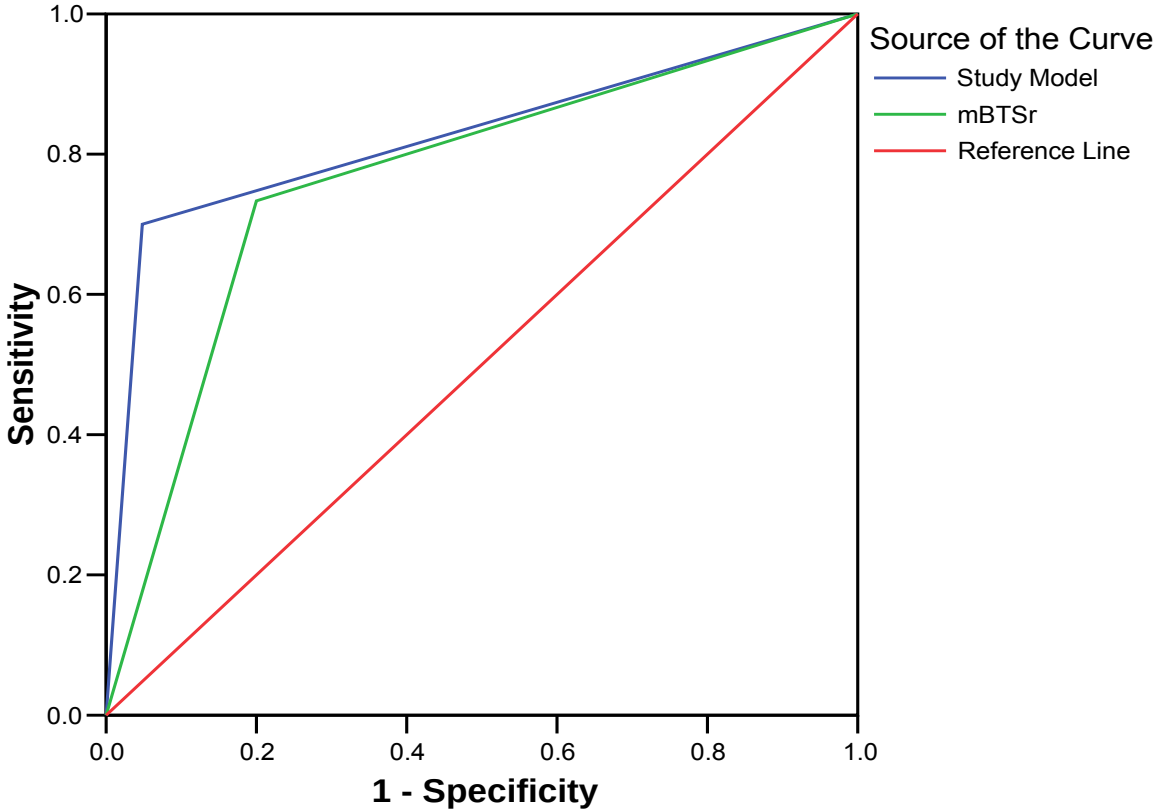
PPV positive predictive value

NPV negative predictive value

(1)Neill Am, Martin IR, Weir R, et al. Thorax 1996;51:1010-1016

Receiver Operating Characteristic

Figure 1: ROC Curve



AUC 0.869

CI : 0.724 - 0.928

DISCUSSIONS

PRIMARY OUTCOME

- Mortality during hospitalization was 19.4%
- Mortality was high compared to study by
  - Loh et al[1] , 12%
  - Liam et al[2] , 11.1%
- Comparable with meta-analysis by Fine et al (1999)[3] 14 - 18%

[1]Loh et al. Respirology(2004)9,379-386.

[2]Liam CK. Med J Malaysia(2005)2,249-263.

[3]Fine MJ et al. JAMA(1996);275:134-41

REASONS FOR HIGH MORTALITY

- Our patients may had more severe pneumonia on admission
  - More tachypnoec (31±6 vs 22±2)
  - More tachycardic (116±15 vs 100±26)
  - Lower mean SBP and DBP
- Nathwani et al (2002)
  - Severity of pneumonia was the strongest predictor of death

Nathwani D, Williams F, Winter J et al. Use of Indicators to evaluate the Quality of CAP Management. Clinical Infectious Disease 2002;34:318-23

- More severe pneumonia in poor outcome cohort
  - ? appropriate treatment given
    - ICU versus general medical ward
    - Aggressive blood sugar controlled
      - Severe Sepsis Management
- We had 7.1% patients with neoplastic disease .

More Mortality with pts on combination antibiotics

- ß-lactam plus macrolide
  - Majority received EES
    - 3rd generation cephalosporins or ß-lactam/ß-lactamase inhibitors plus IV Macrolide (Azithromycin) or anti-pseudomonal ß-lactam/ß-lactamase inhibitor. Restepo MI, Anzueto A. Clin Chest Med 2005;26:65-73
  - ? Timing of antibiotic
    - Administration within 4 hours was associated with reduced in mortality. Houck et al. Arch Intern Med 2004;164:637-644

REASONS FOR HIGH MORTALITY

- OTHER CO-FOUNDING FACTORS
  - Preadmission functional status[1,2,3]
  - Early treatment failure[4,5]
  - CAP due to "atypical/undiagnosed pathogens" eg. legionella spp.[6] and Meliodosis(7)

[1]Davies et al. Med Care 1995;33:906-921. [2]Veecchiarino et al. Heart Lung 2004;33:301-307. [3]Marrie and Wu. CHEST 2005;127:1260-1270. [4]Roson et al.Arch Intern Med 2004;164:502-508. [5]Menendez et al. Thorax 2004;59:960-965. [6]Yu and Vergis CHEST 1999;113:1158-1159(7)SH How et al. Med J Malaysia 2005;60(5):606-613

Impact of current study

- Certain clinical parameters of severity index are similar
- Consider degree of pneumonia severity in patients who requires hospitalization
- Institute appropriate treatment measure
  - Adequate empirical antibiotics coverage
  - Appropriate ward i.e ICU/HDW in severe cases

CONCLUSION

- Mortality due to CAP was high (19.4%).
- Our patients may had severe degree of pneumonia on admission.
- Certain clinical parameters may associated with severe pneumonia and hence poor in-hospital outcome.
- There was an association between predictive value of severity scoring system and in-hospital mortality due to pneumonia.

THANK YOU

Limitations of Study

- This was a retrospective study
  - Diagnosis and death attributed to pneumonia may be over diagnosed.
- Sample size was small, difficult to draw firm conclusions for secondary objectives.
- Data was affected by poor records documentation, limitation of x-ray reporting and subjective bias of pneumonia as a caused of death.

SAMPLE SIZE CALCULATION

- Single proportion formula $n=(Z/\Delta)^2[p(1-p)]$
  - $Z=1.96$ (for 95% confidence interval)
  - $\Delta=0.05$ ($\alpha=0.05$); $p=12\%$ mortality from Loh et al study.
  - Total sample required = 162

Effect RBS > 13 mmol/l

- From regression analysis (not included)

RBS (mmol/l)	p - value	OR	95% CI
< 8	0.001	9.8	2.5-38.4
9-13	0.002	8.58	2.2-33.7
14-17	0.139	3.0	0.7-12.8
> 18			

- almost similar levels with Fine et al[1] and ATS guideline[2] (13.8 mmol/l)

[1]Fine et al. A prediction rule to identify low risk patients with CAP. NEJM(1997);336:243-250.
[2]Niederman MS et al. ATS guideline. Am J Respir Care(2001);163:1730-1754

CAP Mortality

Table 1. Leading Causes of Death in the United States in 2000*

Cause of Death	No. of Deaths	Death Rate per 100 000 Population
Heart disease	710 760	258.2
Malignant neoplasm	553 091	200.9
Cerebrovascular disease	167 661	60.9
Chronic lower respiratory tract disease	122 009	44.3
Unintentional injuries	97 900	35.6
Diabetes mellitus	69 301	25.2
Influenza and pneumonia	65 313	23.7
Alzheimer disease	49 558	18
Nephritis, nephrotic syndrome, and nephrosis	37 251	13.5
Septicemia	31 224	11.3
Other	499 283	181.4
Total	**2 403 351**	873.1

Mokdad AH et al (2004) Actual Causes of Death in the United State. JAMA;291: 1238-1245

STUDY BACKGROUND

- CAP has high morbidity and mortality
- It is the commonest caused of death in industrialized countries and is the leading caused of death from infectious disease[1]
- Mortality rate due to CAP varies
  - Geographical areas[2]
  - Severity of pneumonia[3]
  - Inpatient vs outpatient management[4]

(1) Marrie Tj. Clin Infect. Dis 1994;18:501-15(2) Kalin M, Ortvist A, Almela M, et al. Prospective study of prognostic factors in bacteremic pneumococcal pneumonia in 5 countries. J Infect Dis 2000;182:840-47 (3) Marrie TJ et al. Mortality during hospitalization for pneumonia in Alberta, Canada. Eur Respir J 2003;22:148-155 (4) Fine MJ, Smith MA, Carson CA, et al. Prognosis and outcomes of patients with CAP. JAMA 1996;275:134-141

CAP Mortality in Malaysia

- Data are limited
- In 1997, based on second national health survey, there were 12.4% mortality.
- While recent studies found mortality rate of 11%[3] and 12%[4].

3 Liam. CK, Lim. KH and Wong. CMM (2001) Community-acquired pneumonia in patients requiring hospitalization.Respirology, 6,259-264

4 Loh. LL, Khoo. SK, Quah. SY et al,(2004) Adult community-acquired pneumonia in Malaysia: Prediction of mortality from severity assessment on admission. Respirology,9,379-386