

Adjuvant Systemic Steroid Therapy and Length of Hospital Stay in Pneumonia Patients:

A Retrospective Cohort Study in a Community Hospital

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BACKGROUND

Pneumonia is a leading cause of morbidity and mortality worldwide resulting in a substantial healthcare expenditure. Antimicrobial agents are the main treatment. Although there were studies showed the benefits of steroid therapy as an adjuvant therapy for patients with pneumonia.¹⁻³ The benefit of adjuvant steroid therapy in real world setting remains controversial.

OBJECTIVE

Our objective is to assess whether adjuvant systemic steroid with antibiotic treatment improves patients' outcomes under routine operational conditions outside of the restrictions and support of a controlled clinical trial.

METHODS

Study design and setting:

- A retrospective cohort study in a critical access hospital in rural Maine

Study population:

- Adult patients with discharge diagnosis of pneumonia by ICD-10

Exposure: Systemic steroid (either oral or IV)

Outcomes:

- Primary:** Length of hospital stay (LOS)
- Secondary:** inpatient mortality, transfer to tertiary care center, and disposition

Confounding and significant covariates:

- Demographic, comorbidities, physical exam and laboratory data on admission
- Calculated Pneumonia Severity Index (PSI) and categorized based on PSI score on admission

Class	Points	Mortality (%)
I	No predictors	0.1
II	≤70	0.6
III	71 to 90	0.9
IV	91 to 130	9.3
V	>130	27.0

Statistic analysis:

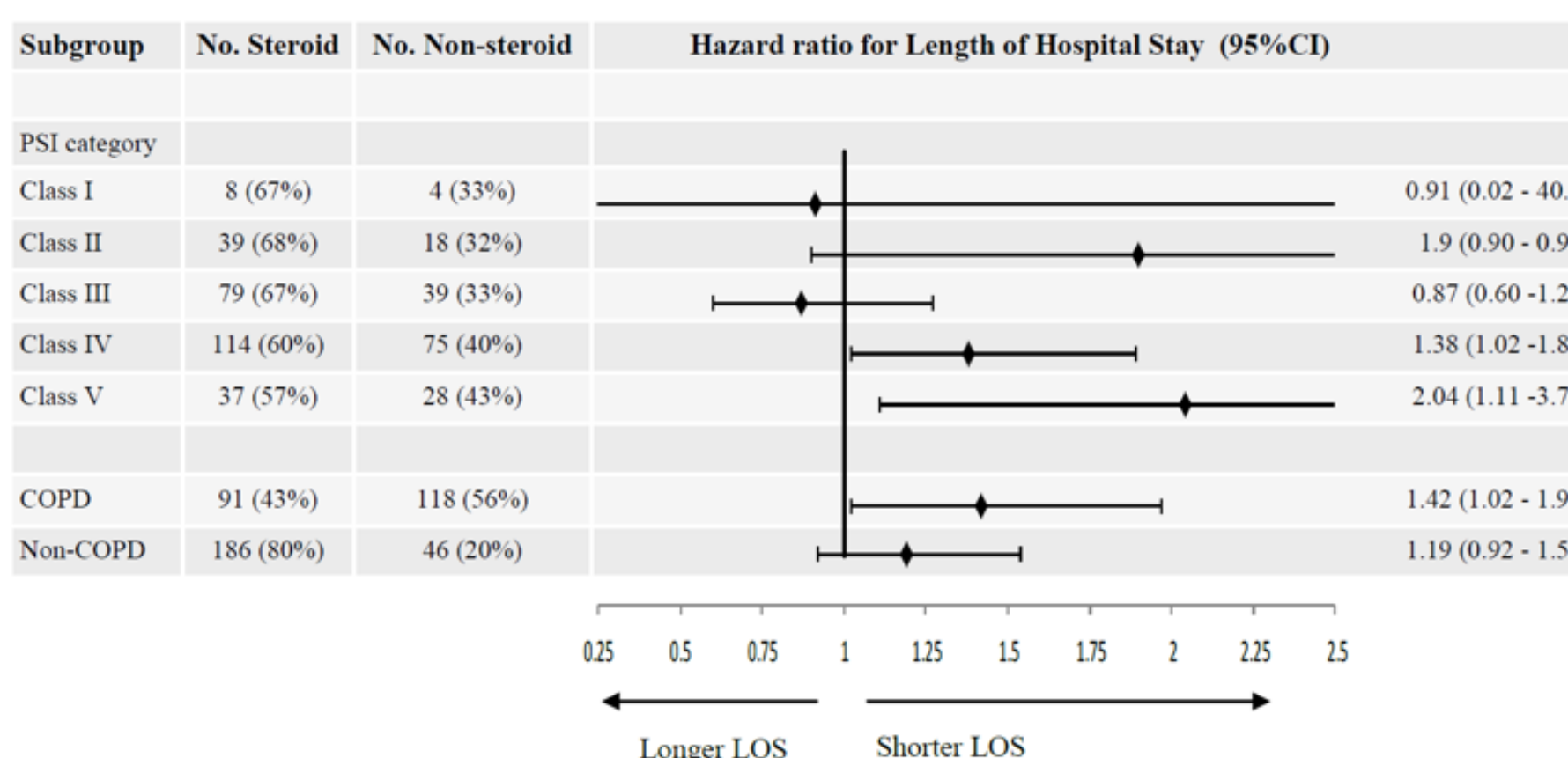
- Competing-risks regression analysis for primary outcome (LOS)
 - Inpatient mortality and transfer treated as competing events
- Multivariable logistic regression analysis for secondary outcomes.
- Stata v 14.2 (Stata Corp, College Station, Texas)

Table 1: Baseline characteristic of patients in the study

Variables	Steroid (n=277)	Non-steroid (n=164)	p-value
Age (mean, SD)	72.03 (14.63)	74.82 (14.18)	0.05
Female (n, %)	149 (53.8%)	85 (51.8%)	0.69
COPD (n, %)	186 (67.1%)	46 (28.0%)	<0.01
DM (n, %)	87 (31.4%)	56 (34.1%)	0.55
On baseline oxygen (n, %)	95 (34.3%)	18 (11.0%)	<0.01
Current smoking (n, %)	68 (24.5%)	15 (9.1%)	<0.01
Active lung cancer (n, %)	15 (5.4%)	12 (7.3%)	0.42
History of congestive heart failure (n, %)	72 (26.0%)	37 (22.6%)	0.64
Nursing home residents (n, %)	29 (10.5%)	28 (17.1%)	0.05
Altered mental status on admission (n, %)	18 (6.5%)	23 (14.0%)	0.01
Respiratory rate >30/min (n, %)	38 (13.7%)	8 (4.9%)	<0.01
Wheezing on presentation (n, %)	175 (63.2%)	18 (11.0%)	<0.01
ICU admission (n, %)	43 (15.5%)	20 (12.2%)	0.33
CURB-65 (median, IQR)	1 (1, 2)	1 (1, 2)	0.11
PSI score (mean, SD)	95.14 (29.40)	101.01 (28.35)	0.04

COPD: chronic obstructive pulmonary disease. DM: diabetes mellitus
No missing data

Figure 1: Hazard ratio for LOS in the subgroup analysis



RESULTS

A total of 441 admissions were included in the study. The mean age was 73 years (SD 14.4). A total of 277 (63%) patients received systemic steroids. The length of stay (LOS) ranges from 1 to 10 days (median 3 days, IQR 3,4). There were a total of 15 deaths (3.4%) in the study.

The mean LOS of steroid group was 3.71 (SD 1.51) days compared to non-steroid group 3.32 (SD 1.59) days. The multivariable analysis with competing-risks regression found that steroid significantly associated with decreased the length of hospital stay (HR 1.26, CI 1.03-1.54, p=0.023).

Steroid use was significantly associated with inpatient mortality rate in the crude analysis (χ^2 12.18, p<0.01) as well as in the multivariable logistic regression (OR 0.11, 95% CI 0.03-0.45, p<0.01). Steroid did not associate with the risk of transfer to tertiary care center (OR 0.52, 95% CI 0.27-1.03, p=0.06) nor associate with being discharged home compared to rehabilitation facility (OR 1.21, 95% CI 0.77-1.90, p=0.40).

In the subgroup analysis, steroid associated with shorter LOS in PSI class IV and class V (HR 1.38, 95%CI 1.02-1.89, p=0.04 and HR 2.04, 95%CI 1.11-3.74, p=0.02, respectively). However, only in PSI class V that steroid associated with lower inpatient mortality (OR 0.10, 95%CI 0.02-0.64, p=0.01). Patients in PSI class IV was found to have higher chance of discharge home when being on steroid. There was an association of steroid and shorter LOS in subgroup of COPD patients (HR 1.42, 95%CI 1.02-1.97, p=0.03). Steroid also decreased inpatient mortality in COPD patients (OR 0.17, 95%CI 0.03-0.81, p=0.03).

DISCUSSION

Our study concluded that adjuvant steroid therapy associated with a decrease in length of hospital stay and improved inpatient mortality in hospitalized pneumonia patients. Steroid was most beneficial to those with severe pneumonia and COPD patients. Limitations included the nature of retrospective study, small sample size, the potential of inaccurate medical coding for pneumonia, and unknown final outcome of the patients who were transferred.

BIBLIOGRAPHY

- Blum CA, Nigro N, Briel M, et al. Adjunct prednisone therapy for patients with community-acquired pneumonia: a multicentre, double-blind, randomised, placebo-controlled trial. *Lancet* 2015; 385: 1511-1518.
- Meijvis SC, Hardeman H, Remmelts HH, et al. Dexamethasone and length of hospital stay in patients with community-acquired pneumonia: a randomized, double-blind, placebo-controlled trial. *Lancet* 2011; 377: 2023-030.
- Stern A, Skalsky K, Avni T, et al. Corticosteroids for pneumonia. *Cochrane Database Syst Rev*. 2017 Dec 13;12:CD007720
- Fine JP, Gray RJ. A proportional hazards model for the subdistribution of a competing risk. *J Am Stat Assoc*. 1999;94:496-509.