

ABSTRACT

Introduction

CAP is a common infection associated with high morbidity and mortality. Most of the poor outcomes occur in hospitalized patients with clinical failure characterized by hemodynamic or respiratory deterioration. The frequency of clinical failure in hospitalized patients with CAP as well as the etiology is not well characterized.

The objective of this study was to evaluate criteria and frequency of clinical failure in hospitalized patients with CAP.

Methods

This was a secondary data analysis of the Community-Acquired Pneumonia Organization (CAPO) International Cohort Study database. Clinical failure was defined as patients who developed one of the following during the first 14 days of hospitalization: 1) respiratory failure with need for non-invasive ventilation (RF-NIV), 2) respiratory failure with need for invasive ventilation (RF-IV), 3) circulatory failure with need for vasopressors (CF-V), or 4) who died during hospitalization (death).

Results

A total of 3,336 patients were included in the analysis, 488 of who experienced clinical failure (15%). The etiology of clinical failure was as follows: RF-NIV: 170 patients, RF-IV: 203 patients; CF-V: 201 patients; and death: 275 patients.

Conclusions

This study indicates that clinical failure is a common event in hospitalized patients with CAP. The most common etiology of clinical failure is progression of pulmonary infection with development of respiratory failure. Preventing intubation by the use of non-invasive ventilation is an important technique that may prevent hospital-acquired pneumonia. Non-invasive ventilation should be considered a first-line intervention for patients with CAP experiencing respiratory failure.

INTRODUCTION

CAP is a common infection associated with high morbidity and mortality. Up to 5.6 million cases of CAP occur annually in the US, and > 1 million patients require hospitalization.

Once antimicrobial treatment has been initiated, patients who have been hospitalized with CAP can improve and reach clinical stability or can experience a lack of clinical response.

The incidence of clinical failure in patients with CAP, ranges from 6 to 24%, and can reach up to 31% in patients with severe CAP. When failure occurs in patients with CAP, it significantly increases the risk of complications, length of hospital stay, and death, especially in patients with severe CAP. The frequency of clinical failure in hospitalized patients with CAP as well as the etiology is not well characterized. [1]

The objective of this study was to evaluate criteria and frequency of clinical failure in hospitalized patients with CAP.

MATERIALS AND METHODS

Study definitions

CAP: Diagnosis of CAP required the presence of criterion A, B, and C:
A. New pulmonary infiltrate on imaging (CT scan or chest x-ray) at the time of admission to the hospital.

- A. Signs and Symptoms of CAP (at least one of the following)
1. New or increased cough (per the patient)
 2. Fever >37.8°C (100.0°F) or hypothermia <35.6°C (96.0°F).
 3. Changes in WBC (leukocytosis >11,000 cells/mm³, left shift > 10% band forms/microliter, or leukopenia < 4,000 cells/mm³

- B. Working diagnosis of CAP at the time of hospital admission with antimicrobial therapy given within 24 hours of admission.

Criteria for clinical failure: the following criteria were evaluated during the first 10 days of hospitalization.

1. Respiratory failure with need for non-invasive ventilation (RF-NIV).
2. Respiratory failure with need for invasive ventilation (RF-IV)
3. Circulatory failure with need for vasopressors (CF-V) or
4. Who died during hospitalization (death)

To be classified as clinical failure, patients had to meet at least one of those 3 criteria in the first 10 days of admission.

RESULTS

- A total of 3,336 patients were included in the analysis, 488 of who experienced clinical failure (15%).
- Patient's characteristics are shown in table1.
- The etiology of clinical failure in shown in figure 1.

RESULTS

Table 1 Patient's characteristics

Variables	Death n= 275	Invasive Ventilation n = 203	Vasopressors n = 201	Noninvasive Ventilation n = 170
Demographics				
Age, median(IQR)	74 (27)	55 (30.5)	60 (35)	74 (27)
Sex, n (%)	108 (63.5)	19 (9.4)	115 (57.2)	108 (63.5)
Nursing Home, n (%)	10 (5.9)	190 (93.6)	18 (9)	10 (5.9)
Comorbidities				
Cardiac Arrhythmia, n (%)	31 (18.2)	9 (4.4)	37 (18.4)	31 (18.2)
Diabetes Mellitus, n (%)	33 (19.4)	110 (39)	35 (17.4)	33 (19.4)
CHF, n (%)	44 (25.9)	103 (50.7)	38 (18.9)	44 (25.9)
Acute Myocardial Infarction, n (%)	9 (5.3)	8 (0)	17 (8.5)	9 (5.3)
Long-term Arrhythmia, n (%)	7 (4.1)	25 (12.3)	7 (3.5)	7 (4.1)
CVA, n (%)	7 (4.1)	28 (11)	3 (1.5)	7 (4.1)
Cardiovascular Meds, n (%)	40 (23.5)	123 (60.6)	21 (10.4)	40 (23.5)
HIV, n (%)	9 (5.3)	37 (18.2)	28 (13.9)	9 (5.3)
Liver Disease, n (%)	14 (8.2)	18 (8.9)	23 (11.4)	14 (8.2)
Cancer, n (%)	21 (12.4)	24 (11.8)	18 (9)	21 (12.4)
COPD, n (%)	68 (40)	65 (32)	51 (25.4)	68 (40)
Cardio-pulmonary Edema, n (%)	31 (18.2)	55 (30.5)	25 (12.4)	31 (18.2)
Pulmonary Embolism, n (%)	2 (1.2)	37 (9)	6 (3)	2 (1.2)
Renal Disease, n (%)	25 (14.7)	136 (9)	28 (13.9)	25 (14.7)
Physical Examination				
Temperature, Median (IQR)	37.8 (1.6)	126 (61.5)	37.8 (1.8)	37.8 (1.6)
Respiratory Rate, Median (IQR)	27 (10)	16 (18)	28 (12)	27 (10)
Systolic Blood Pressure, Median (IQR)	121 (38.8)	184 (90.6)	110 (39.5)	121 (38.8)
Altered Mental Status, n (%)	37 (21.8)	8 (3.9)	65 (32.3)	37 (21.8)
Labs / Radiography				
Glucose, Median (IQR)	134 (64)	28 (13.8)	128 (72)	134 (64)
Sodium, Median (IQR)	137 (8)	112 (55.2)	136 (10)	137 (8)
PAO2 (ABG), Median (IQR)	54 (16.6)	62.1 (29)	61.9 (27)	54 (16.6)
Ph (ABG), Median (IQR)	7.4 (0.1)	7.4 (0.2)	7.4 (0.1)	7.4 (0.1)
Hematocrit, Median (IQR)	37.5 (10.4)	47 (23.2)	37 (9)	37.5 (10.4)
Pleural Effusion, n (%)	162 (95.3)	32 (41)	12 (6)	162 (95.3)
BUN, Median (IQR)	41 (42)	7 (3.4)	37 (45)	41 (42)
Severity of Disease				
Pneumonia Severity Index, Median (IQR)	139 (60.2)	132 (77.5)	134 (59)	139 (60.2)
Admitted to ICU, n (%)	83 (48.8)	13 (6.4)	169 (84.1)	83 (48.8)

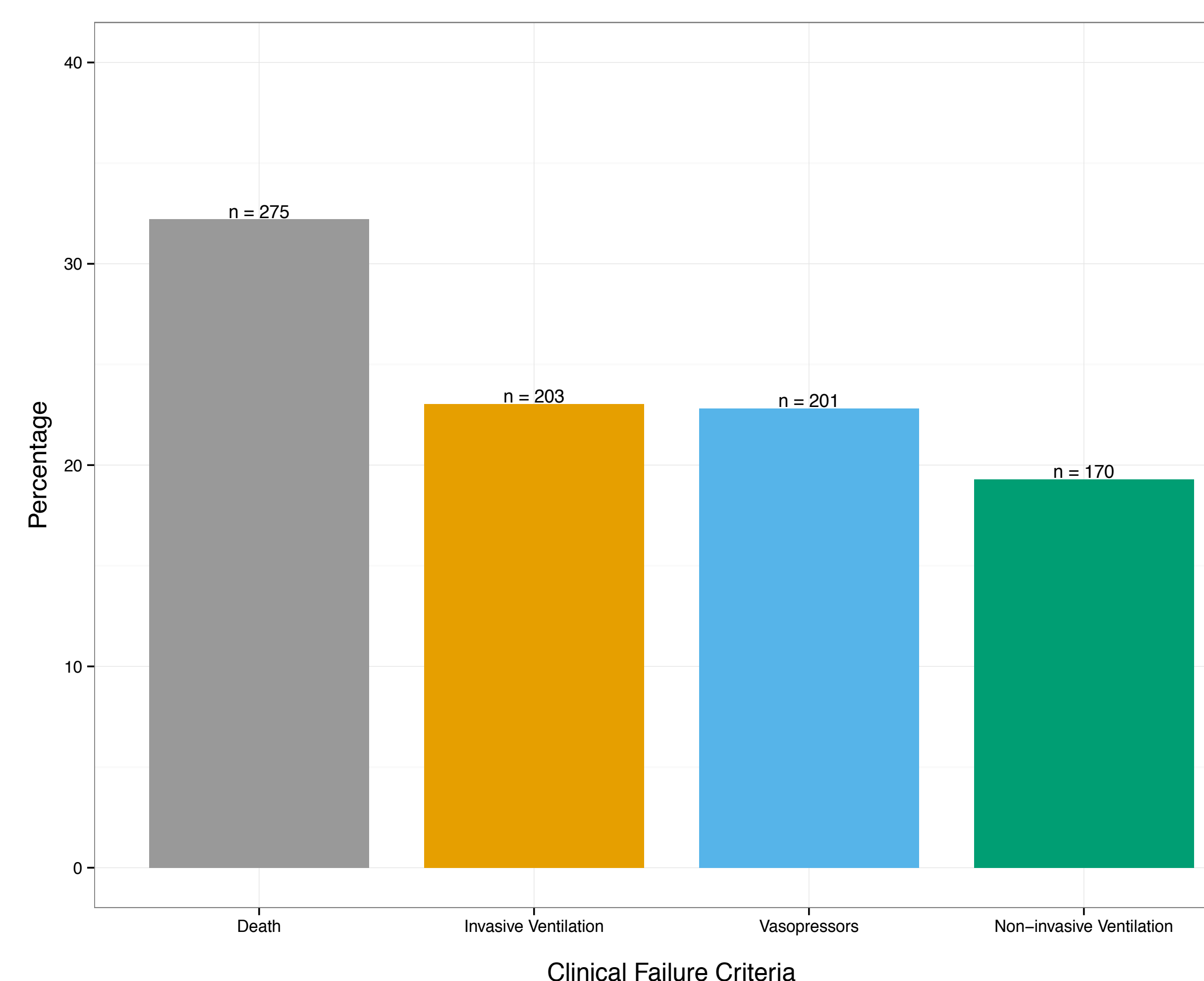


Figure 1 etiology of clinical failure

CONCLUSIONS

- This study indicates that clinical failure is a common event in hospitalized patients with CAP.
- The most common etiology of clinical failure is progression of pulmonary infection with development of respiratory failure.
- The etiology of respiratory failure with the need of mechanical ventilation in patients with CAP is likely multifactorial. In some patients, development of severe multilobar pneumonia may be the only etiology of respiratory failure. In other patients, the association of CAP with cardiovascular events may produce development of congestive heart failure with respiratory failure due to cardiac pulmonary edema. Another possibility is that pneumonia may produce a clinical syndrome of severe sepsis with organ dysfunction and development of acute respiratory distress syndrome (ARDS).
- Preventing intubation by the use of non-invasive ventilation is an important technique that may prevent hospital-acquired pneumonia. Non-invasive ventilation should be considered a first-line intervention for patients with CAP experiencing respiratory failure.

REFERENCES

1. Niederman MS, Mandell LA, Anzueto A, et al. Guidelines for the management of adults with community-acquired pneumonia: diagnosis, assessment of severity, antimicrobial therapy, and prevention.