Length of stay of pneumonia patients associated with comorbid and complications factors in referral National Infectious Diseases Hospital

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Abstract
Introduction: The length of stay for hospitalized pneumonia patients is influenced by various factors. The study aims to describe the relationship between factors that can cause prolonged hospital stays, complications such as metabolic disorders and electrolyte imbalance and comorbidities.
Method: This study is a cross-sectional study, using total sampling with purposive sampling methods to meet the inclusion criteria. The data was taken from the medical record of adult hospitalized pneumonia patients from 1 January 2015 to 31 December 2017 in the Referral Infectious Diseases Hospital Prof. Dr Sulianti Saroso Jakarta.
Results: There were 316 hospitalized pneumonia patients enrolled in the study, most patients were 56-65 years old (29.4%). There 228 of 316 (72.2%) had comorbid and 118 of 316 (37.3%) had a complication. The most common complication was metabolic disorders of plasma proteins (31%) and electrolyte imbalance (46%). Meanwhile, patients who had comorbid complications were 95 of 316 (30.1%). The number of patients treated ≤ 10 days, with comorbid 178 of 228 patients (78.1%) and without comorbidities 82 of 88 patients (93.2%) (p-value = 0.003). There were 175 out of 198 patients (88.4%) patients without complications and treated ≤ 10 days. While pneumonia patients with complications, 85 of 118 patients (72.0%) were treated for 10 days (p-value = 0,000). 65 of 95 (68.4%) patients with both comorbid and complications, were treated for ≤ 10 days. Whereas patients with one comorbidity or complications or none, 195 of 221 (88.2%) patients were treated ≤ 10 days (p-value = 000).
Conclusion: The most common comorbid found in this study was hypertension (15.3%). The most common complication found was metabolic disorders such as electrolyte imbalance (46%). The length of stay for patients without comorbid and or complications was ≤ 10 days or less.
Keywords: pneumonia, hospitalization, comorbid, complication

Background

Pneumonia is still a leading cause of hospitalization and death worldwide, especially in developing countries (Mandell LA et al, 2007, Kosar F, et al 2017). It is known as the one of main causes of morbidity and mortality worldwide. The results of the Sample Registration Survey by the National Institute of Health Research and Development, Ministry of Health in 2014 showed that pneumonia was among the 10 deadliest diseases in Indonesia (MoH 2013). Based on data from the Medical Record Installation at the Referral Infection Hospital Prof. Dr Sulianti Saroso, every year, pneumonia is one of 10 infectious diseases treated in hospitals.

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Pneumonia is an infectious disease with a high health cost. The incidence of pneumonia patients hospitalized for 3-5 per 1,000 adults per year with a mortality rate of 5-15%. The total cost of treating pneumonia obtained by the community is directly related to hospital admission costs and length of stay (LOS) (Menéndez R et al 203).

Some factors contribute to the severity of disease in hospitalized community pneumonia patients. Those factors can be classified into two groups, the major and minor factors or the Pneumonia Severity Index (PORT scale) which are based on demographic factors, physical examination and laboratory (Vidal A et al 2017). The major factors consist of the need for mechanical ventilation, increased infiltrates by more than 50%, the need for vasopressor, and creatinine level in serum or increasing creatinine serum > 2 mg/dl (Suter-Widmer I et al 2012. There are some comorbid diseases commonly found in community pneumonia patients such as Chronic Obstructive Pulmonary Disease (COPD), bronchitis, asthma, cardiovascular disease (chronic heart disease and heart failure), cerebrovascular disease (such as stroke), diabetes mellitus, cancer, kidney disease chronic, rheumatoid arthritis, Human Immunodeficiency Virus (HIV) and anaemia (Vidal A et al 2017).

Commonly, patients with bacterial infections including pneumonia are hospitalized for 7-10 days. The cause of the prolonged length of stay in patients with community-acquired pneumonia is multifactorial and mainly depends on the severity of pneumonia and underlying comorbid disease, complications, and non-clinical factors. Congestive heart failure, COPD, diabetes, and cerebrovascular disease are known as the most common comorbid diseases.

Methods
Study Design
It was a quantitative cross-sectional study where data were collected from the medical records of adult hospitalized pneumonia patients from 1 January 2015 to 31 December 2017 in National Referral Infectious Diseases Hospital Prof. Dr Sulianti Saroso, Jakarta. The study aimed to describe the relationship between factors that can cause prolonged hospital stays, complications such as metabolic disorders and electrolyte imbalance and comorbidities.

Data Collection
Samples were taken from 214 participants who were hospitalized with pneumonia for a specified period based on Lemeshow's formula with Cross Sectional design. Inclusion criteria for samples Effect of Risk Factors on Length of Care for pneumonia patients as follows (a) Patients aged > 18 years with a diagnosis of pneumonia (b) Patients who had received antibiotic therapy (c) There were complete patient medical record data (medical record number, age, gender, antibiotics used). (d) There was information about the comorbid disease (e) There was information about the complicated disease in patients due to the length of hospitalization increases if complications occur. The study got exempted from ethics since the data was collected from the medical record and were not linked to the individual data.

Results
Of hospitalized pneumonia patients, 228 (72.2%) were pneumonia patients with the comorbid disease and 88 patients (27.8%) were without the comorbid disease. The most comorbid disease in patients with pneumonia was hypertension (15.3%), dyspepsia (10.7%), and gastritis (10.2%).

Table 1. Description of comorbid disease and complications from hospitalized pneumonia patients

Variable	N	Percentage (%)
Comorbid Disease		
▪ Without Comorbid Disease	88	27,8
▪ With Comorbid Disease	228	72,2
Complication		
▪ Without Complication	198	62,7
▪ With Complication	118	37,3
Comorbid disease and complications		
▪ One of them or None	221	69,9
▪ With both comorbid disease and complication	95	30,1

In contrast to complications, table 1 shows 118 pneumonia patients (37.3%) had complications and 198 pneumonia patients (62.7%) had no complications. The most complication found in pneumonia patients were metabolic disorders such as electrolyte imbalance (46%) and metabolic disorders of plasma proteins (31%). Meanwhile, pneumonia patients with comorbid disease and complication were found as many as 95 (30.1%) while the remaining 221 patients (69.9%) only had one comorbid disease/complication or without both. Table 2 shows that most of the hospitalized pneumonia patients were discharged (87.0%). Most of the patient's length of stay is > 10 days (82.3%).

Table 2. Description of discharge condition and length of stay of pneumonia patients

Variable	N	Percentage (%)
Discharge condition		
Healthy	275	87,0
Discharge against medical advice	8	2,5
Death	33	10,4
Length of Stay (LOS)		
≤ 10 days	56	17,7
> 10 days	260	82,3

In hospitalized pneumonia patients with the comorbid disease (table 3), 178 patients (78.1%) were treated for ≤ 10 days. Whereas, hospitalized pneumonia patients without the comorbid disease, 82 patients (93.2%) were treated for ≤ 10 days. The results of the chi-square test showed that there was a significant relationship between the presence of comorbidities and length of stay in pneumonia patients (p-value = 0.003).

Table 3. Length of stay of hospitalized pneumonia patients with and without comorbid or complication

Variable	Length of Stay (LOS)					P Value
	≤10 days		>10 days			
	N	%	N	%		
Without comorbid	82	93,2	6	6,8	88	0,003
With comorbid	178	78,1	50	21,9	228	
Without complication	175	88,4	23	11,6	198	<0,001
With complication	85	72,0	33	28,0	118	

In hospitalized pneumonia patients without complication (table 3), 175 patients (88.4%) were treated ≤ 10 days. While hospitalized pneumonia patients with complications, 85 patients (72.0%) were treated for > 10 days. The results of the chi-square test found that there was no relationship between the presence of complications with the length of stay in patients (p-value = 0,000).

Table 4. Relationship between comorbid and complications with the length of stay of hospitalized pneumonia patients

Variable	Length of Stay (LOS)				Total	P Value
	≤10 days		>10 days			
	N	%	N	%	days	
Comorbid and complication						
One or none	195	88,2	26	11,8	221	<0,001
Both comorbid and complication	65	68,4	30	31,6	95	

In hospitalized pneumonia patients with comorbid complications (table 4), 65 patients (68.4%) were treated for ≤ 10 days. Whereas hospitalized pneumonia patients with the comorbid disease only or complication only, 195 patients (88.2%) were treated ≤ 10 days. The results of the chi-square test showed that there was a relationship between the presence of comorbidities and complications with the length of stay in pneumonia patients (p-value = 000).

Discussion
This study found that the most common comorbid disease in pneumonia patients was hypertension (15.3%), dyspepsia (10.7%), and gastritis (10.2%). The percentage of patients treated <10 days in the group of patients who did not have comorbid/complications was more (93.2%) than the group of patients who had comorbid (78.1%). In Vidal, et al research on the comorbid disease in pneumonia, the most common comorbid diseases found were immuno-compromised, hypertension, and smoking history. The study revealed that length of stay seemed associated with comorbidities and the presence of clinical complications. In this research, it was mentioned that comorbid diseases that cause prolonged hospital stays were smoking, dyslipidemia, heart disease, and obesity (Vidal A et al 2017).

Based on this study it was found that most complications were found in patients with metabolic disorders such as electrolyte imbalance (46%) and metabolic disorders of plasma proteins (31%). In the group of patients without complications, the percentage of patients treated <10 days was more (88.4%) compared to the group of patients with complications (72%). Widmer, et al revealed that the complications affecting LOS include abnormal blood results (low PaO2, low albumin, sodium imbalance), or severity markers such as pleural effusion, multi-lobar lung involvement and positive blood culture, or development of complications such as empyema requiring drainage (Suter-Widmer I et al 2012). Other studies mentioned that prolonged hospitalization was significantly associated with neoplastic disease, anaemia, and the development of respiratory, cardiovascular, renal, and gastrointestinal complications within 72 hours of hospital admission. While serum albumin correlated inversely with prolonged hospitalization (Menéndez R et al 2001).

Conclusion
The most common comorbid disease found in hospitalized pneumonia patients in this study was hypertension (15.3%). The most common

complication found in hospitalized pneumonia patients was metabolic disorders such as electrolyte imbalance (46%). Length of stay ≤ 10 days in hospitalized pneumonia patients without comorbid disease and or complication was much more than in patients with the comorbid disease and or complication.

Competing interests
The authors have no conflict of interest to declare.

Authors' contributions
Pompini Agustina Sitompul and Roza Indriani have contributed to the conception and design, acquisition of data, or analysis and interpretation of data; Pompini Agustina Sitompul, Roza Indriani and Vivi Setiawaty were drafting the article and revising the article; and all the authors gave final approval of the version to be published

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