The Influence of Pharmaceutical Care Intervention on Inpatient Community Acquired Pneumonia:
A Small Randomized Single Blind Study

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ABSTRACT: Pneumonia, one of infectious diseases, becomes a major health care problem in Indonesia. The inappropriateness use of treatment can lead to greater unexpected health outcome and prolonged length of stay. A lot of research has proved that pharmacists, as a part of health care professionals, has important role in assuring patients to get the most optimal treatment benefit. The aim of this study is to identify the influence of pharmaceutical care intervention in reducing the length of stay of inpatients community acquired pneumonia. This experimental study involved 32 subjects with community acquired pneumonia hospitalized without any other infection between 18th August and 31st December 2010. Subjects were divided into two groups, i.e. intervention and control group, by simple random sampling technique. Intervention group received pharmaceutical care services i.e. drug related problems identification and solving based on Pharmaceutical Care Network Europe Classification and therapy guideline. Both group received hospital standard care. The primary outcome of this study was length of stay. All subjects were followed until 31 December 2010. Most of drug related problems identified in this study were classified as treatment effectiveness (intervention group 76.19% and control group 81.82%) and treatment cost (intervention group 23.81% and control group 18.18%). Inappropriate use of antibiotic was the main cause for this drug related problems based on the pneumonia guideline. Ceftriaxone and ciprofloxacin (28.21%) were the most inappropriate used antibiotics found in this study. The mean of length of stay between intervention (6 days) and control group (8 days) was significantly different (P<0.05). Pharmaceutical care intervention significantly improved the length of stay of inpatients community acquired pneumonia.

INTRODUCTION

Pneumonia is infectious disease categorized as one of 15 leading causes of death in United State of America in 2007, 2008, and 2009 [1]. In Indonesia according to Southeast Asian Medical Information Center/SEAMIC (2001), pneumonia was classified as the sixth leading caused of death in Indonesia. In 2005, as much as 7071 children in Surabaya was diagnosed with pneumonia infection [2]. Pneumonia is an inflammatory infection on lung parenchyma that could be caused by bacteria,

virus, or fungi [3]. Pneumonia infection mostly caused by bacteria and *Streptococcus pneumoniae* and was count as the most causal pathogen for community acquired pneumonia other than *Mycoplasma pneumoniae, Haemophilus influenzae, Legionella pneumoniae* [3,4]. This result also reflected by study in 14 hospitals in Asian countries showed that *Streptococcus pneumoniae* (29.2%), *Klebsiella pneumoniae* (15.4%) and *Haemophilus influenzae* (15.1%) as the most causal pathogen found in community acquired pneumonia [5].

Antibiotics are the main and vital treatment in any infectious diseases including pneumonia. In spite of massive development in drug including antibiotics, infectious diseases are still to be one of most popular diseases in the world. The challenging issue in antibiotics treatment is to fight against antibiotic resistance that still happening until now. An ANSORP Study in 2004, resistance problem had emerged and reflected by the result among *Streptococcus pneumoniae* isolates showed that 52.4% were not susceptible to penicillin, 23% were intermediate, and 29.4% were penicillin resistant [6]. This result also gave us information that choosing the appropriate antibiotic for each infection culprit is very important step to achieve optimal therapy. Antibiotics treatment should be considered after the diagnosis has been made. According to literatures, microbiological and susceptibility test should be done to choose the best antibiotic for the causal pathogen. Empirical antibiotic therapy usually applied, while waiting for the microbiology and susceptibility test result, based on the possible or most common local causal pathogen. Careful consideration should be used in choosing appropriate empirical therapy, because there were a greater risk of developed antibiotics resistance and sub-optimal therapy due to inappropriate used of antibiotic [7].

Globally, antibiotics have been classified as one of the most frequently used drug, especially in low and developing countries including Indonesia. Ironically, this finding also followed by poor infection diagnosis [8]. This excessive use of antibiotic might lead to many consequences such as high cost of therapy, bacterial resistance, therapy failure, and drug interaction [9]. One observational study conducted in Turkey showed irrational used of antibiotics in community was 40-60%, while the rational used of antibiotic in one of hospital was only 54.3% [10]. This study showed that risk of inappropriate use of antibiotics still high and need to be controlled. Antibiotics used control can be achieve by collaboration between healthcare professional in community and hospital setting.

Pharmacists, as one of the healthcare professional team, have an important role in optimizing medical therapy through pharmaceutical care which can lead to the improvement of patient's quality of life. Pharmaceutical care concept was rising from the evolution of pharmaceutical activity, especially regarding patient centered optimization of drug used. Cipolle, Strand, and Morley defined pharmaceutical care as a practice in which the practitioner takes responsibility for a patient's drug therapy needs, and is held accountable for this commitment [11]. According to Hepler and Strand, pharmaceutical care defined as the responsible provision of drug therapy for the purpose of achieving definite outcomes intended to improve a patient's quality of life [11,12]. Based on that definition the key point of that concept is the shifting role of pharmacist from drug oriented to patients oriented. This new concept has changed the role of pharmacist including in Indonesia and stated in the standard of pharmaceutical care in hospital (2004) and community (2006) [13].

The role of pharmacist through pharmaceutical care is to optimize the benefit of pharmacotherapy by ensuring the outcomes to improve patient's quality of life [14]. The scope

of pharmaceutical care include interaction inter-healthcare professionals interaction, drug therapy monitoring, therapy recommendation, drug related problem, drug information and patients counseling [11,13]. Drug related problems analysis is part of pharmaceutical care practice and become one of the pharmacists' role in hospital according to pharmaceutical care standard [13]. This study will focus on the impact of pharmaceutical care intervention in reducing the length of stay for community acquired pneumonia patients who was hospitalized in one of private hospital in Indonesia.

METHODS

Study design

This study was prospective experimental design using 2 groups of subjects, i.e: control and intervention groups.

Type of subjects

Subjects were adult (>17 years old) inpatients diagnosed with community acquired pneumonia without any infectious disease other than community acquired pneumonia.

Type of intervention

Intervention in this study is defined as drug related problem analysis using Pharmaceutical Care Network Europe 6.2 version as a tool. Therapy guideline used in this study is Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults (2007)/(ATS guidelines).

Type of outcomes

The main outcome is length of stay. Length of stay is calculated based on number of days a patient was hospitalized.

Data collection

All patients in a private hospital who met inclusion criteria were included. Data collection was conducted from August 2010 to December 2010.

Data analysis

Data in this study was presented on percentage of each category. Data between control and intervention groups was compared with length of stay, then it were analyzed using SPSS 17th version and the Mann-Whitney test to see the association between pharmaceutical care intervention (drug related problem analysis) and reduced length of stay. The p value ≤ 0.05 was considered as a statistical significance.
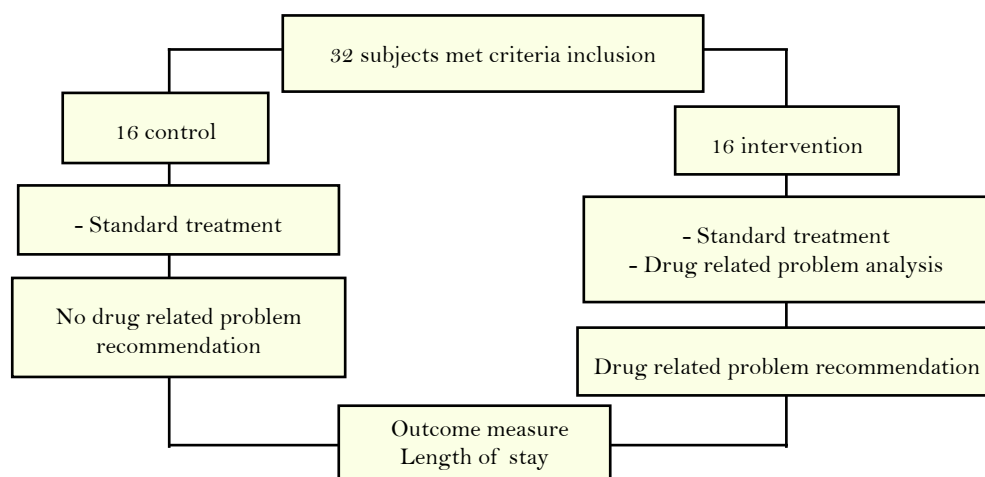

Figure 1. Subject selection and data collection

RESULTS & DISCUSSION

Results

A number of 44 subjects with community acquired pneumonia were collected from 18th August to 31st December 2010. 12 subjects were excluded because they had other infection disease like tuberculosis or HIV. Total of 32 subjects were used in this study and were divided into two groups using odd and event number, 16 patients in the control group and the rest in the intervention group.

Characteristic of patients

The characteristic of subjects is presented in table 1.

Types of drug related problems

The types of drug related problem is presented in table 2. Effect of drug therapy not optimal was the types of drug related problems that most commonly identified.

Drug related problems recommendation

Total drug related problems recommendation is presented in table 3.

Table 1. Characteristic of patients

Characteristic	Control group (n=16)	Intervention group (n=16)
Gender		
Male. (%)	56.25 %	81.25 %
Female. (%)	43.75 %	18.75 %
Age, Mean	61.56	54.75
> 45	2	5
45-54	1	0
55-64	6	5
65-74	5	4
75-84	1	1
> 85	1	1
Compelling indication		
Diabetes mellitus	1	1
Post CVA	1	1
Myelom tumour	1	0
Without compelling indication	13	14

Length of stay

Reduction mean length of stay in intervention group was found shorter than control group (6 versus 8 days). Data analysis using Mann-Whitney test is presented in table 4.

Discussion

This study finding indicate that pharmaceutical care intervention by pharmacist could reduce mean length of stay significantly in hospitalized patients with community acquired pneumonia.

Pharmaceutical care purpose is to improve patient's quality of life through optimization of drug therapy [11,12]. Pharmaceutical care could cover many scope and one of them is drug related problems analysis by pharmacist. Therefore, the term of pharmaceutical care intervention used in this study will focus on drug related problems analysis. Pharmaceutical Care Network Europe 6.2 version tool was used to identify classification of drug related problems.

Based on the PCNE tool, this study found that most of drug related problems were categorized on the treatment effectiveness (79.07%). Non-optimal drug therapy was majority problems found in this study (62.79%), followed by unnecessary drug treatment (18.6%). Higher proportion in non-optimal therapy was primarily caused by inappropriateness of antibiotic selection. Antibiotics therapy comparator in this study was antibiotics that were recommended by the Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults. Ideally the choice of antibiotic is based on definite diagnosis of infection and microbiological test to choose the best and appropriate antibiotic based on the causal pathogen. But in practice one of the obstacles was length of time needs to get a microbiology test [7,15,16]. Based on that obstacle, empirical antibiotic therapy was used

Table 2. Details of drug related problems

Primary domain	Problem	Control	Intervention	Total	Percentage (%)
Treatment effectiveness	Effect of drug treatment not optimal	15	12	27	62.79
	No effect of drug treatment/ therapy failure	3	4	7	16.28
Treatment cost	Unnecessary drug-treatment	4	4	8	18.6
	Drug treatment more costly than necessary	-	1	1	2.33
	Total	22	21	43	100

while waiting for microbiological test result. This study revealed that most of antibiotic selection used was also the daily practice based on empirical therapy. DRP's analysis will focus on the empirical therapy and not definite therapy because there is a habit to continue empiric antibiotic therapy until hospital discharge in patients who had a better condition with it.

Table 3. Drug related problems recommendation

Recommendation	Total	Percentage (%)
Drug changes	17	85
Drug stoppage	3	15
Total	20	100

ATS guidelines indicate that the first line empirical therapy for community acquired pneumonia inpatient was using respiratory fluoroquinolone (levofloxacin, moxifloxacin, gemifloxacin) with level 1 recommendation or combination of beta lactam (ceftriaxone, cefotaxime, or ampicillin sulbactam) and macrolide (azithromycin, clarithromycin) [16]. This study found most of antibiotic used was combination of ceftriaxone and ciprofloxacin (47.83%) and combination of ceftriaxone and levofloxacin (26.09%). This finding also gave us information on antibiotic choice adherence to the guideline in clinical practice. This guideline was chosen because most of clinician on this private hospital used it to treat the patients. Antibiotic combinations found in this study were not supported by strong evidence especially for community acquired pneumonia when compare to antibiotic choice in the guideline. Respiratory fluoroquinolone single therapy or combination of beta lactam and macrolide were supported by many evidences. One of the evidence was a meta-analysis of randomized controlled trial by Konstantinoz et al stated that respiratory fluoroquinolone was equal to combination of beta lactam and macrolide in mortality rate (2.7% vs 3.4%), or in the treatment success (84.2% vs 82.2 [17].

The mean length of stay was shortened in the intervention group than control group (6 days versus 8 days). According to study in Spain about factors that could influence length of stay hospitalized patient with community acquired pneumonia found three factors (health care systems and hospital management, physician's practices and skills, and patient's characteristics). According to the study, choosing good proven clinical guideline, severity of pneumonia, complication, and comorbidities will influence total length of stay in patients with community acquired pneumonia [18]. Adherence to good proven clinical guideline in prescribing empirical antibiotic could also affect on patient's length of stay. This factor could be seen in study by Dambrava et al showed that adherence to guideline on empirical antibiotic selection have impact on mortality (3 versus 10.6%) and mean length of stay (7.6 versus 10.4 days) between adherence group and not adherence group [19]. The appropriateness of empirical

antibiotic selection also give a benefit in the treatment effectiveness and length of stay. One study compared levofloxacin and moxifloxacin in hospitalized patients with community acquired pneumonia reveal there is no significant difference in patient length of stay (5.53 versus 5.61 days) with treatment consistency more higher in moxifloxacin than levofloxacin (81 versus 78.9%) [20]. In one of meta analysis which comparing respiratory fluoroquinolone versus combination of beta lactam and macrolide found that median length of stay using respiratory fluoroquinolone were 1-2 days less than combination of beta lactam and macrolide, but based on mean length of stay there were no difference between those two [17]. Other study conducted by Frei et al comparing levofloxacin 750 mg versus ceftriaxone 1000 mg and azithromycin 500mg daily showed there was 0.8 day reduction of length of stay and 1.2 days reduction of length of intravenous antibiotic therapy [21]. Although the result found significantly different in patient's mean length of stay between groups, there was some limitation in this study, including: the inability to calculate the severity level of pneumonia due to limitation of data to calculate severity index.

CONCLUSION

Pharmaceutical care intervention, defined as drug related problems analysis, could affect significantly in reducing mean length of stay. Appropriateness use of antibiotic was playing important role for the treatment effectiveness that also influenced patient's length of stay. This study could reflect the need of pharmacist role in optimizing drug therapy management in the future.

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