

# Cost-effectiveness of Antipsychotics in Treatment of Schizophrenia Patients admitted to a Secondary Hospital

*Yuni Andriani\**, *Frisca Nindy Septiani*, *Defirson*,

*Sekolah Tinggi Ilmu Kesehatan Harapan Ibu Jambi*

**Abstract.** Schizophrenia is a chronic disease that requires relatively high treatment cost. Several studies have found that atypical antipsychotics are more effective compared to typical antipsychotics. As a result, the duration of treatment and the patients' length of hospital stay will be shorter which ultimately reduce the overall treatment costs. Therefore, it is necessary to conduct a cost-effectiveness analysis (CEA) of the two classes of antipsychotic drugs in the treatment of schizophrenia inpatients admitted to Jambi Province Hospital period 2013-2016. This retrospective cohort study was undertaken to analyze cost-effectiveness of the antipsychotic drugs provided to patients with schizophrenia (n=910) admitted to Jambi Province Hospital from the perspective of a healthcare provider. using purposive sampling technique. Characteristics of the patients, antipsychotic drugs usage, costs consumed, and treatment outcome were extracted from the hospital databases and descriptively analyzed. Average Cost-effectiveness Ratios (ACERs) and Incremental Cost-effectiveness Ratio (ICER) of the two type of antipsychotics were analyzed. It was found that the ACER of: the typical antipsychotic group, IDR 142,789.25; atypical antipsychotics, IDR 163,045.50 which indicates that the typical ACER antipsychotic drug was lower than those of atypical antipsychotics based on the length of stay (LOS) of patients in the Psychiatric Intensive Care Unit (PICU) room. Whereas based on the PANSS-EC score of the patient, the total ACER value of the typical antipsychotic group was IDR1,189,910.42 and in atypical antipsychotics was IDR. 572,089.47. Atypical antipsychotics are more cost-effective than typical antipsychotics.

**Keywords:** Schizophrenia, Antipsychotic drugs, Cost Effectiveness

**Abstrak.** Skizofrenia adalah penyakit kronis yang membutuhkan biaya perawatan yang relatif tinggi. Beberapa penelitian telah menemukan bahwa antipsikotik atipikal lebih efektif dibandingkan dengan antipsikotik tipikal, sehingga durasi perawatan dan lama tinggal di rumah sakit akan lebih pendek yang pada akhirnya mengurangi keseluruhan biaya perawatan. Berdasarkan hal tersebut perlu dilakukan analisis efektivitas biaya (CEA) dari dua kelas obat antipsikotik dalam pengobatan pasien rawat inap skizofrenia yang dirawat di Rumah Sakit Provinsi Jambi periode 2013-2016. Studi kohort retrospektif ini dilakukan untuk menganalisis efektivitas biaya obat antipsikotik yang diberikan kepada pasien dengan skizofrenia (n = 910) dirawat di Rumah Sakit Provinsi Jambi dari perspektif penyedia layanan kesehatan. menggunakan teknik purposive sampling. Karakteristik pasien, penggunaan obat antipsikotik,

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\*Corresponding author at: Sekolah Tinggi Ilmu Kesehatan Harapan Ibu Jambi

E-mail address: yuni23\_fmasi@yahoo.com

*biaya yang dikonsumsi, dan hasil pengobatan diperoleh dari data yang dimiliki rumah sakit dan dianalisis secara deskriptif. Average Cost-effectiveness Ratios (ACERs) dan Incremental Cost-effectiveness Ratio (ICER) dari kedua jenis antipsikotik dianalisis. Ditemukan bahwa ACER dari: kelompok antipsikotik tipikal, Rp. 142.789,25; antipsikotik-atipikal, Rp.163.045,50 yang menunjukkan bahwa obat antipsikotik ACER khas lebih rendah daripada antipsikotik atipikal berdasarkan lama tinggal (LOS) pasien di ruang Unit Perawatan Intensif Psikiatri (PICU). Sedangkan berdasarkan skor PANSS-EC pasien, total nilai ACER dari kelompok antipsikotik tipikal adalah Rp1.189.910,42 dan pada antipsikotik atipikal adalah Rp. 572.089,47. Hasil menunjukkan bahwa antipsikotik atipikal lebih hemat biaya daripada antipsikotik tipikal.*

**Kata kunci:** Skizofrenia, obat antipsikotik, Efektivitas Biaya

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## 1. Introduction

Cost-effectiveness analysis is necessary to be carried out to make decisions on drug selection in terms of benefits and costs [2]. Pharmacoeconomic analysis such as CEA can be used to determine whether a drug is sufficient to be offered and used in health services [3]. Cost-effective drug selection allows the rational use of health care funds so that the quality and scope of services can be further enhanced [4]. In 2013, O'Day, Rajagopalan, Meyer, Pikalov, & Loebel conducted research on cost-effectiveness of atypical antipsychotics and found that the cost-effectiveness of lurasidone was better than that of generic atypical antipsychotics (Risperidoneeridone, ziprasidone, and olanzapine) and atypical branded antipsychotics (extended-release quetiapine and aripiprazole). Other study suggested that atypical antipsychotics were more cost-effective compared to first-generation of antipsychotics (Haloperidolperidol). Additionally, in 2015, Adriana et al concluded that atypical antipsychotics were more cost-effective than typical antipsychotics [7].

Most of the previous studies carried out generally focused on comparing two antipsychotic therapies by measuring LOS as the effectiveness measure of schizophrenia treatment. For this reason, an assessment of PANSS-EC (Positive and Negative Syndrome Scale Component) is needed to measure the effectiveness of a drug to treat schizophrenia. PANSS is a rating scale of positive, negative, and general psychopathology in schizophrenia patients that can be used to indicate psychotic symptoms related to treatment targets and accurately and validly predict the patient's response to the treatment given. PANSS-EC is an indicator of restless rowdy patients also used to quickly treat restless rowdy patients [8]. Based on the above facts, this study analyzed the cost-effectiveness of antipsychotics in schizophrenia patients by measuring PANSS-EC scores as their treatment effectiveness.

## **2. Methods**

### **2.1 Place / Location and Time of Research**

This research was conducted at the Regional Mental Hospital of the Province of Jambi medical record section from November 2017 to March 2018.

### **2.2 Research Design**

This research is a retrospective cohort study. The researcher used a purposive sampling technique.

### **2.3 Population and Sample of the Study**

The population in this study is medical records of in-patients with schizophrenia who used antipsychotics in the installation of the Jambi Provincial Hospital. The research sample was medical records of the in-patients with schizophrenia admitted to the hospital period 2013-2016 with inclusion criteria: medical records of patients registered in the inpatient installation of Jambi Provincial Hospital in 2013-2016, diagnosed with schizophrenia, taking typical antipsychotic drugs (Haloperidol, Chlorpromazine, and fluphenazine-decanoate) and / or atypical (Risperidone, olanzapine and Clozapine) until cured, complete and clearly read patient medical records. The exclusion criteria were medical records of the schizophrenia patients with complications, patients who discharged with their own, patients who experienced recurrence after being declared cured.

### **2.4 Data Sources**

Characteristics of the schizophrenia patients, antipsychotic drugs provided, costs consumed, and their treatment outcome period 2013-2016 were extracted from the hospital databases. All of these data were organized in and descriptively analyzed. Average Cost-effectiveness Ratios (ACERs) and Incremental Cost-effectiveness Ratio (ICER) of the two type of antipsychotics were analyzed

### **2.5 Research Procedures**

#### **2.5.1 Sampling**

Sampling was done by searching the medical records of schizophrenia patients hospitalized period 2013-2016. The data extracted were the patients' initial name, medical record number, age, gender, LOS, antipsychotics provided, antipsychotics costs; average patient PANSS-EC score; costs of doctor's intervention; maintenance costs during the PICU room.

#### **2.5.2 Data processing**

Editing was performed by re-checking the completeness of the data obtained from the medical records in the in-patient installation of Jambi Provincial Hospital. All of the required data were organized and entered into the EXCEL program.

## 2.6 Data Analysis

Cost-effectiveness analysis was undertaken by calculating the cost-effectiveness ratio (CER) and incremental cost-effectiveness ratio (ICER). The data were tabulated based on the type of data collected in the medical record room of the Jambi Province Regional Mental Hospital including the costs of antipsychotic drugs provided to the patients, physicians' costs, maintenance fees in the PICU room, the length of treatment of the schizophrenia patients while in the PICU room, the patients' PANSS-EC scores. Cost-effectiveness analysis of the schizophrenia treatment with the antipsychotics was undertaken effectiveness, ACER, and ICER using the following formula:

$$\text{Effectiveness} = \frac{\text{PANSS Score} \leq \text{average}}{\text{total sample}} 100 \% \quad (1)$$

$$\text{ACER} = \frac{\text{costs of antipsychotics}}{-\text{effectiveness of antipsychotic}} \quad (2)$$

$$\text{ICER} = \frac{\text{Costs of Drug A} - \text{Costs of Drug B}}{\text{Effectivity of drug A} - \text{effectivity of Drugs B}} \quad (3)$$

## 3. Results and Discussion

Based on the results of a preliminary study at the Jambi Provincial Mental Hospital, number of the schizophrenia patients during period 2013 to 2016 reached about hundreds to thousands of patients each year, with the highest number of patients in 2014 totaling 3,197 patients with temporary schizophrenia, schizotypal disorders, and acute psychotic disorders. Of the 3,197 patients admitted during the period, only 916 patients met the inclusion criteria.

### 3.1 Results

#### 3.1.1 Overview of research subjects

The results of the study in the inpatient installation of the Jambi Provincial Hospital indicated that there were more male patients (68.67%) compared to female which only reached 31.33%. Based on age range, most of the patients were in the age range of 17-25 years and the lowest was in the age range of higher than 65 years old. Then based on the level of education, most patients were with elementary education level and the lowest was the D2 education level.[9] Data can be seen in Table 1.

**Table 1.** Characteristics of the Patients with Schizophrenia (n=916)

Characteristics	Total	Percentage (%)
<b>Gender:</b>		
Male	629	68.67
Female	287	31.33
<b>Age (years):</b>		
17-25	352	38.43
26-35	308	33.62
36-45	161	17.58
46-55	73	7.97
56-65	16	1.75
≥65	6	0.655
<b>Level of education</b>		
Uneducated	227	24.78
SLB	2	0.22
Elementary	306	33.41
Junior High School	168	18.34
Senior High School	198	21.62
Diploma 2	1	0.11
Diploma 3	7	0.76
Bachelor	7	0.76

### 3.1.2 Utilization and Costs of the Typical Antipsychotic Drugs Provided to Patients with Schizophrenia

Utilization of antipsychotic drugs based on class therapy provided to patients with schizophrenia admitted to the installation of the Jambi Provincial Hospital period 2013 to 2016 is shown in Table 2. Most (52.29%) of the patients with schizophrenia were provided typical antipsychotics.

**Table 2.** Utilization of Antipsychotic Drugs based on Class Therapy

Class Therapy	Total	Percentage
Typical	479	52.29
Atypical	437	47.71

Typical antipsychotic usage cost data obtained an average of IDR 19,773 where the highest cost is in combination with fluphenazine decanoate because its dosage form is ampoules with a quite expensive

cost (IDR 72,500/ampoule). Then the cost of hospitalization in the PICU room has obtained an average of RPIDR 522,634.08 per treatment period. While the cost of the doctor's intervention was obtained an average of IDR.28,750. So that a total average cost of IDR 571.157 (table 3).

**Table 3.** Costs (in IDR ) of Typical Antipsychotics Provided to Patients with Schizophrenia

Class	Antipsychotics	Average Cost	Cost in PICU room	Average Cost of Doctor's intervention	Average Total Cost
Typical	Haloperidol	1.748	524.347,83	25.000	551.096
	Chlorpromazine	421	505.000	25.000	530.421
Typical + Typical	Haloperidol + chlorpromazine	2.208	529.859	25.000	557.067
	Haloperidol + chlorpromazine + Fluphenazine	74.714	531.329,48	40.000	646.043
Average		19.773	522.634,08	28.750	571.157

Antipsychotics consumed by the patients can affect their LOS in the PICU room where from 479 patients using typical antipsychotics, the average LOS for patients in the PICU room was 4 days (table 4).

**Table 4.** The average LOS of PICU Room with Typical Anti Antipsychotics

Class	Antipsychotic	The average LOS of PICU room
Typical	Haloperidol	4.4
	Chlorpromazine	4.2
Typical + Typical	Haloperidol + chlorpromazine	4
	Haloperidol + chlorpromazine + fluphenazine	4.4
Average		4.25

In addition to being assessed based on LOS, the effectiveness of therapy can also be assessed by PANSS-EC (Positive and Negative Syndrome Scale-Excited Components). In patients with typical antipsychotics, the average PANSS-EC score is 22. Data can be seen in Table 5 below:

**Table 5.** Average PANSS-EC score of Typical Antipsychotics

Class	Antipsychotic	Average PANSS score
Typical	Haloperidol	23,39
	Chlorpromazine	22,71
Typical + Typical	haloperidol + chlorpromazine	21,5

	haloperidol + chlorpromazine + fluphenazine	20
Average		22

### 3.1.3 Costs of Atypical Antipsychotic Drugs Provided to Patients with Schizophrenia

Calculation of costs of atypical antipsychotic drugs provided to patients with schizophrenia is listed in Table 6. Average cost of antipsychotic drugs was IDR 12,052, the average cost of treatment in the PICU room was IDR 289,039.25, and the average cost of the doctor's intervention was IDR 25,000. Thus, the average total costs for the treatment of the patients was IDR 326,091.

**Table 6.** Costs Atypical Antipsychotics Provided to Patients with Schizophrenia

Class	Drug name	Average cost	Average of Care cost	Average Cost of Doctor's interventions	Average of the total cost
Atypical	Risperidone	14.182	293.425	25.000	332.607
	Olanzapine	11.248	281.194	25.000	317.442
	Clozapine	4.362	290.769	25.000	320.131
Atypical + Atypical	Risperidone + Clozapine	18.415	290.769	25.000	334.184
Average		12.052	289.039,25	25.000	326.091

**Table 7.** Average LOS of the Patients Provided Atypical Drugs in PICU Room

Class	Antipsychotic	Average LOS in PICU room
Atypical	Risperidone	2.4
	Olanzapine	2.3
	Clozapine	2.4
Atypical + Atypical	Risperidone + Clozapine	2
Average		2.275

**Table 8.** Average PANSS-EC Score of Atypical

Class	Antipsychotic	Average
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		PANSS Score
Atypical	Risperidone	19.38
	Olanzapine	19.01
	Clozapine	19.04
Atypical + Atypical	Risperidone + Clozapine	18.5
Average		18.9825

### 3.1.4 Calculation of the Effectiveness of the Cost of Using Antipsychotic Therapy

Comparison of the use of antipsychotics based on an analysis that is more cost effective based on LOS in the PICU room and PANSS-EC score was atypical antipsychotic. The ACER value of the total cost of atypical antipsychotic use based on LOS in the PICU room was IDR 163,045.5 and atypical antipsychotic IDR 145,789.25 as demonstrated in Table 9. ACER value for the cost of antipsychotics using atypical antipsychotics based on length of stay in the PICU room was IDR 6,026 and atypical antipsychotic IDR 4,943.25 as listed in Table 10.

**Table 9.** Calculation of Total ACER Based on LOS in the PICU Room

	Typical	Atypical
Total costs (IDR)	571,157	326,091
LOS in PICU room (days)	4	2
ACER	IDR 571,157/4 = 142,789.25	IDR 326,091/2 = 163,045.5
ICER	No ICER calculation needed	

**Table 10.** Calculation of ACER Antipsychotics Based on LOS in the PICU Room

	Typical	Atypical
CER		
Drugs Costs (IDR)	19,773	12,052
LOS in PICU room (days)	4	2
ACER	IDR 19,773/4 = 4,943.25	IDR 12,052/2 = 6,026
ICER	No ICER calculation needed	

ACER value in total costs based on the effectiveness with PANSS-EC score on atypical antipsychotics of IDR 57,089,47 and typical antipsychotics of IDR 1,189,910.42 (11). While the value of ACER based on PANSS-EC scores on atypical antipsychotics was IDR 21.143.86 and typical antipsychotics was IDR 41,193.75 as shown in Table 12.

**Table 11.** Calculation of Total ACER Based on PANSS-EC Score



	Typical	Atypical
PANSS Score $\leq$ Average	232	250
Total Sample	479	437
	$232/479 \times 100\% = 48.43\%$	$250/437 \times 100\% = 57.21\%$
<b>CER</b>		
Total Costs (IDR)	571,157	326,091
Effectiveness	0.48	0.57
ACER	$571,157/0.48 = 1,189,910.42$	$326,091/0.57 = 572,089.47$
ICER	No ICER calculation needed	

**Table 12.** Calculation of ACER Antipsychotics Based on PANSS-EC Score

	Typical	Atypical
<b>Effectiveness</b>		
PANSS Score $\leq$ Average	232	250
Total Sample	479	437
	$232/479 \times 100\% = 48.43\%$	$250/437 \times 100\% = 57.21\%$
<b>CER</b>		
Cost of antipsychotic (IDR)	19,773	12,052
Effectivity	0.48	0.57
ACER	$19,773/0.48 = 41,193.75$	$12,052/0.57 = 21,143.86$
ICER	No ICER calculation needed	

Based on the CEA as shown in Table 12, ICER calculation was not necessary because the typical antipsychotic has low effectiveness with high costs, so it did not need to be considered as an alternative, and atypical antipsychotics had high effectiveness with lower costs so it was definitely chosen and not needed ICER calculation. Based on these data it can be concluded that atypical antipsychotics were more cost effective than typical antipsychotics [5], [10]–[13].

### 3.2 Discussion

From the research data in the Jambi Provincial Hospital in 2013-2016, there were a total of 1036 in-patients with schizophrenia admitted to the hospital. One hundred and twenty of them were excluded from the study because 103 of them had not recovered (re-hospitalized), 14 patients were discharged in a condition that had not recovered and 3 patients died. Therefore, 916 of the 1036 patients fulfilled the inclusion criteria in which 479 patients received typical antipsychotics and 437 patients received atypical antipsychotics.

Cost analysis was carried out by recording the costs of antipsychotics per dosage form (tablet/ampoule), treatment costs, and the cost of doctor's interventions. An intervention is said to be

cost-effective if: it is cheaper and as effective as the comparative intervention; more expensive but also more effective than the comparison (excess costs are proportional to the excess effectiveness provided); cheaper and less effective than the comparison, but the excess price of comparative intervention is not comparable to the excess effectiveness given [1].

Based on the cost-effectiveness analysis, typical antipsychotics are in column C where costs are higher with lower effectiveness. And atypical antipsychotics are in column G where lower costs with higher effectiveness. From the observation of the above table, it can be directly concluded that atypical antipsychotics are more cost effective than typical antipsychotics

**Table 13.** Determination of cost analysis with cost effectiveness

Cost-effectiveness	Low cost	Same Cost	High cost
Low effectiveness	A	B	C Typical
Same effectiveness	D	E	F
High effectiveness	G Atypical	H	I

Then to strengthen the results, ACER calculations were carried out. The value of ACER obtained from both the cost of antipsychotics and the total cost based on the LOS and PANSS-EC scores showed that the ACER of typical antipsychotic drug was higher than atypical antipsychotics. The present study proved that the atypical antipsychotics are more cost effective compared to typical antipsychotics.

Whereas ICER calculation was considered unnecessary because the typical antipsychotic had low effectiveness with high costs so it does not need to be considered as an alternative, and atypical antipsychotics had high effectiveness with lower costs. so it is definitely chosen and ICER calculations were not needed. Based on these data it can be concluded that atypical antipsychotics were more cost effective than typical antipsychotics.

#### 4. Conclusion

From the results of the study, it can be concluded that atypical antipsychotics were more cost-effective than typical antipsychotics based on PANSS-EC scores and LOS of the patients.

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