



The Analysis of Drug-Related Problems in Schizophrenia Patients with Lean Hospital Approach

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ABSTRACT

Schizophrenia is a severe psychotic disorder requiring optimal therapy management to ensure treatment effectiveness and patient safety. This study aims to analyze Drug-Related Problems (DRPs) in schizophrenia inpatients using the Lean Hospital approach and the Pharmaceutical Care Network Europe (PCNE) Classification V9.1. The research employed a cross-sectional design using medical records from the Inpatient Installation of RSJD dr. Arif Zainudin Surakarta in 2024. Data were collected on patient characteristics, antipsychotic drug use, DRPs, and length of stay. Qualitative analysis was performed using NVIVO, while quantitative analysis used SPSS with chi-square tests. Results showed risperidone was the most prescribed antipsychotic (17%). The prevalence of DRPs in the problem dimension was 53%, while the cause dimension was 47%. The average length of stay was 13 days, with 72% of patients discharged in less than 13 days. Chi-square analysis indicated no significant association between DRPs and treatment outcomes ($p = 0.566$). Lean Hospital analysis identified waste in service, including inappropriate prescribing and inadequate monitoring. Implementing standardization, non-value-added activity elimination, and Clinical Decision Support Systems (CDSS) can help reduce DRPs and improve care quality for schizophrenia patients

INTRODUCTION

Mental health is an essential component of overall health and quality of life, yet it often receives less attention due to its hidden symptoms (WHO, 2016; Gabriel Mane et al., 2018). Schizophrenia is one of the most severe psychiatric disorders, characterized by hallucinations, delusions, disorganized thinking, and negative affect (WHO, 2019). Globally, WHO (2020) reported 20 million people suffered from schizophrenia, increasing to 24 million in 2021, with relapse rates rising from 28% in 2019 to 54% in 2021. In Indonesia, the 2023 National Health Survey reported the highest prevalence of psychosis/schizophrenia symptoms in households was found in Yogyakarta (9.3%), Central Java (6.5%), and West Sulawesi (5.9%).

The main therapy for schizophrenia is antipsychotic medication. First-generation antipsychotics are effective for positive symptoms but often cause extrapyramidal side effects, while second-generation antipsychotics treat negative symptoms but may lead to metabolic disorders (Kemenkes RI, 2015). Long-term and combination therapy increases the risk of Drug-Related Problems (DRPs), including inappropriate dosing, interactions, and severe adverse effects (Zhang, 2017). Previous studies showed high DRPs prevalence: Ratnasari (2018) found 19.44% of cases due to inappropriate drugs, while Khaira (2015) reported incorrect dosing in 51.4% of patients.

Most DRPs studies in schizophrenia use inpatient data due to higher complexity and more diverse pharmacotherapy. However, research in Indonesia is still limited and has not yet integrated the Lean Hospital approach, which focuses on eliminating waste in healthcare services to improve quality and efficiency.

Based on RSJD dr. Arif Zainudin Surakarta's 2023 data, there were 1,999 psychiatric inpatients, with 3,603 cases of schizophrenia as the dominant diagnosis. Complex drug regimens for schizophrenia increase the risk of DRPs, making systematic evaluation necessary. This study aims to analyze DRPs in schizophrenia inpatients using PCNE V9.1 and evaluate their relationship with treatment outcomes and healthcare efficiency through the Lean Hospital approach.

LITERATURE REVIEW

Schizophrenia is one of the most serious mental disorders, characterized by a variety of clinical symptoms, including cognitive, emotional, perceptual, and behavioral impairments. Schizophrenia is a psychotic disorder characterized by the presence of more than two symptoms, delusions, hallucinations, confused speech, and negative emotions (Handayani et al., 2017). Pharmacological treatment for schizophrenia patients is divided into two groups: typical antipsychotics and atypical antipsychotics. The pattern of antipsychotic administration in schizophrenia patients at Prof. Dr. V. L. Ratumbusang Hospital, Manado, from January to March 2013, showed that 21.1% of patients used risperidone as a single antipsychotic, while 23.2% used haloperidol and chlorpromazine as a combination antipsychotic. Typical antipsychotics were the most commonly used class of drugs, accounting for 41.5% (Jarut et al., 2018).

Medication selection is a critical issue in hospitals. Many medications are used in hospitals, even though they are limited to hospital formularies. The large number of medications circulating in hospitals requires close attention to avoid errors and ensure their correct use. Medication errors, or medication errors, are a common occurrence in treatment (Resmiati, 2023).

The use of antipsychotics for the treatment of schizophrenia patients requires a long time, necessitating research on Drug-Related Problems (DRPs), as the influence of medication administration can affect the desired therapeutic outcome in patients. The classifications used in this study focused on drug selection and dosage. The classifications were based on research conducted by Susanti (2020), which identified 145 cases (44%) of drug selection and 12 cases (3.6%) of dose selection. Khaira's (2015) study on antipsychotic DRPs in patients with acute paranoid schizophrenia at the "X" Mental Hospital in Jakarta found a high prevalence of 51.4% for dose selection and 7.81% for underdosing. According to research by Hariyanto et al. (2016), the average results of patient hospitalizations indicate that combination antipsychotic therapy can increase the length of stay for schizophrenia patients, with a length of stay of approximately 32 days. The results of the analysis of therapy outcomes showed that there was no influence between length of stay and the pattern of medication given. This evaluation can be used to describe if there are DRPs that occur in schizophrenia patients and to analyze the influence of DRPs on the outcome of antipsychotic therapy in schizophrenia patients.

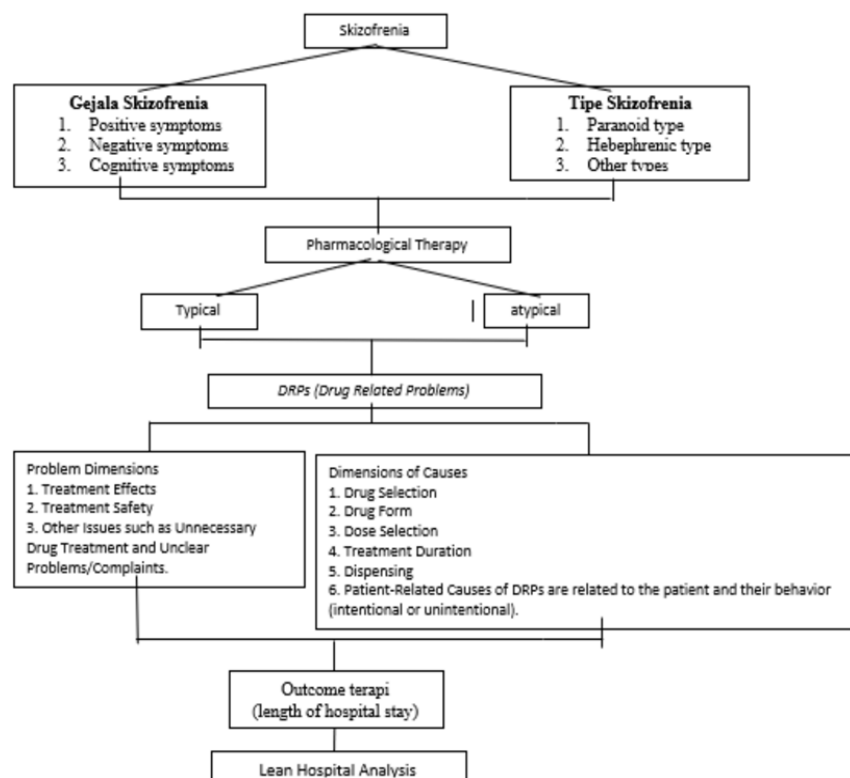


Figure 1. Conceptual Framework

METHODOLOGY

This research used a cross-sectional design based on medical records of schizophrenia inpatients at RSJD dr. Arif Zainudin Surakarta during 2024.

Population and Sample: All inpatients diagnosed with schizophrenia and treated with antipsychotics. Sampling used a total sampling method with inclusion criteria of complete medical records and exclusion of incomplete or comorbid cases.

1. **Instruments:** Data collection sheets, PCNE V9.1 classification for DRPs, and Lean Hospital analysis tools (Value Stream Mapping).
2. **Data Collected:** Patient demographics, drug utilization patterns, DRPs categories, length of stay, and waste indicators in clinical processes.
3. **Analysis:** Qualitative analysis with NVIVO for identifying non-value-added activities in hospital workflows. Quantitative analysis with SPSS chi-square test to assess the relationship between DRPs and treatment outcomes (length of stay).
4. **Ethics:** Approved by the Research Ethics Committee of Universitas Setia Budi and RSJD dr. Arif Zainudin Surakarta.

RESULTS AND DISCUSSION

1. Patient Demographics

Table 1. Age distribution of schizophrenia patients in the Inpatient Installation of Dr. Arif Zainudin Surakarta Mental Hospital in 2024

NO	Age	Total	Persentase(%)
1	Early Adolescence 12-15 Years	1	1
2	Late Adolescence 16-25 Years	26	16
3	Early Adulthood 26-35 Years	47	28
4	Late Adulthood 36-45 Years	58	35
5	Early Older Adulthood 46-60 Years	34	20
TOTAL		166	100

Table 2. Distribution of schizophrenia patients by gender in the Inpatient Installation of Dr. Arif Zainudin Surakarta Mental Hospital in 2024

No	Gender	Total	Persentase (%)
1.	Male	88	53

2. Distribution of schizophrenia patients by gender in the Inpatient Installation of Dr. Arif Zainudin Surakarta Mental Hospital in 2024

Table 3. Distribution of schizophrenia patients based on education level at the Inpatient Unit of Dr. Arif Zainudin Surakarta Mental Hospital in 2024

Level of education	Total	Persentase (%)
No school	1	1
Elementary school	35	21
Middle school	43	26
Senior High school	61	37
Vocational school	7	4
Primary expert	1	1
Associate	3	2
Bachelor	12	7
Master	2	1
Don't know	1	1
TOTAL	166	100

Table 4. Distribution of schizophrenia patients based on marital status at the Inpatient Unit of Dr. Arif Zainudin Surakarta Mental Hospital in 2024.

Marital status	Total	Persentase (%)
Not married	88	53
Married	52	31
Widow	14	8
Widower	8	5
Don't know	4	2
TOTAL	166	100

3. Antipsychotic Drug Usage Profile

Table 5. Pattern of antipsychotic drug use at Dr. Arif Zainudin Surakarta Mental Hospital in 2021

Drug Class	Drug Name	Total	Persentase (%)
Typical	Chlorpromazine	88	14
	Haloperidol	25	4
	Inj. Haloperidol	9	1
	Trifluoperazin	4	1
	ExtraInj. Haloperidol	1	0
	Inj. Lodomer	16	3
Atypical	Abilify Oral Solution	1	0
	Aripiprazole	10	2
	Clozapin	14	2
	Inj. Zypin	2	0
	Inj. Zyprexa	25	4
	Inj. Olanzapine	1	0
	Olanzapine	20	3
	Quetiapin	10	2
	Risperidone	106	17
	Seroquel	6	1
	Soroquin	18	3
	Curcuma	4	1
Other Medications	Inj. Diphenhydramine	11	2
	Divalproex	10	2
	FE	1	0
	Fenofibrat	1	0
	Fluoxetin	2	0
	Frانيا	1	0
	Genoint	1	0
Combination	Risperidone+ Chlorpromazine	3	0
	Inj. Haloperidol; Diphenhydramine + Risperidone+ Chlorpromazine	4	1

	Total	639	100%
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4. Drug Related Problems (DRPs)

Table 6. DRPs incidence of antipsychotic medication problem dimensions in schizophrenia patients at the Inpatient Unit of Dr. Arif Zainudin Surakarta Mental Hospital in 2021

Primary Domain	The Problems			
	Code V9.1	Problem	Total	Persentase (%)
1. Treatment effectiveness There is a (potential) problem with the (lack of) effect of the pharmacotherapy	P1.2	Effect of drug treatment not optimal	26	10
	P1.3	Untreated symptoms or indication	8	3
2. Treatment safety Patient suffers, or could suffer, from an adverse drug event. N.B. If there is no specific cause, skip Causes coding	P2.1	Adverse drug event (possibly) occurring	163	65
3. Other	P3.1	Unnecessary drug-treatment	55	22
	Total		255	100

Table 7. DRPs incidence according to the selection category for antipsychotic medication use in schizophrenia patients at the Inpatient Unit of Dr. Arif Zainudin Surakarta Mental Hospital in 2021

Primary Domain	The Causes (including possible causes for potential problems)			
	Code V9.1	Cause	Total	Persentase (%)
1. Drug selection The cause of the (potential) DRP is related t of the drug (by	C1.1	Inappropriate drug according to guidelines/formulary	59	26
	C1.2	No indication for drug	13	6
	C1.3	Inappropriate combination of drugs, or drugs and herbal medications, or drugs and dietary supplements	9	4

patient or o the selection health professional)	C1.4	Inappropriate duplication of therapeutic group or active ingredient	21	9
	C1.5	No or incomplete drug treatment in spite of existing indication	26	11
	C1.6	Too many different drugs/active ingredients prescribed for indication	16	7
3. Dose selection The cause of the DRP is related to the selection of the dose or dosage	C3.1	Drug dose too low	11	5
	C3.2	Drug dose of a single active ingredient too high	4	2
	C3.3	Dosage regimen not frequent enough	9	4
	C3.5	Dose timing instructions wrong, unclear or missing	2	1
4. Treatment duration The cause of the DRP is related to the duration of treatment	C4.2	Duration of treatment too long	29	13
9. Other	C9.1	No or inappropriate outcome monitoring (incl. TDM)	31	13
Total			230	100

Table 8. Number of DRPs related to causes and problems in the use of antipsychotic drugs by schizophrenia patients in the Inpatient Unit of Dr. Arif Zainudin Surakarta Mental Hospital in 2024

DRPs	Total	Persentase (%)
The Problems	255	53
The Causes	230	47
Total	485	100

5. Therapy Outcome

Tabel 9. Rata-rata lama rawat inap pasien skizofrenia di Instalasi Rawat Inap RSJD dr. Arif Zainudin Surakarta tahun 2021

No.	Length of stay	Total	Persentase(%)
1.	≤ 13 day	119	72
2.	> 13 day	47	28
Total		166	100

Based on gender, male patients are more prevalent than female (53% vs. 47%). This is consistent with Yosep's (2021) report that men have an earlier onset of schizophrenia than women. Estrogen in women is neuroprotective because it can reduce the sensitivity of dopamine receptors, thus providing hormonal protection against psychotic symptoms. Conversely, men with low estrogen levels are more susceptible to hyperactivity of the mesolimbic dopaminergic pathway, which triggers schizophrenic symptoms. Socioeconomic factors also amplify the risk in men, such as the burden of financial responsibilities and greater social roles.

In terms of education, the majority of patients had a high school education (37%). This finding suggests that patients with secondary education have the highest prevalence of schizophrenia. This situation can be explained because this group is generally just entering their early productive years, when life's demands increase, yet knowledge about mental health remains limited. Lack of understanding of the early symptoms of schizophrenia can lead to delayed diagnosis and treatment.

Furthermore, marital status is also a significant factor. As many as 53% of patients are unmarried. The absence of a spouse reduces the emotional and social support individuals desperately need to cope with stress. Research by Wardani et al. (2018) suggests that marriage is a protective factor because it reflects an individual's ability to establish healthy interpersonal relationships. Unmarried patients are at greater risk of social isolation and loneliness, which can exacerbate vulnerability to mental disorders.

2. Antipsychotic Use Profile

Antipsychotics are the primary therapy in the treatment of schizophrenia. This study recorded 639 medication uses, with 23% being typical antipsychotics, 37% being atypical antipsychotics, and the remainder being combinations or complementary medications. This indicates that atypical antipsychotics are more commonly used than typical antipsychotics. This trend aligns with modern clinical practice, which prioritizes second-generation antipsychotics because they are considered more effective in treating negative symptoms and have a lower risk of extrapyramidal side effects (Leucht et al., 2017).

Risperidone is the most widely used antipsychotic (17%). This drug acts as a dopamine D2 and serotonin 5-HT_{2A} antagonist, is effective in treating both positive and negative symptoms, and is still considered cost-effective in mental health care. Chlorpromazine and haloperidol remain used, especially in acute cases, but the risk of extrapyramidal side effects is quite high. Olanzapine, quetiapine, aripiprazole, and clozapine are also used, albeit in smaller proportions. Clozapine is prescribed for cases of resistant schizophrenia with close monitoring due to the risk of agranulocytosis.

The use of antipsychotic combinations is also quite high, including typical-atypical, atypical-atypical, and typical-atypical combinations. These combinations aim to provide a synergistic effect, for example, risperidone with chlorpromazine. However, using combinations without clear clinical indications actually increases the risk of side effects and increases the burden of treatment. Polypharmacy is also exacerbated by the administration of additional

medications such as trihexyphenidyl, benzodiazepines, and antihistamines, which can increase the risk of drug interactions and drug-related problems.

3. Analysis of Drug-Related Problems (DRPs)

This study identified 485 cases of DRPs, consisting of 255 cases of the problem dimension (53%) and 230 cases of the cause dimension (47%). This proportion indicates that clinical symptoms resulting from DRPs are more frequently identified than their underlying causes.

The problem dimension of DRPs was dominated by adverse drug reactions (ADRs), accounting for 65%. The most common side effects were extrapyramidal symptoms, excessive sedation, orthostatic hypotension, and metabolic disorders. This was closely associated with the use of antipsychotic combinations. Both the NICE (2023) and PDSKJI (2022) guidelines emphasize that monotherapy remains the first-line option, with combinations only being recommended in specific circumstances.

The second most common category was unnecessary drug treatment (22%), primarily the prophylactic use of trihexyphenidyl without EPS symptoms. According to WHO and APA guidelines (2020), anticholinergic administration is only recommended if EPS is evident, as long-term use can cause cognitive impairment and constipation. Another issue identified was suboptimal treatment efficacy (10%), which was related to therapy not following guidelines, resulting in patients not achieving symptom remission. Indications for undertreatment (3%) were also recorded, for example, patients with severe mood symptoms not receiving additional mood stabilizers or antidepressants.

In terms of causes, the largest factor was medication not following guidelines/formularies (26%). Combinations of antipsychotics without clear indications, duplication of therapy, and the use of non-standard medications were frequently encountered. The next factors were inadequate monitoring of therapy outcomes (13%) and excessively long treatment duration (13%). These three factors reflect weaknesses in pharmacotherapy management, both from the clinician's perspective and the hospital's service system.

4. Therapeutic Outcomes and Relationship to DRPs

Therapeutic outcomes were measured by length of stay (LOS). The study showed that the average LOS was 13 days. Seventy-two percent of patients were discharged within 13 days or less, while 28% were discharged within 13 days or more. In general, LOS reflects both the success rate of therapy and the severity of the patient's condition.

A chi-square test showed a p-value of 0.566, indicating no significant association between the incidence of DRPs and treatment outcomes. This may be due to the calculation method, which only counts patients as one case even if they have more than one DRP, thus obscures the cumulative effect of DRPs on outcomes. Furthermore, variations in other factors such as patient compliance, symptom severity, and family support also influence outcomes.

Despite the lack of a significant association, the finding of a high number of DRPs remains important to note. DRPs have the potential to prolong LOS, increase costs, and reduce patients' quality of life. Therefore, strategies for preventing and managing DRPs must be optimized.

5. Implementing Lean Hospitals in Preventing DRPs

From a Lean Hospital perspective, DRPs can be viewed as a defect in the healthcare process, categorized as waste because they increase costs, reduce quality, and compromise patient safety. The causes of DRPs identified in this study, such as medication non-compliance with guidelines, inadequate monitoring, drug duplication, and excessively long therapy duration, are all concrete forms of waste.

Lean Hospital implementation can be implemented through several steps. First, Value Stream Mapping (VSM) is used to map the service flow from prescribing, verification, dispensing, and monitoring, thus identifying DRP-prone areas. Second, standardized SOPs need to be enforced to reduce variation in clinical practice, particularly in dosing and monitoring schedules. Third, the use of technology such as a Clinical Decision Support System (CDSS) can help healthcare professionals detect potential drug interactions and prescribing errors early. Fourth, interprofessional collaboration, particularly the involvement of clinical pharmacists in the psychiatric team, is crucial for evaluating the rationale for therapy, deprescribing when necessary, and providing education to patients and families.

The implementation of Lean Hospital is expected to increase therapy efficiency, reduce the number of DRPs, shorten LOS, and improve the safety and quality of life of schizophrenia patients.

CONCLUSION AND RECOMMENDATION

1. The types of DRPs/problems that occur in schizophrenia patients are dominated by category P2.1 (adverse drug events) at 65%. Furthermore, P3.1 (unnecessary medication use) was also found at 22%, P1.2 (suboptimal treatment effect) at 10%, and P1.3 (untreated indication) at 3%. This indicates that DRPs in schizophrenia patients are more related to medication side effects and inappropriate therapy regimens.
2. The most common cause of DRPs was C1.1 (medication not according to guidelines or formulary) at 26%, followed by C9.1 (inadequate monitoring of therapy) and C4.2 (too long treatment duration), each at 13%. Other causes include incomplete therapy despite indications (C1.5) and duplication of antipsychotics within the same therapeutic group (C1.4), indicating medication use practices that do not fully comply with psychiatric treatment standards.
3. The relationship between the incidence of DRPs and treatment outcomes for schizophrenia patients in the Inpatient Unit of Dr. Arif Zainudin Mental Hospital, Surakarta, was no significant relationship with a significance value of 0.566.
4. The application of the Lean Hospital method to the analysis of Drug-Related Problems (DRPs) in schizophrenia patients at Dr. Arif Zainudin Mental Hospital, Surakarta, in 2024 showed that most DRPs were caused by waste in the service process, such as medication not according to guidelines, inadequate monitoring, and irrational drug combinations. Lean helps identify and eliminate non-value-added activities through evaluation of service flows, standardization of procedures, and the use of technology such

as CDSS. This approach also emphasizes the important role of physicians and clinical pharmacists in preventing DRPs and improving the quality of therapy.

Recomen

1. Medical personnel need to improve adherence to schizophrenia treatment guidelines to prevent irrational medication use.
2. Physicians and clinical pharmacists should be more active in the planning, evaluation, and monitoring of patient therapy to prevent and follow up on DRPs.
3. Lean Hospital implementation needs to be continued and strengthened to improve service efficiency and reduce the incidence of DRPs.
4. Monitoring of drug side effects should be conducted in a structured and regular manner.
6. The PANSS parameter can be added to the analysis of the relationship between DRPs and treatment outcomes.

FUTHER STUDY

This study still has limitations due to its retrospective nature, using only length of stay (LOS) as an outcome indicator, and DRPs analysis calculated per patient, so the cumulative impact is not yet clearly illustrated. Therefore, further studies are recommended to use a prospective design with direct monitoring, add other outcome parameters such as symptom remission, relapse rate, adherence, and add PANSS parameters, while also covering all pharmacotherapy regimens. Furthermore, interventional studies that implement Lean Hospital principles in real-world settings, for example through Clinical Decision Support Systems (CDSS), guideline audits, or Value Stream Mapping, are needed to assess their effectiveness in reducing DRPs and improving the quality of mental health services.

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