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Research Article

Clinical Pharmacist's Role in Optimizing Therapy through Drug-Related Problems Identification

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Abstract
Clinical pharmacists play an important role in a clinical setting as part of a team. Drug-related problem (DRP) is the main part pharmacist should focus on to achieve the optimal therapy for patients. Therefore, this study aimed to investigate the role of clinical pharmacy in a private hospital of West Java, Indonesia, and describe the prevalence of DRPs and several factors associated with the risk of DRPs. The clinical pharmacist's monthly report was obtained from June to August 2020. Furthermore, problems, causes, and types of DRP were identified using PCNE Classification V9.1. Drug classes and other factors related to DRP were also investigated. This was a descriptive study with a retrospective approach to medical records, where 240 DRPs were identified in 157 patients. Approximately 4.45% experienced DRP, especially in ICU at 45.83% and Stroke Unit or SU-IC at 25.42%. The most common DRPs were incomplete drug treatment, drug interaction, and dose adjustment. Antimicrobial, cardiovascular agents, and PPI were the most commonly involved. In the linear regression analysis, length of stay and number of therapy significantly affect DRP. In this study, pharmacists intervented each DRP, with 57% accepted as fully and partially implemented by the physicians. A total of 22% of interventions ended with unknown status due to limited follow-up time. Meanwhile, reviews on medication by clinical pharmacists lead to improvement in drug treatment. The implementation of clinical pharmacy services shows many DRPs to be prevented and increases therapy optimization.

Keywords: Clinical pharmacist, drug-related problems, drugs, hospital, intervention

Peran Farmasis Klinis dalam Optimalisasi Pengobatan melalui Identifikasi Permasalahan Obat

Abstrak
Farmasis klinik memiliki peran penting dalam tim di RS terutama dalam mencapai terapi optimal bagi pasien melalui penanganan *drug related problems* (DRP). Tujuan penelitian ini adalah untuk mengetahui peran farmasis klinik di salah satu RS swasta di Jawa Barat dan faktor risiko terjadinya DRP. Data dari laporan farmasi klinik diambil pada bulan Juni–Agustus 2020. Identifikasi permasalahan, penyebab, jenis DRP dilakukan berdasarkan *PCNE Classification* V9.1. Golongan obat dan faktor lain yang menyebabkan DRP juga dikaji. Studi ini berupa penelitian deskripsi dengan pendekatan retrospektif berdasarkan rekam medik pasien. Farmasis mengidentifikasi 240 DRP pada 157 pasien rawat inap. Sekitar 4,45% pasien di RS berpotensi mengalami DRP, terutama yang dirawat di ruang perawatan intensif (45,83%) dan unit strok (25,42%). DRP yang paling sering terjadi adalah terapi obat kurang tepat, interaksi obat, dan perlunya penyesuaian dosis. Antimikroba, obat kardiovaskular, dan PPI merupakan obat yang paling sering menyebabkan DRP. Pada analisis statistik menggunakan regresi linier, lama perawatan dan jumlah jenis obat signifikan menyebabkan DRP. Farmasis menyampaikan usulan kepada dokter (>70% kasus). Sebanyak 22% usul berakhir dengan status yang tidak diketahui karena kurangnya waktu untuk *follow up* usul kepada dokter. Tingkat penerimaan usul yaitu 57%, baik yang diterima sepenuhnya maupun diterima sebagian. Pengkajian pengobatan pasien mendorong beberapa perbaikan terapi obat. Penerapan layanan farmasi klinis dapat mendeteksi dan mencegah DRP sehingga mengoptimalkan pengobatan pasien.

Kata kunci: *Drug-related problems*, farmasis klinik, intervensi, obat, rumah sakit

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Introduction

According to *Peraturan Menteri Kesehatan (Permenkes) No. 72 of 2016*, clinical pharmacists should provide direct services to the patient.[1] One pharmacist in the ward is in charge of thirty patients, while a pharmacist in the outpatient is responsible for fifty patients.[1] The regulation leads to an increased number of pharmacists in the hospital. All clinical pharmacists have a close relationship to drug-related problems (DRP) prevention programs.

A DRP is defined as *"an event or circumstance involving drug treatment that actually or potentially interferes with desired health outcomes"*.[2] Around 5.3% of hospital admissions are estimated to occur due to DRPs,[3] from which up to 60.0% are preventable, especially in geriatric.[4,5] Clinical pharmacists are specifically trained in reviewing drug charts to identify DRPs and give advice to doctors on how to solve them.[6] A study in Norway showed 1.8 DRPs detected per patient in ICU.[6] While in North Sweden, the clinical pharmacists identified 133 DRPs in 66% [68/103] of the study population.[7]

The role of the clinical pharmacist is to identify and endorse the utilisation of safe and effective medications to resolve these DRPs, by analysing the medicine regimen to be cost-effective, secure, and optimum/appropriate.[8,9] The aims of the study are to investigate the role of clinical pharmacy in a private hospital of West Java, Indonesia and to describe the prevalence of DRPs and also several factors associated with the risk of DRPs.

Methods

The study was considered not to require permission from Ethical Committee because there was no patient intervention by the writers. It was approved by Santo Borromeus Hospital to be published with number 2007/RSB/XII/2020.

According to *Permenkes no.72 of 2016*, pharmaceutical care activities (prescription services, medication review, medication reconciliation and medication history interview, provision of drug information and education, patient counselling, clinical review, monitoring and reporting adverse drug reaction, therapeutic drug monitoring, and visite/ward round participation) were collected from June to August 2020. The hospital has 399 beds with 10 beds for intensive care unit (ICU), 4 beds for pediatric intensive care unit (PICU), 6 beds neonatal intensive care unit (NICU), and 12 beds for stroke unit.

The study involved ten pharmacists in charge of each ward every day. They graduated with a Bachelor Degree in Pharmacy, and they are experience in hospital pharmacy varied from 1 to 5 years. Their activities were recorded on the computer. All patients have been counted as inclusion criteria, while the exclusion was incomplete data in clinical pharmacy reports and medication records. Palliative and Do Not Resuscitate (DNR) patients also counted as exclusion.

Demography data such as gender, age, length of stay (LOS), number of diagnoses, and number of therapy were documented. The primary data include medication record number, diagnoses, an event of DRP, and intervention by the pharmacist. Categorization of problem, cause, intervention, acceptance, and status of the DRP was based on PCNE Classification 9.1.

Medication reviews

Clinical pharmacists reviewed medication in the medication record, prescription, and reconciliation sheet. The pharmacist's intervention was proposed to the prescriber directly, by phone, messenger, or electronic medical record. Intervention to nurses, patients, and caregivers/families was also delivered directly when they found the problem. The intervention acceptance is then recorded in

Table 1 DRP Classification by PCNE V 9.1

Cause Domains of DRPs According to the PCNE DRP Classification V9.1			% Event
Drug selection	**C1.1**	Inappropriate drug according to guidelines/formulary	4.2
	C1.2	No indication for drug	1.7
	C1.3	Inappropriate combination of drugs, or drugs and herbal medications, or drugs and dietary supplements	21.3
	C1.4	Inappropriate duplication of therapeutic group or active ingredient	6.3
	C1.5	No or incomplete drug treatment in spite of existing indication	27.5
	C1.6	Too many different drugs/active ingredients prescribed for indication	3.8
Drug form	**C2.1**	Inappropriate drug form/formulation (for this patient)	-
Dose selection	**C3.1**	Drug dose too low	2.9
	C3.2	Drug dose of a single active ingredient too high	12.1
	C3.3	Dosage regimen not frequent enough	-
	C3.4	Dosage regimen too frequent	1.7
	C3.5	Dose timing instructions wrong, unclear or missing	1.7
Treatment duration	**C4.1**	Duration of treatment too short	-
	C4.2	Duration of treatment too long	3.3
Dispensing	**C5.1**	Prescribed drug not available	0.4
	C5.2	Necessary information not provided or incorrect advice provided	-
	C5.3	Wrong drug, strength or dosage advised (OTC)	-
	C5.4	Wrong drug or strength dispensed	-
Drug use process	**C6.1**	Inappropriate timing of administration or dosing intervals by a health professional	0.8
	C6.2	Drug under-administered by a health professional	-
	C6.3	Drug over-administered by a health professional	-
	C6.4	Drug not administered at all by a health professional	-
	C6.5	Wrong drug administered by a health professional	-
	C6.6	Drug administered via wrong route by a health professional	-
Patient related	**C7.1**	Patient intentionally uses/takes less drug than prescribed or does not take the drug at all for whatever reason	2.9
	C7.2	Patient uses/takes more drug than prescribed	-
	C7.3	Patient abuses drug (unregulated overuse)	-
	C7.4	Patient decides to use unnecessary drug	-
	C7.5	Patient takes food that interacts	-
	C7.6	Patient stores drug inappropriately	-
	C7.7	Inappropriate timing or dosing intervals	-
	C7.8	Patient unintentionally administers/uses the drug in a wrong way	0.4
	C7.9	Patient physically unable to use drug/form as directed	2.1
	C7.10	Patient unable to understand instructions properly	-
Patient transfer related	**C8.1**	Medication reconciliation problem	1.3
Others	**C9.1**	No or inappropriate outcome monitoring (incl. TDM)	-
	C9.2	Other cause; specify (in need of lab test)	5.4
	C9.3	No obvious cause	0.4

the clinical pharmacist report and/or patient's medical record.

Data analysis

The proposed suitable method to investigate factors (age, LOS, number of diagnoses, and number of therapy) associated with DRP is Spearman test as the sample is not normally distributed. The data were presented in a significant value (p) with 95% confidence intervals (CIs). Background data was shown as averages and prevalence, and classification of DRPs was presented in prevalence. Statistical Package for the Social Sciences (SPSS) version 20 was used for all analyses.

Results

Statistical analysis

We found that age, LOS, number of diagnoses, and number of therapy were correlated to drug-related problems. Using Spearman test, age (p=0.022), LOS (p<0.001), number of diagnoses (p=0,036), and number of therapy (p=0.003) correlated with number of DRP.

Problems and causes of DRPs

The total number of patients who received pharmaceutical care during June–August 2020 was 5395 patients. Pharmaceutical care consists of prescription services, medication review, medication reconciliation and medication history interview, provision of drug information and education, patient counselling, clinical review, monitoring and reporting adverse drug reaction, therapeutic drug monitoring, and visite/ward round participation. A systematic review by Puumalainen et al. showed patient/caregiver factor, pharmacotherapy issues, and drug usage process as three major causes of DRP.[10] Approximately 4.45% of the patients in the hospital could experience DRPs, especially those in Intensive Care (45.83%) and Stroke Unit-Intensive Care (25.42%). The prevalence of drug-related issues in the medical ward was 23.33%, surgery and chemotherapy 2.08% each, and pediatric 1.25%.

The top three problems were adverse drug reaction (51.52%), untreated symptoms or indication (30.42%), and the effect of drug treatment not optimal (8.75%). There was unnecessary drug treatment as other problems at 6.67%, complaint at 1.67%, and no effect drug treatment at 1.25%. In table 1, we can see the causes of DRP are 27.5% incomplete drug treatment, 21.3% drug interaction, 12.1% dose adjustment, 6.3% duplication, and 5.4% in need of additional laboratory test.

Intervention from pharmacists to prescribers could be dose adjustment, drug changes, interval administration changes, drug efficacy monitoring, or side effect monitoring.[11] 74.7% intervention proposed and discussed with the prescriber. It covered drug/dose/administration changes (17.8%) and education/counselling for patient/caregiver (4.1%).

All interventions proposed to the prescriber accepted and implemented 53% of pharmacist ideas, whilst 4% were partially implemented. Prescribers rejected approximately 13% of the intervention, and 22% were written on medical records without follow-up.

The status of DRP is mostly solved (71.7%). There were 4.6% cases partially solved and 23.3% not known. Most of the unknown status were the intervention only written on the medical record without direct discussion with the physician.

Medications involved in drug-related problems

The most frequent drug causing DRP were antimicrobials (30%), cardiovascular agents (23%), gastrointestinal agents (10%), supplemental agents (7%), endocrine agents (6%), analgesics (5%), haematological agents and chemotherapy (4% each), respiratory agents (3%), corticosteroid, laxatives, and psychotropic were <2%. Supplemental agents in this category are potassium, calcium, folic acid, magnesium, iron, bicarbonate.

Table 2 Baseline Characteristics of Patients with Drug-Related Problems

	N	%	Statistics (Correlation with Number of DRP using Spearman Test)
Number of patient with DRP	157		-
Gender			
Male	77	49.0	-
Female	80	51.0	
Age			
<18 years	17	10.8	
18–35 years	16	10.2	p=0.022
36–50 years	24	15.3	
51–60 years	30	19.1	
>60 years	70	44.6	
Length of stay (LOS)			
<5 days	42	26.8	
5–10 days	60	38.2	p<0.001
11–20 days	38	24.2	
21–30 days	13	8.3	
>30 days	4	2.5	
Number of diagnoses			
1	50	31.8	
2	40	25.5	
3	29	18.5	
4	19	12.1	p=0.036
5	5	3.2	
6	6	3.8	
7	6	3.8	
>7	2	1.3	
Number of drug therapy			
<5	4	2.5	p=0.003
5–10	47	30.0	
>10	106	67.5	
Number of DRP			
1	111	70.7	
2	26	16.6	
3	8	5.1	-
4	10	6.4	
≥5	2	1.2	

Instead of medication, around 7% of DRP related to the need for additional laboratory tests (19 cases) and blood transfusion (8 cases). Those two categories did not directly affect the drug therapy outcome but potentially supported the hospital's optimal drug treatment.

Discussion

A study in Iran showed that LOS and readmission rates decreased significantly by providing clinical pharmacy services.[12] More than 50% of drug problems were adverse drug events (ADR) in this study. Causes of DRP were improper drug selection (64.8%) including drug interaction (21.3%) and dose adjustment (18.4%), patient's condition/adherence (5.4%), and improper duration (3.3%). Mostly the dose adjustment is performed for chronic kidney disease. The incidence of drug-drug interaction in a patient with heart failure was reduced approximately 67% by clinical pharmacy intervention.[13] The cardiovascular drug was the second-highest drug causing a problem. Thus

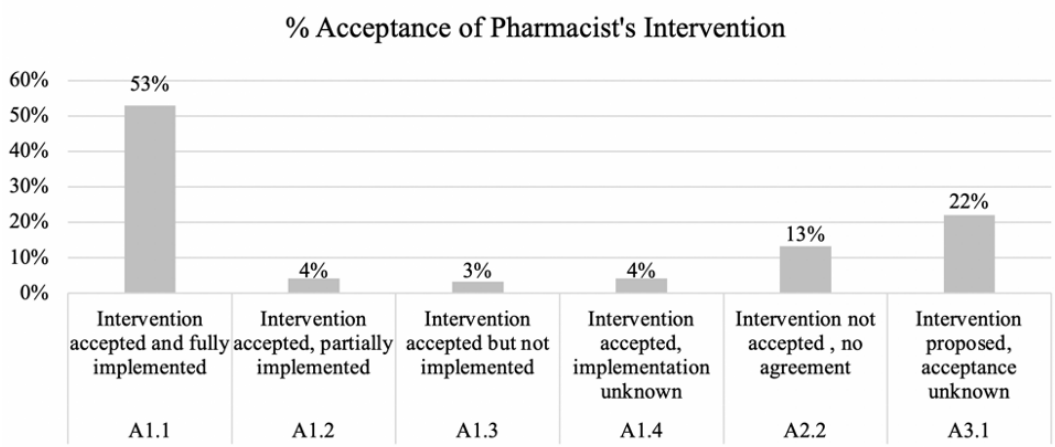

Figure 1 Acceptance Rate of Intervention

pharmacists in the stroke unit must be equipped to optimise pharmacy services.[14,15]

Monitoring side effects also essential for pharmacists. They should check the potential side effect event and provide education about handling the possible side effect both to patients and nurses. The prescriber proposed more than 70% of interventions and 22 % of interventions with unknown status. This indicates that some pharmacists have limited time to discuss with the prescriber or have other problems debating as a team.

Even though the percentage of intervention proposed were high, the acceptance rate was still low (53% fully implemented and 4% partially implemented) compared to other studies. A total of 87% of advice given by the pharmacist were accepted or taken into consideration in Norway,[4] 84% in Swiss,[16] 82.8% in a neurology unit of a Brazilian tertiary teaching hospital,[4] 95.3% in an orthopaedic unit in France,[17] and 96.5% in the coronary heart disease unit in a teaching hospital in Indonesia.[18] The acceptance rate was varied from 50% to 100% due to prescribing process (electronic or handwriting), DRP identification process (electronic software or medication review), different ward (medical/surgery/ICU), and communication (direct/phone/medical record).[19]

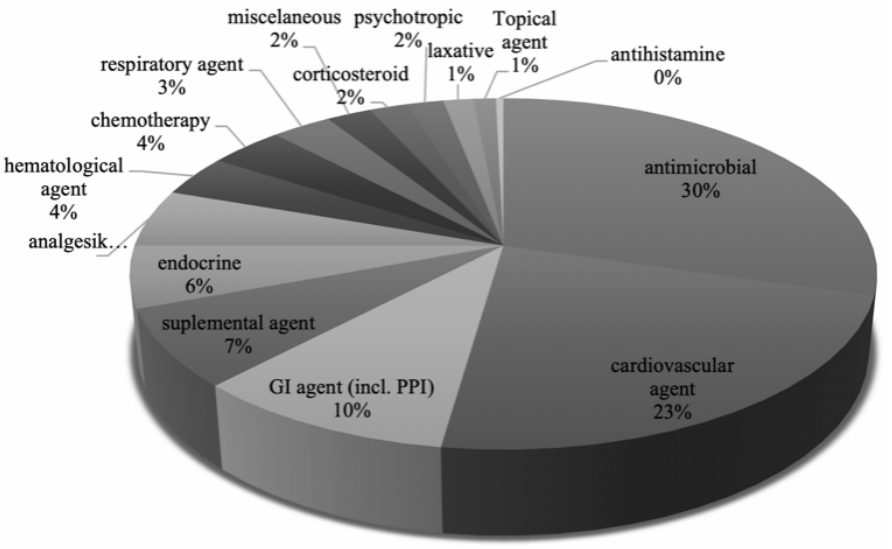

Figure 2 Medication in DRP

Since there might be inequality in clinical pharmacy competency among pharmacists and a lack of practical communication skills, all pharmacists in hospital are encouraged to participate in training on clinical pharmacy and communication skills to upgrade their capacity /capability as clinical pharmacists. Following increased clinical pharmacy competency, the number of interventions proposed with acceptance unknown will be decreased.[20] A meta-analysis conducted by Qin et al. showed that type of disease and type of pharmacist intervention impact the effectiveness of clinical pharmacist intervention.[21] Limitations of this study were the variety of clinical pharmacist's competency and the lack of study period.

Conclusions

Patients in the hospital were at high risk to undergo DRP. Medication reviews by clinical pharmacists lead to some improvements in drug treatment especially antimicrobial, cardiovascular agents, and PPI. The more age, LOS, number of diagnoses, and number of drug prescribed, the more DRPs.

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Conflict of Interest

Clinical pharmacy practice is one of pharmacist' performance in hospital. It becomes the key performance indicator for each pharmacist. The author works as a pharmacist at related hospital.

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