Evaluation of antibiotics prescription in the pediatric patient

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INDEXING

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ABSTRACT

The patient safety incidents is closely related to treatment services. Medication errors in pediatric patients are generally three times higher than adult patients. 40.8% medication errors occur in prescribing drugs such as antibiotics. This study was to analyze the management of antibiotic prescribing in hospitalized pediatric patients at PKU Muhammadiyah Yogyakarta Hospital for patient safety. This study used mixed methods namely quantitative by observational cross sectional and qualitative case study. It used a purposive sampling method with inclusion and exclusion criteria obtained from 494 medical record data from 2367 total patients in 2017. Analysis of the antibiotic rationality of the Gyssens method and deep interviews of pediatricians, pharmacists and patient safety management. The most antibiotic use is cefotaxime 51,83%. It used rational antibiotics (40.69%). The irrational antibiotics were in category V (22.8%), IVD category (25.10%), IIIA category (8.10%), IIC category (2.63%). Giving antibiotics rationally is not maximized so that it needs better regulation and systems. Patient safety incidents occur in patients' identity errors and LASA drugs (look-alike and sound-alike) do not cause serious incidents. Prescribing rational antibiotics in hospitalized pediatric patients has not been maximized and patient safety incidents are still found. Need support from management in optimizing rational antibiotic use programs as well as patient safety culture.

Kata Kunci:

Keselamatan Pasien;
Antibiotik Rasional;
Peresepan Obat;

Insiden keselamatan pasien erat dengan pelayanan pengobatan. Kesalahan pengobatan umumnya terjadi pada pasien anak rawat inap tiga kali lebih banyak daripada pasien dewasa. Kesalahan pengobatan 40,8% terjadi pada peresepan obat seperti antibiotik. Penelitian ini untuk menganalisis manajemen peresepan antibiotik pada pasien anak rawat inap di rumah sakit swasta Yogyakarta terhadap keselamatan pasien. Penelitian ini menggunakan mixed methods yaitu kuantitatif secara observasional cross sectional dan kualitatif secara case study. Menggunakan metode purposive sampling dengan kriteria inklusi dan eksklusi didapatkan 494 data rekam medis dari 2367 total pasien tahun 2017. Analisis rasionalitas antibiotik metode Gyssens dan deep interview dari dokter anak, apoteker dan manajemen keselamatan pasien. Penggunaan antibiotik paling sering yaitu Sefotaksim 51,83%. Rute penggunaan antibiotik terbanyak melalui intravena 93,72% daripada per oral. Penggunaan antibiotik rasional (40,69%). Antibiotik yang tidak rasional kategori V (22,8%), kategori IVD (25,10%), kategori IIIA (8,10%), kategori IIC (2,63%). Pemberian antibiotik rasional belum maksimal, dibutuhkan regulasi dan system yang lebih baik. Insiden keselamatan pasien yang berkaitan dengan pemberian antibiotik terletak pada kesalahan identitas pasien dan kesalahan pada obat-obat LASA (look alike sound alike) dan tidak ditemukan reaksi yang serius. Peresepan antibiotik rasional pada pasien anak rawat inap belum maksimal dan masih ditemukan insiden keselamatan pasien. Perlu dukungan dari manajemen tentang optimalisasi program penggunaan antibiotik rasional serta budaya keselamatan pasien.

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INTRODUCTION

Patient safety is a key consideration in policy making, the establishment of health service organizations, and the provision of health workers such as doctors, nurses, and pharmacists.¹ Medication errors and drug side effects occur in almost all hospitals, thus increasing morbidity, prolonging treatment time and increasing medical

expenses.² Health services are very close to the incidence of patient accidents, but reports of these events are still very few because they can degrade the capability and competence of health services.³

Medication errors generally occur in hospitalized patients with various pharmacological therapies, elderly patients, critical patients and pediatric patients⁴. 5-27% of

medication errors generally occur in pediatric patients. Treatment errors are three times more common in pediatric patients than in adult patients. In addition, medication errors in children, even if only 1%, have the potential to cause side effects. Children have a risk of medication errors, especially at doses of drugs that are adjusted for body weight.⁵

Every treatment process (storage, prescription, transcription, preparation, dispensation, and administration of drugs) has the potential to cause errors in treatment. However, from all of these, prescribing and administration are the ones that most often cause medication errors⁴. The Danish Patient Safety Database states that in 2010-2014 there were 2017, of which 40.8% were medication prescribing errors and 47.7% were dosing errors.⁶

Treatment errors often involve antibiotics and analgesics⁶. In addition to medication dosing errors, the use of antibiotics in respiratory tract diseases is very commonly used in China, even though most of the causes of the

disease are viruses. The benefits of antibiotic use in respiratory diseases are very few and do not even comply with the guidelines.⁷ Re-administration of antibiotics from the initial cycle accelerates resistance mechanisms. Antibiotics encourage selective pressure for bacteria to evolve when administered frequently or irrationally.⁸ Developing nations are at the greatest risk. Low prices of antibiotics, ease of availability and unnecessary use of antibiotics are causing more burdens in developing countries.⁹ Antibiotic use is relatively uncontrolled among the countries where there is no universal health coverage for its citizens. Hence, irrational use of drugs has become a major concern.¹⁰ Some studies suggest that excessive, non-selective and irrational use of antibiotics is often found in health services.¹¹

RESEARCH METHOD

This is quantitative and qualitative research (mixed methods) with a sequential explanatory approach. These methods are used for retrospective observational methods.

Picture 1. Gyssens algorithm of rational antibiotic (2005).

Resources: Gyssens, I., (2005). Audits for Monitoring the Quality of Antimicrobial Prescriptions. Springer US, 197-226.

The population of this study is a medical record of hospitalized pediatric patients for 1 year (1 January 2017 - 31 December 2017). Sampling in the study was conducted by purposive sampling. The inclusion criteria of this study were medical records of hospitalized pediatric patients (ages 1-18 years) who received antibiotic therapy. Exclusion criteria for this study were incomplete data, patients undergoing surgery, patients who stayed less than 48 hours, died, and moved to another hospital.

Of 2367 patients, 1091 patients were excluded into 494 patients. Data obtained in the form of patient profiles and profiles of antibiotic use were analyzed descriptively. Assessment of the use of rational antibiotics using the Gyssens and Meer algorithm¹². The irrational antibiotics are categorized into I-V according to the algorithm.

Qualitative data is obtained through deep interviews with pediatricians, inpatient pharmacists and directors of the patient safety. The data is used as quantitative data triangulation obtained previously. Qualitative analysis is done by using open coding, axial and selective coding so as to find conclusions from qualitative results.

RESULT AND DISCUSSION

Quantitative analysis

Table.1 Distribution of responden's characteristics

Category	f (%)
Gender	
Man	269 (54,5)
Woman	225 (45,5)
Age	
1-5 y.o	352 (71,3)
6-12 y.o	124 (25,1)
13-18 y.o	(18 (3,6)
Length of stay	
0-3 days	386 (78,1)
4-7 days	106 (21,5)
>7 days	2 (0,4)

Table 1 shows the characteristics of respondents in this study. Most respondents were male (54.5%). The age of most respondents is 1-5 years (71.3%). 78.1% of respondents were hospitalized for 0-3 days.

Table 2 shows the sequence of the types of diseases most experienced by pediatric patients in 2010, namely acute bronchitis (16.3%), Acute Gastroenteritis (15.9%), febrile seizures (13.5%), brochopneumonia (8.7%), bacterial infections (7.3%), DF and DHF (5.1%), seizures (3.6%), nausea vomiting (3.4%), asthma (3.0%), typhoid fever (2, 8%), and other diagnoses (20.4%) like pneumonia,

common cold, pharyngitis, stomatitis, rubella, otitis, epileptic, encephalitis, cellulitis, etc.

Table.2 Top Ten for disease in 2017

Diagnosis	ICD 10	f (%)
Acute bronchitis	J209	81(16,3)
Acute gastroenteritis	A09	79(15,9)
Febrile convulsion	R560	67(13,5)
Bronchopneumonia	J180	43(8,7)
Bacterial infection	A499	36(7,3)
Dengue fever,	A90.	25(5,1)
dengue hemoragic fever	A91.	
Seizures	R568	18(3,6)
Nauseous vomit	R11.	17(3,4)
Asthma	J459	15(3,0)
Typhoid fever	A010	14(2,8)
Etc	-	101(20,4)

Table 3 shows the use of antibiotics in hospitalized pediatric patients, including cefotaxime (51.8%), ampiciline (26.7%). The duration of antibiotics is 1-3 days (82.6%), 4-7 days (17.0%), > 7 days (0.4%). Administration of intravenous antibiotics is (93.7%) and oral (6.3%).

Table. 3 The use of antibiotic

Category	f (%)
Type	
Cefotaxime	51,8
Ampicilin	26,7
Ceftriaxone	6,9
Cefixime	5,9
Ceftazdime	5,1
Chloramphenicole	1,8
Amoxicillin	1,2
Azitromicin	0,4
Eritromicin	0,2
Duration	
1-3 hari	82,6
4-7 hari	17,0
>7 hari	0,4
Route	
Intravena	93,7
Per oral	6,3

Table 4 shows that the use of rational / category 0 antibiotics is 40.7%, while the irrational ones are 59.3%. The use of the IIC category was 2.6%, IIIA category 8.1%, IVC category 0.6%, IVD category 25.1%, and category V 22.9%.

Table 4. Rational antibiotic

Category	f (%)
0 (rational antibiotics)	40,7
I (Timely antibiotic administration)	0
IIA (inappropriate dosage of antibiotics)	0
IIB (wrong antibiotics administration interval)	0
IIC (wrong antibiotic administration rout)	2,6
IIIA (too long)	8,1
IIIB (too short)	0
IVA (there are more effective antibiotics)	0
IVB (there are less toxic antibiotics)	0
IVC (there are cheaper antibiotics)	0,6
IVD (there are narrower antibiotic spectrums)	25,1
V (there is no indication of antibiotics)	22,9
VI (incomplete medical record data)	0

Table 5 describes incidents of patient safety related to child care, namely near miss (8 cases), untoward incident (19 cases), sentinel (0 cases). It also shows identification in fatigue (4 cases), exact medication errors (19 cases), risk of infection, and risk of falls (2 cases).

Table 5 Patient safety

Category	f (n)
Incident	
Near miss	8
Untoward incident	19
Sentinel	0
Goals	
Patient identification	4
Effective communication	0
High alert medication	19
Right location, procedure, patient surgery	0
Risk of infection	2
Risk of falls	2

Qualitative analysis

Policy

The ministry of health and development regulation to the control program for antimicrobial resistance. There are 8 policies which include clinical pharmacy functions applied antibiotic use function, antibiotic patterns, microbial patterns, etc. The first thing that must be fulfilled is the use of wise antibiotics. This research shows that these aspects have not been fulfilled in health services. This was stated by doctors and pharmacists who stated that the absence of the PPRA team, the absence of antibiotic patterns and germicidal patterns in hospitals, there were no regulations and SOPs using rational prescription.¹³

"As far as I know, there are no written rules, but the RS Formulary Book exists. There is no standard antibiotic because there is no germ pattern in the hospital, there is no antibiogram in the hospital" (Informant I). "I don't think there is a PPRA here because the accreditation is not SNARS; still KARS" (Informant II). "I hope there will be a PPRA team in the future" (Informant III).

Objectivity

Government regulations on general guidelines for antibiotic use state that an indication of antibiotics can only be done if the patient is clinically suspected of having a bacterial infection which is then given empirical antibiotics for 48-72 hours based on microbial patterns and antibiotic sensitivity. Provision of continued antibiotics must be supported by data from laboratory and microbiological examinations. The route of administration of oral antibiotics should be the first choice for the treatment of infection. Parenteral routes are used in cases of moderate to severe infections.¹³

"The use of rational antibiotics is still an obstacle in this hospital. In general, the tendency of giving antibiotics without indication is still found in hospitalized patients, especially elderly patients, after clean surgery, etc." (Informant III).

"Many patients request antibiotics. That is what drives us to give antibiotics, even though there is no supporting evidence" (Informant II).

Medical personnel still do not maximize the existing microbiology laboratory facilities. The slow performance of the lab, the high cost, and the less accurate results of the problem are not the objective of giving antibiotics. The use of broad-spectrum antibiotics is due to its availability in the National Formulary for Drug Provision, cheap, and more effective. The parenteral route is directly used when the patient has difficulty eating, nausea and vomiting, and an IV infusion has been installed. The slow performance of the laboratory forces medical personnel to use antibiotics when the patient's response deteriorates; after the lab results come out, the patient is declared not having a bacterial infection. This was also realized by the pharmacist and management, so that improvement and evaluation efforts must be made.

"Ideally a microbiological examination is carried out. However, this examination requires quite expensive fees and is completed in 3 days. When patient's LOS is estimated for 3 days, while the results of microbiological examination also come out after 3 days, the examination

becomes useless. Those are the reasons for physician not to use microbiology examination "(Informant IV).

"If there is no response to the improvement of antibiotics, it will be replaced. Antibiotics should be adjusted according to microbiology. Such an examination is rarely done in this hospital, because we do not have a regulation that states that every child patient must undergo the examination "(Informant II).

Financial

Entering Indonesia Universal Health Coverage with a National Health Insurance system that is under the authority of the Social Security Administrator requires all elements of the health sector to follow all existing regulations. The main objective is to achieve public health prosperity with quality control and cost control. This turned out to have a direct impact on the administration of drugs such as antibiotics. Provision of drugs according to National Formulary for Drug Provision and adjusted to the allocation of funds from the INA-CBGs so that the management and medical personnel must seek appropriate and inexpensive treatment.

This study shows that the hospital has worked in accordance with government policies regarding cheap treatment. There is no complaint from the patient regarding expensive medical expenses and the statement is in accordance with the statements of doctors, pharmacists, and management. However, restrictions on these costs do not include other health services such as microbiology laboratory examinations. This means that the low cost is directly proportional to the minimum health services provided.

"80% of patients in this hospital are patients of the BPJS (Indonesian Social Insurance Administration Organization). If the service received is in accordance with the BPJS class that the patient has, then the entire cost of the service is free. BPJS patients who want better service (class above) will only pay the difference in class increase according to the INA CBG's tariff. This hospital only has 20-25% of non BPJS patients so there is no complaint regarding expensive drugs (Informant IV) ".

"BPJS patients will get drugs including antibiotics at affordable prices or even free because BPJS has already covered them. Public patients also will not pay for it. There are no complaints related to expensive drugs here "(informant I).

"We give generic drugs. Even more expensive drugs are often covered by health insurance "(Informant II)

Human resources

Health workers such as pharmacists are very much needed in the process of rational use of antibiotics. Clinical pharmacies must be in each ward in the hospital to monitor the program. Needs are adjusted to the type of hospital and the number of patient visits.

This study examined type C hospitals, but with a large number of patients. This hospital does not meet the ideal pharmacist and patient ratio (1:30). HR limitations will increase workload, decrease work reach, work fatigue, and increase human error. Limited human resources are unable to monitor the rational use of rational antibiotics.¹⁴

"The ratio of the number of clinical pharmacists and patients is not ideal. As a type C hospital, we have facilities, services, and numbers of patients that are equivalent to type B hospitals. We only have 8 pharmacists, while our needs are at least 13 Pharmacists. (Informant III).

"We also still lack nurses so that the ratio of nurses and patients is still not ideal" (Informant II).

Adverse effect

Drug side effects are the primary outcome of administration of drugs including antibiotics. Prevention and monitoring of drug side effects must always be considered and improved. The lack of occurrence of medication errors has caused the hospital to have no data related to the incident. Drug side effects such as itching, nausea, vomiting have been reported several times, but serious events such as SJS have never occurred.

One of the goals of rational antibiotic use programs is to prevent and reduce drug side effects and antimicrobial resistance. Giving antibiotics together with other antibiotics, other drugs or food can cause side effects. Good collaboration between doctors and pharmacists can provide rational treatment and prevent side effects.

"In general, the incidence of ESO is very rare. One patient with severe ESO after the use of cefadroxil is a referral from another hospital. This has been followed up with MESO and PTO from clinical pharmacists in the ward "(Informant III).".

There are no fatal side effects, itching as an allergic reaction exists, but there have never been patients who have experienced shock" (informant I).

Patient safety

The culture of patient safety in hospital health services requires special attention in its implementation. The culture of patient safety by reducing the incidence of patient safety

aims to achieve six overall patient safety goals. A good understanding of all parties, both management, hospital workforce, and patients and families of patients regarding the importance of patient safety must be improved and prioritized.

Hospitalized pharmacy installation units are the main place for high alert medication errors in private hospitals. This is indicated by data on patient safety incidents in 2017. Most of the drugs covered by BPJS are generic drugs and the packaging is almost the same. Evaluations have been made on incidents of patient safety by separating LASA drug storage, labeling LASA on each drug item, carrying out double checks and documented drug handovers between pharmacists and nurses.

"The frequent incidence of patient safety is caused by misidentification. All data is digitally recorded. Identification errors usually occur during the delivery of drugs to patients who have similar names, the incidence of phlebitis occurs due to infusion, while urinary tract infection caused by the installation of a long catheter and VAP infection "(Informant IV).

"Always adhere to patient safety goals to prevent incidents of patient safety such as patient identification, effective communication, appropriate medication, the exact location of surgery, the risk of infection and risk of falling (Informant I).

"For incidents of patient safety related to antibiotics usually experienced by patients with antibiotics in the KNC category (LASA / NORUM drug). LASA is caused by ceftriaxone and cefotaxime preparations, while KNC is caused by similarity in packaging. Not all antibiotics are not rationally included in the category of patient safety incidents. The guidelines are in the guidelines for hospital pharmacy services "(Informant III).

RESULT AND DISCUSSION

Research in Sulianti Saroso Infectious Hospital, Jakarta conducted by Katarnida, et.al in 2014 stated that the highest use of antibiotics in pediatric patients was cefotaxime by 37.3%, according to this study.¹⁵ Purwaningsih (2015), stated that the use of monotherapy antibiotics was 79.5%, while the use of combination antibiotics was 20.5%. Then the use of combination antibiotics that are often given are Ceftriaxone + Metronidazole 4 cases, Chloramfeniko + Metronidazole 1 case, Amikacin + Cefotaxime 1 case, etc. This is in accordance with previous studies which stated that the highest use of antibiotics was cephalosporin group of 61.9%, then chloramphenicol, penicillin, macrolide, etc.¹⁶

The research was conducted at Sultan Agung Islamic Hospital, Semarang in accordance with this study that in 2015 it was reported that intravenous use of antibiotics was 80, 5%, while in oral 1.8% and a combination of both 17.7%.¹⁶ Research in Sultan Agung Islamic Hospital, Semarang in 2015 stated that the highest period of stay was 4-7 days, 76% was different from this study with an average of 1-3 days.¹⁶

Prerequisites for the use of antibiotics are said to be rational if on time, right dosage, right interval, right route of administration, not too long, not too short, more effective, cheaper, narrower spectrum and as indicated. Some studies say that the rational use of antibiotics in hospitals is not optimal, as happened in RSUP dr. Kariadi Semarang at 55.1%; Panti Rapih Hospital in Yogyakarta amounted to 44.63%, and in private hospitals in this study amounted to 40.69%.^{17,18}

These results are in accordance with the research conducted at the Panti Rapih Hospital for the period 1 July - 31 December 2014 which stated that rational antibiotic use (44.63%) was less than irrational antibiotics (55.37%), IVA category (4.13%); IVD category (28.10%); category IIA (4.13%) and category IIB (4.13%).¹⁸ In this study, no antibiotic use was found that was not as indicated. Other studies suggest that the rational use of antibiotics is only 23.9%. Irrational types of antibiotics, namely category V (8.6%); category IV A (22.3%); category IV C (20%); category IV D (1.6%); category II A (44.4%); and category IV B (37.7%).¹⁶

Irrational use of antibiotics in this study is qualitative analysis because regulation of antibiotic use has not been implemented, rational choice of antibiotics is not objective, limited human resources and financing of cheap antibiotic use. Irrational use of antibiotics still allows the occurrence of drug side effects and patient safety incidents such as incorrect patient identity and errors caused by similar packaging.

Regulations that have not yet proceeded at this hospital were also carried out at Sanglah General Hospital, Denpasar. The implementation of the antibiotic use policy at Sanglah Hospital Denpasar has not gone well. This happened because the dissemination of the policies on antibiotic use in the hospital had not gone well, the lack of human resources in the Antimicrobial Resistance Control Program (PPRA), the lack of Infection Control & Prevention (PPI), and the absence of the Pharmacy & Therapy Committee (KFT), and Clinical microbiology has not run according to the duties, functions and obligations.¹⁹

Many studies have found that most of the causes of antibiotic use by doctors are due to the possibility of bacterial infection so that all patients with fever are given antibiotics. Doctors feel it is better to mistakenly prescribe antibiotics for viral diseases than mistakenly not giving antibiotics to bacterial diseases, without thinking about the possibility of antibiotic resistance. This is especially true in outpatient cases, because of limited diagnostic facilities and doctors unable to monitor the patient's condition during outpatient care. This should not occur in inpatients who can be monitored 24 hours and the availability of a more complete diagnostic tool.¹⁷

National health insurance services are carried out by conducting cooperation agreements between BPJS and health facilities that exist throughout Indonesia.²⁰ Analysis of antibiotic financing in hospitals has an effect on the duration of administration of drugs, the amount of drug administration, profit margins, services. JKN is a hospital financing system using INA-CBGs, in which each disease group has determined the cost of treatment.²¹

The small WISN ratio indicates that the number of pharmaceutical personnel is currently smaller than what is needed. On the contrary, a large WISN ratio (more than 1) indicates an excess of energy compared to workload. This can lead to work stress which can lead to fatigue of pharmaceutical personnel and allow triggering conflicts.²²

The use of antibiotics will increase side effects such as nausea, vomiting, diarrhea, and itching. Amoxicillin is the most common side effect¹⁸. Complete information must be conveyed to the patient and patience and good communication skills are needed so that the treatment goals are achieved, likewise, monitoring (follow-up) both on treatment success and on side effects that may arise.²³

Research with the same results was also carried out at Gatot Subroto Hospital that in 2016 showed a 20% error. This means that the planned target is not achieved (accuracy of patient identification is 100%). This error occurred in the identification of patients with blood transfusions and forgot to use the patient's bracelet. The error in the safety of drug administration is 15%, but it also has not reached the target of 100% accuracy in drug safety. These errors occur due to the absence of drug labels and medication arrangement errors.²⁴

This research has been carried out optimally, but still has limitations, namely interview data collected only from the Director of the patient safety section, doctors, pharmacists, whereas supporters of the implementation of rational antibiotic use and a culture of patient safety are also related to other parties. In addition, this study did not

make direct observations about the application of a patient safety culture. To get results that are close to the actual situation in the field requires direct observation.

Future research is expected to be carried out with a mix method study that is more in-depth with deep interview and observation. Research does not involve pediatric patients but can be represented by infants and adult patients for comparison of rational use of antibiotics. In addition, it is expected to be able to compare the use of rational antibiotics in outpatient and inpatient care so that overall they are able to cover all aspects that can be assessed and examined.

CONCLUSION

The most frequent use of antibiotics is cefotaxime 51.83%. The most use of antibiotics is done through the intravenous line (93.72%). Rational use of antibiotic (40.69%). Irrational antibiotics in category V (22.8%), IVD category (25.10%), IIIA category (8.10%), IIC category (2.63%). The lack of regulation, non-objective selection of antibiotics, lack of funds, and HR affect irrational use of antibiotics. The incidence of patient safety related to antibiotics is also caused by error in the patient's identity and errors in LASA drugs (look alike sound alike).

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