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Children Inpatients: Precision Dose Evaluation in Hospital Kraton Pekalongan Period of 2018

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Abstract. The infants and children was a period of growth. Children are not small adults. The medicines for children is a special case related to differences of organ development, the enzyme system responsible, metabolism and excretion. It is important for pediatrics is the optimal dose, dosing regimen can not be reduced simply based on weight or body surface area pediatric patients extrapolation of data obtained from adult patients. The aim of this study was to determine the accuracy of the dose of the drug in children inpatients in the rose room Kraton Hospital Pekalongan in periode 2018. This research method is descriptive with inpatient medical record data retrieval child in the room rose in 2018. 1290 population of medical records by sampling 10% of the population in order to obtain results of 130 samples. The age inclusion was one month until 18 years that medical records are complete and clear and exclusion criteria that patients who died while undergoing treatment. This study suggested that the children not appropriate dose of the drug with a percentage of 27% and the right dose 73%. The doctors and pharmacists can improve their colaboration about the pharmacodinamics and pharmacokinetics to get the best the rational dose adjusment. The efficacy and safety of drugs also should be concern.

Keywords Child, precision dose, hospital, inpatients

1. Introduction

The infants and children was a period of growth and development is very rapid. Children are not small adults so the use of medicines for children is a special case related to differences in rates of organ development, the enzyme system responsible for drug metabolism and excretion. It is important to note for pediatrics is the optimal dose, dosing regimen can not be reduced simply based on weight or body surface area pediatric patients extrapolation of data obtained from adult patients. Bioavailability, pharmacokinetics, pharmacodynamics, efficacy, and information about the side effects can be significantly different between pediatric and adult patients because of their differences in age, organ function and disease status [9].

Demand usual dose based on body weight neonates, infants and children; eg milligrams per kilogram of body weight to be given to one or more doses per day. However, for some drugs such as antineoplastic can be given based on body surface area; eg, milligrams per square meter to be given in one or more doses per day. In another case; the total amount of weight or body surface area of each individual or daily dose in pediatric patients, especially in the adolescent, must not

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exceed the dose indicated for adult patients [9]. The rationale for dose adjustment in children indications may be determined by differences in pharmacokinetics, pharmacodynamics, disease or other factors [15].

In the study regarding the use of doses of the drug in children by Harningsih in 2012 at the Regional General Hospital Prof. Dr. Margono Soekarjo found dose-related problems in the management of pediatric patients of dengue fever therapy with excessive doses by 15% in patients with health insurance and by 8% in patients with non-health insurance [6]. Then, from research Kharis, et al., In 2017 on the evaluation of the suitability of the drug dose in pediatric patients acute bronchitis treated road at Army Hospital Kartika Husada Kubu Raya is equal to 34% of prescriptions are experiencing right dose, meaning that there is 66% error in dosing in children. Based on these data, it can be concluded that there is still inaccuracy in dosage for pediatric patients.

Drug review aims to prevent medication errors [11]. Medication error events related to practitioners, drug products, procedures, environment or systems [12]. Medication errors can occur in the treatment process including prescribing, transcribing, dispensing and administration. In 2010, from 229 prescriptions, found 226 prescriptions with medication errors that occurred in one of Yogyakarta hospitals. Out of 226 medication errors, 99.12% were prescribing errors, 3.02% were pharmaceutical errors and 3.66% occurred in the dispensing process [13]. The analysis of prescription study data in the Pharmacy Installation of Anwar Makkatutu Hospital Bantaeng in 2012 showing that the prescription has the potential to cause medication errors due to incomplete prescription is 36.75% [14].

The right dose is determined by drug factors (chemical, physical and toxicity), drug administration (oral, parenteral, rectal, local), patient factors (age, weight, sex, race, tolerance, obesity, individual sensitivity and pathophysiology) [4]. Administration of drugs takes into account the age, weight and chronology of the disease. Administration of drugs, especially for those with very narrow range of treatment will be at risk of side effects. Conversely, the underdose will not have the desired therapeutic effect [7].

The aim of this study was to determine the accuracy of the dose of the drug in pediatric patients in hospitals rose room Kraton and to developing technology to reduce medication errors by approach pharmacodynamics and pharmacokinetics.

2. Methods

This was a descriptive study. The population of this study was children inpatient in the rose room at Kraton Hospital Pekalongan period of 2018. The population are 1290 medical records by sampling 10% of the population in order to obtain results of 130 samples [2]. The sampling techinique used purposive sampling. The inclusion criteria that the children inpatient in the rose room at Kraton Hospital Pekalongan period of 2018 who have are complete and clear medical records, and the age from 1 month – 18 years. The exclusion criteria was that patients who died while undergoing treatment.

The data satisfaction were collected on Mey – Jun 2019 from medical records period of 2018. Then did data cearing, data tabulation, and data coding. After that, the data was processed and scanned, made presentations and anlyzed based on the amount of data presentation. The accuracy of dose divided two type (right and not exactly dose).

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3. Discussion

Table 1 represent that the age group of children inpatients attending in this study was 1 month – 2 years old (58%). According to the sex category, most were male (53%).

Table 1. Characteristic of patients

Categories	Total	
	n = 130	%
Age		
1 month - 2 years old	75	58
2-12 years old	50	38
12-18 years old	5	4
Sex		
Male	69	53
Female	61	47

The categorized as infants by "The British Pediatric Association" with biological changes at this time is the period of rapid growth. Meanwhile, at the age of 2-12 years is the phase of the child with the biological changes gradually growing period [9]. The accuracy levels of drug dose conformity is given taking into account the age, weight and chronological diseases [7]. Doses are determined by the drug (chemical, physical and toxicity), the way the drug administration (oral, parenteral, rectal, local), factor patients (age, weight, sex, race, tolerance, obesity, individual sensitivity and pathophysiology) [4].

The overdose or underdose drugs is one of the characteristics that the treatment is not rational, it can cause therapeutic failure or not achieving the desired therapeutic results [16]. The treatment of pediatric patients need great concern because the body of pediatric patients has a different response to the drug than the adult body due to the formation of organs that are still less than perfect [17]. How dosing is done by adjusting the weight and age and compared with the standard reference treatment. If the dosage is less than the recommended dose or more, it is said the patient is given a dose that is not appropriate.

Infancy and childhood is a period of very rapid growth and development. Children are not small adults so using drugs for children is a special thing related to organ development, the enzyme system responsible for the evolution and excretion of the drug. This is supported by the lack of research related to the use of drugs in infants and children. Data on pharmacokinetics, pharmacodynamics, efficacy and safety of drugs for infants and children is still very difficult. Information related to the cause of unwanted drug reactions such as baby gray syndrome (due to administration of excessive doses of chloramphenicol), phocomelia (due to thalidomide) and kernicterus (using sulfonamides) [9]. The design and implementation of paediatric often difficult to accomplish.

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Table 2. The accuracy of dose

Right Dose	Number (N)	Percentage (%)
Right	95	73
Not exactly	35	27
Total	130	100

The results of analysis of 130 samples studied, there are still a small fraction of samples categorized as not appropriate dose of the drug with a percentage of 27%. The other research, the imprecision doses given in inpatients is said to be proper dose with a percentage of 30% even in outpatients says right dose only by 17% [1]. Furthermore, the research of the antibiotics in patients with urinary tract infections with the appropriate dose criterion by 66.7% [5].

In this case it can be concluded that there are many errors that occur in pediatric patients related to dosing. Pediatric age are at greater risk than adults experiencing 1.1 dosing errors [10]. Then, children aged <4 years are also more at risk of under-dosing (underdose) or excess dose (overdose) as a result of the compounding process the drug, since the dosage form is given to pediatric patients in the form of pulvis (powder) so that the need for grinding [3].

Pharmacokinetics of drugs in children may differ from adults for some reasons: variability due to age, body composition, the funtion of liver and kidneys, gender, and maturation of enzymatic system [15]. There are some guidelines such as the British National Formulary for Children and the Dutch Children's Formulary may used to recommendations in clinical experience. The empiricism cannot continue as the mainstream method for clinical research in children. Dosing recommendation in children must be derived from an integrated analysis of pharmacokinetic and pharmacodynamic data, accounting for the role of disease factors as well as developmental growth [18].

Precision dosing in clinical medicine is needed for drugs with a narrow therapeutic index (TI) and for pastients who belong to 'special populations' such as paediatric, the elderly, those with renal or hepatic impairment, the infant who is breastfeeding [19]. Futuring precision dosing use technologies such as genomics, transcriptomics, proteomics, and metabolomics. These technologies improved medical imaging, rapid pathology testing, caracterization of gut microbiome, superior analysis of biological samples, and powerful computational tools to analyze 'big data' are all important factors in advancing precision dosing [20-21].

4. Conclusion

In this study it can be concluded that the samples used mostly aged span of 1 month - 2 years and the related evaluation of the use of the drug dose is said to be right most of the drug with a percentage of 73%. Futuring precision dosing need for technological development to reduce dosing errors to get the maximum therapy.

Competing interests

There are no competing interests to declare.

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