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IMPLEMENTATION MODEL OF THE USE OF PROPHYLACTIC ANTIBIOTICS IN SURGICAL PATIENTS HOSPITAL TYPE B

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ABSTRAK

Infectious diseases are still one of the important public health problems, especially in developing countries. The high incidence of Antibiotic resistance due to the irrational use of antibiotics is a special concern at this time. The government is also trying to control it through the Antimicrobial Resistance Control Program, including the rational administration of prophylactic antibiotics in surgery. Prophylactic antibiotics are antibiotics given before, during, and after surgical procedures to prevent complications of infection or infection of the surgical site (IDO). A retrospective and observational (non-experimental) study to know Patient characteristics, surgical characteristics, characteristics of the use of prophylactic antibiotics, rationality and cost analysis of using prophylactic antibiotics in Sectio Caesarea surgery and Appendectomy of patients at Hospital X Type B Jakarta in the period January 1 2021 – September 30 2021. The results of the study found that the selection of prophylactic antibiotics was not right (55.8%), the timing difference for prophylactic antibiotics was not right (84.5%), the prophylactic Antibiotic dose was not right (85.3%), all were correct the route of administration of prophylactic antibiotics by intravenous drip (100%), all of which are not appropriate for giving prophylactic Antibiotic intervals (100%) and entirely irrational in the use of prophylactic antibiotics in hospitals (100%). Hospitals can save costs, reduce the rate of Antibiotic resistance and reduce the incidence of surgical site infections by increasing physician compliance in using prophylactic antibiotics under hospital guidelines.

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INTRODUCTION

Infectious diseases remain an important public health problem, especially in developing countries. One of the mainstay drugs to overcome this problem is antimicrobial, including antibacterial/Antibiotic, antifungal, antiviral, and anti protozoan. Antibiotics are one of the drugs that are currently the most widely used in clinical practice, both in outpatient and hospital care (Gouvêa et al., 2015). Excessive use of antibiotics with inappropriate indications and doses can lead to less effective treatment, increased risk to patient safety so that action is needed to overcome complications, decreased performance due to complications, increased mortality, widespread resistance, and increased average length stay (average). length of stay, ALOS) and high medical costs (Amelia et al., 2019).

The high incidence of Antibiotic resistance is of particular concern at this time. The government is also trying to control this condition so that this incident does not increase. The highly irrational use of antibiotics causes an increased incidence of resistance. Through the Minister of Health regulation number 8 of 2015, the government (Sadli et al., 2023)established an antimicrobial resistance control program (PPRA). One of the contents of this program is controlling the use of prophylactic antibiotics in surgical cases. PPRA is one of the mandatory national programs in hospitals that are assessed nationally at the time of hospital accreditation using the National Hospital Accreditation Standards (SNARS) and internationally using the Joint Commission International Accreditation Standards (JCI) (Thomas et al., 2016).

Prophylactic antibiotics are antibiotics given before, during, and after surgical procedures to prevent complications of infection or infection of the functional area (IDO) . Prophylactic antibiotics are given after the surgical procedure for 24 hours from the first administration.2 Antibiotics are useful for preventing colonization or the development of bacteria that enter the target tissue during surgery. Prophylactic antibiotics do not aim to sterilize the target tissue because the body's immune system will kill the bacteria.

A pattern of resistant bacteria in the hospital. X according to the Antimicrobial Resistance Pattern in 2020, it was found that Methicillin Resistance Staphylococcus Aureus (MRSA) was 9.6%, Methicillin resistance Staphylococcus epidermidis (MRSE) was 68%, and Gram-negative rods producing ESBL enzymes were 43%. The pattern of Antibiotic resistance bacteria in Indonesia according to the results of the Indonesian Antimicrobial Resistant Study (AMRIN-Study) was proven from 2494 individuals in the community, 43% of Escherichia coli were resistant to various types of antibiotics, including ampicillin (34%), cotrimoxazole (29%) and chloramphenicol (25 %). The results of the study of 781 patients who were hospitalized found that 81% of Escherichia coli were resistant to various types of antibiotics, namely ampicillin (73%), cotrimoxazole (56%), chloramphenicol (43%), ciprofloxacin (22%), and Gentamicin (18%) (Roberts & Morris, 2020).

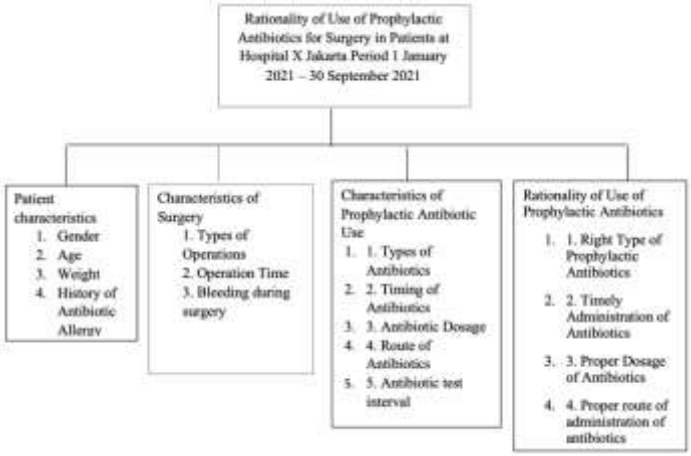
Antibiotic resistance pattern data from several studies around the world can be concluded that many Antibiotic resistances are found, namely Methicillin-Resistant Staphylococcus Aureus (MRSA), Vancomycin-Resistant Enterococci (VRE), Penicillin

Resistant Pneumococci, Klebsiella pneumoniae which produce Extended-Spectrum Beta-Lactamase (ESBL), Carbapenem-Resistant Acinetobacter baumannii and Multiresistant Mycobacterium tuberculosis. Antibiotic-resistant germs occur due to the unwise use of antibiotics and lack of standard precautions in healthcare facilities (Eun et al., 2013).

An Australian study concluded that antibiotics as surgical prophylaxis accounted for the highest Proportion of inappropriate Antibiotic prescribing, which was 28%, where many discrepancies occurred due to inappropriate prophylactic Antibiotic administration and the selection of antibiotics (Haque et al., 2018).

The study's evaluation results at Hospital X showed the use of prophylactic antibiotics for obstetric and gynaecological surgery, in the case of sectio caesarea, in the last three months of 2020. Evaluation related to the timeliness of administration, the accuracy of the type, dose, and completeness of the data on the use of prophylactic antibiotics in surgical cases. Elective caesarean section. The results of the evaluation obtained 59% timeliness of administration. The use of too short time is 27%, and a too long time is 32%. Regarding the accuracy of the selection of antibiotics, 74% of doctors use prophylactic antibiotics not according to the guidelines. The accuracy of the dose of prophylactic antibiotics still needs improvement, and there are 90% of inappropriate doses by the applicable hospital Antibiotic guidelines (Chen et al., 2017).

Figure 1. Conceptual Framework



METHODS

Subject Selection

This study's population met the following inclusion and exclusion criteria: All patients over 18 years of Age (adults) who underwent Sectio Caesarea and Appendectomy at Hospital X Type B Jakarta on January 1, 2021 – September 30, 2021.

Exclusion criteria: 1). The Patient's medical record data must be clearly written and legible. 2). Medical record data is incomplete and cannot be evaluated. 3). The Patient's medical record cannot be tracked.

Sample Size

The number of samples is adjusted to the data in the medical record installation that can be traced from patients undergoing Sectio Caesarea and Appendectomy at Hospital X Type B Jakarta from January 1, 2021 – September 30, 2021. The sampling technique in this study was purposive sampling by determining the sample based on inclusion criteria. The sample size in this study was determined by using a single sample formula to estimate the Proportion of a population to determine the study's validity.

$$n = + \frac{Za^2.P.Q}{d^2!} + \cdots$$

p = Proportion of surgery patients Sectio Caesarea dan Appendectomy = 0.50
Q = (1-P) = 0.50
d = absolute degree of precision desired = 10 % = 0,1 (determined by the researcher)
α = Level of significance = 5 % → Zα = 1,96

$$n = + \frac{Za^2.P.Q}{d^2!} + \cdots$$

$$n = \frac{1,96^2 \text{ x}0,5\text{x}(1-0,5)}{0,10^2} = 97 \text{ people}$$

From the sample size calculation, the number of samples that will be involved is a minimum of 97 patients who underwent Sectio Caesarea Operation and Appendectomy at Hospital X Type B Jakarta on January 1, 2021 – September 30, 2021.

Data collection

Data collection is taken from the Patient's medical record both systemically and physically from the medical record. Data were collected from medical records of surgical patients at Hospital X Type B Jakarta from January 1, 2021 – September 30, 2021. All research data was recorded in the research status on the data collection sheet that had been prepared. The data collected are 1). The Patient's identity is replaced with the study case number to maintain the confidentiality of the data. 2). Patient characteristics data include medical record number, patient name, gender, Age, weight, and history of allergies. 3). Data Characteristics of surgery include the class of surgery, the time of initiation of the incision and the length of the operation in patients undergoing surgery. 4). Data on the characteristics of the use of prophylactic antibiotics, which include the type of Antibiotic, the time of administration of the Antibiotic, the dose of the Antibiotic, the route of the Antibiotic, the interval of repetition and the repeat dose of the prophylactic Antibiotic.

Data analysis

Data obtained from medical records of surgical patients undergoing inpatient at Hospital X Type B Jakarta were entered into a table and then analyzed descriptively. Analysis of the use of Prophylactic Antibiotics will be reviewed according to General

Guidelines for the Use of Antibiotics, Regulation of the Minister of Health of the Republic of Indonesia. Surgical Antibiotic Prophylaxis Guidelines; Department for Health and Aging. Government of South Australia. Guide to Prophylactic and Therapeutic Antimicrobials, Edition II; Orthopedic Surgery Empirical and Prophylactic Antibiotic Recommendations. Hospital Dr. Saiful Anwar Malang. Antibiotic pharmacodynamics in surgical prophylaxis: an association between intraoperative Antibiotic concentrations and efficacy.

Different levels are distinguished in data analysis: univariate and bivariate. Univariate analysis analyses each variable expressed by the frequency distribution, either numerically or by percentage, accompanied by a qualitative explanation. This analysis is used to get an overview of the study's results through the Proportion of patient characteristics, characteristics of surgery, characteristics of prophylactic use of antibiotics and the rationality of using prophylactic antibiotics in surgical patients. The bivariate analysis uses cross tables to highlight and analyze differences or relationships between two variables. This analysis was conducted to analyze the relationship between Patient characteristics and surgical procedures with the wise use of prophylactic antibiotics.

The analysis presented in this study will use a measurement scale to determine the answer scores of respondents using the Guttman Scale. According to Sugiyono, "The Guttman scale is a scale used to obtain firm answers from respondents, that is, there are only two intervals such as "agree-disagree"; "Yes No"; "True False"; "positive-negative"; "never-never" and so on". This measurement scale can produce questions in multiple choice and checklists, with the answers with the highest score (agree) and the lowest (disagree) zero.

Data processing

Data processing is carried out using the SPSS (Statistical Product and Service Solutions) statistical test tool with the following stages: 1). Editing: Performed to re-check the completeness of data entry. 2). Coding: Grouping or coding the data obtained, then included in a file according to the characteristics and marked for each group. 3). Data entry: Data entry into a computer program according to the format in the file. 4). Cleaning: Cleaning data, where data entered in the program, is checked again. This is done so that all incoming data can be processed and ready for analysis.

Data presentation

Data began to be checked for completeness and recorded in the prepared form. Then the data were analyzed using descriptive statistics for all variables and presented in tabular and textual forms.

RESULTS AND CONCLUSIONS

RESULT

Patient Characteristics

The results of the study of patient characteristics consisted of gender, Age, weight and history of allergies in patients with cesarean section (S.C.) and appendectomy (App) surgery at Hospital X Period January 1 – September 30 2021, as follows:

Table 1. Frequency Distribution of Patient Characteristics

Patient Characteristics	Frequency (%)
Gender	
- Man	25 (19, 45 %)
- Woman	104 (80, 6 %)
Age	
- < 20 Years	14 (10, 8 %)
- 20-40 Years	90 (69, 7 %)
- 41-60 Years	17 (13, 2 %)
- > 60 Years	8 (6, 3 %)
Weight	
- > 50 Kg	12 (9, 3 %)
- 50-120 Kg	117 (90, 7 %)
- >120 KG	0 (0 %)
History of Antibiotic Allergy	
There is	4 (3, 1 %)
There are not any	125 (96, 9 %)

The rationality of the Use of Prophylactic Antibiotics

The results of the study: The rationale for the use of prophylactic antibiotics includes the right type of prophylactic antibiotics, the right time for prophylactic antibiotics, the right dose of prophylactic antibiotics, the right route for prophylactic antibiotics and the right interval for repeating prophylactic antibiotics in patients with cesarean section (S.C.) and appendectomy (App) surgery at home. Sick X Period January 1 – September 30 2021 (Sugiyono, 2019), as follows:

Table 2. Measurement of effectiveness, implementation with a Guttman scale >80%

The rationality of the Use of Prophylactic Antibiotics	Frequency (%)
Prophylactic type of Antibiotic (not effective)	
- Not Exactly	72 (55, 8 %)
- Appropriate	57 (44, 2 %)
Timely Administration of Prophylactic Antibiotic (not effective)	
- Not Exactly	109 (84, 5 %)

- Appropriate	20 (15, 5 %)
Proper Dosage of Antibiotic (not effective)	
- Not Exactly	110 (85, 3 %)
- Appropriate	19 (14, 7 %)
Proper route of administration of prophylactic Antibiotic (not effective)	
- Not Exactly	0 (0 %)
- Appropriate	129 (100 %)
Prophylactic Antibiotic repeat interval (not effective)	
- Not Exactly	129 (100 %)
- Appropriate	0 (0 %)
The rationality of prophylactic Antibiotic (not effective)	
- Not Exactly	129 (100 %)
- Appropriate	0 (0 %)

Validity Test

Table 3. Pearson Validity Test

The rationality of the Use of Prophylactic Antibiotics	**R count**	**Sig.**	**Inf**
Right Type of Prophylactic Antibiotics	0,880	0,000	Valid
Timely Administration of Prophylactic Antibiotics	0,724	0,000	Valid
Proper Dosage of Antibiotics	0,710	0,000	Valid

A validity test is useful to determine the validity and or suitability of the questionnaire used by researchers in measuring and obtaining research data from respondents. The basis for taking Pearson's validity test comparison of the value of r count with the r table

1). If the value of r count > r table = valid

2). If the value of r count < r table = invalid

The value of the r table with N = 129 respondents at a significance of 5% distribution of the value of the statistical table r = 0.176

All calculated r values (0.880 / 0.724 / 0.710) in the table above are greater than the r table values (0.176), so the validity test shows all valid results.

Viewing the Significance value (Sig.)

1). If the Significance value < 0.05 = valid

2). If the Significance value > 0.05 = invalid

All significance values (0.000) in the table above are less than 0.05, so the validity test shows the results are all valid.

Reliability Test

Table 4. Croncbach Alpha, Reliability Testing

Cronbach's Alpha	Number of items
0,713	7

The reliability test aims to see whether the questionnaire has consistency if the measurements are carried out using the questionnaire repeatedly. The basis for taking the Cronbach Alpha Reliability Test, according to Wiratna Sujerweni (2014), the questionnaire is said to be reliable if the Cronbach Alpha value is > 0.6.
The results of the Cronbach Alpha Reliability Test of 0.713 are greater than 0.6, so the reliability test results showed that the questionnaire used in this study has consistency if it is measured using this questionnaire repeatedly.

DISCUSSION

Patient Characteristics

Gender

The results of the study of patient characteristics according to gender based on the data (table 6) obtained a frequency distribution of 19.4% male and 80.6% female, according to research by Gloria et al. in 2021 regarding the incidence of appendicitis at Prof. RSUP. Dr R. D. Kandou Manado, of 650 cases, found the most female sex at the Age of 20-29 (Reproductive Age). Respondents of this study for the cesarean section surgery were all female, with as many as 69 respondents (53.5%). In the appendectomy surgery obtained, 60 respondents (46.5) comprised 35 female and 25 male respondents. This shows that this study's total number of respondents was mostly female, with 104 respondents (80.6%) and 25 male respondents (19.4%).

Age

The results of the study of patient characteristics according to Age based on the data (table 6) showed that the distribution of Age < 20 years was 10.8%, age 20-40 years was 69.7%, age 41-60 years was 13.2% and Age>60 years. as much as 6.3% in Gloria et al.'s 2021 research regarding the incidence of appendicitis at Prof. RSUP. Dr R. D. Kandou Manado, from 650 cases, found that the age group most sufferings from appendicitis was the age group 20-29 years.27 In this study, the majority were in the age range of 20-40 years because the predominance of surgery was the sectarian section (S.C.) in women of reproductive Age around 20-40 years.

Weight

The results of the study of patient characteristics according to body weight based on the data (table 6) obtained a distribution of weight < 50 Kg as much as 9.3%, 50 - 120 Kg as much as 90.7% and > 120 kg as much as 0% so it can be concluded that the most surgical patients many weigh 50-120 kg because most of the respondents in the study were women of reproductive Age. Body weight over 120 kg will affect the need for a larger prophylactic Antibiotic therapy dose.

History of Antibiotic Allergy

The results of the study of patient characteristics according to a history of Antibiotic allergy based on the data (table 6) showed that the distribution of patients with no history of Antibiotic allergy was 96.9%, and patients with a history of allergy were 3.1%. We need to always ask about the Patient's history of allergies because this is a standard operating procedure set by the hospital. All officers must be able to overcome the occurrence of anaphylactic shock if it occurs in a patient. Surgical prophylactic antibiotics do not require a skin test. According to recommendations for prophylactic antibiotics, if you have an allergy to cefazolin antibiotics, the recommended prophylactic Antibiotic is Gentamicin (Dewi et al., 2022).

Prophylactic antibiotics in surgical patients with a history of beta-lactam allergy can be given Gentamicin, as follows: Gentamicin injection dose of 2 mg/KgBW or <49 Kg as much as 80 mg, 50-69 Kg as much as 120 mg, 70-89 Kg as much as 160mg and > 90 Kg as much as 200 mg. Half-life 2-3 hours, Not given prophylactic Antibiotic repeat interval. Gentamycin is given 30-60 minutes before the incision is done infusion 30-120 minutes in N.S. and D.S. Single administration intravenously once a day (once daily dosage) avoid in patients with endocarditis, burns >20% or ClCr <20 mL/minute. The dose is calculated based on the ideal body weight (Sutoto et al., 2017).

Characteristics of Prophylactic Antibiotic Use

Types of Prophylactic Antibiotics

The results of the character study of the use of prophylactic antibiotics according to the type of prophylactic antibiotics based on table 8 showed that the distribution of prophylactic antibiotics in the recommended surgical procedure was cefazolin 0.78% and cefuroxime 43.4%, the distribution of prophylactic antibiotics was not recommended, ceftriaxone 45.7%, cefotaxime 6, 28%, ceftazidime 1.5%, levofloxacin 0.78%, moxifloxacin 0.78% and meropenem 0.78%, so it was concluded that the most surgical patients were given the type of Antibiotic ceftriaxone and the least was cefazoline, levofloxacin, moxifloxacin and meropenem. This is not under regulations for the wise administration of prophylactic antibiotics according to the Regulation of the Minister of Health and the Hospital PPAB. Weaknesses in hospitals still need to have a germ map that can strengthen the recommendation of the Antibiotic of choice for surgical prophylaxis.

Timing of Prophylactic Antibiotics

The results of the character study of the use of prophylactic antibiotics according to the time of administration of prophylactic antibiotics based on table 8 showed that the distribution of time for prophylactic antibiotics before surgery was started was <30 minutes as much as 24.8%, 30-60 minutes as much as 34.1% and >60 minutes as much as 41, 1% so that it was concluded that surgical patients were given prophylactic antibiotics more than 60 minutes before the operation was started, which was not under the recommendations for wise prophylactic antibiotics under existing regulations and

guidelines. Based on a pharmacological review, the administration time of 30-60 minutes before the incision is based on when the maximum Antibiotic concentration is in the blood. An administration that is too fast also has a weakness: the drug level needs to be maximized when the doctor makes an incision so that the expected protective effect is less than optimal. A too-long administration time of more than 60 minutes will affect the lack of drug levels in the blood, so there is also a decrease in the protective effect of antibiotics. We give.

Prophylactic Antibiotic Dosage

The results of the character study of the use of prophylactic antibiotics according to the dose of prophylactic antibiotics based on table 8 showed that the distribution of prophylactic Antibiotic doses < 1000 mg was 6.9%, 1000-1999 mg was 48.9%, 2000-2999 mg was 43.4% and 3000 mg as much as 0.8% so that it was concluded that patients with surgery were given a maximum dose of 1000-1999 mg (Sadli et al., 2023). According to the recommendations of the surgical Antibiotic Prophylaxis Guidelines, the recommended adult dose is given as much as 2g (adults BW 120 kg: 3 g) if the patient data results according to body weight are <50 Kg as much as 9.3%, 50-120 Kg as much as 90.7% and > 120 kg as much as 0% so that it can be concluded that the maximum body weight is 50-120 kg with a dose of Prophylactic Antibiotics given 2 g and body weight > 120 kg as much as 0%, there should be no patient receiving a dose of Prophylactic Antibiotics > 3 g.

Route of Administration of Prophylactic Antibiotics

The results of the character study of the use of prophylactic antibiotics according to the route of administration of prophylactic antibiotics, based on table 8, showed that 100% of all surgical patients were given prophylactic antibiotics by intravenous drip route for 15-30 minutes. According to the Dipiro Pharmacotherapy Handbook, the administration of prophylactic antibiotics by IV infusion for 15-30 minutes in 100 mL D5 or N.S. solution or bolus for 5 minutes in 10 mL solvent can be concluded that the route of administration of prophylactic antibiotics is in accordance with the recommendations given.14 According to Zelenitsky on Antibiotics pharmacodynamics in surgical prophylaxis: an association between intraoperative Antibiotic concentrations and efficacy conveyed that steady levels in the blood of Cefazoline as a prophylactic antibiotic can be achieved no later than 15 minutes after being given so that the time for prophylactic antibiotics is at least 15 minutes before the first surgical incision is made.

Prophylactic Antibiotics Repeat Interval

The study's results on the characteristics of the use of prophylactic antibiotics according to the interval of prophylactic antibiotics were repeated based on the data (table 8). The distribution of patients given prophylactic Antibiotic repetition intervals was found to be 100%, so it was concluded that all patients received prophylactic Antibiotic repeat intervals. Based on the guidelines of the Minister of Health No. 28 of 2021, we can

give repeated antibiotics if the duration of the operation is more than 3 hours or there is bleeding of more than 1500 ml in adults and 15 ml/kg in children and repeat antibiotics no more than 24 hours after the first dose (Giordano et al., 2017). Only heart surgery operations such as heart valve surgery, bypass, coronary, and open heart surgery can still give prophylactic antibiotics up to 48 hours after the first dose. If the Patient does not meet these criteria, it is not necessary to give prophylactic antibiotics again to the Patient after surgery. Re-administration of antibiotics more than the provisions is not significantly different from giving prophylactic antibiotics not more than 24 hours calculated from the time of administration of the first dose of antibiotics (Bambona et al., 2022).

Cost Analysis of Prophylactic Antibiotics

According to the guidelines, costs incurred for the use of prophylactic antibiotics in cases of cesarean section surgery (S.C.) and Appendectomy (App) are Rp 69,708,-/case. The use of prophylactic antibiotics that are not following the guidelines will cost Rp. 205,93,-/ case.

Based on this calculation, hospitals, by being able to commit to implementing guidelines for the use of appropriate prophylactic antibiotics, will provide cost efficiency and reduce the rate of Antibiotic resistance (Anggraini & Syachroni, 2020). In the period of this study, there were 56 cases of surgery using cefuroxime which cost Rp. 11,532.192-. In this case, using antibiotics according to the guidelines will cost Rp. 3,903,648-. Thus the hospital can save costs of Rp. 7.628,544-. Hospitals that apply antibiotics under the guidelines, in addition to providing cost efficiency, will also be able to reduce the rate of Antibiotic resistance in hospitals and reduce the incidence of infection in the operating area (Allen et al., 2018).

CONCLUSION

The study results of the surgical patients' characteristics were more women with the age group at most 20-40 years. Most patients weighed 50-120 kg and did not have a history of Antibiotic allergy. The results of the research on the characteristics of the surgical procedure were the most performed Sectio Secaria (S.C.) surgery compared to appendectomy surgery (App), with all respondents undergoing surgery with a duration of fewer than 3 hours. Moreover, had bleeding at the surgery of less than 1500 m. The research results on the characteristics of the most irrational use of antibiotics were given the type of Antibiotic ceftriaxone, and the least was cefazoline, levofloxacin, moxifloxacin and meropenem. The research results on the characteristics of the use of antibiotics when giving prophylactic antibiotics were at most inappropriate more than 60 minutes before the operation started. The research results on the characteristics of the use of antibiotics related to the maximum dose of prophylactic antibiotics are 1000 – 1999 mg. All respondents were given prophylactic antibiotics intravenously by drip, and prophylactic antibiotics repeat intervals after surgery. The results of the research on the rationality of the use of prophylactic antibiotics were found to be incorrect in choosing

the type of prophylactic antibiotics (55.8%), inappropriate timing of prophylactic antibiotics administration (84.5%), Inappropriate doses of prophylactic antibiotics (85.3%), all correct the route of administration of prophylactic antibiotics was intravenous drip (100%), all of which were not appropriate for giving prophylactic Antibiotic repeat intervals (100%) and entirely irrational in the use of prophylactic antibiotics in hospitals (100%). Hospitals can save costs, reduce the rate of Antibiotic resistance and reduce the incidence of surgical site infections by increasing physician compliance in using prophylactic antibiotics according to hospital guidelines.

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