Analysis of the Use of Antibiotic Therapy in Surgical Patients at Royal Prima Marelan Hospital

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Abstract: The use of antibiotics in surgical patients aims to reduce Surgical Site Infection (SSI) so that it can reduce the number of patient admissions to hospital. Fully used antibiotics in patient's cancontributes to the spread of antibiotic resistance, so it is necessary to evaluate the use of antibiotics in hospitals.Quantitative and qualitative assessment of antibiotic use is an important metric in evaluating rational antibiotic prescribing and controlling drug resistance. This study aims to evaluate the use of antibiotics in surgical patients at Royal Prima Marelan Hospital based on assessing the quantity and quality of use. This research is a retrospective study using an observational-analytic design using a quantitative and qualitative approach with secondary data referring to the medical records of 200 surgical patients who received antibiotic therapy and were treated at the Royal Prima Marelan Hospital in the period June - November 2022. Quantitative analysis was carried out using the method ATC/DDD and qualitative analysis using Gyssens criteria. Correlation analysis uses the contingency coefficient statistical test. The results of the quantity of antibiotic use show that the total DDD/100 patient-days value is 77.6 and the quality of antibiotic use using the Gyssens criteria is appropriate/rational, with the most widely used antibiotic being ceftriaxone and the majority of patients' length of stay being ≤ 7 days. This research shows that age (p=0.761), gender (p=0.920), and quality of antibiotic use (p=0.610) do not correlate with length of stay in surgical patients at Royal Prima Marelan Hospital for the period June - November 2022.

Keywords: Antibiotics; Quantity of antibiotic use; Quality of antibiotic use; Surgical patients

Introduction

Antibiotics are one of the most frequently prescribed types of drugs and have a high prevalence of resistance in hospitals (WHO, 2020). One third of hospitalized patients receive antibiotic therapy during their hospital stay and around 50% of the entire course of antibiotic therapy deemed unnecessary (Alnajjar et al., 2022; Kumar, 2019). Misuse of antibiotics is identified as a global public health threat because it is the main cause of resistance to pathogenic bacteria (Li et al., 2016). The increasingly irrational use of antibiotics has an impact on The rapid increase in cases of drug resistance in the world makes infections and deaths more difficult to treat (WHO, 2021).

The Centers for Disease Control and Prevention (CDC) estimates that more than 2.8 million antibiotic-resistant infections occur in the United States each year and result in more than 35,000 people dying (Zhen et al., 2021). A report in the United Kingdom predicts that the number of victims of antibiotic resistance is increasing. globally will reach 10 million deaths per year and cause global economic losses of up to 100 trillion dollars in 2050 (O'Neill, 2016). The main pathogens responsible for 929,000 cases of deaths due to antibiotic resistance are Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Streptococcus pneumoniae , Acinetobacter baumannii, and Pseudomonas aeruginosa (Murray et al., 2022).

Indonesia has a fairly high level of antibiotic resistance like other Southeast Asian countries based on surveillance results (Siahaan et al., 2022). Bacterial resistance to penicillin and sulfamethoxazole respectively increased rapidly from 0% to 28% and 9% to 62% in Indonesia (Kartasasmita et al., 2020). Based on a quantitative evaluation study of antibiotic use, Indonesia is at high risk of experiencing a significant increase in cases of antibiotic resistance. This is based on data on sales of medicines and use of antibiotics which increased 2.5 times between 2000 and 2015, most of the antibiotics used were broad spectrum penicillins, fluoroquinolones and cephalosporins (Kartasasmita et al., 2020). In North Sumatra , around 60% of patients with infections experience antibiotic resistance,

The 2016 World Health Global Guidelines for the Prevention of Septic Infections state that wound infections are caused by bacteria entering through incisions during surgery. This condition threatens the lives of millions of surgical patients every year and contributes to the spread of antibiotic resistance. In low and middle income countries, 11% of surgical patients are infected in the process (Van Tuong et al., 2021; WHO, 2018). Surgical antibiotic prophylaxis aims to reduce Surgical Site Infections (SSI) or Surgical Wound Infections (ILO). If SSI develops as a postoperative complication, it will increase hospital length of stay, readmission rates, and costs.

The World Health Organization (WHO) reports that high levels of resistance in bacteria have an impact on life-threatening bloodstream infections and an increase in general infections in the community based on reports from 87 countries in 2020 (WHO, 2022b). Antibiotic resistance is an important focus because it is associated with an increase in the duration of hospitalization, financing, and patient mortality rates (WHO, 2022a). This condition threatens the potential of antibiotics to save millions of lives from infections (Dadgostar, 2019; Malik et al., 2019). Antibiotic resistance can occur naturally, but the use of antibiotics is not rationally accelerate the process of occurrence of resistant bacteria in society (Irfan et al., 2022; Nepal et al., 2018). The effects of antibiotic resistance are found in countries with lower and upper middle income (King et al., 2022; Klein et al., 2018). This condition is a major threat to public health in the 21st century (Anning et al., 2022).

Assessment of antibiotic use is an important metric for evaluating rational antibiotic prescribing and controlling drug resistance. Defined Daily Dose (DDD) is the most widely used metric to estimate and assess drug consumption (Nunes et al., 2022). Quantitative and qualitative evaluation or assessment is recommended as a way to reduce antibiotic resistance, along with reducing the risk of drug side effects, treatment complications, and institutional costs (Barlam et al., 2016; Wang et al., 2020).

Based on the initial research survey, it was found that within a period of 3 months there were 60 surgical treatment patients who received antibiotic therapy at the RSU. Royal Prima Marelan. The results of the initial survey showed that all patients who received antibiotic therapy based on the Gyssens criteria were appropriate/rational. Patterns of antibiotic use are one indicator for developing an explicit antimicrobial stewardship intervention strategy plan. It is important to understand patterns of antibiotic use to identify appropriate stewardship interventions, the rapid increase in cases of antibiotic resistance, and the absence of related research at RSU. Royal Prima Merelan as a private hospital which is a referral center for the community, especially the city of Medan and the community of North Sumatra in general, encourages researchers to conduct research related to "Analysis of the Use of Antibiotic Therapy in surgical patients at RSU. Royal Prima Marelan".

Method

This research is a retrospective study using an observational-analytic design with a quantitative and qualitative approach, namely in the form of data collection referring to the patient's medical records. Data collection was carried out retrospectively with the aim of knowing patient characteristics, quantity and quality of antibiotic use in surgical patients at Royal Prima Marelan Hospital for the period June to November 2022.

The data collected as a whole will be collected, analyzed, and the research results presented in table form with specific explanations and presented at the final stage of the research.

Result and Discussion

Antibiotics are a type of drug that is commonly prescribed throughout the world because of its effectiveness in treating infections caused by bacteria. However, choosing the type of antibiotic as the right therapy is increasingly becoming a challenge. Antibiotic therapy is based on the characteristics of the patient, type of drug, and microorganisms, which are known as the basic foundations in treating infections (cornerstones of a triangle) (Antibiotic resistance threats in the United States, 2019). The use of antibiotics aims to cure various types of infections caused by germs or bacteria. The choice of type and category of antibiotic must be adjusted to the bacteria causing the infection, to ensure effective use of antibiotics and prevent resistance. In

addition, the choice of antibiotic type, route of administration,

According to a study conducted by Jamiati et al. (2019), the selection of antibiotics is carried out by considering information about the cause of the disease, laboratory test results reports, pharmacokinetic and pharmacodynamic characteristics of antibiotics that are available at an affordable cost, liver function problems, blood clotting disorders, and possible kidney conditions affected (Jamiati et al., 2019). Pattern of antibiotic use in surgical patients at RSU. Royal Prima Marelan for the period June-November 2022 shows that the most widely used antibiotic therapy is cephalosporin class antibiotics, with the most widely used type of drug being ceftriaxone (30.0%). The results of this study are in line with the results of previous research on infectious patients in the internal medicine ward of Dr. H.

Research was also carried out on surgical patients at one hospital. The private sector in the city of Surabaya shows that the use of antibiotics is dominated by ceftriaxone (J01DD04) (Octavianty et al., 2021). Other research that shows the results that ceftriaxone is the most widely used type of antibiotic is research conducted on digestive surgery patients at RSUP dr. Kariadi with a result of 59.4% and research conducted by Desvita in the surgical ward of RSUP dr. Kariadi with a percentage of ceftriaxone use of 80%, followed by cefazolin and cefotaxime (Rachmaputri et al., 2015). The type of antibiotic most frequently used and the treatment of choice is ceftriaxone (77.16%).

Ceftriaxone, as a type of third generation cephalosporin, has broad spectrum activity (Harwiyanti et al., 2022). Previous research stated that among various types of antibiotics, ceftriaxone has advantages in antimicrobial action. The half-life of injected ceftriaxone is 5-11 hours and no repeat administration is required for prophylaxis. Repeated administration is treatment, not prophylaxis (Sadeeqa, 2019). The antibiotic ceftriaxone is the main choice for most surgical patients because it has advantages, including the following (Farizal et al., 2016).

Findings that differ from the research results include research conducted on Orthopedic Surgery patients at the Prof. Infection Center Hospital. Dr. Sulianti Saroso January-July 2019 which shows that the most widely used antibiotic as empirical therapy or surgical prophylaxis is Ampicillin/Sulbactam (Wulandani et al., 2021). Based on Drug Information literature, second and third generation cephalosporins are not significantly better compared to The first generation. This shows that the high use of ceftriaxone as definitive therapy is contrary to the rules stipulated by the Regulation of the Minister of Health of the Republic of Indonesia (Permenkes RI). According to

Minister of Health Regulation no. 2406 of 2011, The use of antibiotics for definitive therapy should prioritize the selection of antibiotics with a narrow spectrum. Thus, the wider use of ceftriaxone as definitive therapy is not in accordance with established guidelines (Sugihantoro et al., 2020).

Profile of antibiotic use in surgical patients at RSU. Royal Prima Marelan for the period June- November 2022, the next most common are metronidazole (15.0%) and cefotaxime (13.5%). The findings of this study are also in line with the results of research on diabetic ulcer patients undergoing treatment at the Abdul Wahab Sjahranie Samarinda Regional General Hospital (RSUD). This research shows that the most commonly used group of antibiotics is cephalosporin (54.43%) and followed by metronidazole (52%) (Rahmawati et al., 2018). Metronidazole is an antibiotic with a broad spectrum that has the ability to fight bacteria. gram positive and gram negative. Therefore, this drug is used as an initial antibiotic choice (empirical therapy) before carrying out a bacterial culture test, to determine the most suitable antibiotic for the bacteria found in the patient (definitive therapy). Apart from that, metronidazole has an effective mechanism of action against protozoa, so this is a consideration factor in using metronidazole as empirical therapy (Fahrurroji et al., 2020). The results of research conducted on Surgical Site Infection (SSI) cases show that administration of metronidazole after surgery significantly reduced symptoms of wound infection, including fever, abnormal discharge from the incision, incision opening, and cellulitis within a week after delivery. In the second week, the results became even more prominent. Metronidazole has broad spectrum coverage and high oral biodisability, and is well tolerated,

Cefotaxime is a beta-lactam antibiotic that was first synthesized in 1976 and has been approved by the FDA to treat gram-positive, gram-negative, and anaerobic bacteria. Its broad-spectrum antibacterial activity is useful in treating susceptible types of bacteria in the lower respiratory tract, genitourinary tract, central nervous system, intra-abdominal infections, bone and joint infections, skin infections, gynecological infections, and sepsis. Cefotaxime may also be used prophylactically before surgery to prevent surgical infections. Cefotaxime is a bactericidal agent whose mechanism of action is by binding to penicillin-binding proteins (PBPs) via the beta-lactam ring and inhibiting transpeptidation activity in the synthesis of peptidoglycan cell walls of susceptible bacterial organisms.

Cefotaxime, which is a third generation cephalosporin, is able to effectively fight many gram-negative organisms which cause increasingly frequent

nosocomial infections, as well as anaerobic bacteria which are also often the cause. Administration of one dose of cefotaxime (1 g or 2 g) 30 minutes before surgery has been shown to be effective as infection prophylaxis after gastrointestinal, biliary, obstetric, gynecological and genitourinary procedures, and helps prevent surgical wound infections (Kannaki et al., 2021).

In cases of severe surgical infections, intravenous administration of antibiotics is recommended to ensure adequate drug levels in the blood. Absorption of drugs via other routes in patients with severe infections is usually inconsistent, especially when digestion is not functioning properly. Other administration method options can be considered after the patient's condition improves.

Quantitative evaluation through ATC (Anatomical Therapeutic Chemical) is a drug classification system based on pharmacology, chemical compounds and therapeutic function. This system was developed by the World Health Organization (WHO) and can be interpreted in units of DDD/100 patient-days. DDD (Defined Daily Dose) evaluation is the average dose per day assumed when using antibiotics for certain indications in adults. The ATC/DDD method is a quantitative method for calculating antibiotic use recommended by WHO. In this research, this method is used to analyze and measure antibiotic use based on ATC and DDD categories (Rachmawati et al., 2020).

The results of this study showed that there were 10 variations in the use of antibiotics used as treatment for surgical patients at RSU. Royal Prima Marelan with totalthe DDD/100 patient-days value was 77.6.The largest DDD/100 patient-days value was ceftriaxone, namely 24.28, followed by levofloxacin at 12.5 and cefotaxime at 10.44.Research was also carried out on surgical patients at one hospital. The private sector in the city of Surabaya showed that antibiotic use was dominated by ceftriaxone (J01DD04) with a significant total DDD/100 patient-days value. In the pre-operative phase, the quantity of ceftriaxone used was 17.95 DDD/100 patient-days, while in the surgical and post-operative phases, this figure increased to 23.57 and 23.22 DDD/100 patient-days (Octavianty et al., 2021).

Previous studies also provided results similar to this research. Calculation of the DDD (defined daily dose) value for the use of prophylactic antibiotics with a total length of stay of 52 days shows that the class of prophylactic antibiotics with the highest use is third generation cephalosporins, especially ceftriaxone (J01DD04) with a total use of 25 DDD/100 patient-days. The percentage of ceftriaxone use reached 59.77%. This shows that ceftriaxone was the antibiotic most widely used as prophylaxis in patients during that period (Nisak et al., 2022).

Similar results were also seen in research conducted on Orthopedic Surgery patients at Abdul Wahab Sjahranie Hospital Samarinda which showed that the use of ceftriaxone in 2017 was the highest, the value DDD/100 patient-daysreached 20.21. This indicates that out of every 100 inpatients, around 20 patients receive a dose of the antibiotic ceftriaxone of 2000 mg every day. This finding is in line with the results of previous research which also found that third generation cephalosporin antibiotics, especially ceftriaxone, had the highest number of prescriptions DDD/100 patient-daysamounting to 61.63. Another study also showed that consumption of cephalosporin antibiotics, especially the third generation, has value DDD/100 patient-daysreached 35.8. In this study, it was seen that of the total use of cephalosporins, 21% were third generation, 20.8% first generation, and 15.2% second generation. Another study conducted by Fazriyah on appendectomy patients showed that the highest antibiotic use was ceftriaxone with value DDD/100 patient-days is 46.52 (Fitriyani et al., 2018).

The results of this study show that totalDDD/100 patient-dayshigher than research conducted at St. Elisabeth Semarang during the period October - December 2019 which shows the totalDDD/100 patient-daysreached 18.17. Apart from that, totalDDD/100 patient-daysin this study also exceeded the totalDDD/100 patient-daysat Ngudi Waluyo Wlingi Blitar Regional Hospital, it was 47.30, as well as in research conducted at Dr. H. Slamet Martodirdjo Pamekasan who shows the totalDDD/100 patient-days is76.03 (Norcahyanti et al., 2019; Ridwan et al., 2019; Rukminingsih et al., 2021).

Different results were also found in research conducted on surgical inpatients at Airlangga University Hospital which showed that cefazolin was the antibiotic that had the highest DDD rate, reaching 69.08 per 100 operations. This means that the average use of cefazolin in each surgical procedure is 0.69 times the standard DDD dose set by WHO, namely 3 grams (Pratama et al., 2019).

The level of antibiotic use will be linearly aligned with the recorded DDD (Dose Defined Daily) value. The lower the amount of antibiotics used, this indicates a more selective approach in prescribing antibiotics by doctors. This illustrates that antibiotic prescribing is closer to the principles of rational antibiotic use (Fitriyani et al., 2018; Pratama et al., 2019).

The qualitative evaluation method for antibiotic use in Indonesia that has been approved by the Indonesian Ministry of Health is the Gyssens method. The Gyssens method was chosen because it has more specific aspects for evaluating every important parameter related to antibiotic use, such as indication, effectiveness, safety,

price and antibiotic spectrum. This method also considers the length of treatment, dose, interval, administration route, and administration time. The aim of the Gyssens method is to assess whether the quality of antibiotic use by patients is appropriate or not in accordance with established standards. The Gyssens method is the standard for qualitative evaluation in antibiotic prescribing. The advantages of this method are its accuracy and higher level of detail, so that we can evaluate the use of antibiotics more precisely. This helps prevent the development of antibiotic resistance. In addition, the use of this method in evaluating antibiotic use allows an assessment of the rational use of antibiotics (category 0) and the irrational use of antibiotics (categories I-VI) (Efrilia et al., 2023).

The flow of assessing the rationality of antibiotic use based on the Gyssens criteria starts with category VI, namely checking whether there is incomplete secondary data that cannot be evaluated. If there is incomplete secondary data, the assessment continues to category V, and so on until it reaches category I. If the secondary data is not included in categories I-VI, then it can be concluded that the use of antibiotics is classified in category 0, which means that the use of antibiotics has been precise and rational (Belinda et al., 2021).

The results of this study show that based on the Gyssens category, the use of antibiotics in surgical patientsat RSU. Royal Prima Marelan period June - November 2022almost all (93%) are oncategory 0, which means that the use of antibiotics is carried out appropriately or rationally. Antibiotic therapy is considered appropriate if it meets the criteria for categories VI-I according to the Gyssens criteria line. The use of antibiotics is considered appropriate based on the accuracy of indications for use, selection of antibiotics based on effectiveness, toxicity, price and spectrum, duration of administration, dose, interval, route and time of administration (Anggraini et al., 2020). These results are in line with research conductedin the oral surgery clinic at Padjadjaran University, Bandung City, the oral dental hospital showed significantly higher antibiotic rational results, namely 75.32% (Belinda et al., 2021). The results of research conducted at BDH Hospital for the 2016 period showed similar results, The quality of antibiotic use in post-surgical patients who meet the Gyssens category of appropriate or rational use of antibiotics is dominant although not significant (59.7%) (Sugihantoro et al., 2020). Similar findings were also shown in the assessment of the rationality of antibiotics at Loa Janan Community Health Center. Antibiotic prescriptions were in category 0 as many as 53 cases (66.25%) (Ramlah et al., 2021).

The high rationality or accuracy of antibiotic use in this study may be due to the attention given by various parties to the use of antibiotics. Writing antibiotic prescriptions based on guidelines and literature, monitoring and evaluating antibiotic use is carried out carefully by the team involved. However, different percentage results in research literature reviews show variations that may be caused by differences in target place, scope, time, and research methods used (Efrilia et al., 2023). Evaluation with the Gyssens method can be carried out continuously to prevent antibiotic resistance. In an effort to improve the quality of antibiotic use, all parties must play an active role. This includes preventing antibiotic overdose to avoid the risk of toxicity and unwanted side effects. Subdose prevention can also help reduce the risk of antibiotic resistance, speed patient recovery, and prevent therapy failure. Through ongoing evaluation and appropriate prevention efforts, the development of antibiotic resistance can be minimized and patient treatment outcomes can be improved. The assessment of antibiotics, both rational and irrational, is based on indication, dose, duration, type selection, and other factors. Antibiotic administration can be divided into several types, including empirical, definitive and prophylactic therapy. Prophylactic therapy involves administering antibiotics 30 minutes to 1 hour before surgery in the absence of signs of infection. Empiric therapy is used within a 72-hour period during initial treatment when culture results are not yet known. Definitive therapy is given after the type of bacteria and its resistance pattern have been identified (Ramlah et al., 2021).

Rational use of drugs refers to the appropriate use of drugs, taking into account clinical needs, appropriate doses, and also economical costs, especially for certain patient groups or communities (Ramlah et al., 2021). Excessive and inappropriate use of antibiotics inappropriate use can have serious impacts such as increased treatment costs, failure in therapy, drug toxicity, and drug interactions (Titus et al., 2019). Irrational use of antibiotics creates a number of significant problems and poses a global threat to public health, especially in terms of bacterial resistance to antibiotics. The main cause of antibiotic resistance lies in its very widespread and inappropriate use. About 80% of the total antibiotics consumed for human needs, and nearly 40% of that use was based on inappropriate indications. Factors that trigger resistance include inappropriate (irrational) use, such as short treatment or single treatment which ultimately causes resistance when compared with combination therapy. Apart from that, the large-scale sale of drugs by pharmaceutical companies, as well as the influence of globalization which triggers the exchange of goods and expands the distribution of antibiotics also contributes (Jamiati et al.,

2019). The large-scale sale of drugs by pharmaceutical companies, as well as the influence of globalization which triggers the exchange of goods and expands the distribution of antibiotics also contributes (Jamiati et al., 2019).

The Ministry of Health of the Republic of Indonesia explains that 40-62% of antibiotic use is inappropriate, and around 30-80% of this use is not in accordance with the correct indications, which has the potential to cause health problems, especially in terms of bacterial resistance to antibiotics. This is caused by non-compliance with regulations and a lack of vigilance in health service standards, both in hospitals and in community health centers (Arrang et al., 2019). Examples of irrational prescribing practices that are often encountered in daily practice by personnel health includes indications of inappropriate medication, such as the wrong dose, inappropriate administration method, and incorrect duration of administration, as well as expensive treatment (Dewi et al., 2018).

There are several factors that influence the duration of treatment for surgical patients. These factors include the type of operation, infection of the surgical wound, complications that may arise as a result of the operation, patient age, type of financing, patient occupation, as well as administrative policies adopted by the hospital. Rochfika (2019) stated that one of the factors that influences the duration of hospital treatment is age. The older a patient is, the longer their inpatient treatment tends to be. Age or longevity is a measure of time used to identify the length of time an object or creature, both living and dead. The age groups that are more susceptible to disease are toddlers and the elderly. Toddlers' immune systems are not yet fully developed so they are more susceptible to infection.

This study shows a bivariate analysis of the correlation between age characteristics andlength of stay in patientsobtained p-value =0.761, then it can be concluded that age characteristics are not correlated withLength of stay in surgical patients at RSU. Royal Prima Marelan period June - November 2022. The results of this research are in line with research conducted in post-surgical inpatient care at the Prof. Orthopedic Hospital. Dr. R. Soeharso Surakarta who showed that there was no relationship between the age of long bone fracture patients and the length of stay after surgery with p-value = 0.363 (p > 0.05). (Rozi, Tekwan and Nugroho, 2021) This finding is also supported by research conducted conducted at Klungkung Regional Hospital, it was found that there was no significant relationship (p = 0.270) between age and length of stay of the patient (Darmapadmi et al., 2018).

A short length of stay in hospital has an impact on lower physiological reserves, especially in older individuals, compared to younger individuals. This decrease in physiological reserves can result in elderly patients having difficulty maintaining body balance (homeostasis), which in the end can lead to life-threatening conditions, but this condition is not absolutely caused by age. A longer hospitalization period indicates disease complications or the presence of comorbid diseases affecting the patient. Therefore, the disease in question requires more prolonged treatment in the treatment process (Wanadiatri et al., 2021). The results of this study do not match the initial expectations in the hypothesis, namely that the patient's age is related to the duration of hospitalization in surgical patients. This is caused by other factors that play a role in influencing the length of stay for surgical patients, not only limited to age. There are other intrinsic and extrinsic factors that also have an influence on the duration of treatment for surgical patients.

The absence of a relationship between age and duration of patient hospitalization in the study results may be due to the limitations of the subjects studied. In addition, variations in the age susceptibility range of the patients studied and differences in age grouping criteria could also influence these differences.

Various factors have an influence on the healing process, including age, gender, nutritional conditions, medical conditions before and after surgery such as anemia, diabetes, hepatitis, kidney failure, anesthesia score, fatigue during surgery, suture solubility, type of surgery performed (elective or emergencies), infections in surgical wounds, and increased intra-abdominal pressure (Velnar et al., 2019). The Hungu theory explains that gender (sex) refers to biological differences between female and male individuals that have existed since birth. Sex is related to the physical characteristics between men and women, where men produce sperm while women produce eggs, as well as having unique biological functions such as menstruation, the ability to get pregnant, and breastfeeding.

The statistical analysis of this research shows a correlation between gender characteristics andlength of stay in surgical patientsobtained p-value =0.920,Thus it can be stated that gender is not correlated withLength of stay in surgical patients at RSU. Royal Prima Marelan period June - November 2022. The results of research conducted at Mardi Rahayu Kudus Hospital in 2021 are in line with the results of this study by showing that there is no correlation between gender and the duration of inpatient treatment. The correlation coefficient (rho) value of 0.150 indicates that there is a weak relationship between the two factors, with a positive relationship direction (Sari et al., 2022). Statistical analysis uses the Chi-Square test and also another alternative test, namely the Fisher Exact Test with levels The significance of $p <$

α (0.05) in previous research was that results showed that the p value = 0.178. This indicates that the hypothesis is rejected, which means there is no significant relationship between gender and the length of the patient's inpatient stay. These results are also in line with previous research.

Assessment of the quality of antibiotic use using the Gyssen criteria is an evaluation tool to monitor and evaluate the rational use of antibiotics and according to indications. These criteria involve the selection of appropriate antibiotics as well as the achievement of therapy related to the rational use of antibiotics. The results of research conducted by Fetri in 2018 showed that administering antibiotic therapy empirically without following the 2007 ATS/IDSA guidelines had a 10.25 times higher risk of prolonging the length of stay in hospital compared to administering antibiotics based on guidelines. A study conducted by Ellen in 2014 suggested that the goal of reducing the duration of hospitalization could be achieved through implementing guidelines for antibiotic use.

Statistical analysis of this study shows a correlation between the quality of antibiotic use andlength of stay in surgical patientsobtained p-value =0.920,Thus it can be stated that the quality of antibiotic use is not correlated withLength of stay in surgical patients at RSU. Royal Prima Marelan period June - November 2022. Research conducted at the Sultan Agung Islamic Hospital also showed similar results, where there was no relationship between the quality of antibiotic use and the patient's length of stay (p=0.53) at the Sultan Agung Islamic Hospital, Semarang. This research reveals that lengthening the duration of hospitalization may be related to gender factors and the number of antibiotic prescriptions given. Atmojo et al. (2018) findings that are different from this research are shown in the results of research conducted on patients at the Regional General Hospital Dr. H. Abdul Moeloek in 2021 which shows that there is a relationship between the quality of antibiotic use and the patient's length of stay (Silalahi, 2022).

Appropriate and rational use of antibiotics has the potential to reduce the consequences of disease, especially infectious diseases. On the other hand, uncontrolled and irrational use of antibiotics can result in more serious impacts, such as increasing resistance to antibiotics and potentially prolonging hospital stays. (Atmojo et al., 2018).

Conclusion

Based on the results of research conducted on 200 medical records of surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 can be concluded that: a) Mayo Ritasurgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is male. b) Mayo Ritasurgical patients at RSU. Royal Prima Marelan for the period June - November 2022 has an age range of 36 – 45 years. c) MayoRitasurgical patients at RSU. Royal Prima Marelan for the period June - November 2022 has a length of stay of ≤ 7 days. d) The most widely used antibiotics in surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is ceftriaxone, followed by metronidazole and cefotaxime. e) Appropriate use of antibioticsin surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is 93%. f) Inappropriate timing of antibiotic administration in surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is 0%. g) Inappropriate doses and routes of antibiotic administration in surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is 2%. h) Inappropriate duration of antibiotic administrationin surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is 0%. i) Inappropriate selection of antibioticsin surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is 7%. j) Inappropriate indications for administering antibiotics to surgical patients at RSU. Royal Prima Marelan for the period June - November 2022 is 5%. k) Quantity of patient antibiotic use surgery at RSU. Royal Prima Marelan for the period June – November 2022 showsthe total DDD/100 patient-days value was 77.6. l) Quality of patient antibiotic use surgery using criteria Gyssens at RSU. Royal Prima Marelan for the period June – November 2022 is appropriate/rational. m) There is no correlation betweenage withlong inpatientpatient surgery at RSU. Royal Prima Marelan for the period June – November 2022 with p-value = 0.761. n) There is no correlation betweengender withlong inpatientpatient surgery at RSU. Royal Prima Marelan for the period June – November 2022 with p-value = 0.920. o) There is no correlation betweenquality prolonged use of antibiotics inpatientpatient surgery at RSU. Royal Prima Marelan for the period June – November 2022 with p-value = 0.761.

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