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# Analysis of Predictors Associated with Acid Suppressant Drug Related Problems (DRPs) among Inpatients at Dr. Mintohardjo Naval Hospital

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***Keywords***
gastric acid suppressants, drug-related problems, pcne, predictors, inpatients

**Abstract**
The use of gastric acid suppressants such as Proton Pump Inhibitors (PPI) and Histamine-2 Receptor Antagonists (H2RA) is very common in inpatient settings, but inappropriate use is often found, posing risks to patient safety and cost efficiency. This study aims to analyze the relationship of predictors (age, number of drugs, number of comorbidities, and length of stay) to the occurrence of Drug-Related Problems (DRPs) in inpatients using gastric acid suppressants. This study was an observational study with a cross-sectional design was conducted retrospectively using patient medical record data at Rumkital Dr. Mintohardjo from January to December 2024. A sample of 432 patients was taken using a simple random sampling technique based on inclusion criteria. DRPs were identified using the Pharmaceutical Care Network Europe (PCNE) V9.0 instrument. Data analysis used the chi-square test for bivariate analysis and binary logistic regression for multivariate analysis. DRP characteristics were dominated by treatment safety issues (49.1%), particularly adverse drug events, with the most frequent drug interaction being ranitidine and ketorolac. Bivariate analysis showed that length of stay (p=0.105), and number of drugs (p=0.001) significantly influenced the number of DRPs. Multivariate analysis identified the number of drugs as the most influential predictor; inpatients receiving ≥10 drugs had a 2.580 times higher risk of experiencing DRPs (p=0.003; OR 2,580; 95% CI 1.396-4.779)

## INTRODUCTION

Gastric acid suppressant drugs are one of the groups of therapies that are commonly prescribed globally. This therapy plays a crucial role in the management of various gastrointestinal conditions. The pharmacological approach in this therapy generally involves the utilization of two main classes of therapeutic agents, namely proton pump inhibitors (PPIs) that work by suppressing gastric acid production at the cellular level, or H2 receptor antagonists (H2RA) that selectively inhibit the action of histamine on H2 receptors in gastric parietal cells, thereby reducing acid secretion. The use of PPIs and H2RA, has become a common therapeutic intervention in clinical practice, especially in inpatient settings. These drugs are effective in reducing stomach acid production, making them useful for treating various conditions such as peptic ulcers, gastroesophageal reflux disease (GERD), and as a prophylaxis of stress ulcers in high-risk patients. Although its effectiveness is proven, the data show significant problems

regarding the appropriateness of the use of gastric acid suppressants, which have the potential to have a negative impact on patients and the health system. (Shanika et al., 2023) (Posada Bustos et al., 2018) (Begg et al., 2023) (Hussain Sabir et al., 2025) (Zhou et al., 2019) ( Laoveeravat et al., 2020)

Drug-related problems have a fairly high prevalence, reaching 45.1% in various medical specialties in the world, especially in the elderly population who tend to experience polypharmacy and multimorbidity. Meanwhile in Indonesia, patients with chronic diseases have drug-related problems that most often occur are ineffective therapy (74.9%) and untreated indications (68.3%), improper dosage (50.3%), unnecessary therapy (34.7%), and the most rare is an unexpected drug reaction (ROTD) (10.2%). This is in line with the findings of a study conducted in Jordan that found that 86% of the use of PPIs in patients was not necessary, as it did not correspond to the indications p there were patients receiving treatment. This figure reflects a global problem, where 50-70% of patients receive a prescription for gastric acid suppressant therapy without proper indications according to (Garin et al., 2021) (Tampa et al., 2021) (Alqudah et al., 2016) *the Food and Drug Administration* (FDA). Data shows that 65% of the prescription of gastric acid suppressant drugs does not meet clinical guidelines. In addition, from 2011 to 2013, 72-84% of the use of gastric acid suppressant drugs was found to be inappropriate. This problem of inaccuracy of use is not only limited to indications, but also includes the frequency and duration of administration. Prophylaxis of stress ulcers is often administered with a frequency of 1-3 times/day, either singly or in combination, through the oral or intravenous route. Although PPI as a prophylaxis for stress ulcers had an effectiveness of 61.4-77.4%, 56% of patients were identified as using PPIs inappropriately. The rate of patients receiving PPI and H2RA inappropriately reached 76%. Ironically, patients who were supposed to be at high risk of bleeding but did not receive treatment had a four-fold higher risk than patients who received the drug inappropriately. . This situation underscores the urgency to address the problem of inappropriateness in the use of gastric acid suppressants in hospitals. (Posada Bustos et al., 2018) (Nardino et al., 2000) (Singh et al., 2016) (Laughs) Mahdayana et al., 2020) (Octavia et al., 2019) (Albugeaey et al., 2014) ( Korayem et al., 2021)

The Indonesian Navy Hospital (Rumkital) Dr. Mintohardjo Jakarta, as the main referral facility of the Indonesian Navy in the western region, has a crucial role in providing health services and medical support for TNI soldiers, especially Indonesian Navy soldiers and their families. Its reputation for providing comprehensive healthcare services, ranging from general services to specialties, makes it an attractive representation of the dynamics and challenges faced by modern hospitals in Indonesia. Not only that, this hospital also serves the general public who need treatment. As an accredited hospital, Rumkital Dr. Mintohardjo is responsible for providing high-quality healthcare services, especially in the inpatient unit, with a focus on patient safety Rumkital Dr. Mintohardjo, as one of the leading hospitals with a long history of serving the community, attracts attention as a significant research location and patient population served, potentially resulting in the discovery of drug-related problems. (Trina et al., 2024)

Analysis of drug-related problems with the use of gastric acid suppressants plays a crucial role in efforts to improve the quality of health services and cost efficiency. Improper or excessive use not only has the potential to cause adverse side effects such as nausea, vomiting, headaches, and diarrhea but also contributes to an increase in unnecessary medical costs. Understanding the use of gastric acid suppressant drugs in depth is essential to optimize patient therapy and minimize the risk of side effects. Research shows that several predictors play a significant role in drug-related problems (MTOs) in inpatients. Age, for example, is a known predictor of causing MTO. This data is reinforced by the study of Wilmer et al. (2015), and other studies by Octavia et al. (2019) and Luo et al. (2017) also show a link between age and

drug problems. The presence of comorbidities or comorbidities also increases the risk (Nardino et al., 2000; Korayem et al., 2021). The amount of medication consumed is closely related to the increased morbidity of the disease that causes MTO, as shown by Zulkarnaini & Martini (2019) as well as Singh et al. (2016) and Posada Bustos et al. (2018). Finally, shorter duration of hospitalization can reduce the risk of adverse events, as concluded by Sinjal et al. (2018). By analyzing these predictors, hospitals and healthcare providers can develop more effective strategies to improve patient safety and treatment efficiency. (Mohamed Mohamed et al., 2023) (Kate et al., 2023) (Tezel Yalçın et al., 2025)

In the classification of Drug-Related Problems (MTOs), the instrument used, namely *Pharmaceutical Care Network Europe* (PCNE) V9.0, is used to identify, classify, and document MTOs that occur in patients. The selection of this instrument was based on its ability to provide a comprehensive and standardized framework for MTO data collection. The accuracy and reliability of this instrument have been internationally tested and widely used in a wide range of pharmaceutical nursing studies, making it an ideal choice for ensuring consistency and comparison of results with other studies. (Satria et al., 2022) Therefore, research that focuses on the analysis of predictive relationships with MTOs of gastric acid suppressants is important to encourage more rational prescribing practices, improve service quality, and achieve cost efficiency in the health system.

**Problem Formulation**

The use of acid suppressant drugs is a common practice in managing various conditions related to stomach acid in the hospital environment, including at Rumkital Dr. Mintohardjo. Potential improper or excessive use can have negative implications for patient outcomes and cost efficiency. Therefore, this study aims to analyze the presence of a predictor relationship with MTO in inpatients who use gastric acid suppressant drugs in hospitals. Identifying predictors is critical because it can improve patient safety, optimize clinical outcomes, and reduce health costs due to unnecessary treatment or preventable complications.

**Hypothesis**

There was an association between predictors such as age, number of drugs, number of comorbidities, and length of hospitalization on the incidence of MTO in inpatients using gastric acid suppressant drugs at Rumkital Dr. Mintohardjo.

**Research Objectives**

**General Purpose**

This study aims to analyze the predictor relationships that contribute to the incidence of MTO in inpatients at Rumkital Dr. Mintohardjo.

**Special Purpose**

a. To obtain an overview of demographic and clinical characteristics in inpatients using gastric acid suppressant drugs at Rumkital Dr. Mintohardjo.
b. Identify the types of MTO based on the PCNE V9.0 classification among inpatients using gastric acid suppressant drugs at Rumkital Dr. Mintohardjo.
c. To determine the predictor factors—specifically age, number of medications, number of comorbidities, and length of stay—that influence the occurrence of DRPs in inpatients receiving gastric acid suppressants.

**Research Benefits**

**Benefits for Colleges**

This research has the potential to generate in-depth and specific new knowledge regarding a variety of complex problems associated with the use of gastric acid suppressants in inpatients. Thus, the findings of this study are expected to fill the existing knowledge gap and provide unique insights into the hospital's clinical practice.

**Benefits for Rumkital Dr. Mintohardjo and health workers**

The results of this study can provide valuable information about the pattern of use of gastric acid suppressants, so that hospitals can identify areas that need improvement in the practice of prescribing and using drugs. This has the potential to improve the quality of pharmaceutical services and overall patient care. The data from this study can be used as a basis for drafting or updating policies and guidelines for the use of gastric acid suppressants at Mintohardjo Hospital, ensuring more rational practices and in accordance with standards

**Benefits for researchers**

The results of this study can increase the knowledge and understanding of researchers regarding the appropriate and appropriate use of gastric acid suppressant drugs in inpatients so as to obtain optimal treatment results.

## RESEARCH METHODS

### Research Design

This study uses an observational method with *a cross sectional* design. The data used were secondary data from the medical records of inpatients at Rumkital Dr. Mintohardjo during the period from January to December 2024. A retrospective approach was chosen to analyze the MTO of gastric acid suppressant drug use by analyzing already recorded data, allowing the identification of patterns and associated factors without direct intervention on patients or clinical practice.

### Research Location and Time

The research was carried out at Rumkital Dr. Mintohardjo, a public hospital located on Jl. Bendungan Hilir No.17, RT.4/RW.3, Bendungan Hilir, Tanah Abang District, Central Jakarta City, Special Capital Region of Jakarta. The research time was August to December 2025 and the data collection period: January to December 2024.

### Population and Research Sample

### Research Population

The population of this study is all inpatients at Rumkital Dr. Mintohardjo during the period from January to December 2024 who received gastric acid suppressant drugs.

### Research Sample

The sample of this study is all inpatients at Rumkital Dr. Mintohardjo during the period from January to December 2024 who received gastric acid suppressant drugs that meet the inclusion criteria.

Inclusion Criteria:

- Receive PPI or H2RA gastric acid suppressant drug therapy during treatment.
- Complete and accessible medical records.
- Age ≥ 18 years old

Exclusion Criteria:

- Patients with a length of stay of less than 24 hours.
- Pregnant patients.
- HCU, ICU and ICCU inpatients.

### Sampling Techniques

The number of samples will be determined based on the total population that meets the inclusion criteria. All patients who met the inclusion criteria would be included in the study using *simple random sampling*. The minimum number of samples used in this study is calculated based on the formula for calculating the required samples, with the following formula (Lwanga & Lemeshow , 1991) :

$$n = \frac{Z^2 \cdot P(1-P)}{E^2}$$

Description :

n = minimum sample number required
Z = Z-value of the standard normal distribution corresponding to the level trust (e.g., 1.96 for a 95% confidence level).
P = estimated proportion of the population (if unknown, usually used 0.5 to get the maximum number of samples).
E = margin of error.

So that :

$$n = \frac{1{,}96^2 * 0{,}5(1+0{,}5)}{0{,}05^2} = \frac{0{,}9604}{0{,}0025}$$

n = = 384.16 ~ 385 samples

How Sampling Works

The steps taken in sampling are as follows:

1) Access the patient's physical medical records and record them accurately and in accordance with the records contained in the medical records which include:
- Patient Data: Age, sex, primary diagnosis at admission, comorbidities, length of hospitalization.
- Risk Factors: History of use of other medications, dosage and type of gastric acid suppressant medications used, frequency, route of administration, and start/end date of medication administration or duration of treatment.
- Drug-Related Problems: Symptoms of side effects (e.g., nausea, diarrhea, headache), possible drug interactions, or therapy failure.

2) The data is recorded every day during the patient's treatment and is observed if there are any changes in the medication used (dosage, type of drug, frequency, route of administration, interaction and duration of treatment) as well as symptoms of side effects experienced by the patient during treatment.
3) Once the data is collected, *double-check* to make sure there are no errors

**Concept Framework**

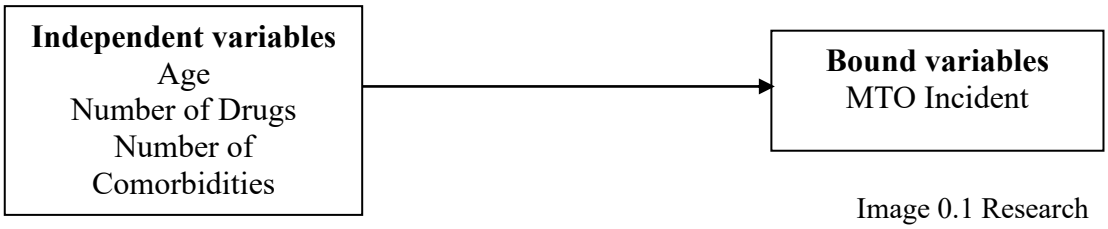


Image 0.1 Research concept framework

## Data Processing and Data Analysis

Data was obtained from the medical records of Rumkital Dr. Mintohardjo during the period of 2024.

**Data Processing**

***Editing***

This activity is carried out by checking the completeness of the data obtained from medical records.

***Coding***

This activity is carried out by providing code on the data obtained to facilitate data processing. Coding is carried out on free and bound variables, with code 1 if it has a risk factor and code 0 if it does not have a predictor.

***Entry* Data**

This activity is carried out by entering the data that has been given a code into the statistics program. In this study, the statistical program used is the SPSS program.

***Data Cleaning***

This activity is carried out by re-checking the data that has been entered into the program, to ensure that there are no input errors.

**Data analysis**

**Univariate Analysis**

This analysis was carried out to obtain an overview of the characteristics of the research subjects consisting of the frequency and proportion distribution of each variable, both independent variables and bound variables. The data will be presented on the frequency distribution table.

**Bivariate Analysis**

Bivariate analysis was performed to analyze the relationship of bound variables with independent variables.

**Multivariate Analysis**

Multivariate analysis was conducted to analyze the influence of dependent and independent variables on the incidence of MTO. In this study, the multivariate analysis that will be used is the binary *logistic regression test*. The variables that will be included in the multivariate analysis are those that in bivariate analysis have a p< value of 0.25 and variables that based on existing theories have an important substance to the occurrence of MTO. The relationship between variables is expressed by the odds (Hastono & Sabri, 2013) *ratio* (OR) value.

## RESULTS AND DISCUSSION

### Identifying Drug-Related Problems in Inpatients

### Drug-Related Problems in Inpatients

This study succeeded in revealing a significant picture of the complexity of patient treatment, where a total of 733 drug-related problems (MTOs) were found out of a total of 432 patients observed. Statistically, this figure shows that the average burden of treatment risk reaches 1.70 problems per patient, with variations in the number of MTOs that vary from 0 to 4 problems in each individual. To understand the dynamics and root causes of each type of problem, complete data has been presented in Table 4.2 in this chapter.

Table 4.2 Number and Type of MTOs in Inpatients for the Period of 2024 (n = 733)

| Types of MTO | Causes of MTO | Case | Quantity |
|---|---|---|---|
| **P1 Treatment Effectiveness** | | | **209 (28,5%)** |
| P1.1 No effect of drug therapy | | | 0 (0,0%) |
| P1.2 Effects of drug therapy are not optimal | | | |
| | C1.4 Improper combination of drugs | interactions of omeprazole and clopidogrel | 5 (0,7%) |
| | | interaction of omeprazole and aspilet | 3 (0,4%) |
| | | interaction of omeprazole and nitrokaf | 2 (0,3%) |
| | | Others | 25 (3,4%) |
| | C3.1 Drug dose too low | Patients taking ranitidine injection at doses of 2 x 50 mg | 171 (23,3%) |
| | | Patients taking oral lansoprazole at a dose of 1 x 10 mg | 1 (0,1%) |
| | C3.3 Low-dose regimen | Patients taking oral omeprazole at a dose of 1 x 20 mg | 2 (0,3%) |
| P1.3 Untreated symptoms or indications | | | 0 (0,0%) |

| | | | |
|---|---|---|---|
| **P.2 Medication Safety** | | | **360 (49,1%)** |
| P2.1 Adverse (probable) drug events occur | | | |
| Types of MTO | Causes of MTO | Case | Quantity |
| | C1.4 Improper combination of drugs | Interactions of ranitidine and ketorolak | 76 (10,4%) |
| | | interactions of omeprazole and atorvastatin | 8 (1,1%) |
| | | Omeprazole and furosemide interactions | 6 (0,8%) |
| | | Other | 120 (16,4%) |
| | C3.2 Too high a dose of the drug | Patients taking oral lansoprazole at doses of 2 x 30 mg) | 4 (0,5%) |
| | C3.4 Overdose regimen | Patients taking omeprazole at doses of 2 x 40 mg | 145 (19,8%) |
| | | Patients taking omeprazole injection at a dose of 3 x 40 mg | 1 (0,1%) |
| **P3 Others** | | | **181 (23,8%)** |
| P3.1 Treatment issues related to cost-effectiveness | | | 0 (0,0%) |
| P3.2 Unnecessary treatment | | | |
| | C1.1 Drugs are not in accordance with the guidelines/formulary | Patients using omeprazole for more than 3 days | 76 (10,3%) |
| | C1.3 No indication for the drug | Patients were using unindicated acid suppressants | 82 (11,1%) |
| | C1.5 Duplication of inappropriate therapeutic groups or active ingredients | The patient used 2 acid- suppressant drugs, namely ranitidine and omeprazole () | 6 (0,8%) |
| P3.3 Unclear drug-related issues that require further clarification (please use only as an alternative) | | | 0 (0,0%) |
| Total 432 Patients | | | 733 (100%) |

Remarks: MTO, drug-related issues.

The types of drug-related problems (DRPs) in this study were dominated by P.2 Treatment Safety (49.1%), with the secondary domain being P2.1 Adverse drug event (possibly) occurring, which were majority caused by C1.4 Drug-drug interaction (28.6%), C3.4 Dose regimen too frequent (19.9%), and C3.2 Drug dose too high (0.5%). Drug-drug interactions were dominated by the interaction between ranitidine and ketorolac (10.4%), reinforcing the findings of a previous study by Anggun et al. (2024), which noted a higher incidence rate for the same drug pair interaction, reaching 39.2%. Although this combination aims for gastroprotection, this minor interaction occurs due to the inhibition of metabolic processes caused by changes in gastric acid levels, altering the absorption of ketorolac, which may induce adverse effects in patients, such as epigastric pain, nausea, headache, dizziness, and skin rashes (Farida & Faizatus, 2020).

The next interaction was omeprazole and atorvastatin (moderate), which occurred in patients P4, P149, P204, P213, P252, P255, P330, and P405, accounting for 1.1%. Pharmacokinetically, omeprazole is a moderate inhibitor of cytochrome P450 enzymes, particularly CYP2C19 and CYP3A4. Since atorvastatin is metabolized primarily through the CYP3A4 pathway, the inhibition of this enzyme by omeprazole can lead to a decreased

metabolic rate of atorvastatin, potentially increasing atorvastatin plasma levels in the body, which clinically elevates the risk of statin-related adverse effects, such as myalgia or, in rare cases, rhabdomyolysis (Liang et al., 2025). The administration of omeprazole does not always cause overt manifestations of toxicity in all patients; however, monitoring for symptoms of muscle pain or weakness remains recommended, especially in elderly patients or those with comorbidities (Nisa, 2020).

The third most common drug interaction was found in the combination of omeprazole and furosemide (moderate), occurring in patients P5, P7, P50, P255, P273, and P399 at 0.8%, which aligns with a study conducted by Primadhini et al., which also identified the concurrent use of these two drugs at a higher percentage, reaching 8.73%.. Unmonitored hypomagnesemia can trigger further complications, such as cardiac arrhythmias, muscle cramps, and seizures (Primadhini et al., 2023).

This study also identified discrepancies in C3.4 Dose regimen too frequent, where the most significant finding was the use of omeprazole at a dose of 2 x 40 mg, totaling 145 cases (19.8%). Clinically, omeprazole is a Proton Pump Inhibitor (PPI) with a long duration of action; thus, once-daily administration (40 mg/day) is generally sufficient to suppress gastric acid secretion for most indications (DiPiro et al., 2013). The twice-daily frequency without specific indications, such as Zollinger-Ellison Syndrome or gastrointestinal bleeding, potentially increases the risk of long-term adverse effects and therapeutic inefficiency (DiPiro et al., 2025). Other findings showed the use of omeprazole 3 x 40 mg in patient P104 (0.1%), where a dosing frequency of up to three times daily for a PPI is considered highly excessive given the drug's mechanism of action, which irreversibly binds to the H+/K+-ATPase enzyme, providing a high acid-inhibitory effect (DiPiro et al., 2025).

Based on the research results, the prevalence of C3.2 Drug dose too high was most commonly found in the use of oral lansoprazole in patients P74, P181, P346, and P418 (0.5%). The usual dose for oral lansoprazole is 30 mg/day; hence, administration at a dose of 2 x 30 mg is classified as an overdose. The use of such high doses can only be justified in specific clinical conditions, such as severe upper gastrointestinal bleeding (DiPiro et al., 2025). Administering doses above the standard without an urgent clinical indication can increase the risk of toxicity and the patient's financial burden for treatment; consistent with the conclusions of Fahmi et al. (2020), the data obtained in this study indicate a trend where excessive dosing dominates the spectrum of drug-related problems.

Problems in the category P1.2 Effect of drug treatment not optimal were mostly caused by C3.1 Drug dose too low (23.4%), C1.4 Inappropriate drug combination including drug-drug interactions (4.8%), and C3.3 Under-dosing regimen (0.3%). Based on the study results, the occurrence of C3.1 Drug dose too low involved an inappropriate dosing regimen in the form of injectable ranitidine administered at a frequency of 2 x 50 mg per day in patients (23.3%). Theoretically and clinically, the standard regimen recommended by various clinical practice guidelines, such as the American Hospital Formulary Service (AHFS) and the National Drug Information Center (PIONAS) for adult patients with normal renal function, is 3 x 50 mg per day (or 50 mg every 8 hours), for both active gastric ulcer treatment and stress ulcer prophylaxis.

A drug dose that was too low was also found in the use of lansoprazole in patient P82, with a prevalence of 0.1%. According to the literature, lansoprazole is a PPI with a usual adult dose of 30 mg once daily for indications such as gastric ulcer or GERD, which can be increased up to 60 mg per day in pathological hypersecretory conditions (DiPiro et al., 2025). Several

findings in this study demonstrate consistency with prior literature, confirming that the main barrier to treatment effectiveness centers on achieving a suboptimal therapeutic effect, which indicates that despite medical interventions being provided, expected clinical outcomes are frequently not met maximally (Febriani et al., 2020).

Drug-drug interactions under this category were dominated by the interaction between omeprazole and clopidogrel (major), which occurred in patients P50, P195, P253, P282, and P314 (0.7%). The drug interaction emerges during concurrent use with PPIs, particularly omeprazole and esomeprazole, which act by inhibiting the CYP2C19 enzyme, resulting in a decreased conversion of clopidogrel to its active form, thereby reducing its antiplatelet effectiveness. This is supported by a study by Savi et al. (1992), which showed that the combination of omeprazole and clopidogrel significantly decreased the inhibition of platelet aggregation compared to clopidogrel monotherapy.

The next interaction was found in patients P50, P271, and P303, namely omeprazole and Aspilet (0.4%). This minor interaction was also found in a study conducted by Tw et al., where PPIs such as omeprazole and lansoprazole are known to decrease the lipophilicity of Aspilet, negatively impacting its absorption process in the gastrointestinal tract. The increase in gastric pH due to PPI use causes the Aspilet formulation, particularly those with an enteric coating, to experience dissolution impairment. Although PPIs are given as a gastroprotective strategy to prevent gastric irritation due to antiplatelets, it must be considered that this interaction can affect the clinical efficacy of aspirin, to ensure a balance between gastric mucosal protection and successful cardiovascular therapy (Tw et al., 2025).

Patients P50 and P271 also experienced an interaction between omeprazole and Nitrokaf (0.3%), where the concurrent use of omeprazole and Nitrokaf (minor) can theoretically trigger an interaction affecting the pharmacokinetic profile of nitrates. This not only risks reducing the duration of Nitrokaf's efficacy in preventing angina but can also increase the risk of acute vascular adverse effects, such as orthostatic hypotension or severe headaches, due to spikes in plasma nitrate levels (Ramesh et al., 2025).

Additionally, C3.3 Under-dosing regimen was found in the use of oral omeprazole at 0.3%, occurring in patients P43 and P78; this finding is considered very small but clinically still requires evaluation. In standard pharmacotherapy literature, the effective oral dose of omeprazole for gastric acid suppression generally ranges from 20 mg to 40 mg per day (DiPiro et al., 2025).

In this study, problems in category P.3 (Other) were dominated by P3.2 No obvious indication for drug treatment, with the secondary domain being C1.1 Drug not compliant with formulary/guidelines at 10.4%. The high rate in this domain is closely related to hospital formulary restriction policies that limit the duration of use for certain drugs, such as PPIs like omeprazole, to a period of 3 days.

Apart from issues related to restriction duration, this study also identified problems in domain C1.3 No indication for drug, with a prevalence of 11.2%. This finding indicates that a number of patients received drug therapy despite their clinical needs being undocumented in medical records or inconsistent with the established diagnosis. The 11.2% finding in this study aligns with a study conducted by Chia et al. (2014), which showed that 43.2% of PPI use was inappropriate (without indication), particularly among inpatients. Therefore, an active role of pharmacists is required to ensure that every therapy provided has strong medical justification, aligning with patient safety principles.

Another problem identified in this study was C1.5 Inappropriate duplication of therapeutic group or active ingredient with a prevalence of 0.8%. This finding is consistent with research published in the Journal of Management and Pharmacy Practice, which highlights that the concurrent use of drugs from the same therapeutic group can increase potential toxic effects while hindering the optimization of expected therapeutic outcomes (Annisa et al., 2023).

**Predictor Relationship and Number of Drug-Related Problems**

Bivariate analysis was performed using the chi-square test. The chi-square test was used to determine the relationship between age type, number of comorbidities, length of hospitalization, and number of medications to the number of MTOs. The results of bivariate and multivariate analysis of the relationship between risk factors and the number of MTOs can be seen in Table 4.3.

Table 4.3 Results of Bivariate and Multivariate Analysis of Predictor Relationships and Number of MTOs

| Predictors | Number of MTOs | | Bivariate Analysis | Multivariate Analysis | | |
|---|---|---|---|---|---|---|
| | Not Identified | Identified | Value p | OR | 95% KI | Value p |
| Gender | | | 0,268 | | | |
| Male | 27 (6,3%) | 215 (49,7%) | | | | |
| Women | 28 (6,5%) | 162 (37,5%) | | | | |
| Age | | | 0,809 | | | |
| 18-44 Years | 24 (5,6%) | 170 (39,4%) | | | | |
| 45-59 Years | 18 (4,2%) | 108 (25,0%) | | | | |
| ≥60 Years | 13 (3,0%) | 99 (22,9%) | | | | |
| Comorbidities | | | 0.303 | | | |
| None | 41 (9,5%) | 242 (56.0%) | | | | |
| 1-2 Comorbidities | 13 (3,0%) | 121 (28,0%) | | | | |
| 3-4 Comorbidities | 1 (0,2%) | 14 (3,5%) | | | | |
| Length of Stay | | | 0.105 | 1,287 | 0,699-2,3770 | 0,418 |
| <4 Days | 21 (4,9%) | 104 (24,1%) | | | | |
| ≥4 Days | 34 (7,9%) | 273 (63,2%) | | | | |
| Number of Drugs | | | 0.001 | 2,580 | 1.396-4,771 | 0.003 |
| <10 Drugs | 37 (8,6%) | 162 (37,5%) | | | | |
| ≥10 Drugs | 18 (4,2%) | 215 (49,8%) | | | | |

Description: MTO, drug-related problems

Based on the bivariate analysis results, it can be concluded that two predictors of DRPs significantly influenced the number of DRPs, namely length of stay (p = 0.105) and number of medications (p = 0.001). Based on the bivariate analysis criteria with a p-value less than 0.25, these two predictors were eligible to be included in the multivariate analysis. The bivariate analysis showed that the age variable had a p-value of 0.809. In a statistical context, since the p-value was greater than 0.25, there was no statistically significant relationship between age categories and the occurrence of DRPs. Descriptively, the age group of ≥60 years (elderly) indeed presented a higher percentage in the group with DRPs (89.3%) compared to the group without DRPs (10.7%). However, the even distribution across all age groups (18–44 years and

45–59 years) prevented age from becoming a strong standalone predictor in this study. This might occur if pharmacotherapy management for elderly patients in this sample was tightly monitored, or if other factors, such as the number of medications, dominated the risk profile more than biological age alone. Although not statistically significant in this study, other research has shown that the elderly exhibit a fairly high prevalence of DRPs, ranging from 41% to 82%. This high prevalence is frequently associated with age-related physiological changes that alter drug pharmacokinetics and pharmacodynamics; thus, even though age did not emerge as a primary predictor in this bivariate test, close monitoring of potential drug-related problems in geriatric patients cannot be disregarded (Islami, 2025).

The comorbidity variable showed a p-value of 0.303 in the bivariate analysis. This value indicates that the number of accompanying diseases (comorbidities) was not a significant independent risk factor for the occurrence of DRPs in this study. Although clinically, patients with 3–4 comorbidities tend to have higher therapeutic complexity, this reinforces the assumption that it is not the number of diseases that directly causes DRPs, but rather the number of medications used during the patient's hospitalization. This finding differs from other studies concluding that all evaluated patients were accompanied by comorbid conditions, with an average of 4.8 comorbidities per patient, which cumulatively increased treatment complexity and the risk of developing DRPs (Alssageer et al., 2023).

The length of stay variable showed interesting results. In the bivariate analysis, a length of stay of ≥4 days had a p-value of 0.105, meaning there was a partially significant relationship with the number of DRPs. Patients hospitalized for ≥4 days tended to experience DRP events (88.9%). However, in the multivariate analysis, the significance value shifted to $p = 0.418$ ($p > 0.05$). This indicates that length of stay is not a standalone (independent) risk factor. This is supported by findings from other studies showing no significant relationship between the number of DRP occurrences and the patient's length of stay in the hospital ($p = 0.386$). Collectively, these findings indicate that the duration of hospitalization does not automatically increase the risk of drug-related problems unless accompanied by an increase in the complexity of the therapeutic regimen (Rapiah et al., 2021).

The results of the multivariate analysis showed that the number of medications was the most influential risk factor for the number of DRPs. Inpatients receiving ≥10 medications had a 2.580 times higher risk of experiencing DRP events compared to patients receiving less than <10 medications ($p = 0.001$). The results of this study align with prior research reporting that the number of medications significantly affects the number of DRPs (Andrajati et al., 2024). The greater the number of medications received by a patient, the higher the likelihood of DRP occurrences (Gona et al., 2020). Polypharmacy can increase the risk of drug-drug interactions and trigger adverse drug events, thereby increasing the overall number of DRPs (Krustev et al., 2022; Sharp et al., 2019).

**Advantages and Limitations of Research**

This study has a significant novelty because it is the first study conducted at Rumkital Dr. Mintohardjo in analyzing Drug-Related Problems (MTO) in inpatients using acid-suppressive drugs with reference to the international standard instrument PCNE V9.0 In addition, the strength of this study lies in the depth of its analysis which not only identifies problems, but also statistically evaluates the relationship between various specific predictive factors such as age, number of drugs, number of comorbidities, and length of stay against the incidence of MTO. This provides a comprehensive overview of the risk profile of patients at the hospital during the 2024 period.

While providing valuable insights, the study has limitations because it relies entirely on secondary data from the patient's medical records. This led to analysis limited to written documentation in the absence of confirmation through direct clinical observation to validate

conditions in the field. In addition, the design of this study was observational and did not provide direct clinical intervention, so the effectiveness of treatment improvement suggestions could not be measured in this study period.

## CONCLUSION

1. The majority of hospitalized patients receiving acid-suppressant therapy were male (56.0%) and fell within the 18–44 years age group (44.9%). Most patients were prescribed a regimen consisting of ≥10 medications (53.9%), presented with no comorbidities accompanying the primary diagnosis (65.5%), and had a length of stay of ≥4 days (71.1%). Notably, the incidence of Drug Therapy Problems (DTPs) among the study population was 88.2%.
2. A total of 733 DRP events were identified across 432 patients. The most dominant category was Treatment Safety (P2.1), accounting for 49.1% of the cases. The primary issues within this category included drug-drug interactions (28.6%), excessive dosing frequency (19.9%), and excessive drug dosage (0.5%).
3. Based on multivariate analysis, the number of medications was identified as the only significant independent predictor for the occurrence of DRPs ($p = 0.003$). Patients receiving ≥10 medications had a 2.580 fold increased potential (OR 2.580; 95% CI 1.396–4.771) of experiencing a DRP compared to those receiving fewer than 10.

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