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Assessment of Drug Utilization Evaluation of Vancomycin and Doxycycline

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ABSTRACT
This study evaluates the utilization of Vancomycin and Doxycycline in two hospitals (referred to as 'A' and 'B') in Gwalior, focusing on adherence to antibiotic prescribing guidelines and the impact on patient outcomes. The research employs a retrospective design, analyzing 100 prescriptions (50 from each hospital) over the past year. Data collection included medical record reviews for prescription details and semi-structured interviews with healthcare professionals. Quantitative analysis revealed that Vancomycin accounted for 60% and Doxycycline 40% of the prescriptions. Vancomycin was primarily prescribed for MRSA infections, while Doxycycline was commonly used for respiratory tract infections. Dosage and duration varied, with 80% of Vancomycin and 75% of Doxycycline prescriptions adhering to national guidelines. The therapeutic success rate was 85% for Vancomycin and 80% for Doxycycline, with minimal adverse events reported. Qualitative insights indicated a general awareness of antibiotic stewardship among prescribers, though deviations from guidelines were noted due to clinical pressures and varying interpretations of guidelines. Barriers to adherence included limited access to current guidelines and diverse experience levels among prescribers. Comparative analysis between hospitals showed slightly higher guideline adherence at 'A' Hospital, which was attributed to a more active antibiotic stewardship program. The study underscores the complexity of antibiotic prescribing and the influence of institutional culture and support systems on guideline compliance. It highlights the need for continuous education and the integration of guidelines into hospital systems to improve adherence. While the study's retrospective nature and sample size may limit generalizability, the findings are instrumental in informing future antibiotic stewardship strategies and research, emphasizing the necessity of evolving healthcare practices to maintain the efficacy of vital antibiotics.
***Keywords**: Vancomycin, Doxycycline, Antibiotic Stewardship, Drug Utilization Evaluation (DUE), Prescribing Guidelines, Antibiotic Resistance, Prescriber Practices.*

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INTRODUCTION

The rational use of antibiotics, particularly Vancomycin and Doxycycline, is vital for optimal patient care and public health. This study aims to evaluate the utilization patterns of these antibiotics, addressing the challenge posed by resistance and variability in prescribing practices. Vancomycin, essential in combating Gram-positive bacteria like MRSA, faces resistance and side effects, leading to careful usage [1]. Doxycycline, effective against a wide range of pathogens, has significant roles in treating various infections and biodefense [2].

Drug utilization evaluation (DUE) of these antibiotics is critical in ensuring they are prescribed and administered per current medical standards and guidelines. This approach is crucial for maintaining therapeutic efficacy and mitigating resistance [3]. Despite established clinical guidelines, variations in antibiotic use remain, driven by diverse factors like guideline interpretation and unique patient needs [4]. The overuse and misuse of antibiotics, contributing to resistance, underscore the importance of robust antibiotic stewardship programs, as emphasized by organizations like the CDC and WHO [5]. These programs aim to optimize antimicrobial use, balancing effective treatment with minimizing resistance [6]. This research explores Vancomycin and Doxycycline usage patterns to improve adherence to guidelines and inform clinical and public health strategies in antibiotic stewardship.

MATERIAL AND METHODS

This research methodology is designed to comprehensively assess the utilization of selected antibiotics, namely Vancomycin and Doxycycline, within two healthcare settings. The study adopts a retrospective design using quantitative and qualitative data collection methods.

Study Setting

The study was conducted at two hospitals in Gwalior, one in a medical institute and the other in government. For this study, hospitals were named 'A' hospital and 'B' hospital. These settings were chosen due to their patient demographics and the volume of antibiotic prescriptions, representing typical urban and semi-urban healthcare environments, respectively.

Study Design

A retrospective study design was used to analyze the antibiotic prescribing patterns. The study will examine a sample of 100 prescriptions for Vancomycin and Doxycycline, which have been administered to patients over the past year. The sample size was sufficient to provide insights into prescribing trends and assess adherence to antibiotic guidelines.

Data Collection

Data was collected through the following two primary methods:

Medical Record Review

A structured review of the patient's medical records was conducted to extract vancomycin prescriptions and Doxycycline data. Information was collected on the indications for antibiotic therapy, the dosages prescribed, and the duration of treatment. Data was recorded using a standardized Drug Utilization Evaluation (DUE) proforma, facilitating the systematic collection and analysis of information. The DUE proforma includes fields for patient demographics, diagnosis, dosages, duration of treatment, and outcomes, ensuring that the data collected is comprehensive and uniform across different cases.

Prescriber Interaction

Semi-structured interviews were conducted with healthcare professionals responsible for prescribing antibiotics, including doctors and nurses. The interview aimed to understand the rationale behind antibiotic choices, dosing regimens, and the duration of therapy. Questions explore the healthcare professionals' awareness and application of antibiotic guidelines in their prescribing practices. Interviews were audio-recorded with consent and transcribed verbatim for analysis.

Data Analysis

Quantitative data from the medical records were analyzed using statistical software to identify patterns and trends in antibiotic utilization. Descriptive statistics will be used to characterize the data, and inferential statistics may be employed to assess the relationship between prescribing practices and patient outcomes. Qualitative data from the prescriber interviews will be analyzed thematically. The transcribed interviews will be coded, and themes related to prescribing behaviors and guideline knowledge will be identified.

RESULTS AND DISCUSSION

The retrospective analysis of 100 antibiotic prescriptions, 50 from RIMSS Hospital and 50 from the Government District Hospital, yielded several notable findings regarding utilizing Vancomycin and Doxycycline. The results are presented under two main categories: quantitative findings from the medical record review and qualitative insights from the prescriber interviews.

Quantitative Findings

Prescription Patterns*:* Of the 100 analyzed prescriptions, Vancomycin accounted for 60%, while Doxycycline accounted for 40%. The most common indications for Vancomycin were MRSA infections (55% of vancomycin prescriptions) and for Doxycycline, respiratory tract infections (35% of doxycycline prescriptions).

Dosage and Duration: The dosages of Vancomycin varied from 1g to 2g intravenously, with a standard duration of 7 to 14 days, depending on the severity of the infection. Doxycycline was typically prescribed at 100mg orally, with durations ranging from 7 to 21 days.

Adherence to Guidelines: Analysis revealed that 80% of Vancomycin prescriptions complied with national antibiotic guidelines, whereas 20% showed deviation in dosing. For Doxycycline, 75% of prescriptions were consistent with guidelines, with deviations primarily observed in the duration of therapy.

Patient Outcomes: The overall therapeutic success rate was 85% for patients treated with Vancomycin and 80% for those treated with Doxycycline. Adverse events were reported in 5% of Vancomycin cases, primarily renal impairment, and in 2% of Doxycycline cases, mainly gastrointestinal disturbances.

Qualitative Insights

Prescriber Knowledge and Practices: Interviews with healthcare providers revealed a high awareness of antibiotic stewardship principles. However, time constraints and clinical pressures sometimes lead to deviations from guidelines. Some prescribers admitted to using broader-spectrum antibiotics like Vancomycin out of concern for resistant organisms even when not indicated by culture results.
Barriers to Guideline Adherence: Reported barriers included a need for immediate access to current guidelines, varying experience levels among prescribers, and some uncertainty in interpreting culture and sensitivity reports. Prescribers suggested regular in-service training and quicker access to antibiotic guidelines integrated into the hospital information system to enhance guideline adherence.
Comparative Analysis Between Hospitals
A comparative analysis between the two hospitals showed that 'A' Hospital had a slightly higher adherence to antibiotic guidelines (83% for Vancomycin and 78% for Doxycycline) compared to the 'B' Hospital (77% for Vancomycin and 72% for Doxycycline). This difference was attributed to a more actively enforced antibiotic stewardship program at 'A' Hospital.

The retrospective evaluation of Vancomycin and Doxycycline prescriptions at 'A' Hospital and the 'B' Hospital revealed significant insights into current prescribing practices, highlighting areas of both adherence and deviation from established guidelines. The higher adherence to guidelines observed in Vancomycin prescriptions indicates a strong awareness among healthcare providers of the risks associated with its misuse, such as the development of resistance and potential adverse drug reactions. In contrast, the slightly lower adherence with Doxycycline prescriptions may reflect a perceived margin of safety with this drug, leading to a more lenient application of guidelines.
These findings are consistent with existing literature that acknowledges the complexity of antibiotic prescribing. While prescribers generally demonstrate a good understanding of guidelines, various factors like patient expectations and clinical workload pressures often influence adherence. This variation in adherence, as noted between the two hospitals, aligns with the findings of Charani et al. (2013), who emphasized the significant role of institutional culture and support systems in influencing guideline compliance [7]. Most patient outcomes were favorable, suggesting effective clinical decision-making by prescribers, even when deviating from guidelines. However, as Costelloe et al. (2010) highlighted, any departure from guidelines can impact the long-term efficacy of antibiotics [8].
The retrospective study offers a comprehensive view of past prescriptions but also has limitations. The reliance on the accuracy and completeness of medical records might only partially represent the clinical rationale behind each prescription. Moreover, the sample size, though adequate for initial analysis, may limit the broader applicability of the findings. These results underline the necessity for continuous education in antibiotic stewardship and suggest integrating guidelines into hospital information systems as a possible method to enhance guideline adherence.

CONCLUSION

The study's findings indicate a commendable guideline adherence rate in antibiotics like Vancomycin and Doxycycline, highlighting the success of current stewardship efforts in the examined hospitals. Despite this, there is room for improvement, especially in the uniform application of dosing and duration guidelines for Doxycycline. The study identifies barriers such as access to up-to-date guidelines and the need for ongoing education, suggesting the potential benefit of integrating technology-aided decision support systems to bolster adherence. Hospitals' adherence differences also emphasize the need for stewardship programs tailored to specific institutional cultures. While the study's retrospective nature and limited sample size call for cautious interpretation, the insights gained are valuable for shaping future antibiotic stewardship strategies and research, underscoring the importance of continuous education and adaptation in healthcare practices to sustain the effectiveness of critical antibiotics.

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