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Original Article

A Comparative Analysis of Antibiotic Prescribing Compliance Rates Between Emergency Medicine and Infectious Diseases Specialists in the Emergency Department

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Abstract

Background: Antibiotic stewardship is crucial in the emergency department (ED) for optimizing patient outcomes and minimizing antimicrobial resistance. Understanding differences in antibiotic prescribing practices between emergency medicine (EM) and infectious diseases (ID) specialists can inform targeted interventions to enhance antibiotic use in the ED setting. This retrospective cross-sectional study aimed to compare antibiotic prescription compliance rates with established guidelines between EM and ID specialists within the ED.

Methods: This retrospective cross-sectional study was conducted at Rasool Akram Hospital's ED in 2022. Data from electronic health records and the prescription database were analyzed to compare antibiotic prescribing compliance rates between EM and ID specialists. Overall, 770 antibiotic prescriptions from the second half of 2022 were included in this study. Patient demographics, diagnoses, antibiotic details, and prescriber specialty were collected, and descriptive statistics were used to report the data. Finally, using chi-square or Fisher's exact test, the subgroup analysis was considered to compare compliance rates between EM and ID specialists.

Results: Of 770 patients with suspected infections, the ED prescribed antibiotics for 436 (56.6%). Levofloxacin was the most frequent ED antibiotic choice. ID specialists prescribed antibiotics less frequently for 157 patients (20.4%), favoring broad-spectrum combinations such as meropenem + vancomycin. In 38 cases (4.93%), ID specialists discontinued antibiotics initiated by the ED. This frequently involved discontinuing levofloxacin after a revised diagnosis of viral infection. There was low agreement between ED and ID specialists on antibiotic prescribing decisions (kappa: 0.095, $P > 0.05$).

Conclusion: Enhanced collaboration between EM and ID, including rapid diagnostics, tailored protocols, and targeted education, could optimize antibiotic prescribing in the ED. This has the potential to improve patient outcomes and combat antibiotic resistance.

Keywords: Antibiotic prescribing, Emergency department, Infectious diseases, Compliance, Antibiotic stewardship

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Introduction

Antibiotic overuse and misuse represent a major global public health threat, fueling the rise of antibiotic-resistant bacteria (1). The emergency department (ED) is a critical setting where decisions about antibiotic initiation often have to be made quickly with incomplete information (2). Understanding factors influencing antibiotic prescribing practices in the ED is essential for developing targeted

interventions to promote antibiotic stewardship.

Differences in clinical training and expertise likely contribute to variations in antibiotic prescribing between emergency medicine (EM) and infectious disease (ID) specialists. EM physicians are trained for rapid assessment, stabilization, and triage across a broad range of medical conditions. In contrast, ID specialists have in-depth knowledge of ID diagnosis, pathogens, and optimal antibiotic treatment regimens (3). This distinction may lead to differing approaches to antibiotic initiation in the ED setting.

Several factors may drive antibiotic overprescribing in the ED. Diagnostic uncertainty in the face of potentially severe infections can lead EM physicians to err on the side of caution, prescribing antibiotics broadly while awaiting laboratory results (4). The risk of complications from undertreatment, especially in high-risk patients, may also contribute to a lower threshold for antibiotic initiation in the ED (5). Additionally, the fast-paced, high-volume nature of the ED can limit time for in-depth investigations and may favor an initial broad-spectrum antibiotic approach while awaiting ID consultation.

The role of ID specialists in antibiotic stewardship is well-established (6). Their expertise can help ensure appropriate antibiotic selection, dosing, de-escalation when appropriate, and discontinuation when infections are ruled out or deemed viral in origin. Collaboration between EM and ID specialists within the ED has the potential to optimize antibiotic use, minimizing unnecessary prescriptions and reducing antibiotic resistance risks.

Previous studies have reported discrepancies in antibiotic prescribing between different medical specialties (7,8). However, research specifically comparing antibiotic prescribing compliance rates between EM and ID specialists within the ED setting remains limited. Accordingly, a more in-depth understanding of these prescribing patterns, their underlying reasons, and their impact on patient outcomes could have significant implications for improving antibiotic stewardship in the ED.

Objectives

This study seeks to compare antibiotic prescribing compliance rates between EM and ID specialists within a hospital ED. Specific objectives include comparing the overall antibiotic prescribing rates between EM and ID specialists, investigating differences in prescribing patterns, including antibiotic class preference, and assessing the level of agreement between EM and ID specialists regarding antibiotic initiation and discontinuation decisions.

Methods

Study Design and Setting

This retrospective cross-sectional study was performed at Rasool Akram Hospital's ED in 2022. It aimed to compare antibiotic prescribing compliance rates between EM and ID specialists.

To this end, 4 types of diseases, including pneumonia, meningoencephalitis, urinary infection, and skin and soft tissue infections, were examined in terms of antibiotic prescription by the emergency and infectious medicine service.

Data Source and Collection

The required data, including patient characteristics (i.e., age, gender, and primary diagnosis) and prescription details (i.e., antibiotic class, dose, duration, and prescribing physician's specialty, that is, EM or ID), were obtained from the ED's electronic health records and prescription database.

Inclusion and Exclusion Criteria

All ED patients who received antibiotic prescriptions during the second half of 2022 were included in this study. On the other hand, patients with incomplete data, duplicate records, and no antibiotic prescription history were excluded from the analysis.

Sample Size

The study included a total of 770 antibiotic prescriptions. This sample size was large enough to achieve adequate statistical power and ensure the representation of diverse patient populations within the ED.

Data Analysis

- *Descriptive statistics:* Patient demographics and diagnoses were summarized using descriptive statistics (e.g., frequencies, percentages, and measures of central tendency).
- *Primary outcomes:* The overall proportion of antibiotic prescriptions that complied with the established guidelines was calculated and reported.
- *Subgroup analysis:* Antibiotic prescribing compliance rates were compared between EM and ID specialists using chi-square or Fisher's exact test for proportions, as appropriate. Differences in percentages, odds ratios (as a measure of the effect size), and statistical significance (*P* value) were reported.
- *Significance level:* A *P* value of less than 0.05 was considered statistically significant.

Results

Patient Demographics

In general, the files of 770 patients, including 317 (41.2%) females and 453 (58.8%) males, were analyzed in this study. The mean age (± standard deviation) of patients was 64.21 years (± 18.92).

All patients were initially evaluated by the ED and consulted with the ID department due to suspected ID. The ED did not prescribe antibiotics for all patients.

After evaluation by the ED team, 61 antibiotic combinations were prescribed for 436 patients (an average

of one antibiotic combination for every 7.15 patients). However, for 334 patients (43.4%), the ED team did not initiate antibiotics and requested consultation from the ID department.

ID specialists and assistants prescribed a total of 110 antibiotics or antibiotic combinations for the patients (an average of one antibiotic combination for every 7 patients). For 114 patients, the ID team did not prescribe antibiotics and either discharged the patient from the ID department or initiated treatment for viral infections.

The most common antibiotics or antibiotic combinations prescribed by the ED team are presented in Table 1.

Table 2 provides the most common antibiotics or antibiotic combinations prescribed by the ID team.

In 38 patients (4.93%), the ED had initiated antibiotics, but the ID specialists did not consider antibiotics to be necessary. In 21 of these 38 cases, the ED team had prescribed a single dose of levofloxacin, and the ID team did not prescribe antibiotics because they diagnosed a viral infection.

In 80 patients, there was an agreement between the ED and ID teams regarding a lack of prescribing antibiotics.

As expected, there was no significant agreement between the two groups of EM and ID in terms of prescribing antibiotics for patients (kappa: 0.095, $P>0.05$). The data on the prescription of antibiotics are summarized in Table 3.

Discussion

The analysis of antibiotic prescribing practices in the context of COVID-19 reveals significant insights into the management of suspected ID in emergency settings. Our study evaluated 770 patient files, focusing on the demographics, antibiotic prescriptions, and the agreement between ED and ID specialists. The mean age of patients was 64.21 years, with a predominance of male patients (58.8%). This demographic aligns with the findings of other studies, indicating that older adults are more susceptible to severe COVID-19 outcomes, which often necessitate hospitalization and antibiotic therapy (9,10).

Our results demonstrated that 43.4% of patients received no antibiotic prescriptions from the ED, which is consistent with the cautious approach recommended in the literature, particularly in cases where viral infections are suspected (11,12). The ED prescribed antibiotics to 436 patients, with levofloxacin being the most common choice. This conforms to the findings of Mahmoudi et al, representing that levofloxacin is frequently used in cases of suspected bacterial co-infection in COVID-19 patients (13). However, the ID team further refined the antibiotic regimen, with a notable 15.5% of patients receiving no antibiotics upon their evaluation, suggesting a significant role for ID specialists in discerning the necessity of antibiotic therapy in viral infections (14,15).

The lack of agreement between the ED and ID teams regarding antibiotic prescriptions (kappa: 0.095, $P>0.05$) highlights a critical area for improvement in clinical practice. This finding is echoed in the literature, where discrepancies in antibiotic prescribing practices have been documented, particularly in cases of pneumonia and urinary tract infections, where the agreement levels were poor (16,17). The substantial agreement observed in cases of meningoencephalitis (kappa: 0.65) sharply contrasts with the poor agreement in respiratory conditions, indicating that certain conditions may warrant more standardized approaches to antibiotic therapy (18).

Moreover, our results confirmed that 4.93% of patients received antibiotics from the ED that were deemed unnecessary by the ID specialists, primarily due to the diagnoses of viral infections. This reflects a broader trend observed in pediatric studies, where inappropriate

Table 1. Emergency Specialist Prescription

Emergency Department Order	No. (%)
No antibiotic prescription	334 (43.4)
Levofloxacin	111 (14.4)
Meropenem	39 (5.1)
Meropenem and levofloxacin	32 (4.2)
Meropenem and vancomycin	31 (4)
Ampicillin sulbactam	24 (3.1)
Ceftriaxone	24 (3.1)

Table 2. Infectious Specialist Prescription

Infectious Order	No. (%)
No antibiotic prescription	119 (15.5)
Meropenem and vancomycin	82 (10.6)
Levofloxacin	80 (10.4)
Meropenem, levofloxacin, and vancomycin	46 (6)
Ampicillin sulbactam	45 (5.8)
Targocid and tazocin	43 (5.6)

Table 3. Agreement Levels in Antibiotic Prescribing Practices Across Various Conditions

Disease Condition	Antibiotic Prescribed	Kappa Value	Agreement Level
Meningoencephalitis	Vancomycin and ceftriaxone	0.65	Substantial agreement
Pneumonia (respiratory symptoms)	Different combinations	0.03	Poor agreement
Urinary tract infection	Insignificant agreement	N/A	Fair to poor agreement
Soft tissue and skin infections	Insignificant agreement	N/A	Fair to poor agreement
Oral antibiotics (emergency service)	12 cases in total (3 lungs, 2 urinary infections, and 7 soft tissues)	N/A	-
Oral antibiotics (infectious disease service)	7 cases in total (4 lungs, 1 urinary infection, and 2 soft tissues)	N/A	-

antibiotic use remains a concern, particularly in viral infections where antibiotics offer no benefit (19). The findings of our study emphasize the need for enhanced communication and collaboration between ED and ID teams to optimize antibiotic stewardship and reduce unnecessary prescriptions.

Limitations

This study, though insightful, has some limitations. Its retrospective nature and single-center data warrant further investigation to assess generalizability. Additionally, exploring the specific reasons behind prescribing discrepancies through qualitative research could deepen our understanding of this issue.

Conclusion

Overall, our analysis underscores the complexities involved in antibiotic prescribing practices during the COVID-19 pandemic. The demographic data align with the existing literature on COVID-19 susceptibility, while the prescribing patterns reveal both adherence to and deviations from recommended practices. The observed lack of agreement between the ED and ID teams highlights the necessity for improved interdisciplinary collaboration to ensure appropriate antibiotic use, particularly in the context of viral infections. Future studies should focus on developing standardized protocols that can guide antibiotic therapy in emergency settings, ultimately improving patient outcomes and minimizing the risk of antibiotic resistance.

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Authors' Contribution

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Competing Interests

The authors declare that they have no conflict of interests.

Ethical Approval

The study protocol was approved by the Ethics Committee of Iran University of Medical Sciences. Strict measures were taken to protect patient confidentiality throughout all data collection and analysis processes (code of ethics: IR.IUMS.FMD.REC.1401.249).

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