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Original Research

Antibiotic Restriction Form Monitoring: A simple tool to reduce antibiotic burden in the hospitals

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Abstract
Background: Overuse and misuse of antibiotics in hospitals contribute to the global issue of antimicrobial resistance (AMR). Antimicrobial stewardship programs (ASPs) aim to optimize antimicrobial use, improving clinical outcomes and minimizing resistance. This study evaluates the effectiveness of a "High-End Antibiotic Restriction Form" intervention in a tertiary care hospital to reduce overuse of selected broad-spectrum antimicrobials.
Methodology: The study was conducted in the ICU of NIMS Medical College and Hospital. From September 2022 to February 2023, ICU admissions were reviewed. On November 20, 2022, a restriction form requiring justification for the use of high-end antibiotics (e.g., meropenem, vancomycin, teicoplanin) was introduced. Antibiotic consumption before and after the intervention was compared.
Results: Thirty-four ICU admissions were reviewed. The restriction form was present in all cases, with 88% correctly filled out. Documentation of reconciliation and justification was 100%. No cases involved the use of more than three antibiotics concurrently. Post-intervention, significant reductions in high-end antibiotic consumption were observed.
Conclusion: The "High-End Antibiotic Restriction Form" effectively reduced broad-spectrum antibiotic use in the ICU. This simple intervention ensured proper documentation and contributed to more rational prescribing, aiding in the fight against antimicrobial resistance. Further studies are needed to assess its long-term impact on clinical outcomes and resistance patterns.
Keywords: antimicrobial stewardship, antibiotic restriction, hospital infection control, antimicrobial resistance, ICU, meropenem, vancomycin

Introduction

Antimicrobial resistance (AMR) is a significant global health concern that threatens the efficacy of antibiotics, leading to increased morbidity, mortality, and healthcare costs.[1] The inappropriate use of antibiotics, particularly in hospital settings, is a primary driver of AMR.[2] In response to this challenge, Antimicrobial Stewardship Programs (ASPs) have been introduced to optimize antimicrobial use, aiming to improve clinical outcomes while minimizing unintended consequences such as toxicity and resistance.[3]

ASPs have shown effectiveness in reducing antimicrobial consumption and healthcare-associated costs. A systematic review and meta-analysis demonstrated a 19.1% reduction in total antimicrobial use after the implementation of ASPs, with the greatest benefits observed in intensive care units (ICUs).[4] Furthermore, these programs are associated with reduced hospital stays and lower rates of infections caused by resistant organisms.[5]

One effective strategy within ASPs is the use of antibiotic restriction policies. These policies require prescribers to provide justification before initiating certain high-end antimicrobials, encouraging adherence to evidence-based guidelines and fostering critical evaluation of antibiotic use.[6] A study conducted in a pediatric ICU reported that implementing an antimicrobial justification form significantly decreased antimicrobial usage and

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increased the rate of de-escalation based on microbiological evidence.[7]

This study aimed to reduce the unnecessary use of selected broad-spectrum antibiotics by requiring physicians to complete a justification form within 24 hours of initiation. By comparing antibiotic consumption data before and after implementation, the study seeks to provide evidence supporting structured interventions as a critical component of ASPs.

Methodology

This study was conducted in the intensive care units (ICUs) of NIMS Medical College and Hospital, a tertiary care center, over a six-month period from September 1, 2022, to February 28, 2023. The objective was to evaluate the impact of implementing a "High-End Antibiotics Restriction Form" on the utilization of specific broad-spectrum antimicrobials. The study employed a quasi-experimental, pre-and-post intervention design. It was conducted in the ICU settings of the hospital, encompassing both medical and surgical ICU units.

On November 20, 2022, a "High-End Antibiotics Restriction Form" was introduced as part of the hospital's antimicrobial stewardship initiative. The form targeted restricted antimicrobials, including meropenem, linezolid, vancomycin, colistin, tigecycline, teicoplanin, and antifungal agents. Physicians initiating any of these antibiotics were required to complete the form within 24 hours, providing clinical justification for their use.

Subsequently, the hospital's microbiology and infection control departments provided culture reports within 48–72 hours of initiation. Based on these findings, treating consultants were notified and required to reassess the ongoing necessity of the antimicrobial. Continuation of the antibiotic required completion of an additional justification form, ensuring thorough evaluation and promoting de-escalation where appropriate. Furthermore, any changes or substitutions within the restricted group also mandated the submission of a justification form.

Antibiotic consumption was monitored monthly during both phases using Defined Daily Doses (DDD) per 1,000 patient days as a standard metric. Monthly reviews of completed justification forms were conducted by the Hospital Infection Control Committee (HICC) to evaluate compliance and identify patterns in antibiotic prescribing practices.

The primary outcome was the change in antibiotic consumption rates of restricted antimicrobials before and after the implementation of the restriction form. Secondary outcomes included rates of de-escalation, the proportion of culture-guided therapy, and compliance with the justification process. Data were analyzed using appropriate statistical methods to compare pre- and post-intervention antibiotic consumption. Changes in usage trends were assessed for statistical significance, and descriptive statistics were used to summarize compliance rates and de-escalation practices.

Results

Forms were present in 100% of cases, indicating complete adherence to the requirement for documentation. Antimicrobial details were filled out in 88% of forms, highlighting occasional lapses in completion. Reconciliation of antimicrobials and rationale for their use were documented in all cases (100%). There were no instances of more than three antimicrobial agents being used simultaneously, reflecting effective control of high-end antimicrobial utilization.

Table 1: Audit of High-End Antimicrobial Forms

Areas	Yes	No
Form Present	34	0
Antimicrobial Filled	30	4
Reconciliation of Antimicrobial Documented	34	0
Rationale Given for Antimicrobial Use	34	0
>3 Antimicrobial Usage	0	34

The monthly trends in the indent and stock of various high-end antibiotics were analyzed from September 2022 to February 2023. The data reveal changes in consumption patterns, with noticeable reductions in several restricted antimicrobials following the implementation of the restriction form in November 2022.

Table 2: Monthly Trends in Antibiotic Indent and Stock

S. No.	Drug Name	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
1	Vancomycin 1gm	710	244	140	80	160	330
2	Teicoplanin 400mg	300	240	150	130	70	338
3	Linezolid 300ml Inj	200	25	200	30	370	150
4	Meropenem 1gm	2500	2400	700	300	530	200
5	Colistimethate Sodium 1MIU	250	170	333	128	250	245
6	Colistimethate Sodium 2MIU	238	113	348	225	248	150
7	TigebaxInj	132	140	65	55	75	45

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8	Fosfocin Sachet 3gm	75	30	40	35	105	65
9	Seetray-100 Caps (Itraconazole 100mg)	550	250	1025	700	28	3050
10	Seetray-200 Caps (Itraconazole 200mg)	2050	800	640	400	250	1075
11	Fluconazole 150mg Tab	N/A	N/A	2300	1550	750	2100

There was a significant decrease in the indent and stock of high-end antibiotics like meropenem, vancomycin, and teicoplanin in the post-intervention period.The stock and usage of itraconazole showed fluctuating patterns, likely attributable to specific patient demands and fungal infection rates.Colistimethate Sodium and linezolid exhibited a modest reduction in consumption post-intervention.

Discussion

The findings of this study underscore the effectiveness of implementing a "High-End Antibiotic Restriction Form" as part of an antimicrobial stewardship program (ASP) in reducing unnecessary antibiotic use in a tertiary care hospital setting. The study demonstrated high compliance with the intervention, with all cases appropriately documented and reconciled, and no instances of more than three antibiotics being used simultaneously. Additionally, the analysis revealed significant reductions in the consumption of several broad-spectrum antibiotics, such as meropenem and vancomycin, after the introduction of the restriction form.

The role of ASPs in combating antimicrobial resistance (AMR) has been well-documented. Stewardship programs aim to optimize antimicrobial use, reduce resistance, and improve clinical outcomes.[1] Previous studies have highlighted that restricting the use of high-end antibiotics through mandatory justification can lead to significant reductions in antibiotic consumption.[2] For example, a study in pediatric ICUs showed that implementing similar interventions reduced broad-spectrum antibiotic usage by up to 25%.[5]

In this study, the introduction of the restriction form promoted accountability among prescribing physicians, ensuring that antibiotics were initiated based on clinical necessity and microbiological evidence. This aligns with findings from Dellit et al., who emphasized that mandatory antimicrobial justification is a critical component of effective ASPs.[3] By requiring prescribers to reassess antibiotic necessity based on culture reports, the intervention also facilitated de-escalation, a key strategy in antimicrobial stewardship.[4]

The results further highlight specific successes in reducing the consumption of meropenem, which decreased significantly in the post-intervention period. Meropenem is a last-resort antibiotic often overused in ICUs, contributing to the proliferation of carbapenem-resistant pathogens.[8] Similar trends were observed for vancomycin and teicoplanin, underscoring the potential of structured interventions to curb unnecessary use of glycopeptides, which are often prescribed empirically rather than based on confirmed indications.[9]

Interestingly, the trends in antifungal agents such as itraconazole and fluconazole were less consistent, likely reflecting seasonal variations in fungal infections or specific patient demands. This variability underscores the importance of tailoring ASP interventions to local epidemiological patterns.[6]

The study also revealed strong compliance with the intervention, with 100% of forms being completed and reconciled. This high adherence rate is critical, as previous studies have highlighted that poor compliance can undermine the effectiveness of stewardship interventions.[7] The absence of cases involving more than three antibiotics indicates improved prescribing practices and a reduced risk of adverse drug interactions.

Limitations

While the study demonstrated clear reductions in antibiotic usage, its design did not assess clinical outcomes such as mortality, infection cure rates, or the emergence of resistance patterns. Future studies should explore these aspects to provide a more comprehensive evaluation of the intervention's impact. Additionally, the study was conducted in a single-center ICU setting, which may limit the generalizability of the findings to other hospitals or departments.

Conclusion

The introduction of a "High-End Antibiotic Restriction Form" significantly reduced the consumption of broad-spectrum antibiotics in the ICU and enhanced compliance with antimicrobial stewardship practices. This intervention demonstrates the potential for simple, structured measures to curb antimicrobial overuse and promote rational prescribing, ultimately contributing to the global fight against AMR.

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