



IMPACT OF ANTIMICROBIAL STEWARDSHIP STRATEGIES IN A TERTIARY CARE HOSPITAL

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ABSTRACT **Aim:** To study the impact of Antimicrobial stewardship (AMS) strategies in the form of Reserved antimicrobial indent form and Surgical prophylaxis form in a tertiary care hospital. **Methodology:** Antibiotic utilization was calculated in terms of defined daily dose per 100 bed days for each month for six consecutive months. Higher level Antibiotics were categorised as Reserved antibiotics and approvals through indent forms were made mandatory prior to prescription of those antibiotics. **Results:** Antibiotic indent forms like Reserved antimicrobial indent forms and Surgical prophylaxis forms prior to prescription with justifications significantly improved the sensitivity pattern of Bacterial isolates in the post intervention period. The utilization of reserved antibiotics significantly reduced after the AMS interventions. **Conclusion:** The Reserved antibiotic indent forms can be effectively used as AMS tool to combat the growing problem of antimicrobial resistance.

KEYWORDS : Antimicrobial stewardship strategies, Antibigram, Reserved antibiotics, defined daily dose

Introduction:

Monitoring and control of Antimicrobial drugs (AMD) use is a growing concern as AMD resistance is emerging global problem and prescribing practices lack uniformity. As a result, patients with AMD resistant infections are likely to experience longer and costlier hospital stays, requiring treatment with powerful AMDs that may cause additional and more severe side effects. Drug review programs are commonly accepted as a means to encourage appropriate use and may assist in controlling expenditures¹. For organizations like Society of Healthcare Epidemiology of America (SHEA) and Infectious Disease Society of America (IDSA), Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO), optimizing antibiotic use has become a priority². With this objective they have created guidelines on Antibiotic Stewardship (AMS) to streamline the use of antimicrobials. These include two major interventions like "Prospective audit and feedback program" and "preauthorization program"³. Drug review programs in the health care setting helps in detecting early signals of irrational drug use and also serve as indicators of drug prescribing practices. With this view, the present study was undertaken to study the impact of Antimicrobial stewardship strategies such as reserved antimicrobial indent forms and surgical prophylaxis forms on the Antibigram and Antibiotics utilization in the tertiary care hospital.

Methodology:

The antibiotics prescribed and their defined daily doses were noted during the study period. Imipenems, Colistin, Linezolid, Aztreonam, Teicoplanin, Tigecycline and Vancomycin were included in reserved antibiotic list. The prescribers were required to take approval from Hospital Infection Control Committee through the reserved antibiotic and surgical prophylaxis forms with justification before prescribing any of the antibiotics. The interventions in the study included revision of antibiotic policy and discussion of antibiotic treatment on daily basis with clinicians with view of rationalizing antibiotic treatment and provision of antibiogram and reserved antibiotic usage analysis to clinicians on weekly basis through emails. Defined daily dose (DDD)/100 patient days was calculated using the below formula for each category of antibiotics on monthly basis for six consecutive months.

$DDD/100 \text{ patient days} = \frac{\text{Antimicrobial consumption in grams} \times 100}{\text{Number of days} \times \text{occupancy index} \times \text{number of beds}}$

DDD x Number of days x occupancy index x number of beds

The identification of organisms from the clinical samples and susceptibility of the organisms to various antibiotics was tested by using a modified Kirby Bauer disk diffusion method and results were interpreted as per the CLSI guidelines.

Results and Discussion:

Antibiogram: The total number of clinical samples received from admitted patients during the six month period was 132, of which 30

was blood, 46 urine, 49 sputum, 7 pus/wound. Bacterial growth was observed in 67(50.75%) specimens – pus 6 (8.9%), sputum 26 (38.8%), blood 8(11.9%) and urine 27 (40.29%). Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Acinetobacter baumannii, and Staphylococcus aureus were the predominant organisms isolated during the study period.

Table 1 shows the Antibiotic sensitivity pattern of the common isolated organisms in the pre intervention and post intervention period.

% Sensitivity of Bacterial isolates	Escherichia coli	Klebsiella pneumoniae	Pseudomonas aeruginosa	Acinetobacter baumannii	Staphylococcus aureus					
Imipenem	71	77	68	73	67	72	81	92	-	-
Vancomycin	-	-	-	-	-	-	-	-	93	100
Teicoplanin	-	-	-	-	-	-	-	-	87	100
Linezolid	-	-	-	-	-	-	-	-	89	100
Colistin	91	98	86	93	92	100	94	100	-	-
Tigecycline	95	97	83	98	-	-	87	98	-	-
Aztreonam	56	62	62	67	57	65	52	59	-	-

AMS Interventions implemented in the hospital such as Antibiotic policy revision, Antibiotic cycling and Reserved Antibiotic indent forms like Reserved antimicrobial indent forms and Surgical prophylaxis forms prior to prescription with justifications significantly improved the sensitivity pattern of Bacterial isolates as shown in Table 1. Similar results have been reported in previous studies^{4,5,6}.

Antibiotic usage:

Table 2 shows the Utilization of reserved antibiotics in terms of Defined daily doses (DDD) in the pre intervention and post intervention period.

Antibiotic Utilization	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
Imipenem	24.5	22.3	20.5	19.6	19.2	19.1
Vancomycin	22.5	20.3	20.1	19.5	18.6	18.2
Teicoplanin	15.3	14.6	14.2	13.9	13.6	13.1
Aztreonam	8.2	7.3	7.1	6.5	6.4	6.1
Linezolid	13.6	13.1	12.5	11.5	11.1	10.5
Colistin	9.2	8.6	8.1	7.5	7.1	6.5
Tigecycline	8.6	8.1	7.5	7.1	6.9	6.5

The utilization of reserved antibiotics significantly reduced after the AMS interventions. Similar results were reported in a study from Pakistan⁷ wherein Introduction of the 'reserve antibiotic indent forms' resulted in reduction in usage of Carbapenems. Also a similar study reported decreased consumption of restricted antibiotics by 40%⁸

through enforcement of restriction policy. Himmelberg, et al⁹ found that removal of antimicrobial restriction policy resulted in increased use and higher expenditures for previously restricted agents.

The most important goal of AMS is to provide safe and effective antibiotic therapy whilst safeguarding its effectiveness for future generations. This can be accomplished by reducing the total consumption of antibiotics and ensuring their appropriate usage. Interventions to reach that goal include prescription of appropriate empirical therapy, optimal timing, optimal dosing, de-escalation and discontinuation¹⁰. Good collaboration between clinicians, the clinical microbiology laboratory, the committee for infection control and the pharmacy is necessary for achieving all the goals of AMS and a multidisciplinary antibiotic team should be formed to ensure this¹¹.

Conclusion and Recommendations:

- Reserved antimicrobial indent forms and Surgical prophylaxis forms are an effective method for antibiotic utilization review and can have a significant impact on a physician's prescribing patterns to combat the growing problem of antimicrobial resistance.
- Antibiogram and Antibiotic utilisation review should be done at regular intervals in healthcare settings as it contributes to rational drug use, detects early signs of irrational drug use and helps in identifying interventions to improve drug use and follow up.
- Every Healthcare facility should have a multidisciplinary therapeutic committee which should develop a local antibiotic policy based on the antibiogram and national recommendations.

Acknowledgment :

Author acknowledges the immense help received from the scholars whose articles are cited and included in references of this manuscript.

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