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An audit of antimicrobial stewardship 'start smart-then focus' compliance with hospital antimicrobial prescribing policy and guideline.

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Abstract:

Introduction:

All antibiotics should be prescribed appropriately, used for the shortest duration possible that gives an appropriate clinical outcome, and should be managed within a multifactorial programme (including hand hygiene and infection prevention and control precautions) aimed at reducing HCAI and improving antimicrobial use. An Antimicrobial Stewardship Programme is seen as a key component in the reduction of HCAI infections. There are many standards that can be used, and the audit tool could focus on initiation of therapy, switches (intravenous – oral) or 'de-escalation' therapy. Also, the appropriateness of the clinical diagnosis may be difficult to evaluate. However, documentation of the diagnosis itself in the notes can be audited.

OBJECTIVES:

To evaluate antimicrobial utilization pattern in intensive care units along with analysis of complete prescription chart, and to adopt and document evidence of an Antimicrobial Prescribing decision, adherence to Bangalore Baptst Hospital antibiotic policy, de-escalation of antimicrobial therapy, documentation of antimicrobial switch, and of drug allergies if any. Also to adopt and document The 'Start Smart – then Focus' approach for all antibiotic prescriptions.

METHODOLOGY:

It is a prospective observational study in which Medication chart of patients admitted to intensive care units were reviewed and noted down in a predefined data collection form. The collected data include antimicrobial allergies noted, appropriate antibiotics prescribed for infection, start date on chart, indications documented, review/stop dates on the charts, first dose actually administered to the patient within (1–4) hours as according to local agreement/guidelines), IV to oral switch appropriate timing and choice according to local guidelines. The data was compiled in an excel sheet, with appropriate statistical method and was further analyzed.

RESULTS:

Out of a 117 people analysed, 60.68% individuals were cultured positive whereas 39.32% patients either, did not have their culture and sensitivity test performed or were cultured negative. The demographic results male preponderance 57.1% compared to 41.9% female.Majority of patients in the study fall in the range of 46-60 years' age group. Respiratory tract infection was the most common bacterial diagnosis (35.2%) closely followed by Urinary tract infection (26.4 %). Piperacillin/tazobactam (18.46%) was the most commonly prescribed antibiotic. It is followed by Meropenem (17.07%), Colistin (13.24%), Ceftriaxone (10.10%). Escherichia Coli was found to be the most predominat isolate with (22.92%) followed by Klebsiella sp (18.75%) and Enterococcus sp (14.58%). The rates of compliance with local policy was found to be as high as 90.1% in culture performed cases and 78.2 % in non-performed. And, the events of 'review of clinical decision' after 48hrs were found to be 91.5% in Culture positive individuals and 82.6% in culture negative. The most trusted duration of

eradication of micro- organism following antibiotic administration was 3-5 days which was chosen in 47.59 % of prescriptions. Also, the incidences including both ICU and HICU where de-escalation was performed was found to be remarkably superior to other studies in both culture performed 85.9% and non-performed 52.2 % patients.

CONCLUSION:

The study is an attempt to audit antimicrobial stewardship in intensive care unit. It concluded that, the non-compliance with antibiotic policy in the ICUs were largely due to improper and inappropriate antibiotic usage in other indoor units of the hospital. The prevention of respiratory and urinary tract infections is probably the most effective mode to reduce antibiotic use. Physicians commonly prescribed newer AMAs, which when paired with focused approaches are required to tackle MDR and XDR organisms. Finally, the effort of this study revealed, presence of conclusive microbiology and colonization result can notably improve antimicrobial utilization through improved compliance with local policy, presence of bacterial diagnosis, review of clinical decision and timely administration of 1st dose of drugs.

Key words: Antimicrobial stewardship, Antibiotics ,Prescribing Pattern

Introduction

Antimicrobial stewardship is an important concept that is pertinent to virtually every clinician. It involves a multifaceted approach aimed at achieving its goals of combating the emergence of resistance, improving clinical outcomes, and controlling costs by improving antimicrobial use. Although progress in achieving these goals has been realized through the implementation of stewardship programs, there is considerable room for improvement. And because antimicrobial therapy is frequently prescribed in the intensive care unit (ICU), stewardship is particularly relevant in this setting because it provides the framework necessary to improve antimicrobial use. (2)

The discovery of potent antimicrobial agents was one of the greatest contributions to medicine in the 20th century. When introduced, they had an immediate and dramatic impact on the outcomes of infectious diseases, making once-lethal infections readily curable. (3)
In the early days of antibiotics, booming drug development meant that even when resistance developed, a new drug was always available to treat the increasingly resistant bacteria. Fourteen new classes of antibiotics were introduced between 1935 and 2003. However, rapid antimicrobial development came with a cost—antimicrobial resistance.

In the hospital, resistance to antibiotics and antifungals poses the greatest concern. In 2003, US intensive care units (ICUs) reported to the Centers for Disease Control and Prevention that nearly 60% of *Staphylococcus aureus* isolates were resistant to methicillin. Although the rate of invasive methicillin-resistant *S aureus* infections in health care settings was shown to be decreasing in a 2010 Centers for Disease Control and Prevention study, isolates intermediately or overtly resistant to vancomycin are becoming less rare. Perhaps even more difficult to manage has been the increase in gram-negative resistance. Programs such as the international SMART (Study for Monitoring Antimicrobial Resistance Trend) and the SENTRY Antimicrobial Surveillance Program have shown substantial increases in the rate of *Klebsiella* resistance to third generation cephalosporins, extended-spectrum β-lactamase– producing *Klebsiella pneumoniae* and *Escherichia coli*, and *Pseudomonas* resistant to fluoroquinolones. During the past 30 years, antibiotic development has slowed considerably, and our options for treating increasingly resistant infections are becoming more and more limited. This review aims to describe the why, what, who, how, when, and where of antimicrobial stewardship. (1)
The Infectious Diseases Society of America recently published guidelines stating that all hospitals should develop an institutional programme to enhance antimicrobial stewardship. Antimicrobial stewardship entails diverse interventions aimed at reducing inappropriate antimicrobial use while optimizing antimicrobial drug selection, dosing, route and duration of therapy in order to maximize clinical cure or prevention of infection and to limit unintended consequences, such as the emergence of resistance, adverse drug events and the selection of pathogens.
Although these guidelines are intended to apply to all hospitalized patients, many have advocated that initial stewardship interventions be targeted at critical care patients. On one hand, the critical care unit is the area of greatest antimicrobial use and the epicentre of antimicrobial resistance in most hospitals. On the other hand, the vulnerability of critical care patients and the complexity of their clinical management may hinder reductions in antimicrobial use. (4)

ELEMENTS OF AN ANTIMICROBIAL STEWARDSHIP PROGRAM

A comprehensive evidence-based stewardship program to combat antimicrobial resistance

includes elements chosen from among the following strategies, which are based on local antimicrobial use and resistance problems, and on available resources that may differ depending on the size of the institution or clinical setting. (5)

Active Antimicrobial Stewardship Strategies

• **Antibiotic "Time outs."** Antibiotics are often started empirically in hospitalized patients while diagnostic information is being obtained. However, providers often do not revisit the selection of the antibiotic after more clinical and laboratory data (including culture results) become available. An antibiotic "time out" prompts a reassessment of the continuing need and choice of antibiotics when the clinical picture is clearer and more diagnostic information is available. All clinicians should perform a review of antibiotics 48 hours after antibiotics are initiated to answer these key questions.

• **Prior authorization**. Some facilities restrict the use of certain antibiotics based on the spectrum of activity, cost, or associated toxicities to ensure that use is reviewed with an antibiotic expert before therapy is initiated.

• **Prospective audit and feedback**. External reviews of antibiotic therapy by an expert in antibiotic use have been highly effective in optimizing antibiotics in critically ill patients and in cases where broad spectrum or multiple antibiotics are being used. Prospective audit and feedback is different from an antibiotic 'time out' because the audits are conducted by staff other than the treating team. (6)

• **Syndrome-specific interventions** – It is recommended to carry out focused multifaceted interventions for the treatment of specific syndromes, rather than trying to improve treatment of all infections at once. For example, leading hospital's antibiotic stewardship program might take a close look at management of pneumonia during winter, including making recommendations to shorten the amount of time people are treated and switching to an oral agent more quickly, and then measuring the results of those interventions. In the fall, the program might focus on urinary tract infections and then several months later, switch to skin and soft tissue infections. This method makes stewardship more manageable and provides a targeted and clear treatment message.

• **Rapid diagnostic testing** – Rapid diagnostic testing of respiratory specimens can help determine if the cause is viral and therefore reduce the inappropriate use of antibiotics. Rapid testing of blood cultures in addition to conventional culture is helpful, but should be guided by the antibiotic stewardship team for maximum benefit to the patient. (7)

METHODOLOGY:
STUDY SITE:

This study was conducted at Bangalore Baptist Hospital (BBH), Hebbal a multispecialty tertiary care teaching hospital. The hospital has various departments like Medicine, Surgery, Paediatrics, Gynaecology and Obstetrics, Orthopaedics, Ear Nose Throat (ENT), Nephrology, Psychiatry and Dermatology.

STUDY DESIGN
Study setting:

This is a prospective observational study carried out in (i) Intensive Care Unit and (ii) High Intensity Care Unit of Bangalore Baptist Hospital (BBH)

Study criteria
Inclusive criteria:

 All patients admitted to HICU or ICU prescribed with Antimicrobial Agents (AMAs).

 All inpatients that are admitted to HICU or ICU and have their culture investigations are already done.

Exclusion criteria:

- All inpatients and outpatients not prescribed with AMAs
- Patient that are neither presented nor suspected with any form of bacterial infection.

STUDY DURATION

Study is conducted for a six months' duration

SOURCES OF DATA AND MATERIALS

- Prescriptions chart inspection
- Medication charts
- Medication history charts
- Lab data
- Culture results
- Progress charts
- BBH antibiotic policy/ HIC manual

STUDY PROCEDURE:

Medication chart of patients admitted to intensive care units will be reviewed and noted down in a predefined data collection form. The collected data will include demographics, current diagnosis, medical history, medications prescribed (dose, route of administration, frequency, therapy duration, indication, pharmacological classification), marketing categories (generic or branded, single or fixed dose combination), laboratory investigations along with clinical diagnosis consistent with documentation, e.g.CURB score or X-ray changes, documented symptoms and signs that fit with tentative diagnoses. It also includes antimicrobial allergies noted, appropriate antibiotics prescribed for infection , start date on chart ,indications documented ,review/stop dates on the charts need where necessary for serum levels in notes/on charts where appropriate time first dose actually administered to the patient within (1–4) hours as according to local agreement/guidelines), IV to oral switch appropriate timing and choice according to local guidelines.
The patient is further evaluated for the improvement of infection. The patient is observed and monitored and the case is followed until the day of discharge. The observations are noted and recorded. The data will be compiled in an excel sheet, with appropriate statistical method the data will be further analysed.

STATISTICAL ANALYSIS
The study data was analysed by using Microsoft Excel.

Results

CHARACTERESTICS OF THE STUDY POPULATION (n=117)

The study was conducted for a period of 6 months in a tertiary care hospital. Data were prospectively collected from 117 patients, of which 68 (57.1%) were male and 49 (41.9%) were female (Table1). Majority of patients in the study fall in the range of 46 -60 years' age group. It consists of 37.7% of people including both HICU 33(37.5 %) and ICU 11(37.9%). Patients aged 15-30 consists of 16(18.2%) in HICU and 2(6.9%) in ICU, that aged 31-45 years consists of 10(11.3%) in HICU and 6(20.7%) in ICU, that aged 61-75 years consists of of 18(20.4%) in HICU and 8(27.6%) in ICU. Whereas, minority lies in patients above 76 years of age who represent only 11(12.5%) in HICU and 2(6.9%) in ICU were found.

Table 1: Distribution of gender of patients involved in the study.

	MALE	FEMALE	TOTAL
HICU	50 (56.8%)	38 (43.2%)	88
ICU	18 (62.1%)	11 (37.9%)	29
TOTAL	68 (57.1%)	49 (41.9%)	117

Table 2: Distribution of Age of patients involved in the study.

Age distribution (years)		

	HICU	ICU
15-30	16 (18.2%)	2 (6.9%)
31-45	10 (11.3%)	6 (20.7%)
46-60	33 (37.5%)	11 (37.9%)
61-75	18 (20.4%)	8 (27.6%)
75&Above	11 (12.5%)	2 (6.9%)
TOTAL	88	29

DIAGNOSIS OF THE PATIENT

The most presenting bacterial diagnosis include Respiratory tract infection 44 (35.2%), Urinary tract infection 33 (24.6%), Cellulitis 12 (9.6%), Gastro intestinal surgery 4 (3.2%), CNS infection 4 (3.2%) and Unresponsive infection 4 (3.2%).

Table 3: Distribution of bacterial diagnosis of patients involved in the study.

Diagnosis	Frequency(n)			Percentage
	Male	Female	Total	
Urinary tract infection	7 (5)	14 (7)	33	26.4
Abdominal laprotomy	1 (2)	1 (2)	6	4.8
Abscess	0 (1)	1	2	1.6
Cellulitis	5 (3)	3 (1)	12	9.6
CNS infection	2 (2)	0	4	3.2
Diabetic foot	1 (2)	0	3	2.4
Epiglottitis	1	0	1	0.8
Gastrointestinal surgery	2	2	4	3.2
Herninoplasty	0	1 (1)	2	1.6
Pancreatitis	1 (2)	1	4	3.2
Respiratory Tract Infection	17 (7)	14 (6)	44	35.2
Unresponsive infection	1 (1)	1 (1)	4	3.2
Septicemia	1 (2)	0	3	2.4
Encephalopathy	2 (1)	0	3	2.4
TOTAL	69	56	125	100

DISTRIBUTION OF DIFFERENT ORGANISMS AFFECTING THE PATIENTS.

Out of 117 people that were analyzed, 71 individual's culture and sensitivity test showed presence of either gram positive or gram negative bacteria. Among which Escherichia Coli was found to be the most common with 22 (22.92%). Common species like Klebsiella sp, Enterococcus sp and Acinetobacter sp were present in 18 (18.75%), 14 (14.58%) and 13 (13.54%) respectively of the total number of microorganisms. Other frequent enteries include Coagulase Negative Staphylococcus, Staphylococcus Aureus and Pseudomonas Aeruginosa which were present in 9 (9.38%), 8 (8.33%) and 7 (7.30%) respectively. Whereas, organisms such as Enterobacter sp, Proteus Vulgaris, Acinetobacter Calcoaceticus/ Baumani were present only once each.

Table 4: Percentage of culture performed and non- performed patients in HICU and ICU setting.

	HICU	ICU	TOTAL
Culture performed	54	17	71
Not- performed	34	12	46
TOTAL	88	29	117

Table 5: Organisms found in patient's culture and sensitivity test.

Organisms	No. of organisms			Percentage
	MALE	FEMALE	Total	
Enterobacter sp	1	0	1	1.04%
Enterococcus sp	8	6	14	14.58%
Escherichia coli	10	12	22	22.92%
Staphylococcus aureus	5	3	8	8.33%

Pseudomonas aeruginosa	3	4	7	7.30%
Acinetobacter sp	8	5	13	13.54%
Klebsiella sp	11	7	18	18.75%
Proteus vulgaris	0	1	1	1.04%
Proteus mirabilis	1	1	2	2.08%
Coagulase negative staphycococcus	6	3	9	9.38%
Acinetobacter calcoaceticus/ baumani	1	0	1	1.04%

DE- ESCALATION

Streamlining or de-escalating antimicrobial therapy to more targeted therapy decreases antimicrobial exposure and contains cost. Incidences including both ICU and HICU where deescalation was performed was found to be 61(85.9%) in culture performed patients and 24 (52.2 %) in non-performed patients.

Table 6: Incidences of carrying out de-escalation between culture performed individuals vs non- performed individuals.

	DE-ESCLATION PERFORMED			DE-ESCLATION NOT PERFORMED		
	HICU	ICU	TOTAL	HICU	ICU	TOTAL
CULTURE PERFORMED	46 (85.2%)	15 (88.2%)	61 (85.9%)	08 (14.8%)	02 (11.8%)	10 (14.1%)
CULTURE NOT PERFORMED	18 (52.96%) (47.05%)	06 (50.0%)	24 (52.2 %)	14 (47.05%)	06 (50.0%)	22 (47.8 %)

IV ORAL SWITCH

Antimicrobial therapy for patients with serious infections is generally initiated with parenteral therapy. Enhanced oral bioavailability among certain antimicrobials allows conversion to oral therapy once a patient meets defined clinical criteria. This can result in reduced length of hospital stay, health care costs, and potential complications due to intravenous access. Incidences including both ICU and HICU where IV-Oral switch was performed was found to be 14 (19.4%) in culture performed patients and 09 (19.6%) in non- performed patients.

Table 7: IV-oral switch carried out in culture performed and non- performed patients.

	IV-ORAL SWITCH CARRIED OUT			IV-ORAL SWITCH NOT CARRIED OUT		
	HICU	ICU	TOTAL	HICU	ICU	TOTAL
CULTURE PERFORMED	09 (16.7%)	05 (29.4%)	14 (19.4%)	45 (83.3%)	12 (70.6%)	57 (80.3 %)
CULTURE NOT PERFORMED	06 (17.6%)	03 (25.0%)	09 (19.6%)	28 (82.4%)	09 (75.0%)	37 (80.4%)

CLINICAL DECISION TO CONTINUE/ DISCONTINUE THE DRUG:

Antibiotics are generally started before a patient's full clinical picture is known. By 48-72 hours, when additional information is available, it is important for clinicians to re-evaluate why the therapy was initiated in the first place and to gather evidence on whether there should be changes to the therapy. Here, the events of 'review of clinical decision' after 48hrs was found in 65 (91.5%) in Culture performed individuals compared to 38 (82.6%) in non- performed individuals.

Table 8: Incidences of clinical decision reviewed after 48hrs between culture performed individuals vs non- performed individuals.

	CLINICAL DECISION REVIEWED AFTER 48 HRS			CLINICAL DECISION NOT REVIEWED AFTER 48 HRS		
	HICU	ICU	TOTAL	HICU	ICU	TOTAL
CULTURE PERFORMED	50 (92.6%)	15 (88.2%)	65 (91.5%)	04 (07.4%)	02 (11.8%)	06 (08.5%)
CULTURE NOT PERFORMED	28 (82.3%)	10 (83.3%)	38 (82.6%)	06 (17.7%)	02 (16.7%)	08 (17.4%)

INDICATION OF BACTERIAL DIAGNOSIS:

Presence of bacterial diagnosis is one the basic components mentioned under IDSA guidelines for antimicrobial stewardship as it helps maintain an easy exchange of data among various health care workers. Here, the cases with inclusion of indication of bacterial diagnosis on drug chart was found in 63 (88.7%) in Culture performed individuals compared to 09 (19.6%) in non- performed individuals.

Table 9: Table showing presence or absence of indication of bacterial diagnosis.

	INDICATION PRESENT ON DRUG CHART			INDICATION ABSENT ON DRUG CHART		
	HICU	ICU	TOTAL	HICU	ICU	TOTAL
CULTURE PERFORMED	46 (85.2%)	17 (100.0%)	63 (88.7%)	08 (14.8%)	0 (0%)	08 (11.3 %)
CULTURE NOT PERFORMED	05 (14.7%)	04 (33.3%)	09 (19.6%)	29 (85.3%)	08 (66.7%)	37 (80.4%)

TIMELY ADMINISTRATION OF 1ST DOSE OF DRUGS

Early antibiotic use was defined as administration of a broad-spectrum antibiotic within 12 hours from the time of arrival. All patients were classified into either the early administration group or delayed administration group for comparison. Here, the cases early administration was found in 102 (87.17%) cases and delayed administration was found in 15(12.82%) cases.

Table 10: Timely administration of first dose of drug in HICU and ICU setting.

	TIMELY ADMINISTRATION OF 1ST DOSE OF DRUGS DONE			DELAYED ADMINISTRATION OF 1ST DOSE OF DRUGS DONE		
	HICU	ICU	TOTAL	HICU	ICU	TOTAL
CULTURE PERFORMED	50 (92.6%)	15 (88.2%)	65 (91.5 %)	04 (07.4%)	02 (11.8%)	06 (8.5%)
CULTURE NOT PERFORMED	28 (82.3%)	09 (75.0%)	37 (80.4%)	06 (17.7%)	03 (25.0%)	09 (19.6%)

ANTIBIOTIC PIOLICY COMPLIANCE AND DRUG ALLERGY

To curb out inappropriate use of antibiotic guideline on antimicrobial therapy have been developed. Here, compliance with BBH HIC and antibiotic policy was observed and 70

(98.5%) cases were found to be complaint in culture performed and 39(84.7%) cases in nonperformed patients.

Table 11: Compliance and non-compliance with local antibiotic policy/ HICU manual.

	CULTURE PERFORMED			CULTURE NOT PERFORMED		
	HICU	ICU	TOTAL	HICU	ICU	TOTAL
Compliance with local antibiotic policy/ HIC manual	47	17	64 (90.1%)	29	7	36 (78.2%)
Non-Compliance with local antibiotic policy/ HIC manual	7	0	7 (9.9%)	5	5	10 (21.8%)

DRUG ALLERGY

The incidence of drug allergy was found in only one prescription throughout the data collection process.

Total number of drug allergy found= 01

Drug in question= INJ. VANCOMYCIN

NAME	TYPE OF REACTION	DESCRIPTION
INJ. VANCOMYCIN	Augmented pharmacological effect.	The patient under question, 29 year of old male patient was admitted to HICU for Acute Kidney Injury and thrombophlebitis. Later when his urine sample was sent for culture test, it showed presence of Gram positive cocci; Enterococcus SP which was sensitive to Linezolid, Nitrofurantoin, Teicoplanin and Vancomycin. However, under administration of Inj. Vancomycin, his potassium levels reduced significantly from 3.7 mmol/L to 1.3 mmol/L. Vancomycin is commonly known to cause hypokalemia (13%) according to Micromedex drug information, hence in this case was classified as drug allergy.

PARENTAL DRUG ADMINISTRATION

Table 12: Prescription of various parental preparations along with dose and number of days prescribed.

S.N	Drug	Dose	Single Dose	1-2 days	3-5 days	6-7 days	>7days	Total
1	INJ. ACYCLOVIR 750 mg/	500 mg	0	1	0	1	1	3
2	INJ. AMIKACIN	750 mg	1	0	2	4	2	9
3	INJ. AMPICILLIN	500 mg	0	0	1	0	0	1
4	INJ. AUGMENTIN	1.2 gm / 625 mg	0	1	3	1	2	7
5	INJ. AZITHROMYCIN	500 mg	0	0	1	0	0	1
6	INJ. CEFAZOLIN	2 gm	0	0	2	0	0	2
7	INJ. CEFTRIAXONE	2gm/1 gm	5	5	13	2	4	29
8	INJ.CIPROFLOXACIN	500 mg/200 mg	0	0	2	0	0	2
9	INJ. CLINDAMYCIN	600 mg	0	0	1	0	0	1
10	INJ. COLISTIN	3 mu/ 2mu/ 1mu	1	3	18	8	8	38
11	INJ. DOXYCYCLINE	100 mg	0	0	0	0	1	1
12	INJ. ERTAPENEM	1 gm	0	0	1	0	0	1
13	INJ. FLUCONAZOLE	200/400	0	0	4	2	1	7

		mg						
14	INJ. GENTAMICIN	160 mg	0	1	2	3	0	6
15	INJ. IMIPENEM	1 gm	0	0	1	1	1	3
16	INJ. LEVOFLOXACIN	750/ 500 mg	0	0	0	1	1	2
17	INJ. LINEZOLID	600 mg	0	1	2	1	2	6
18	INJ. MAGNEX	1 gm/ 2 gm	1	0	7	1	1	10
19	INJ. MAGNEX FORTE	3gm/ 1.5 gm	2	1	4	2	0	9
20	INJ. MEROPENEM	1gm/ 500 mg	0	0	18	12	19	49
21	INJ. METRONIDAZOLE	500 mg/ 400 mg	0	1	5	8	6	20
22	INJ. PIPTAZ	4.5 gm/ 2.25 gm	1	5	33	9	5	53
23	INJ. STREPTOMYCIN	1.2 gm	0	0	2	0	1	3
24	INJ. TEICOPLANIN	750 mg	1	3	3	4	1	1
25	INJ. TIGECYCLINE	400 mg	0	0	4	2	1	7
26	INJ. VANCOMYCIN	100 mg	0	2	1	0	3	6
	TOTAL		11	22	130	61	63	287

ORAL DRUG ADMINISTRATION

Table 13: Prescription of various oral preparations along with dose and number of days prescribed.

S.N	Drug	Dose	Single Dose	1-2 days	3-5 days	6-7 days	>7days	Total
1	TAB. ACYCLOVIR	400/ 200 mg	0	0	1	0	1	2
2	TAB. ALBENDAZOLE	400 mg	0	0	0	01	1	1
3	TAB. AUGMENTIN	625 mg	0	0	0	0	1	1
4	TAB. AZITHROMYCIN	500 mg	0	2	11	2	0	15
5	TAB. CEFIXIMe	200 mg	0	0	1	0	0	1
6	TAB. CIPROFLOXACIN	500 mg	0	1	2	1	0	4
7	TAB. CLARITHROMYCIN	500 mg	0	0	0	2	1	3
8	TAB. DOXYCYCLINE	100 mg	0	0	2	1	0	3
9	TAB. LEVOFLOXACIN	750 mg	0	0	2	0	0	2
10	TAB. LINEZOLID	600 mg	0	2	3	0	1	6
11	TAB. METRONIDAZOLE	400 mg	0	1	0	0	0	1
	Total		0	6	28	6	5	45

URINARY TRACT INFECTION

The second most common diagnosis found among the 71 patients whose culture and sensitivity test showed presence of microorganism was Urinary Tract infection. UTI was seen in 21 cases.

Among which 7 patients were male and 14 patients were female. The most common diagnosis was found to be Urosepsis 6 (28.5%). It was closely followed by Sepsis 5 (23.8%) and UTI with Acute Kidney Injury 4 (19.0%). The other diagnosis found were Urethritis 2 (9.5%), Pyelonephritis 2 (9.5%), Catheter induced UTI 1 (4.8%) and Obstructive Uropathy 1 (4.8%). The most predominant isolate was Enterococcus sp 7 (33.3%) which was highly sensitive to linezolid, vancomycin and nitrofurantoin. Followed by Escherichia coli 6 (28.5%) highly sensitive to Amikacin, Gentamicin, Imipenem, Meropenem, Ertapenem, and Piptaz. And Klebsiella sp 6 (28.5%) highly sensitive to Meropenem, Gentamicin and Amikacin.

Table 14: Diagnosis of bacterial infection in UTI with frequency and organism.

S.NO	Diagnosis of bacterial infection	Frequency	ORGANISM
1	UROSEPSIS	6 (28.5%)	ENTEROCOCCUS SP, ACINETOBACTER SP, ESCHERICHIA COLI, KLEBSIELLA SP, COAGULASE NEGATIVE STAPHYLOCOCCUS
2	SEPSIS	5 (23.8%)	ENTEROCOCCUS SP, ESCHERICHIA COLI, KLEBSIELLA SP
3	UTI WITH AKI	4 (19.0%)	ENTEROCOCCUS SP, KLEBSIELLA SP, ACINECTOBACTER SP, ESCHERICHIA COLI
4	URETHRITIS	2 (9.5%)	ENTEROCOCCUS SP, ESCHERICHIA COLI
5	PYELONETHRITIS	2 (9.5%)	ESCHERICHIA COLI, KLEBSIELLA SP
6	CATHETER INDUCED UTI	1 (4.8%)	ESCHERICHIA COLI
7	OBSTRUCTIVE UROPATHY	1 (4.8%)	ENTEROCOCCUS SP

ANTIBIOTIC UTILIZATION IN UTI

Table 15: Antibiotic utilization along with no. of days prescribed in UTI sorted according to diagnosis.

Diagnosis of bacterial infection	TREATMENT (DRUGS WITH NO OF DAYS PRESCRIBED)
UROSEPSIS	1. PIPTAZ 4, MEROPENEM 10, TEICOPLANIN 10, COLISTIN 6 2. CEFTRIAXONE 4, PIPTAZ 4, MEROPENEM 6, TEICOPLANIN 3, COLISTIN 2 3. IMIPENEM 7, ERTAPENEM 3, MAGNEX FORTE 4, MEROPENEM 3, COLISTIN 3, AMIKACIN 4 4. PIPTAZ 5, MEROPENEM 5, TEICOPLANIN 8, COLISTIN 8 5. MEROPENEM 11, TEICOPLANIN 9, COLISTIN 6, LINEZOLID 3 6. MEROPENEM 9, TEICOPLANIN 6, AMIKACIN 6
SEPSIS	1. CIPROFLOXACIN 5 2. PIPTAZ 3, MEROPENEM 7, METRONIDAZOLE 5, CIPROFLOXACIN 5 3. CIPROFLOXACIN 1, MAGNEX FORTE 3, MEROPENEM 5 4. AZITHROMYCIN 2, MEROPENEM 10, PIPTAZ 2, COLISTIN 5 5. PIPTAZ 5, MEROPENEM 5, IMIPENEM 2, COLISTIN 3, LINEZOLID 2
UTI WITH AKI	1. PIPTAZ 3D, MEROPENEM 9, TEICOPLANIN 6 2. PIPTAZ 7 DAYS 3. MEROPENEM 3, COLISTIN 2 4. MEROPENEM 6, COLISTIN 4, METRONIDAZOLE 7
URETHRITIS	1. MEROPENEM 7, COLISTIN 2, MAGNEX 8, CIPROFLOXACIN 2 2. MAGNEX FORTE 6, CIPROFLOXACIN 2
PYELONETHRITIS	1. PIPTAZ 2, MEROPENEM 5, MAGNEX FORTE 6, CEFIXIME 4, CEFTRIAXONE 2 2. MEROPENEM 14, COLISTIN 12, MAGNEX 5
CATHETER INDUCED UTI	PIPTAZ 5, TEICOPLANIN 3, AZITHROMYCIN 5
OBSTRUCTIVE UROPATHY	METRONIDAZOLE 22, PIPTAZ 10, COLISTIN 5, IMIPENEM 5, TIGECYCLINE 5

Table 16: Illustration of antibiotics used in UTI with frequency and percentage.

Antibiotics using in UTI	Frequency[n]	Percentage
PIPTAZ	11	15.27 %
MEROPENEM	16	22.22 %
TEICOPLANIN	7	9.72 %
COLISTIN	12	16.66 %
CEFTRIAXONE	2	2.77 %
IMIPENEM	3	4.16 %
ERTAPENEM	1	1.38 %
MAGNEX FORTE	4	5.55 %
AMIKACIN	2	2.77 %
LINEZOLID	1	1.38 %
CIPROFLOXACIN	5	6.94 %
METRONIDAZOLE	3	4.16 %
MAGNEX	2	2.77 %
CEFIXIME	2	2.77 %
TIGECYCLINE	1	1.38 %

RESPIRATORY TRACT INFECTION

The most common diagnosis found among the 71 patients whose culture test showed presence of microorganism was Respiratory Tract infection. RTI was seen in 31 cases. Among which 17 patients were male and 14 patients were female. The most common diagnosis was found to be LRTI with sepsis/ hypoxia 10 (32.25%). It was followed by Ventricular associated pneumonia 5 (16.12%) and Septic Shock 4 (12.90%).

The most predominant isolates were Acinetobacter sp 6 (19.35%) which was highly sensitive to Colistin and Co-trimoxazole. And Klebsiella sp 6 (19.35%), sensitive to Colistin, Imipenem, Meropenem, Ertapenem and Amikacin. Followed by Escherichia coli 5(16.12%) highly sensitive to Cefipime, Imipenem, Meropenem, Amikacin, Piptaz, Cotrimoxazolem Ertapenem. Followed by Pseudomonas Aeruginos 4 (12.90%) which was highly sensitive to Amikacin, Gentamycin, Imipenem, Meropenem and Piptaz. And Staphylococcus Aureus (MSSA) 3 (9.6%) which was highly sensitive to Chloramphenicol, Vancomycin, Clindamycin, Linezolid, Cloxacillin,Cephalexin.

Table 17: Diagnosis of bacterial infection in RTI with frequency and organism.

Diagnosis of bacterial infection	Frequency	ORGANISM
LRTI WITH SEPSIS/ HYPOXIA	10 (32.25%)	KLEBSIELLA SP, ESCHERICHIA COLI, ACINETOBACTER SP, STAPHYLOCOCCUS AUREUS (MSSA), COAGULASE NEGATIVE STAPHYLOCOCCUS, VIRIDANS GROUP STREPTOCOCCUS, ENTEROCOCCUS
COPD/ TB/ PLEURAL EFFUSION	3 (9.67%)	ESCHERICHIA COLI, ACINECTOBACTER SP, , PSEUDOMONAS AERUGINOS, ETEROCOCCUS SP.
SEPTIC SHOCK	4 (12.90%)	KLEBSIELLA SP, PSEUDOMONAS AERUGINOSA, STAPHYLOCOCCUS AUREUS (MSSA), ACINECTOBACTER SP
VENTRICULAR ASSOCIATED PNEUMONIA	5 (16.12%)	KLEBSIELLA SP, STAPHYLOCOCCUS AUREUS (MSSA), ENTEROBACTER SP, ACINECTOBACTER SP
PNEUMONIA (ASPIRATION/ NOSOCOMICAL)	3 (9.67%)	ESCHERICHIA COLI, KLEBSIELLA SP, ENTEROCOCCUS SP
PULMONARY EDEMA	3 (9.67%)	ESCHERICHIA COLI, KLEBSIELLA SP, ACINECTOBACTER SP
BRONCHIAL ASTHAMA	1 (3.22%)	PSEUDOMONAS AERUGINOSA
TRACHEAL STENOSIS	2 (6.45%)	PSEUDOMONAS AERUGINOSA, ACINECTOBACTER SP

ANTIBIOTIC UTILIZATION IN RTI

Table 18: Antibiotic utilization along with no. of days prescribed in RTI sorted according to diagnosis.

Diagnosis of bacterial	TREATMENT (DRUGS WITH NO OF DAYS PRESCRIBED)

infection	
LRTI WITH SEPSIS/ HYPOXIA	1. PIPTAZ 6, MEROPENEM 6, VANCOMYCIN 15, COLISTIN 10, STREPTOMYCIN 29, LEVOFLOXACIN 28, TIGECYCLINE 12, MAGNEX FORTE 6 2. CEFTRIAXONE 1, PIPTAZ 3, MEROPENEM 6, DOXYCYCLINE 3, COLISTIN 4, TIGECYCLINE 3, FLUCONAZOLE 3 3. CEFTRIAXONE 2, AZITHROMYCIN 7, PIPTAZ 5 4. CEFTRIAXONE 13, AMIKACIN 7, AZITHROMYCIN 3, MEROPENEM 3, COLISTIN 2 5. AUGMENTIN 2, CEFAZOLIN 5, PIPTAZ 3, MEROPENEM 11, COLISTIN 7, MAGNEX 5, TIGECYCLINE 3 6. CEFTRIAXONE 1, AZITHROMYCIN 5, OSELTAMIVIR 5, PIPTAZ 7, MEROPENEM 9, COLISTIN 6 7. PIPTAZ 5, AZITHROMYCIN 5, OSELTAMIVIR 5, TEICOPLANIN 3 8.PIPTAZ 5, DOXYCYCLINE 7, MEROPENEM 5, TEICOPLANIN 2, COLISTIN 3, LINEZOLID 2 9. MAGNEX 1, FLUCONAZOLE 7, PIPTAZ 7, MEROPENEM 3 10. PIPTAZ 4, AZITHROMYCIN 4, LINEZOLID 21, MEROPENEM 4, COLISTIN 4
COPD/ TB/ PLEURAL EFFUSION	1. CEFTRIAXONE 3, PIPTAZ 3, COLISTIN 17, MEROPENEM 16, AUGMENTIN 8 2. CEFTRIAXONE 5, AZITHROMYCIN 4, PIPTAZ 6, STREPTOMYCIN 4, LEVOFLOXACIN 4 3. PIPTAZ 2, AZITHROMYCIN 4, OSELTAMIVIR 5, MEROPENEM 7, TEICOPLANIN 7, MAGNEX FORTE 5, COLISTIN 5
SEPTIC SHOCK	1. AZITHROMYCIN 4, PIPTAZ 6, MEROPENEM 5, COLISTIN 3 2. CEFTRIAXONE 3, AMIKACIN 8, PIPTAZ 4, MEROPENEM 7, TEICOPLANIN 5, COLISTIN 3, FLUCONAZOLE 3 3. PIPTAZ 5, AZITHROMYCIN 5, MEROPENEM 5, LINEZOLID 4 4. CEFTRIAXONE 2, AZITHROMYCIN 5, OSELTAMIVIR 5, PIPTAZ 5, MEROPENEM 8, COLISTIN 6
PNEUMONIA (ASPIRATION/ NOSOCOMICAL)	1. CEFTRIAXONE 3, METRONIDAZOLE 7, PIPTAZ 5, MEROPENEM 7, COLISTIN 5 2. AUGMENTIN 4, PIPTAZ 6, METRONIDAZOLE 6, CIPROFLOXACIN 5 3. MAGNEX 8, AZITHROMYCIN 6, CIPROFLOXACIN, MEROPENEM 7, COLISTIN 2
PULMONARY EDEMA	1. CEFTRIAXONE 9, CLARITHROYCIN 12, ALBENDAZOLE 8, AUGMENTIN 6, FLUCONAZOLE 7 2. CEFTRIAXONE 3, AZITHROMYCIN, PIPTAZ 4 3. PIPTAZ 9, MEROPENEM 4, COLISTIN 4
BRONCHIAL ASTHAMA	CEFTRIAXONE 3, AZITHROMYCIN 5, LINEZOLID 8, OSELTAMIVIR 5, PIPTAZ 5, MEROPENEM 4
TRACHEAL STENOSIS	1. CEFTRIAXONE 1, AMIKACIN 7, MAGNEX 6, PIPTAZ 2, MEROPENEM 4, COLISTIN 1 2. MAGNEX FORTE 1, CEFTRIAXONE 3, PIPTAZ 9, COLISTIN 4
VENTRICULAR ASSOCIATED PNEUMONIA	1. MEROPENEM 7, COLISTIN 7 2. PIPTAZ 4, MEROPENEM 5, COLISTIN 7, TIGECYCLINE 7 3. AUGMENTIN 2, CEFAZOLIN 5, PIPTAZ 3, MEROPENEM 11, COLISTIN 7, MAGNEX 5 4. CEFTRIAXONE 8, AMIKACIN 8, PIPTAZ 5, LINEXOLID 7, MEROPENEM 11, COLISTIN 11, GENTAMICIN 6 5. MAGNEX 5, METRONIDAZOLE 8, IMIPENEM 11, PIPTAZ 5, COLISTIN 5

Table 19: Illustration of antibiotics used in RTI with frequency and percentage.

Antibiotics using in RTI	Frequency[n]	Percentage
PIPTAZ	27	17.88 %
MEROPENEM	23	15.23 %

VANCOMYCIN	1	0.66 %
COLISTIN	22	14.56 %
STREPTOMYCIN	2	1.32 %
MAGNEX FORTE	3	1.98 %
LEVOFLOXACIN	2	1.32 %
TIGECYCLINE	4	2.64 %
FLUCONAZOLE	4	2.64 %
MAGNEX	6	3.97 %
CEFTRIAXONE	15	9.93 %
DOXYCYCLINE	2	1.32 %
AZITHROMYCIN	13	8.60 %
AMIKACIN	4	2.64 %
ALBENDAZOLE	1	0.66 %
CEFAZOLIN	2	1.32 %
OSELTAMIVIR	5	3.31 %
TEICOPLANIN	4	2.64 %
LINEZOLID	4	2.64 %
IMIPENEM	1	0.66 %
CLARITHROMYCIN	1	0.66 %
AUGMENTIN	5	3.31 %

CELLULITIS

The term cellulitis is used to indicate a non-necrotizing inflammation of the skin and subcutaneous tissues, usually from acute infection. Cellulitis usually follows a breach in the skin; the breach may involve microscopic skin changes or invasive qualities of certain bacteria. It was found in 8 individuals in the study, among which 5 patients were male and 3 patients were female. The most common organism associated was found to be Coagulase negative staphylococcus 3 (37.5%) which was highly sensitive to Chloramphenicol followed by Escherichia Coli 2 (25.0%) which was highly sensitive to Clotrimoxazole and Enterococcus SP 2 (25.0%) which was sensitive to Gentamycin, Linezolid and Vancomycin. Proteus Vulgaris was found in one instance.

Table 20: Organisms, frequency and drug therapy for cellulitis.

ORGANISM	FREQUENCY	TREATMENT (DRUGS WITH NO OF DAYS PRESCRIBED)
ESCHERICHIA COLI	2 (25.0%)	1. CEFTRIAXONE 3, METRONIDAZOLE 7, PIPTAZ 5, MEROPENEM 7, COLISTIN 5 2. CEFTRIAXONE 2, AZITHROMYCIN 7, PIPTAZ 5 3. PIPTAZ 6, MEROPENEM 6, CLARITHROMYCIN 7 4. PIPTAZ 5, AUGMENTIN 9, MEROPENEM 10, COLISTIN 6 5. AUGMENTIN 3, CLINDAMYCIN 3, METRONIDAZOLE 9, PIPTAZ 14, MEROPENEM 3, LINEZOLID 18 6. PIPTAZ 13, METRONIDAZOLE 2, CLARITHROMYCIN 5, MEROPENEM 10, LINEZOLID 2, VANCOMYCIN 2 7. CEFTRIAXONE 1, AUGMENTIN 5, METRONIDAZOLE 6, PIPTAZ 4, LINEZOLID 2 8. AMPICILIN 5, GENTAMICIN 5, METRONIDAZOLE 5
PROTEUS MIRABILIS	1 (7.6%)	
ENTEROCOCCUS SP	2 (25.0%)	
COAGULASE NEGATIVE STAPHYLOCOCCUS	3 (37.5%)	

ANTIBIOTIC UTILIZATION IN CELLULITIS

Table 21: Illustration of antibiotics used in Cellulitis with frequency and percentage.

Antibiotics using in Cellulitis	Frequency	Percentage
CEFTRIAXONE	3	8.57 %
METRONIDAZOLE	5	14.28 %
PIPTAZ	7	20.00 %
MEROPENEM	5	14.28 %
COLISTIN	2	5.71 %
AZITHROMYCIN	1	2.85 %
CLARITHROMYCIN	2	5.71 %
AUGMENTIN	3	5.55 %
AMPICILIN	1	2.85 %
GENTAMYCIN	1	2.85 %
LINEZOLID	3	6.94 %
VANCOMYCIN	1	8.57 %
CLINDAMYCIN	1	2.85 %

Discussion

Antimicrobial stewardship is an important concept that is important to virtually every clinician. AMS programs have been pursuing goals focusing on ensuring the proper use of antimicrobials to provide the best patient outcomes, lessen the risk of adverse effects, promote costeffectiveness, and reduce or stabilize levels of resistance. (1) Although progress in achievin these goals has been realized through the implementation of stewardship programs, there is considerable room for improvement. And because antimicrobial therapy is frequently prescribed in the intensive care unit (ICU), stewardship is particularly relevant in this setting because it provides the framework necessary to improve antimicrobial use.(2) In the present study, the utilization pattern of antibiotic agents used in infections have been studied. The data of 117 patients admitted to intensive care units (HICU and ICU) with diagnosis of bacterial infection during the period OCTOBER 2016 and MARCH 2017 were analysed. Out of 117 people that were analysed, 71 (60.68%) individual's culture and sensitivity test showed presence of either gram positive or gram negative bacteria whereas the remaining 46 (39.32%) patients either did not have their culture and sensitivity test performed or were cultured negative. Similar results were obtained by cross sectional retrospective study carried out by Radji M, Fauziah S et al (3) where Specimens were collected from 385 patients who were given antimicrobial treatment, of which 249 (64.68%) were cultured positive and 136 (35.32%) were negative.

The demographic results of the study revealed male preponderance as 68 (57.1%) patients were male compared to 49 (41.9%) female. Majority of patients in the study fall in the range of 46-60 years' age group similar to the study carried out by Meher BR, Mukharjee D et al (4) where out of a total of 200 patients taken into study, 116(58%) were males and 84(48%) were females respectively with a mean of age of patients was 48.8 years.

In another surveillance study conducted by Bergmans DC, Bonten MJ et al (5) recording the incidence of infections, antibiotic use, and antimicrobial susceptibilities of pathogens supply, they found that, of all antibiotics prescribed for therapy, 49% were for respiratory tract infections, 19% for abdominal infections and 13% for sepsis. Similarly, the result of the present study has shown the most presenting bacterial diagnosis include Respiratory tract infection (35.2%), Urinary tract infection (24.6%), Cellulitis (9.6%), Gastro intestinal surgery (3.2%), CNS infection (3.2%) and Unresponsive infection (3.2%). Bergmans DC, Bonten MJ et al even concluded that Respiratory infections were the single most common infection and accounted for 49% of all antibiotics used. Therefore, in their setting, prevention of respiratory tract infections is probably the most effective mode to reduce antibiotic use. While, RTI may not be equally as epidemic in the present study, it certainly in the sole runner as the most frequently diagnosed bacterial infection. Hence preventive measures of RTI can significantly reduce antibiotics.

The present study shows Piperacillin/tazobactam (18.46%) as the most commonly prescribed antibiotic. It is followed by Meropenem (17.07%), Colistin (13.24%), Ceftriaxone (10.10%) and Metronidazole (20 6.9%). The result obtained by Anand N, Nagendra Nayak I et al (6) after conducting a prospective observational study about the utilization of different classes of AMAs in the ICU of a tertiary care hospital shows Ceftriaxone (22.77%) as the most commonly prescribed AMA followed by Piperacillin/tazobactam (15.79%), metronidazole (12%), amoxicillin/clavulanic acid (6.44%), and azithromycin (4.34%). While variation between the results of most commonly used AMAs can be seen between the two studies upon comprehensive view but upon detailed review we find that macrolides and penicillins (like azithromycin and augmentin) found in high percentage in Anand N, Nagendra Nayak I et al's

study have also been frequently prescribed in the present study too. Furthermore, Anand N, Nagendra Nayak I et al concluded leaving a note mentioning the increased use of newer AMAs such as linezolid, clindamycin, meropenem, colistin on their study too.

A study conducted by Radji M, Fauziah S et al (3) shows that the most predominant isolate was Pseudomonas aeruginosa (P. aeruginosa) (26.5%) followed by Klebsiella pneumoniae (K. pneumoniae) (15.3%) and Staphylococcus epidermidis (14.9%). However, in the present study Escherichia Coli was found to be the most predominat isolate with (22.92%) followed by Klebsiella sp, (18.75%), Enterococcus sp (14.58%), Coagulase negative staphycococcus (9.38%) and Staphylococcus aureus (8.33%). While Klebsiella and Staphylococcus are almost similarly distributed in both studies, the predominace of Escherichia Coli may be due to high incidences of Respiratory and Urinary Tract infection in present study.

According to a study conducted by Conly JM (7) at The Toronto Hospital it suggests that at least 40% of antibiotic drugs are eligible for early conversion to oral therapy. A similar survey of patients at Mount Sinai Hospital in Toronto revealed that 40% of patients receiving a thirdgeneration cephalosporin were eligible for oral therapy after 72 h of intravenous therapy. However,the rates of conversion from IV to oral in the present study is very low at 19.4 %. This may be mainly due to shifting of patients to other indoor units of hospital or discharge to reduce cost or under influence from the patient representative. Or due to understandings such as Infectious diseases needing intravenous treatment and conversion to oral therapy should be used sparingly.Also beliefs such as oral antimicrobials not being equivalent to intravenous therapy and that the oral antimicrobial must be the same medication or from the same medication class as the intravenous agent.

Streamlining or de-escalating antimicrobial therapy to more targeted therapy decreases antimicrobial exposure and contains cost. Incidences including both ICU and HICU where deescalation was performed was found to be 61(85.9%) in culture performed patients and 24 (52.2 %) in non-performed patients. De Waele JJ, Ravyts M et al (8) conducted a retrospective analysis of all meropenem prescriptions in a surgical intensive care unit (ICU) during 1 year. Data from 113 meropenem prescriptions were available for analysis. Empirical prescription of meropenem was de-escalated in 42% of the patients. De-escalation after empirical treatment with meropenem was performed in less than half of the patients. Reasons for not de-escalating in their study included the absence of conclusive microbiology and colonization which is similar to findings in the present study.

Compliance with the newly introduced antibiotic policy was studied for a period of six months in the present study as well as in a prospective study conducted by Banerjee T, Anupurba S et al (9) to determine the compliance with the antibiotic policy in the intensive care unit (ICU) of a tertiary care hospital. The rate of compliance in their study with the antibiotic policy was 21.18%. However, the rates of compliance in the present study was much better at 90.1% in culture performed cases and 78.2 % in cases where culture was not performed. The reason for such non-compliance in Banerjee T, Anupurba S et al's study was mentioned to be due to heavy use of antibiotics prior to the time of admission in the ICU. They found non-compliance with the antibiotic policy in the ICU mainly due to improper and inappropriate antibiotic usage in other indoor units of the hospital.

A retrospective analysis of the indoor case papers of ICUs by Sheth K V, Patel TK et al (10) showed Respiratory tract infection (RTI) as the most common infection. Imipenem, Meropenem and levofloxacin were the most effective antimicrobials for Gram negative isolates (GNIs) while vancomycin ciprofloxacin, and gentamicin were the most efficacious antimicrobials for Gram-positive isolates (GPIs). Similarly, in the present study too Respiratory Tract Infection was the most common bacterial infection (35.2%). Colistin, Meropenem, Impenem and Co-trimoxazole were the most effective antimicrobials for Gram negative isolates (GNIs) while Chloramphenicol, Vancomycin, Clindamycin, Cloxacillin and Cephalexin were the most efficacious antimicrobials for Gram-positive isolates (GPIs). A study conducted by Pattanayak C, Patanaik S et al (11) in the ICU of Hi-Tech Medical College and Hospital, Odisha, Eastern India showed Urinary tract infection was the most common infection (54.9%). The predominant isolate was E. coli (52.7%) followed by P. mirabilis (15.4%) and Ps aeruginosa (13.2%). E. coli was highly sensitive to Polymyxin B, Gatifloxacin and Ceftriaxone and showed high degree of resistance to Cephalexin, Cefadroxil, Tobramycin and Prulifloxacin. Similary in present study, Urinary tract infection was the second most common infection (26.4 %). The most predominant isolate was Enterococcus sp 7 (33.3%) which was highly sensitive to linezolid, vancomycin and nitrofurantoin. Followed by Escherichia coli 6 (28.5%) highly sensitive to Amikacin, Gentamicin, Imipenem, Meropenem, Ertapenem, and Piptaz. And Klebsiella sp 6 (28.5%) highly sensitive to Meropenem, Gentamicin and Amikacin.

Conclusion

The study attempted to audit antimicrobial stewardship pattern in intensive care unit.The rates of compliance with local policy was found to be as high as 90.1% in culture performed cases and 78.2 % in cases where culture was not performed. The reason for non-compliance was addressed to heavy usage of antibiotics prior to admission in the ICU. This study concludes that, the non-compliance with antibiotic policy in the ICUs were largely due to improper and inappropriate antibiotic usage in other indoor units of the hospital.

Respiratory tract infection was the most common bacterial diagnosis (35.2%) closely followed by Urinary tract infection (26.4 %). These two infections were combinedly responsible for >60% of admissions. Therefore, in this setting, prevention of respiratory and urinary tract infections is probably the most effective mode to reduce antibiotic use.

It was observed that physicians commonly prescribed antimicrobial agents like Piperacillin/tazobactam, Meropenem and Colistin coupled with other Newer-Antimicrobial Agents (AMAs) like Tigecycline and Rifampicin. 'Smart' strategies such as this, paired with 'focused' ingenious and judicious approaches are required to tackle MDR and XDR organisms. The results provided an insight to the meagre rates of conversion (19.4%) from IV to oral. The ratio of oral to IV prescription was 1: 6.37. In other words, for every single prescription of oral drugs, >6 parental preparations were prescribed. This shows an in increased risk of cannularelated infection, thrombophlebitis, increased cost and also increased duration of hospital stay.
Of a total of 117 patients that were enrolled, it was observed that 60.68% individuals were cultured positive whereas 39.32% patients either, did not have their culture and sensitivity test performed or were cultured negative.While, Incidences including both ICUs where 'deescalation was performed' were found to be remarkably superior compared to other similar studies with 85.9% positive in culture performed and 52.2 % in non-performed patients. Nonetheless, a significant difference can be seen between the two groups (culture performed vs non-performed). Similar substantial differences were also evident in other sections such as compliance with local policy, presence of bacterial diagnosis, review of clinical decision and timely administration of 1st dose of drugs. Hence, the effort of this study revealed, presence of conclusive microbiology and colonization result can notably improve antimicrobial utilization.

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