
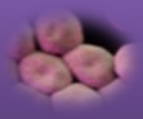
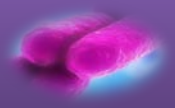
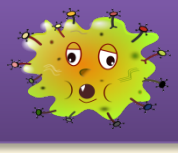

Healthcare Associated Infections (HAI)

About 5% - 10% of patients admitted to hospitals acquire one or more infections, as per the data reported from developed countries. In the USA, it is reported that 1 out of every 136 hospital patients becomes seriously ill as a result of acquiring an infection in the hospital. It is estimated that in developing countries (including India) the risk of Healthcare Associated Infections (HAI) is 2 to 20 times higher than in developed countries. In India, indiscriminate use of antibiotics both in community settings and in hospital settings contributes to development of antibiotic resistance. Further there is need for robust reporting of HAI in India. This 'double-edged-sword' of indiscriminate antibiotic use and lack of reporting of healthcare associated infections needs to be addressed. The Director-cum-Vice Chancellor of SVIMS **Dr. B. Vengamma** announced that SVIMS is taking a step forward to contribute in containing HAI in India. Adapting international guidelines (eg WHO, CDC) SVIMS is invoking a ten pronged strategy. One key component is 'Antimicrobial Stewardship', which aims to optimize antibiotic use among patients in order to reduce antibiotic resistance, improve patient outcomes and safety and ensure cost effective therapy. Hon'ble Health Minister of Andhra Pradesh, released the first edition of "SVIMS Antimicrobial Stewardship pocket guide" on 12.07.2016. This is revised 6 monthly and new editions are released every January and July to inform all health care personnel (doctors, nurses, and allied health staff) of pathogen surveillance, antimicrobial use, infection control measures and outcomes. This programme is jointly monitored by Hospital Infection Control Committee and SVIMS Quality Council.

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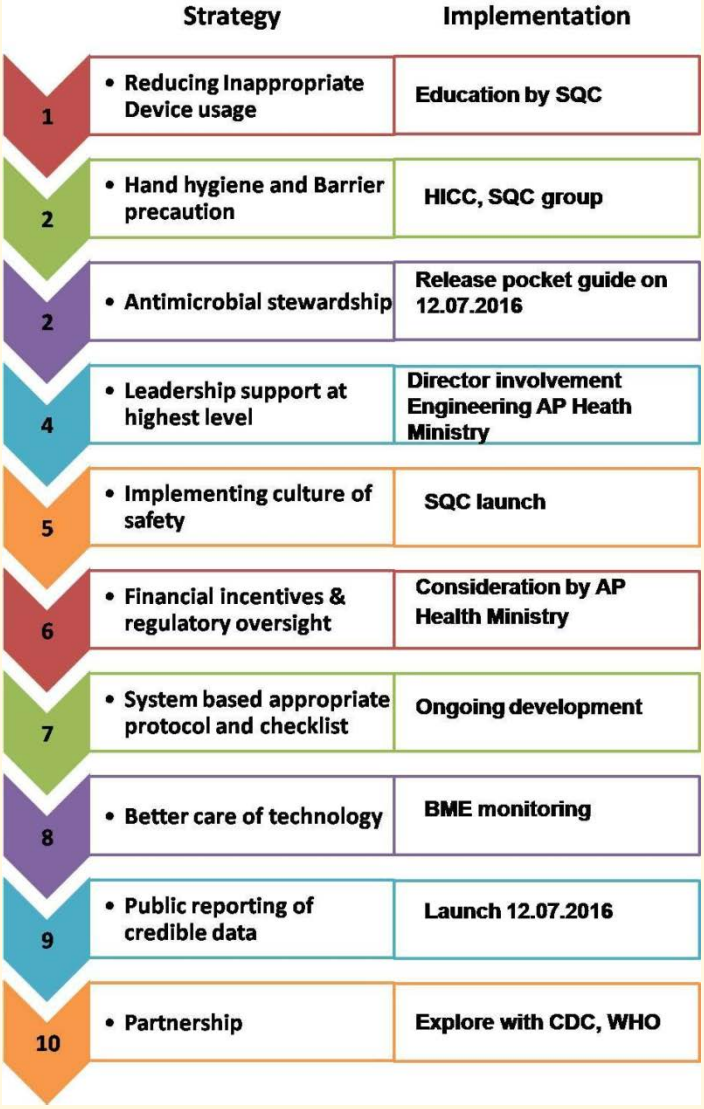


SQC = SVIMS Quality Council

HICC = Hospital Infection Control Committee

BME = Biomedical Engineering

CDC = Center for Disease Control and Prevention

WHO = World Health Organization

2) Hospital Infection Control (HIC) Committees

HIC Committee Members:

- HICC Chairman – Dr B. Vengamma, Director cum Vice Chancellor
  HICC Co-Chairman
- Dr. Ram, Medical Superintendent
- Member Secretary- Dr K.V. Sreedhar Babu, HOD i/c of Microbiology
- Hospital Infection Control Officers-Dr.R.Jayaprada, Dr.N.Ramakrishna, Dr S. Yamini
- Senior Consultant- Dr A. Mohan, Senior professor& HOD of Medicine-
  Member All the heads of the departments- Members
- Nursing AD- Mrs T. Prabhavathi
- Nursing Superintendent Grade I- Mrs.C.Sunitha-Member
- Infection Control Nurses- V.Karpugam, D.Redemma, A.Shobharani & all 47 Head nurses-Members
- Infection Control technicians: Mr P.Yashodhar, Mr V. Venkatesh
- Operating theatre Incharge- Mrs Munilakshmi- Member
- In-charge of Central Sterile Supplies Department- Mrs. T. Prabhavathi-Member
- Health inspector – Mrs. A.Umamaheswari-Member
- In-charge of pharmacy- Dr. P.Subramanyam-Member In-charge of
  hospital linen- Mrs. C.Sunitha-Member
- In-charge of hospital laundry- D.Indiramma-Member
- In-charge of hospital kitchen- Mrs M.Sunitha, Mrs Geetha-Member
- Epidemiologist- Dr V. Chandrasekhar, Assistant professor, Social &
  Preventive medicine-Member

3) HIC Terms of Reference

1. **Health care associated infections**

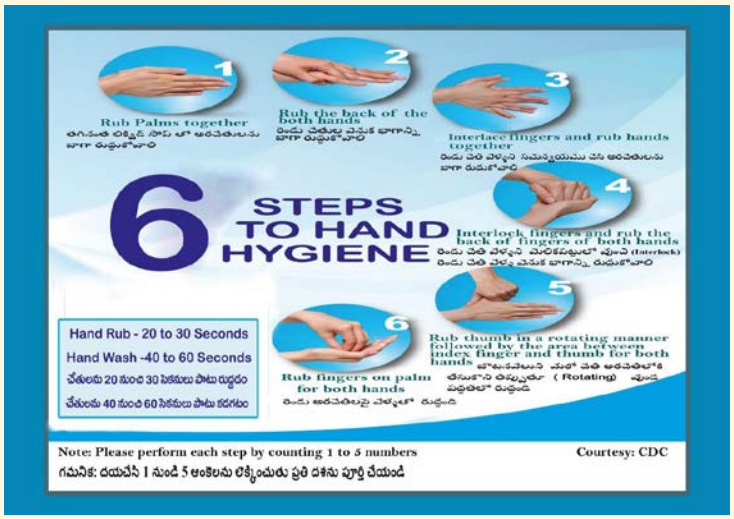
    i) Ventilator Associate Pneumonia (VAP)
    ii) Central Line Associated Blood Stream Infections (CLABSI)
    iii) Catheter Associated Urinary Tract Infections (CAUTI)
    iv) Surgical Site Infections (SSI)
    v) Standardized infection ratio (SIR)
    vi) Needle stick injury incidence
    vii) Hand hygiene compliance

2. Bed sore analysis
3. O.T. surveillance (Monthly)
4. Blood bank surveillance
5. Environmental surveillance (water& air) (Monthly)
6. Hand hygiene
7. Dialysate fluid testing
8. Needle-stick injuries incidence
9. Multi drug-resistant organisms (MDRO's) Surveillance
10. Outbreak investigation
11. Biomedical waste management
12. High end antibiotic monitoring
13. AMR surveillance
14. HBs Ag antibody titre testing
15. Endotoxin (LAL) assay for Dialysate fluid & water
16. Disinfectant testing-new and in-house
17. Stool for *Clostridium difficile* toxin A&B testing
18. Blood contamination rate
19. *Legionella* spp screening in humidifier water from ACs.
20. Audits: Bundle care audits for VAP, CLABSI, CAUTI and SSI, Hand hygiene audit, PPE audit, Biomedical waste audits

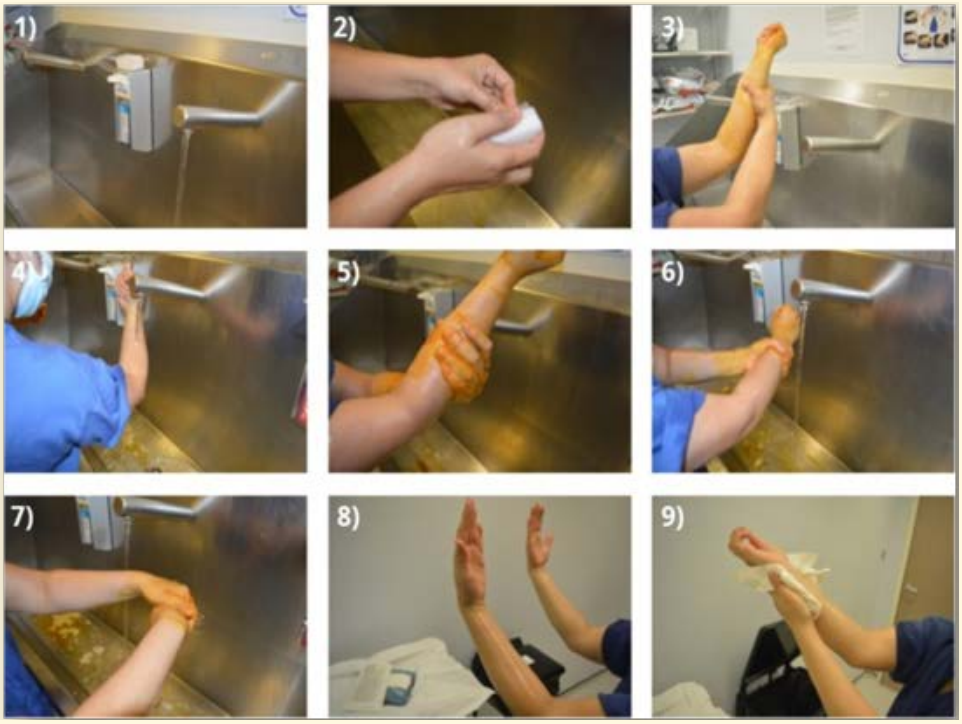
4) Hand Hygiene

- The organization adheres to standard precautions at all times regarding the use of PPE, prevention of sharp injury etc.
- Hand Hygiene guidelines are followed in all areas of the hospital-Posters regarding Hand Hygiene are available.
- Specific precautions are being followed when required. Safe Injection and Infusion practices are followed.
- Cleaning, disinfection and sterilization practices being followed

Steps of Procedure Hand Hygiene – Hand Rub (20-30 secs)



Surgical Hand Wash (3-5mts)



Greeting each other in Health care

Another dimension
in Hand Hygiene!

Spread Goodwill, not Germs

SVIMS

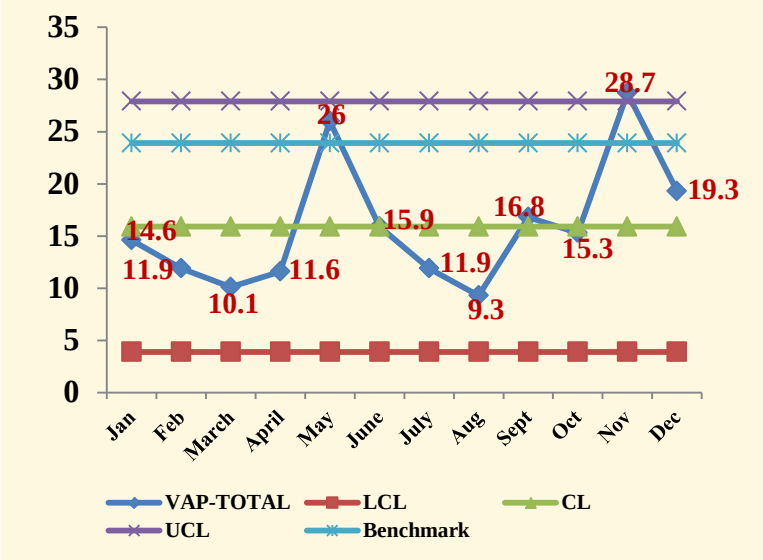
Prevent droplet spread
when coughing, sneezing

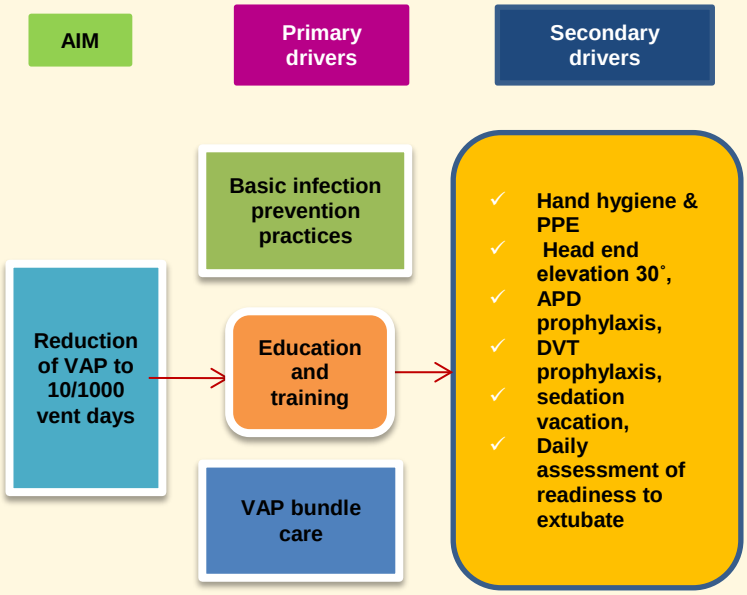
Director cum Vice-Chancellor

Sri Venkateswara Institute of
Medical Sciences, Tirupati.

5) Outcomes & KPIs for Infections

i) Control chart for VAP from Jan to Dec 2020





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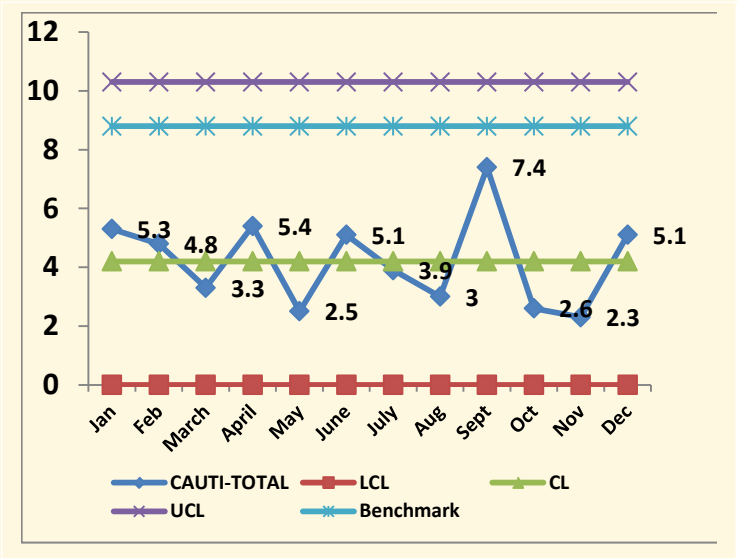
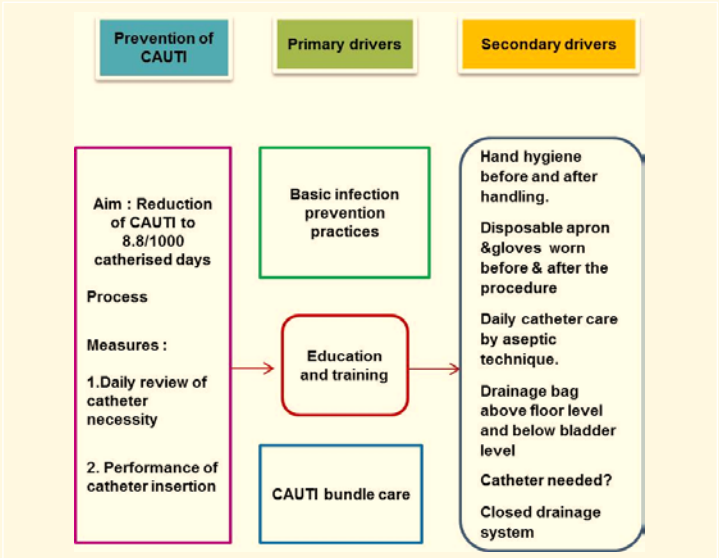
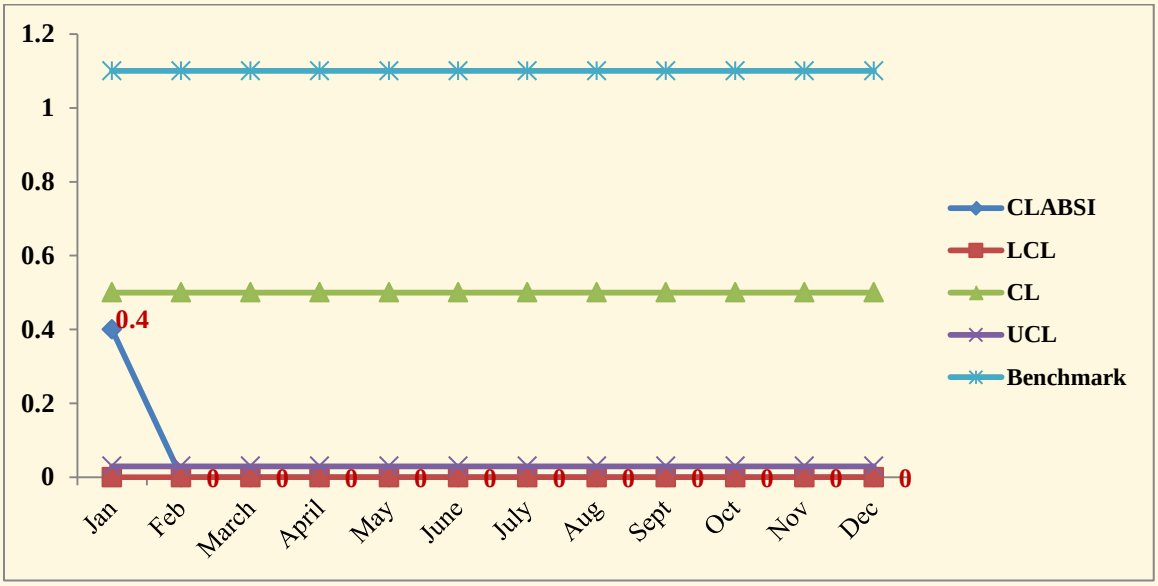
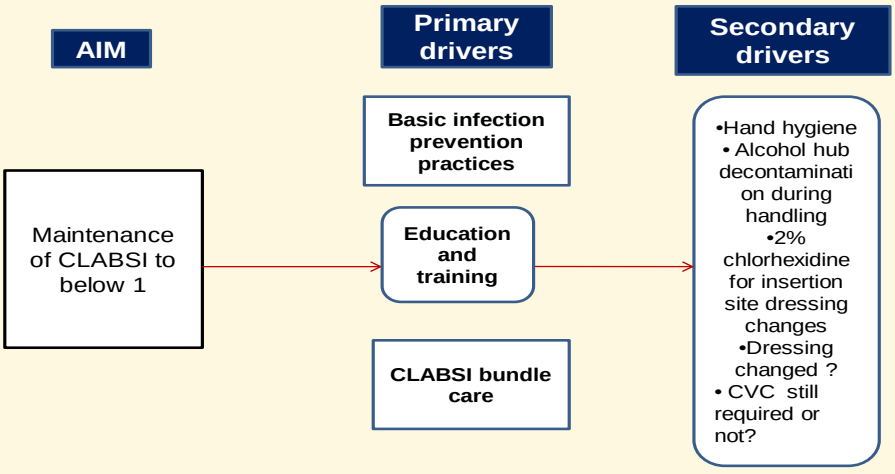




iii) Control chart for CLABSI from Jan to Dec 2020



Driver diagram for CLABSI



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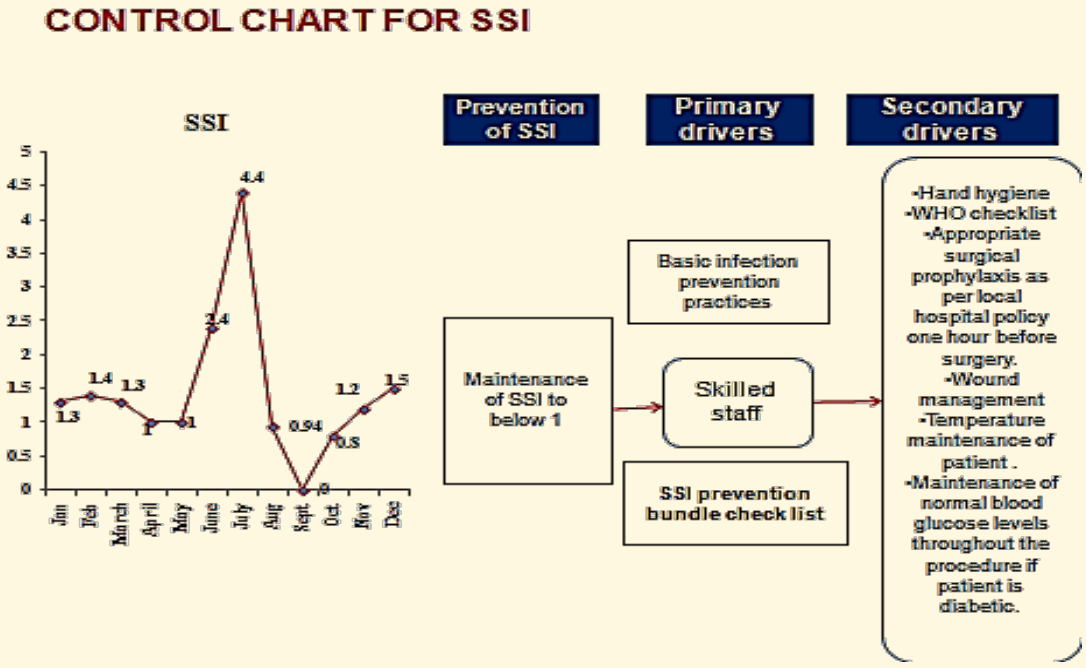

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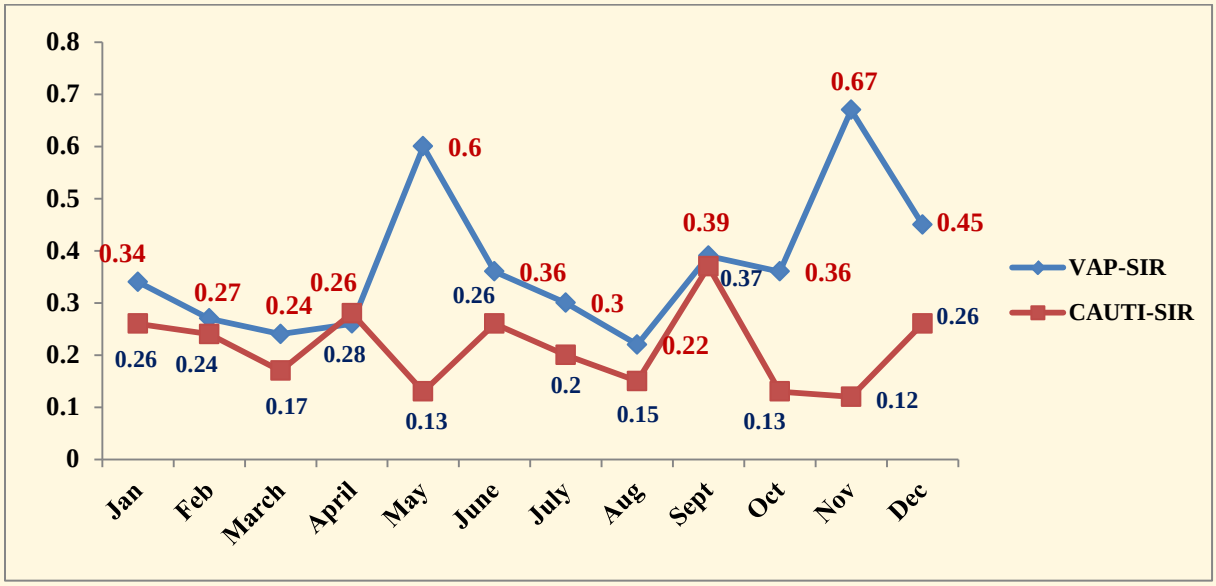

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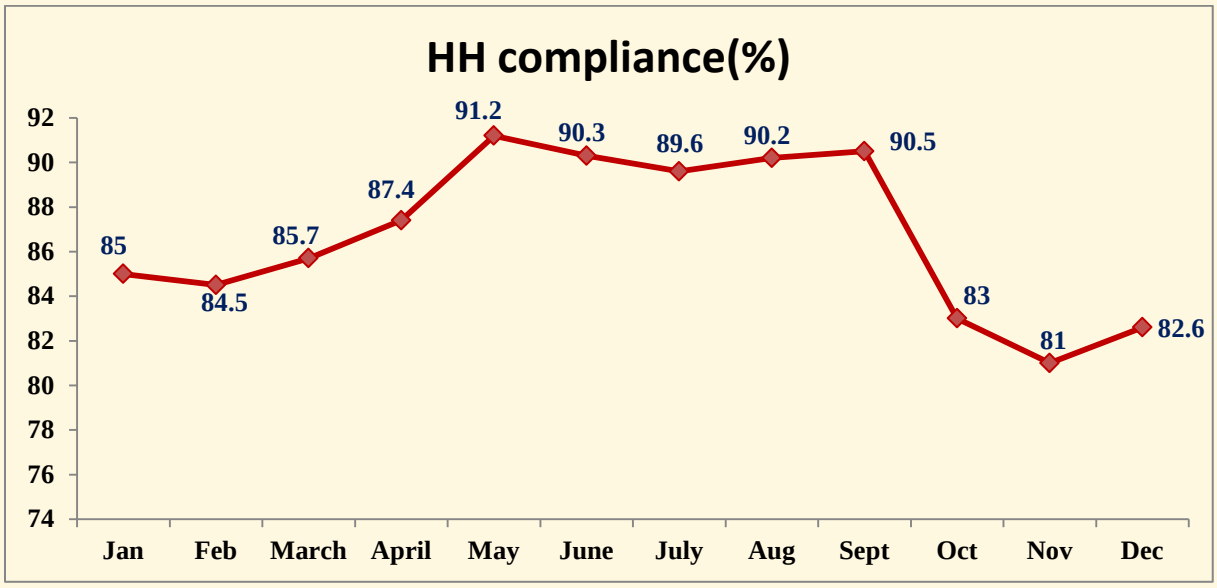

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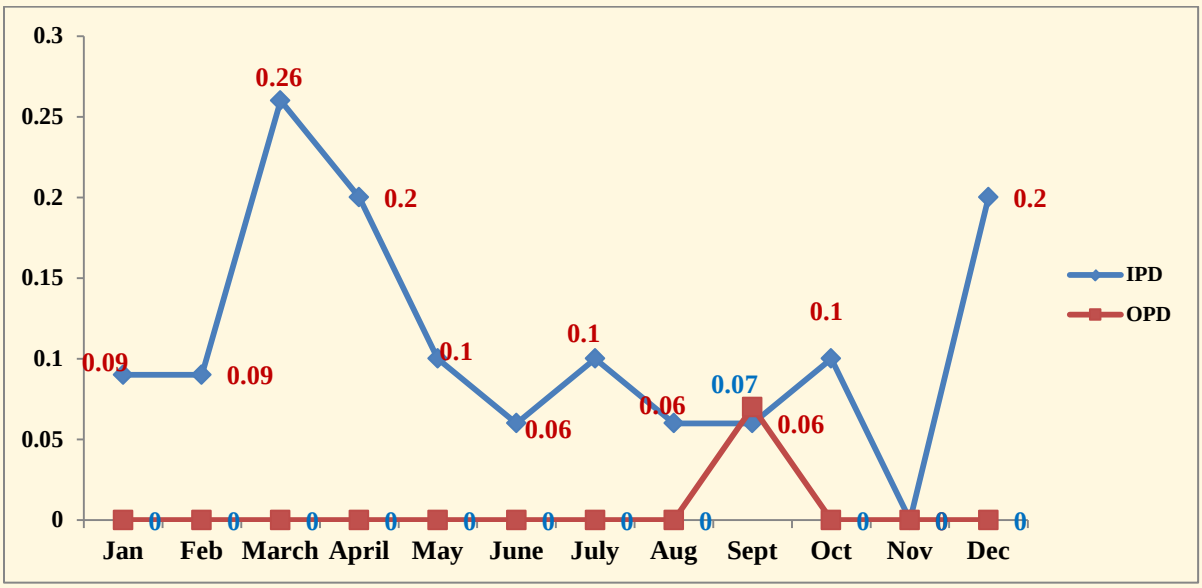

SRI VENKATESWARA INSTITUTE OF MEDICAL SCIENCES, TTD, TIRUPATI

ANTIMICROBIAL STEWARDSHIP POCKET GUIDE

JUL-DEC 2020 (10TH EDITION)

10th Edition

Editors

Dr B.Vengamma, Director-cum-VC

Dr. Ram, Medical Superintendent

Dr K.V.Sreedhar Babu (HOD I/C)

Dr R.Jayaprada, HICO, AMSP Lead

Dr N.Ramakrishna, HICO, AMSP Lead

Preface

Healthcare Associated Infections (HAI)

Dr. B.Vengamma, Director- cum-Vice Chancellor of SVIMS announced that SVIMS is taking a step forward to contribute in containing HAI in India. Adapting international guidelines (e.g. WHO, CDC), SVIMS is invoking a ten pronged strategy. One key component is 'Antimicrobial Stewardship', which aims to optimize antibiotic use among patients in order to reduce antibiotic resistance, improve patient outcomes and safety and ensure cost effective therapy. This will be revised 6 monthly and new editions will be released every January and July to inform all health care personnel (doctors, nurses, and allied health staff) of pathogen surveillance, antimicrobial use, infection control measures and outcomes. This programme is jointly monitored by Anti-Microbial Stewardship Committee Hospital Infection Control Committee and SVIMS Quality Council.

To learn how to use antibiotics, one must first learn how not to use antibiotics." -Unknown

Dr. B.Vengamma
Director cum Vice Chancellor

From the desk of editors…….

Greetings from Anti-Microbial Stewardship Programme & Infection Control team,

- Antimicrobial resistance (AMR) results in increased morbidity, mortality, and costs of healthcare
- Prevention of the emergence of resistance and the dissemination of resistant microorganisms will reduce these adverse effects and their attendant costs.
- Predominant isolates in ICUs were *Klebsiella* followed by *Acinetobacter, Escherichia coli and Pseudomonas spp.*
- In ICUs empirical choice of antibiotic in our institute is Cefoperazone + Sulbactam
- Based on Gram staining report prophylactic drug of choice for Gram negative bacilli is Cefoperazone + Sulbactam, and for Gram positive bacteria is Linezolid in all ICUs.

We therefore here by asseverate everyone to use antimicrobial agents judiciously

R.Jayaprada, N.Ramakrishna, S.Yamini
Infection Prevention & Control Officers,
AMSP Lead

Ram
Medical Superintendent

B.Vengamma
Director-cum-Vice

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1. Trends of Multidrug Resistance from July 2020 – December 2020

Key messages.....

- ✓ Prevalence of Multi drug resistance (MDR) from July to December 2020 was – **50.1%**
- ✓ Predominant isolates in intensive care units (ICU) were *Escherichia coli* followed by *Klebsiella spp*, *Acinetobacter spp* and *Pseudomonas spp*. As per our local antibiogram, empirical choice of antibiotic in **ICUs** in our institute is **Cefoperazone+sulbactam.** In case of suspicion of *Pseudomonas spp* infections, empirical choice of antibiotic is Piperacillin+ Tazobactam. Based on Gram staining report, prophylactic drug of choice for Gram negative bacilli is **Cefoperazone+ sulbactam,** and for Gram positive bacteria is **Vancomycin** in all ICUs depending on the department.
- ✓ Percentage of Vancomycin Resistance Enterococci (VRE): 9.5%
- ✓ Percentage of Methicillin resistance *Staphylococcus aureus* (MRSA): 74.7%,
- ✓ Percentage of Methicillin resistance *Coagulase negative Staphylococcus (*MRCoNS):75.7%
- ✓ Percentage of Vancomycin resistance *Staphylococcus aureus* (VRSA): 0.6%
- ✓ Percentage of Vancomycin resistance *Coagulase negative Staphylococcus* (VRCoNS): 1.4%
- ✓ Most common Gram negative isolates were *Escherichia coli, Klebsiella spp, Acinetobacter spp, Pseudomonas spp and Enterobacter spp.*
- ✓ *Escherichia coli* isolates were highly resistant to Cefazolin (90.9%%), Ciprofloxacin(88%), Cotrimoxazole (68.1%) and sensitive to Amikacin (73.7%), Cefoperazone+sulbactam (81.1%), Gentamicin (64.3%), Piperacillin+tazobactum (80.8%), Meropenem (94.9%), Colistin/Polymyxin B (99%) and Tigecycline (99.5%).
- ✓ *Klebsiellae spp.* isolates were highly resistant to Cefazolin (95.9%), Cotrimoxazole (91.9%), Ciprofloxacin (81%), Cefoperazone+sulbactam (54.5%), Amikacin (60.1%), Gentamicin (63.6%), Piperacillin +tazobactam (55%) and sensitive to Meropenem (53.1%), Colistin/Polymyxin B (98.%) and Tigecycline (97%).
- ✓ Acinetobacter spp. isolates were highly resistant to Cefazolin (96.6%), Ciprofloxacin (68.6%), Cotrimoxazole (81.3%), Amikacin (73.7%), Gentamicin (69.4%), Piperacillin +tazobactam (74.5%), Meropenem (73.7%), and sensitive to Cefoperazone+sulbactam (67.8%), Colistin/Polymyxin B (99.2%) and Tigecycline (71.2%).
- ✓ Pseudomonas spp. isolates were highly resistant to Ciprofloxacin (86.9%), Ceftazidime (72.4%), Amikacin (62.3%), Gentamicin (79.7%),and sensitive to Piperacillin + tazobactam (76.9%), Cefoperazone+sulbactam (60.9%), Imipenem (68.2%) and Colistin/Polymyxin B(100%).
- ✓ Most of the Gram negative isolates were shown highly resistant to cephalosporins (86.5%), cotrimoxazole (70.8%), and ciprofloxacin (71.4%).
- ✓ On the other hand, Gram negative isolates were shown sensitivity to cefoperazone+sulbactum (72%), aminoglycosides (58.3%), Meropenem (77.4%), and Polymyxin B (98.1%).
- ✓ Screening of health care workers (HCWs) for Methicillin resistance Staphylococcus aureus (MRSA) should be done as MRSA percentage was 74.7% & Methicillin resistance Coagulase negative Staphylococcus (MRCoNS) percentage was 75.7%, and these isolates were predominantly from Emergency, General Medicine and Nephrology departments. HCWs were treated for the same. As percentage of Methicillin resistance being high, mandate recommendation for HCWs is to follow standard precautions (Hand Hygiene, Contact precautions) strictly at all times of patient

care.

- ✓ Staphylococcus aureus has show high resistance against Ciprofloxacin (82.5%), Erythromycin (68.1%), Clindamycin (48.8%), and Cotrimoxazole (54.2%).
- ✓ VRE (Vancomycin Resistance Enterococci) percentage was 9.5% and most of the isolates were reported from EMD, Nephrology, General Medicine, Urology and Neurology departments.
- ✓ Imipenem resistance was noted high in Acinetobacter spp (73.7%) followed by Pseudomonas spp (68.2%), Klebsiellae spp (53.1%).
- ✓ Among isolated MDR Enterobacteriaceae, 15.1% were Carbapenem resistant Enterobacteriaceae (CRE)

So cautious and judicious prescription of carbapenems is required.

Note : Empirical therapy should be reviewed once the culture and susceptibility results are ready (usually within 72 hours) and targeted therapy should be done whenever possible to give the narrowest spectrum antibiotic based on culture and sensitivity report, the site of infection and the clinical status of the patient.

Fig 1: Resistance patterns to various antimicrobials among *Escherichia coli*

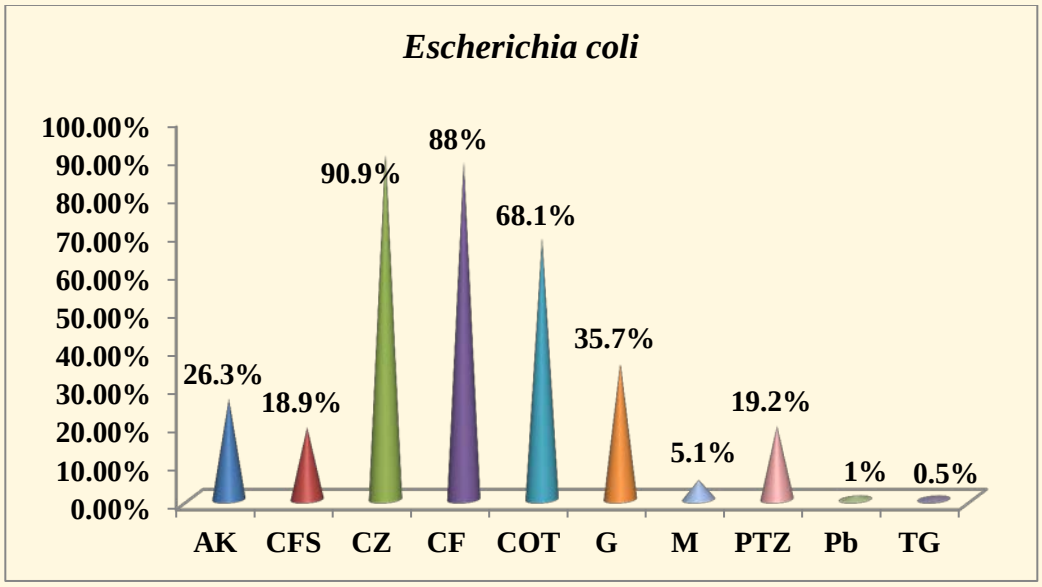

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Fig 2: Resistance patterns to various antimicrobials among *Klebsiella spp.*

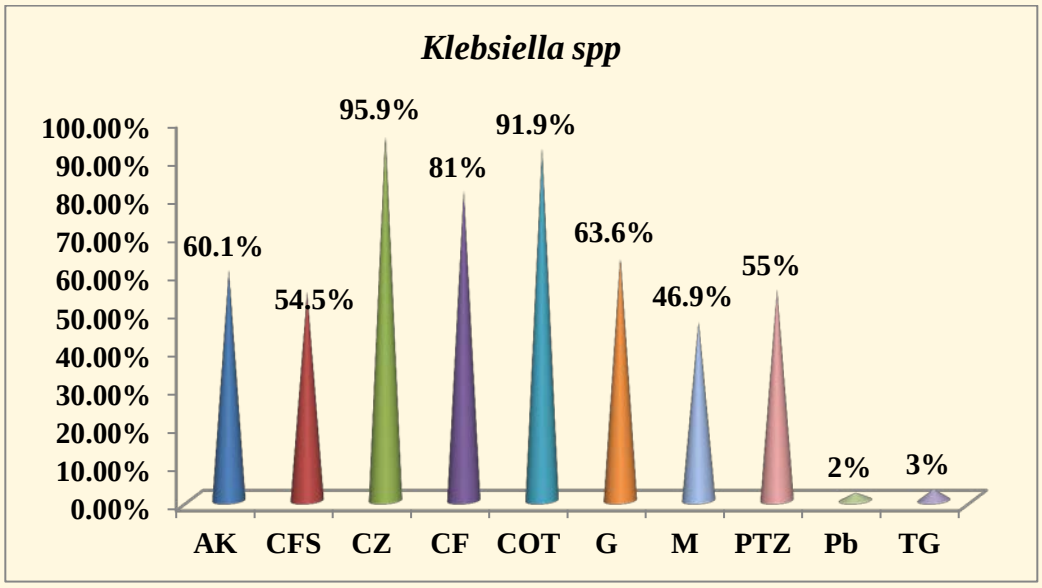

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Fig 3: Resistance patterns to various antimicrobials among *Acinetobacter spp*.

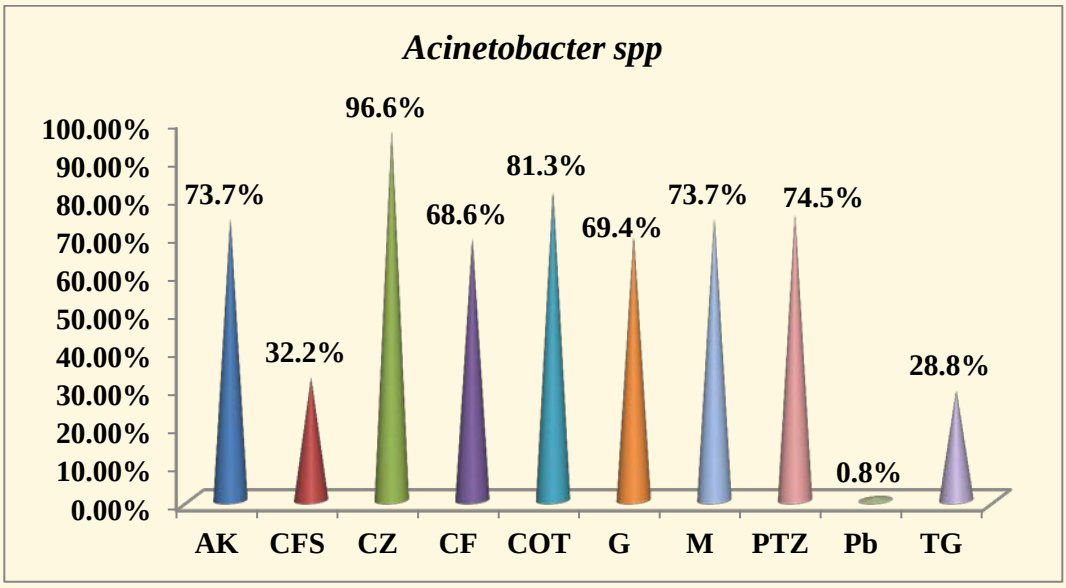

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Fig 4: Resistance patterns to various antimicrobials among *Pseudomonas spp.*

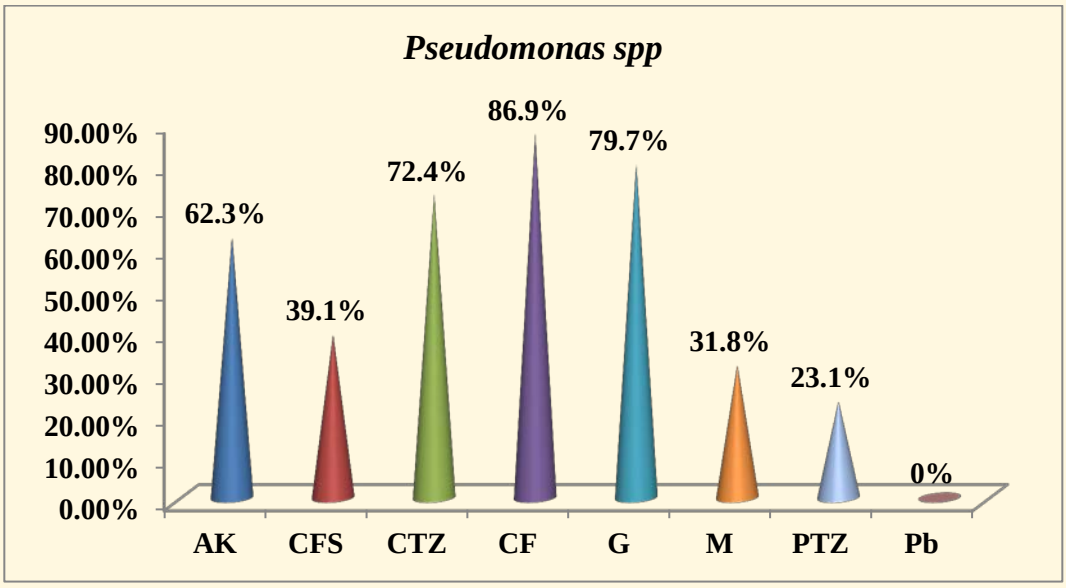

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Fig 5: Resistance patterns to various antimicrobials among *Enterobacter spp*.

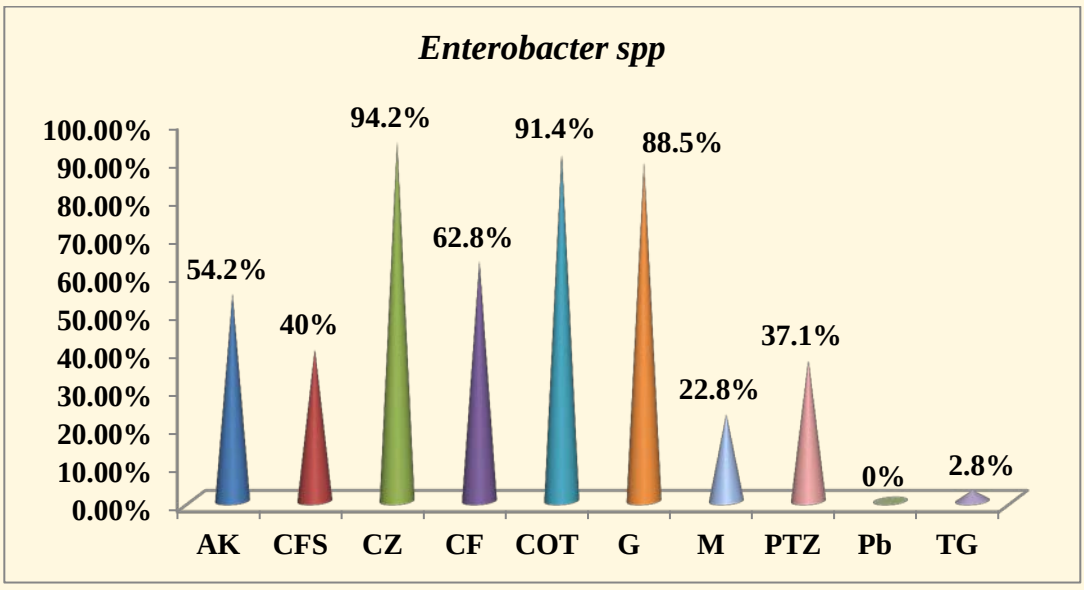

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Fig 6: Resistance pattern to various antimicrobials among *Staphylococcus aureus*

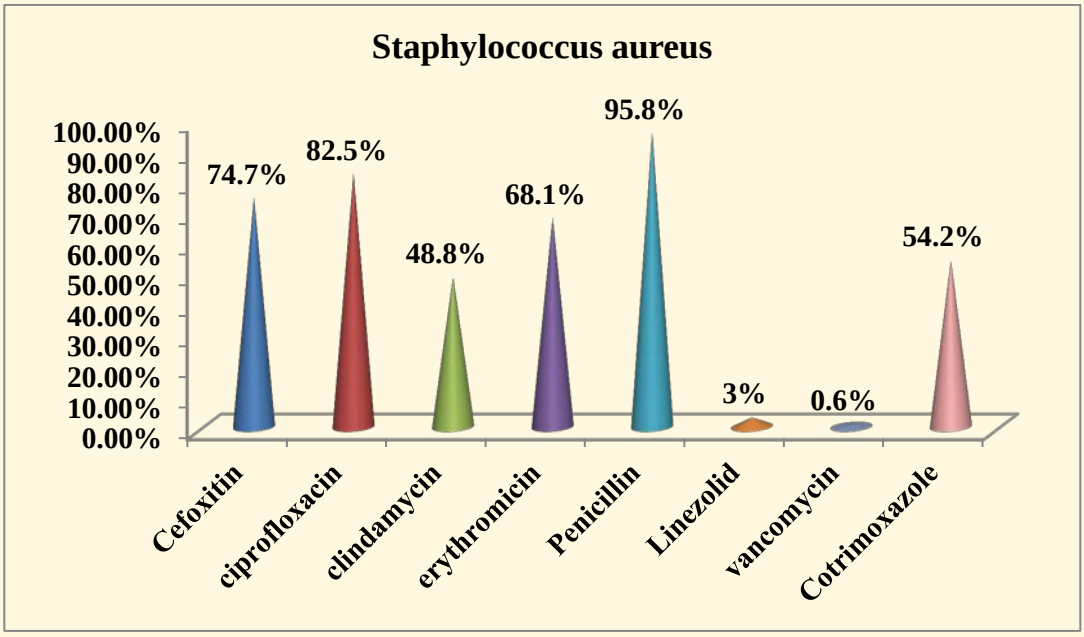


Fig 7: Resistance pattern to various antimicrobials among MRSA isolates

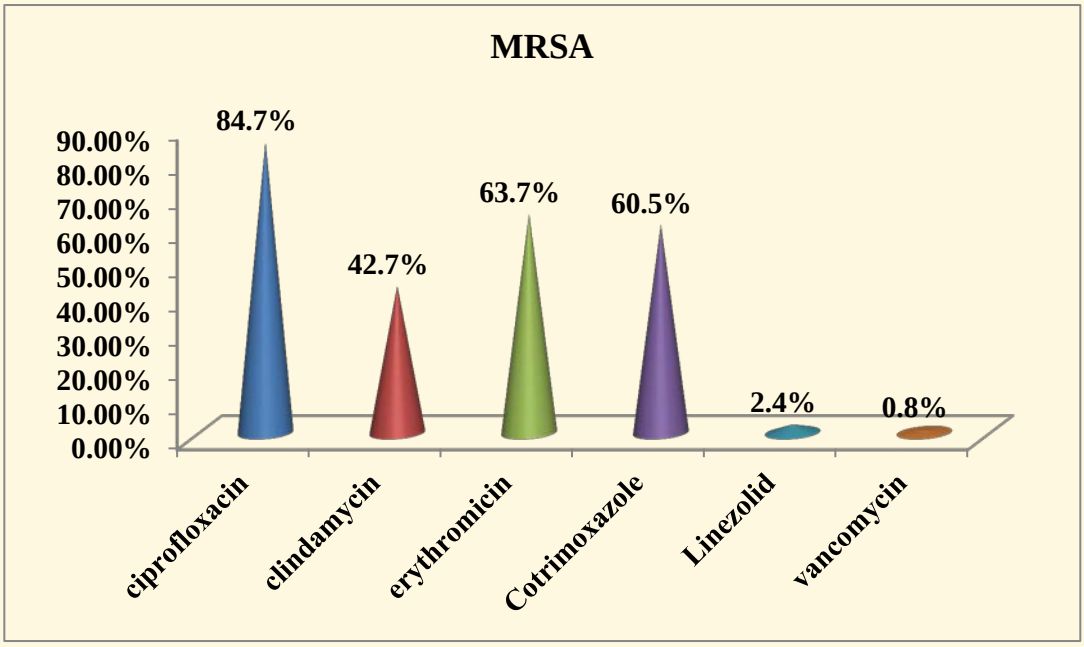


Fig 8: Resistance pattern to various antimicrobials among Coagulase negative *Staphylococcus aureus* (CoNS)

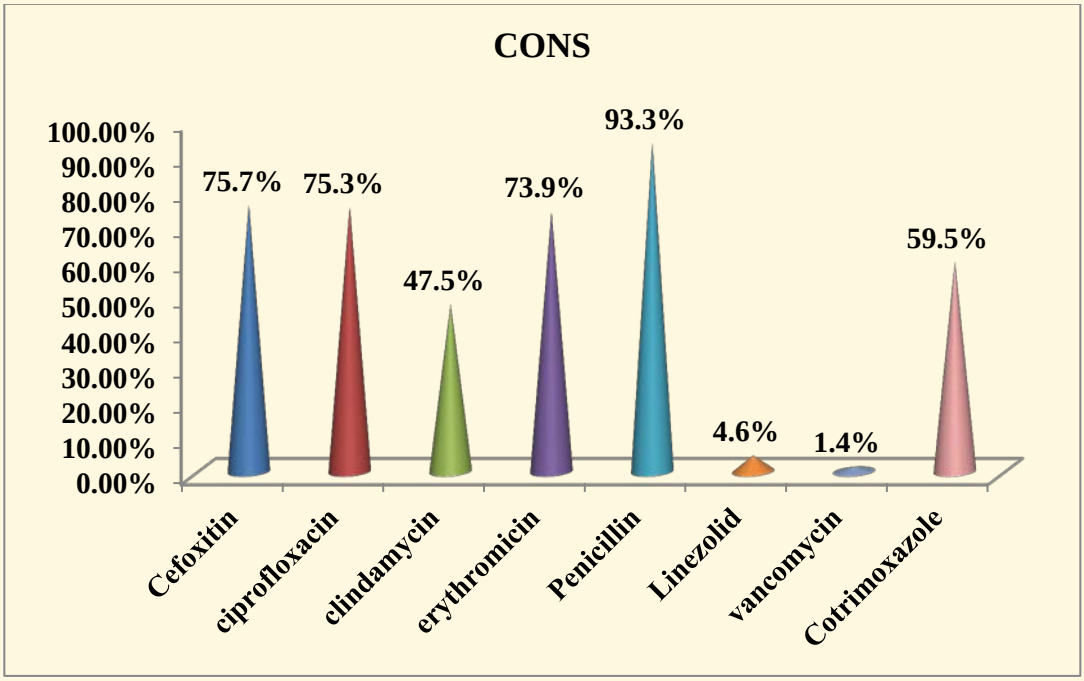


Fig 9: Resistance pattern to various antimicrobials among *Enterococcus spp*

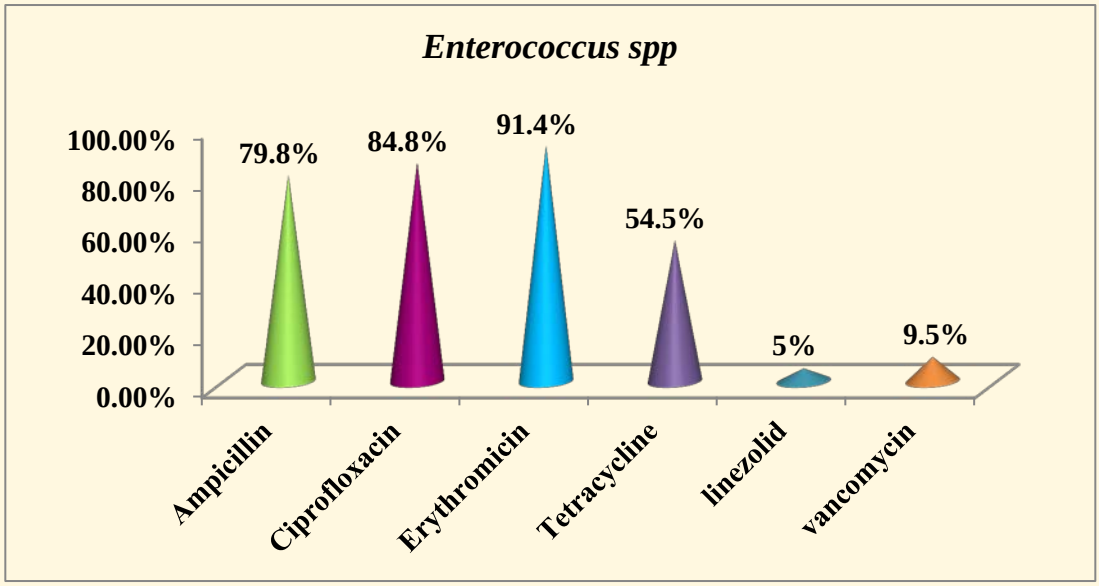


Fig 10: Resistance pattern among Gram positive isolates

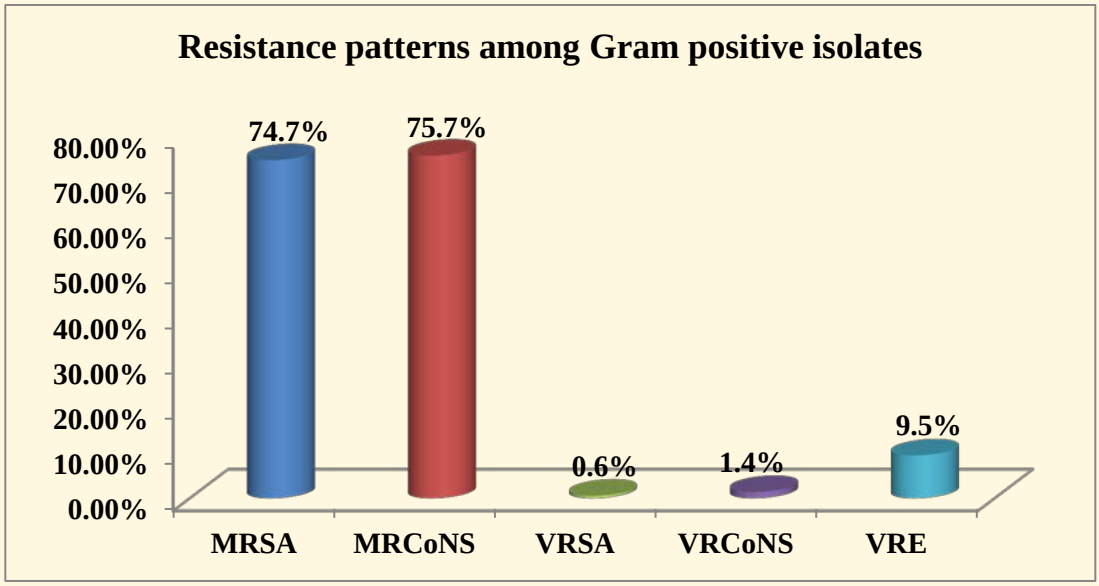


Table 1

Gram negative bacilli distribution and sensitivity pattern among (Multidrug resistance organisms) MDROs

Organism	AK	CFS	CZ	CF	COT	G	M/I	PTZ	Pb	TG
Escherichia coli (n=675)	73.7%	81.1%	9.1%	12%	31.9%	64.3%	94.9%	80.8%	99%	99.5%
Klebsiella spp. (n=198)	39.9%	45.5%	4.1%	19%	8.1%	36.4%	53.1%	45%	98%	97%
Acinetobacter spp. (n=118)	26.3%	67.8%	3.4%	31.4%	18.7%	30.6%	26.3%	25.5%	99.2%	71.2%
Pseudomonas spp. (n=69)	37.7%	60.9%	27.6%	13.1%		20.3%	68.2%	76.9%	100%	
Enterobacter spp. (n=35)	45.8%	60%	5.8%	37.2%	8.6%	11.5%	77.2%	62.9%	100%	97.2%

AK- AMIKACIN, CFS-CEFOPERAZONE+SULBACTAM, CZ-CEFAZOLIN, CF-CIPROFLOXACIN, COT-COTRIMOXAZOLE, G-GENTAMICIN, M-MEROPENEM, PTZ-PIPERACILLIN+TAZOBACTAM, Pb-POLYMYXIN-B, TG-TIGECYCLINE, n-number

MRSA percentage was 74.7% and VRE percentage was 9.6%.

<50% susceptible

>80% susceptible

50-80% susceptible

Table 2

Gram negative bacilli distribution and sensitivity pattern among Medical departments

Organism	AK	CFS	CZ	CF	COT	G	M/I	PTZ	Pb	TG
Escherichia coli (n=316)	70.3%	79.5%	8.6%	17.8%	27.5%	59.5%	94%	79.5%	99.7%	100%
Klebsiella spp. (n=70)	37.2%	42.9%	4.3%	41.5%	7.2%	45.8%	52.9%	42.9%	98.6%	95.8%
Acinetobacter spp. (n=34)	29.5%	76.5%	5.9%	41.2%	17.7%	35.3%	41.2%	38.3%	100%	70.6%
Pseudomonas spp. (n=27)	37.1%	63%	33.4%	7.5%		29.7%	63%	81.5%	96.3%	
Enterobacter spp. (n=9)	33.3%	33.3%	0%	44.5%	11.1%	11.1%	77.8%	44.5%	100%	100%

AK- AMIKACIN, CFS-CEFOPERAZONE+SULBACTAM, CZ-CEFAZOLIN, CF-CIPROFLOXACIN, COT-COTRIMOXAZOLE, G-GENTAMICIN, M-MEROPENEM, PTZ-PIPERACILLIN+TAZOBACTAM, Pb-POLYMYXIN-B, TG-TIGECYCLINE, n-number

MRSA percentage was 72.1% and VRE percentage was 13.3%. Percentage of Carbapenem resistance among Gram negative bacterial isolates was 18.9%.

Table 3

Gram negative bacilli distribution and sensitivity pattern among Surgical departments

Organism	AK	CFS	CZ	CF	COT	G	M/I	PTZ	Pb	TG
Escherichia coli (n=229)	81.7%	86.5%	9.2%	19.3%	36.3%	70.8%	97%	86.1%	98.3%	98.7%
Klebsiella spp. (n=72)	44.5%	51.4%	5.6%	37.5%	9.8%	44.5%	59.8%	52.8%	95.9%	98.7%
Acinetobacter spp. (n=21)	23.9%	52.4%	0%	24%	24%	19.1%	14.3%	0%	100%	71.5%
Pseudomonas spp. (n=17)	53%	58.9%	23.6%	5.9%		23.6%	64.8%	88.3%	100%	
Enterobacter spp. (n=4)	50%	75%	0%	25%	25%	25%	100%	75%	100%	100%

AK- AMIKACIN, CFS-CEFOPERAZONE+SULBACTAM, CZ-CEFAZOLIN, CF-CIPROFLOXACIN, COT-COTRIMOXAZOLE, G-GENTAMICIN, M-MEROPENEM, PTZ-PIPERACILLIN+TAZOBACTAM, Pb-POLYMYXIN-B, TG-TIGECYCLINE, n-number

MRSA percentage was 88.9% and VRE percentage was 3.4%. Percentage of Carbapenem resistance among Gram negative bacterial isolates was 16.7%.

<50% susceptible

>80% susceptible

50-80% susceptible

Table 4

Gram negative bacilli distribution and sensitivity pattern among intensive care units (ICUs)

Organism	AK	CFS	CZ	CF	COT	G	M/I	PTZ	Pb	TG
Escherichia coli (n=26)	57.7%	61.6%	3.9%	38.5%	19.3%	23.9%	84.7%	50%	96.2%	100%
Klebsiella spp. (n=22)	13.7%	13.8%	0%	36.4%	4.6%	13.7%	27.3%	13.7%	100%	91%
Acinetobacter spp. (n=15)	20%	53.4%	0%	40%	26.7%	26.7%	20%	20%	100%	46.7%
Pseudomonas spp. (n=3)	0%	33.3%	33.3%	0%		0%	33.3%	33.3%	100%	
Enterobacter spp. (n=1)	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%

AK- AMIKACIN, CFS-CEFOPERAZONE+SULBACTAM, CZ-CEFAZOLIN, CF-CIPROFLOXACIN, COT-COTRIMOXAZOLE, G-GENTAMICIN, M-MEROPENEM, PTZ-PIPERACILLIN+TAZOBACTAM, Pb-POLYMYXIN-B, TG-TIGECYCLINE, n-number

MRSA percentage was 100% and VRE percentage was 14.3%. Percentage of Carbapenem resistance among Gram negative bacterial isolates was 38.6%

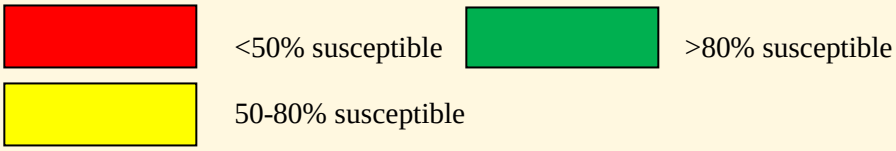


Table 5

Gram negative bacilli distribution and sensitivity pattern among OPD/OI samples

Organism	AK	CFS	CZ	CF	COT	G	M/I	PTZ	Pb	TG
Escherichia coli (n=72)	70.8%	83.4%	9.8%	25%	38.4%	72.3%	98.7%	84.3%	100%	100%
Klebsiella spp. (n=18)	61.2%	72.3%	0%	50%	5.6%	33.3%	72.3%	72.3%	100%	100%
Acinetobacter spp. (n=30)	36.7%	66.7%	3.3%	40%	10%	43.4%	16.7%	23.3%	96.7%	20%
Pseudomonas spp. (n=8)	50%	50%	25%	62.5%		25%	75.6%	75%	100%	
Enterobacter spp. (n=13)	77%	92.4%	0%	69.3%	0%	7.7%	92.4%	92.4%	100%	100%

AK- AMIKACIN, CFS-CEFOPERAZONE+SULBACTAM, CZ-CEFAZOLIN, CF-CIPROFLOXACIN, COT-COTRIMOXAZOLE, G-GENTAMICIN, M-MEROPENEM, PTZ-PIPERACILLIN+TAZOBACTAM, Pb-POLYMYXIN-B, TG-TIGECYCLINE, n-number

MRSA percentage was 73.8% and VRE percentage was 7.7%. %. Percentage of Carbapenem resistance among Gram negative bacterial isolates was 23.3%

Table 6

Resistance pattern among various categories of Gram negative bacteria

S.No	Organisms	AK	CFS	CF	PTZ	Pb	TG	COT	M
1	**Enterobacteriaceae (*n*=1012)**	36.3%	26.9%	84%	27.6%	1.8%	1.7%	74.5%	15.1%
2	**CRE (*n*=153)**	83%	81.6%	90.8%	92%	2.6%	6.5%	89.5%	-
4	**Non-fermenters (*n*=210)**	67.1%	33.3%	71.9%	52.3%	1.9%	16.2%	52.8%	56.6%

AK- AMIKACIN, CFS-CEFOPERAZONE+SULBACTAM, CZ-CEFAZOLIN, CF-CIPROFLOXACIN, COT-COTRIMOXAZOLE, G-GENTAMICIN, M-MEROPENEM, PTZ-PIPERACILLIN+TAZOBACTAM, Pb-POLYMYXIN-B, TG-TIGECYCLINE, n-number

Table 7

CRE distribution among wards (*n*=153)

Area of the Hospital	Percentage of CRE
ICUs	16.3%
Surgical	24.8%
Medical	40.5%
OPD/OI	5.9%

Fig 11: Distribution of CRE among various departments

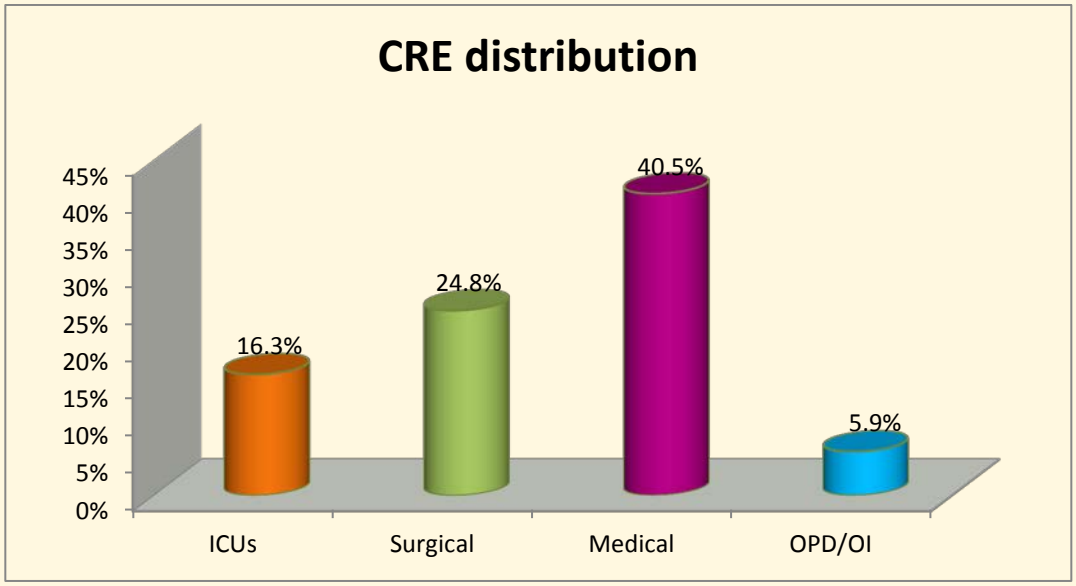
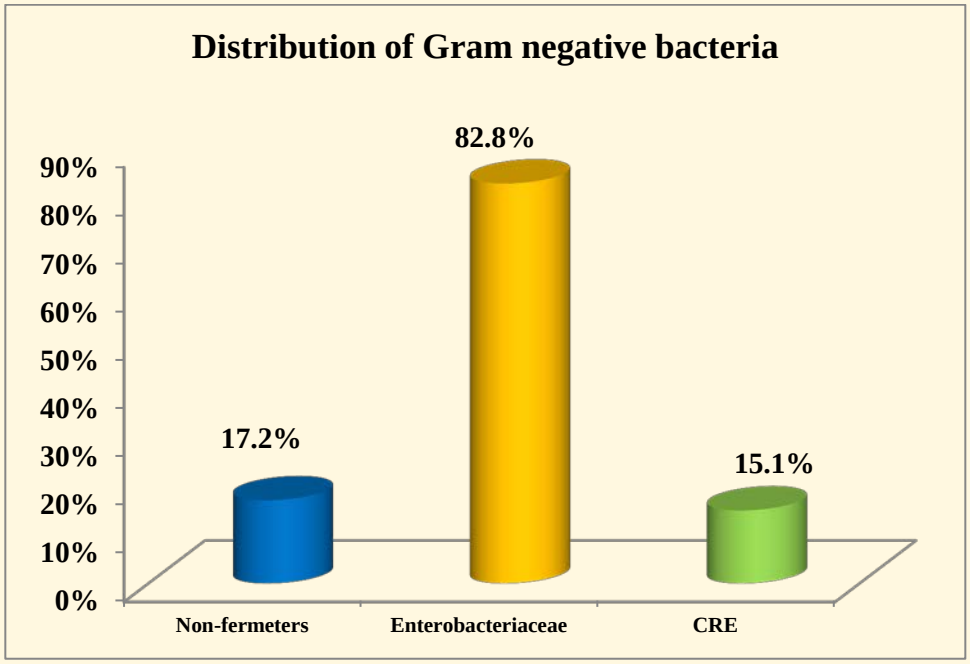


Fig 12: Distribution of various Gram negative bacteria



Overall MDR gram negative bacilli isolated were 1222, which includes 17.2% (210) of non-fermenters and 82.8% (1012) enterobacteriaceae. Out of 1012 enterobacteriaceae 15.1% (153) were CRE.

Fig 13: Organism wise distribution of isolates in Intensive care units (ICU)

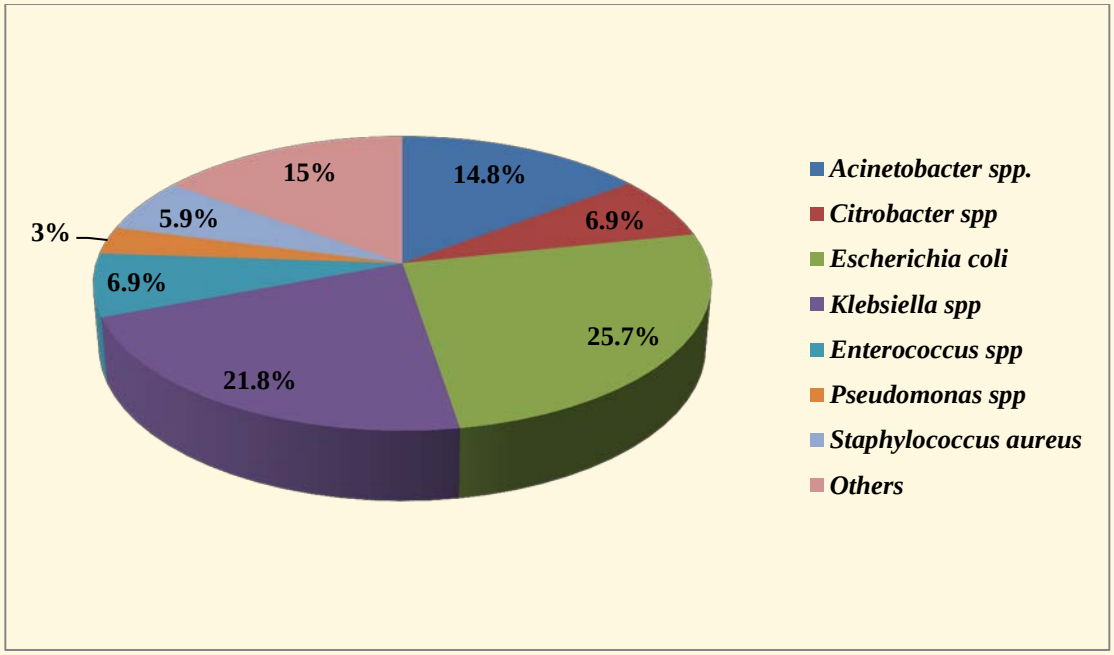


Fig 14: Sample wise distribution of Multi Drug Resistant Organisms (MDROs)

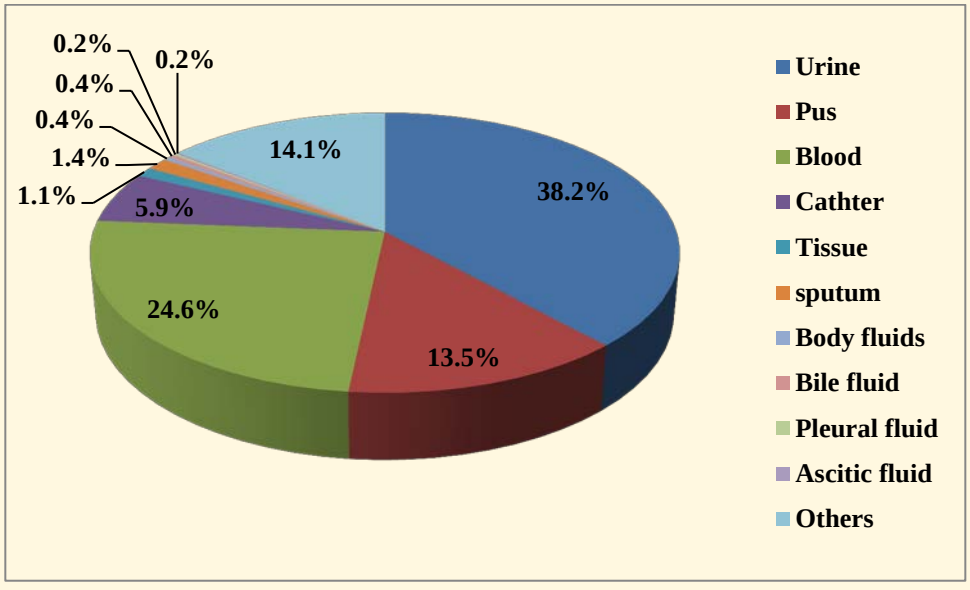


Fig 15: Organism wise distribution of Multi Drug Resistant Gram negative isolates

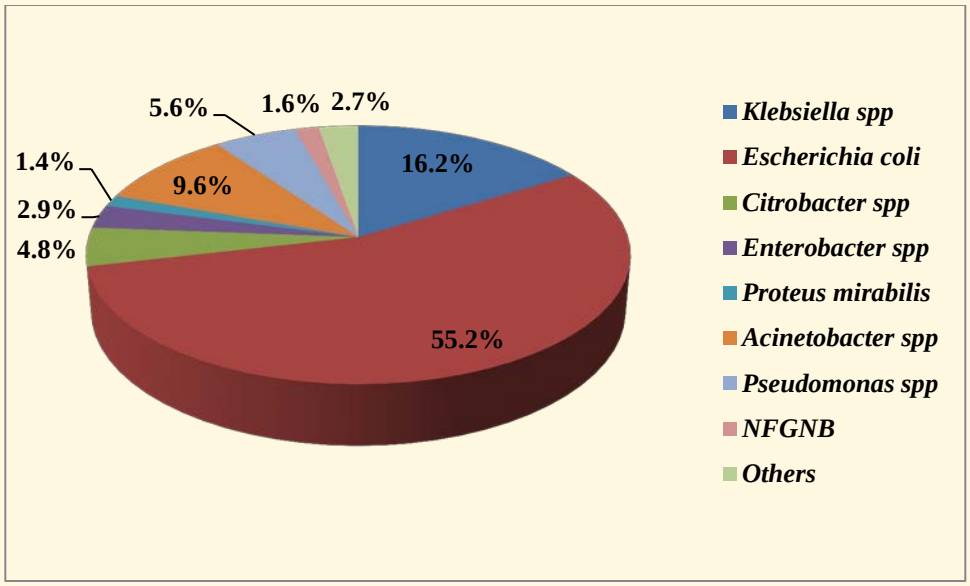


Fig 16: Organism wise distribution of Carbapenem Resistant Enterobacteriaceae (CRE) isolates

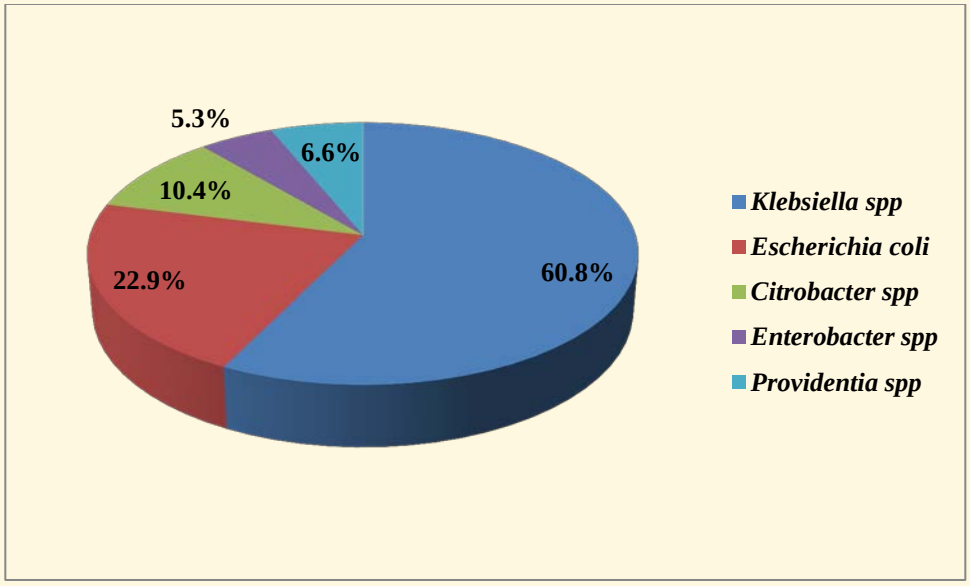
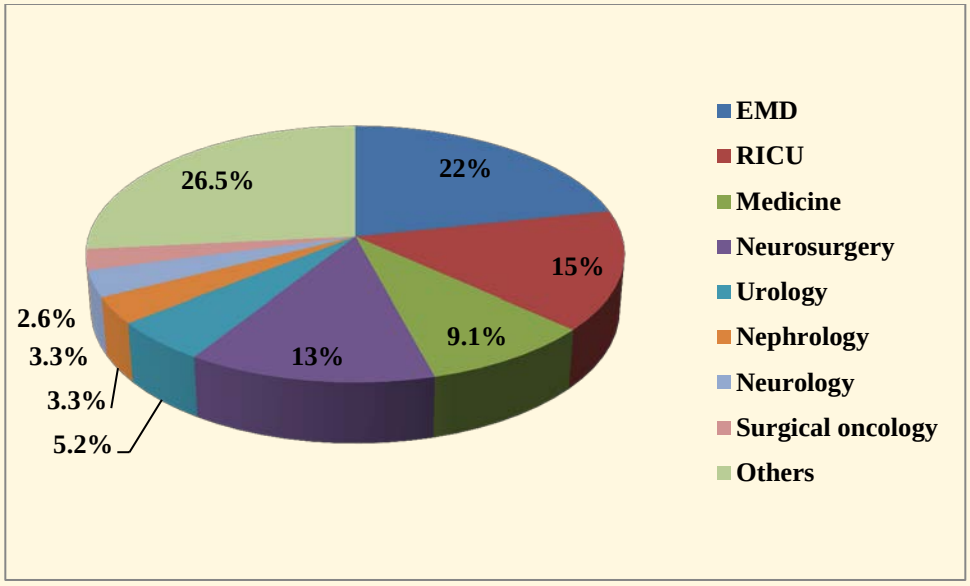
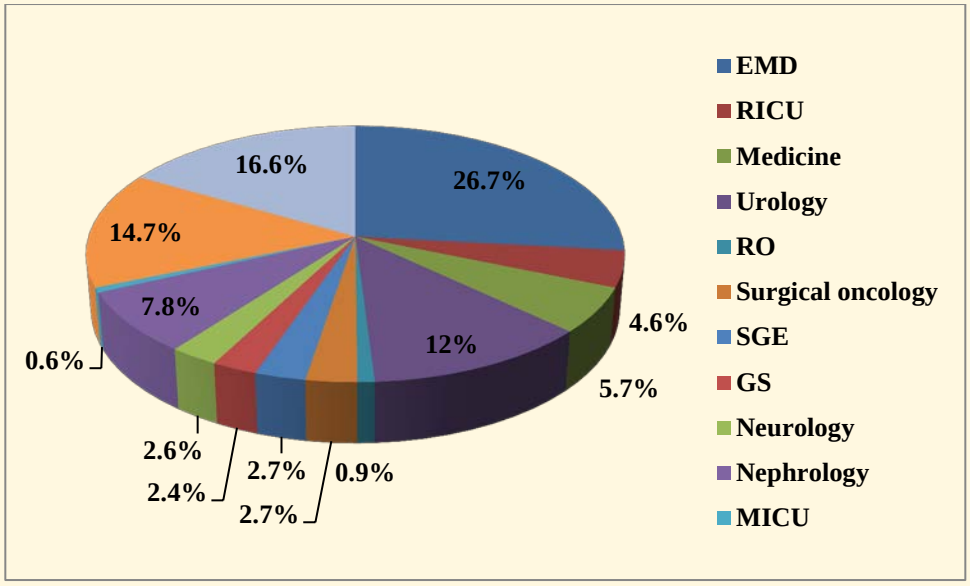


Fig 17: Department wise distribution of Carbapenem Resistant Enterobacteriaceae (CRE) isolates



EMD-Emergency department, OPD-Outpatient department, GS-General surgery, RICU-Respiratory intensive care unit.

Fig 18: Department wise distribution of Multi Drug Resistant Organisms (MDROs)



EMD-Emergency department, OPD-Outpatient department, GS-General surgery, RICU-Respiratory intensive care unit, RO-Radiation oncology, SGE-Surgical gastroenterology, MICU-Medical intensive care unit.

Fig 19: Organism wise distribution of Multi Drug Resistant Gram positive isolates

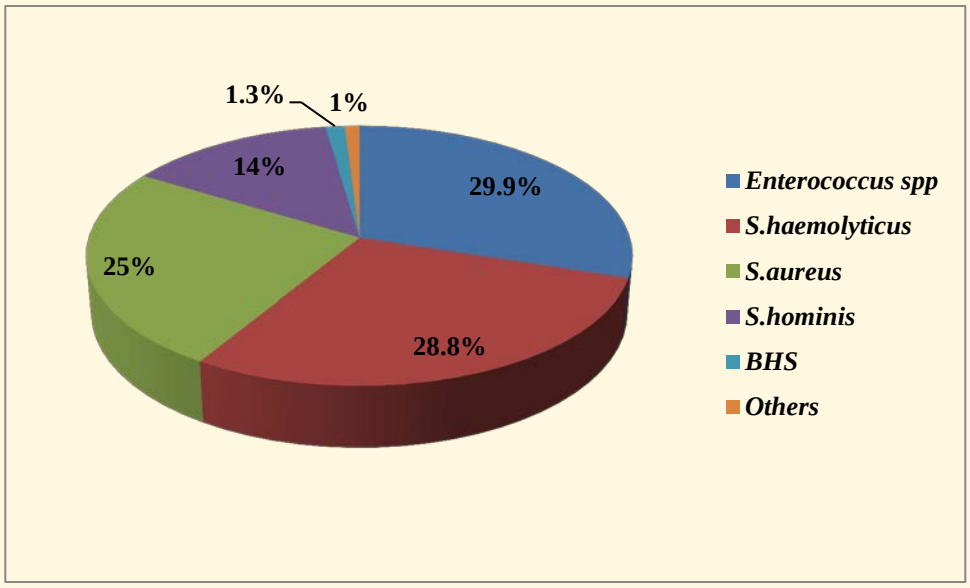
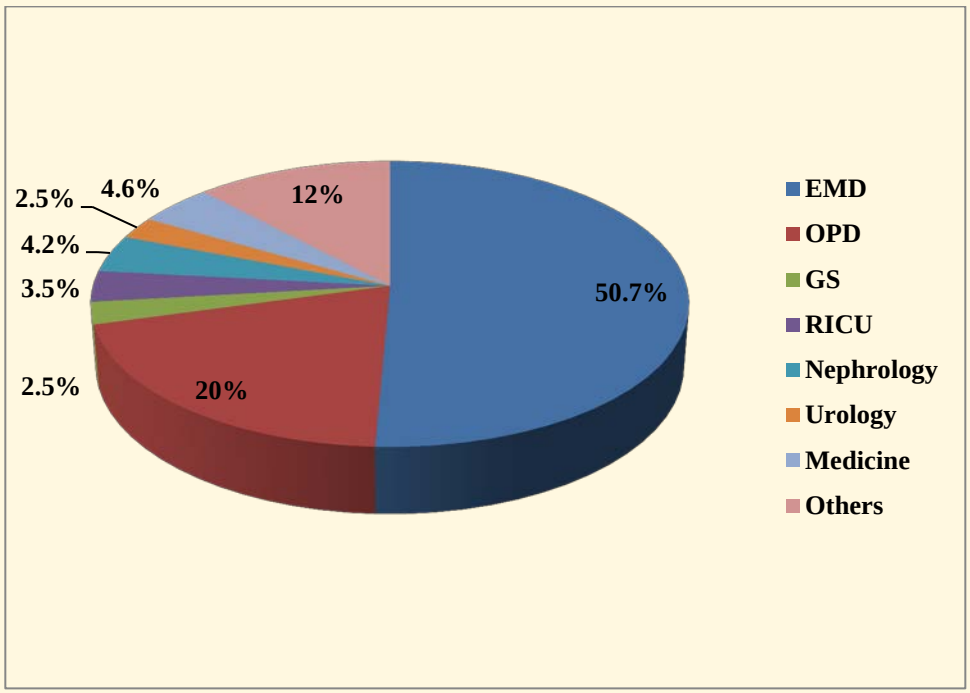


Fig 20: Department wise distribution of

Methicillin Resistant *Staphylococcus aureus* (*MRSA)* in clinical samples



EMD-Emergency department, OPD-Outpatient department, GS-General surgery, RICU-Respiratory intensive care unit

2. Antibiotic policy

Antimicrobial policy should be implemented through the Antimicrobial stewardship committee or Hospital infection control committee.

- Antibiotic use must be justifiable on the basis of the clinical diagnosis and known or expecting micro-organisms.
- Appropriate specimens for bacteriological examination must be obtained before initiating antibiotic treatment, in order to confirm the treatment is appropriate.
- The selection of antibiotic must be based not only on the nature of the disease and that of the pathogenic agents, but on the sensitivity patterns, patient tolerance, and cost.

Selection based on

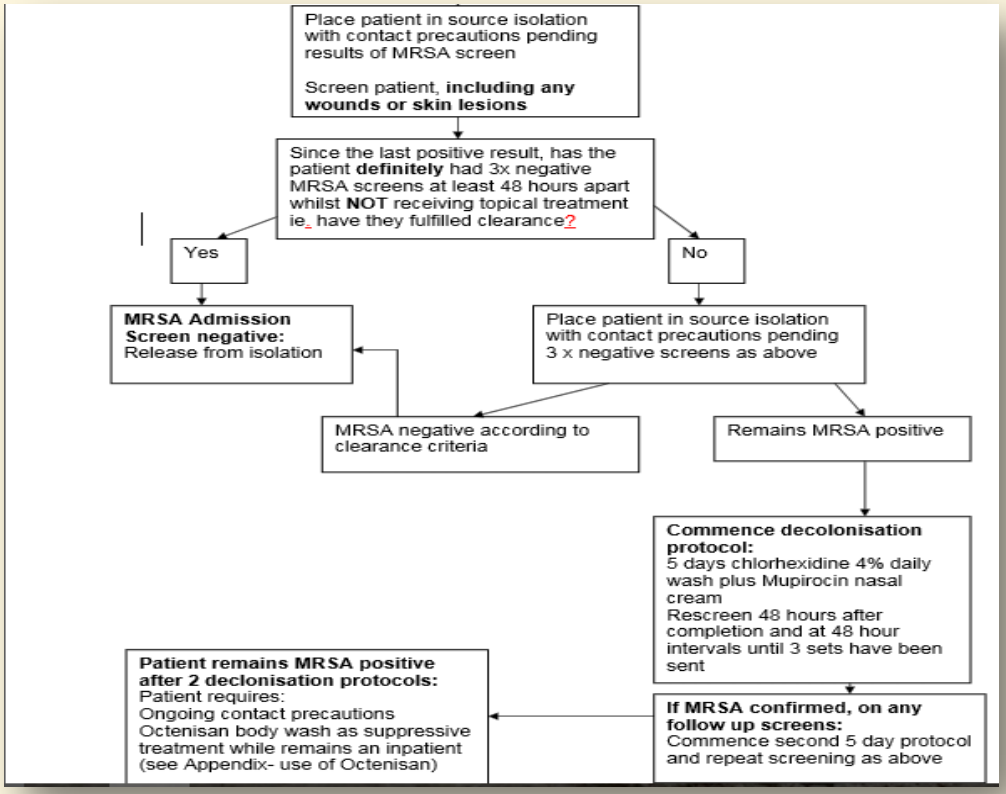
- Based on the spectrum of the antibiotic taking into account possible resistant patterns.
- Use the correct dose, route and duration.
- Ensure chosen antibiotic has adequate tissue penetration at the site of infection.
- Optimize PK-PD parameters according to co-morbidities

De-escalation/modification

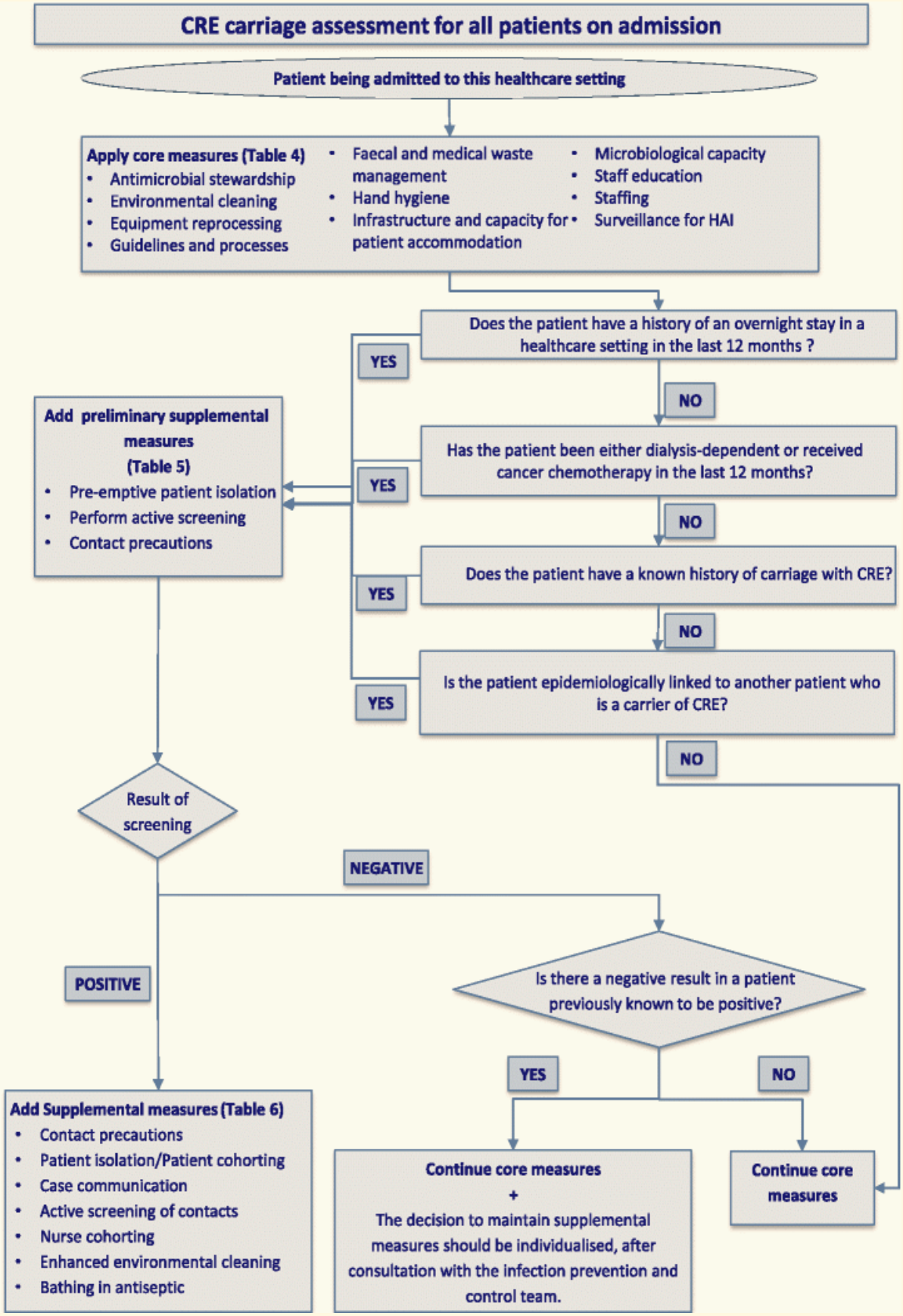
a. Modify empiric broad spectrum antibiotics depending on culture and antimicrobial susceptibility reports and patient status
b. Stop polymyxins and glycopeptides if no carbapenem resistant organisms (CRO) or methicillin resistant *Staphylococcus aureus*(MRSA) identified on cultures
c. Avoid double or redundant gram negative or anaerobic coverage
d. Discontinue antibiotics if a non-infectious mimic identified
e. De-escalate combination therapy to a single agent
f. Change a broad spectrum antibiotic to a narrow spectrum one
g. Change IV to oral antibiotics
h. De-escalation is safe in all patients including febrile neutropenia and septic shock and reduces mortality and length of hospital stay.

- The physician should receive timely, relevant information of the prevalence of resistance in the facility.
- An agent with as narrow a spectrum as possible should be used.
- Antibiotic combinations should be avoided, if possible,
- Selected antibiotics may be restricted in use (like vancomycin, linezolid, Carbapenems etc..)
- The correct dose must be used (low doses may be ineffective for treating infections, and encourage the development of resistance, while excessive doses may have adverse effects, and may not prevent resistance)

Flow diagram for known MRSA positive patients



Routinely assess all patients on admission for CPE status
Guideline for Infection Prevention and Control (IPC) of Carbapenemase-Producing Enterobacteriaceae (CPE)



Revision of Antibiotic AWaRe Classification as per WHO 2019 guidelines

As part of the review of antibacterial agents, a new categorization of antibacterial agents into three groups was proposed:

- **ACCESS** – first and second choice antibiotics for the empiric treatment of most common infectious syndromes;
- **WATCH** – antibiotics with higher resistance potential whose use as first and second choice treatment should be limited to a small number of syndromes or patient groups; and
- **RESERVE** – antibiotics to be used mainly as 'last resort' treatment options

ACCESS Group

Beta-lactam medicines		Other antibacterials	
Amoxicillin	Cefotaxime*	Amikacin	Gentamicin
Amoxicillin + clavulanic acid	Ceftriaxone*	Azithromycin*	Metronidazole
Ampicillin	Cloxacillin	Chloramphenicol	Nitrofurantoin
Benzathinebenzylpenicillin	Phenoxymethylpenicillin	Ciprofloxacin*	Spectinomycin (EML only)
Benzylpenicillin	Piperacillin + tazobactam*	Clarithromycin*	Sulfamethoxazole + Trimethoprim
Cefalexin	Procaine benzyl Penicillin	Clindamycin	Vancomycin (oral)*
Cefazolin	*Meropenem**	Doxycycline	Vancomycin (parenteral)*
Cefixime*			

Watch group antibiotics

Quinolones and fluoroquinolones e.g. Ciprofloxacin, Levofloxacin, Moxifloxacin, Norfloxacin
3rd-generation cephalosporins (with or without beta-lactamase inhibitor) e.g. Cefixime, eftriaxone, Cefotaxime, Ceftazidime
Macrolides e.g. Azithromycin, Clarithromycin, Erythromycin
Glycopeptides e.g. Teicoplanin, Vancomycin
Anti-Pseudomonalpenicillins with beta-lactamase inhibitor e.g. piperacillin +tazobactam
Carbapenems e.g. Meropenem, Imipenem + Cilastatin, Penems e.g. Faropenem

Reserve group ('last-resort') antibiotics

Aztreonam	Fosfomycin (IV)
4th generation cephalosporins e.g. Cefepime	Oxazolidinones e.g. Linezolid
5th generation cephalosporins e.g.Ceftaroline	Tigecycline
Polymyxins e.g. Polymyxin B, Colistin	Daptomycin

3. Biomedical Waste Management

Segregation of Biomedical Waste

Yellow (Non-Chlorinated Plastic Bags)	Red (Non-Chlorinated Plastic Bags)	Blue Card Board Boxes	White (Translucent Puncture Proof Container)
Human Anatomical, Infectious Waste & Cytotoxic Waste ➢ Human tissues, organs, body parts and foetus ➢ Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs ➢ Bags containing residual or discarded blood and blood components ➢ Antibiotics, cytotoxic drugs along with glass or plastic ampoules, vials (with cytotoxic labelled bag) ➢ Discarded disinfectants ➢ Discarded linen, mattresses, beddings contaminated with blood or body fluid ➢ Blood bags ➢ Laboratory culture, stocks or specimens of microorganisms ➢ Live or attenuated vaccines	**Contaminated Waste (Recyclable)** ➢ Disposable items ➢ Tubing ➢ Bottles ➢ Intravenous tubes & sets ➢ Catheters ➢ Urine bags ➢ Gloves ➢ Syringes (without needles and fixed needle syringes) ➢ Vaccutainers with their needles cut	**Glassware** ➢ Broken or discarded and contaminate glass including medicine vials and ampoules except those contaminate with cytotoxic wastes **metallic body implants**	**Waste Sharps Including Metals** ➢ Needles ➢ Syringes with fixed needles ➢ Needles from needle tip cutter or burner ➢ Scalpels ➢ Blades ➢ Any other contaminated sharp object that may cause puncture and cuts ➢ Contaminated sharps

Black/ Green – General Garbage (domestic waste, papers, packaging material, left over food)

Biomedical Waste Management (BMW) RULES 2016

Category	Type ofwaste	Type of Bag/ container	Treatment/ Disposal options
Yellow	Human anatomical waste	Yellow coloured	Incineration/ Plasma pyrolysis/ deep burial
	Animal anatomical waste		
	Soiled waste	non chlorinated plastic bags	Incineration/ Plasma Pyrolysis/ deep burial/ autoclaving or hydroclaving + shredding/mutilation
	Expired/ discarded medicines- pharmaceutical waste, cytotoxic drugs	Yellow coloured containers/ non chlorinated plastic bags	Incineration (cytotoxic drugs at temperature > 1200□C)
	Chemical waste	Yellow coloured containers/ non chlorinated plastic bags	Incineration or Plasma pyrolysis or Encapsulation
	Discarded linen contaminated with blood/ body fluids	Non- chlorinated yellow plastic bags / suitable packing material	Non- chlorinated chemical disinfection followed by incineration/ plasmapyrolysis
	Microbiology, other clinical lab waste, blood bags, live/attenuated vaccines	Autoclave safe plastic bag/container	Pre-treat to sterilize with non-chlorinated chemicals on-site as per NACO/ WHO guidelines + Incineration
Red	Contaminated Waste(Recyclable)	Red coloured non-chlorinated Plastic bags or containers	• Autoclaving/ micro- waving/ hydroclaving + shredding • Mutilation/ sterilization+ shredding. Treated waste sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making,
White (Translucent)	Waste sharps including Metals	Puncture proof, Leak proof, tamper proof containers	• Autoclaving/dry heat sterilization+ shredding/ mutilation • Encapsulation in metal container or cement concrete • Sanitary landfill/ designated concrete waste sharp pit
Blue	Glassware, Metallic body implants	• Glass test tubes • Empty glass Bottles • Contaminated glass bottles • Broken glass ampoules containing discarded/Expired medicines except chemotherapeutic medicines • Metallic body implants • Reusable glass slide	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment)/ through autoclaving/ microwaving/ hydroclaving + recycling

BMW 2018 Amendment

- Establish a Bar- code system for bags
- Phase out use of chlorinated plastic bags (excluding blood bags) and gloves (By the 27thMarch, 2019)
- Health Care Facilities having less than ten beds shall have to install Sewage Treatment Plant by the 31st December, 2019.
- All the health care facilities (any number of beds) shall make available the annual report on its web-site within a period of two years from the date of publication of Bio-Medical Waste Management (Amendment) Rules,2018;"

h) Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual, toxins, dishes and devices used for cultures.	Autoclave safe plastic bags or containers	Pre-treat to sterilize with non-chlorinated chemicals on-site as per National AIDS Control Organization or World Health Organization guidelines thereafter for Incineration.

- Autoclave, Microwave and Hydroclave
- As per World Health Organisation guidelines on Safe management of wastes from healthcare activities and WHO Blue Book, 2014 and thereafter sent for incineration
- Routine mask and gown –yellow
- Cardboard boxes with blue colored marking - Puncture proof and leak proof boxes or containers with blue colored marking
- Chemical treatment using at least 10% Sodium Hypochlorite – corrected1-2%

Autoclave

Condition:

- 121°C, 15 pounds pressure for 60minutes
- 135°C, 31 pounds pressure for 45minutes
- 149°C, 52 pounds pressure for 30minutes

- Validation:
  - *Geobacillusstearothermophilus* with at least 1X10^{6} spores
  - Three monthly interval
- Daily - Chemical indicator strip

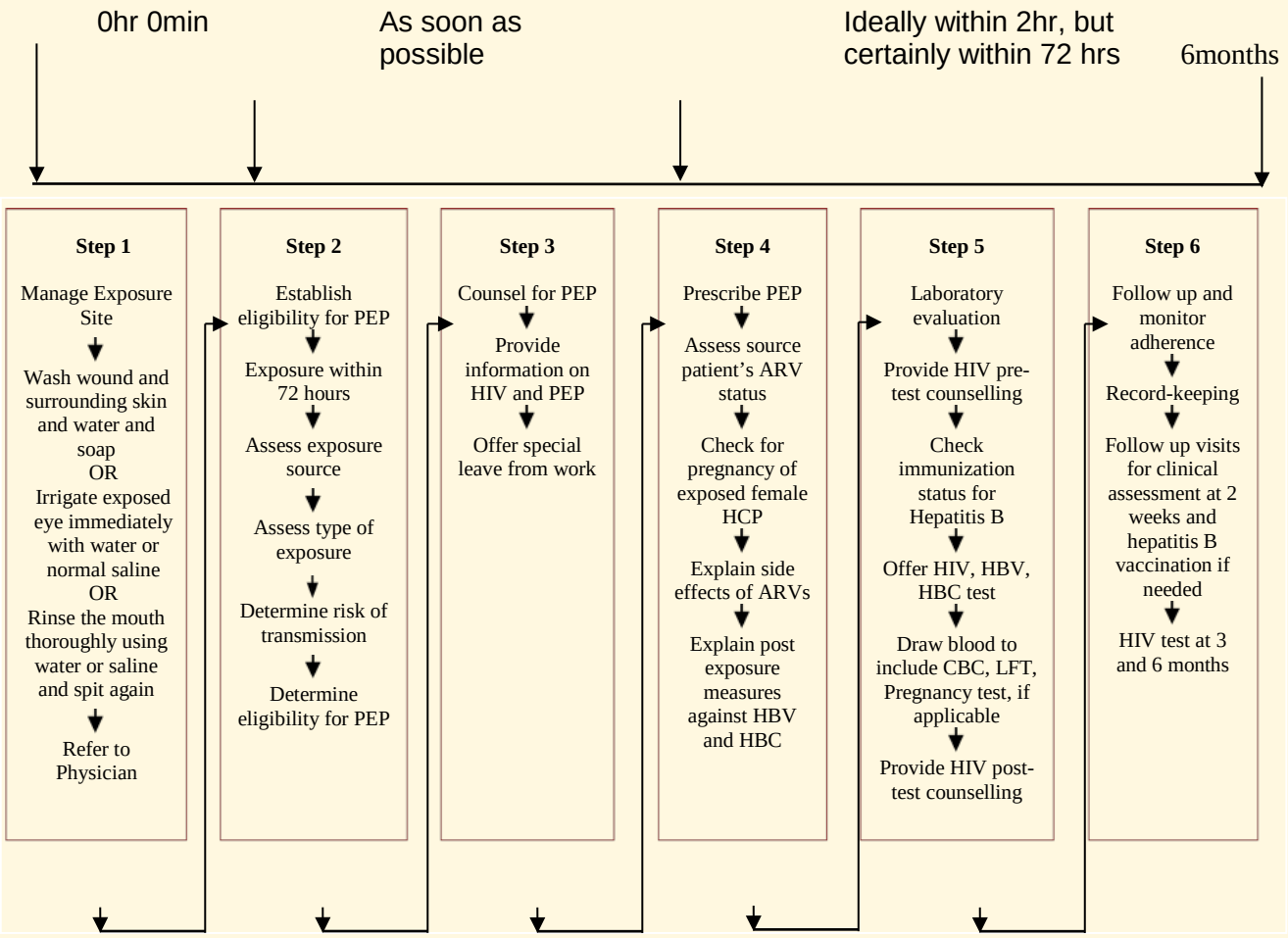
BMW 2019 Amendment

1. Update on day to day basis the bio-medical waste management register and display the monthly record on its website according to the bio-medical waste generated in terms of category and colour coding as specified in Scheduled.
2. Annual report on its web-site within a period of two years from the date of publication of the Bio- Medical Waste Management (Amendment) Rules, 2018 is made available.
3. Health Care Facilities having less than ten beds shall have to comply with the output discharge standard for liquid waste by 31st December,2019.

4. Post exposure prophylaxis (PEP)

"Post exposure prophylaxis" (PEP) refers to the comprehensive management given to minimize the risk of infection following potential exposure to blood-borne pathogens (HIV, HBV, HCV).

Steps for Managing Occupational Exposure



PEP : Post Exposure Prophylaxis ARV : Anti Retroviral
HCP : Health Care Professional CBC: Complete Blood Count
LFT : Liver Function Test.

References:

1. https://www.who.int/gpsc/5may/Hand_Hygiene_Why_How_and_When_Brochure.pdf
2. https://www.ijmm.org/documents/Treatment_Guidelines_2019_Final.pdf
3. https://www.who.int/medicines/news/2019/WHO_releases2019AWaRe_classification_antibiotics/en/
4. https://dhr.gov.in/sites/default/files/Bio-medical_Waste_Management_Rules_2016.pdf
5. https://www.cdc.gov/hai/organisms/cre/cre-facilities 2018.pdf