Bharati Vidyapeeth University Medical College Hospital & Research Centre, Pune

Antimicrobial Policy
and
Antimicrobial Stewardship Program
2025-2026
Version - 11.0

EDUCATE.
ADVOCATE.
ACT NOW.

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar Prof Microbiology	Dr. M S Modak Prof & HoD Microbiology	Dr. Shilpa Acharya Quality Department	Dr. SK Lalwani Medical Director

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List of amendments in Version 11.0

1. Isolate listing and antibiogram for the year 2024
2. Updated Clinical Pathway (Pg.no 5)
3. Updated workflow of Antimicrobial Stewardship (Pg.no 7)
4. Restricted antimicrobials classified as per WHO watch and reserve class (Pg.no 9)
5. Added Irrational Fixed Dose Combination (Pg no.9)
6. Added list of Antibiotics with Overlapping anaerobic coverage (Pg no 9)
7. Added list of BL-BLI combinations not recommended by WHO (Appx 5)
8. Inj colistin changed to inj polymyxin B for treatment of XDR gram negative Pneumonia (Table 2)
9. Clarified timing of empiric dose of oseltamivir (Pg no 41)
10. Updated treatment guidelines for pelvic inflammatory disease (Table 4a)
11. Fluroquinolones removed from acute uncomplicated pyelonephritis (Table 4)
12. Updated empiric treatment of necrotizing fasciitis (Table 5)
13. Inj Vancomycin added to empiric treatment of, bone and joint infection in paediatrics (Table 10)
14. Loading doses of colistin, polymyxin and teicoplanin added (Table 21)
15. Added Diagnostic stewardship flowchart (Pg.no 69)
16. Table of duration of therapy updated. (Appx 2)
17. Added Antimicrobial agent form V3 (Appx 3)
18. Updated blood culture sample collection method (butterfly needle / adaptor) (Appx 4)

1. Introduction -

Over the last 75 years antimicrobials have been widely used to treat infectious diseases. Their indiscriminate use has led to resistance developing to almost all known antimicrobials. Antimicrobial resistance has become widespread not only in hospitals but also in the community.

A rational antimicrobial policy and antimicrobial stewardship is a must for all hospitals and is mandated by the Ministry of Health and Family Welfare through its document "National Policy for Containment of Antimicrobial Resistance, India". The purpose of this document is to provide a guide for rational antimicrobial use at Bharati Hospital based on local patterns of antimicrobial susceptibility.

DEFINITIONS

Antimicrobial agent (Antibiotic): Any agent, which has a potential for or is used with an intention of affecting microbial growth inside or on the human body. This includes antibacterial, antifungal, antiviral and anti-parasite agents.

Antimicrobial Stewardship: A set of coordinated activities that includes appropriate selection of antimicrobial agent, dosing, route and duration of antimicrobial therapy. The primary goal of antimicrobial stewardship is to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms and the emergence of resistance.

Surgical Antimicrobial Prophylaxis/Prophylactic anti-microbial agents: Administration of an antibiotic or antimicrobial agent prior to the commencement of a surgical procedure and appropriate re-administration of the agent during prolonged surgery.

Empiric Antibiotic/Antimicrobial therapy: This is an early institution of antimicrobial therapy pending the results of culture and / or other relevant investigation and clinical response, in patients who have an illness and in whom there is an expectation of an infectious cause, the treatment being directed against the most likely microbial agent(s) in that particular episode.

Definitive Antimicrobial Therapy: Usage of antimicrobial agent against infection by specific microorganisms which have been confirmed by culture of appropriate samples.

2. Clinical Pathway

1. Postgraduate Resident of respective department will assess patient for symptoms and signs of infection, including laboratory evidence of infection.
2. He/she will document appropriately on the culture requisition form.
   - suspected cause/site of infection,
   - possibly community (CA)/hospital acquired(HA)
   - patient type (types 1-3 described below)
3. Appropriate site cultures and blood cultures will be sent according to HICC protocol.
4. Antimicrobial will be chosen according to antimicrobial guide after informing lecturer on call and checking for allergy risks**. Same will be endorsed in the case notes along with drug chart dose and indication**
5. Any deviation from the policy will be documented along with the reason for deviation.
6. Some antimicrobials will be part of the restricted formulary and use of these "ALERT" antimicrobials will require infectious disease/ critical care (ICU/PICU/NICU) consult. These include;

   Piperacillin/Tazobactam, Carbapenems, Ceftazidime avibactam, Aztreonam, Polymixins, Linezolid, Teicoplanin, Vancomycin, Echinocandins, Voriconazole, Amphotericin B
7. Clinical response will be followed up.
8. Once culture reports are available (Day 2 – Day 4) antimicrobial is to be de-escalated (if possible) and duration of therapy is to be specified if not already done so.
9. Antimicrobial prescription should have a record of the day and expected duration of antimicrobials in the left-hand margin of the drug chart, eg D4/7
10. Antimicrobial Stewardship team will fill antimicrobial audit form and conduct regular department wise audits.

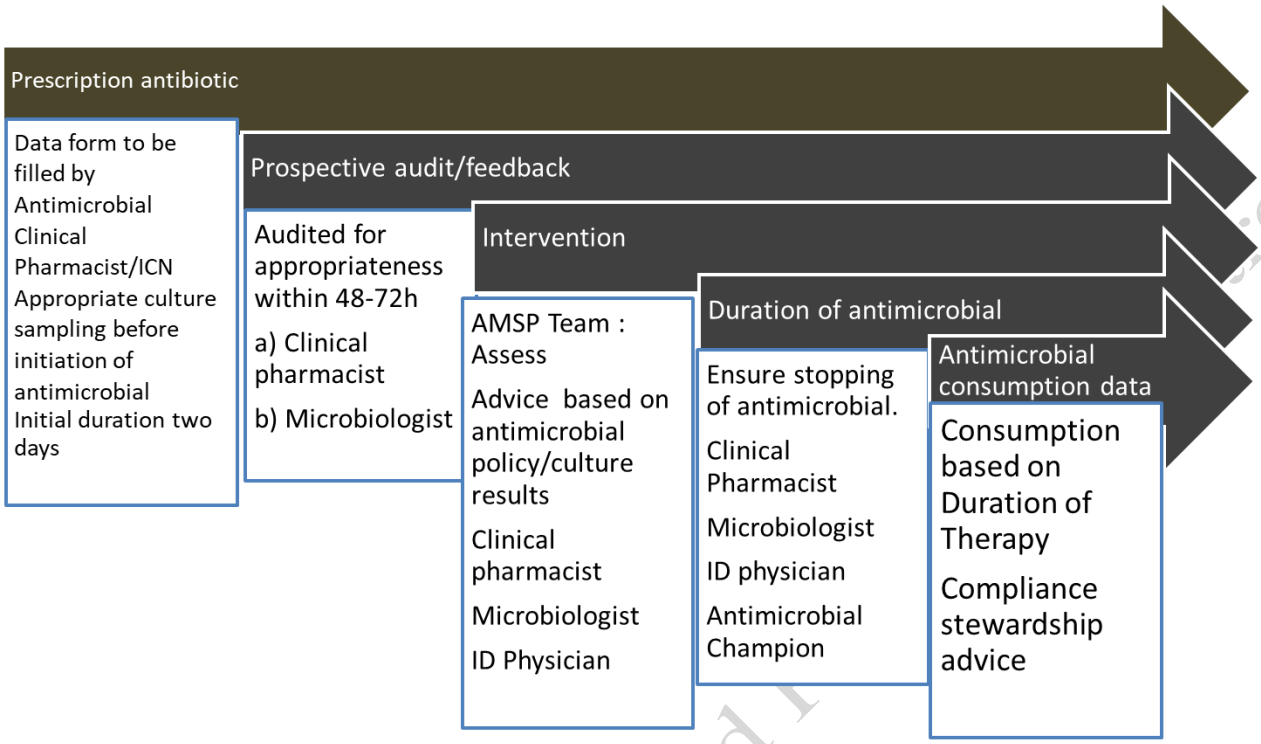
3. Antimicrobial Stewardship

- A set of coordinated strategies to improve the use of antimicrobials

Goal

- Enhancing patient health outcomes
- Reducing resistance to antibiotics
- Decreasing unnecessary costs

4Workflow of Antimicrobial stewardship



Data of all patients who are prescribed antimicrobials are filled in the antimicrobial agent form and are audited for the following parameters:

- To ensure the antibiotics prescribed are appropriate as per their indication
- Streamlining or de-escalation will be done to ensure targeted therapy
- Dose optimization will be done based on body weight, site, renal and hepatic function and on drug pharmacokinetics and dynamics
- To ensure patient receives antibiotics for appropriate duration
- Surgical Prophylaxis will be monitored for correct timing and cessation at 24 hours

Metrics used in AMSP

- Days of therapy
- Cost metrics
- Average length of stay
- Mortality rate
- Acceptance of intervention
- Resistance pattern
- Comparison of HAI with ABX consumption rate

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4 a) List of Restricted Antimicrobials

These will not be prescribed without obtaining concurrence of HoD/HoU ;

Antibiotics (as per WHO AWaRE Classification)	
WATCH	• **Piperacillin/tazobactam** • **Carbapenem** • **Vancomycin** • **Teicoplanin**
RESERVE	• **Linezolid** • **Daptomycin** • **Tigecycline** • **Polymyxin B** • **Colistin** • **Ceftazidime avibactam** • **Aztreonam**
Antifungals	
	• **Echinocandins : Caspofungin, Micafungin**

4 b) Irrational Fixed Dose Combination

1) Ofloxacin+ Ornidazole
2) Norfloxacin+ Tinidazole
3) Ciprofloxacin+ Tinidazole
4) Ofloxacin + Tinidazole
5) Norfloxacin + Metronidazole

c) Antibiotics with overlapping anaerobic coverage

1) Piperacillin/tazobactam+ Metronidazole
2) Amoxicillin/clavulanate+ Metronidazole
3) Meropenem + Metronidazole
4) Clindamycin + Metronidazole
5) Piperacillin/tazobactam + Clindamycin
6) Meropenem + Clindamycin
7) Amoxicillin/clavulanate + Clindamycin

(Detailed list of irrational BL-BLI antibiotic combinations is mentioned in Appendix 5)

4 d) Common antimicrobial resistant organisms:

Extended spectrum beta-lactamase producers (ESBL)

These are Gram negative organisms (GNB) like E coli & Klebsiella, which are resistant to the penicillin's; first-, second and third-generation cephalosporins; In addition, the plasmids bearing genes-encoding ESBLs frequently also carry genes encoding resistance to other antimicrobial agents, such as aminoglycosides, trimethoprim, sulphonamides, tetracyclines and chloramphenicol. They remain susceptible to beta lactam- beta lactamase inhibitor combinations and carbapenems.

Amp C beta lactamases
These are inducible beta lactamases produced by certain organisms after exposure to cephalosporins. The organisms are resistant to the penicillins; first-, second- and third-generation cephalosporins and beta-lactam-beta lactamase inhibitor combinations. They may remain susceptible to cefepime and carbapenems. Seen in *Serratia, Pseudomonas, Proteus, Citrobacter and Enterobacter* spp.

Carbapenemase producers:
These are Gram negative organisms resistant to the Carbapenems and almost all beta-lactam antimicrobials except monobactams. Colistin and polymyxins are currently used for these organisms.

Methicillin Resistant Staphylococcus aureus (MRSA)
These are resistant to all beta lactam antimicrobials (Penicillins, BL-BLI, Cephalosporins, monobactams and Carbapenems.)

Vancomycin Resistant Enterococcus (VRE):
These isolates are resistant to Vancomycin, Teicoplanin but susceptible to linezolid.

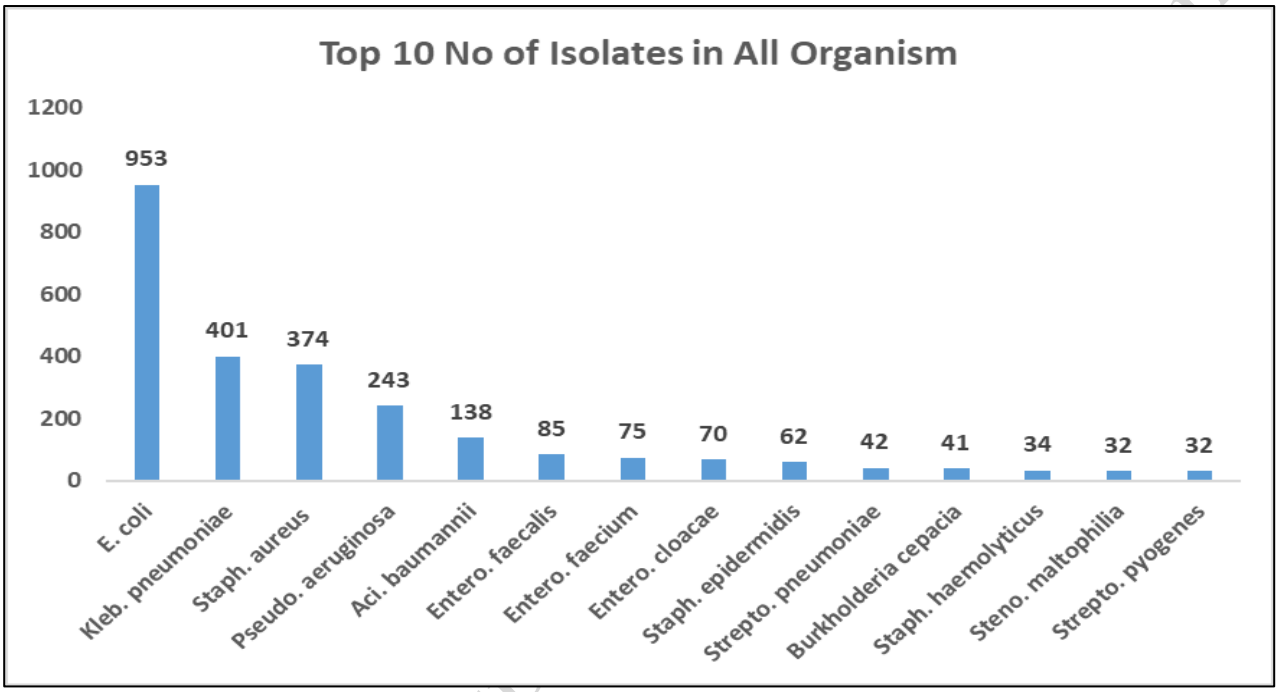
MDR (Multi-drug resistance):
Isolates resistant to representatives of three or more classes of antimicrobial agents,

XDR (Extensive drug resistance):
Isolates resistant to all but one or two classes

PDR (Pan drug resistance):
Isolates resistant to all classes of antimicrobial agents available

5. Organisms Commonly Isolated and Antibiogram:

Overall Hospital
All organism: Top 10 Isolates



Susceptibility Percentage of All Organism 2024

Organism	Number of patients	Nitrofurantoin	Penicillin	Ampicillin	Oxacillin	Levofloxacin	Ciprofloxacin	Norfloxacin	Ofloxacin	Cotrimoxazole	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefotaxime	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Gentamicin high leve	Clindamycin	Erythromycin	Tetracycline	Ertapenem	Meropenem	Imipenem	Tigecycline	Daptomycin	Linezolid	Teicoplanin	vancomycin	Fosfomycin	Minocycline	Colistin
Escherichia coli	953	84	0	22		0	11	45	46	49	50	15	15	54	22	6	29	62	71	87	76				88	83	85	84	99					99	100	100
Klebsiella pneumoniae	401	28	0			0	37	78	78	51	48	35	36	69	40	29	43	51	51	65	66	0		67	100	60	58	56	91	0				0	100	100
Pseudomonas aeruginosa	243					64	65	100	100	67				77			78		84	74	71						72	71	0						100	100
Acinetobacter baumannii	138					100	15			30				0	15		12		13	13	19					0	11	10							100	99
Enterobacter cloacae	70	0					69	75	50	79	3	42	33	80	63	0	79	84	83	91	80			100	100	85	89	87	93					0	0	
Burkholderia cepacia	41					62	0			80				92	0		4	37	5	12	8						92								76	
Staphylococcus aureus	374	100	7		45	8	8		0	46											74	100	90	44	93	0			100	97	100	100	99			
Enterococcus faecalis	85	95	93			28	28															0	0	4	11				100	68	99	99	99			
Enterococcus faecium	75	8	6			5	5			0														3	9				0		95	81	89			
Staphylococcus epidermidis	62	100	13		22	48	49			48											80	100	73	25	80				0	100	100	88	100			
Streptococcus pneumoniae	42		100	0		92	0			56	0	0			92	100	0	0	100	100	100		47	11	31		100		97		97		97			
Staphylococcus haemolyticus	34	100	12		10	4	9			35											27		18	0	71				0	100	100	100	100			
Stenotrophomonas maltophilia	32					87				65				0																				67	
Streptococcus pyogenes	32		100	90		57	0							100	96	100							96	39	65				100		100		100			

Reserved/ Restricted Drugs:Not to be used emperically unless justified

Will be useful clinically

Will be useful clinically in about 2/3 cases

Will not be useful clinically

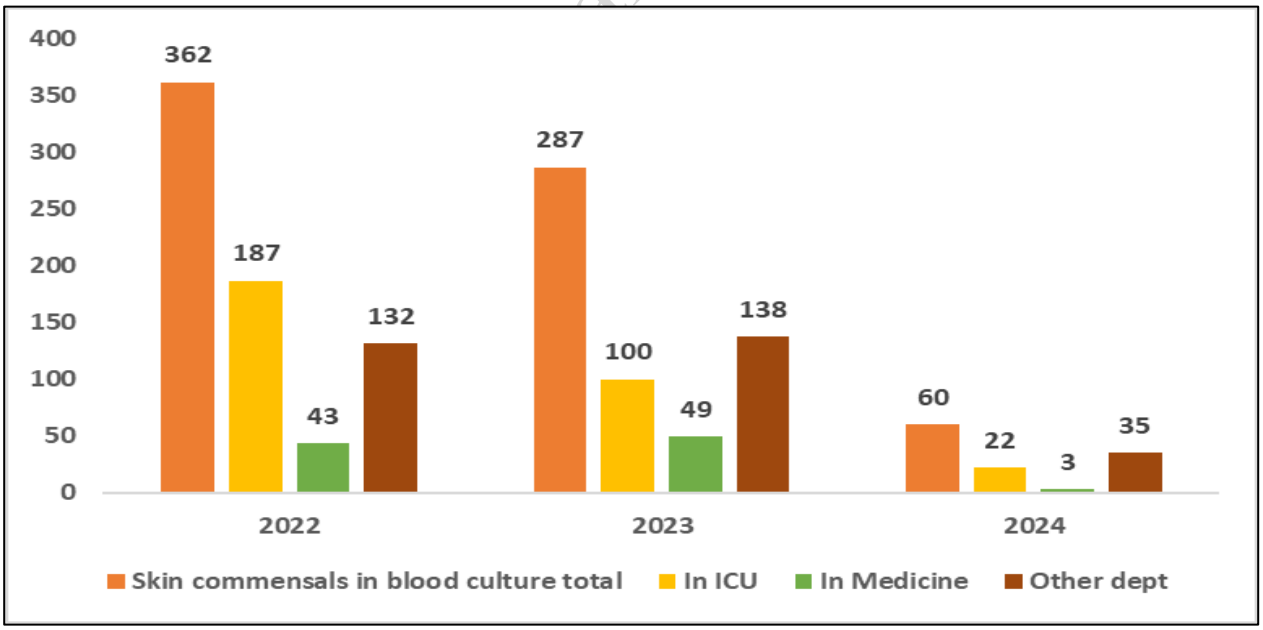
Not tested/not appropriate antibiotic

Candida Isolated in all location 2024

Specimen type	Organism	Number of patients	Fluconazole	Voriconazole	Ampho B	Caspofungin	Micafungin
Blood	Candida albicans	12	91	100	33	100	92
	Candida auris	13	0	0	100	100	100
	Candida glabrata	3		0	67	33	100
	Candida parapsilosis	21	76	95	85	95	95
	Candida tropicalis	8	88	100	100	100	88
Fluid	Candida parapsilosis	1	100	100	100	100	100
Pus	Candida albicans	2	100	50		100	100
	Candida parapsilosis	2	100	100	100	100	100
	Candida tropicalis	2	100	100	100	100	100
Urine	Candida albicans	5	100	100	20	100	100
	Candida parapsilosis	2	50	100	100	100	100
	Candida tropicalis	3	67	100	100	100	100

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Skin flora/Collection contamination in blood culture:

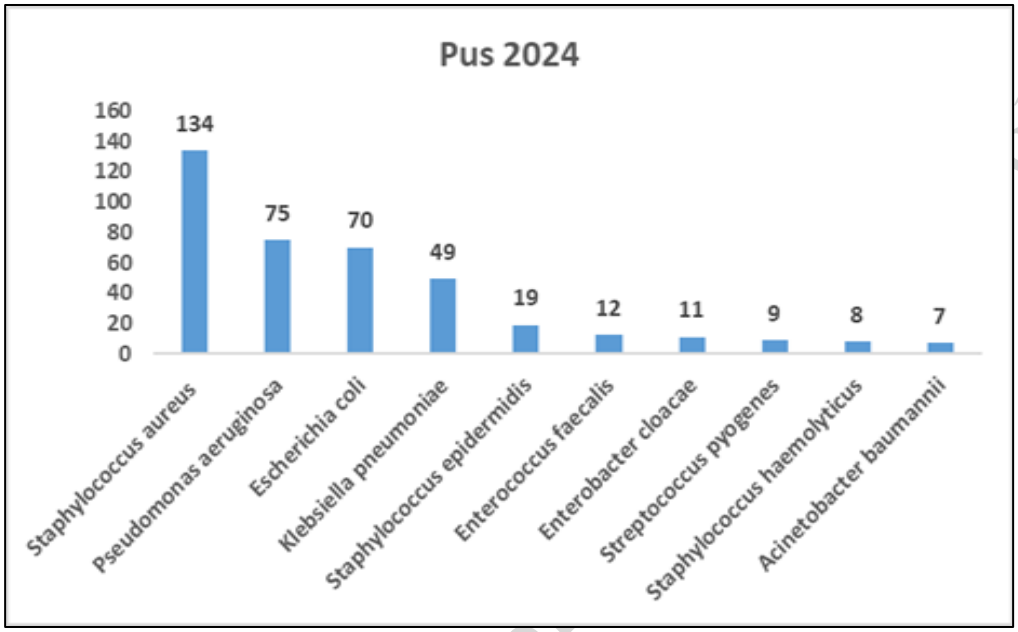


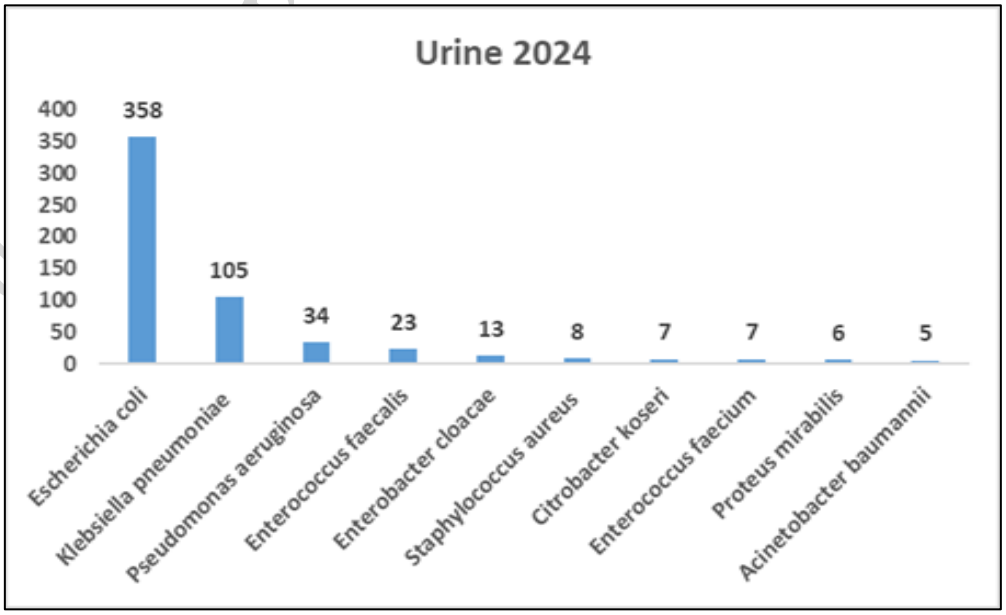
There has been a reduction in the number of collection contamination or skin

flora reported in blood culture during the year 2024
Organism Commonly Isolated and Antibiogram: Area wise

OPD: Top 10 Isolates Sample wise

Specimen Type	Overall No. of Isolates
Pus	451
Urine	601





OPD Antibiogram:

Percentage Susceptibility Gram Negative Organism 2024

Location	Specimen type	Organism	Number of patients	Nitrofurantoin	Levofloxacin	Ciprofloxacin	Cotriamoxazole	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefotaxime	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Ertapenem	Meropenem	Imipenem	Tigecycline	Fosfomycin	Minocycline	Colistin
OPD	Pus	Escherichia coli	39			7.7	49	54	18	21		26		28	74	82	81	74	90	86	85	100			100
		Klebsiella pneumoniae	26			39	54	46	46	47		50		50	58	56	58	68	62	59	65	100			100
		Pseudomonas aeruginosa	51		63	67	50		100		90			94	79	89	90	80		89	84			100	100
	Urine	Escherichia coli	358	85	0	15	50	52	20	18	59	28	14	35	69	75	86	75	90	88	88	99	99	100	100
		Klebsiella pneumoniae	105			38	48	47	33	32	73	40	43	42	46	51	67	64	63	54	50	88			100
		Pseudomonas aeruginosa	34		26	33					46			47	35	80	58	46		37	40	0			100
		Enterobacter cloacae	13			85	85	8	60	50	67	62		100	100	85	92	92	85	100	100	100			100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Percentage susceptibility Gram Positive organism 2024

Location	Specimen type	Organism	Number of patients	Nitrofurantoin	Oxacillin	Penicillin	Ciprofloxacin	levofloxacin	Clindamycin	Gentamicin	Gentamicin high level	Erythromycin	Tetracycline	Sulfa/Trimeth	Tigecycline	Daptomycin	Linezolid	Teicoplanin	Vancomycin
OPD	Pus	Staphylococcus aureus	125		45	6	9	10	89	73	100	30	91	45	100	99	100	100	100
		Staphylococcus epidermidis	12		27		75	78	67	82		33	73	58	0	100	100	100	100
	Urine	Enterococcus faecalis	23	86		100	17	11									100	100	100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

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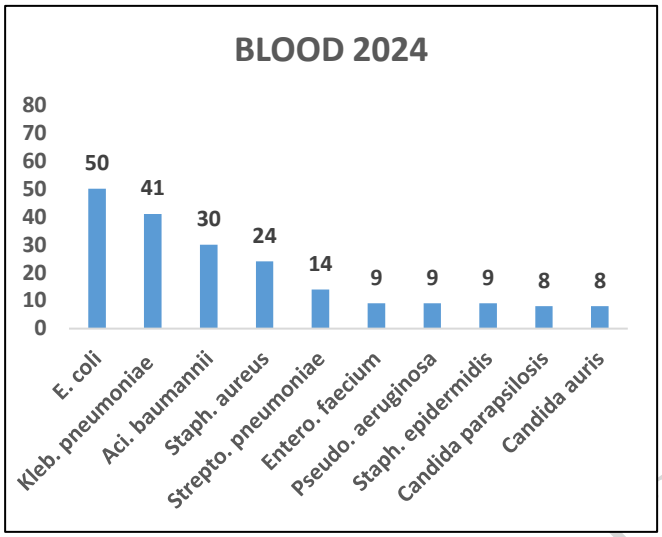
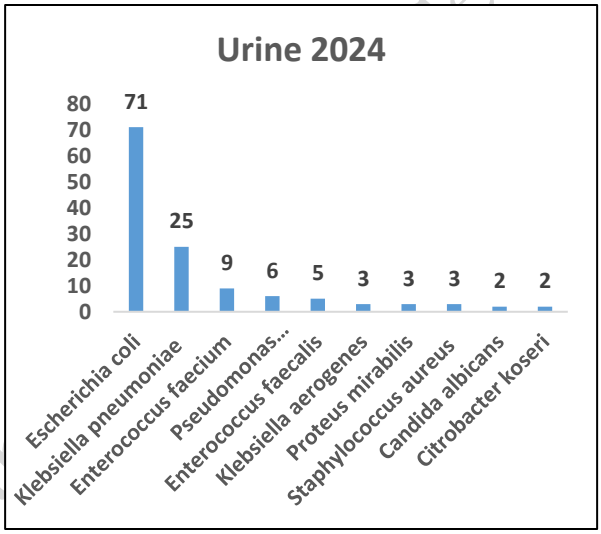
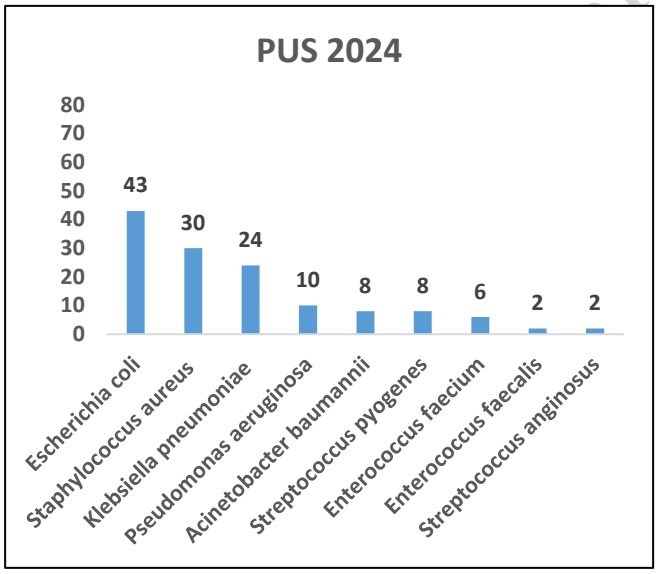
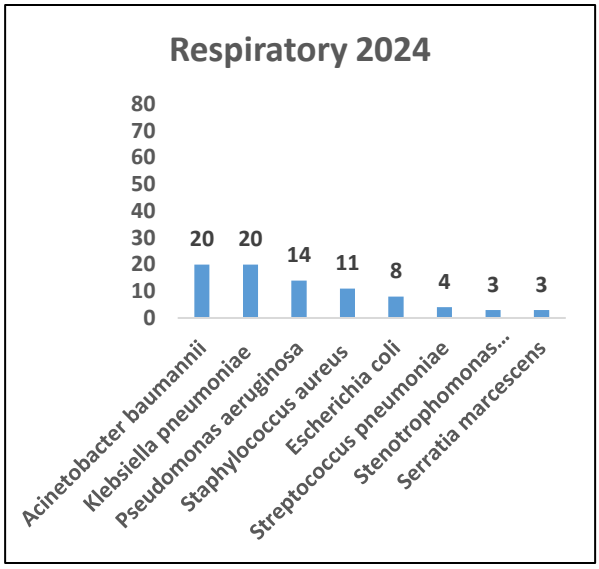
INTENSIVE CARE UNIT: TOP 10 ISOLATES BY SAMPLE:

SPECIMEN TYPE	OVERALL NO. OF ISOLATES
Blood	290
Pus	142
Respiratory	89
Urine	140









INTENSIVE CARE UNIT ANTIBIOGRAM:

Percentage Susceptibility Gram Negative Organism 2024

Location	Specimen type	Organism	Number of patients	Levofloxacin	Ciprofloxacin	Cotrimoxazole	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Ertapenem	Meropenem	Imipenem	Tigecycline	Fosfomycin	Colistin
ICU	Blood	Escherichia coli	50	0	6	47	59	14	14		22	32	69	80	83	80	84	84	86	100		100
		Klebsiella pneumoniae	41		27	48	36	24	25		29	32	32	39	51	61	35	42	38	90		100
		Acinetobacter baumannii	30		7	37	0	0	0		8	7	7	7	3	11		3	3			100
	Pus	Escherichia coli	17		12	47	41	12	13		12	24	59	59	71	53	69	81	69	94		100
		Klebsiella pneumoniae	12		17	42	18	18	11		17	17	17	17	25	50	20	27	33	80		100
	Tissue	Escherichia coli	15		13	53	31	14	18		13	27	40	40	62	47	58	64	69	100		100
	Urine	Escherichia coli	71		9	48	47	12	14	100	12	26	55	60	89	80	71	76	76	100	99	100
		Klebsiella pneumoniae	25		25	28	36	16	17		16	21	36	33	60	56	46	44	39	83		100
	Respiratory	Acinetobacter baumannii	20		5	20					6	5	0	5	5	10		5	5			100
		Klebsiella pneumoniae	20		11	32	29	5	0		5	11	0	26	40	45	33	35	31	87		100
		Pseudomonas aeruginosa	14	85	79	0	100			85		85	0	90	86	100		58	58			100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

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Percentage susceptibility gram positive organism 2024

Location	Specimen type	Organism	Number of patients	Oxacillin	Penicillin	Ciprofloxacin	Levofloxacin	Moxifloxacin	Clindamycin	Gentamicin	Erythromycin	Tetracycline	Sulfa/Trimeth	Tigecycline	Daptomycin	Linezolid	Teicoplanin	Vancomycin
ICU	Blood	Staphylococcus aureus	24	57	17	17	21		95	48	48	96	48	100	95	100	100	100
		Streptococcus pneumoniae	14		100		82	90	67		9	23	31	100		100		100
	Pus	Staphylococcus aureus	30	48	14	3	3		94	76	44	94	64	100	96	100	100	97
	Respiratory	Staphylococcus aureus	11	30	0	10	10		100	73	50	91	46	100	89	100	100	100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

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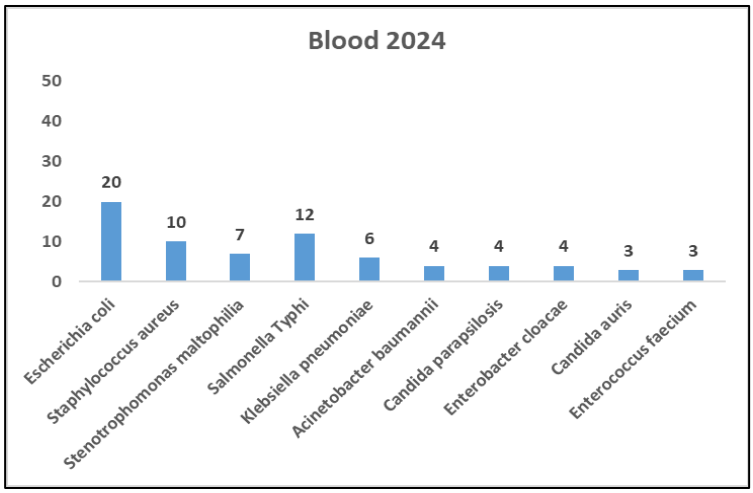
Candida Isolated in ICU

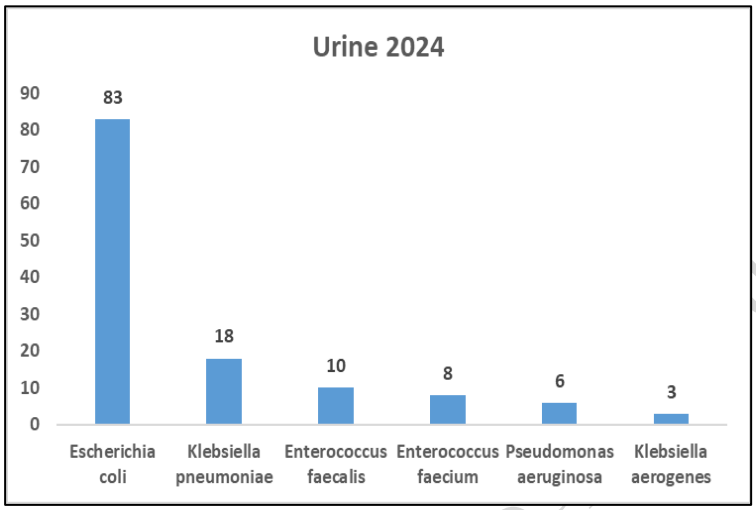
Location	Specimen type	Organism	Number of patients	Fluconazole	Voriconazole	Ampho B	Caspofungin	Micafungin
ICU	Blood	Candida albicans	6	100	100	0	100	100
		Candida glabrata	2		0	50	50	100
		Meyerozyma guilliermondii	2	0	0	50	50	50
		Issatchenkia orientalis	1	0	100	0	100	100
		Candida parapsilosis	8	63	100	75	100	100
		Candida auris	8	0	0	100	100	100
		Candida tropicalis	4	75	100	100	100	75
	Fluid	Issatchenkia orientalis	1	0	100	0	100	100
	Pleural fluid	Candida glabrata	1		0	100	100	100
	Pus	Candida tropicalis	1	100	100	100	100	100
	Urine	Candida albicans	2	100	100	0	100	100
		Meyerozyma guilliermondii	1	0	0		100	100
		Candida parapsilosis	2	50	100	100	100	100
		Candida tropicalis	1	100	100	100	100	100

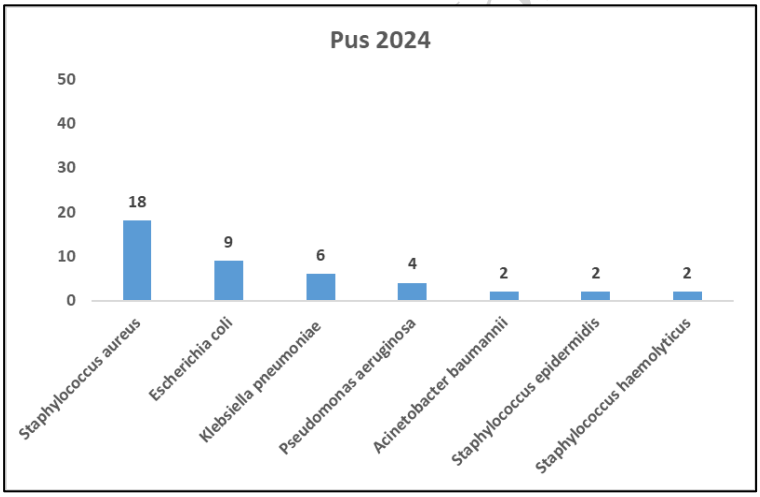
Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Medicine: Top 10 Isolates by Sample



Specimen Type	Overall No. of Isolates
Blood	93
Pus	56
Urine	142





Medicine Antibiogram Gram Negative:

Percentage Susceptibility Gram Negative Organism 2024

Location	Specimen type	Organism	Number of patients	Ciprofloxacin	Norfloxacin	Cotrimoxazole	Amox/clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefotaxime	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Ertapenem	Meropenem	Imipenem	Tigecycline	Fosfomycin	Colistin
MED	Blood	Escherichia coli	20	5		60	35	10	11		10	0	26	65	75	90	90	95	95	95	100		100
		Salmonella Typhi	12	17		92					100							100	100	100			
	Urine	Escherichia coli	83	7	0	39	49	13	13	0	15	0	22	57	63	83	68	75	78	81	99	99	100
		Klebsiella pneumoniae	18	41	100	61	67	50	50	0	44	0	53	65	71	78	83	72	77	77	94		100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Medicine Antibiogram Gram Positive:

Percentage susceptibility gram positive organism 2024

Location	Specimen type	Organism	Number of patients	Nitrofurantoin	Oxacillin	Penicillin	Ciprofloxacin	Levofloxacin	Clindamycin	Gentamicin	Erythromycin	Tetracycline	Sulfa/Trimeth	Tigecycline	Daptomycin	Linezolid	Teicoplanin	Vancomycin
MED	Blood	Staphylococcus aureus	10		56	25	11	0	100	90	44	100	22	100	100	100	100	100
	Urine	Enterococcus faecalis	10	90		100	20	20			0	0		100	78	100	100	100

Reserved/ Restricted Drugs:Not to be used emperically unless justified

Will be useful clinically

Will be useful clinically in about 2/3 cases

Will not be useful clinically

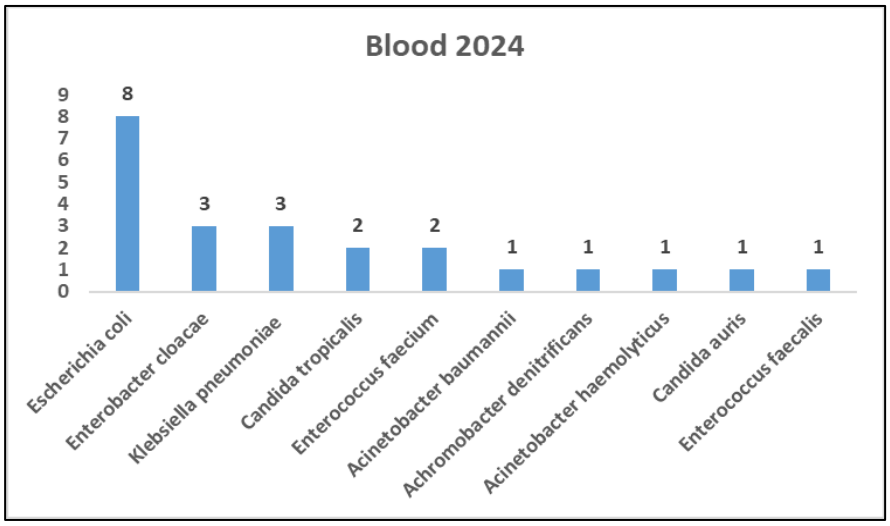
Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

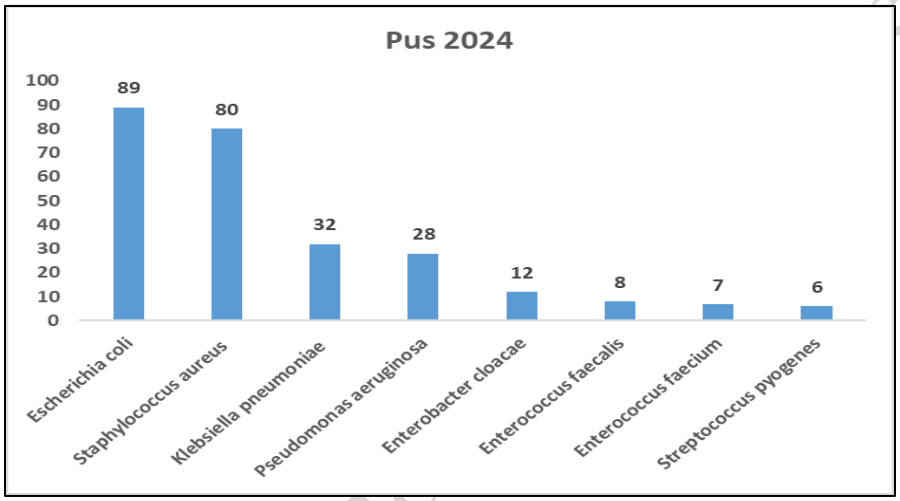
Candida Isolated in Medicine:

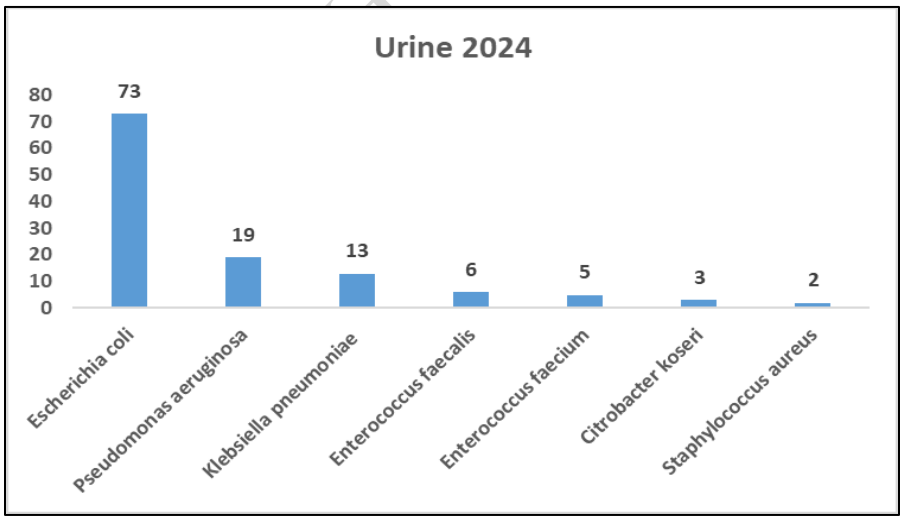
Location	Specimen type	Organism	Number of patients	Fluconazole	Voriconazole	Ampho B	Caspofungin	Micafungin
Med	Blood	Candida albicans	1			100	100	100
		Candida glabrata	1		0	100	0	100
		Candida parapsilosis	4	75	100	100	100	100
		Candida auris	3	0	0	100	100	100
		Candida tropicalis	1	100	100	100	100	100
	Pus	Candida parapsilosis	1	100	100	100	100	100
	Urine	Candida parapsilosis	1	100	100	100	100	100

Surgery: Top 10 Isolates by Sample



Specimen Type	Overall No. of Isolates
Blood	25
Pus	307
Urine	126





Surgery Antibiogram:

Percentage Susceptibility Gram Negative Organism 2024

Location	Specimen type	Organism	Number of patients	Levofloxacin	Ciprofloxacin	Cotrimoxazole	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Ertapenem	Meropenem	Imipenem	Tigecycline	Fosfomycin	Colistin
Surg	Pus	Escherichia coli	39		8	41	46	14	17		18	24	58	65	94	77	79	79	82	100		100
		Klebsiella pneumoniae	12		75	83	80	50	44		58	50	64	82	83	92	78	78	78	100		100
	Tissue	Escherichia coli	14		7	50	50	7	8		7	21	64	69	93	57	92	92	92	100		100
		Klebsiella pneumoniae	11		36	46	30	36	22		46	44	50	50	55	55	44	44	33	90		100
		Pseudomonas aeruginosa	10	67	67					88		78	70	88	100	100		80	78			100
	Urine	Escherichia coli	73		8	48	41	10	8		12	25	58	70	85	59	81	84	84	98	99	100
		Pseudomonas aeruginosa	19	28	32					33		37	22	63	50	43		39	39			100
		Klebsiella pneumoniae	13		33	46	36	39	36		39	33	46	33	54	46	55	50	55	82		100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Percentage susceptibility gram positive organism 2024

Location	Specimen type	Organism	Number of patients	Oxacillin	Penicillin	Ciprofloxacin	levofloxacin	Ofloxacin	Clindamycin	Gentamicin	Gentamicin high level	Erythromycin	Tetracycline	Sulfa/Trimeth	Tigecycline	Daptomycin	Linezolid	Teicoplanin	Vancomycin
Surg	Pus	Staphylococcus aureus	80	45	5	8	4	0	92	75	100	51	98	47	100	97	100	100	100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

Candida Isolates:

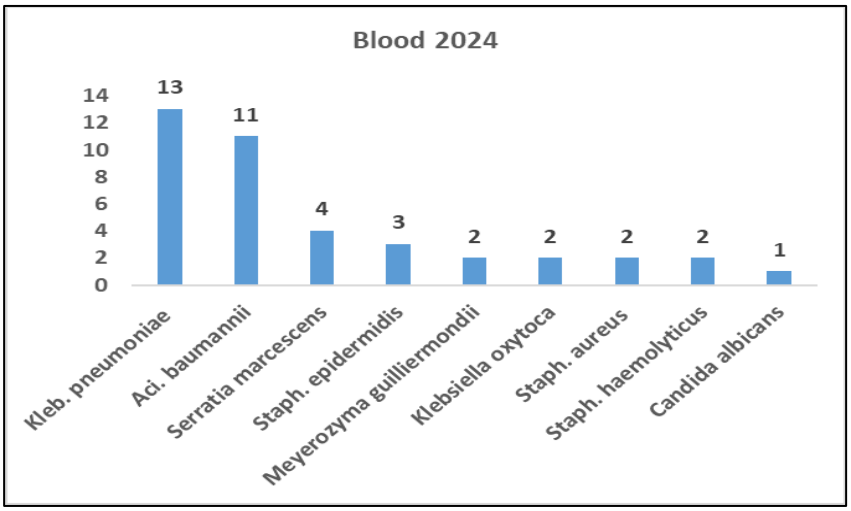
Candida Isolated in Surgery

Location	Specimen type	Organism	Number of patients	Fluconazole	Voriconazole	Ampho B	Caspofungin	Micafungin
Surg	Blood	Candida auris	1	0	0	100	100	100
		Candida tropicalis	2	100	100	100	100	100
	Fluid	Candida parapsilosis	1	100	100	100	100	100
	Pus	Candida parapsilosis	2	50	100	100	100	100
		Candida albicans	2	50	50	0	100	100
		Candida tropicalis	1	100	100	100	100	100
	Urine	Candida albicans	1	100	100	100	100	100

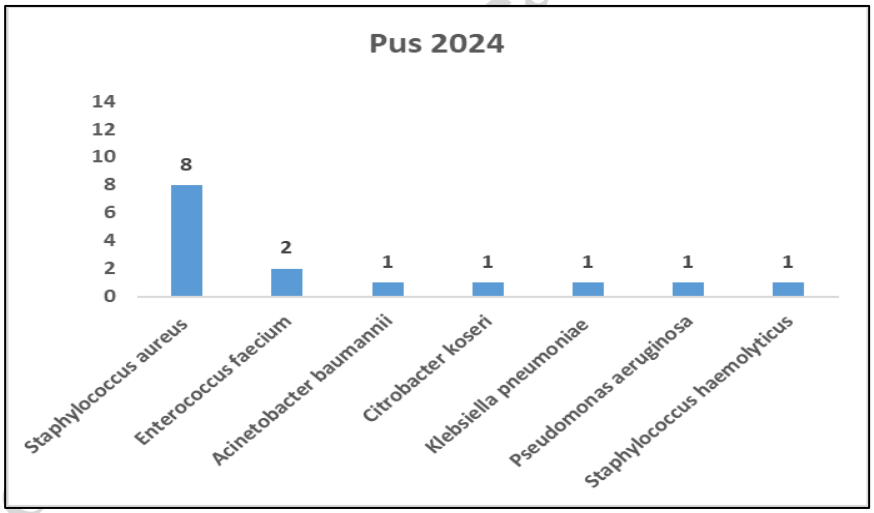
Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

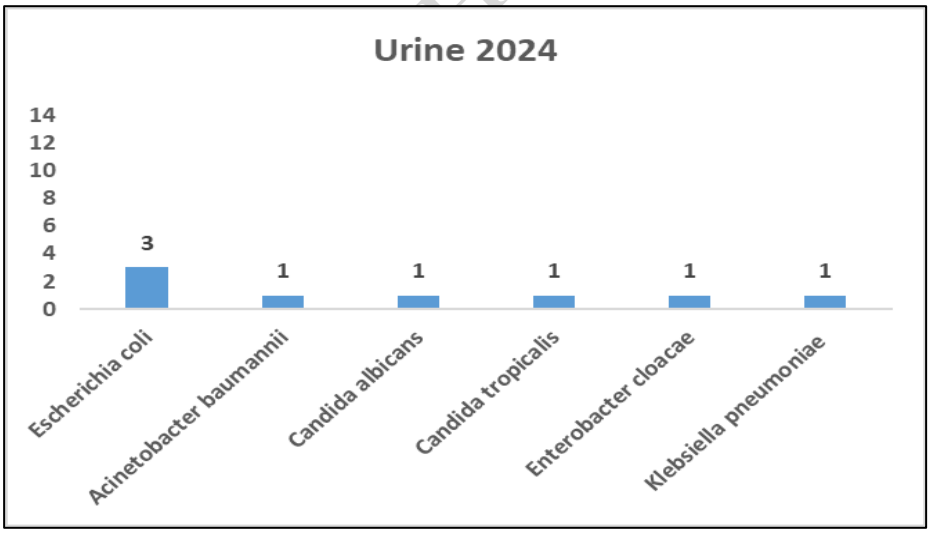
Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar Prof Microbiology	Dr. M S Modak Prof & HoD Microbiology	Dr. Shilpa Acharya Quality Department	Dr. SK Lalwani Medical Director

Neonatal Intensive Care Unit: Top 10 Isolates Sample wise:



Specimen Type	Overall No. of Isolates
Blood	53
Pus	15
Urine	8





Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar Prof Microbiology	Dr. M S Modak Prof & HoD Microbiology	Dr. Shilpa Acharya Quality Department	Dr. SK Lalwani Medical Director

NICU Antibiogram:

Percentage Susceptibility Organism -NICU 2024

Organism	Number of patients	Cotrimoxazole	Amox/clav	Ciprofloxacin	Levofloxacin	Penicillin	Oxacillin	Cefuroxime	Cefuroxime Axet	Ceftriaxone	Cefepime	Cel/Sul	Piptaz	Amikacin	Gentamicin	Clindamycin	Erythromycin	Tetracycline	Ertapenem	Imipenem	Meropenem	Teicoplanin	Linezolid	Daptomycin	Vancomycin	Tigecycline	Fosfomycin	Colistin
Klebsiella pneumoniae	15	67	50	40				40	36	53	60	64	64	86	100			100	79	71	71					100		100
Acinetobacter baumannii	13	54		23				0	0	36	25	33	33	23	31				0	18	25							100
Escherichia coli	5	80	80	0				0	0	0	25	50	50	100	80				100	100	100					100	100	100
Serratia marcescens	4	75	0	100				0	0		100			100	100				100	100	100							
Enterobacter cloacae	2	100	0	50				50	50	50	50	50	50	100	50				100	100	100					100		100
Klebsiella oxytoca	2	50	100	100				100	100	100	100	100	100	100	100				100	100	100					100		100
Staphylococcus aureus	9	13		0	0	0	14								75	100	33	100				100	100	100	100	100		
Staphylococcus epidermidis	4	25		25	25	50	25								25	25	25	100				100	100	100	100	0		
Enterococcus faecium	3			0	0	0											0	67				67	100		100	0		
Staphylococcus haemolyticus	3	67		0	0	0	0								0	50	0	67				100	100	100	100	0		
Sphingomonas paucimobilis	2	50		50	100						100	100	100	100	50					50	100							

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Percentage Susceptibility Gram Negative Organism 2024

Location	Specimen type	Organism	Number of patients	Ciprofloxacin	Cotrimoxazole	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftriaxone	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Ertapenem	Meropenem	Imipenem	Tigecycline	Colistin
NICU	Blood	Klebsiella pneumoniae	13	46	69	50	39	33	54	62	69	67	92	100	75	75	75	100	100
		Acinetobacter baumannii	11	27	64				36	30	30	36	27	36		30	22		100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

Candida Isolates:

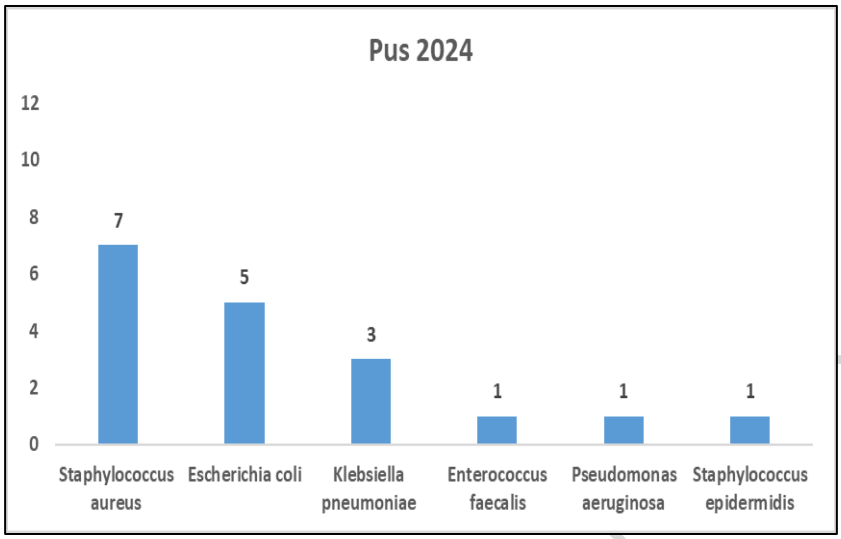
Candida Isolated in Neonatology

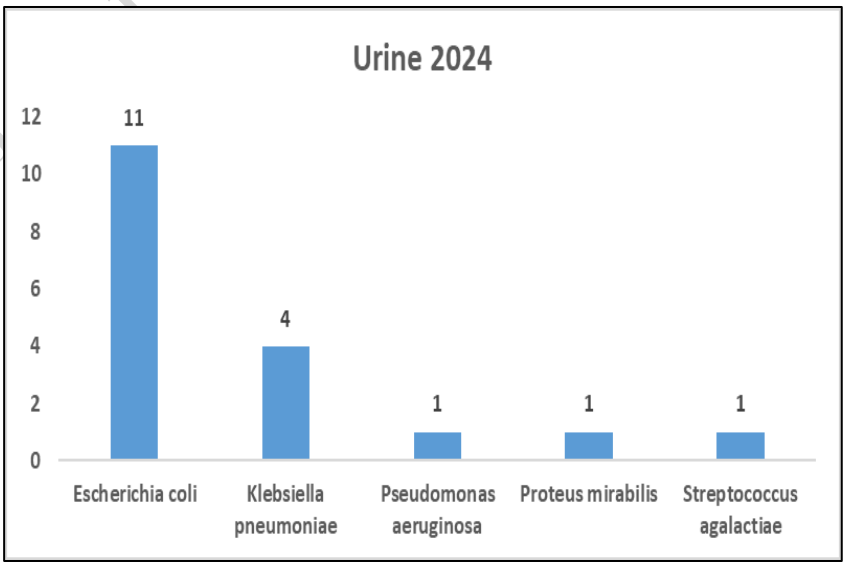
Location	Specimen type	Organism	Number of patients	Fluconazole	Voriconazole	Ampho B	Caspofungin	Micafungin
Nicu	Blood	Candida albicans	1	100	100	0	100	100
		Meyerozyma guilliermondii	2	0	0	100	100	100
	Urine	Candida albicans	1	100	100	0	100	100
		Candida tropicalis	1	100	100	100	100	100

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Obstetrics And Gynaecology:
Top 10 Isolates Sample wise

Specimen Type	Overall No. of Isolates
Pus	18
Urine	18





Obstetrics And Gynaecology Antibiogram:

Percentage Susceptibility All Organism 2024

Organism	Number of patients	Nitrofurantoin	Ciprofloxacin	Levofloxacin	Moxifloxacin	Oxacillin	Penicillin	Cotrimoxazole	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefotaxime	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Clindamycin	Erythromycin	Tetracycline	Teicoplanin	Linezolid	Daptomycin	Vancomycin	Ertapenem	Meropenem	Imipenem	Tigecycline	Fosfomycin	Colistin
Escherichia coli	20		10					55	55	5	6		21	0	32	0	74	85	85		100						94	94	94	100	100	100
Klebsiella pneumoniae	7		43					57	57	43	50		43	0	57	0	57	100	86								86	86	71	100	0	100
Pseudomonas aeruginosa	2		100	100								100			100	0	100	100	100									100	100			100
Staphylococcus aureus	9	100	0	0		67	0	56											89	89	44	100	100	100	86	100				100		
Enterococcus faecalis	2	100	50	50			100														0	0	100	100	100	100				100		
Streptococcus dysgalactiae	1			100	0		100						100	100						100	100	0		100		100				100		
Staphylococcus epidermidis	1	100	0	0		0	0	0											100	100	0	0	0	100	100	100				0		
Streptococcus agalactiae	1	100		0			100															0		100		100				100		
Staphylococcus warneri	1	100	100	100		100		100											100	100	100	100	100	100	100	100				0		

Reserved/ Restricted Drugs:Not to be used emperically unless justified

Will be useful clinically

Will be useful clinically in about 2/3 cases

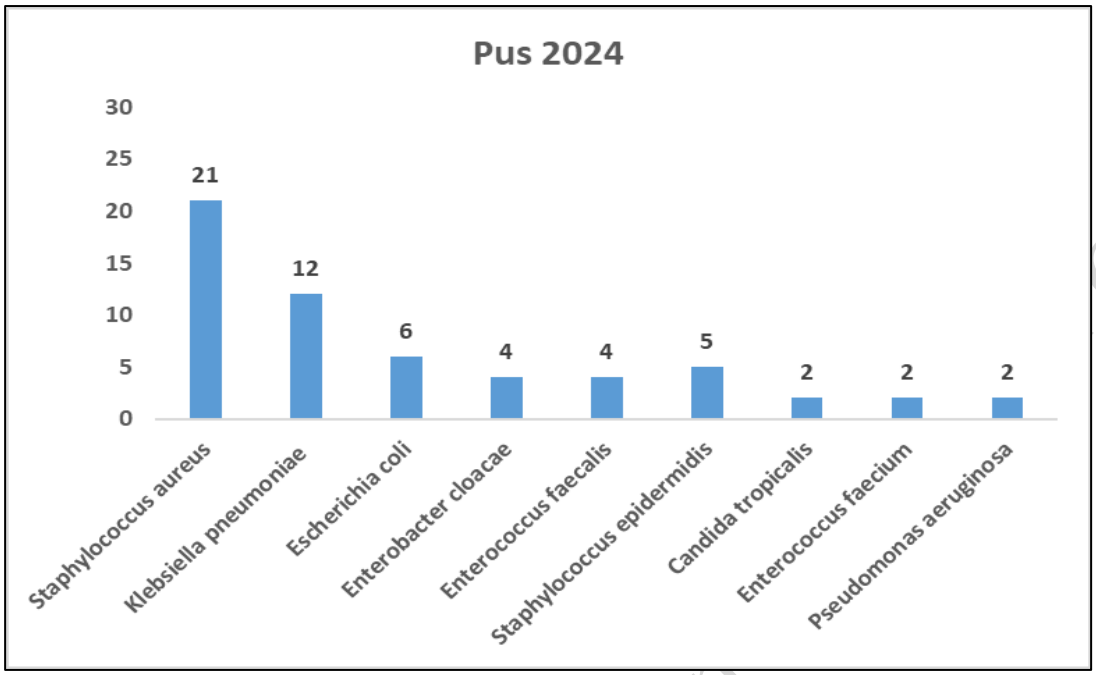
Will not be useful clinically

Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Orthopedics:

Top 10 Isolates Pus (n =60)



Orthopedics Antibiogram:

Percentage Susceptibility Gram Negative Organism 2024

Location	Specimen type	Organism	Number of patients	Nitrofurantoin	Levofloxacin	Ciprofloxacin	Norfloxacin	Cotriamoxazole	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefotaxime	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Ertapenem	Meropenem	Imipenem	Tigecycline	Fosfomycin	Minocycline	Colistin
Ortho	Pus	Escherichia coli	29			7.7		49	54	18	21		26		28	74	82	81	74	90	86	85	100			100
		Klebsiella pneumoniae	18			39		54	46	46	47		50		50	58	56	58	68	62	59	65	100			100
		Pseudomonas aeruginosa	13		63	67		50		100		90			94	79	89	90	80		89	84			100	100
	Urine	Escherichia coli	32	85	0	15	44	50	52	20	18	59	28	14	35	69	75	86	75	90	88	88		99	100	100
		Klebsiella pneumoniae	10	24		38	75	48	47	33	32	73	40	43	42	46	51	67	64	63	54	50				100
		Pseudomonas aeruginosa	15		26	33	100					46			47	35	80	58	46		37	40				100
		Enterobacter cloacae	13	0		85	67	85	8	60	50	67	62		100	100	85	92	92	85	100	100				100

Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

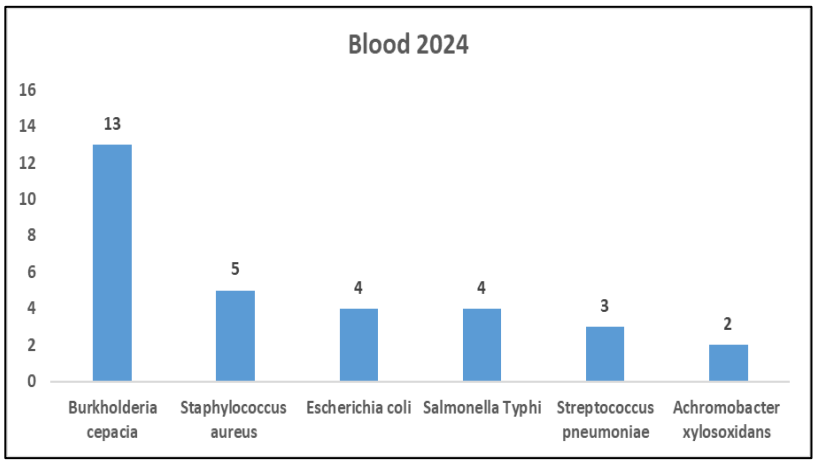
Percentage susceptibility Gram Positive organism 2024

Location	Specimen type	Organism	Number of patients	Cotrimoxazole	Penicillin	Oxacillin	Ciprofloxacin	Levofloxacin	Gentamicin	Clindamycin	Erythromycin	Tetracycline	Daptomycin	Tigecycline	Teicoplanin	Linezolid	Vancomycin
ortho	Pus	Staphylococcus aureus	21	38	13	75	0	0	63	88	63	71	71	100	100	100	100
		Enterococcus faecalis	4		100		33	50			0	0	100	100	100	100	100
		Staphylococcus epidermidis	4	0	0	0	100	100	100	100	0	100	100	0	100	100	100
		Enterococcus faecium	2				0	0			0	100		0	100	100	100

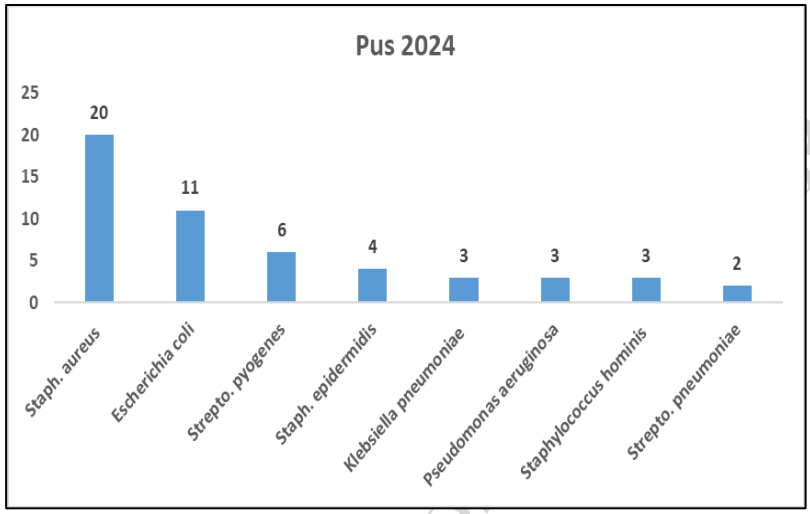
Reserved/ Restricted Drugs:Not to be used emperically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/not appropriate antibiotic

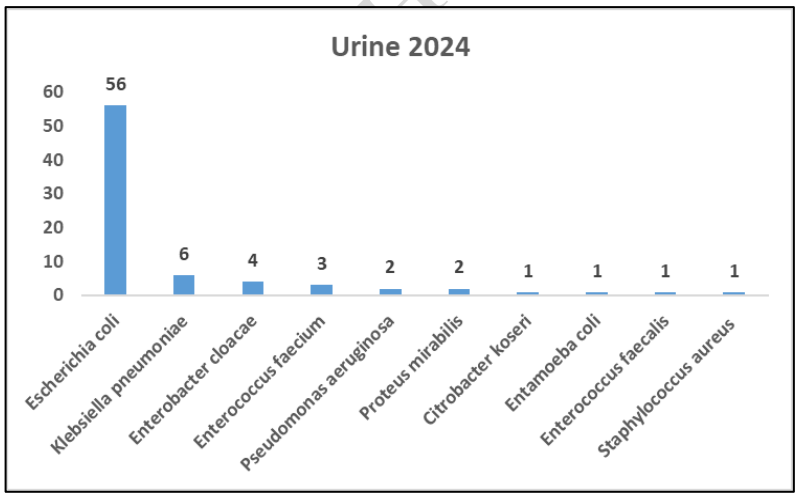
Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar Prof Microbiology	Dr. M S Modak Prof & HoD Microbiology	Dr. Shilpa Acharya Quality Department	Dr. SK Lalwani Medical Director

Paediatrics: Top 10 Isolates Sample wise



Specimen Type	Overall No of Isolates
Blood	42
Pus	57
Urine	77





Paediatrics Antibiogram:

Percentage Susceptibility Organism -Peds 2024

Organism	Number of patients	Nitrofurantoin	Cotrimoxazole	Penicillin	Oxacillin	Ampicillin	Norfloxacin	Ofloxacin	Ciprofloxacin	Levofloxacin	Moxifloxacin	Amox/Clav	Cefuroxime	Cefuroxime axetil	Ceftazidime	Ceftriaxone	Cefotaxime	Cefepime	Cel/Sul	Piptaz	Amiacin	Gentamicin	Clindamycin	Erythromycin	Tetracycline	Ertapenem	Imipenem	Meropenem	Tigecycline	Minocycline	Fosfomycin	Colistin	Daptomycin	Teicoplanin	Vancomycin	Linezolid
Escherichia coli	72	80	51			56	64	67	11			57	12	11	55	23	0	22	83	83	89	86				94	93	96	100		100	100				
Burkholderia cepacia	13		83						0	75					100													91		88						
Klebsiella pneumoniae	11		55						55			73	50	50		64	0	64	73	73	82	73				82	73	82	100			100				
Enterobacter cloacae	6	0	100				100	100	50			0	20	20	100	50	0	60	83	83	100	50		100		100	100	100	100			100				
Pseudomonas aeruginosa	5								100	100					100			80	100	100	100	100					75	75				100				
Salmonella Typhi	4		75						0			0				100		0								100	100	100	100							
Staphylococcus aureus	27	100	50	4	48				15	17												82	82	59	100				100				100	100	96	100
Streptococcus pneumoniae	6		100							100	100					100	100						20	17	33				100						100	100
Streptococcus pyogenes	6			100		100				40	0					100	100						100	40	100				100						100	100
Staphylococcus epidermidis	5	100	80	33	40				80	75												100	100	25	100				0				100	100	100	100
Enterococcus faecium	3	0		0					0	0														0	0				0					100	100	100
Staphylococcus hominis	3		50	0	0				100	100												100	50	50	100				0					100	100	100
Enterococcus faecalis	2	100		100					50	50														0	0				100				100	100	100	100

Reserved/ Restricted Drugs:Not to be used emperically unless justified

Will be useful clinically

Will be useful clinically in about 2/3 cases

Will not be useful clinically

Not tested/not apprc Nitrofurantoin for urinary isolates only

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Paeds ICU Antibiogram:

Percentage Susceptibility Organism - PICU 2024

Organism	Number of patients	Cotrimoxazole	Amox/Clav	Penicillin	Ciprofloxacin	Levofloxacin	Cefuroxime	Cefuroxime Axetil	Ceftazidime	Ceftriaxone	Cefotaxime	Cefepime	Cef/Sul	Piptaz	Amikacin	Gentamicin	Clindamycin	Erythromycin	Tetracycline	Ertapenem	Imipenem	Meropenem	Teicoplanin	Tigecycline	Fosfomycin	Linezolid	Vancomycin	Colistin
Escherichia coli	12	33	36		27		27	22		27		40	0	73	91	83			100	63	78	78		100	100			100
Pseudomonas aeruginosa	12				50	55	33	0	50	0		50	0	63	60	0					42	42						100
Klebsiella pneumoniae	11	46	73		27		27	30		36	0	55	0	46	82	82				73	73	73		73				100
Acinetobacter baumannii	3	100			33					50		33	0	33	33	67					33	33						100
Burkholderia cepacia	4	100			0	33			67	0		0	0									75						
Enterobacter cloacae	2	100			100		100	100		50		100	0	100	100	100				100	100	100		100	0			
Staphylococcus aureus	16	31		0	19	21										94	94	56	100				100	100		100	100	
Streptococcus pneumoniae	6	60		100		83				100	100							17	40					100		100	100	

Reserved/ Restricted Drugs:Not to be used emperically unless justified

Will be useful clinically

Will be useful clinically in about 2/3 cases

Will not be useful clinically

Not tested/not appropriate antibiotic

Please Note: Individual Isolates are less than 30 in number, not statistically significant. Antibiogram has been shown with available number of organisms. Hence these isolates may not be truly representative of the antimicrobial susceptibility pattern.

Antimicrobial therapy in hospitalized patients

Antimicrobial therapy is used in hospitalized patients in three situations

1. **Empiric therapy** before the causative organism has been identified
2. **Definitive therapy** once the causative organism is identified
3. **Prophylactic therapy** to prevent infection, eg. surgical prophylaxis

Empiric therapy

Patient requiring empirical antimicrobial therapy should be classified into three types (Table 1) depending on the past history, prior exposure to health care, previous antimicrobials and associated co-morbidities. Antimicrobial should then be chosen according to the site of infection and suspected micro-organism based on local hospital microbiologic data (antibiogram). Appropriate cultures must be sent prior to antimicrobial therapy. Identification of the micro-organism will then dictate definitive therapy and also contribute to the hospital antibiogram for choosing empiric therapy.

Please note: Empiric therapy will be started only after appropriate samples for culture have been taken

TABLE 1- Patient Types for selecting empiric antimicrobial therapy

Patient Type 1	**Patient Type 2**	**Patient Type 3**
(Community acquired)	**(Healthcare associated)**	**(Nosocomial Infections)**
No contact with health care system	Contact with health care system (e.g. recent hospital admission, nursing home, dialysis) without invasive procedure within last90 days. Current hospitalization less than7 days	Current hospitalization>7 days. Invasive procedures within last 90 days
No prior antimicrobial treatment	Recent antimicrobial therapy (within last 90 days)	Recent & multiple antimicrobial therapies within last 90 days Major invasive procedures done
No procedures done	Minimum procedures done	
Patient young with only a few co-morbid conditions.	Patient old with Multiple co-morbidities.	Cystic fibrosis, structural lung disease, advanced AIDS, neutropenia other Severe immunodeficiency

6.Empiric Antimicrobial choice

Recommended antimicrobials for common conditions are listed below. This guide is a broad outline; not all-inclusive and; not meant to replace treating physician's judgment.

Table 1**: Acute gastroenteritis**

Name of condition	Patient Type 1 (Community acquired)	Patient Type 2 (Healthcare associated)	Patient Type 3 (Nosocomial Infections)
			.
Acute gastroenteritis	Most cases are self-limited and require only supportive treatment and hydration or being viral in nature. Selected sick patients can be treated as per following guidelines. Tab Cefixime 200mg BD If stool examination shows invasive diarrhoea (> 5 leucocytes /HPF or blood in the stool). Then consider stool culture followed by therapy as per AST		

Table 2: Pneumonia

Name of condition	Patient Type 1 (Community acquired)	Patient Type 2 (Healthcare associated)	Patient Type 3 (Nosocomial Infections)
Pneumonia	**1] For non-ICU patients with community acquired pneumonia (CAP)**Ceftriaxone (2g IV q24h X 5-7 days)/ Amoxicillin/Clavulanic acid (1.2g q8h IV) + Macrolide (Azithromycin- 500mg IV/PO once a day), x 5-7 days).	**Late Onset HAP/VAP** (For more than 48 hours of hospitalization but less than 7 days) If septic shock or multisystem organ failure, Imipenem0.5-1gm q6h or Meropenem1-2 gm q8h	**Late onset HAP/VAP suspected MDR Gram negative –** Imipenem (0.5-1 gm q6h /Meropenem (1-2 g IV q8h)
			Suspected XDR Gram negative Polymixin B 15 lac loading dose f/b 7.5 Lac mg BD **Suspected MRSA-** Vancomycin (1g IV q12h OR Teicoplanin (400mg IV for 3 doses, then q24h)
	2] ICU patients with CAP Ceftriaxone (2g IV q24hr X 5-7 days)/ Amoxicillin/Clavulanic acid (1.2g q8hr IV) + Macrolide: Azithromycin-500mg IV/PO q24h)/ Doxycycline 100mg PO q12h x 5-7 days). If aspiration is suspected clindamycin 600mg q8h **Early onset HAP/VAP (less than 48 hours**		**For suspected VRE-** Linezolid (600mg IV/PO q12hr)**x 7-14 days **For suspected Fungal (Filamentous fungi/mould) infections-** Consider Antifungals in Immunocompromised host. Add Liposomal Amphotericin B. Substitute Voriconazole, if Aspergillus suspected on radiological evidence or galactomannan positive
			If PCP suspected- add TMP-SMX or Clindamycin

	admission) Antimicrobial choice as above unless Pseudomonas or Gram negative bacilli are suspected. Then use Cefoperazone-Sulbactam* (1.5g-3gm q6h) or piperacillin–tazobactam (PIP-Taz) 4.5gm q6h		
H1N1 **Flu-like illness**	Look for typical viral symptoms such as sneezing and running nose. If fever, sore throat ,dry cough and viral symptoms present, initiate Oseltamivir 75 mg BD x 5 d without waiting for confirmation by PCR		

Note :

1. Fluoroquinolones should not be used for empiric treatment.
2. Fluoroquinolones should not be used routinely for treating Acute exacerbation of COPD
3. In the uncommon scenario of hypersensitivity to β-lactams, respiratory Fluoroquinolones (e.g. levofloxacin 750 mg daily) may be used if tuberculosis is not a diagnostic consideration at admission. Patients should also undergo sputum testing for acid-fast bacilli simultaneously if fluoroquinolones are being used in place of β-lactams.
4. **Patients with suspected MRSA infection, we recommend the use of empiric Vancomycin or Teicoplanin. The use of linezolid in India should be reserved because of its potential use in extensively drug-resistant tuberculosis.
5. Suspected viral pneumonia [influenza] Oseltamivir and/or Zanamavir should be given.It should be given within 48 hrs of onset of symptoms otherwise there is no clinical benefit.
6. In late HAP/VAP with suspected Acinetobacter infection combination of Colistin + carbepenem / sulbactam.
7. Duration of treatment for community acquired pneumonia should be minimum 5-7 days and patient should be afebrile 48-72 hours prior to stopping treatment.

8. For ESBL / MRSA health care associated pneumonia minimum duration of treatment should be 10-14 days.
9. For proven pseudomonal / Acinetobacter health care associated pneumonia treatment should be for minimum 2 weeks and preferably combination of antimicrobial therapy should be used.
10. Colonization should be suspected if respiratory secretions culture show growth but following features are absent like Fever, leukocytosis, increased bronchorrhea, increasing oxygen requirement, new lung infiltrates.
11. In presence of Fever, leukocytosis, increased bronchorrhea, increasing oxygen requirement but absence of lung infiltrates with positive cultures [MDR GNB / MRSA] to be treated as health care associated tracheobronchitis with appropriate broad spectrum antimicrobials.
12. Aerosolised Tobramycin/ Colistin can be added to IV antimicrobials as an adjunctive therapy for MDR gram negative infection with specialized nebulizers.

Table 3: Meningitis

Name of condition	Patient Type 1 (Community acquired)	Patient Type 2 (Healthcare associated)	Patient Type 3 (Nosocomial Infections)
Meningitis	1] **Age 2yrs-50yrs** Vancomycin 1gm q12h + Ceftriaxone 2gm q12h 2] **Age > 50yrs** Above Antimicrobials + Ampicillin 2gm q4h	Vancomycin 1gm q12h + cefepime 2gm q12h /Ceftazidime 2gm q8h	**Empirical Therapy** Vancomycin 1gm q12h + Colistin 9 MIU loading f/b 4.5 MU BD+/- Meropenem 2gm q8h. Consider Intrathecal Gentamicin/ Colistin 4.5 MIU BD **Organism specific** A] **Suspected MRSA** Meningitis – Vancomycin 1gm q12h +/- Rifampicin 600mg q12hor Linezolid 600mg q12h B] ESBL Gram negative/Pseudomonas or Acinetobacter (MDR / XDR) Meropenem 2gm q8h + Colistin 9 MIU loading f/b 4.5 MIU BD .

Note : Intrathecal/ Intraventricular route dosage-
Vancomycin 10-20mgq24h;
Gentamicin 4-8 mgq24h;
Amikacin 30-50mg q24h;
Colistin 5-20mg q24h[1mg = 12,500 units]
IV Dexamethasone should be given in suspected pneumococcal meningitis before antimicrobial therapy and should be continued only if Gram stain / Culture confirms pneumococcal etiology

Table 4: Urinary tract infection

Name of condition	Patient Type 1 (Community acquired)	Patient Type 2 (Healthcare associated)	Patient Type 3 (Nosocomial Infections)
UTI	**Asymptomatic bacteriuria** No empirical therapy. Send C/S. **Non complicated UTI** (Cystitis, Urethritis, No evidence of obstructive uropathy) PO TMP SMX 160/800 q12h / PO Nitrofurantoin 100 mg q12h **Acute Uncomplicated Pyelonephritis** Gentamicin 3 – 5 mg/kg q24h 5-7 days Ceftriaxone 1gm q12h	**Complicated UTI** (Obstruction, reflux, azotemia, CAUTI) IV Meropenem 1gm q8h/ IV Imipenem-cilastatin0.5 gm q6h **Complicated Pyelonephritis** (Obstruction, reflux, azotemia, CAUTI, Shock, perinephric abscess) Meropenem 1gm q8h/Imipenem-cilastatin 0.5 gm q6h in presence of obstruction	**Complicated UTI and Pyelonephritis** (Suspected MDRO's/ Post renal transplant/ Recurrent UTI's) IV Meropenem 1gm q8h/IV Imipenem-cilastatin 500mg q6h +/- IV Colistin 9 MIU loading f/b 4.5 MIU BD **If MRSA or enterococcus,** ConsiderVancomycin 1 gm q12h/ Teicoplanin 400 mg 3doses f/b 400 mg q24h look for obstruction. Surgical management is mandatory to relieve obstruction

Lower Urinary tract infection(UTI) in antenatal patients up to 20 weeks gestation	**OPD-** Cap.Amoxicillin500 mg q8h PO **In-patient** IV Ceftriaxone 1gm q12h		Meropenem1gm q8h Or Colistin 4.5 MIUBD
Lower Urinary infection(UTI) in antenatal patients after 20 weeks gestation	**OPD** Tab. Nitrofurantoin SR100 mg BD oral/ Oral Fosfomycin 1g sachet single dose/Oral Cefixime 200mg BD x 3-5 days Inpatient: Ceftriaxone 1gm q12h	IV PIP-TZ 4.5 gm q6h	Meropenem 1gm q8h

Table 4 a : Pelvic Inflammatory Disease

Pelvic inflammatory disease: Mild to moderate	**Tab Cefixime Plus Tab Metronidazole Plus Cap Doxycycline**	Levofloxacin Plus Metronidazole or Ceftriaxone with doxycycline +/- metronidazole	
Pelvic inflammatory disease: Severe	**Clindamycin Plus Gentamicin**	IV PIP-TZ 4.5 gm q6h or Imipenem	

Table 5- Skin & soft tissue infections

Name of condition	Patient Type 1 (Community acquired)	Patient Type 2 (Healthcare associated)	Patient Type 3 (Nosocomial Infections)
Erysipelas / uncomplicated cellulitis	IV Ceftriaxone 2 gm q24h **If beta lactam allergy** IV Clindamycin 600 – 900 mg q8h		
Necrotizing infection of skin/fascia and muscle	IV Ceftriaxone 2gm q12h + IV Clindamycin 600-900mg q8h / IV Metronidazole 500mg q6h or Inj Piperacillin-Tazobactam +/- Inj clindamycin **If Suspected MRSA** IV Vancomycin1 gm q12h/ IV Teicoplanin 400 mg q24h		
Fournier gangrene	**Mixed aerobic and anaerobic cover including S.aureus** MRSA cover IV Vancomycin1gm q12h **If pseudomonas suspected** IV PIP-TZ 4.5gm q6h		
Diabetic foot	IV Co-amoxiclav 1.2 gm q8h **if beta lactam allergy**- IV Clindamycin 600 q8h	**IV PIP-TZ4.5 gmq6h** **If Suspected MRSA infection** IV Vancomycin1 gmq12h	IV Meropenem 1gm q8h or IV Imipenem-Cilastatin 1gm q6h. If MRSA suspected IV Vancomycin 1gm q12h

Table 6- Bone and joint infections

Name of condition	Patient Type 1 (Community acquired)	Patient Type 2 (Healthcare associated)	Patient Type 3 (Nosocomial Infections)
Acute Osteomyelitis / Septic Arthritis	Ceftriaxone IV q12h OR Co-amoxiclav 1.2 gm q8h with/without Gentamicin 3 –5 mg/kg q24h If MRSA suspected- Vancomycin1gm IVq12h	-	-
Early implant associated infection (< 3 months)	-	Usual Suspected organism- Staph aureus/ MRSA IV Vancomycin 1 gm q12h/ Teicoplanin(400mg IV q12h for 3 doses, then q24h) + If Suspected MDR Gram negative organism IV Meropenem 1gm q8h IV Imipenem + Cilastatin 1gm q6h IV/IV Colistin	-
Late implant associated infection (after 3 months)	-	-	Usually low grade infection If Coagulase negative staphylococcus suspected - IV Vancomycin 1 gm q12h / Teicoplanin (400mg IV q12h for 3 doses, then q24h) If Anaerobe (Propionibacterium acne) suspected IV Clindamycin 600-900 mg q8h.

Table 7 Intra-abdominal infections -

Name of condition	Patient Type 1(Community acquired)	Patient Type 2 (Healthcare associated)	Patient Type 3 (Nosocomial Infections)
A) Extra – biliary	IV Ceftriaxone1-2 gm q12h+IV Metronidazole500mg q8h or IV PIP-TZ 4.5gm q6h	IV Meropenem 1gm q8h/ IV Imipenem-cilastatin 500mg q6h	IV Meropenem 1gm q8h IV Imipenem - cilastatin500mg q6h In case of suspected Acinetobacter or XDR Gram negative organisms Colistin 4.5 MU BD **If MRSA or Enterococcus suspected** IV Vancomycin 1 gm q12h / Teicoplanin(400mg IV q12h for 3 doses, then q24h) **If VRE suspected** Linezolid 600 mg IV q12h **suspected,** Add Fluconazole 400 mg IV q24h **If non albicans Candida-** IV Caspofungin 70 mg stat and 50 mg q24h or Ampho B
B)Intra Abdominal Biliary	IV Ceftriaxone1-2 gm q12h + IV Metronidazole500mg q8h or IV PIP-TZ 4.5gm q6h	IV Meropenem 1gm q8h / IV Imipenem- cilastatin 500mg q6h	Eg- Acute cholangitis following bilio enteric anastomosis IV Meropenem 1gm q8h/ IV Imipenem - cilastatin500mg q6h .If MRSA or Enterococcus suspected IV Vancomycin 1 gm q12h / Teicoplanin(400mg IV q12h for 3 doses, then q24h). If VRE suspected Linezolid 600 mg IV q12h If Fungal Infection suspected, Add Fluconazole 400 mg IV q24h If non Albicans Candida IV Caspofungin 70 mg stat and 50 mg q24h Or Ampho B

Note: Metronidazole dosing based on Pharmacokinetic studies is 1.5 gm q24h. Piperacillin-Tazobactam covers all anaerobic infections except Bacteroides fragilis. For lower GI surgeries add Metronidazole

Table 8: Infective Endocarditis

Name of condition		
Native Valve Endocarditis	IV Ceftriaxone	Alternative Penicillin G2-3mu IV q4h or Vancomycin500 mg q12h for 4weeks Ceftriaxone 2 gmq24h for 2 weeks plus Gentamicin 3mg per kg divided into equal doses q8h for 2 weeks
Prosthetic valve endocarditis	Cloxacillin 2gm IV q4h for 4-6 weeks or IV Vancomycin500 mg q12h for 4-6 weeks	IV Cefazolin 2g q8h

Note:-

If Penicillin resistant Streptococci - Ceftriaxone 2 gram per day IV q24h for 6 weeks plus Gentamicin 3mg per kg divided into equal doses q8h for 6 weeks

Enterococci – Ampicillin 2gm IV q4h + Gentamicin3mg per kg divided into equal doses q8hboth 4-6 weeks or Vancomycin 500 mg q12h + Gentamicin for 4weeks.

Staphylococci –Nafcillin or Oxacillin 2gm IV 4 hourly for 4-6 weeks or Vancomycin 15 mg /kg IV 12 hourly for 4-6 weeks

Table 9: Malaria, Leptospirosis, Scrub Typhus, Enteric fever
(IN LABORATORY CONFIRMED CASES)

Plasmodium Vivax Malaria	Chloroquine Sensitive	Chloroquine resistant –
	Chloroquine (10mg base/kg stat followed by 5 mg/kg at 12,24,36 hours) plus Primaquine (7.5 mg (base) q12h PO x14days) (Primaquine should not be given in severe G6PD deficiency)	any of the ACT therapy excluding SP 1. Artesunate +Amodiaquine 2. Artesunate +Mefloquine 3. Dihydroartemisin plus piperaquine

Plasmodium Falciparum Malaria	**OPD** Artesunate(2.4 mg/kg at 12 & 24 hours)	Drug resistant Falciparum Malaria
	plus Sulfadoxine (25 mg/ kg) &Pyrimethamine (1.25 mg/kg) as a single dose or Artesunate(same dose as above) plus Amodiaquine(10mg) base per kg OD for 3 days (Fixed dose combinations are available) or Artemether plus Lumefantrine(1.5/9mg/kg BD for 3 days) Drug combination of A+L(mg)available 40+240:60+360:80+480 or Artesunate +Mefloquine (25mg base/kg –total) (8mg/kg once a day for 3 days) **Hospitalized patient** Artesunate IV 2.4 mg/kg at 12 & 24 hours and 2.4 mg/kg q24h X 5 days + Doxycycline 100mg q12h x 7 days	Artesunate 2.4 mg/kg for 7 days or Quinine (10mg/kg TDS for 7 days plus one of the following three 1. Tetracycline 4mg/kg Odx7 days 2. Doxycycline 3mg/kg OD x 7days 3. Clindamycin 10mg/kg BD x 7days
Leptospirosis (Mild) Leptospirosis (Moderate or Severe)	Doxycycline 100mg q12h x 7 days Ceftriaxone (1gm 12 hourly x7 days or Cefotaxime (1gm 6 hourly IV x 7 days	Alternative: Amoxicillin (500 mg)PO TDS x7 days Ampicillin (500mg)PO TDS x 7 days Alternative Penicillin (1.5 million units /IV /IM 6 hourly x7 days
Scrub Typhus	Doxycycline (100mg) BD x 7 to 15 days or Azithromycin (500mg) OD x 3days	Alternative Chloramphenicol (500mg)QID x7-15 days
Enteric Fever (OPD)	T. Cefixime 400 mg TDS for 14 days	Alternative T. Azithromycin (1gm)OD for 5 days
Enteric Fever(IPD)	Ceftriaxone (4gm/day)IV for 7-14 days	

Table 10 Pediatric Infections

Name of condition	**Patient Type 1 (Community acquired)**	Patient Type 2	Patient Type 3
Pneumonia **AGE: 3 weeks to 3 months**	Community acquired Pneumonia Ceftriaxone100mg/kg/d od or Cefotaxime 150mg/kg/d tds x 10-14 days and *Azithromycin 10mg/kg/day x	Either Type II or Early HAP/VAP Piperacillin-tazobactam 300 mg/kg/d qid	Either Type III or late HAP/VAP, IV Meropenem (60-120 mg /kg/day divided 8 hrly) plusVancomycin (40-60 mg/ kg/ day divided 6-8 hrly IV Meropenem (60-120 mg /kg/day divided 8 hrly) plusVancomycin (40-60 mg/ kg/ day divided 6-8 hrly. Add Fluconazole 6-12 mg/kg/day or amphotericin B (if renal dysfunction)
AGE: 4 months to 5 years	Lobar pneumonia/effusion Ceftriaxone 100mg/kg/d od with Cloxacillin 100-200mg/kg/d Bronchopneumonia without effusion Ampicillin 200mg/kg/d qid days*consider adding macrolide(azithromycin,) to cover Pertussis in partially unimmunized with DPT	Piperacillin-tazobactam 300 mg/kg/d Qid plusVancomycin (40-60 mg/ kg/ day divided 6-8 hrly Ceftriaxone100mg/kg/d od Or Piperacillin-tazobactam 300 mg/kg/d qid	Same as above
Meningitis	**Community acquired**	**Either type II/post neurosurgical meningitis**	**Either type II/III or post shunt infection**
Age > 3 months	Cefotaxime 200 mg/kg/d qid/or Ceftriaxone100mg/kg/d od/bd plus Vancomycin*60mg/kg/d qid*Discontinue Vancomycin if rapid latex agglutination negative for S. pneumoniae, or positive for N. meningitidis, or H. influenzae	IV Meropenem (120 mg /kg/day divided 8 hrly) plusVancomycin(60 mg/ kg/ day divided 6 hrly +/- rifampin 10 mg/kg(PO) q12h	IV Meropenem (120 mg /kg/day divided 8 hrly)/ plusVancomycin60mg/kg/d qid with or without rifampin 10 mg/kg (PO) q12h x 7-10 days after shunt removal Consider additional Intraventricular therapy Vancomycin 10mg or Gentamicin 1-2 mg or Polymixin B 2mg or Colistin 10mg[1mg = 12,500 units]
Urinary Tract			

Infection			
Cystitis	Co-trimoxazole 8-10 mg/kg/d of trimethoprim bd OR Amoxy-clav 30-40 mg/kg/d bd OR Cefixime 8-10 mg/kg/d od		
Pyelonephritis	**Uncomplicated** Amoxy-clav 30-40 mg/kg/d bd OR Ceftriaxone100mg/kg/d od OR Cefotaxime150mg/kg/d tds **Complicated:** Ceftriaxone100mg/kg/d od OR Cefotaxime150mg/kg/d tds OR Piperacillin- tazobactam 300 mg/kg/d tds/qid +/- Amikacin 15- Piperacillin-tazobactam 300 mg/kg/d tds/qid+/- Amikacin 15-20mg/kg/d od X10-14 days	Piperacillin-tazobactam300 mg/kg/d tds/qid Or Meropenem120mg/kg/d	Same as for type II Same as for type II

HEENT **Infections** **Orbital cellulitis**	Cloxacillin 200mg/kg/d plus either Cefotaxime 150mg/kg/d tds or Ceftriaxone 100mg/kg/d od/bd x 10-14 days	Piperacillin- tazobactam 300 mg/kg/d tds/qid plus Vancomycin 60mg/kg/d qid	IV Meropenem (120 mg /kg/day divided 8 hrly)/ plus Vancomycin 60mg/kg/d qid
Bone and Joint **Infections** **Acute** **Osteomyelitis/septic arthritis**	Cloxacillin 200mg/kg/d plus either Cefotaxime 150mg/kg/d tds or Ceftriaxone 100mg/kg/d od/bd + Vancomycin x 10-14 days	Vancomycin 60mg/kg/d qid or Clindamycin 20-40 mg/kg/d tds/qid Plus either Cefotaxime 150mg/kg/d tds or Ceftriaxone 100mg/kg/d od/bd	IV Meropenem (120 mg /kg/day divided 8 hrly)/ plus Vancomycin 60mg/kg/d qid or Clindamycin 20-40 mg/kg/d tds/qid
Osteochondritis	Piperacillin-tazobactam300 mg/kg/d tds/qid or combination therapy with cloxacillin 200mg/kg/d plus Ceftazidime 100mg/kg/d tds 7-10 days after surgery		
Skin and soft **tissue** **infections**	Cloxacillin 200mg/kg/d or Cefazolin 60- 100mg/kg/d or Clindamycin 20-40 mg/kg/d tds/qid x 7-10 days	Vancomycin 60mg/kg/d qid	Piperacillin- tazobactam 300 mg/kg/d tds/qid or IV Meropenem (120 mg /kg/day divided 8 hrly plus Vancomycin 60mg/kg/d qid

Animal bite wounds (dog / cat)	Amoxicillin/clavulanate 50mg/kg/d tdsi.v or p.o	Alternatives Piperacillin300mg/kg/d qid 7-10 days <u>Penicillin allergy</u> Clindamycin20-40mg/kg tds/qid plus TMP /SMX 80mg/kg/ bd X 7-10 days (dog bites); or cefuroxime 20-30mg/kg/d x 7-10 days (cat bites)	NA
Vascular **catheter associated Infections**		Piperacillin- tazobactam300 mg/kg/d tds/qid + Vancomycin60mg/kg/d qid	Meropenem 120mg/kg/d tds plus Vancomycin 60mg/kg/d qid
Severe Sepsis/septic **shock**	Cefotaxime 150 mg/kg/ day divided 6-8 hrly OR Ceftriaxone 100 mg/kg/ day divided 12 hrly +/- amikacin 15-20 mg/kg/d od	IV Piperacillin – Tazobactam 300-400 mg/kg/day divided 8 hrly + IV Vancomycin 45-60 mg/kg/day divided 6-8 hrly	IV Meropenem 80-120 mg/ kg/8 hrly + IV Vancomycin 45-60 mg/kg/day divided 6-8 hrly

Table 11: Empiric Therapy of Neonatal Intensive Care Unit Sepsis and Meningitis

Diagnosis	Suspected organisms	Early onset	Late onset	Nosocomial	Community acquired	Duration
Sepsis	Klebsiella, Acinetobacter, E.coli, Enterococcus, Others :Serratia, Burkholderia, Pseudomonas, Proteus	Gentamicin (for haemodynamically stable) Piperacillin-Tazobactum (for haemodynamically unstable)	1st line :Piperacillin-Tazobactam 2nd line: Meropenem 3rd line: Colistin	1st line Piperacillin-Tazobactam 2nd line: Meropenem 3rd line: Colistin	1st line :Cefotaxime and Amikacin 2nd line:Piperacillin-Tazobactam 3rd line: Meropenem 4th line: Colistin	10days
Pneumonia	E coli, Klebsiella, Acinetobacter, Enterococcus, Staphylococcus (CONS) Others :Serratia, Burkholderia, Pseudomonas, Proteus	Gentamicin (haemodynamically stable) Piperacillin-Tazobactam (haemodynamically unstable)	1st line :Piperacillin-Tazobactam 2nd line: Meropenem 3rd line: Colistin	1st line Piperacillin-Tazobactam 2nd line Meropenem 3rd line Colistin	Ceftriaxone plus Azithromycin	7days
NEC			1st line Piperacillin-Tazobactam and Amikacin 2nd line Meropenem 3rd line Colistin	1st line Piperacillin-Tazobactam 2nd line Meropenem 3rd line Colistin	1st line Piperacillin-Tazobactam 2nd line Meropenem 3rd line Colistin	7-10days
Meningitis	For early onset: E coli, GBS, enteric bacilli, ~~listeria~~, streptococcus, H	1st line: Cefotaxime plus Gentamicin 2nd line: Meropenem	Meropenem	Meropenem	Ceftriaxone /cefotaxime	Gram Positive: 14-days Gram negative: 21 days# #Ventriculi

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar Prof Microbiology	Dr. M S Modak Prof & HoD Microbiology	Dr. Shilpa Acharya Quality Department	Dr. SK Lalwani Medical Director

	influenza, Neisseria meningitides. For late onset: Klebsiella, Acinetobacter, E.coli, Enterococcus, Staphylococcus (CONS) Others :Serratia, Burkholderia, Pseudomonas, Proteus					tis/Brain abscess: 6-8 weeks
UTI	Enterococcus, E coli, Enterobacter		1st line: Piperacillin-Tazobactam 2nd line: Meropenem 3rd line: Colistin	1st line Piperacillin-Tazobactam 2nd line: Meropenem 3rd line: Colistin	Amikacin	10days
Skin and soft tissue infection	Staphylococcus		1stline:Cloxacillin 2ndline:Vancomycin	Vancomycin	Cloxacillin	7days
Arthritis	Staphylococcus ,Klebsiella		1st line Piperacillin-Tazobactam 2nd line Meropenem 3rd line Colistin	1st line: Piperacillin-Tazobactam 2nd line: Meropenem 3rd line Colistin	Ceftriaxone plus Vancomycin	Culture Negative: 2weeks Culture positive: 3 weeks
Osteomyelitis	Staphylococcus, Gram Negative Bacilli		1st line Piperacillin-Tazobactam 2nd line Meropenem 3rd line Colistin	1st line Piperacillin-Tazobactam 2nd line Meropenem 3rd line Colistin	Ceftriaxone plus Vancomycin	4 weeks

Catheter related Infection	Staphylococcus(CONS), S.aureus, Gram negative bacteria		1st line: Vancomycin and Amikacin 2nd line:Piperacillin-Tazobact 3rd line: Meropenem 4th line Colistin			10days
Fungal infection	Candida albicans and Candida Non albicans		Amphotericin B or Fluconazole (depending on Antifungal susceptibility report)			Depending on location

Table : 12 Empiric therapy of Ophthalmic infections

Sr. No	Category	Suspected Organisms	First Line	Alternative
1	Bacterial conjunctivitis	S aureus and albus H Aegyptius H Influenzae, C diphtheriae	Topical Moxifloxacin 0.5% eyedrops 3-6 times per day Tobramycin eye ointment at bed time Penicillin eye drops 10,000 units/ml	
2	Bacterial Keratitis	Pseudomonas, S.aureus Pneumococcus N gonorrheae	Moxifloxacin eye drops 0.5% 1 hourly Fortified Tobramycin eye drops	Fortified Vancomycin eye drops Amikacin eye drops
3	Fungal Keratitis	Aspergillus, Fusarium, Candida albicans	Natamycin eye drops 6 times a day Itraconazole eye drops /ointment at bed time Tablet Fluconazole 150mg twice a day& eye drops 4-6 times per day Nystatin eye ointment	Amphotericin B eye drops Voriconozole eye drops Intracameral Amphotericin B
4	Viral Keratitis	H Simplex H Zoster	Acyclovir Tablet 800mg 5 times a day and ointment 5 times a day Gancyclovir ointment	Tablet Valacyclovir 1000mg 3 times a day
5	Endophthalmitis	S aureus Sepidermidis Streptococcus Pseudomonas H Influenzae Candida /fusarium	Intravitreal Vancomycin 1 mg /0.1 ml andAmikacin 400micrograms /.ml Intravitreal Amphotericin B	Intravitreal Vancomycin 1mg /0.1ml and Ceftriaxone 2.25mg/0.1ml
6	Orbital cellulitis	Staphylococci Mucormycosis/Aspergillosis	Intravenous Piperacillin and Tazobactam 4.5g twice a day Intravenous Metronidazole 100ml 3 times a day Intravenous Amphotericin B	Intravenous Ceftriaxone
7	Acute Dacryocystitis	Staphylococcus, Streptococcus, Pneumococcus	Tablet Amoxicillin and Clavulanic acid 625 mg twice a day Moxifloxacin eye drops 0.5% 3-6 times a day	

Table 13: ENT Infection

Name of condition	Patient Type 1 (Community acquired)	Patient Type 2	Patient Type 3
Acute infection like acute membranous tonsillitis, ASOM, Acute epiglottitis without complication	Inj Ampicillin 1 gm q6h Amoxicillin +clavulanic acid 1.2 gm q8h	-	-
Acute infection with complications like acute mastoiditis, Quinsy	Addition Of aminoglycoside for gram negative coverage and metronidazole for anaerobic coverage	-	-
Chronic infection without complication like CSOM, chronic sinusitis	Amoxicillin +clavulanic acid 1.2 gm q8h IV Ceftriaxone 1 gm q12h IV	ID/ Medicine consult	ID/Medicine consult
Chronic infection with complications like meningitis, orbital cellulitis, brain abscess	Inj Ceftriaxone+ inj amikacin + inj metronidazole	ID/ Medicine consult	ID/ Medicine consult

Table 14: Surgical site infection

Name	Type 1	Type 2	Type 3
Head & Neck	Ceftriaxone 1gm q12h IV + Metronidazole Or PIP-TZ 4.5 gm q6h IV If MRSA suspected Add Vancomycin 1gm IV q12h If CNS infection Ceftazidime 2 gm q8h IV instead of Ceftriaxone/PIP-TZ	Meropenem 2gm q8h IV + Vancomycin 1 gm q12h IV	If fungal infection suspected Ampho B If VRE suspected Linezolid If XDR or PDR Gram negative infection suspected Colistin 4.5MUBD If CNS infection Add intrathecal antimicrobials as above
Other infections **Sternal infections** **Chest** **Abdominal** **Perineal**	Ceftriaxone 1gm q12h IV + Metronidazole Or PIP-TZ 4.5 gm q6h IV If MRSA suspected Add Vancomycin 1gm IV q12h	Meropenem 2gm q8h IV + Vancomycin 1 gm q12h IV	If fungal infection suspected Ampho B If VRE suspected Linezolid If XDR or PDR Gram negative infection suspected Colistin 4.5MUBD If clostridium difficile colitis or sepsis suspected Oral Vancomycin 250 mg q6h + Metronidazole 500 mg q8h IV

Note:

Surgical debridement is almost always necessary. Any graft, device or foreign body must be removed.

Table 15: Catheter related blood stream infections (CRBSI)

Name	Type 1	Type 2	Type 3
Peripheral catheter		Cloxacillin 1 gm q6h IV	Ceftriaxone 1gm - q12h IV
Central venous catheter (short term) **Dialysis catheter (short term)**	-	+ Meropenem 2gm q8h IV Vancomycin 1 gm q12h IV	Meropenem 2gm q8h IV + Vancomycin 1 gm q12h IV
Dialysis catheter (long term) **Hickman or other implanted catheter (long term)**			If fungal infection (Non-AlbicansCandida suspected) Ampho B iv Or Caspopfungin 70 mg IV q24h flowed by 50 mg If VRE suspected Linezolid If XDR or PDR Gram negative infection suspected Colistin 4.5MUBD

Note:

Change catheter if signs of thrombophlebitis are present

Catheter cultures and blood cultures to be sent as per HICC protocol.

Catheter maybe kept in situ pending culture reports especially if CRBSI not strongly suspected and no other IV access is available

Remove catheter immediately if local signs of suppuration present or if central venous catheter and blood cultures are positive

DEFINITIVE THERAPY ONCE THE CAUSATIVE ORGANISM IS IDENTIFIED

It is vital to send cultures before empiric antimicrobials are prescribed. Once cultures results are available the next steps are

1. Decide whether the organism grown is a colonizer or an actual pathogen. Evaluate carefully if the site from which culture has been sent has active infection either from clinical signs or from elevated WBC counts or radiological evidence.
2. Don't treat colonizing organisms, Consult microbiology for the decision
3. Choose the simplest antimicrobial class to which the organism shows susceptibility
4. If the cultures show intermediate susceptible or multidrug resistant organism, consult infectious disease specialist for choice of appropriate antimicrobial.
5. Linezolid should be given only in culture confirmed MRSA infections after consultation with ID physician.
6. Levofloxacin is reserved for use in culture confirmed pulmonary infections only
7. Do not continue therapy beyond indicated duration. If the duration is to be exceeded then the clinician will justify the same and endorse it in the clinical notes

Table 16. Antimicrobial Prophylaxis for Surgery
Clean and Clean Contaminated cases

Procedure	Antimicrobial
Clean surgeries (example: elective hernia repair, breast surgeries)	Cefazolin / Cefuroxime
Orthopedic surgery	Cefazolin / Cefuroxime (add amikacin and metronidazole in open fractures)
Cardiovascular / vascular surgery	Cefazolin / Cefuroxime
Neurosurgery	Cefazolin / Cefuroxime
Ophthalmic surgery	Topical quinolone. Systemic- Cefazolin / Cefuroxime
Head, neck and ENT surgery	Cefazolin / Cefuroxime/Amoxyclav (Ceftriaxone in cases involving dural exposure)
Gastroduodenal	Cefuroxime / Cefazolin
Appendicular / Colorectal surgery Biliary	Cefuroxime / Cefazolin and Metronidazole Cefuroxime / Cefazolin/ cefoperazone-sulbactam
Abdominal / Vaginal hysterectomy / Caesarian section/MTP/Sterilization/Laparoscopic procedures	Cefazolin / Cefuroxime +Metronidazole
Urologic surgery	Cefuroxime (or as guided by urine culture)
Opthalmology Intraocular surgeries under LA Surgeries under GA (Clean Surgeries)	Topical Quinolone eye drops IV Inj. Cefazoline / Cefuroxime Topical Quinolone eye drops

Note: Preoperative dose of antimicrobial is to be given 15 to 60 minutes before incision

- **Dose of Cefazolin 2 gm IV**
- **Dose of Cefuroxime 1.5 gm IV**
- **Dose is to be repeated if surgery> 4 hours**
- **If penicillin allergy: consider either clindamycin or Vancomycin (infusion to be started more than 60 min before incision for vancomycin in view of prolonged infusion time required) (WHO Guidelines on surgical prophylaxis 2018)**
- **Antimicrobial prophylaxis must not be continued for more than 24 hours after surgery**
- **In case patient is already on antimicrobials the same antimicrobial should be adjusted for the period of surgery.**

Table 17 : Pediatric surgery

Procedure	Antimicrobial	Duration
Urosurgery	Amoxiclav	3 days
Genitourinary: Clitoroplasty Hypospadias, vaginoplasty (plain) Vaginoplasty (use of bowel)	Amoxiclav Ceftriaxone + Metronidazole	5days 1 day prior
Hirschprung ARM pull-through	Ceftriaxone + metronidazole	3 days
Esophageal procedures	Amox-clav	
Biliary tract	Cefoperazone -sulbactam	3 days
Appendix : Nonperforated Perforated	Cefuroxime Ceftraxone + Metronidazole Piptaz if required	1 dose
Paediatric Tumours	Cefuroxime	3 doses

Clean surgeries:

Procedure	Antimicrobial	Duration
Circumcision, Orchiopexy	Cefuroxime	Single dose
Herniotomy, LN biopsy, Thyroglossal cyst Lipoma, small lumps	No antimicrobials	-

Table 18 : Antimicrobial prophylaxis for GI endoscopy

	Antimicrobial prophylaxis and/or treatment to prevent local infections				
	Patient condition	Procedure contemplated	Goal of prophylaxis	Antimicrobial	Periprocedural antimicrobial prophylaxis
	Bile duct obstruction in absence of cholangitis	ERCP with complete drainage	Prevention of cholangitis	Nil	Not recommended
	Bile duct obstruction in absence of cholangitis	ERCP with incomplete drainage	Prevention of cholangitis	Ceftriaxone	Recommended; continue antimicrobials after procedure X 3 days
	Solid lesion in upper GI tract	EUS-FNA	Prevention of local infection	-	Not recommended
	Solid lesion in lower GI tract	EUS-FNA	Prevention of local infection	-	Not recommended
	Pancreatic cysts	EUS-FNA	Prevention of cyst infection	Ceftriaxone+ Metronidazole	Three doses
	All patients	Percutaneous endoscopic feeding tube placement	Prevention of peristomal infection	Cefazolin/Cefuroxime	Recommended single dose
	Cirrhosis with acute GI bleeding	Required for all patients regardless of endoscopic procedures	Prevention of infectious adverse events and reduction of mortality	Ceftriaxone	On admission
	Synthetic vascular graft and other nonvalvular cardiovascular devices	Any endoscopic procedure	Prevention of graft and device infection	-	Not recommended
	Prosthetic joints	Any endoscopic procedure	Prevention of septic arthritis	-	Not recommended
	Peritoneal dialysis	Lower GI endoscopy	Prevention of peritonitis	Ceftriaxone + metronidazole	Suggested
	EUS-FNA, EUS-guided FNA.				

Table -19 FEBRILE NEUTROPENIA

Febrile Neutropenia-definition

- Neutropenia-ANC<500/mm3and expected to fall below 500/mm3 in 48hrs
- Fever-single oral temperature of 38.3oC(1010F) on one occasion or 38oC (100.40F) on atleast 2 occasions (1 hour apart)
- Neutropenic patients may not have usual signs of infection. Redness, tenderness and fever may be the only signs.

Protocol:

- Critical examination of areas usually harboring infections, including but not limited to, oral cavity, axillary region, scalp, groin, perineal region.
- Send blood Cultures 2 sets (each bottle 10ml x 4 bottles)
- Other relevant investigations: urea, creatinine, ALT, urine culture ,Chest Xray, separate culture from central line, etc.

Patient-Hemodynamically stable

- Blood culture 2 sets
- Start IV Cefoperazone sulbactam 1.2gm IV 8 hourly
- No need to add glycopeptides in the initial regimen (except in specific situations, given below)

Patient-Hemodynamically unstable

- Start BL-BLI agent(Cefoperazone-Sulbactam 1.2gm IV 8 hourly/ piperacillin- tazobactam 4.5gm IV 8 hourly) OR

Carbapenem (meropenem 1gm IV 8 hourly/imipenem 500mg IV 6 hourly/doripenem 500mg IV 6 hourly)

- No need to add glycopeptides in the initial regimen (except in specific situations, givenbelow)

Reassess after 48 hours:

If blood cultures are negative, hemodynamically stable but still febrile

- Reculture blood
- Add amikacin 500mg IV BD for 3days
- Add colistin (instead of amikacin) if indicated (see below)

If blood cultures are negative, hemodynamically unstable but still febrile

- Inj Colistin (+/-Carbapenem) + glycopeptides + Echinocandin/ L-AmphoB

Blood culture growing Gram negative bacilli

- Patient afebrile- continue the empirical antimicrobial till antimicrobial sensitivity is available.
- Rationalise as per susceptibility profiles

When to add glycopeptides?

1. Haemodynamic instability,or other evidence of severe sepsis, septic shock or pneumonia
2. Colonisation with MRSA or penicillin-resistant S. pneumonia
3. Suspicion of serious catheter-related infection e.g. chills or rigors within fusion through catheter and cellulitis around the catheter exit site
4. Skin or soft-tissue infection at any site
5. Positive blood culture for gram-positive bacteria, before final identification and susceptibility testing is available
6. Severe mucositis

When to add empirical colistin in febrile neutropenic patients?

1. Hemodynamic instability.
2. Colonization with carbapenem resistant gram-negative bacteria.
3. Previous infection with carbapenem resistant gram-negative bacteria.
4. GNB in blood, sensitivity pending, persistent fever with hemodynamic instability.

Empirical Antifungal Therapy

- No response to broad spectrum antimicrobials (3-5days)- add L-AmphoB/echinocandin
- When a patient is located at a remote area and may not have access to emergency healthcare services, febrile neutropenia can be life threatening. Under such circumstances, availability of broad-spectrum oral antimicrobials with the patient can help them gain time to reach emergency healthcare service.

Useful tips

- Febrile after 72hrs- CT chest and consider empirical antifungal.
- If fever persists on empirical antimicrobials, send two sets blood cultures/day for 2 days
- Send further cultures if clinical deterioration
- Unexplained persistent fever in otherwise stable patient doesn't require change in empirical antimicrobial regimen.

Continue the regimen till ANC is >500cells/mm3

- If glycopeptides started as a part of empirical regimen, STOP after 48hrs, if no evidence of Gram positive infection
- Antimicrobial treatment should be given for at least seven days with an apparently effective antimicrobial, with at least four days without fever.
- Once Neutrophil count has recovered, with no culture positivity and hemodynamically stable; antimicrobials can be stopped and patient observed, even if remains febrile. Evaluate for fungal infection, if at risk.

Antiviral prophylaxis

- For HSV IgG positive patients undergoing allo-HSCT or leukemia induction needs acyclovir prophylaxis
- All patients being treated for cancer need to receive annual influenza vaccination with an inactivated vaccine.
- Neutropenic patients presenting with influenza like illness should receive empirical treatment with neuraminidase inhibitor.

Antifungal prophylaxis

a) Induction chemotherapy of Acute Leukemia: Posoconazole
b) Post allo BMT

Pre engraftment:
Voriconazole/ echinocandin

Post engraftment:
Posoconazole

Table - 20 Cardiac Device implant Prophylaxis

A risk assessment score is proposed with one point for each

a) Diabetes mellitus
b) Heart failure
c) Oral anticoagulation therapy
d) Chronic corticosteroid use
e) Renal insufficiency/failure
f) Prior CIED infection
g) Presence of more than two leads implanted
h) Presence of epicardial leads
k) Use of temporary pacemaker
l) Replacement, or upgrade procedure.

According to the score, patients will be stratified in two groups and the **same documented in the case notes**:

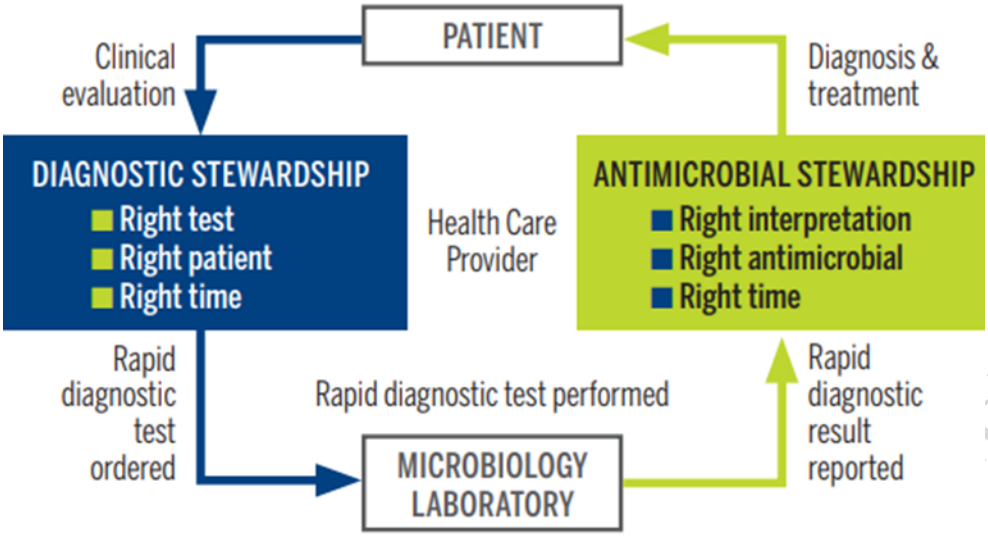
(a) low infective risk (score <3)
(b) high infective risk (score ≥3)

Patients in the 'low-risk' group will treated with only two doses of antimicrobials, both intravenous, of whom the first 15-60min before skin incision and the second after 8 hours. Patients in the 'high-risk' group will get intravenous prophylaxis for two full days (of whom the first administration 15-60min before skin incision

Antimicrobial prophylaxis will be amoxicillin/clavulanic acid unless the patient had a history of allergic reactions to penicillin. The dosage will be dependent on renal function:

(a) intravenous amoxicillin/clavulanic acid 2/0.2 g in patients with creatinine clearance (CrCl) >30 mL/min and 1/0.2 g in patients with CrCl <30mL/ min
(b) oral amoxicillin/clavulanic acid 875/125 mg every 8 h in patients with CrCl >30 mL/min, and 875/125 mg every 12 h in patients with CrCl <30mL/min.
(c) In case of penicillin allergy Intravenous clindamycin day for 2 doses for the low risk group and two days for the high risk group.

Diagnostic Stewardship



Diagnostic Stewardship is defined as the co-ordinated guidance and interventions to improve appropriate use of microbiological diagnostics to guide therapeutic decisions. It should promote appropriate, timely diagnostic testing, including specimen collection and pathogen identification and accurate , timely reporting of results to guide patient treatment

Appendix 1

Commonly used antimicrobials

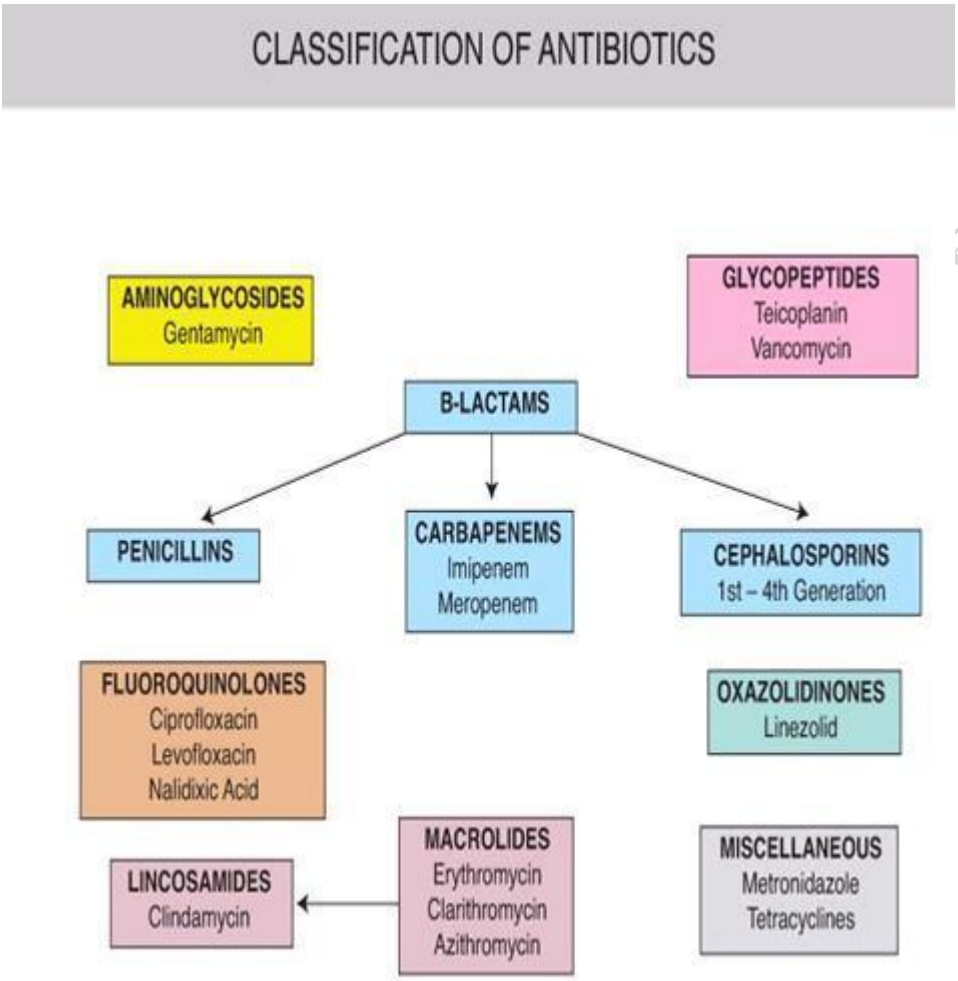


Table 21 : Spectrum of commonly used antimicrobials:

Antimicrobial Class	Name	Organisms	Indication & Dose	Side effects
Penicillins				Allergy
β-lactamase susceptible	Penicillin G Penicillin V Ampicillin. Amoxicillin (PO)	Gram +ve Gram +ve Gram +ve & Gram –ve Gram +ve	Not easily available 1-2 gms q6h 500 mg q8h	
β – lactamase resistant	Cloxacillin	Gram +ve	0.5-1gm q6h	
β-lactam/ β-lactam inhibitor combination	Piperacillin-tazobactam. Ampicillin-sulbactam. Amoxicillin-clavulanate (IV)	ESBL Gram –ve organisms ESBL Gram –ve organisms Gram +ve & Haemophilus. influenzae	4.5 gm q6h as infusion 1 gm q6h 1.2 gm q8h	
Cephalosporins				
1st Generation	Cefazolin (IV) Cephalexin (PO)	Gram +ve	1gm q8h 500 mg q8h	
2nd Generation	Cefadroxil (PO) Cefuroxime (PO & IV)	Gram +ve Gram +ve	500 mg q12h 750 mg q8h	
3rd Generation	Cefotaxime Ceftriaxone Ceftizoxime Ceftazidime Cefixime (PO) Cefpodoxime (PO) Cefdinir (PO)	Gram +ve & Gram -ve Gram +ve & Gram –ve Gram +ve & Gram –ve Gram +ve & Gram –ve Anti-pseudomonas	1 gram q6h 1-2gm q12h 1 gm q12h 1-2 gm q8h 200 mg q12h	

Antimicrobial Class	Name	Organisms	Indication& Dose	Side effects
Cephalosporin Plus beta lactamase inhibitor	Cefoperazone /sulbactam	Anti-pseudomonas	q12h 1.5 gm – 3gm q12h	
Aminoglycosides	Streptomycin Kanamycin Gentamicin Amikacin Tobramycin Netilmicin	Gram –ve Gram –ve Gram –ve Gram –ve Gram –ve Gram -ve	0.75 -1gm q24h 3mg/kg q24h 13mg/kg q24h 3mg/kg q24h 5mg/kg q24h	Deafnes s Vertigo Muscle weaknes s
Quinolones **Extended spectrum**	Nalidixic acid Norfloxacin Ciprofloxacin Ofloxacin Levofloxacin Moxifloxacin		1 gm q6h 400 mg q12h 500 mg q12h 200 mg q12h 750 mg q24h 400 mg q24h	 Seizures
Carbapenems Imipenem-cilastatin Meropenem Doripenem Ertapenem		Gram +ve except MRSA, ESBL Gram –ve except Stenotrophomonas, Burkholderia, Corynebacterium, Enterococcus faecium not covered Does not cover Pseudomonas, Acinetobacter & Enterococcus	0.5gm -1gm q6h 1 – 2 gm q8h 1gm q24h	Seizures
Polymyxins Polymyxin B Colistin		ESBL, Metalloproteinase producing Gram –ve	Polymyxin B 15Lac unit Loading f/b 7.5 lac unit BD Colistin 4.5MUBD (loading dose of 9MU is mandatory	Muscle weakness Renal toxicity
Lincosamide Clindamycin		Gram +ve and anerobes	600mg q8h	C. difficile colitis

Antimicrobial Class	Name	Organisms	Indication& Dose	Side effects
Glycopeptides Vancomycin Teicoplanin		MRSA	1gm q12h 400 mg 3 doses f/b 400 mg q24h	Renal toxicity
Oxazolidinedione Linezolid		VRE	600 mg q12h	Thrombocytopenia
Lipopeptides Daptomycin		MRSA	4-6mg/kg q24h	
Antifungals Fluconazole Voriconazole Caspofungin Anidulafungin AmphoB aqueous AmphoB colloidal AmphoB liposomal		Candida albicans Aspergillus Non albicans candida Non albicans candida Broad spectrum covers all above + Mucor etc	400 mg q12h 6mg/kg q12h first day then 4mg/kg 70mg IV then 50 mg q24h Refer product insert	

Appendix 2 Duration of therapy for various clinical conditions

Short course therapy is equally effective			
Condition	**Short Course (Days)**	**Long Course (Days)**	**Outcome**
Chronic Bronchitis and obstructive pulmonary disease, acute exacerbations	<=5	>=7	Equivalent Most patients do not require antimicrobials at all
Pneumonia community acquired	<=8	10-15	Equivalent
Possible pneumonia NICU	3	14-21	Equivalent
Atypical CAP	1	3	Equivalent
VAP	5-8	10-15	Equivalent
Empyema	14-21	21-42	Equivalent
Neutropenic fever	Until afebrile and stable	Until non neutropenic	Equivalent
Osteomyelitis, Chronic	42	84	Equivalent
Osteomyelitis removed implant	28	42	Equivalent
Debrided diabetic osteo	10-21	42-90	Equivalent
Septic arthritis	14	28	Equivalent
Intra abdominal infection	4	8-10	Equivalent
Complex appendicitis	1-2	5-6	Equivalent
Pyelonephritis /cUTI	5-7	10-14	Equivalent
Skin Infections (Cellulitis, Major abscesses, wound infections)	5-6	10-14	Equivalent
Sinusitis, acute bacterial	5	10	Equivalent
Bacteremia (Non Staph aureus)	7	14	Equivalent
Bacterial meningitis(peds)	4-7	7-14	Equivalent
Cystic fibrosis exacerbation	10-14	14-21	Equivalent

Note

- Recommended duration of therapy for candidemia without persistent fungemia or metastatic complications is for 2 weeks after documentation of negative cultures of candida from the bloodstream. (IDSA). Repeat blood culture after three days of starting therapy
- In cases of CRE, MRSA, CRAB bacteremia, repeat blood culture after 3 days of initiating appropriate antibiotics as per AST

Appendix 3
Antimicrobial Agent Form

BHARATI VIDYAPEETH'S
BHARATI HOSPITAL
AND RESEARCH CENTRE
PUNE

BHRC / HIC / F23 / (V-3)
IPD PAPER

ANTIMICROBIAL AGENT FORM

(Please Write Legibly)

Past Antimicrobials : _____

Ward : SSICU I/II/III/IV/ICU2/PICU/NICU/1/2/3/6/8/11/12/13/14/15/CVTS **Other Wards :** _____

Bed No : _____ **Clinician/Unit Head :** _____

Date of filling : ☐☐☐☐☐☐☐☐ **Patient type :** 1 2 3 **Wt. of Patient** _____**kg**

Patient Barcode here

Confirmed Diagnosis : _____

Suspected cause/Procedure : _____

Date of Surgery : ☐☐☐☐☐☐☐☐ **Type : Clean** ☐ **Clean cont.** ☐ **Contaminated** ☐ **Dirty** ☐

INVESTIGATIONS :

DAY	TLC	S.CT	CRP/PCT	RADIOLOGICAL EXAMINATIONS WITH DATE
DAY - 1				
DAY - 3				
DAY - 5				
DAY - 7				

AMA (Generic name)	*E /D / SP/MP	Route, Freq and Dose(mg/g)	Start Date	Stop Date	ID ref/AMSP Advice	IV to Oral

Device in situ : **1. Peripheral line** **2. Urinary Catheter** **3. ETT/TT** **4. Central Line** **5. Drains** **6. HD Catheter**

Date of insertion : _____ _____ _____ _____ _____ _____

Date of removal : _____ _____ _____ _____ _____ _____

Specimen taken (B/P/U/Resp/CSF/F) ** and Date (DD/MM)	Microorganism isolated Date received (DD/MM/)	Sensitivity Pattern (Name of imp antibiotics)	Change of AMA Y/N	Response after change Y/N

Data Collected by : _____

Prescriber sign : _____
(in case of High end Antibiotic)

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar Prof Microbiology	Dr. M S Modak Prof & HoD Microbiology	Dr. Shilpa Acharya Quality Department	Dr. SK Lalwani Medical Director

1) Appropriate	Score	Description
	A	Empiric
	B	Definitive
	C	Surgical prophylaxis
	D	De-escalation/Escalation
2) Inappropriate	A	No Indication
	B	Empiric
	C	Definitive (No de-escalation/ escalation based on culture/advice)
	D	Surgical Prophylaxis
	E	Duration longer than required
	F	Duration longer for surgical prophylaxis
	G	Dose/Freq (underdosing/overdosing)
	H	Irrational Combination
3) Others	A	Indication not documented
	B	ID reference
	C	Referred from outside
	D	Readmitted

*** E- Empiric, D-Definitive, SP- Surgical prophylaxis, MP- Medical prophylaxis**

**** B - Blood, P - PUS, U - Urine, Resp – Sputum, ETT, BAL, CSF. - Cerebro Spinal Fluid, F - Fluids.**

List of high-end antibiotics :

1. Carbapenems 2. Piptaz 3. Levofloxacin 4. Colistin / Polymyxin-B 5. Fosfomycin 6. Daptomycin
7. Teicoplanin 8. Vancomycin 9. Tigecycline/Minocycline 10. Linezolid 11. Echinocandins
12. Voriconazole/Posaconazole 13. Amphotericin B 14. Cefta/Avi Aztreonam

Appendix 4

Operative Procedure for Sample Collection

1. URINE CULTURE

(a) Items required

The following items should be available as preparation for collecting a catheter specimen of urine for analysis:

- Sterile gloves;
- Alcohol-saturated swab;
- Gate clip or non-traumatic clamps;
- Sterile Universal specimen container;

(b) Collection of urine sample from indwelling catheter:

Use sterile precautions

Clean hands using hand rub

Clamp the distal portion of the catheter.

Disconnect urine bag.

Disinfect distal portion of the catheter using 70% alcohol swab Allow it to dry thoroughly.

Do not allow the distal end of the catheter to touch body or clothes of the patient.

After 10 minutes release the clamp and collect urine in a sterile urine collection container

(c) Urine must be transported to the lab without delay. If delay is unavoidable, sample should be stored in the refrigerator at 4^0 C.

2. BLOOD CULTURE

(a) Hands should be clean and dry and gloved before taking sample.

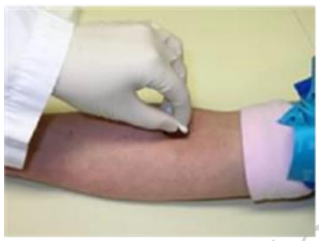
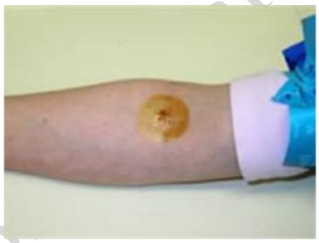


(b) Prepare Blood culture vials by proper labeling

(c) The culture bottle should be brought to room temperature before the sample inoculation and should not be refrigerated after inoculation.

(d) Remove flip-off caps and wipe the rubber bung with a 70% alcohol swab

(e) Disinfect skin at venepuncture site by wiping with 70% alcohol in a circular motion from centre to periphery and then with 1% iodine. Wait for at least one minute, allow to dry before venipuncture. The blood can be drawn using a 10mL syringe or a double sided butterfly needle with an adapter.

(f) After venepuncture carefully withdraw the needle and compress the venepuncture site.

(g) The number of sets to be collected is as follows.

(i) Febrile episode: 2 bottles from separate sites within 10 min

(ii) Acute endocarditis: 6 bottles from separate sites at 30 min intervals

(iii) Central Line related : 1 bottle drawn from the central line and 1 bottle from a peripheral venipuncture site

(h) The various culture bottles for Automated Blood Culture System and the volume of blood to be added to them are as under.

(i) BacT/Alert/BACTEC Aerobic (30 ml): 10 ml blood (optimal)

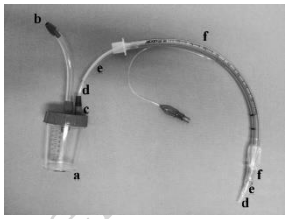
(ii) BacT/Alert/BACTEC Paediatric (20 ml): 4 ml blood (optimal)

3. ENDOTRACHEAL/TRACHEOSTOMY ASPIRATE CULTURES

(a) The collection of endotracheal aspirate will be performed by the Anaesthetist or the Intensivist.

(b) Do not use a swab for collecting sample.

(c) Use a BAL collection trap to collect the endotracheal aspirate.



(d) The aspirate is to be drawn as such in case it is less tenacious or alternatively, 5 ml of sterile saline is instilled and withdrawn immediately through the disposable sterile endotracheal aspiration catheter.

(e) The material is to be sent to laboratory within the next one hour.

4. PUS CULTURE

(a) Clean surface of wound or abscess with 70% alcohol and allow to dry; aspirate pus or fluid from the depth of the wound in a disposable syringe, place in a sterile container and send to the laboratory.

Cotton swab to be used only if pus cannot be collected in sterile bottle or syringe.

5. Body fluids

Sample-Amniotic fluid, Synovial fluid, pericardial fluid, Pleural fluid, peritoneal fluid

Sterile fluids are usually collected by a trained, qualified physician.

Aseptically collect at least 1 ml of fluid into a new disposable sterile container.

6. Bronchoalvelar Lavage

BAL should be collected under aseptic conditions preferably with a protected specimen brush if available. The material should be collected in a BAL trap container.

7. High vaginal swabs (HVS)

Use speculum to separate the vaginal walls.

Wipe away any excess cervical mucus with a sterile cotton swab.

Use the sterile swab stick to collect sample as high as possible in the vaginal vault.

Appendix 5

List of BL-BLI combination not recommended by WHO

- amoxicillin/sulbactam
- cefadroxil/clavulanic acid
- cefepime/sulbactam
- cefepime/tazobactam
- cefixime/clavulanic acid
- cefixime/clavulanic acid/lactobacillus acidophilus
- cefotaxime/sulbactam
- cefpodoxime proxetil/clavulanic acid
- cefoperazone/tazobactam
- ceftazidime/sulbactam
- ceftazidime/tazobactam
- ceftriaxone/sulbactam
- ceftriaxone/tazobactam
- cefuroxime axetil/clavulanic acid
- cefuroxime/clavulanic acid
- cefuroxime/sulbactam
- meropenem/sodium/sulbactam
- meropenem/sulbactam
- piperacillin/sulbactam

References:

1.National treatment guidelines for antimicrobial use in infectious disease, version 1 (2016)
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