Bharati Vidyapeeth University Medical College Hospital & Research Centre, Pune

Antimicrobial Policy
and
Antimicrobial Stewardship Program

2023-2024
Version - 9.0

Prepared by	Checked by	Verified by	Approved by
Dr M Kumar	Dr. MODAK M.S.	Dr AK VERMA	

SR NO	CONTENTS	PAGE NO
Prelude	List of amendments in Version 9	3
1	Introduction	4
2.	Clinical pathway	5
3.	Antimicrobial Stewardship Goals Workflow, Metrics	6-7
4.	List of restricted antimicrobials and Types of antimicrobial resistant organisms	8-9
5.	Common isolates from various samples and their antibiogram for the year: 2022	
	Critical care	10-12
	Medicine	13-15
	Surgery	16- 18
	Neonatology	19-21
	Obst Gynae	22-24
	Orthopaedics	25-26
	Paediatrics& PICU	27- 30
	Oncology	31-33
	OPD (All)	34-36
	Index of multidrug resistance	37
6.	Antimicrobial therapy in hospitalized patients	38
7.	Empiric Antimicrobial choice in various clinical conditions according to patient category, Definitive therapy	39-62
8.	Surgical Antimicrobial prophylaxis/Gastrointestinal endoscopy prophylaxis	63-65
9.	Febrile Neutropenia	66-68
10.	Appendix 1 : Commonly used antimicrobials , their spectrum of activity and side effects	69-72
11.	Appendix 2 Duration of therapy of common conditions	73
12.	Appendix 3 : Antimicrobial Agent form	74
13.	Appendix 4 : Sample collection methods	75-77
14.	References	78

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List of amendments in Version 9.0

1. Isolate listing and Antibiogram for the year 2022
2. Added antibiogram for Oncology isolates (Page 31)
3. Added guidelines for treatment for Febrile neutropenia (Table 19, Page 66)
4. Previous Table 19 renumbered to Table 20 (Commonly used antimicrobials and spectrum of activity) (Page 69)
5. Updated Multiple Antimicrobial Resistance Index for common pathogens (Page 37)
6. Added Ceftazidime-avibactam and Aztreonam to the list of restricted antimicrobials (Page 8) and in the Clinical Pathway description (Page 5)
7. Amended the Antimicrobial Agent form to include the above antimicrobials (Appx 3, Page 74)

1. Introduction -

Over the last 60 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.

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

2. Clinical Pathway

1. 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.
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 requires infectious disease/ critical care (ICU/PICU/NICU) consult. These include;

   Carbapenems, Ceftazidime avibactam, Aztreonam, Colistin, Linezolid, Teicoplanin, Vancomycin, Echinocandins, Voriconazole, Amphotericin B
7. Clinical response will be followed.
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. Infection control team will fill antimicrobial audit form and conduct regular department wise audits.
11. Findings of the audit will drive improvement in antimicrobial use.

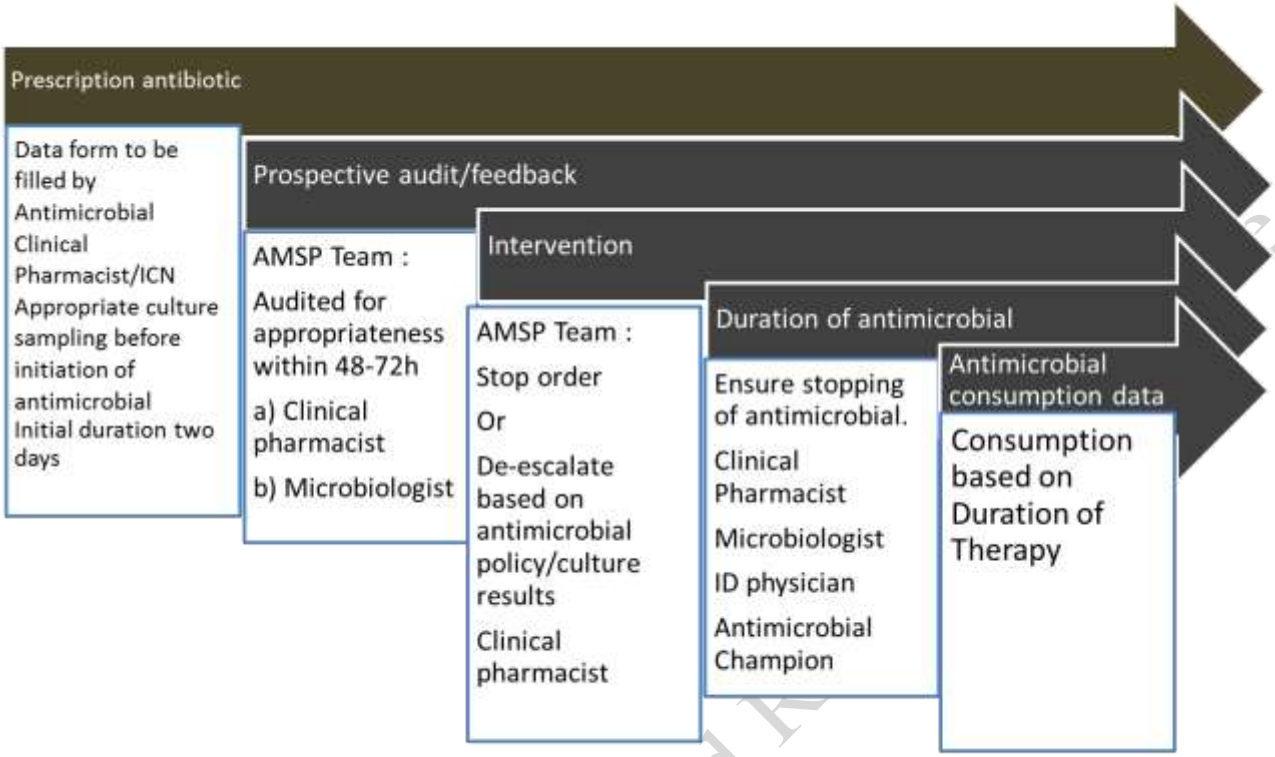
3. Antimicrobial Stewardship

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

Goal

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

Workflow of Antimicrobial stewardship



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

4. List of Restricted Antimicrobials

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

1. **Piperacillin tazobactam**
2. **Carbapenems**
3. **Linezolid**
4. **Vancomycin**
5. **Teicoplanin**
6. **Daptomycin**
7. **Tigecycline**
8. **Echinocandins : Caspofungin, Micafungin**
9. **Ceftazidime avibactam**
10. **Aztreonam**

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 penicillins; 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

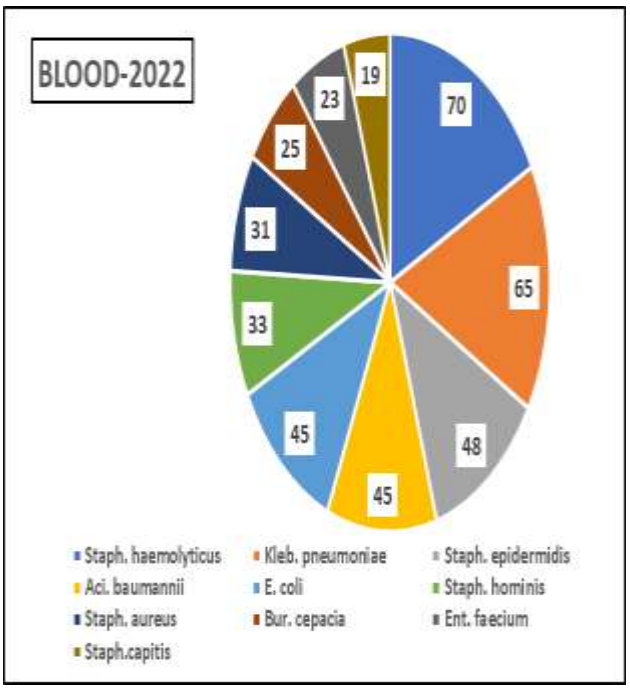
PDR (Pan drug resistance):

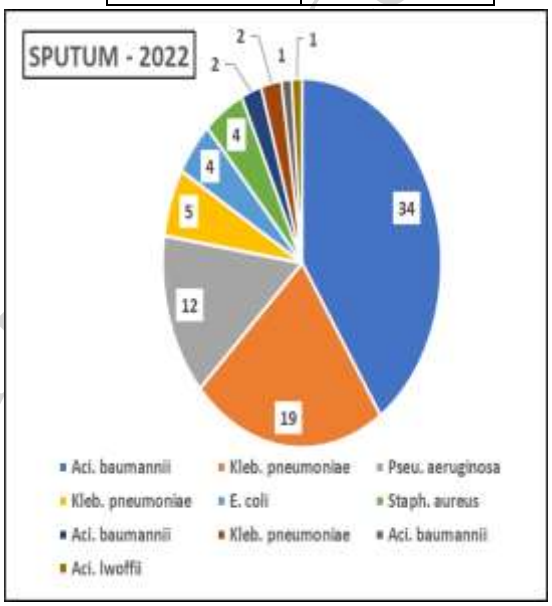
Isolates resistant to all classes of antimicrobial agents available

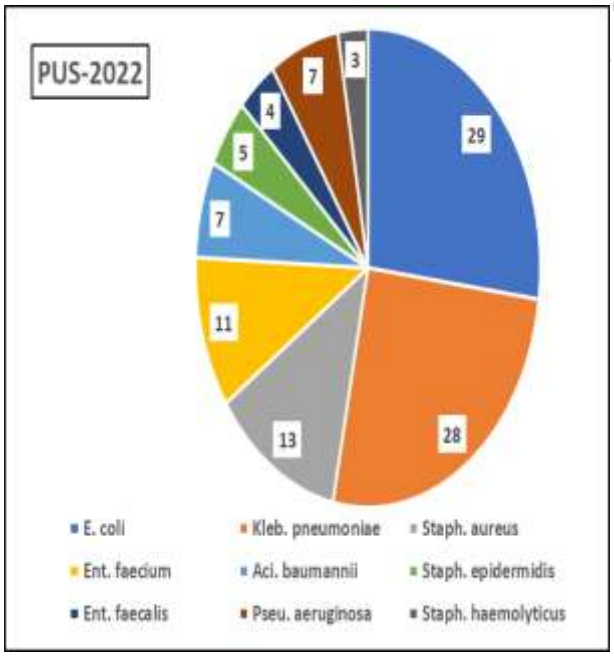
5. Organisms commonly isolated and antibiogram: Area wise

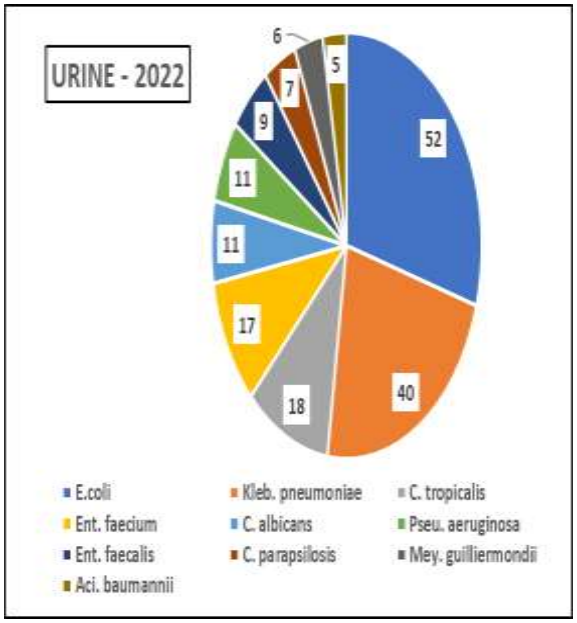
Intensive care unit

SPECIMEN TYPE	NO OF ISOLATES
BLOOD	**611**
PUS	**134**
SPUTUM	**96**
URINE	**215**









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Intensive Care unit antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	LEVOFLOXACIN	CIPROFLOXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	CEFUROXIME	CEFOXITIN	CEFTAZIDIME	CEFTRIAXONE	CEF/SUL	CEFEPIME	PIPTAZ	AMIKACIN	GENTAMICIN	ERTAPENEM	IMIPENEM	MEROPENEM	TIGECYCLINE	MINOCYCLINE	FOSFOMYCIN	COLISTIN
ICU	Blood	Klebsiella pneumoniae	64	50	20		47	23	18	50		24	38	31	31	57	58	37	35	38	82		58	97
		Escherichia coli	44		9		59	46	21			25	75	50	71	91	68	86	88	88	100		98	100
		Acinetobacter baumannii	43	0	9		33				0	10	16	9	9	9	23		9	9		50		100
		Burkholderia cepacia	23	91	82		91				64	0	41	0	0	0	0		0	67		82		
		Enterobacter cloacae	18		94		94	0	0			94	94	94	94	94	94	94	94	94	100		77	94
		Pseudomonas aeruginosa	16	67	69						80		75	75	69	75	75		75	75				100
		Stenotrophomonas maltophilia	12	80			67															100		
	Pus	Escherichia coli	29	0	0		52	29	4	0		7	57	38	54	79	64	71	82	79	100		100	100
		Klebsiella pneumoniae	28	0	22		33	27	19	0	0	19	33	25	30	30	33	35	33	32	82	0	33	71
	Urine	Escherichia coli	52	16	6	94	47	37	14	100		26	71	52	59	90	67	77	84	76	100	78	100	100
		Klebsiella pneumoniae	40	20	13	40	35	30	18			18	35	28	33	48	50	35	35	33	78	60	50	85
		Pseudomonas aeruginosa	11	27	33						33		30	27	30	30	50		30	30				82
	Respiratory (Tracheal)	Acinetobacter baumannii	32	0	7		23				0	7	13	10	10	7	16		10	10		0		97
		Klebsiella pneumoniae	19		21		33	32	16			16	42	33	39	53	47	39	39	37	90		37	84
		Pseudomonas aeruginosa	12	92	92						92		92	92	92	100	100		83	83				100

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

Skin flora/Collection contamination in blood culture

Organism	Number of isolates
Staphylococcus haemolyticus	70
Staphylococcus epidermidis	48
Staphylococcus hominis	33
Staphylococcus capitis	19
Staphylococcus caprae	11
Staphylococcus saprophyticus	4
Staphylococcus arlettae	1
Staphylococcus cohnii	1
Staphylococcus vitulinus	1
Staphylococcus warneri	1
Staphylococcus xylosus	1
Total	190

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Intensive Care unit antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM POSITIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	COTRIMOXAZOLE	NITROFURANTOIN	PENICILLIN	OXACILLIN	CIPROFLOXACIN	LEVOFLOXACIN	CLINDAMYCIN	GENTAMICIN	GENTAMICIN HIGH LEVEL	ERYTHROMYCIN	TETRACYCLINE	TIGECYCLINE	DAPTOMYCIN	LINEZOLID	TEICOPLANIN	VANCOMYCIN
ICU	Blood	Staphylococcus haemolyticus	70	59		2	9	10	12	19	32		4	77	100	100	86	96	97
		Staphylococcus epidermidis	48	55		9	23	36	36	61	77		32	85	100	100	96	89	98
		Staphylococcus hominis	33	61		13	24	39	39	65	88		24	64	100	100	100	85	97
		Staphylococcus aureus	30	73		17	60	3	10	67	83		40	97	100	100	100	100	97
		Enterococcus faecium	22			5		5	5			32	0	5	100		96	55	50
		Staphylococcus capitis	19	95		21	53	63	63	63	74		63	95	100	100	79	100	95
		Enterococcus faecalis	13			100		36	36			36	18	9	100	46	100	100	100
		Staphylococcus caprae	11																
	Pus	Staphylococcus aureus	13	85		0	46	0	0	69	69		23	100	100	100	100	100	100
		Enterococcus faecium	11			0		0	0			40	0	0	100		70	90	90
	Urine	Enterococcus faecium	17		6	0		0	0			12	0	0	100		59	47	47

Reserved/Restricted Drugs : Not to be used empirically 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 ICU

Department	Specimen type	Organism	Number of patients	FLUCYTOSINE	FLUCONAZOLE	VORICONAZOLE	CASPOFUNGIN	MICAFUNGIN	AMPHO B
ICU	Blood	Candida parapsilosis	7	100	57	71	100	100	57
		Candida albicans	5	100	80	80	100	100	100
		Candida tropicalis	3	100	100	100	100	100	100
	Urine	Candida tropicalis	18	100	100	100	100	100	100
		Candida albicans	11	100	100	100	100	100	100
		Candida parapsilosis	7	86	57	57	100	100	57
		Candida guilliermondi	6	100	67	100	100	100	100
		Candida glabrata	4	100		75	25	100	100

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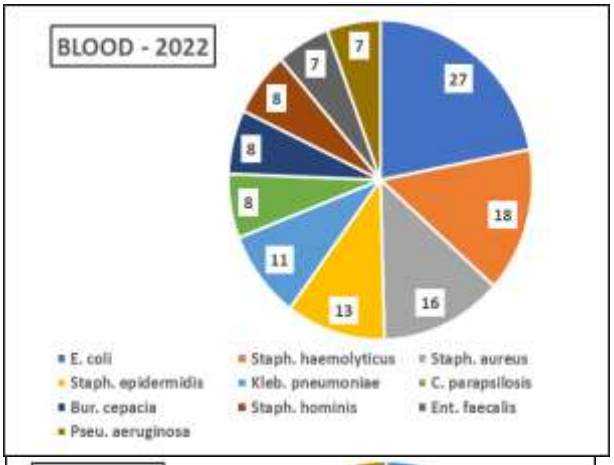
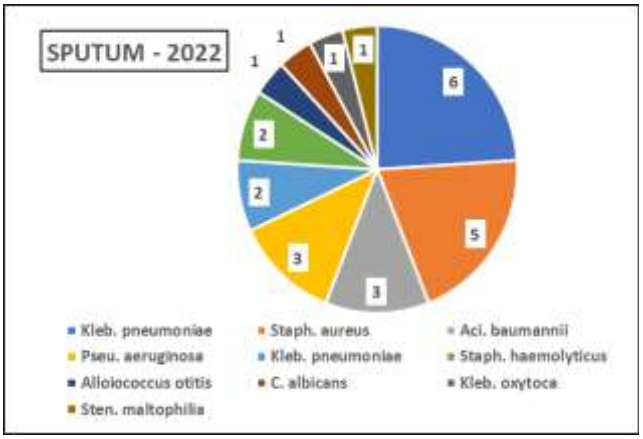
MEDICINE

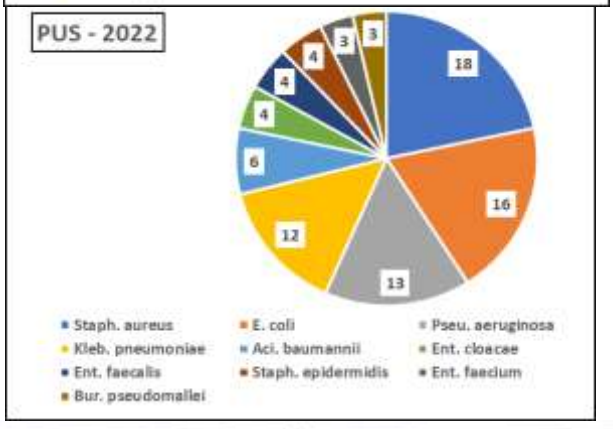
SPECIMEN TYPE	NO OF ISOLATES
BLOOD	**198**
PUS	**100**
SPUTUM	**29**
URINE	**199**

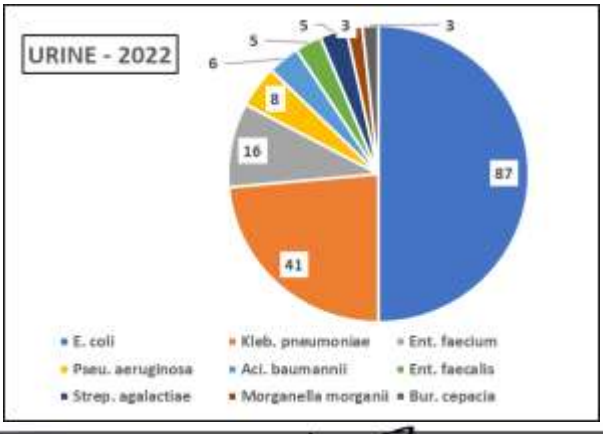
Skin flora/Collection contamination in blood culture

Staphylococcus haemolyticus	18
Staphylococcus epidermidis	13
Staphylococcus hominis ss. hominis	8
Staphylococcus capitis ss. capitis	3
Aerococcus viridans	1
Kocuria rosea	1
Micrococcus luteus	1
Brevundimonas diminuta	1
Staphylococcus saprophyticus ss. saprophyticus	1
Staphylococcus lugdunensis	1
Debaryomyces hansenii	1
Total	49









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Medicine antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	LEVOFLOXACIN	CIPROFLOXACIN	NORFLOXACIN	OFLAXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	CEFUROXIME	CEFTAZIDIME	CEFEPIME	CEF/SUL	CEFTRIAXONE	PIPTAZ	AMIKACIN	GENTAMYCIN	IMIPENEM	MEROPENEM	ERTAPENEM	MINOCYCLINE	TIGECYCLINE	FOSFOMYCIN	COLISTIN
Medicine	Blood	Escherichia coli	25		4				58	54	17		72	92	21	92	100	75	92	88	92		100	100	100
		Klebsiella pneumoniae	10		30				30	50	30		30	50	30	50	60	60	50	60	50		90	60	100
	Pus	Escherichia coli	16		6				50	38	13		25	56	13	56	94	88	50	63	63		100	100	94
		Pseudomonas aeruginosa	12	33	33							83	75	75		75	50	50	75	75					100
		Klebsiella pneumoniae	11		46				64	46	27		55	64	55	64	64	64	46	73	64		82	55	100
	Urine	Escherichia coli	79		0	0	0	79	41	37	8		37	74	9	68	91	67	80	78	75	70	100	98	100
		Klebsiella pneumoniae	41		3			10	15	13	5		10	20	10	18	31	23	21	23	21	20	59	39	95

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be ueful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

PERCENTAGE SUSCEPTIBILITY GRAM POSITIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	COTRIMOXAZOLE	NITROFURANTOIN	PENICILLIN	OXACILLIN	CIPROFLOXACIN	LEVOFLOXACIN	CLINDAMYCIN	GENTAMYCIN	GENTAMYCIN HIGH LEVEL	ERYTHROMYCIN	TETRACYCLINE	TIGYCYCLINE	DAPTOMYCIN	LINEZOLID	TEICOPLANIN	VANCOMYCIN
Medicine	Blood	Staphylococcus aureus	15	87	100	0	67	20	20	67	73		40	100	100	100	100	100	93
		Staphylococcus epidermidis	12	70	100	0	20	30	30	90	90		40	100	100	100	90	100	100
		Staphylococcus haemolyticus	18	61	100	6	6	11	11	22	22		11	78	100	100	100	100	94
	Pus	Staphylococcus aureus	18	44	100	0	39	28	28	44	72		22	89	100	100	100	100	94
	Urine	Enterococcus faecium	16		6	6		0	0			0	0	0	100		69	75	69

Reserved/Restricted Drugs : Not to be used empirically 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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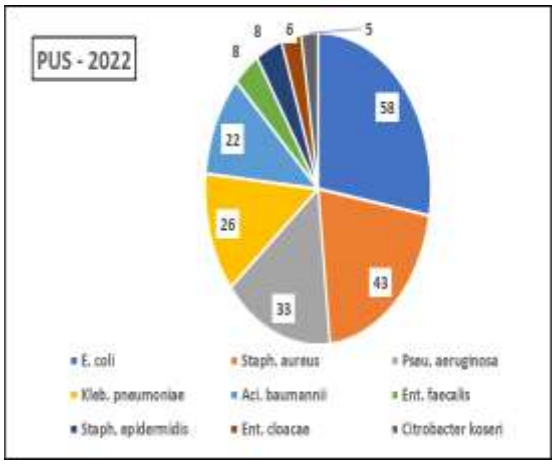
Medicine antibiogram

Candida

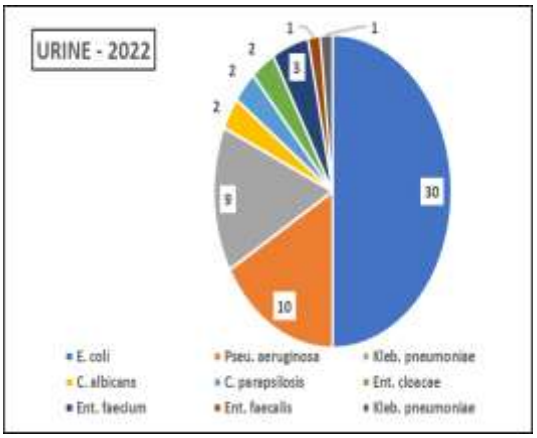
Please note: Individual isolates are less than 30 in number. Antibiogram has been shown with available number of organisms.

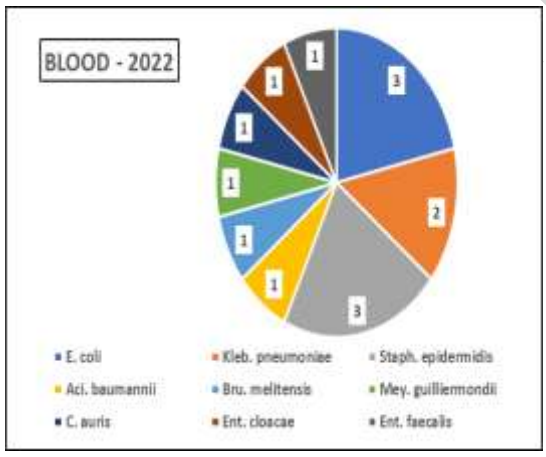
Department	Specimen type	Organism	Number of patients	FLUCYTOSINE	FLUCONAZOLE	VORICONAZOLE	CASPOFUNGIN	MICAFUNGIN	AMPHO B
Medicine	Blood	Candida parapsilosis	8	100	63	75	88	88	88
		Candida tropicalis	4	100	67	67	67	33	67
		Candida albicans	2	100	100	100	100	100	100
		Candida glabrata	1	100		100	100	100	100
	Pus	Candida albicans	1	0	100	100	100	100	100
	Urine	Candida albicans	2	100	100	50	100	100	100
		Candida tropicalis	2	100	100	100	100	100	100
		Candida glabrata	1	100		100	100	100	100
		Pichia kudriavzevii	1	0	0	100	0	100	0
		Kluyveromyces marxianus	1	100	100	100			100

Surgery



SPECIMEN TYPE	NO OF ISOLATES
BLOOD	23
PUS	286
URINE	65





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Surgery Antibiogram (IPD)

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	LEVOFLOXACIN	CIPROFLOXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	CEFUROXIME	CEFEPIME	CEF/SUL	CEFTAZIDIME	CEFTRIAXONE	PIPTAZ	AMIKACIN	GENTAMYCIN	IMIPENEM	ERTAPENEM	MEROPENEM	MINOCYCLINE	TIGECYCLINE	FOSFOMYCIN	COLISTIN
Surgery	Pus	Escherichia coli	58		5		43	36	10	41	59		12	57	91	67	79	71	74		100	100	100
		Pseudomonas aeruginosa	33	58	61					55	58	52		49	64	64	64		64				97
		Klebsiella pneumoniae	25		20		36	28	16	32	48		28	40	52	48	44	48	48		72	56	100
		Acinetobacter baumannii	13		0		0			0	0		0	0	0	0	0		0				100
	Urine	Escherichia coli	30	33	0	33	31	41	10	41	79		24	66	86	62	83	83	85	33	100	100	100
		Pseudomonas aeruginosa	10	25	22					33	22	38		33	22	33	22		22				78

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

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Surgery Antibiogram (IPD)

PERCENTAGE SUSCEPTIBILITY GRAM POSITIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	COTRIMOXAZOLE	NITROFURANTOIN	PENICILLIN	OXACILLIN	CIPROFLOXACIN	LEVOFLOXACIN	CLINDAMYCIN	GENTAMYCIN	TETRACYCLINE	TIGYCYCLINE	ERYTHROMYCIN	DAPTOMYCIN	LINEZOLID	TEICOPLANIN	VANCOMYCIN
Surgery	Pus	Staphylococcus aureus	43	58	100	7	33	5	7	65	79	93	100	44	100	100	100	95

Reserved/Restricted Drugs : Not to be used empirically 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

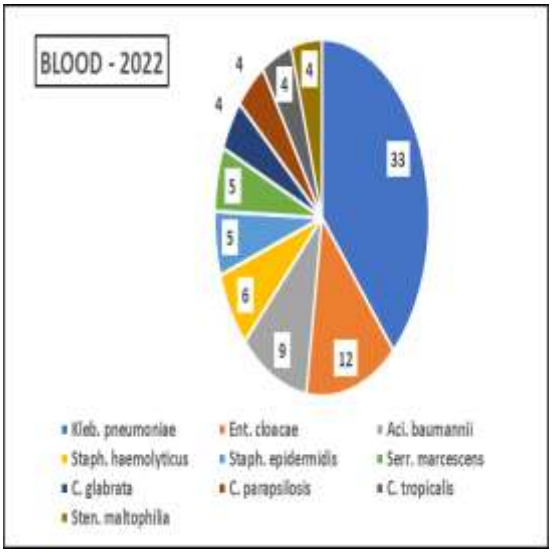
Please note: Individual isolates are less than 30 in number. Antibiogram has been shown with available number of organisms.

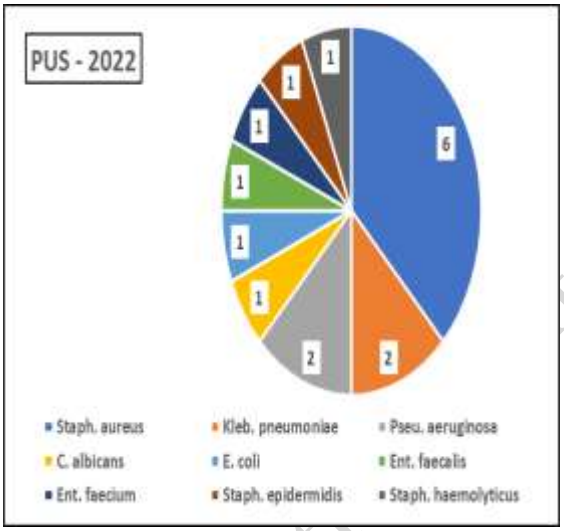
Department	Specimen type	Organism	Number of patients	FLUCYTOSINE	FLUCONAZOLE	VORICONAZOLE	CASPOFUNGIN	MICAFUNGIN	AMPHO B
Surgery	Blood	Candida guilliermondii	1	100	100	100	100	100	100
	Urine	Candida albicans	2	100	100	100	100	100	100
		Candida parapsilosis	2	100	100	100	100	100	100
	Pus	Candida albicans	4	100	100	75	75	75	75
		Candida guilliermondii	1	100	100	100	100	100	100
		Candida tropicalis	1	100	100	100	100	100	100

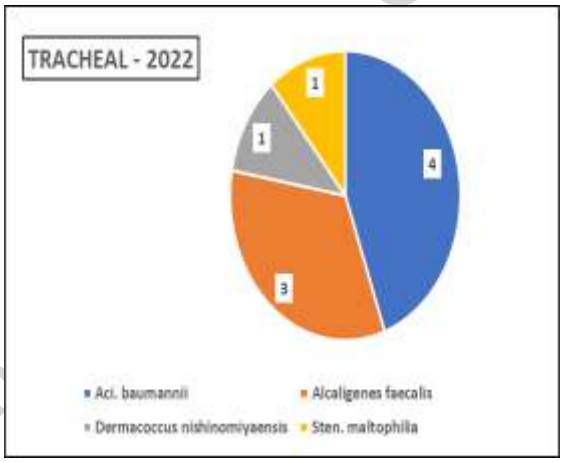
Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. Modak M.S.	Dr. A.K. Verma	

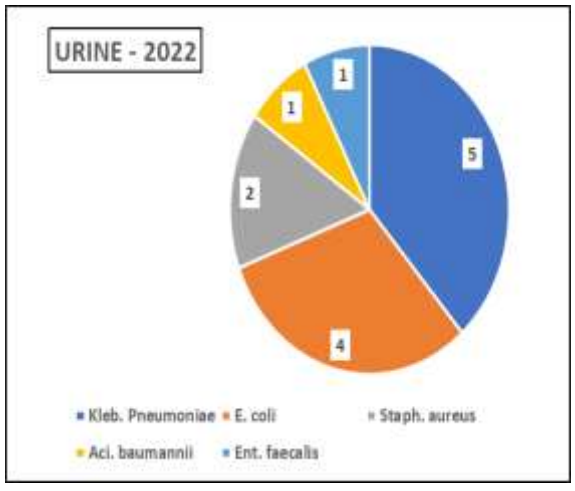
NEONATAL INTENSIVE CARE UNIT

SPECIMEN TYPE	NO OF ISOLATES
BLOOD	86
PUS	16
ENDOTRACHEAL ASPIRATE	9
URINE	13









Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. MODAK M.S.	Dr. AK VERMA	

NICU antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	CIPROFLOXACIN	LEVOFLOXACIN	COTRIMOXAZOLE	AMOX/CLAV	AZTREONAM	CEFUROXIME	CEFTAZIDIME	CEFTRIAXONE	CEFEPIME	CEF/SUL	PIPTAZ	AMIKACIN	GENTAMYCIN	IMIPENEM	MEROPENEM	ERTAPENEM	MINOCYCLINE	TIGECYCLINE	COLISTIN	FOSFOMYCIN
Neonatology	Blood	Klebsiella pneumoniae	33	6		55	12		3		3	18	39	36	64	46	39	42	42		100	85	91
		Enterobacter cloacae	12	42	0	92	0	0	0	0	64	83	92	92	92	67	92	92	91	100	92	92	50

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

Will be useful clinically

Will be ueful clinically in about 2/3 cases

Will not be useful clinically

Antimicrobial not appropriate/Not Tested

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. Modak M.S.	Dr. A.K. Verma	

NICU antibiogram

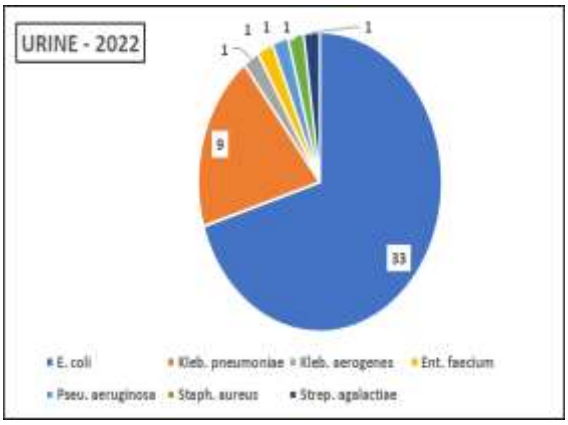
No significant number of Gram Positive isolates

Candida

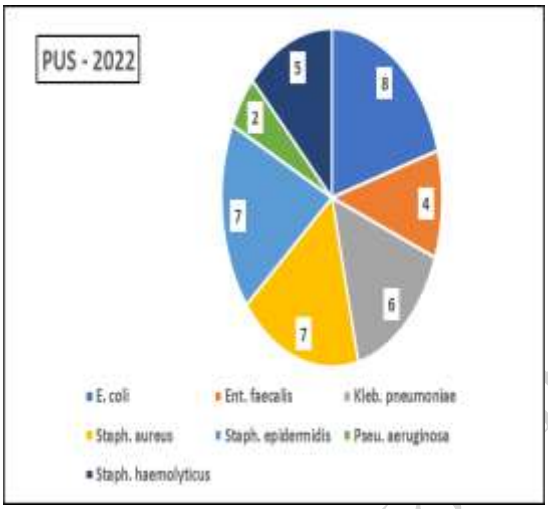
Please note: Individual isolates are less than 30 in number. Antibiogram has been shown with available number of organisms.

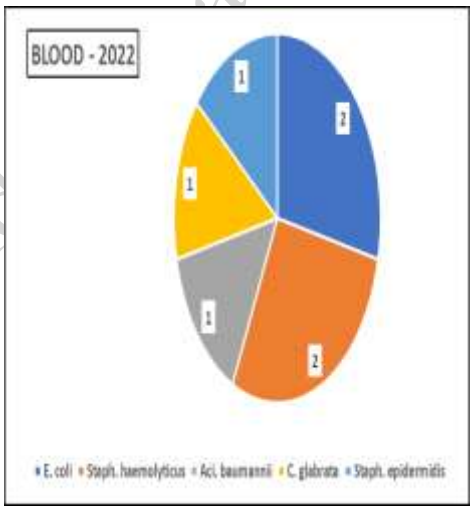
Department	Specimen type	Organism	Number of patients	FLUCYTOSINE	FLUCONAZOLE	VORICONAZOLE	CASPOFUNGIN	MICAFUNGIN	AMPHO B
Neonatology	Blood	Candida glabrata	4	100		100	50	75	50
		Candida parapsilosis	4	100	100	100	100	100	100
		Candida tropicalis	4	100	100	100	100	100	100
		Candida lusitaniae	3	100	100	100			100
		Candida guilliermondii	2	50	50	100	100	100	50
		Candida albicans	1	100	100	100	100	100	100
	Pus	Candida albicans	1	100	100	100	100	100	100

Obstetrics and Gynaecology



SPECIMEN TYPE	NO OF ISOLATES
BLOOD	7
PUS	44
URINE	**42**





Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. MODAK M.S.	Dr. AK VERMA	

Obstetrics and Gynecology Antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	CIPROFLOXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	CEFEPIME	CEFUROXIME	CEF/SUL	CEFTAZIDIME	CEFTRIAXONE	PIPTAZ	AMIKACIN	GENTAMYCIN	IMIPENEM	MEROPENEM	ERTAPENEM	MINOCYCLINE	TIGECYCLINE	COLISTIN	FOSFOMYCIN
ObGyn	Urine	Escherichia coli	33	5	71	54	65	64	8	92	100	23	89	100	85	96	90	92	83	100	100	100

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

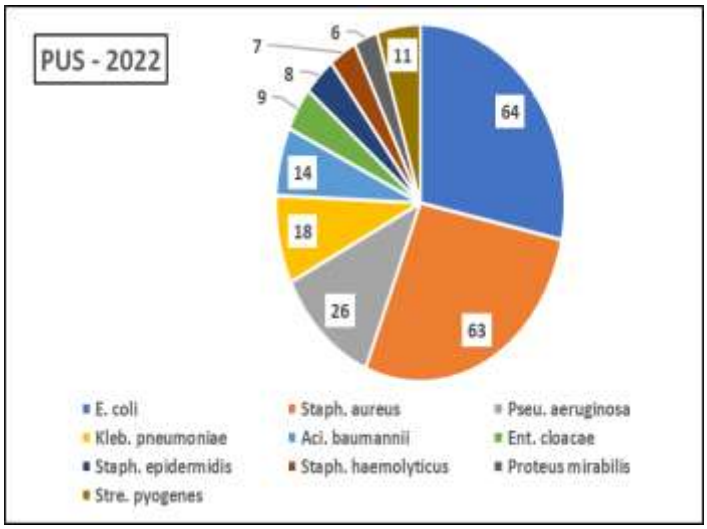
Please note: Other individual isolates are less than significant numbers.

Obstetrics and Gynaecology

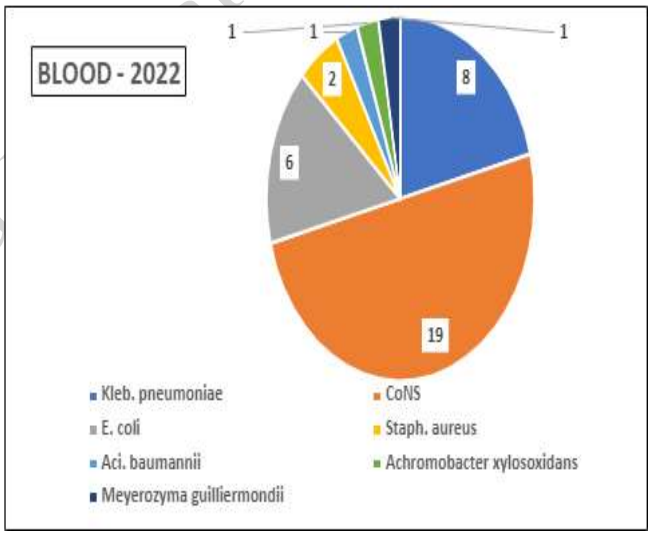
Please note: Individual isolates are less than 30 in number.

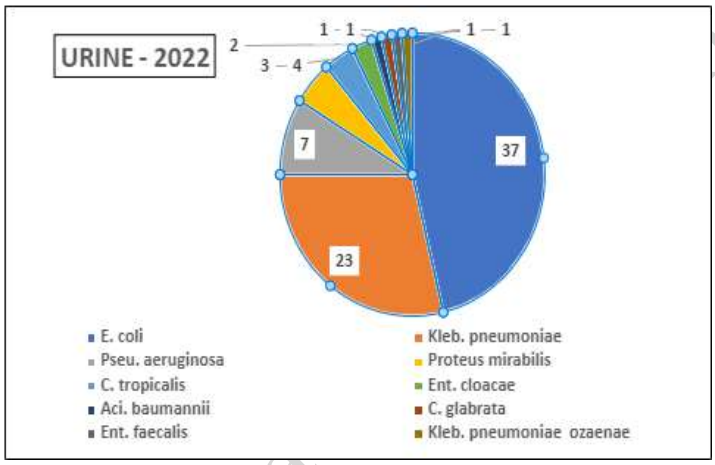
No significant number of Gram Postive isolates in 2022

ORTHOPAEDICS



SPECIMEN TYPE	NO OF ISOLATES
PUS	**276**
BLOOD	**43**
URINE	**81**





Orthopaedics Antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	LEVOFLOXACIN	CIPROFLOXACIN	NORFLOXACIN	OFLAXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	AZTREONAM	CEFUROXIME	CEFTAZIDIME	CEFTRIAXONE	CEFEPIME	CEF/SUL	PIPTAZ	AMIKACIN	GENTAMYCIN	IMIPENEM	ERTAPENEM	MEROPENEM	MINOCYCLINE	TIGECYCLINE	FOSFOMYCIN	COLISTIN
ORTHO	Pus	Escherichia coli	63	0	2				39	28	0	8	0	12	41	68	67	94	73	80	75	82	0	100	98	98
		Pseudomonas aeruginosa	26	76	68								81		76	76	71	84	76	72		76				96
		Klebsiella pneumoniae	18		6				39	17		6		11	11	28	28	39	39	28	28	28		72	78	94
		Acinetobacter baumannii	14		7				21					7	7	7	7	7	7	7		7				100
	Urine	Escherichia coli	37	0	13			83	35	27		16		22	46	73	62	92	54	84	78	84	50	100	100	100
		Klebsiella pneumoniae	22	0	11	0	0	0	27	14		5	0	9	14	24	23	32	46	14	23	39	0	86	32	100

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be ueful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

Orthopaedics Antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM POSITIVE ORGANISM 2022

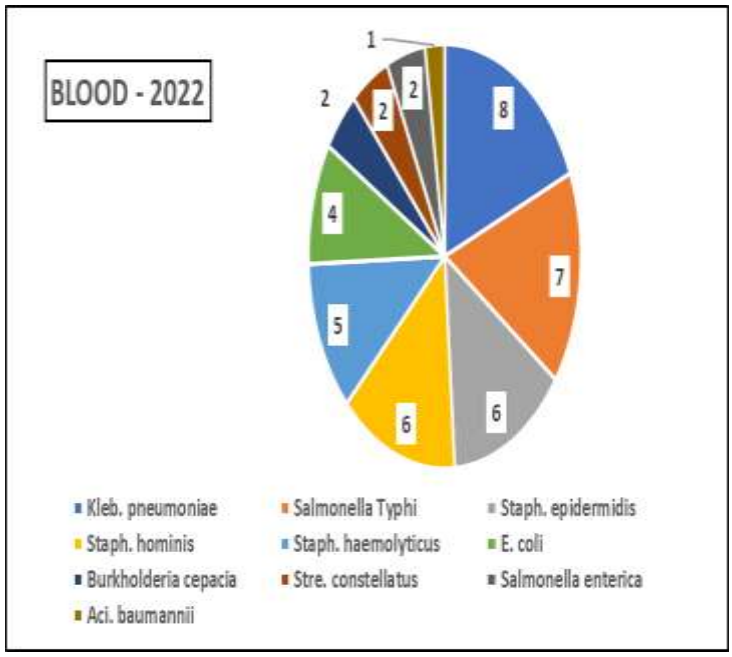
Department	Specimen type	Organism	Number of patients	COTRIMOXAZOLE	PENICILLIN	OXACILLIN	CIPROFLOXACIN	LEVOFLOXACIN	CLINDAMYCIN	GENTAMECIN	ERYTHROMYCIN	TETRACYCLINE	TIGECYCLINE	DAPTOMYCIN	LINEZOLID	TEICOPLANIN	VANCOMYCIN
ORTHO	Pus	Staphylococcus aureus	61	83	5	47	25	25	73	85	45	97	100	100	98	100	97

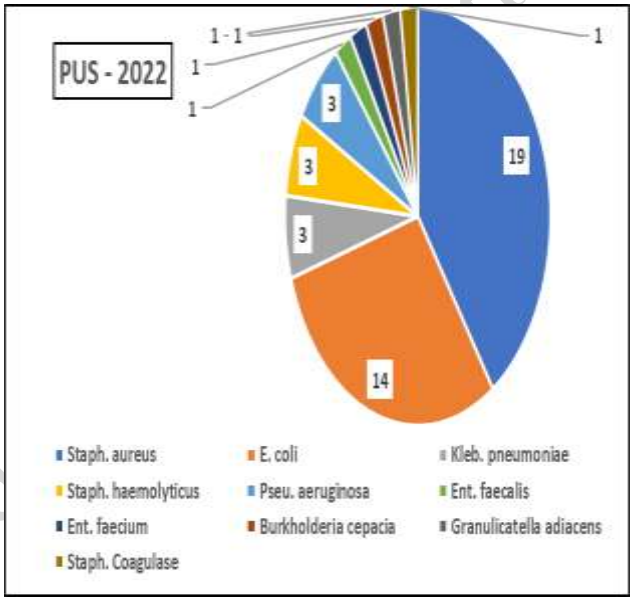
Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be useful clinically in about 2/3 cases
Will not be useful clinically
Not tested/Not appropriate antibiotic

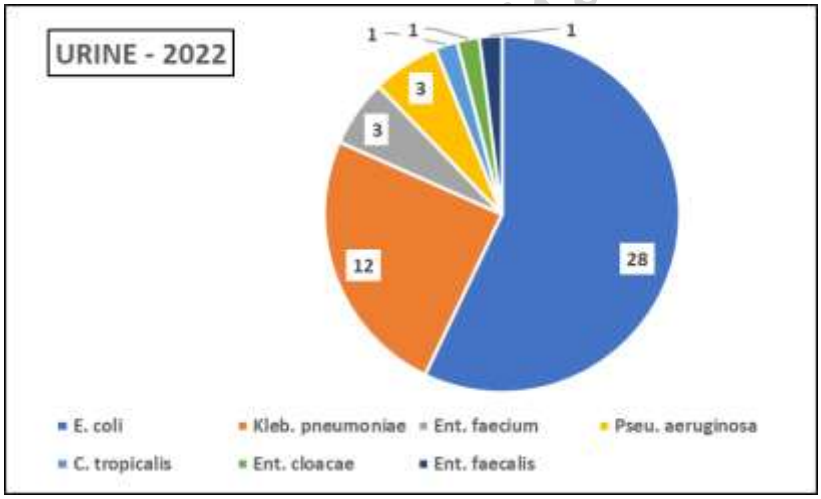
Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. Modak M.S.	Dr. A.K. Verma	

PEDIATRICS

SPECIMEN TYPE	NO OF ISOLATES
BLOOD	**66**
PUS	**49**
URINE	**49**







Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. MODAK M.S.	Dr. AK VERMA	

Paediatrics Antibiogram

Please note: Individual isolates are less than 30 in number. Antibiogram has been shown with available number of organisms.

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	CIPROFLOXACIN	LEVOFLOXACIN	NORFLOXACIN	OFLAXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	CEFUROXIME	CEFTRIAXONE	CEFEPIME	CEFIXIME	CEF/SUL	PIPTAZ	AMIKACIN	GENTAMICIN	IMIPENEM	ERTAPENEM	MEROPENEM	MINOCYCLINE	TIGECYCLINE	COLISTIN	FOSFOMYCIN
PAEDIATRICS	Urine	Escherichia coli	27	9	25			100	41	22	11	22	44		74	67	85	59	85	85	83	75	100	100	100
		Klebsiella pneumoniae	12	33	0	100	100	50	50	33	9	17	36	0	55	25	58	58	46	42	63	33	82	100	58
	Tracheal	Acinetobacter baumannii	13	0					46			0	0		31	0	0	8	0		0			100	
	Pus	Escherichia coli	13	0					54	31	8	39	54		85	69	92	69	92	92	92		100	100	100

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be ueful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022 - PICU

Department	Specimen type	Organism	Number of patients	CIPROFLOXACIN	LEVOFLOXACIN	NORFLOXACIN	OFLAXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	CEFUROXIME	CEFTRIAXONE	CEFEPIME	CEFIXIME	CEF/SUL	PIPTAZ	AMIKACIN	GENTAMICIN	IMIPENEM	ERTAPENEM	MEROPENEM	MINOCYCLINE	TIGECYCLINE	COLISTIN	FOSFOMYCIN
PAED ICU	Tracheal	Acinetobacter baumannii	13	0					46			0	0		31	0	0	8	0		0			100	
	BLOOD	Klebsiella pneumoniae	8	75					50	50	50	50	50		63	63	63		63	63	63		100	100	63

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be ueful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. Modak M.S.	Dr. A.K. Verma	

Please note: Individual isolates are less than 30 in number. Antibiogram has been shown with available number of organisms.

PERCENTAGE SUSCEPTIBILITY GRAM POSITIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	COTRIMOXAZOLE	NITROFURANTOIN	PENICILLIN	OXACILLIN	CIPROFLOXACIN	LEVOFLOXACIN	CLINDAMYCIN	GENTAMYCIN	ERYTHROMYCIN	TETRACYCLINE	TIGYCYCLINE	DAPTOMYCIN	LINEZOLID	TEICOPLANIN	VANCOMYCIN
PAEDIATRICS	Pus	Staphylococcus aureus	19	68	95	5	11	11	11	42	100	42	100	100	100	100	100	84

Reserved/Restricted Drugs : Not to be used empirically 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

Skin flora/Collection contamination in blood culture – Paediatrics & PICU

Staphylococcus epidermidis	**12**
Staphylococcus hominis ss. hominis	**13**
Staphylococcus haemolyticus	**9**
Streptococcus constellatus	**2**
Kocuria kristinae	**1**
Micrococcus luteus	**1**
Staphylococcus arlettae	**1**
Streptococcus anginosus	**1**
Staphylococcus caprae	**1**
Staphylococcus gallinarum	**1**
Streptococcus mutans	**1**
Staphylococcus hominis ss. novobiosepticus	**1**
Staphylococcus cohnii ss. cohnii	**1**
Staphylococcus warneri	**1**
Total	46

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. Modak M.S.	Dr. A.K. Verma	

Please note: Individual isolates are less than 30 in number. Antibiogram has been shown with available number of organisms.

Paediatrics Candida 2022

Department	Specimen type	Organism	Number of patients	FLUCYTOSINE	FLUCONAZOLE	VORICONAZOLE	AMPHO B	CASPOFUNGIN	MICAFUNGIN
PAEDIATRICS	Blood	Candida albicans	1	100	100	100	100	100	100
		Clavispora lusitaniae	1	100	100	100	100		
	Cerebrospinal fluid	Candida tropicalis	1	100	100	100	100	100	100
	Urine	Candida tropicalis	1	100	100	100	100	100	100

PICU Candida 2022

Department	Specimen type	Organism	Number of patients	FLUCYTOSINE	FLUCONAZOLE	VORICONAZOLE	AMPHO B	CASPOFUNGIN	MICAFUNGIN
Paed ICU	Blood	Candida tropicalis	4	100	100	100	100	100	100
	Urine	Candida albicans	3	100	100	100	100	100	100
		Candida tropicalis	5	75	100	100	100	100	100
		Candida dubliniensis	1	0	0	100	0		
	Pus	Candida tropicalis	1	100	100	100	100	100	100

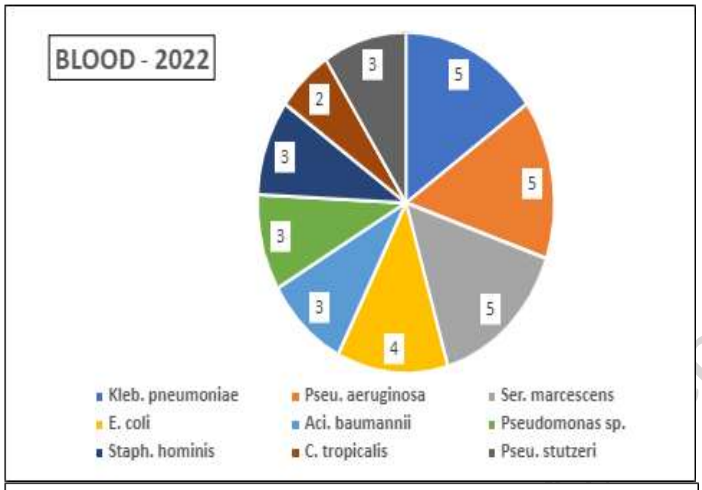
Prepared by	Checked by	Verified by	Approved by
Dr M Kumar	Dr. MODAK M.S.	Dr AK VERMA	

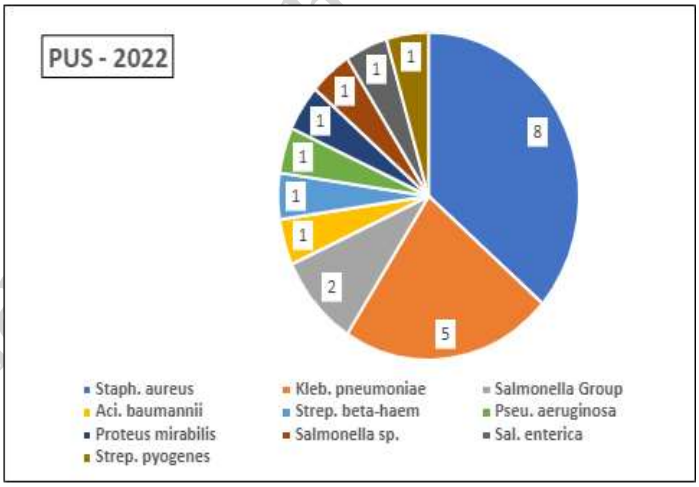
ONCOLOGY

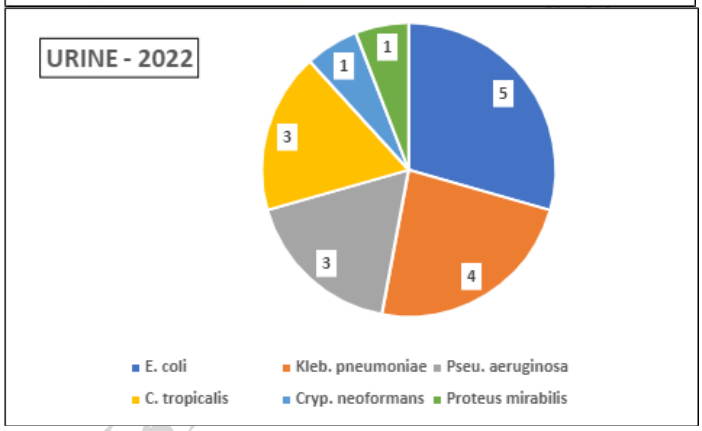
Please note: Individual isolates are less than 30 in number. Antibiogram has been shown with available number of organisms.

Please prescribe as per policy guidelines outlined in the section on therapy of common conditions.

SPECIMEN TYPE	NO OF ISOLATES
BLOOD	**47**
PUS	**22**
URINE	**17**







Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. MODAK M.S.	Dr. AK VERMA	

ONCOLOGY

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	CIPROFLOXACIN	LEVOFLOXACIN	COTRIMOXAZOLE	AMOX/CLAV	CEFUROXIME	CEFTRIAXONE	CEFTAZIDIME	CEFEPIME	CEF/SUL	NITROFURANTOIN	PIPTAZ	AMIKACIN	GENTAMYCIN	ERTAPENEM	FOSFOMYCIN	IMIPENEM	MEROPENEM	MINOCYCLINE	TIGECYCLINE	COLISTIN
ONCO	Blood	Klebsiella pneumoniae	5	25	0	25	25	25	50		40	50		50	50	50	50	50	25	40		100	100
		Serratia marcescens	5	100		100	0	0	100		80	100			100	100	80	100	80	80			
		Escherichia coli	4	0		50	0	0	0		50	50		0	100	100	50	100	50	50		100	100
		Pseudomonas aeruginosa	4	100	100					100	100	100		100	100	100			100	100			100
		Pseudomonas sp.	3	0	0	0				100	100	100		100	0	0			100	67			
		Acinetobacter baumannii	2	100		100			100		100	100		50	100	100			100	100			100
		Pseudomonas stutzeri	2	100	100	100			100	100	100	100		100	100	100			100	100			
		Aeromonas hydrophila	1	100	100	100				100	100	100			100	100			100	0			
		Aeromonas salmonicida	1																				
		Klebsiella aerogenes	1	0		100	0	0	100		100	100		100	100	100	100	100	100	100		100	0
	Pus	Klebsiella pneumoniae	5	20		40	20	20	40		40	40		40	40	40	40	100	40	40		80	100
		Salmonella Group D1 (O:9)	2	100		100	100		100		100	100		100			100	100	100	100			
		Acinetobacter baumannii	1	0		0			0		0	0		0	0	0			0	0			100
		Pseudomonas aeruginosa	1	100	100					100	100	100		100	100	100			100	100			100
		Proteus mirabilis	1	100		100	100	100	100		100	100		100	100	100	100	100	100	100			
		Salmonella sp.	1	100		100	100	0	100		100	100		100	0	0	100	100	100	100		100	100
		Salmonella enterica	1	0		100	100		0		0	100		100			100	100	100	100			
	Urine	Escherichia coli	5	0	0	20	60	20	20		60	60	0	60	80	60	60	100	60	75		100	100
		Klebsiella pneumoniae	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	100
		Pseudomonas aeruginosa	3	33	33					67	67	67		33	67	67			67	67			67
		Proteus mirabilis	1	0		0	100	0	0		100	100		100	100	0	100	100	100	100			

Reserved/Restricted Drugs : Not to be used empirically unless justified
Will be useful clinically
Will be ueful clinically in about 2/3 cases
Will not be useful clinically
Antimicrobial not appropriate/Not Tested

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. Modak M.S.	Dr. A.K. Verma	

ONCOLOGY

Skin flora/Collection contamination in blood culture - Oncology

Staphylococcus hominis ss. hominis	3
Enterococcus faecium	1
Kocuria rosea	1
Staphylococcus arlettae	1
Staphylococcus warneri	1
Staphylococcus warneri	1
Total	8

PERCENTAGE SUSCEPTIBILITY GRAM POSITIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	COTRIMAZOLE	NITROFURANTOIN	CIPROFLOXACIN	LEVOFLOXACIN	AMPICILLIN	CEFTRIAXONE	CHL %S	CLINDAMYCIN	ERYTHROMYCIN	GENTAMYCIN	GENTAMYCIN HIGH LEVEL	OXACILLIN	PENICILLIN	TIGYCYCLINE	LINEZOLID	DAPTOMYCIN	TEICOPLANIN	VANCOMYCIN	RIFAXIMIN	TCY %S
ONCO	Blood	Staphylococcus hominis	3	33	100	33	33				33	33	67		33	0	100	67	100	100	100	67	67
		Enterococcus faecium	1		100	100	100					0		100		100		100		100	100		100
		Staphylococcus warneri	1	0	100	100	100				100	0	100		0	0	100	100	100	100	100	100	100
	Pus	Staphylococcus aureus	8	50	100	38	38				63	25	75		50	0	100	100	100	100	100	100	75

Reserved/Restricted Drugs : Not to be used empirically 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 Oncology

Department	Specimen type	Organism	Number of patients	FLUCYTOSINE	FLUCONAZOLE	VORICONAZOLE	CASPOFUNGIN	MICAFUNGIN	AMPHO B
ONCO	Blood	Candida tropicalis	2	100	100	50	100	100	100
	Urine	Candida tropicalis	2	100	50	50	100	100	100

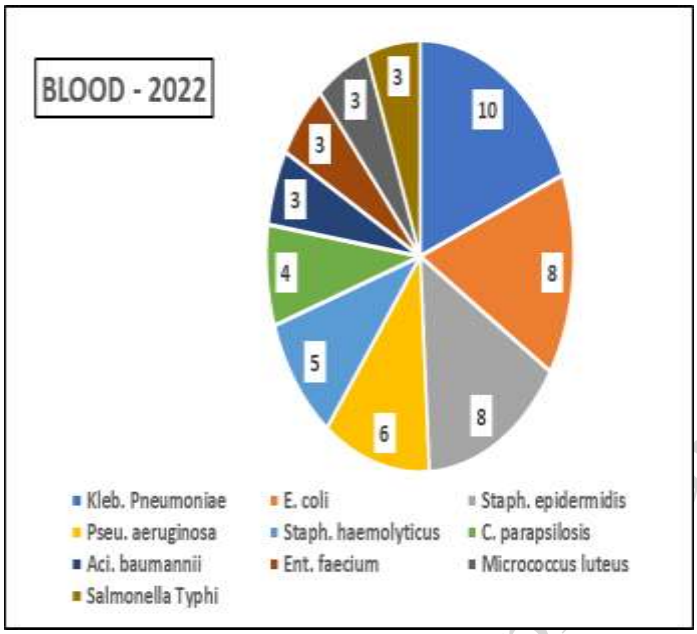
Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. Modak M.S.	Dr. A.K. Verma	

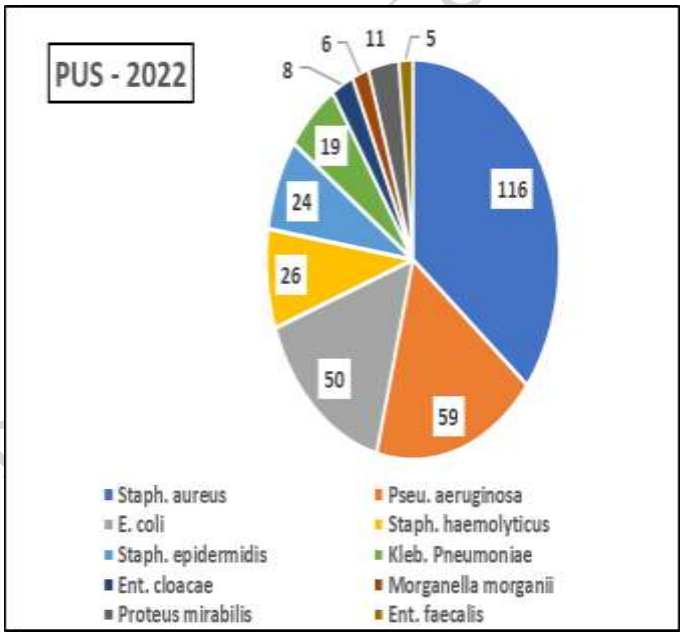
OPD

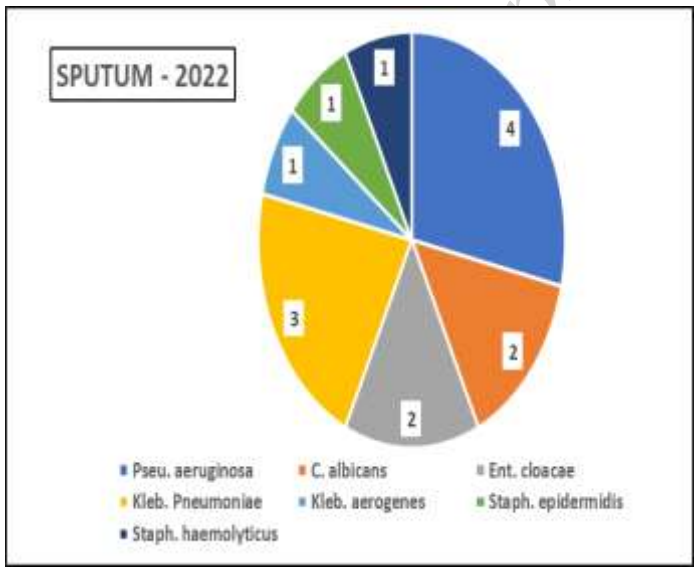
SPECIMEN TYPE	NUMBER OF ISOLATES
BLOOD	86
PUS	374
SPUTUM	14
URINE	664

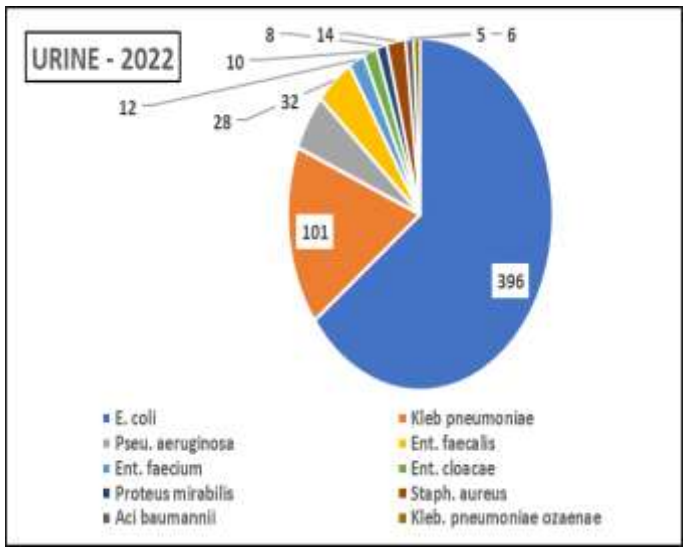
Blood isolates are from cultures taken in the EMD
Skin flora/Collection contamination in EMD :

Staph. epidermidis	**8**
Staph. haemolyticus	**5**
Micrococcus luteus	**3**
Total	16









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OPD Antibiogram

PERCENTAGE SUSCEPTIBILITY GRAM NEGATIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	LEVOFLOXACIN	CIPROFLOXACIN	NORFLOXACIN	OFLAXACIN	NITROFURANTOIN	COTRIMOXAZOLE	AMOX/CLAV	CEFUROXIME	CEFEPIME	CEFIXIME	CEFTAZIDIME	CEFTRIAXONE	CEF/SUL	PIPTAZ	AMIKACIN	GENTAMICIN	IMIPENEM	ERTAPENEM	MEROPENEM	MINOCYCLINE	TIGECYCLINE	COLISTIN	FOSFOMYCIN
OPD	Pus	Pseudomonas aeruginosa	56	67	68							83		82		81	82	87	83	83		89			98	
		Escherichia coli	49	0	4	0	0	100	47	49	13	42	0	33	23	77	78	94	90	83	81	83	50	100	100	100
		Klebsiella pneumoniae	19		53				58	58	47	63			53	74	74	74	74	68	74	74		100	95	63
	Urine	Escherichia coli	392	0	25	48	46	86	56	51	18	49	28	56	32	77	78	96	78	86	89	87			100	99
		Klebsiella pneumoniae	100	0	30	56	53	21	51	48	23	52	31	42	37	70	57	73	69	73	71	83			93	61
		Pseudomonas aeruginosa	32	41	45							44		48		47	50	52	55	47		47			94	
		Enterobacter cloacae	10		60	60	60	20	90	0	0	75	40	80	70	80	78	80	70	75	80	80			100	

- Reserved/Restricted Drugs : Not to be used empirically unless justified
- Will be useful clinically
- Will be ueful clinically in about 2/3 cases
- Will not be useful clinically
- Antimicrobial not appropriate/Not Tested

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PERCENTAGE SUSCEPTIBILITY GRAM POSITIVE ORGANISM 2022

Department	Specimen type	Organism	Number of patients	COTRIMOXAZOLE	NITROFURANTOIN	PENICILLIN	OXACILLIN	CIPROFLOXACIN	LEVOFLOXACIN	CLINDAMYCIN	GENTAMYCIN	GENTAMYCIN HIGH LEVEL	ERYTHROMYCIN	TETRACYCLINE	TIGECYCLINE	DAPTOMYCIN	LINEZOLID	TEICOPLANIN	VANCOMYCIN
OPD	Pus	Staphylococcus aureus	116	65		9	44	10	10	55	81		37	93	100	100	99	100	99
		Staphylococcus haemolyticus	26	44		0	0	4	12	20	20		4	88	100	100	100	100	100
		Staphylococcus epidermidis	24	71		0	29	46	46	58	88		29	79	100	100	100	92	92
	Urine	Enterococcus faecium	12		42	8		0	0			50	0	0	100		92	83	75
		Enterococcus faecalis	28		86	89		11	11			39	0	4	100	70	100	96	96

Reserved/Restricted Drugs : Not to be used empirically 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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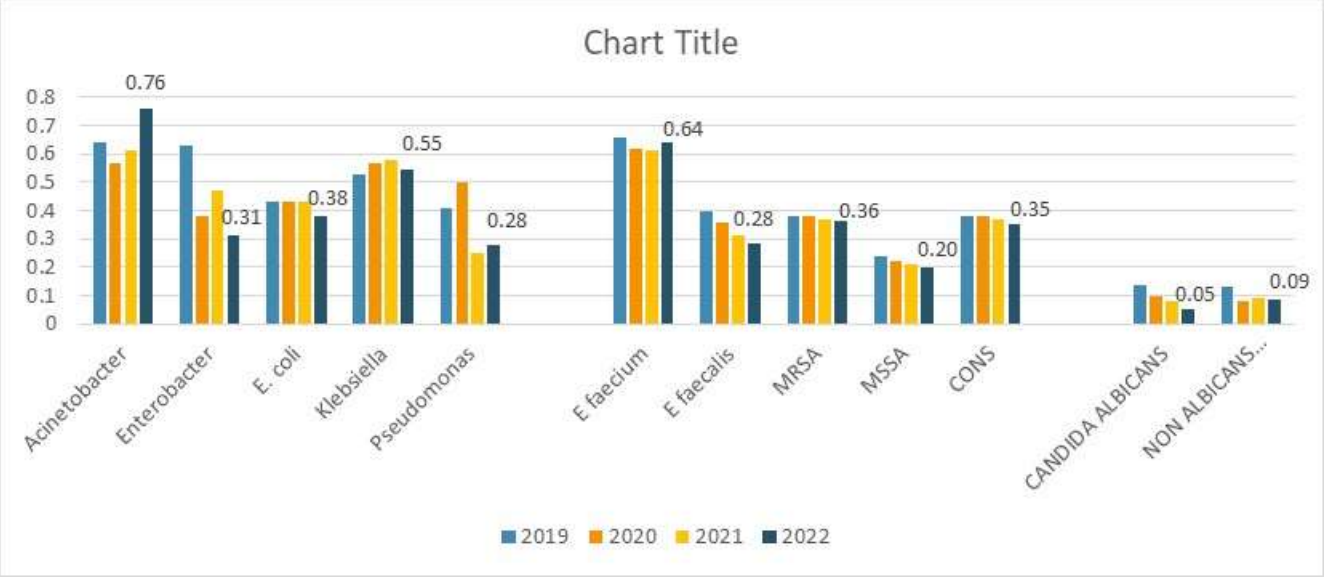
Index of multidrug resistance
Shows the trend of multidrug resistance of common pathogens for the years 2019-2022

Multi drug resistance index is calculated by formula $\frac{\text{Number of drugs resistant}}{\text{Number of drugs tested}}$

Value closer to 0.2 is considered the best

The chart depicts decreasing index in most of the organisms except Acinetobacter and Enterococcus faecium



Prepared by	Checked by	Verified by	Approved by
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6. 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 (Community acquired)	**Patient Type 2 (Healthcare associated)**	**Patient Type 3 (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 than 7 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
No procedures done	Minimum procedures done	Major invasive 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

7. Empiric Antimicrobial choice

Recommended antimicrobials for common conditions are listed below. This guide is 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. Selected very sick patients can be treated as per following guidelines. • Co-trimoxazole 1DS tab for 3 days OR • Cap. Doxycycline 100 mg BD-3-5 days OR • Tab Nitazoxanide 500mg BD 3days 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)/ Amoxycillin/Clavulanic acid (1.2g q8h IV) + Macrolide (Azithromycin- 500mg IV/PO once a day), x 5-7 days). **2] ICU patients with CAP** Ceftriaxone (2g IV q24hr X 5-7 days)/ Amoxycillin/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 admission)** Antimicrobial choice as	**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** Colistin **4.5 MU/BD** **Suspected MRSA-** Vancomycin (1g IV q12h OR Teicoplanin (400mg IV q12h for 3 doses, then q24h) **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

	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.
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 nebulisers.

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 4.5 MU BD+/- Meropenem 2gm q8h. Consider Intrathecal Gentamicin/ Colistin 4.5 MU 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 4.5 MU 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** Fluroquinolones Ofloxacin 400 mg q12h OR Gentamicin 3 – 5 mg q24h 5-7 days If hospitalized 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 4.5 MUBD **If MRSA or enterococcus,** ConsiderVancomycin 1 gm q12h/ Teicoplanin 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.Amoxycillin500 mg q8h PO **In-patient** IV Ceftriaxone 1gm q12h		Meropenem1gm q8h Or Colistin 4.5MUBD
Lower Urinary tract infection(UTI) in antenatal patients after 20 weeks gestation	**OPD** Tab. Nitrofurantoin SR100 mg BD oral Inpatient: Ceftriaxone 1gm q12h	IV PIP-TZ 4.5 gm q6h	Meropenem 1gm q8h

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	IVCeftriaxone 2 gm q24h **If beta lactam allergy** IVClindamycin 600 – 900 mg q8h		
Necrotizing infection of skin/fascia and muscle	IV Ceftriaxone 2gm q12h + IV Clindamycin 600-900mg q8h / IV Metronidazole 500mg q6h **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 Arthitis	Ceftriaxone IV q12h OR Co-amoxiclav 1.2 gm q8h with/without Gentamicin 3 –5 mg 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.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 albicansCandida-** 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 bilioentericanastomosis 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

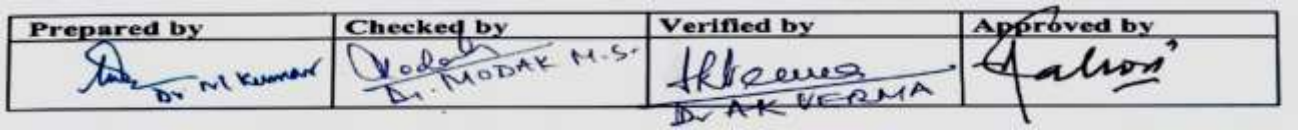

Table 8: Infective Endocarditis

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 + Gentamycin 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) 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	Drug resistant Falciparum Malaria 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	

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 qidplusVancomycin (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 Genta 1-2 mgor Polymixin B 2mg or Colistin 10mg[1mg = 12,500 units]
Urinary Tract Infection			

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Cystitis	Co-trimoxazole 8-10 mg/kg/d of trimethoprimbd 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/dod ORCefotaxime150mg/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)/ plusVancomycin 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 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)/ plusVancomycin 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	Gentamycin (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	Gentamycin (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	1st line: Cefotaxime plus Gentamycin	Meropenem	Meropenem	Ceftriaxone /cefotaxime	Gram Positive: 14-days

	bacilli, listeria, streptococcus, H influenza, Neisseria meningitides. For late onset: Klebsiella, Acinetobacter, E.coli, Enterococcus, Staphylococcus (CONS) Others :Serratia, Burkholderia, Pseudomonas, Proteus	2nd line: Meropenem				Gram negative: 21 days# #Ventriculitis/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		1st line Piperacillin-Tazobactam	1st line Piperacillin-Tazobactam	Ceftriaxone plus Vancomycin	4 weeks

	Negative Bacilli		2nd line Meropenem 3rd line Colistin	2nd line Meropenem 3rd line Colistin		
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	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
Consider either clindamycin or Vancomycin, if penicillin allergy
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	Amox -clav	3 days
Genitourinary: Clitoroplasty Hypospadias, vaginoplasty (plain) Vaginoplasty (use of bowel)	Amox-clav 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-Haemodynamically 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-Haemodynamically 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, haemodynamically 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, haemodynamically unstable but still febrile

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

Blood culture growing Gram negative bacilli

- **Patient afebrile- continue the empirical antibiotic till antibiotic 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 rigours 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. **Heamodynamic instability.**
2. **Colonisation with carbapenem resistant gram-negative bacteria.**
3. **Previous infection with carbapenem resistant gram-negative bacteria.**
4. **GNB in blood, sensitivity pending, persistent fever with haemodynamic instability.**

Empirical Antifungal Therapy

- **No response to broad spectrum antibiotics (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 antibiotics 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 antibiotics, 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 antibiotic 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**

- **Antibiotic treatment should be given for atleast seven days with an apparently effective antibiotic, with atleast four days without fever.**
- **Once Neutrophil count has recovered, with no culture positivity and heamodynamically stable; antibiotics can be stopped and patient observed, even if remains febrile. Evaluate for fungal infection, ifatrisk.**

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

Appendix 1

Commonly used antimicrobials

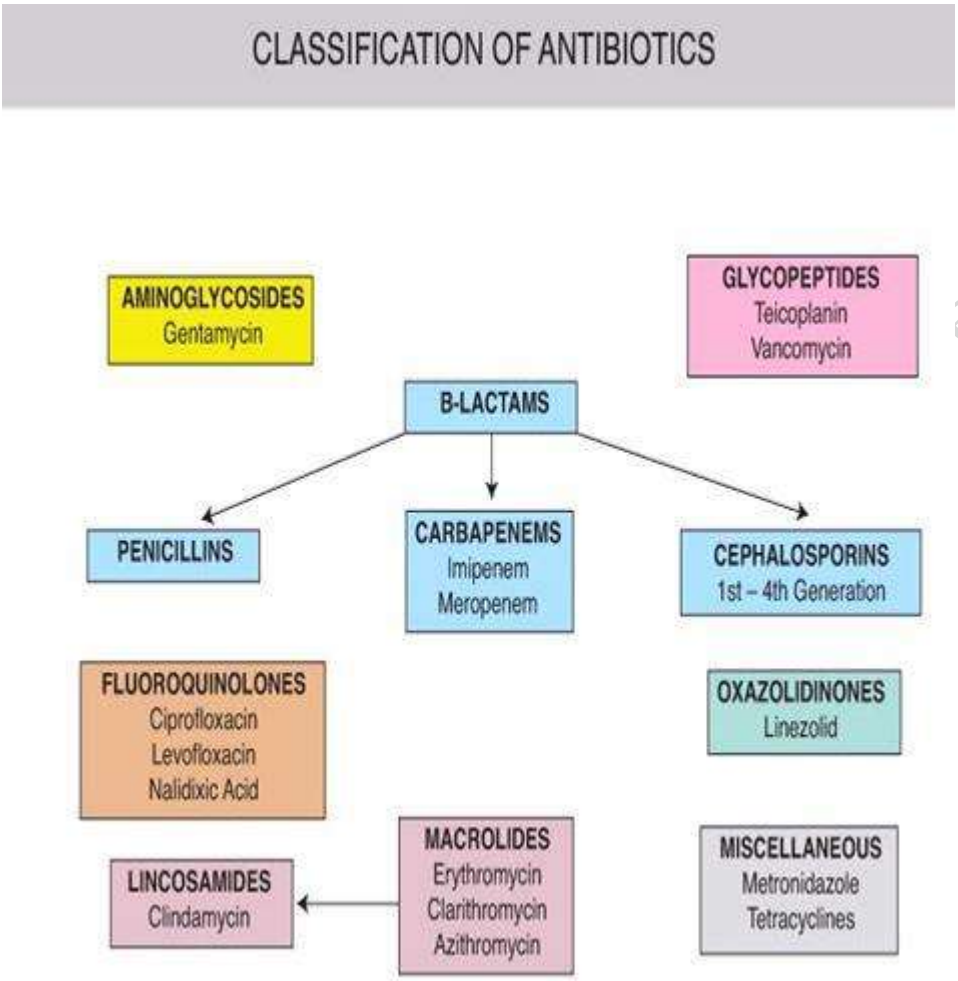


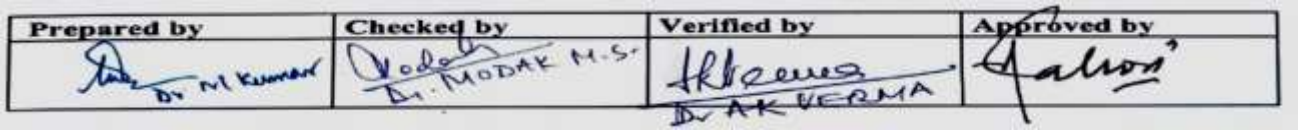
Table 20 : Spectrum of commonly used antimicrobials:

Antimicrobial Class	Name	Organisms	Indication & Dose	Side effects
Penicillins				Allergy
β-lactamase susceptible	Penicillin G Penicillin V Ampicillin. Amoxycillin (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. Amoxycillin-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	Deafness Vertigo Muscle weakness
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	 Colistin 4.5MUBD (loading dose of 9MU is mandatory	Muscle weakness Renal toxicity
Lincosamide Clindamycin		Gram +ve and anerobes	600mg q8h	C. difficile colitis

Prepared by	Checked by	Verified by	Approved by
Dr. M Kumar	Dr. MODAK M.S.	Dr. AK VERMA	

Antimicrobial Class	Name	Organisms	Indication& Dose	Side effects
Glycopeptides Vancomycin Teicoplanin		MRSA	1gm q12h 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
Intra-abdominal infection	4	10	Equivalent
Neutropenic fever	Until afebrile and stable	Until non neutropenic	Equivalent
Osteomyelitis, Chronic	42	84	Equivalent
Pneumonia community acquired	<=8	10-15	Equivalent
Pyelonephritis	5-7	10-14	Equivalent
Skin Infections (Cellulitis, Major abscesses, wound infections)	5-6	10-14	Equivalent
Sinusitis, acute bacterial	5	10	Equivalent

Reference : Harrison's principle of Internal Medicine 20th ed

Appendix 3
Antimicrobial Agent Form

BHARATI VIDYAPEETH UNIVERSITY MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE

ANTIMICROBIAL AGENT FORM

BHRC/HIC/F23(V-2)

List of high end antibiotics:
1. Carbapenems 2. Piptaz 3. Levofloxacin ,4. Colistin, 5. Polymyxin B , 6. Fosfomycin/daptomycin 7.Teicoplanins 8.Vancomycin, 9.Tigecycline/ Minocycline 10. Teicoplanins 11. Linezolids 12 .Echinocandins 13. Voriconazole/ Posaconazole 14.Amphotericin B

Ward : ICU I/II/III (Surg/ Ortho) Med 3/6/10/11 Other Wards:_____

Bed No : _____ Clinician/Unit Head :_____

Date of Admission: Date of filling:

Paste Patient Barcode here

Confirmed Diagnosis: _____ Patient type : 1 2 3

Suspected cause/ site of infection: _____ Wt of patient____kg.

Date of Surgery:

Time of incision Time of 1st dose Time of 2nd dose Duration of surgery HRS

AMA Details: 1. High End Antibiotics 2. Other Antibiotics

AMA(Generic name)	E/D/SP*	Route , Freq and Dose (mg/g)	Start Date	Day 1 (TEMP, TLC ,PCT, SERUM CREATININE)	Day3	Day7	IV to Oral	Stop Date	CHANGE OF AMA (remarks)

*=E- Empirical; D- Definitive; SP- Surgical Prophylaxis

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

Date of insertion _____ Date of removal_____

Culture/ Sensitivity Investigations done: **YES / NO**; If **YES**; Date of Report:

Specimen taken **(B/P/U/Resp/CSF)*** and Date(DD/MM/YY) (1BEFORE,2AFTER)	Microorganism isolated Date received(DD/MM/YYYY)	Sensitivity Pattern (Name of imp antibiotics)	Change of AMA **Y/N**	Response after change **Y/N**

*=B- Blood ; P- Pus ; U- Urine; Resp – Sputum,ETT,BAI ; CSF- Cerebro spinal fluid

Collected Data by : _____

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

Prepared by	Checked by	Verified by	Approved by
Dr M Kumar	Dr. MODAK M.S.	Dr AK VERMA	

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.

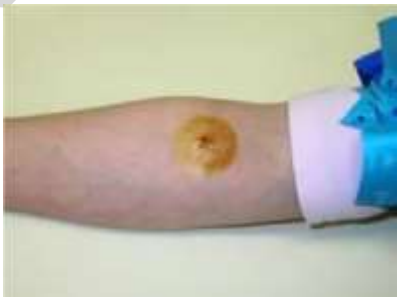


(b) Prepare Blood culture vials by proper labeling

(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.

(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.

(b) 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.

References:

1. National treatment guidelines for antimicrobial use in infectious disease, version 1 (2016)
2. ICMR Treatment guidelines for antimicrobial use in common syndromes, 2019 2nd edition
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4. Antimicrobial stewardship: Systems and processes for effective antimicrobial medicine use. NICE guideline 2015 (updated Jan 2018)
5. IDSA : New Antibiotic Stewardship Guidelines Focus on Practical Advice for Implementation 2016
6. Harrison Principles of Medicine 20th ed
7. ASGE guidelines for antimicrobial prophylaxis in GI Endoscopic procedures