LHMC & Associated Hospitals Antibiotic Policy

2025

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Message

Antibiotics are lifesaving medications that play a vital role in management of infectious diseases and minimize morbidity and mortality. Inappropriate use of antibiotics has resulted in the emergence of antibiotic resistance, which has now become a significant threat to public health, globally. Microbes have become resistant to many of the available and time-tested antimicrobials. This becomes more worrisome as not many new molecules are being developed.

Antimicrobial Stewardship Programs (AMSP) have helped tremendously to educate the healthcare professionals about the appropriate use of antibiotics. Guidance on when not to use, misuse or overuse antimicrobials will help in changing the practices by the clinicians and inculcate good habits in the residents and medical students.

It is imperative that each Institution develops its own Antibiotic Policy for benefit of the clinicians as well as the patients as the final beneficiary. It is a pleasure to note that AMSP Committee of Lady Hardinge Medical College has revised the Institutional Antibiotic Policy with active inputs by all the clinical departments and Department of Microbiology for preparing the Antibiogram.

Although guidelines are prepared but the most important part is its applications I commend the Team efforts and the onus now lies with the clinicians to put the same to practice as well as the administration to ensure continued availability of the recommended antimicrobials.

Dr Sunita Sharma

Dr Sarita Beri
Director
Lady Hardinge Medical College
New Delhi

Message

It is with great pride that we present the Antibiotic Policy Manual of LHMC & Associated Hospitals, New Delhi, a vital document developed by the Hospital Antibiotic Stewardship Committee. This manual is more than just a guide—it represents our institution's firm commitment to patient safety, clinical excellence, and the global fight against antimicrobial resistance (AMR).

The inappropriate and overuse of antibiotics has become a major public health threat, leading to the emergence of multidrug-resistant organisms. This crisis has a direct impact on treatment outcomes, length of hospital stay, healthcare costs, and most importantly, patient lives. Antibiotic Stewardship Programs (ASPs) have emerged as a proven strategy to optimize the use of antimicrobials, improve patient outcomes, and reduce resistance.

In diverse clinical setups—whether it's emergency care, intensive care, surgical wards, or outpatient services—the rational use of antibiotics must be guided by evidence-based protocols tailored to the local antibiogram and patient population. A structured antibiotic policy ensures consistency in practice, minimizes variability in prescriptions, and supports clinicians in making informed decisions.

For a government hospital like ours, the need for such a policy is even more critical. We serve a large and often vulnerable population, many of whom cannot afford the consequences of antibiotic resistance. Moreover, limited resources make infection control and optimal antimicrobial use a top priority. By adopting this policy, we not only improve the quality of care for our patients but also fulfil our responsibility as a public health institution in leading by example.

I commend the members of the Antibiotic Stewardship Committee for their relentless efforts in creating this manual. I urge every healthcare professional—physicians, nurses, pharmacists, and microbiologists—to use this policy as a daily reference. Let us work collectively to ensure that antibiotics remain effective for generations to come.

Dr Sarita Beri

Dr Anju Seth
Principal
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New Delhi

Foreword

Establishing a formal antibiotic policy within an Institute serves multiple vital purposes. It ensures optimal clinical outcomes for patients while fostering consistency in patient management and facilitating evaluation of treatment results. Additionally, it acts as a valuable educational tool for undergraduate students and resident doctors, equipping them with the ability to manage infections based on evidence-based guidelines. Training these young doctors creates a cascading effect, promoting rational infection management within the broader community. Further, the policy plays a crucial role in preventing the emergence of antimicrobial resistance—an ever-present threat capable of undermining advancements in medical care.

I extend my warm appreciation to the individual department Heads for their efforts in developing these guidelines as relevant to their speciality and to the Antimicrobial Stewardship Committee, led by Dr. Anup Mohta, for meticulously compiling these recommendations into a comprehensive hospital policy.

May these guidelines serve as a cornerstone for optimal antibiotic use within our Institute and beyond.

Anju Seth

Dr Anju Seth

Dr Anup Mohta
Chairperson
AMSP Committee
LHMC

A Word from the AMSP Committee

Addressing the threat of antimicrobial resistance is a fundamental global health priority, and the responsibility of all stake holders. Although antimicrobial drugs form an essential component of modern medicine, indiscriminate and non-judicious use of these has led to antimicrobial resistance which threatens the effective treatment of an increasing range of infections caused by various organisms. One of the reasons is inadequate training and guidance.

It is our sincere hope that this Antibiotic Policy becomes an indispensable resource for healthcare providers, enabling them to deliver the highest standard for evidence based judicious use of antimicrobials for containment of anti-microbial resistance in Institution. It is our sincere hope that this document becomes an indispensable resource for healthcare
providers, allowing them to deliver the highest standard of care. Judicious use of antimicrobials for containment of anti-microbial resistance in health care set up leading to decrease in morbidity and mortality of their patients will help to achieve our shared goal of improving the quality of life for the patients and the society as a whole.

We appreciate and acknowledge the vital inputs from the Department of Microbiology led by Dr Manoj B Jais in the form of Antibiogram which is the guiding force in developing the Antibiotic policy. As each Department has prepared the guidelines themselves and own these, it is but expected that these guidelines are followed earnestly by all healthcare professionals.

I take this opportunity to thank Dr Sameer Gulati for his efforts in compilation and bringing the document in present form.

Dr Anup Mohta

Introduction

INTRODUCTION AND PRINCIPLES OF ANTIMICROBIAL THERAPY

AIMS OF ANTIMICROBIAL THERAPY

1. To provide a simple, best empirical/specific treatment of common infections
2. To promote the safe, effective, economic and rational use of antibiotics
3. To minimize the emergence of bacterial resistance in the community

PRINCIPLES OF TREATMENT

1. These guidelines are based on the best available evidence till date.
2. A dose and duration of treatment is suggested but can be modified by consultants based on clinical scenarios.
3. Prescribe an antibiotic only when there is likely to be a clear clinical benefit.
4. Do not prescribe an antibiotic for viral sore throat, simple coughs and colds and viral diarrhea.
5. Use simple generic antibiotics first whenever possible. Avoid broad spectrum antibiotics (e.g. Amoxycillin + Clavulanate, quinolones and cephalosporins) when standard and less expensive antibiotics remain effective, as they increase the risk of Clostridium difficile, MRSA and resistant UTIs.
6. Avoid widespread use of topical antibiotics (especially those agents also available as systemic preparations).
7. Clarithromycin is an acceptable alternative in those who are unable to tolerate erythromycin because of side effects.
8. Test dose to be given for beta-lactam antibiotics.

STEPS TO FOLLOW THE PROTOCOLS

1. Identify the type of infection — bloodstream, respiratory, intra-abdominal or urinary tract,
2. Define the location — OPD, IPD, ICU patient
3. Wait for at least 48hrs of antimicrobial therapy before labelling patient as non-responding to the therapy and to switch to the higher next line of therapy. Also consider upgrade if patient's condition deteriorates before this period.
4. Send respective cultures and or primary set of investigations before starting antibiotic therapy
5. Once culture / sensitivity report is available, initiate specific antimicrobial therapy. Antimicrobial may require to be changed/de-escalated.
6. De-escalation based on biomarkers such as procalcitonin in appropriate scenarios may be considered.

7. The need for antimicrobial therapy should be reviewed on a daily basis and de-escalation/cessation considered based on the clinical and laboratory criteria.
8. Emergent source control in cases of identified anatomical diagnosis of infections should be considered.
9. If a clinician needs to deviate from the Protocols, the reasons for deviation must be mentioned alongside the prescription.

PATIENT TYPES

Patient Type 1:

i) No contact with health care system.
ii) No prior antibiotic treatment
iii) No procedures done.
iv) Patient with few co-morbid conditions.

Patient Type 2:

i) Contact with health care system (e.g. recent hospital admission, nursing home, dialysis) without invasive procedure within last 90 days
ii) Recent antibiotic therapy-within last 90 days
iii) Minimum procedures done.
iv) Patient with multiple comorbidities.

Patient Type 3:

i) Long hospitalization and or invasive procedures-within last 90 days.
ii) Recent & multiple antibiotic therapies within last 90 days.
iii) Major invasive procedures done.
iv) Cystic fibrosis, structural lung disease, advanced AIDS, neutropenia, other severe immunodeficiency states.

A WORD ABOUT "AWaRe"

The WHO AWaRe (Access, Watch, Reserve) antibiotic book

About 90% of all antibiotics are taken by patients in the primary health care setting. It is estimated that around half of all antibiotic use is inappropriate in some way, such as: the use of an antibiotic when none is indicated; the choice of an antibiotic with unnecessarily broad spectrum (e.g. Watch instead of Access antibiotics; see the following section); and the wrong dose, duration of treatment, and delivery or formulation of the antibiotic.

The AWaRe book gives guidance on first- and second-choice antibiotics for common infections in line with the recommendations in the EML and EMLc.

WHO has classified antibiotics into four groups, Access, Watch, Reserve (AWaRe) and a fourth – Not Recommended – group.

- Access antibiotics have a narrow spectrum of activity, lower cost, a good safety profile and generally low resistance potential. They are often recommended as empiric first- or second-choice treatment options for common infections.
- Watch antibiotics are broader-spectrum antibiotics, generally with higher costs and are recommended only as first-choice options for patients with more severe clinical presentations or for infections where the causative pathogens are more likely to be resistant to Access antibiotics, such as upper urinary tract infections (UTIs).
- Reserve antibiotics are last-choice antibiotics used to treat multidrug-resistant infections.

Improving the use of antibiotics with the AWaRe book

- No antibiotic care – safely reducing antibiotic use
- Improving Access antibiotic use and reducing inappropriate use of oral and IV Watch antibiotics
- Reducing the use of Not Recommended antibiotics
- Improving AWaRe-ness!
- Improving appropriate antibiotic dosing and duration

Final aim of the AWaRe book is to promote responsible use of antibiotics and slow the spread of antibiotic resistance, the WHO Global Programme of Work includes a target that at least "60% of total antibiotic prescribing at the country level should be Access antibiotics."

Points to always consider when prescribing

Diagnose – What is the clinical diagnosis? Is there evidence of a significant bacterial infection?
Decide – Are antibiotics really needed? Do I need to take any cultures or other tests? Remember pregnancy & lactation to choose safe and appropriate antibiotics.
Drug (medicine) – Which antibiotic to prescribe? Is it an Access or Watch or Reserve antibiotic? Are there any allergies, interactions or other contraindications? Remember penetration, coverage & likelihood of resistance.
Dose – What dose, how many times a day? Are any dose adjustments needed, for example, because of renal impairment?

Delivery – What formulation to use? Is this a good quality product? If intravenous treatment is needed, when is step down to oral delivery possible? Optimise pharmacokinetics and pharmacodynamics wherever possible.
Duration – For how long? What is the stop date?
Discuss – Inform the patient of the diagnosis, likely duration of symptoms, any likely medicine toxicity and what to do if not recovering.
Document – Write down all decisions and the management plan.

From: The WHO AWaRe (Access, Watch, Reserve) antibiotic book. Geneva: World Health Organization; 2022. Licence: CC BY-NC-SA 3.0 IGO. Available at https:// www.who.int /publications/i/item/WHO-MHP-HPS-EML-2023.04

Combination antimicrobials

Combination of 2 or more antimicrobial agents is recommended in selected scenarios -

- When agents exhibit synergistic activity against a microorganism
- When critically ill patients require empiric therapy before microbiological etiology ± Antibiotic Sensitivity Tests can be determined.
- To extend antimicrobial spectrum beyond that achieved by use of a single agent for treatment of polymicrobial infections.

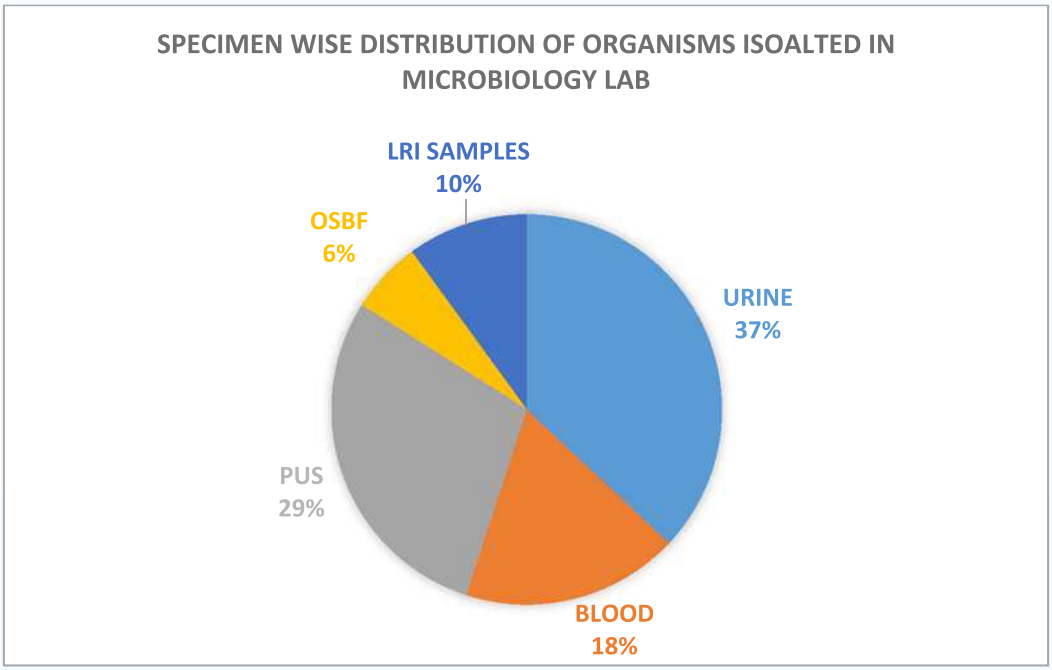
Therapeutic drug monitoring (TDM)

- TDM is utilized to ensure safe and effective prescribing for drugs with narrow therapeutic index.
- Examples - Aminoglycosides, vancomycin, linezolid, daptomycin, antifungals (itraconazole, voriconazole).

ANTIMICROBIAL DATA JANUARY 2024- DECEMBER 2024

1. Specimen Type wise distribution of Organism isolated in Microbiology Laboratory

Specimen type	Total Number of Isolates	
URINE	37%	1971
BLOOD	18%	928
PUS	29%	1563
OSBF	6%	341
LRI SAMPLES	10%	529



The most common sample from which the pathogenic organism was isolated in Microbiology lab was Urine culture(37%), followed by Pus (29%) and Blood culture (18%). Out of total pathogens isolated in microbiology lab, only 10% were isolated from Lower Respiratory Tract and 6 % were isolated from other sterile body fluids.

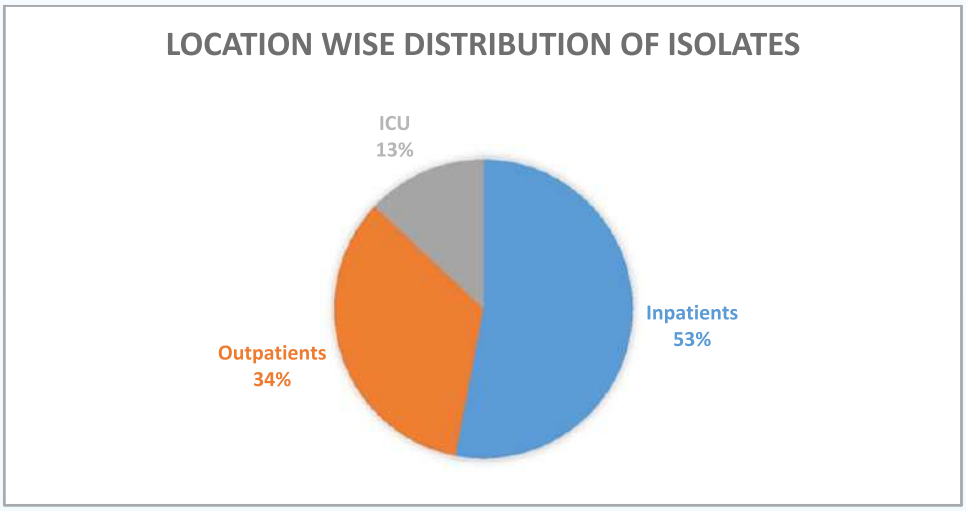
2. Distribution of isolates by organism type

Priority Pathogens	Percentage of isolates (%))	Number of isolates (N)
Acinetobacter spp.	14%	700
Klebsiella spp.	16%	812
Escherichia coli	37%	1867
Pseudomonas spp.	9%	435
Salmonella Typhi & Paratyphi	5%	231
Staphylococcus aureus	13%	676
Enterococcus spp.	6%	294

So Escherichia coli was the most common bacteria to be isolated (37%), followed by Klebsiella spp(16%).followed by Acinetobacter spp(14%) and Staphylococcus aureus (13%)

3. Location wise distribution of isolates

Location	Total Number of isolates (%)	Total Number of isolates (N)
Inpatients	53%	2582
Outpatients	34%	1678
ICU	13%	646



So out of total pathogens isolated in Microbiology Laboratory, 53 % were isolated from IPD, 34% FROM OPDs and 13% from ICU

4. Specimen wise isolation of Priority Pathogens

Priority Pathogens	BLOOD (N)	PUS (N)	URINE (N)	OSBF (N)	LRT SAMPLE (N)
Acinetobacter spp.	18% (150)	10% (148)	5% (84)	26% (82)	48% (236)
Klebsiella spp	17% (149)	13% (185)	16% (300)	17% (54)	25% (124)
Escherichia coli	13% (110)	25% (362)	66% (1246)	25% (78)	14% (71)
Pseudomonas spp.	10% (89)	14% (200)	3% (55)	13% (42)	10% (49)
Salmonella Typhi Paratyphi	27% (228)	0% (0)	0% (3)	0% (0)	0% (0)
Staphylococcus aureus	10% (82)	36% (530)	1% (26)	8% (26)	2% (12)
Enterococcus spp.	5% (46)	2% (37)	9% (170)	11% (36)	1% (5)

From the above chart it can be seen that Salmonella spp was the most common organism isolated from Blood culture sample(27%), followed by Acinetobacter spp.(18%) and Klebsiella spp.in (17%).

The most common organism isolated from pus was Staphylococcus aureus(36%), followed by Escherichia coli (25%) and Pseudomonas spp(14%).

The most common organism isolated from Urine was Escherichia coli (66%), followed by Klebsiella spp. in 16% cases

From sterile body fluids, the most common organism isolated was Acinetobacter spp(26%), and Escherichia coli (25%) followed by Klebsiella spp. (17%)

Similarly from Lower Respiratory Tract Samples , Acinetobacter spp was the most common organism to be isolated in48% cases, followed by Klebsiella spp in 25% cases and Escherichia coli in 14% cases

5. Location wise distribution of different Priority Pathogens

Priority Pathogens	IPD	OPD	ICU
Acinetobacter spp.	13%	5%	42%
Klebsiella spp.	15%	14%	26%
Escherichia coli	35%	50%	13%
Pseudomonas spp.	11%	6%	7%
Salmonella Typhi& Paratyphi	5%	5%	1%
Staphylococcus aureus	14%	15%	6%
Enterococcus spp.	7%	5%	5%

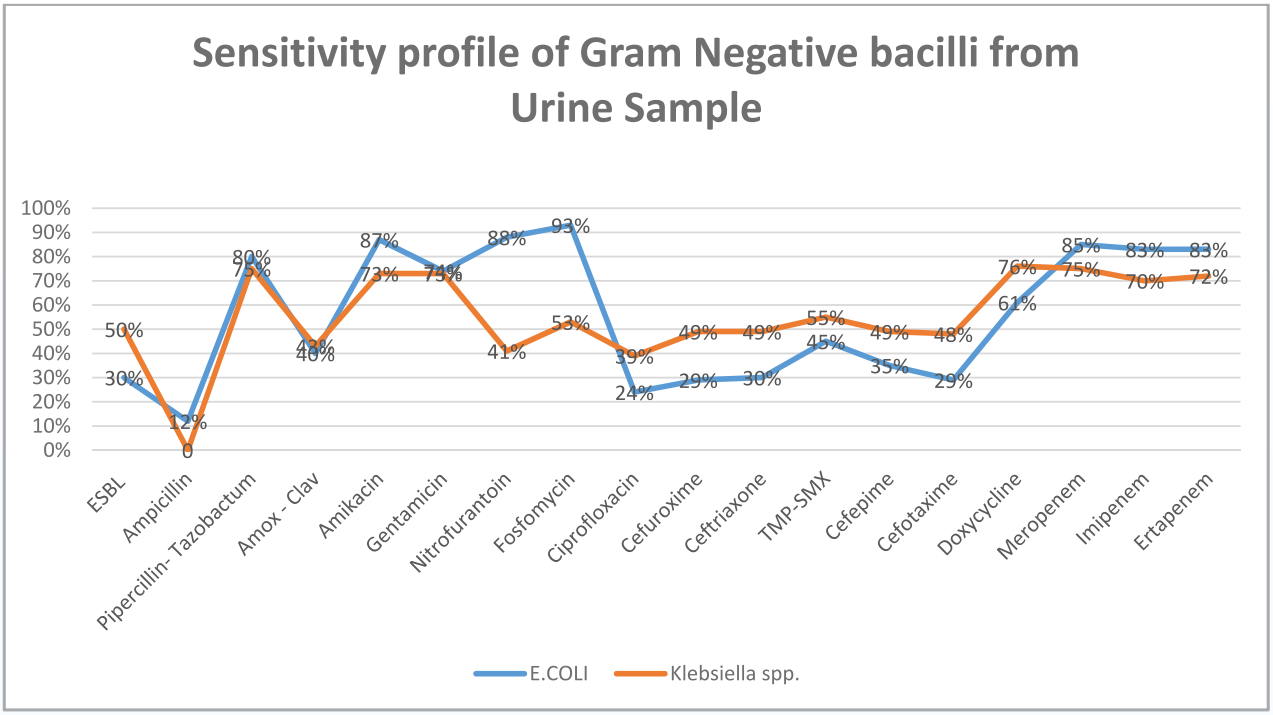
In location wise distribution of pathogens , from IPD the most common organism to be isolated was Escherichia coli(35%), followed by Klebsiella spp. (15%) and Staphylococcus aureus(14%). From OPD also most common organism to be isolated was Escherichia coli(50%), followed by Staphylococcus aureus(15%) and Klebsiella spp(14%). However from ICU, most commonly isolated organism was Acinetobacter spp(42%), followed by Klebsiella spp(26%) and Escherichia coli(13%)

6. Sensitivity profile of Gram-Negative bacilli from Urine Sample

Antibiotics	***E.COLI***	***Klebsiella spp.***
ESBL	30%	50%
Ampicillin	12%	-
Pipercillin - Tazobactum	80%	75%
Amox - Clav	40%	43%
Amikacin	87%	73%
Gentamicin	74%	73%
Nitrofurantoin	**88%**	**41%**
Fosfomycin	**93%**	**-**
Ciprofloxacin	24%	39%
Cefuroxime	29%	49%
Ceftriaxone	30%	49%
TMP-SMX	45%	55%
Cefepime	35%	49%
Cefotaxime	29%	48%
Doxycycline	61%	76%
Meropenem	**85%**	**75%**
Imipenem	**83%**	**70%**
Ertapenem	**83%**	**72%**

For E.coli isolated from urine sample Nitrofurantoin showed good sensitivity of 88% . Also, Aminoglycosides like Gentamicin had sensitivity of 74%. Reserved drugs like carbapenems also showed good sensitivity ranging from 83 to 85%. Also Piperacillin + Tazobactum showed sensitivity of 80%. Almost 30% of the Escherichia coli isolates from urine were ESBL producers

For Klebsilla spp isolated from Urine sample sensitivity to drugs was less compared to Escherichia coli. 50% of Klebsiella spp were ESBL producers. Sensitivity to piperacillin+ Tazobactum was seen in 75% of the isolates, to Nitrofurantoin 41% isolates were sensitive. For carbapenems sensitivity varies from 72 to 75%. Cefotaxime showed better sensitivity in Klebsiella spp (48%) compared to Escherichia coli. Cefepime also showed 49% sensitivity



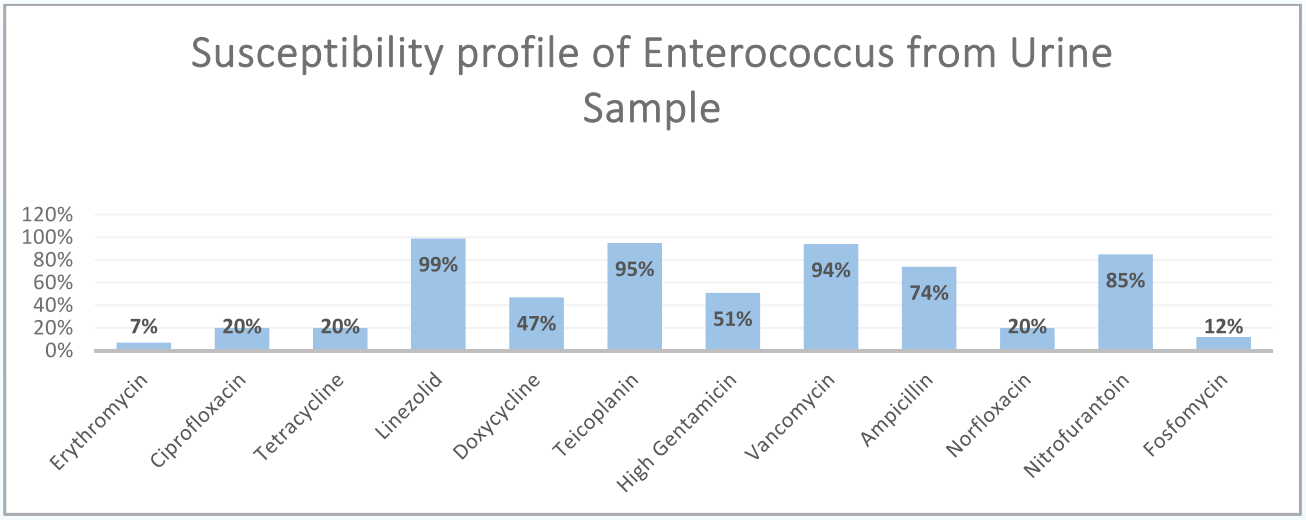
7. Susceptible Profile of Gram-Negative Bacilli from Urine in Different locations

Antibiotics	IPD %	OPD%	ICU%
ESBL	24%	45%	8%
Ampicillin	9%	17%	0%
Pipercillin-Tazobactum	64%	90%	40%
Amox- Clav	27%	48%	24%
Gentamicin	65%	81%	58%
Amikacin	73%	90%	50%
Nitrofurantoin	64%	76%	42%
Fosfomycin	78%	80%	65%
Ciprofloxacin	21%	38%	4%
Cefuroxime	22%	43%	6%
Ceftriaxone	22%	43%	12%
TMP-SMX	37%	56%	20%
Cefepime	25%	47%	12%
Cefotaxime	21%	42%	6%
Doxycycline	58%	69%	59%
Meropenem	69%	92%	38%
Imipenem	64%	88%	35%
Ertapenem	66%	90%	50%

The above table depicts the susceptibility of different drugs for Gram Negative bacilli obtained from urine according to location wise. It can be seen that ICU has most drug resistant isolates. In ICU sensitivity to carbapenems is low ranging from 35-50 %. For piperacillin tazobactum sensitivity in ICU is only 40%. Better sensitivity is seen for aminoglycosides like Gentamicin(58%). Only 42% pathogens from urine sample are sensitive to Nitrofurantoin in ICU.

8. Susceptible Profile of Enterococcus from urine

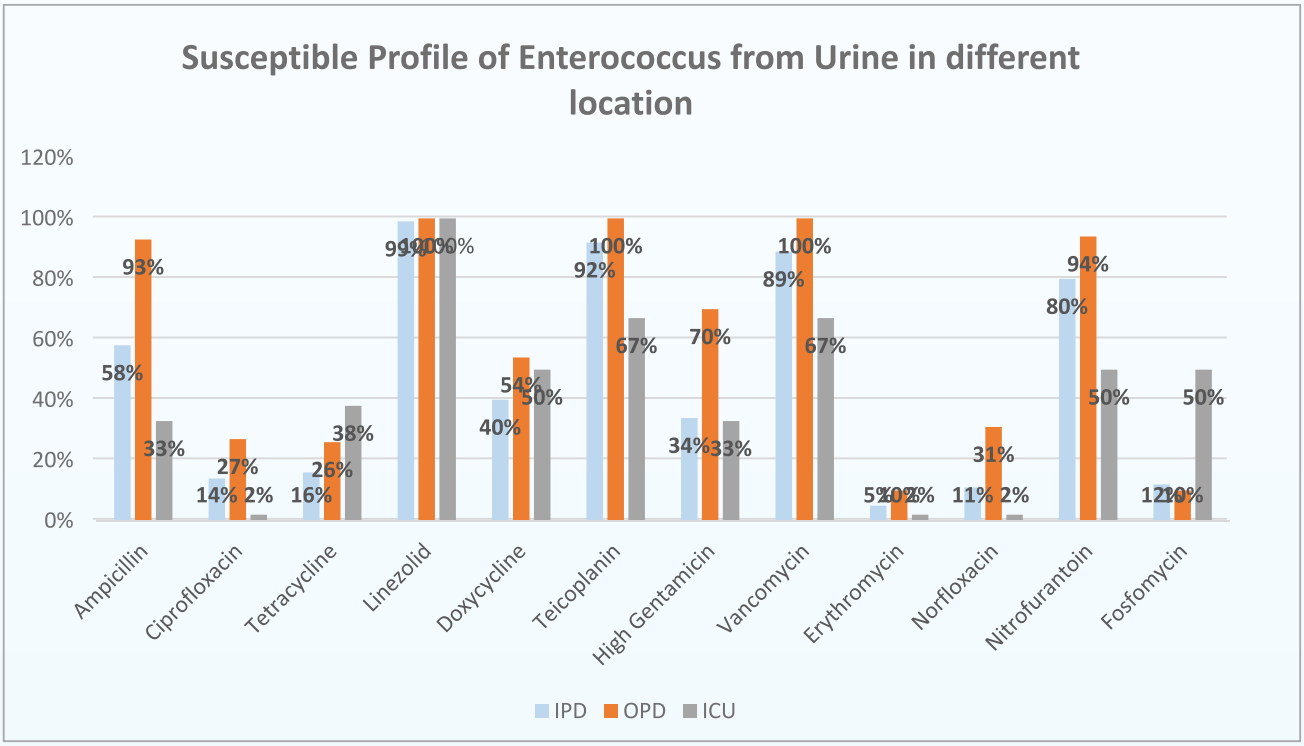
Antibiotics	***Enterococcus spp.***
Erythromycin	7%
Ciprofloxacin	20%
Tetracycline	20%
Linezolid	99%
Doxycycline	47%
Teicoplanin	95%
High Gentamicin	51%
Vancomycin	94%
Ampicillin	74%
Norfloxacin	20%
Nitrofurantoin	85%
Fosfomycin	12%



Enterococcus spp . was the only pathogen among Gram positive cocci to be isolated from Urine sample significantly. It showed good 85% susceptibility to Nitrofurantoin. Sensitivity to High Level Gentamicin was 51%., which can be used with B lactum drug for the treatment of Enterococcus infections as they have synergistic effects. Sensitivity to Vancomycin, Teicoplanin and Linezolid was very good, but these drugs should be kept as reserved drugs for treatment of serious Enterococcal infections.

9. Susceptible Profile of Enterococcus from Urine in different location

Antibiotics	IPD	OPD	ICU
Ampicillin	58%	93%	33%
Ciprofloxacin	14%	27%	2%
Tetracycline	16%	26%	38%
Linezolid	99%	100%	100%
Doxycycline	40%	54%	50%
Teicoplanin	92%	100%	67%
High Gentamicin	34%	70%	33%
Vancomycin	89%	100%	67%
Erythromycin	5%	10%	2%
Norfloxacin	11%	31%	2%
Nitrofurantoin	80%	94%	50%



Again for Enterococcus spp isolated from Urine samples, more drug resistant isolates were seen from ICU.. Sensitivity to Nitofurantoin was 50% in ICU.

10. Sensitivity profile of Gram-Negative bacilli from Blood Sample

Antibiotics	*E.coli*	*Klebsiella spp.*	*Acinetobacter spp.*	*Salmonella Typhi Paratyphi*
ESBL	8%	11%	23%	-
Ampicillin	2%	-	24%	95%
Pipercillin -Tazobactum	55%	20%	27%	-
Amox - Clav	30%	14%	-	99%
Colistin	100%	97%	100%	100%
Gentamicin	56%	29%	29%	-
Amikacin	73%	27%	25%	-
Ciprofloxacin	3%	13%	22%	-
Cefuroxime	7%	9%	-	
Ceftazidime	-	-	21%	99%
TMP-SMX	15%	16%	17%	97%
Cefepime	12%	14%	19%	99%
Cefotaxime	7%	16%	-	100%
Chloramphenicol	-	-	-	98%
Tetracycline	98%	-	42%	-
Doxycycline	54%	60%	-	-
Minocycline	-	-	48%	-
Meropenem	62%	21%	25%	100%
Imipenem	63%	19%	24%	100%
Ertapenem	57%	19%	-	100%
Azithromycin	-	-	-	100%
Cefixime	-	-	-	99%
Ceftriaxone	7%	12%	-	99%

From the above chart it can be concluded that for gram negative isolates from blood culture samples, susceptibility to even Piperacillin+ Tazobactum and Carbapenems was also low. Amionoglycosides like Gentamicin showed moderate sensitivity patterns(29 to 56%). Cephalosporins showed very less sensitivity(around 7 to 21%).

However, Salmonella Typhi and Paratyphi were sensitive to almost all drugs except Quinolones.

11. Susceptible Profile E.coli from Blood in different locations

Antibiotics	IPD	OPD	ICU
Ampicillin	3%	0%	0%
Amox - Clav	37%	0%	9%
Gentamicin	53%	67%	61%
Amikacin	70%	83%	78%
Ciprofloxacin	3%	17%	0%
TMP-SMX	16%	33%	4%
Cefepime	11%	0%	13%
Cefuroxime	6%	0%	4%
Cefotaxime	9%	0%	0%
Ceftriaxone	6%	0%	9%
Doxycycline	56%	60%	38%
Meropenem	65%	67%	48%
Ertapenem	61%	67%	43%
Imipenem	63%	67%	57%
Pipercillin-Tazobactum	58%	67%	39%
Colistin	100%	100%	100%

For samples from OPD , good sensitivity was seen for amikacin(83%), moderate sensitivity to carbapenems(67%), and Piperacillin+Tazobactum(67%); From IPD, Aminoglycosides showed sensitivity of around 53 to 70%, Piperacillin +Tazobactum around 58% and to carbapenems sensitivity was around 61 to 65% . Again more drug resistant Escherichia coli isolates were obtained from ICU samples. Similar is the case for Klebsiella spp and Acinetobacter spp.(Table 12 & 13)

12. Susceptible Profile Klebsiella spp. from Blood to different locations

Antibiotics	IPD	OPD	ICU
Amox - Clav	26%	25%	0%
Gentamicin	43%	25%	12%
Amikacin	35%	25%	16%
Ciprofloxacin	18%	25%	6%
TMP-SMX	23%	25%	7%
Cefuroxime	16%	25%	0%
Ceftriaxone	16%	25%	4%
Cefepime	20%	25%	4%
Cefotaxime	22%	20%	7%
Doxycycline	62%	54%	60%

Antibiotics	IPD	OPD	ICU
Meropenem	34%	25%	4%
Ertapenem	31%	25%	4%
Imipenem	31%	25%	3%
Pipercillin-Tazobactum	32%	25%	6%
Colistin	97%	100%	97%

The Klebsiella spp were resistant to almost all drugs .

13. Susceptible Profile Acinetobacter spp. from Blood in different locations

Antibiotics	IPD	ICU
Ampicillin	32%	0%
Ampicillin / Sulbactam	52%	13%
Gentamicin	47%	6%
Amikacin	38%	6%
Ciprofloxacin	33%	6%
Ceftazidime	28%	9%
TMP-SMX	26%	6%
Cefepime	30%	8%
Tetracycline	60%	0%
Minocycline	62%	30%
Meropenem	40%	6%
Imipenem	37%	6%
Pipercillin- Tazobactum	42%	7%
Colistin	100%	100%

14. Susceptible Profile of Staphylococcus aureus from Blood Culture

Antibiotics	*Staphylococcus aureus*
Cefoxitin	28%
Penicillin G	4%
Gentamicin	84%
TMP/SMX	46%
Clindamycin	61%
Erythromycin	28%
Ciprofloxacin	12%

Antibiotics	*Staphylococcus aureus*
Teicoplanin	97%
Tetracycline	87%
Vancomycin	100%
Doxycycline	98%
Linezolid	100%

For Staphylococcus aureus isolated from Blood culture samples good sensitivity was seen to Gentamicin(84%), and 100% sensitivity Vancomycin and Linezolid. Sensitivity to Cefoxitin is seen only in 28% cases, which means 72% isolated Staphylococcus aureus were MRSA.

15. Susceptible Profile of Staphylococcus aureus from Blood in different location

Antibiotics	IPD	OPD	ICU
Cefoxitin	33%	17%	18%
Penicillin G	2%	17%	5%
Gentamicin	80%	100%	91%
TMP/SMX	46%	67%	41%
Clindamycin	61%	67%	59%
Erythromycin	26%	33%	32%
Ciprofloxacin	11%	33%	9%
Teicoplanin	96%	100%	100%
Tetracycline	100%	100%	95%
Vancomycin	100%	100%	100%
Doxycycline	97%	100%	100%
Linezolid	100%	100%	100%

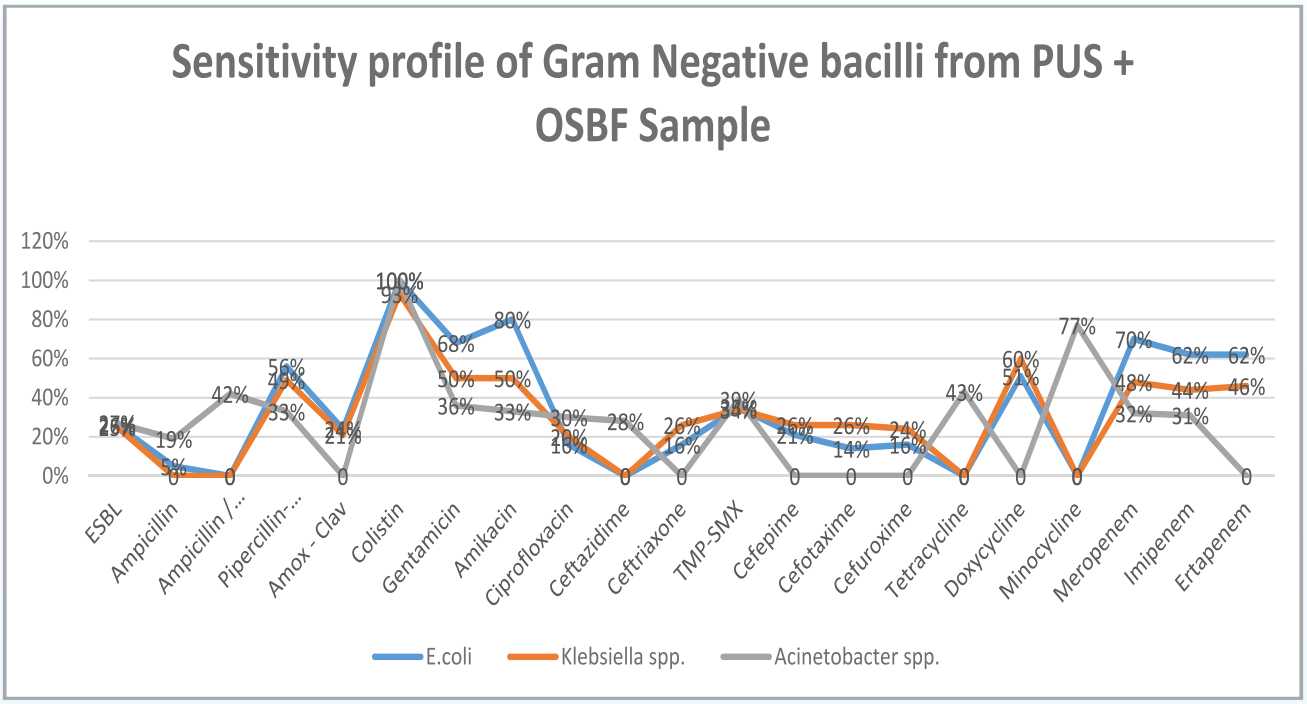
Again, more drug Resistant Staphylococcus aureus isolates were seen in ICU. Almost 82 % isolates were MRSA in ICU.

16. Sensitivity profile of Gram-Negative bacilli from PUS + OSBF Sample

Antibiotics	E.coli	*Klebsiella spp.*	*Acinetobacter spp.*
Ampicillin	5%	-	19%
Ampicillin / Sulbactam	-	-	42%
Pipercillin-Tazobactum	56%	49%	33%
Amox - Clav	24%	21%	-

Antibiotics	E.coli	*Klebsiella spp.*	*Acinetobacter spp.*
Colistin	100%	93%	100%
Gentamicin	68%	50%	36%
Amikacin	80%	50%	33%
Ciprofloxacin	16%	20%	30%
Ceftazidime	-	-	28%
Ceftriaxone	16%	26%	-
TMP-SMX	35%	34%	39%
Cefepime	21%	26%	-
Cefotaxime	14%	26%	-
Cefuroxime	16%	24%	-
Tetracycline	-	-	43%
Doxycycline	51%	60%	-
Minocycline	-	-	77%
Meropenem	70%	48%	32%
Imipenem	62%	44%	31%
Ertapenem	62%	46%	-

For Gram negative pathogens isolated from Pus + Other Sterile Body Fluids, only promising Drugs were Aminoglycosides, Carbapenems and Colistin



17. Susceptible Profile of E. coli from PUS + OSBF in different locations

Antibiotics	IPD	OPD	ICU
Ampicillin	4%	16%	0%
Amox - Clav	23%	29%	27%
Gentamicin	68%	70%	70%
Amikacin	80%	79%	83%
Ciprofloxacin	15%	20%	13%
Cefuroxime	13%	16%	10%
TMP-SMX	33%	47%	43%
Cefepime	19%	30%	10%
Cefotaxime	13%	21%	7%
Ceftriaxone	13%	27%	7%
Doxycycline	49%	66%	43%
Meropenem	70%	77%	63%
Ertapenem	61%	70%	57%
Imipenem	61%	73%	60%
Pipercillin-Tazobactum	55%	66%	47%
Colistin	100%	100%	100%

70% isolates from ICU were sensitive to Gentamicin and only 47% were sensitive to Piperacillin+ Tazobactum in ICU. For meropenem sensitivity was 63% in ICU. Better sensitivity was seen in OPD isolates. In IPD sensitivity to aminoglycosides was around 68-80% and for carbapenems it was around 61-70%

18. Susceptible Profile of Klebsiella spp. from PUS + OSBF to different locations

Antibiotics	IPD	OPD	ICU
Amox - Clav	19%	37%	6%
Gentamicin	52%	63%	23%
Amikacin	50%	66%	19%
Ciprofloxacin	18%	34%	10%
Cefuroxime	20%	39%	6%
TMP-SMX	34%	50%	13%
Cefepime	22%	53%	6%
Cefotaxime	21%	55%	7%
Ceftriaxone	23%	53%	6%
Doxycycline	59%	66%	57%
Meropenem	49%	66%	10%
Ertapenem	46%	66%	10%
Imipenem	44%	63%	13%
Pipercillin -Tazobactum	51%	66%	13%
Colistin	95%	100%	83%

Klebsiella spp isolated from ICU were almost pan drug resistant. IN OPD isolates 63% sensitivity was seen for gentamicin and around 63-66% sensitivity to carbapenems, and for piperacillin +tazobactam around 66%.

19. Susceptible Profile of Acinetobacter spp. from PUS + OSBF to different locations

Antibiotics	IPD	OPD	ICU
Ampicillin	21%	27%	0%
Ampicillin / Sulbactum	44%	59%	14%
Gentamicin	37%	64%	7%
Amikacin	34%	64%	7%
Ciprofloxacin	32%	41%	3%
Ceftazidime	30%	45%	3%
TMP-SMX	37%	64%	33%
Tetracycline	45%	67%	19%
Minocycline	74%	86%	90%
Meropenem	33%	59%	7%
Imipenem	31%	59%	7%
Pipercillin-Tazobactum	35%	45%	7%
Colistin	100%	100%	100%

20. Susceptible Profile of Gram-Positive Staphylococcus aureus from PUS +OSBF

Antibiotics	Staphylococcus aureus
Cefoxitin	37%
Penicillin G	3%
Gentamicin	84%
TMP/SMX	87%
Clindamycin	73%
Erythromycin	36%
Ciprofloxacin	5%
Teicoplanin	100%
Tetracycline	87%
Vancomycin	100%
Doxycycline	98%
Linezolid	100%

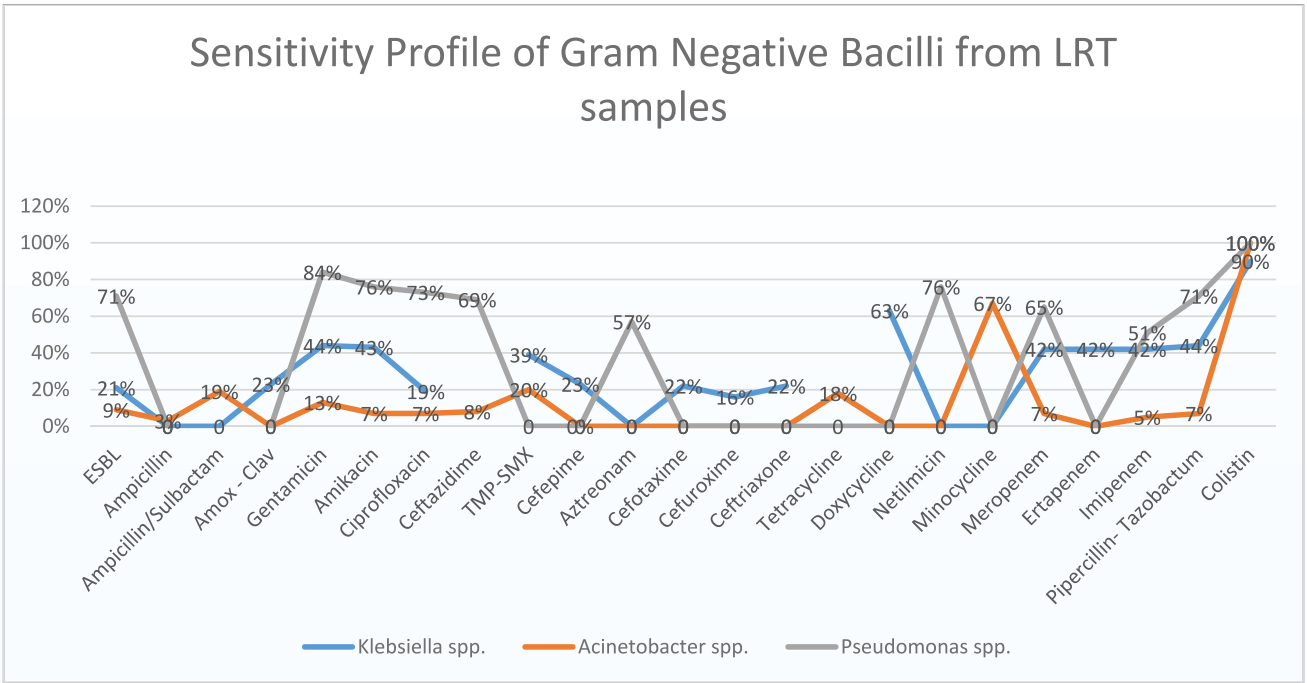
For Staphylococcus aureus isolated from Pus and Other Sterile body fluids, good sensitivity was seen to Gentamicin (84%), clindamycin (73%), And tetracycline's, Vancomycin and Linezolid. Almost 63% isolates were MRSA.

21. Susceptible Profile of Gram-Positive Cocci from PUS + OSBF in different location Staphylococcus aureus

Antibiotics	IPD	OPD	ICU
Cefoxitin	38%	34%	73%
Penicillin G	3%	2%	0%
Gentamicin	86%	81%	64%
TMP/SMX	85%	93%	64%
Clindamycin	71%	75%	82%
Erythromycin	35%	34%	64%
Ciprofloxacin	6%	5%	0%
Teicoplanin	100%	100%	100%
Tetracycline	85%	89%	91%
Vancomycin	100%	100%	100%
Doxycycline	98%	99%	100%
Linezolid	100%	100%	100%

22. Sensitivity profile of Gram-Negative bacilli from LRT Sample

Antibiotics	Klebsiella spp.	Acinetobacter spp.	Pseudomonas spp.
Ampicillin	-	3%	-
Ampicillin/Sulbactam	-	19%	
Amox - Clav	23%	-	-
Gentamicin	44%	13%	84%
Amikacin	43%	7%	76%
Ciprofloxacin	19%	7%	73%
Ceftazidime		8%	69%
TMP - SMX	39%	20%	-
Cefepime	23%	0%	-
Aztreonam	-	-	57%
Cefotaxime	22%	-	-
Cefuroxime	16%	-	-
Ceftriaxone	22%	-	-
Tetracycline		18%	-
Doxycycline	63%	-	-
Netilmicin	-	-	76%
Minocycline	-	67%	-
Meropenem	42%	7%	65%
Ertapenem	42%	-	-
Imipenem	42%	5%	51%
Pipercillin -Tazobactum	44%	7%	71%
Colistin	90%	100%	100%



The least susceptibility was seen in Acinetobacter spp, which was the most commonly isolated pathogen from Lower Respiratory Tract samples

23. Susceptible Profile of Klebsiella spp. from LRI in different locations

Antibiotics	IPD	OPD	ICU
Amox - Clav	31%	47%	12%
Gentamicin	53%	87%	25%
Amikacin	55%	87%	22%
Ciprofloxacin	24%	53%	7%
Cefuroxime	27%	67%	7%
TMP-SMX	49%	77%	23%
Cefepime	29%	67%	8%
Cefotaxime	27%	67%	7%
Ceftriaxone	27%	67%	7%
Doxycycline	61%	80%	60%
Meropenem	51%	87%	23%
Ertapenem	53%	87%	22%
Imipenem	51%	87%	23%
Pipercillin -Tazobactum	53%	86%	25%
Colistin	100%	100%	84%

All isolates from ICU were resistant to almost all drugs for Klebsiella spp. Similar Picture was seen for Acinetobacter spp (Table 24)

24. Susceptible Profile of Acinetobacter spp. from LRI in different locations

Antibiotics	IPD	OPD	ICU
Ampicillin	3%	25%	2%
Ampicillin/ Sulbactam	16%	50%	20%
Gentamicin	16%	50%	11%
Amikacin	9%	25%	6%
Ciprofloxacin	16%	25%	4%
Ceftazidime	14%	25%	5%
TMP-SMX	34%	25%	15%
Tetracycline	21%	75%	15%
Minocycline	66%	75%	68%
Meropenem	12%	25%	5%
Imipenem	7%	25%	3%
Pipercillin-Tazobactum	14%	25%	5%
Colistin	100%	100%	100%

25. Susceptible Profile of Pseudomonas spp. from LRI to different locations

Antibiotics	IPD	OPD	ICU
Gentamicin	86%	100%	78%
Amikacin	75%	100%	72%
Ciprofloxacin	75%	100%	67%
Ceftazidime	71%	67%	67%
Aztreonam	57%	67%	56%
Netilmicin	79%	100%	67%
Meropenem	68%	100%	56%
Imipenem	46%	100%	50%
Pipercillin-Tazobactum	68%	100%	72%
Colistin	100%	100%	100%

DENTAL & ORAL MAXILLOFACIAL SURGERY

S No.	Department of Dental & Oral Maxillofacial Surgery	I Line antibiotic	II Line antibiotic	Reserve Antibiotic	Justification (Prevalent Microbial Agent)
1	Periapical Abscess	Amoxicillin Cephalexin Co-Trimoxazole Metronidazole	Amoxicillin-Cv Gentamycin Cifixime	Ornidazole Ofloxacin Clindamycin	Gram + Aerobes Gram- Anaerobes
2	Periodontal Abscess	Amoxicillin Metronidazole Co-Trimoxazole	Amoxicillin-Cv Ciprofloxacin Tinidazole	Ornidazole Ofloxacin Clindamycin	Gram+ Aerobes Gram-Anaerobes Mixed
3	Chronic Periodontitis	Doxycycline	Ciprofloxacin Metronidazole Amoxicillin-Cv	Ornidazole Ofloxacin	Gram+ Aerobes Gram-Anaerobes Mixed
4	Acute Necrotizing Ulcerative Gingivitis (ANUG)	Metronidazole Amoxicillin	Ciprofloxacin Tinidazole	Clindamycin	Gram+ Aerobes Gram-Anaerobes Fusobacterium Spirochetes
5	Space Infections of Headand Neck	Amoxicillin Metronidazole Cephalexin Co-Trimoxazole Gentamycin	Amoxicillin-Cv Amikacin Cefotaxime Cifixime Ornidazole	Clindamycin Cefuroxime/ Sulbactum	Gram+ Aerobes Gram-Anaerobes Mixed Streptococcus
Life threating space infections like Ludwig's angina -start with II line antibiotics directly					
6	Maxillofacial injury (soft tissue)	Amoxicillin Cephalexin	Amoxicillin-Cv Cifixime	Clindamycin Cefuroxime/ Sulbactum	Gram+ Aerobes Gram- Staphylococcus
7	Maxillofacial injury (hard tissue/ open fractures)	Amoxicillin Cephalexin Co-trimoxazole	Amoxicillin-Cv Cifixime	Clindamycin Cefuroxime/ Sulbactum	Gram+ Aerobes Gram-Anaerobes Mixed
8	Maxillofacial injury (hard tissue/ open fractures)	Amoxicillin Metronidazole Cephalexin Co-trimoxazole	Amoxicillin-Cv Ciprofloxacin Tinidazole	Clindamycin Cefuroxime/ Sulbactum	Gram+ Aerobes Gram-Anaerobes
9	Pre & post-surgical prophylaxis OPD (minor procedures)	Amoxicillin Cephalexin Co-trimoxazole	Amoxicillin–cv cefotaxime Metronidazole	Cefuroxime	Gram+ Aerobes Gram-Anaerobes Mixed
10	Pre & post-surgical prophylaxis OPD (minor procedures)	Amoxicillin Cephalexin Co-trimoxazole	Amoxicillin–cv cefotaxime Metronidazole	Cefuroxime	Gram+ Aerobes Gram-Anaerobes Mixed
11	Pre & post-surgical prophylaxis OPD (major procedures)	Amoxicillin Metronidazole Gentamycin	Amoxicillin-Cv Cefuroxime Amikacin Cifixime cefotaxime	Cefuroxime/ Sulbactum Clindamycin Vancomycin Piperacillin/	Gram+ Aerobes Gram-Anaerobes Mixed
12	Salivary gland infection	Amoxicillin Cephalexin	Amoxicillin–cv Azithromycin Cifixime	Cefuroxime/ Sulbactum Clindamycin	Gram+ Aerobes Gram-Anaerobes

S No.	Department of Dental & Oral Maxillofacial Surgery	I Line antibiotic	II Line antibiotic	Reserve Antibiotic	Justification (Prevalent Microbial Agent)
13	Oro– antral fistula/involving Maxillary sinusitis	Amoxicillin Cephalexin	Amoxicillin–cv Azithromycin Cifixime	Cefuroxime/ Sulbactum Clindamycin	Gram+ Aerobes Gram -Anaerobes Mixed
14	Sub-acute bacterial endocarditis (SABE) Prophylaxis	Amoxicillin Erythromycin Azithromycin	Clindamycin Cefazolin Clarithromycin		Gram+ Aerobes Streptococcus mutans
15	Osteomyelitis jaws (bacterial)	Amoxicillin-cv Metronidazole Co-trimoxazole	Ofloxacin Ornidazole	Cefuroxime/ Sulbactum Clindamycin	Gram+ Aerobes Gram - Anaerobes Mixed
16	Osteomyelitis jaws (Tuberculous)	ATT/referral to DOTS			Mycobacterium tuberculate
17	Oral Candidates/ Thrush	Clotrimazole Nystatin	Fluconazole	Amphotericin B	Candida albicans
18	Herpes simples/ Labialis/Herpes zooster	Acyclovir			Herpes simplex virus
19	Irreversible pulpitis Root Canal treatment	Amoxicillin-cv Metronidazole Co-trimoxazole	Amoxicillin–cv Ciprofloxacin Tinidazole		Gram + Aerobes Gram- Anaerobes
20	Immuno–compromised patients	Amoxicillin-cv Metronidazole Cephalexin	Amoxicillin–cv Ciprofloxacin Tinidazole Cifixime	Cefuroxime/ Sulbactum Clindamycin	Gram+ Aerobes Gram -Anaerobes Mixed Hospital acquired

Notes:

1. Prophylactic therapy- should be started for surgeries in clean-contaminated surgical areas and in clean areas for immunocompromised patients.
2. Empirical therapy- should be started for surgeries in contaminated to dirty surgical areas.
3. Definitive therapy- should be started for surgeries in contaminated to dirty surgical areas refractory to empirical therapy after culture and sensitivity report.

DERMATOLOGY & STD

INFECTIVE DERMATOLOGICAL INDICATIONS			
	FIRST LINE	**SECOND LINE**	**ALTERNATE THERAPY**
Superficial folliculitis	2% Mupirocin ointment x 5-7 days or 2% topical Fusidic acid cream x 5-7days or Amoxicillin-Clavulanic acid (625 mg tid x 7 days)	Cephalexin 250-500mg QID x 7 days or Cefadroxil (500 mg BD X 7 days)	1% Ozenoxacin cream x 7 days
Impetigo	Amoxicillin-Clavulanic acid (625 mg tid x 7 days)	Cephalexin 250-500mg QID x 7 days Or Cefadroxil (500 mg bid X 7 days)	For MRSA Impetigo - Cotrimoxazole DS BD Or Clindamycin 300mg BD Or Doxycycline 100mg BD
Furuncle	Amoxicillin-Clavulanic acid (625 mg tid x 7 days) Or I & D	Cephalexin 250-500mg QID x 7 days Or Cefadroxil (500 mg bid X 7 days)	Ciprofloxacin 500mg BD
Cellulitis	Amoxicillin-Clavulanic acid (625mg - 1 gm tid x 7 days) Or Cephalexin 500mg BD x 7 days Or Cefazolin 500mg QID x 7 days	Inj. Ceftriaxone (Inj. 1gm bid X 7 -14 days) +Amikacin (Inj. 500 mg bid X 7-14 days) Or Inj. Linezolid (600mg bid)	Vancomycin (Inj. 500 mg tid X 7-14 days) + Amikacin (Inj. 500 mg bid X 7-14 days)
Erysipelas	Amoxicillin-Clavulanic acid (625mg - 1 gm tid x 7 days)	Cephalexin 250-500mg QID x 7 days or Cefadroxil (500 mg bid X 7 days)	

INFECTIVE DERMATOLOGICAL INDICATIONS			
	FIRST LINE	**SECOND LINE**	**ALTERNATE THERAPY**
Secondary pyoderma	Amoxicillin-Clavulanic acid (625 mg tid x 7 days)	Cephalexin 250-500mg QID x 7 days Or Cefadroxil (500 mg bid X 7 days)	
Septicemia (initially empirical, later updated as per culture sensitivity)	Imipenem – Cilastatin +/ - Amikacin +/- Vancomycin/ Teicoplanin +/- docycycline +/- colistin/ polymyxin – B	Meropenem / Cefoperazone – Sulbactam +/ - Amikacin +/ - Vancomycin / Teicoplanin	
Gram negative folliculitis	Ampicillin 250-500mg QID Or Ciprofloxacin 500mg BD Or Cotrimoxazole DS BD	Ticarcillin– clavulanic acid	
Erythrasma	Topical 2% Fusidic acid X 2 weeks	Erythromycin 500mg QID X 2 weeks	
Pitted keratolysis	Topical 2% Fusidic acid or Topical 1%Clindamycin or 2% Mupirocin or 5% Benzoyl peroxide or 1% Clotrimazole X 2 weeks	Erythromycin 500mg QID X 2 weeks	
Anaerobic sepsis	Inj. Metronidazole*	Inj. Clindamycin*	Inj. Imipenem/ meropenem* Or Piperacillin – tazobactam*
NON-INFECTIVE DERMATOLOGICAL INDICATIONS			
Acne	Doxycycline/Minocycline	Azithromycin	Clarithromycin Or Lymecyline
Psoriasis (guttate)	Amoxycillin/erythromycin	Amoxicillin-Clavulanic acid	
Folliculitis decalvans	Dapsone/doxycycline*	Amoxicillin-Clavulanic acid*	Rifampicin + Clindamycin*

INFECTIVE DERMATOLOGICAL INDICATIONS			
	FIRST LINE	**SECOND LINE**	**ALTERNATE THERAPY**
NON-INFECTIVE DERMATOLOGICAL INDICATIONS			
Pityriasis lichenoides chronica	Erythromycin/doxycycline		
Hidradenitis suppuritiva	Doxycycline/Minocycline*	Amoxicillin-Clavulanic acid*	Clarithromycin* Or Rifampicin + clindamycin*
Post biopsy / postprocedure	Mupirocin Or Fucidic acid		

*As per culture sensitivity

GENERAL MEDICINE

GENERAL PRINCIPLES IN EVALUATION OF FEBRILE SYNDROMES

1. The febrile patient should be evaluated for associated localising symptoms to identify corresponding febrile syndromes. The empirical antibiotics may be started accordingly.
2. The patient should be clinically reassessed periodically to watch for emergence of fresh clinical symptoms and signs. The laboratory investigations may be ordered accordingly.
3. Timely and judicious use of available diagnostics will help in making a microbiological diagnosis. Availability of a microbiological diagnosis helps in selecting a 'definitive' antibiotic regimen, which will have a narrow spectrum and thus will be least likely to aid development of antimicrobial resistance.
4. Periodic reassessments may guide escalation/de-escalation of empirical antibiotics.
5. Blood cultures should always be sent before initiating antibiotics.
6. Empirical antibiotics will be most helpful in conditions where their timely initiation leads to mortality/morbidity benefits (eg. sepsis, acute bacterial meningitis, community acquired pneumonia, necrotizing fasciitis)
7. The non infectious causes of fever (autoimmune disease, drugs, malignancy, factitious etc) should be considered in appropriate clinical situations.
8. The approach and aggressiveness in selection of empirical antibiotics may change as per the category of the patient (contact with hospital settings, use of antibiotics in past 3 months, any surgical procedures, immunosuppressed condition/drugs, comorbidities, vitals of the patient etc).
9. The locally prevalent antimicrobial resistance patterns are very important considerations for selection of antimicrobials.
10. The penetration of the selected antimicrobials should be evaluated in context to the febrile syndrome/organ involvement.
11. The pharmacokinetic principles may be utilised to maximise the antimicrobial potential and to decrease the corresponding chances of resistance development.

Acute undifferentiated fever

In contrast to Pyrexia of unknown origin (PUO), acute undifferentiated fever (AUF) does not have a standard definition. For practical purposes, this clinical entity may be defined as a fever of two weeks or shorter duration which lacks localizable or organ specific symptoms/signs.

The choice of empirical antimicrobials is guided by the most likely local causes of AUF. Various case series have identified malaria, influenza viruses, dengue viruses, scrub typhus, rickettsia, leptospira and enteric fever as the common causes of AUF.

Besides these common tropical infections, community acquired secondary bacteremia can also lead to AUF. Bacteremia may result due to underlying pneumonia, intra-abdominal infection or urosepsis. Many times the primary source may remain occult as the related symptoms may not manifest,

especially in the elderly. This category of patients may present in sepsis and may require empirical broad spectrum antimicrobials as per sepsis guidelines.

Acute undifferentiated fever for less than three days

Patients presenting with acute undifferentiated fever (AUF) should be evaluated for malaria with help of peripheral smear examination and a rapid diagnostic kit. If laboratory evaluation is positive for malaria then the same should be treated as per the type of malarial pathogen and severity of infection. Non Malaria AUF (NMAUF) should be further evaluated for other common tropical infections with the help of rapid diagnostic kits and managed accordingly. Patients whose RDTs are negative and have self limiting fever should just receive paracetamol along with other supportive care. Empirical antibiotics and further laboratory evaluation will probably be of no help for these self limiting RDT negative fevers of less than three days duration.

Acute undifferentiated fever for more than three days

For patients with persistent fever beyond three days a complete blood count (CBC) should be done in addition to evaluation for malaria along with RDTs. If the suspicion for Dengue fever is high then an ELISA test for the same should be done as the sensitivity and specificity for RDT for dengue fever are not good.

If AUF is persistent for more than 5 days, then additionally paired blood cultures should be sent along with an evaluation for dengue fever, chikungunya, scrub typhus and leptospirosis. Beyond 7 days, radiological evaluation consisting of chest X ray and an ultrasound of abdomen should be done in addition to already discussed laboratory evaluation. Treatment with empirical antibiotics azithromycin or doxycycline (Azithromycin 1 gram (1000 mg) on day 1, 500 mg daily for next five days; Doxycycline (100 mg twice daily) for 7 days) may be justified if suspicion for enteric fever, scrub typhus or leptospirosis is high.

If the fever is persistent, even after the empirical antibiotics as discussed above --

- May change empiric antibiotic to a beta lactam.
- Consider cultures (blood & urine), imaging (CXR, USG abdomen, CT chest/abdomen) and biochemical investigations (LFT)
- Bone marrow examination and cultures if needed
- Consider CNS infections

If no cause is found out and fever still persists, then the patient should be investigated in lines of PUO. Tuberculosis should be considered in any patient with prolonged undifferentiated fever, especially if there is weight loss.

Prevalent AMR status in common pathogens

(As per ICMR guidelines and LHMC data)

Malaria: Since, P. vivax is susceptible to chloroquine hence this remains the drug of choice. On the other hand, P. falciparum is resistant to chloroquine in at least 25% of cases nationwide, hence artemisinin-based combination therapies (ACT) is the first line treatment for P. falciparum malaria

(even when species is unclear). Significantly, Artemisinin (especially oral) monotherapy is strongly discouraged because of its potential to lead to resistance.

Typhoid fever: Quinolone resistance is noticeable in 69% of cases of Salmonella Typhi and 23% of Salmonella Paratyphi A. However, resistance rates are low for co-trimoxazole, chloramphenicol and third generation cephalosporins. Fortunately, the response to azithromycin is good in most of the clinical studies. However, it should be noted that defervescence times are longer with third generation cephalosporins and chloramphenicol may lead to bone marrow depression.

As per our hospital's antibiogram, S typhi and S paratyphi were found to be sensitive to beta lactam and beta lactamase inhibitors, azithromycin, co-trimoxazole, chloramphenicol and cephalosporins. However only 11% of them were found to be sensitive to quinolones. This trend is as per the national trends shared by ICMR.

Gram negative organisms: Enterobacteriaceae (E. coli and Klebsiella) are increasingly showing resistance to quinolones (up to 80%) and third generation cephalosporins (up to 75% because of ESBL strains). Hence, the choice for initial empirical therapy for infections attributed to these organisms (eg. pyelonephritis, severe intra abdominal infections etc) should cover ESBL producers e.g. carbapenem or with a beta-lactam/beta-lactamase inhibitor for less severely ill patients.

As per our hospital's antibiogram, more than 80% of the Enterobacteriaceae (E. coli and Klebsiella) isolates were ESBL producers. Sensitivity to quinolones (26%), third generation cephalosporins (20-30%) was in concordance with national data. However, our hospital's data shows that sensitivity to beta lactam/beta lactamase inhibitors (20-50%) and carbapenems (40-63%) is also low. Sensitivity to aminoglycosides was also comparable (46-60%). Colistin showed 97-100% sensitivity.

Gram positive organisms: Community acquired S. aureus are mostly susceptible to methicillin, hence standard anti staphylococcal drugs (eg. cloxacillin and first cephalosporins) may be used. Penicillin still remains the drug of choice for pneumococcal infection.

For Staphylococcus Aureus isolated from blood samples in our hospital, good sensitivity was seen with gentamicin (88%), vancomycin (100%) and linezolid (100%). However in contrast with national data, our hospital's antibiogram reveals that 65% of the S Aureus isolates were MRSA.

Condition	Etiology (likely pathogen)	Antibiotics	Comments
Malaria	P. Vivax	Oral chloroquine followed by primaquine	Chloroquine = 25 mg/kg divided over 3 days. I.e 10 mg/kg on D1, 10 mg/kg on D2 & 5 mg/kg on D3 Primaquine = 0.25 mg/kg daily for 14 days if G6PD is normal.
	P. Falciparum	If the patient is able to take orally, oral artesunate and pyrimethamine. If the patient is not able to take orally, then IV artesunate. Switch over to oral therapy as soon as possible. Add a second agent such as doxycycline or clindamycin.	Followed by primaquine (0.75 mg/kg) single dose.
Enteric fever	S. enterica ser. Typhi S. enterica ser. Paratyphi A	**Oral**: azithromycin/Cefixime 20mg/kg/day BD for 10- 14 days or 5-7 days after defervescence. **Parenteral** : ceftriaxone 2 g IV BD for 10 -14 days	
Leptospirosis	Leptospira interrogans	Ceftriaxone Ceftriaxone 1 gm IV x once a day for 7	

Condition	Etiology (likely pathogen)	Antibiotics	Comments
Leptospirosis	Leptospira interrogans	Ceftriaxone Ceftriaxone 1 gm IV x once a day for 7 days or doxycycline 100 mg twice a day for 7 days.	
Scrub Typhus	Orientia tsutsugamushi	Doxycycline 100 mg p.o. BID x 7 day	
Spotted fever	Rickettsia group	Doxycycline 100 mg p.o.BID x 5 -7 days	
Dengue/Chikunguny a Fever	Dengue virus/ Chikungunya Virus	No antiviral effective.	Prompt and meticulous fluid replacement as per national guidelines.

SEPSIS

THE GOLDEN HOUR: HOUR-1 SURVIVING SEPSIS CAMPAIGN BUNDLE OF CARE

1. Measure lactate level.
2. Obtain blood cultures before administering antibiotics. (Two or more sets of blood cultures are recommended before initiation of any new antimicrobial in all patients with suspected sepsis.)
3. Administer broad spectrum antibiotics
4. Begin rapid IV administration of 30 ml/kg crystalloid for hypotension or lactate level ≥ 4 mmol/L. (Hydroxyethyl starches (HESs) are not recommended for intravascular volume replacement in patients with sepsis or septic shock.)
5. Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mmHg. (Norepinephrine is the first-choice vasopressor.)

Factors determining the selection of antimicrobials for sepsis and septic shock

1. Clinical syndrome/site of infection
2. Prevalent pathogens and their resistance patterns
3. Severity of illness
4. Age and concomitant underlying disease, chronic organ failures, medications, indwelling devices
5. Immunosuppression or other form of immunocompromise
6. Recent infections, intake of antimicrobials within previous 3 months

EMPIRICAL ANTIMICROBIAL CHOICE FOR DISEASE CONDITIONS

Diagnosis	Suggested regimens		Remarks
	Preferred	**Alternative**	
Sepsis or septic shock with focus unclear Rule out common tropical infections Refer to appropriate sections for empirical antibiotic therapy for different sites of infection	Colistin +/- Gentamicin / Amikacin **+/-** Vancomycin / Linezolid *If risk factors for candida add an echinocandin (Caspofungin or micafungin or anidulafungin)	Meropenem +/- Gentamicin / Amikacin +/- Vancomycin / Linezolid	• Septic shock patient must receive empiric combination therapy with at least two antibiotics of different antimicrobial classes. • Add MRSA or CR-GNB coverage or antifungals in patients with appropriate risk factors. • Avoid piperacillin-tazobactam in septic shock till bacteremia with cephalosporin resistant organisms is excluded, as mortality increases (MERINO trial) • De-escalation of antimicrobials should be considered daily and at the earliest stage when the clinical situation permits/ once culture susceptibility reports are available • Treatment duration of 7 to 10 days is adequate for most cases. • Longer courses appropriate in slow clinical response, undrainable foci of infection, bacteremia with *S. aureus* , some fungal and viral infections, or immunologic deficiencies. • Measurement o f procalcitonin levels can be used to support shortening the duration of antimicrobial therapy.

STANDARD DOSES OF ANTIMICROBIAL AGENTS

Antibiotics	Doses, duration and route of administration
Imipenem-Cilastatin	500 mg IV q6h or 1g q8h
Amikacin	15 mg/kg IV q24h
Gentamicin	5 mg/kg IV in three divided doses
Meropenem	1gm IV q8h
Cefoperazone – Sulbactam **Vancomycin**	3g IV q12h 15 mg/kg IV q8–12h
Linezolid	600mg IV every 12h
doxycycline	100 mg iv q12h
Colistin	9mu iv stat, then 4.5 mu iv q12h
Polymyxin B	15-20 lak units iv stat, then 7.5-10 laks iv q12h
Caspofungin	70 mg IV on day 1, then 50 mg IV q24h
micafungin	100 mg iv od
anidulafungin	200 mg iv stat then 100 mg iv od

MANAGEMENT OF CNS INFECTIONS

Acute febrile encephalopathy/)/ Acute Encephalitis Syndrome (AES)

Fever + change in mental status

Infectious-

Viral encephalitis, bacterial & tubercular meningitis, cerebral malaria, sepsis

Non infectious-

Reye's syndrome, ADEM, NCSE and autoimmune

1)Resuscitation and stabilization

2)blood cultures

3)empirical therapy (ceftriaxone, vancomycin, acyclovir,

antiepileptic +/- (H/O seizures, GCS<8,raised ICT features)
Steroids-ADEM

imaging* and investigations(including LP)

Prevention/management of complications

Reevaluate the diagnosis with investigations and imaging reports

Stop artesunate-peripheral smear and RDT neg
Stop acyclovir - alternative diagnosis made
- MRI findings differ
- 2 PCR >48hrs apart neg

In clinical non responders at 48hrs
Repeat CSF
r/o subdural empyema,cerebral abscess,ventriculitis.

* Imaging done before LP in focal deficit, papilledema, immune compromised hosts and those with features of raised ICP

CAUSES OF AFE WITH POINTERS TO DIAGNOSIS AND RECOMMENDED TESTS

Cause	Pointers to diagnosis	Diagnostic test
Meningococcus	Petechial rash, adrenal hemorrhage	Blood and CSF cultures Latex/PCR in CSF for meningococcus
Herpes simplex virus 1 and 2	PLEDS on EEG, MRI showing temporal lobe involvement, CSF rbc	CSF HSV PCR for HSV-1 and II
HHV6,HHV7	Rash	Specific PCR in CSF
EBV	Rash, generalized adenopathy, tonsillitis, organomegaly	EBV VCA IgM in blood EBV PCR in CSF
Varicella zoster	Antecedent rash	Varicella IgM in blood CSF varicella PCR
HIV	Fever, adenopathy, rash	HIV ELISA in blood HIV PCR in blood
Japanese encephalitis	Epidemiology, dystonic and extrapyramidal movements MRI shows changes in thalami, basal ganglia, substantia nigra	IgM antibody in serum and CSF
Measles	Antecedent or concurrent rash History of vaccination	Measles IgM in blood and CSF
Mumps	Antecedent/ concurrent parotitis, high amylase, low sugar in CSF	Mumps IgM in blood Mumps virus in CSF by PCR
Influenza	Respiratory prodrome, ongoing outbreak	Influenza PCR in throat swab
Dengue	Ongoing outbreak, rash, low WBC and platelets, biochemical hepatitis	Dengue specific PCR in CSF Dengue IgM, NS1 antigen in blood
Chikungunya	Ongoing outbreak, Rash, severe joint pains	Chinkungunya PCR in CSF Chinkungunya PCR in blood, IgM in blood
Enterovirus	Vesicular lesions in the mouth, GI symptoms, brain stem involvement	Specific PCR in CSF
Rabies	Animal bite, hydrophobia, brain stem involvement	Specific IgM antibody in CSF Nuchal skin biopsy/ conjunctival smears for direct fluorescent antibody Brain biopsy
Chandipura	Epidemiology	PCR in CSF, saliva/ IgM

Cause	Pointers to diagnosis	Diagnostictest
		ELISAin CSF
Nipah	Epidemiology, contact with animals, fruit bats	PCR/IgM ELISA in CSF
Mycoplasma	Respiratory illness, skin rash, haemolytic anemia	Mycoplasma IgM in blood Mycoplasma PCR in swab throat
Rickettsia	Epidemiology, rash, eschar, multisystem involvement	IgM & IgG antibodies in serum Scrub typhus DNA in whole blood, buffy coat, eschar/skin rash
Leptospirosis	Icterus, myalgia, renal failure	Leptospira PCRin blood Specific IgM in blood
Enteric fever	Protracted illness, hepatosplenomegaly	Blood cultures
Cerebral malaria	Pallor, splenomegaly	Smear or rapid antigen test for malaria
Sepsisassociated encephalopathy	Infection at extra CNSsite	Blood, urine cultures, CXR, chest and abdominal CT

DIFFERENTIATION OF CAUSE OF AFE BASED ON CSF ANALYSIS

Parameter	ABM	Partially treated ABM	Viral	TBM
CSF TLC	1000 -5000 (<100 -10000)	100 -1000	10 -1000	50 -1000
CSF DLC	80 -95% PMN	L >PMN	L>PMN In acute stage PMN may predominate	L > PMN In acute stage PMN ma y predominate
CSF sugar	<40 in 50 -60%	Low	Normal (except mumps)	ratio <0.5 in 95%
CSF protein mg%	100 -500, elevated in all	100 -500	100 -500	50 -1000
CSF lactate	Elevated	Elevated	Normal	?

L: LymphocytesPMN: polymorph nuclear cells

Etiology of bacterial meningitis

Age	Likely pathogen	First line	alternative
1m -50years	S. pneumoniae, H.infl uenzae,meningococcus	Ceftriaxone and vancomycin	Cefotaxime and vancomycin
>50years, alcoholism, Other diseases with impaired CMI	S. pneumoniae,meningococcus, Listeria, gm neg bacilli	Ceftriaxone and vancomycin, listeria	Meropenem and vancomycin

HEALTH CARE ASSOCIATED MENINGITIS/ VENTRICULITIS:

Organism	Preferred drug	Alternative drug
Methicillin sensitive *Staphylococcus*	Cloxacillin	Ceftriaxone
Methicillin resistant *Staphylococcus*	Vancomycin	Linezolid/Cotrimoxazole if susceptible
Non ESBL gram negative	Ceftriaxone	Cefotaxime/ Ceftazidime
ESBL gram negative	Meropenem	Cotrimoxazole/ Moxifloxacin
Carbapenem resistant gram negative	Systemic Colistin/ Polymyxin B with (depending upon susceptibility) high dose tigecycline/minocycline/ fosfomycin/ co-trimoxazole/ quinolones/chloramphenicol With intraventricular/ intrathecal colistin/ polymyxin / aminoglycosides	

*Elevated CSF lactate (> 4 mmol/l) and procalcitonin help in differentiating between infective and chemical meningitis.

BRAIN ABSCESS

Predisposing factor	Likely etiology	Empiric therapy
Hematogenous spread from cyanotic congenital heart disease/lung infections/endocarditis	Aerobic/microaerophilic *Streptococci, S. aureus*	Cefriaxone and Metronidazole with/ without vancomycin
Contiguous spread from otitis media/mastoiditis/sinusitis/dental infection	Aerobic, microaerophilic, anaerobic streptococci, Anaerobic gram negative bacilli, *S aureus, Pseudomonas*	Ceftriaxone and metronidazole
HIV	*Mycobacterium* tuberculosis, *Nocardia, Toxoplasma, Cryptococcus, Listeria*	No empiric therapy
Immunocompromised	*Nocardia, Mycobacterium, Toxoplasma, Mucorales, Aspergillus,Listeria, Cryptococcus, Candida*	

- Blood cultures and aspiration of pus if possible is indicated (esp; drug resistant or large abscess)
- Imaging of the chest and abdomen should be done to see if an extra-CNS site can be sampled

Duration of therapy

	Duration of therapy
uncomplicated meningitis	10 -14 days
meningococcal, *H. influenzae*	7 days
pneumococcus	10 -14 days
Group B streptococcus	2-3 weeks
Listeria	3-6 weeks
Gm –ve meningitis	3 weeks
HSV	14 -21days
Brain abscess –drained - not drained	3 weeks 4-6 weeks

Doses of drugs used in CNS infections

Drug	Adult dose	Paediatric dose
Artesunate	2.4 mg/kg 0,12 and 24 hours and then q 24 hourly	< 20 kg 3 mg/kg at 0,12 and 24 hours and then q 24 hourly
Acyclovir	10 mg/kg 8 hourly	10 mg/kg 8 hourly and in children below 12 20 mg/kg 8 hourly

Drug	Adult dose	Paediatric dose
Ceftriaxone	2 gm 12 hourly	50 mg/kg 12 hourly
Ceftazidime	2 gm q 6-8 hourly	50 mg/kg 8 hourly
Cefepime	2 gm 8-12 hourly	50 mg/ kg 12 hourly
Cefotaxime	2 gm 6 hourly	50 mg/kg 6 hourly
Meropenem	2 gm 8 hourly	40 mg/kg 8 hourly
Colistin	9 million unit loading and then 4.5 million units 12 hourly	
Polymyxin B	20000- 25000 units/kg loading and then12500 to 15000 units/kg 12 hourly, single dose not to exceed 20,00,000 units	
Fosfomycine	4gm 6 hourly	75 -100mg/kg/dose 6 hourly
Cotrimoxazole	3-6 mg/kg of TMP thrice daily	
Vancomycin	15 mg/kg (max 2gm) eight hourly	15 mg/kg 6 hourly
Cloxacillin	2 gm 4 hourly	50 mg/kg 6 hourly
Doxycycline	100 mg 12 hourly	1.5 -2 mg/kg 12 hourly
Chloramphenicol	1-2 gm 6 hourly	25 mg/kg 6 hourly
Rifampicin	600 mg once daily	10 -20 mg/kg oncedaily
Metronidazole	400 mg 8 hourly	10 mg/kg 8 hourly
Amphotericin B deoxycholate	1 mg/kg/day	
Liposomal amphotericin B	3-5 mg/kg/day	
Fluconazole	800 mg loading and then 400 mg once daily	12 mg/kg loading and then 6 mg/ kg daily 25 mg/kg loading in neonates and then 12 mg/kg daily

Doses of drugs to be given by the intrathecal/ intraventricular route (CSF shunt infections)

Drug	Dose
Vancomycin	5-20 mg
Teicoplanin	5-40 mg
Amikacin	5-50 mg
Gentamicin	1-8 mg
Colistin	10-20 mg
Polymyxin B	50,000 units
Daptomycin	2-5 mg
Tobramycin	5-20 mg

Reference; ICMR Treatment guidelines for antimicrobial use in common syndromes 2019 and LHMC antimicrobial data 2022 .

ANTIBIOTIC POLICY FOR MANAGEMENT OF UTI AND INFECTIVE ENDOCARDITIS

(As per ICMR guidelines and LHMC data)

UTI

Microbiology:

As per our hospital's antibiogram, prevalence of different microbial pathogens causing UTI are as follows:

E. Coli (51%) >> Klebsiella (22%) >> Enterococcus (15%) >> Acinetobacter (5%) ~ Staph aureus (4%) ~ Pseudomonas (3%)

This order matches with the ICMR data which also found the three most common organisms as being E. Coli, Klebsiella and Enterococcus.

Diagnostic considerations:

Test	Remarks if any
Urine routine microscopy	More than 10 WBCs/ HPF is significant
Urine dipstick	Leukocyte esterase, however negative test doesn't rule it out
Urine culture and drug sensitivity	10-20 ml midstream clean catch urine is collected before the first dose of antibiotic. If transport and plating can not be done within one hour of collection, it should be refrigerated at 4°C for a maximum of 6-8 hours. ≥ 105 CFU/ml, or any growth with typical signs and symptoms, or any growth from suprapubic aspirate is significant.
Prostatic massage culture	
Blood culture and drug sensitivity	Sent before the first dose of antibiotics
Ultrasound KUB	Indicated for all complicated or recurrent UTIs
CECT KUB	Indicated for suspected intra-renal or perinephric abscess

Treatment regimes (EMPIRICAL):

Condition	First choice	Dosing
Acute cystitis *(absence of systemic features of infection)*	Nitrofurantoin OR Fosfomycin (not checked in LH)	100 mg BD PO *5 days 3 g single dose oral sachet
Acute pyelonephritis	Piperacillin-tazobactam OR Ertapenem	4.5 g IV q 6 hourly *7-14 days 1 g IV q 24 hourly *7-10 days
Acute prostatitis	Ertapenem	1 g IV q 24 hourly (minimum 3 weeks)
Acute epididymo-orchitis	Ceftriaxone + Doxycycline	500 mg IM and 100 mg BD PO *14 days

Few general principles to be followed while managing patients with UTI:

- Antibiotics should be changed based on the susceptibility results as soon as they are available
- Intravenous antibiotics should be reviewed at 48 hours and stepping down to orl therapy should be considered
- UTI in males are considered complicated
- In case of persistent pus cells in urine with negative culture results, causes for sterile pyuria should be investigated
- No antibiotic is required to treat asymptomatic bacteriuria per se.

Treatment regimes in case of failure to respond to empiric therapy and culture NA or no significant growth

Condition	Alternative choice	Dosing
Acute cystitis *(absence of systemic features of infection)*	TMP-SMX OR Amikacin OR Ertapenem	160/ 800 mg BD PO *3 days 15 mg/kg/day IM/IV *3 days 1 g IV q 24 hourly *7 days
Acute pyelonephritis	Imipenem OR Meropenem OR Amikacin	1 g IV q 8 hourly 1 g IV q 8 hourly 15 mg/kg IM/IV *7 -14 days
Acute prostatitis	Piperacillin-tazobactam OR Imipenem OR Meropenem OR TMP-SMX	Same as above (3 weeks)
Acute epididymo-orchitis	Ofloxacin OR Levofloxacin	200 mg BD PO* 14 days 500 mg OD PO* 14 days

IE

In India, IE is increasingly becoming more common in older age group (>40 years) with no previously known valve disease as compared to younger patients with underlying valvular heart disease (most important risk factors being VSD and RHD).

Microbiology:

Common organisms in the order of prevalence (high to low) from literature review revealed the following:

Streptococcus >> Enterococcus >> Non-tuberculous mycobacteria >> MSSA/ MRSA >> Pseudomonas ~ Klebsiella ~ Aspergillus ~ Candida ~ HACEK ~ Brucella

Diagnostic considerations:

Clinical suspicion, blood culture and echocardiography remain the cornerstone of diagnosis of IE. Modified Duke's Criteria which includes major and minor criteria is useful in the diagnosis of IE. Presence of 2 major criteria or 1 major and 3 minor criteria or 5 minor criteria is suggestive of definite IE while presence of 1 major and 1 minor or 3 minor criteria is suggestive of possible IE. Rejected IE is a firm alternative diagnosis explaining evidence of IE; or resolution of IE syndrome with antibiotic therapy for ≤4 days; or no pathological evidence of IE at surgery or autopsy with antibiotic therapy for ≤4 days; or does not meet criteria for possible IE as above.

Table: Modified Duke's Criteria for the Diagnosis of IE

Criteria	Features
Major criteria	1. Blood culture positive for IE Typical microorganisms consistent with IE from 2 separate blood cultures: Viridans streptococci, Streptococcus bovis, HACEK group, Staphylococcus aureus; or community-acquired enterococci in the absence of a primary focus, or microorganisms consistent with IE from persistently positive blood cultures defined as follows: at least 2 positive cultures of blood samples drawn >12 h apart or all 3 or a majority of ≥4 separate cultures of blood (with first and last sample drawn at least 1 h apart) Single positive blood culture for Coxiella burnetii or anti–phase 1 IgG antibody titer ≥1:800 2. Evidence of endocardial involvement Echocardiogram positive for IE (TEE recommended for patients with prosthetic valves, rated at least possible IE by clinical criteria, or complicated IE [paravalvular abscess]; TTE as first test in other patients) defined as follows: oscillating intracardiac mass on valve or supporting structures, in the path of regurgitant jets, or on implanted material in the absence of an alternative anatomic explanation; abscess; or new partial dehiscence of prosthetic valve or new valvular regurgitation (worsening or changing or pre-existing murmur not sufficient)
Minor criteria	1. Predisposition, predisposing heart condition, or IDU 2. Fever, temperature >38°C 3. Vascular phenomena, major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial hemorrhage, conjunctival hemorrhages, and Janeway lesions 4. Immunological phenomena glomerulonephritis, Osler nodes, Roth spots, and rheumatoid factor 5. Microbiological evidence: positive blood culture but does not meet a 156 major criterion as noted above (excludes single positive cultures for coagulase negative staphylococci and organisms that do not cause endocarditis) or serological evidence of active infection with organism consistent with IE

HACEK indicates Haemophilus species, Aggregatibacter species, cardiobacterium hominis, Eikenella corrodens, and Kingella species; IDU, injection drug use; IE, infective endocarditis; IgG, immunoglobulin G; TEE transesophageal echocardiography; and TTE, transthoracic echocardiography

Treatment: EMPIRICAL THERAPY (pending blood culture results)

Condition	Drug regime	Dosing
Native valve endocarditis	Ampicillin + Ceftriaxone + Gentamicin OR Ampicillin-Sulbactam + Gentamicin	2 g IV q 4 hourly 2 g IV q 24 hourly 1 mg/kg IV q 8 hourly 3 g (2g-1g) IV q 6 hourly 1 mg/kg IV q 8 hourly
Native valve endocarditis (with risk factors for Staph aureus*)	Vancomycin OR Daptomycin	25 mg/kg loading dose followed by 15 mg/kg IV q 12 hourly 8-10 mg/kg IV q 24 hourly
Prosthetic valve endocarditis	Ceftriaxone + Vancomycin + Gentamicin + Rifampicin	Same as mentioned above 300-600 mg PO/IV 12 hourly

*History of skin/soft tissue infection or abscesses, IV drug abuse, CVC line or recent cardiac/ prosthetic valve replacement

- Once the blood culture report is available, further therapy can be tailored according to the organism isolated and the drug sensitivity report.
- Duration of therapy is variable, ranging from 2-6 weeks, depending on organism isolated and drug sensitivity results.

Reference; ICMR Treatment guidelines for antimicrobial use in common syndromes 2019 and LHMC antimicrobial data 2022.

MANAGEMENT OF RESPIRATORY TRACT INFECTIONS (RTI) & COMMUNITY ACQUIRED PNEUMONIA (CAP)

Upper respiratory tract infections (URTI)

Includes-

- acute rhinitis/ rhino sinusitis,
- acute pharyngitis/ tonsillopharyngitis,
- acute epiglottitis,
- acute laryngitis and
- acute otitis media.

Causative Agents

virus	rhinovirus, influenza, parainfluenza, RSV, human meta pneumovirus, enterovirus, adenovirus, Ebstein Barr virus and herpes simplex virus
Non viral	*Streptococcus pyogenes,* Pneumococcus, Moraxella, H. *influenzae,* S. *aureus,* B. *pertussis*, Mycoplasma, gonorrhoea and C. *diphtheriae*

ANTIMICROBIAL THERAPY IN URTI

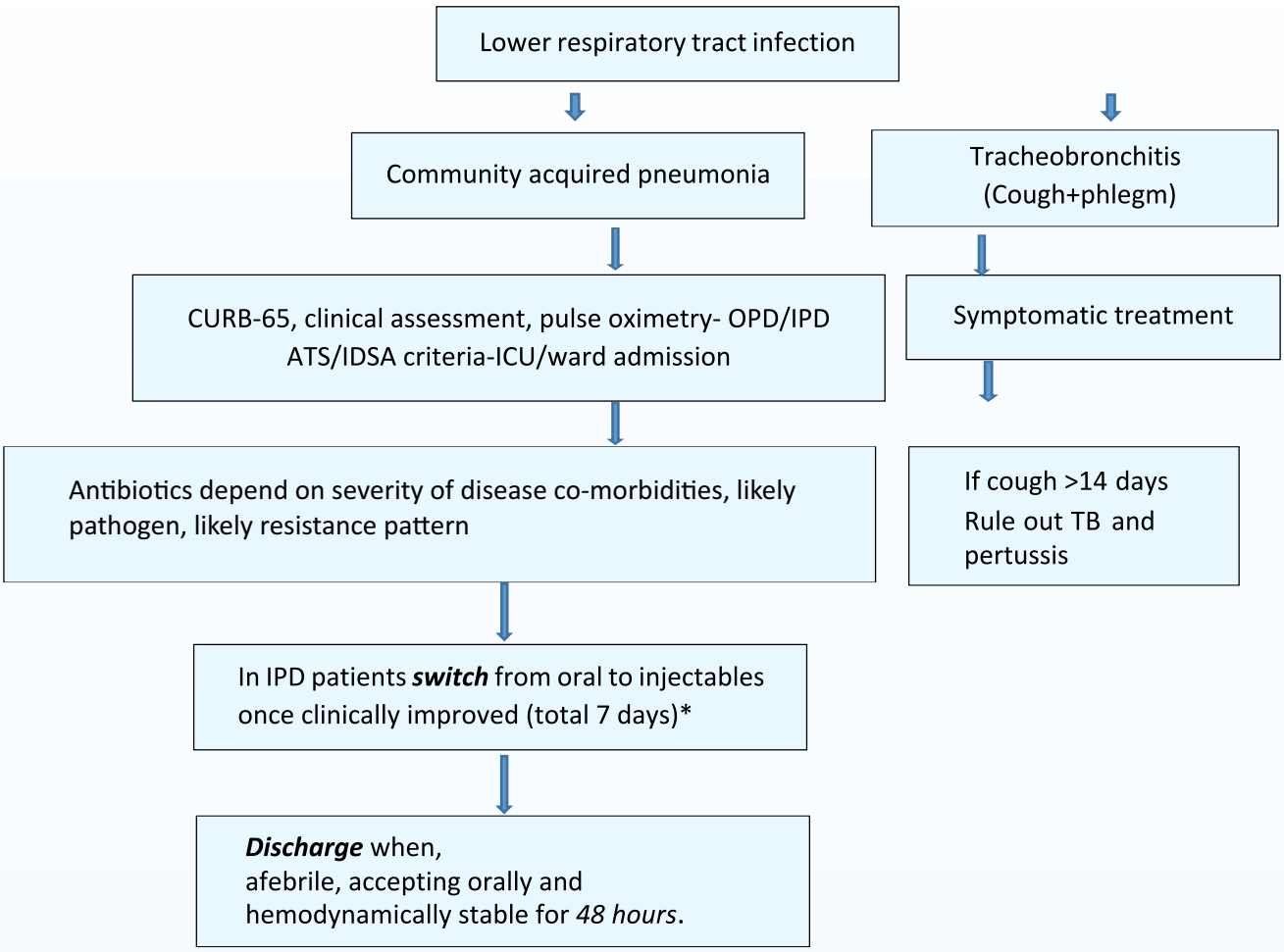
Condition	Preferred drug	Alternative	Penicillin allergy
Viral pharyngitis	Symptomatic therapy +/- nasal decongestants, anti tussives*		
Streptococcal /bacterial pharyngitis (10days)	Penicillin V (not easily available in India, Penicillin G not a substitute since oral absorption is poor	Amoxicillin Benzathine penicillin single dose	Anaphylactic: clindamycin/ clarithromycin/azithromycin Non-anaphylactic: cephalexin/ cefadroxil
Bacterial sinusitis (5-7days)	Amoxicillin Co-amoxiclav	Ceftriaxone Cefpodoxime (adults)	Adults: doxycycline/resp quinolones Children: Anaphylactic resp quinolones, Non-anaphylactic: cefixime and clindamycin
Acute otitis media (5-7days)**	Amoxicillin Co-amoxiclav	Cefpodoxime, cefuroxime, cefdinir, Ceftriaxone	Anaphylactic: azithromycin/ clarithromycin Non-anaphylactic: cephalosporins

*Empirical therapy with *oseltamivir* in-pregnant women, those with co-morbidities and the immunocompromised if they have influenza like symptoms in an outbreak.

**Indications for antimicrobial therapy- include the age of the child <24m

Bilateral, severity (temperature 39 0C or higher OR severe otalgia OR otalgia > 48hr

TREATMENT GUIDELINES



**Longer duration of therapy* in patients with bacteremic pneumococcal pneumonia, S. *aureus* pneumonia, *Legionella* pneumonia, lung abscess, empyema, pneumonia with enteric gram negative bacilli *(Klebsiella)* or non fermentative gram negative bacilli *(Pseudomonas/ Acinetobacter)* or if there is endocarditis/ meningitis complicating pneumonia.

LOWER RESPIRATORY TRACT INFECTIONS (LRTI)

1) Tracheobronchitis

2) Community acquired pneumonia (CAP) Characterized by

- *Symptoms* - cough with or without expectoration, shortness of breath, pleuritic chest pain, for less than 1 week.
- At least one *systemic feature* (temperature >37.7°C, chills, and rigors, and/or severe malaise).
- New focal chest signs on *examination* (bronchial breath sounds and/or crackles); with no other explanation for the illness.
- When a *chest* X-Ray is available, CAP is defined as the above with new shadows on the X-Ray with no other defined cause.

ETIOLOGY AND CAUSATIVE AGENTS

bacteria	S. pneumonia(commonest), H. influenzae, S. aureus, S. pyogenes, gram negative bacilli
Virus	influenza, parainfluenza, RSV, human metapneumovirus, adenovirus, coronavirus
Atypical pneumonia pathogens	Mycoplasma pneumonia, Chlamydophilia pneumonia, Legionella sp
Tropical pathogens	scrub typhus, leptospirosis, melioidosis

CHOICE OF EMPIRIC ANTIMICROBIAL THERAPY IN ADULT CAP

Type of CAP	Preferred drug	Alternative	Comments
Outpatients without co-morbidities (5days)	Co amoxiclav	Macrolides** Cefuroxime Cefpodoxime	Beta lactam preferred over macrolides due to high prevalence of macrolide resistance in *S. pneumoniae* in India. • Caution in elderly with macrolides • Doxycycline monotherapy not recommended
*Outpatients with co-morbidities** or *use of antimicrobial in 3 months* (5days)	Co-amoxiclav and macrolide/doxycycline	Cefuroxime/ cefpodoxime and macrolide/doxycycline	
Inpatient, non ICU (7days)	Ceftriaxone with macrolide/doxycycline	Cefotaxime/ amoxclav with macrolide/doxycycline	If there is hypersensitivity to beta lactams: respiratory fluoroquinolones (exclude TB)
Inpatient ICU	Ceftriaxone with macrolide/doxycycline	Cefotaxime, piperacillin-tazobactam with macrolide	Colistin>doxycycline and minocycline have better sensitivity spectrum against icu isolated samples in our institute.
Inpatient ICU with risk factors for *Pseudomonas aeruginosa*/ other enteric gram negative bacteria#	Piperacillin tazobactam with macrolide/doxycycline	Cefepime/imipenem, aminoglycosides with macrolide/ doxycycline	carbapenems preferred over beta lactam beta lactamase inhibitor combinations in patients with septic shock. • Aminoglycosides have comparable sensitivity to Piperacillin tazobactums against pseudomonas and klebsiella as per our institute's data.
If CA MRSA## is suspected then vancomycin or teicoplanin may be added			

***comorbidities-** *Chronic heart, liver, renal or lung disease, diabetes mellitus, malignancies, alcoholism or use of immunosuppressive drugs*

** *Azithromycin/Clarithromycin*

gm-ve-Chronic respiratory disease (COPD, bronchiectasis, asthma, chronic bronchitis),neurologic disorders, enteral tube feeding and immunocompromised states

##*MRSA- Preceding influenza, cavitary infiltrates with no underlying aspiration, shock, empyema*

EMPYEMA

- It's a *common complication* of bacterial CAP.
- The common pathogens-*Pneumococcus, S.aureus, S.pyogenes* and sometimes *Klebsiella* or other gram negative bacilli.
- Suspect if there is persistent fever, leukocytosis and effusion on the CXR.
- Diagnosis with USG, pleural fluid analysis(purulent/bacteria on gm stain).
- It should also be suspected in *complicated para-pneumonic effusions* (pH < 7.0/ sugar <40 mg/dl/ LDH> 1000 IU/l/ lactate > 45 mg/dl).
- *Drainage* of the infected fluid is paramount and can be done by chest tube with or without fibrinolytics, if needed VATS or thoracotomy .

Drug doses, duration and route

Drug	Adult dose
Penicillin V	500 mg twice daily
Benzathine penicillin	<27 kg 6,00,000 units IM single dose > 27 kg 1.2 million units IM single dose
Amoxicillin	500 – 1000 mg thrice daily (PO or IV)
Co-amoxiclav	1 gm twice daily/ 625 mg thrice daily oral 1.2 gm IVq8h
Azithromycin	500 mg daily (PO or IV)
Clarithromycin	500 mg twice daily
Oseltamivir	75 mg twice daily PO
Doxycycline	100 mg twice daily
Clindamycin	300 mg four times a day PO 600 mg thrice daily IV
Cephalexin	750 mg twice daily PO
Cefadroxil	1 gm once daily
Levofloxacin	750 mg once daily PO or IV
Moxifloxacin	400 mg once daily PO or IV
Cefpodoxime	200 mg twice daily
Cefuroxime	500 mg twice daily oral 1.5 gm twice daily IV
Ceftriaxone	2 gm once daily IV
Cefotaxime	2 gm thrice daily IV
Cefepime	2 gm twice daily IV
Piperacillin tazobactam	4.5 gm thrice daily
Cefoperazone sulbactam	3 gm twice daily

Drug	Adult dose
Imipenem	1 gm thrice daily or 500 mg four times daily IV
Meropenem	1 gm thrice daily IV
Vancomycin	1 gm twice daily
Teicoplanin	400 mg twice daily for 3 doses and then 400 mg once daily
Linezolid	600 mg twice daily PO or IV

GENERAL SURGERY

Preoperative measures to prevent SSI

1. Preoperative bathing
2. Patients with known nasal carriage of S. aureus undergoing other types of surgery with perioperative intranasal applications of mupirocin 2% ointment with or without a combination of Chlorhexidine gluconate body wash.
3. Preoperative oral antibiotics combined with mechanical bowel preparation (MBP) should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery.
4. In patients undergoing any surgical procedure, hair should either not be removed or, if absolutely necessary, it should be removed only with a clipper. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room.
5. Alcohol-based antiseptic solutions based on CHG should be used for surgical site skin preparation in patients undergoing surgical procedures.
6. Antimicrobial sealants should not be used after surgical site skin preparation for the purpose of reducing SSI.
7. Surgical hand preparation be performed either by scrubbing with a suitable antimicrobial soap and water or using a suitable Alcohol Based Hand Rub before donning sterile gloves.
8. Consider the administration of oral or enteral multiple nutrient-enhanced nutritional formulas for the purpose of preventing SSI in underweight patients who undergo major surgical operations.
9. Adult patients undergoing general anaesthesia with endotracheal intubation for surgical procedures should receive an 80% fraction of inspired oxygen (FiO2) intraoperatively and, if feasible, in the immediate postoperative period for 2-6 hours to reduce the risk of SSI.
10. Warming devices should be used in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI.
11. Protocols for intensive perioperative blood glucose control for both diabetic and non-diabetic adult patients undergoing surgical procedures are advised be used to reduce the risk of SSI.
12. Goal-directed fluid therapy (GDFT) should be utilized intraoperatively to reduce the risk of SSI.
13. Either sterile, disposable, non-woven or sterile, reusable woven drapes and surgical gowns can be used during surgical operations for the purpose of preventing SSI.
14. Plastic adhesive incise drapes with or without antimicrobial properties should not be used for the purpose of preventing SSI
15. Use of prophylactic negative pressure wound therapy (pNPWT) in adult patients on primarily closed surgical incisions in high-risk wounds, for the purpose of the prevention of SSI may be considered if resources permit.
16. Do not routinely use antiseptic-impregnated sutures as a strategy to prevent SSI
17. Do not using any type of advanced dressing over a standard dressing on primarily closed surgical wounds for the purpose of preventing SSI.
18. Perioperative antibiotic prophylaxis should not be continued to the presence of a wound drain for the purpose of preventing SSI.

Condition	Likely causative Organisms	First line/ Presumptive antibiotics	Second line antibiotics	Comments
Enteric fever	S.Typhi/ S .Paratyphi A	Outdoor: Cefixime 20mg /kg/day for 14 days or Azithromycin 500 mg twice a day for 7 days Indoor: Inj. Ceftriaoxne 2 gm BD IV for 2 weeks +/- Azithromycin 500 mg BD for 7 dyas	Cotrimoxazole 920 mg BD for 2 weeks	Majority of strains are nalidixic acid resistant. Ceftriaxone to be changed to oral cefixime when patient is afebrile to finish total duration of 14 days.
Biliary tract infections (cholangiti, cholecystitis)	Enterobacteriaceae *(E.coli, Klebsiella sp.)*	Ceftriaxone 2gm IV OD or Piperacillin-Tazobactam 4.5gm IV 8 hourly Or Cefoperazoe-Sulbactam 3gm IV 12 hourly For 7-10days	Imipenem 500 mg IV 6 hourly or Meropenem 1 gm IV 8hourly For7-10days	Surgical or endoscopic intervention to be considered if there is biliary obstruction. High prevalence of ESBL producing *E.coli*, *Klebsiella sp.*strains. De-escalate therapy once antibiotic susceptibility is known.
Spontaneous bacterial Peritonitis	S pneumoniae E coli Klebsiella Enterococcus	Cefotaxime1-2gm IV 8 hourly Or Piperacillin-Tazobactam 4.5gm IV 8 hourly Or Cefoperazone-Sulbactam 3 gm IV 12h	Imipenem 500mg IV 6 hourly or Meropenem 1gm IV 8 hourly	Descalate to Ertapenem 1gm IV OD for 5-7 days once the patient improves
Secondary peritonitis, Intra-abdominal abscess/ GI perforation	Enterobacteriaceae (*E.coli, Klebsiella sp.*), Bacteroides (colonic perforation), Anaerobes	Piperacillin-Tazobactam 4.5gm IV 8 hourly Or Cefoperazone-Sulbactam 3gm IV 12 hourly in severe infections In very sick patients, if required, addition of cover for yeast (fluconazole iv800mg loading dose day1, followed by 400mg 2ndday onwards) & And for Enterococcus (vancomycin / teicoplanin) may be contemplated	Imipenem 1g IV 8hourly Or Meropenem 1gm IV 8hourly or Ertapenem 1gm IV OD	*Source control is important to reduce bacterial load.* If excellent source control– for 5-7days; otherwise 2-3 weeks suggested.
Pancreatitis Mild-moderate		No antibiotics		

Condition	Likely causative Organisms	First line/ Presumptive antibiotics	Second line antibiotics	Comments
Post necrotizing pancreatitis: infected pseudocyst; pancreatic abscess	*Entrobacteriaceae, Enterococci, S.aureus, S. epidermidis, anaerobes, Candida sp.*	Piperacillin-Tazobactam 4.5gm IV8hourly empirically or Cefoperazone-Sulbactam 3gmIV 8hourly in severe infections In very sick patients, if required, addition of cover for yeast (fluconazole iv 800mg loading dose day1, followed by 400mg 2nd day onwards) & and for Enterococcus (vancomycin /teicoplanin) may be contemplated For 7-10days	Imipenem-Cilastatin 500mg IV 6 hourly or Meropenem 1gm IV 8 hourly	Duration of treatment is based on source control and clinical improvement
Liver Abscess	*Polymicrobial*	Amoxycillin-clavulanate/ 3rd generation cephalosporin + Metronidazole 500mgI.V. TID/ 800 mg oral TID for 2 weeks	Piperacillin-Tazobactam 4.5gm IV 8 hourly	Ultrasound guided drainage indicated in large abscesse, signs of imminent rupture and no response to medical treatment.
Cellulitis	*Streptococcus pyogenes* (common), *S.aureus*	Amoxicillin-Clavulanate1.2 gm IV TDS/625mg oral TDS or Ceftriaxone 2gm IV OD	Clindamycin 600-900mg IV TDS	Treat for 5-7days.
Furunculosis	*S.aureus*	Amoxicillin-Clavulanate1.2gmIV/Oral625TDS or Ceftriaxone2gmIVOD Duration–5-7days	Clindamycin 600-900mg IV TDS	Get pus cultures before starting antibiotics
Necrotizing fasciitis	*Streptococcus pyogenes, S.aureus*, anaerobes, Enterobacteriaceae (polymicrobial)	Piperacillin-Tazobactam 4.5gm IV 6 hourly Or Cefoperazone-Sulbactam 3gm IV 12 hourly & Clindamycin 600-900mg IV 8 hourly Duration depends on the progress	Imipenem 1g IV 8 hourly or Meropenem 1gm IV 8 hourly AND Clindamycin 600-900mg IV TDS /linezolid600mg IV BD/daptomycin 6mg/kg/day	Early surgical intervention crucial

Condition	Likely causative Organisms	First line/ Presumptive antibiotics	Second line antibiotics	Comments
Lung abscess, Empyema	*S.pneumoniae, E.coli, Klebsiella sp., Pseudomonas aeruginosa, S.aureus,* anaerobes	Piperacillin-Tazobactam4.5gmIV6hourly Or Cefoperazone-Sulbactam3gm IV 12hourly	Add Clindamycin 600-900mg IV 8hourly	Surgical drainage required; 3-4 weeks treatment required
Acute uncomplicated Cystitis	*E.coli, Staphylococcus saphrophyticus* (in sexually active young women), *Klebsiella pneumoniae*	Nitrofurantoin 100mg BD for 7 days or Cotrimoxazole 960mg BD x 3-5 days or Ciprofloxacin 500mg BD for 3-5 days	Cefuroxime 250mg BD for 3-5days	Get urine cultures before antibiotics & modify therapy based on sensitivities
Acute prostatitis	Enterobacteriaceae (*E.coli, Klebsiella sp.*)	Doxycline100mg BD or Co-trimoxazole 960 mg BD.		

TREATMENT OF FUNGAL INFECTIONS

Routine antifungal prophylactic therapy in critically ill patients is NOT recommended. Fungal therapy is usually started based on positive cultures or systemic evidence of fungal infection. It is advised to take paired cultures if fungal infection is suspected. Evidence includes persistent sepsis / SIRS despite broad spectrum antibiotic (exclude sepsis, abscess, drug fever, DVT etc). Treat according to identification and antifungal sensitivity of Candida isolate.

Fluconazole IV/oral 800 mg OD first day (12mg/kg) and then 400 mg OD (6mg/kg from second day) if fluconazole naïve or sensitive

Or

2nd line Liposomal Amphotericin B (for Candida krusei and C.glabrata as inherently resistant to Fluconazole.) or Caspofungin (As Caspofungin is inherently inactive against Zygomycetes, Cryptococcus, Fusarium and TrichosporonSpp) Liposomal Amphotericin B IV 3mg/kg OD or Caspofungin dose: IV 70mg on Day 1 (loading), 50mg OD (<80kg) or 70mg OD (if >80kg) thereafter.Moderate to severe hepatic dysfunction: reduce the subsequent daily dose to 35mg OD. Check for drug interactions.

To be decided by Microbiologist based on patient's hepatic / renal functions/Severity of infection /drug interactions e.g. rifampicin, carbamazepine, phenytoin, efavirenz, nevirapine, cyclosporin, dexamethasone, tacrolimus etc.

SURGICAL ANTIMICROBIAL PROPHYLAXIS

- To be administered within 1 hr before the surgical incision (120 minutes in case of vancomycin and fluroquinolones)
- Single dose is recommended. Consider for second intra-operative dose in prolong surgery based on the choice of antibiotic used for prophylaxis.
- Prophylaxis should not be given beyond surgery duration (except for cardiothoracic surgery where up to 48 hours is permissible)

Clean surgeries- No antibiotics

1. Head and Neck- Lipoma, Dermoid, Sebaceous cyst, Goitre, Parathyroid
2. Breast-Surgery for non-malignant breast lesions- Fibroadenoma, Simple cyst
3. Soft tissue- Lipoma, neurofibroma, corn, ganglion
4. Abdomen- Low-risk Lap cholecystectomy

   Ventral hernia- uncomplicated, primary
5. Groin- Lap/open hernioplasty (in selected case)
6. Nephrectomy for Non Functioning Kidney

Clean Contaminated- Prophylactic antibiotics

S.No.	Organ	Antibiotics
1	Breast	Inj. Cefazolin 2gm or Inj. Cefuroxime 1.5gm IV stat
2	Gastroduodenal & biliary	Inj. Cefaperazone -Sulbactam 2gm IV stat & 12 hourly for 24hrs (maximum)
3	Colonic surgery	Inj. Cefaperazone -Sulbactam 2gm IV stat & 12 hourly for 24hrs (maximum)
4	Abdominal surgery (hernia)	Inj. Cefazolin 2gm or Inj. Cefuroxime 1.5gm IV stat
5	Trauma	Inj. Cefuroxime 1.5gm IV stat and q 12h (for 24hrs) or Inj. Ceftriaxone 2gm IV once a day
6	Urologic procedures	Antibiotics only to patients with documented bacteriuria
7	Trans-rectal prostatic surgery	Inj. Cefaperazone -Sulbactam 2 gm IV stat

GYNAECOLOGY AND OBSTETRICS

1. Asymptomatic bacteriuria –
   a) Primary-Tab Nitrofurantoin 100 mg 12 houly (if macrocrystal, dual release formulation) or 6 hourly (if regular release formulation) x 5 days, Cap Amoxycillin 500 mg 8 hourly x 5 days
   b) Alternative- Tab Cephalexin 500mg 6 hourly x 5 days, Tab Trimethoprim+ Sulphamethoxazole (800mg/160 mg) double strength 12 hourly x 3 days (to be avoided in last trimester): Antibiotic to be changed according to culture report
2. Acute Cystitis-
   a) Primary- Tab Nitrofurantoin 100 mg 12 hourly (if macrocrystal, dual release formulation) or 6 hourly (if regular release formulation) x 7 days, Cap Amoxycillin 500 mg 8 hourly x 7 days
   b) Alternative-Tab Cephalexin 500mg 6 hourly x 7 days, Tab Trimethoprim + Sulphamethoxazole (800mg/160 mg) double strength 12 hourly x 7 days (to be avoided in last trimester); Antibiotic to be changed according to culture report
3. Recurrent Cystitis (2 episodes in 6 month/>3 episodes in 1 year)-Tab Nitrofurantoin 100 mg or Tab Cephalexin 250-500mg at bedtime x 3-6 months
4. Pyelonephritis
   a) Ceftriaxone IVV 1 gm/24 hrs OR Ampicillin 1-2gm 6 hourly+ Gentamycin 1.5 mg/kg 8 hourly; Once afebrile for 48 hour, switch to oral treatment according to sensitivity for 10-14 days;
   b) Alternative- Piperacillin tazobactum 4.5gm 8 hourly or Meropenem 1 gm 8 hourly or Ertapenem 1 gm 24 hourly; duration and route of administration of drug to be individualized as per patient's condition, compliance and culture report.
5. Pre Mature Rupture of Membranes (PROM): No antibiotics
6. Premature Pre Mature Rupture of Membranes (PPROM) –
   a) Cap Amoxicillin 500mg 8 hourly x 7 days or (if sensitive to Penicillin) Erythromycin 250 mg 6 hourly x 10 days:
   b) Alternative-oral cephalexin 500mg 6hrly for 7 days
7. Chorioamnionitis
   a) Ampicillin VV 2gm 6 hourly Gentamycin IV 1.5 mg/Kg 8 hourly Metronidazole 500 mg 8 hrly I/V till culture reports are obtained,
   b) Alternative- Ceftriaxone I/V 2gm 24 hourly or Amoxycillin- clavulonic acid 1.2gm 12 hourly Gentamycin I/V 1.5 mg/Kg 8 hourly Metronidazole 500 mg 8 hourly IV. Switch to oral preparation after patient is afebrile for 48 hrs. Total duration of antibiotics for a minimum of 7 days
8. Septic abortion
   a) Ceftriaxone I/V 2gm 24 hourly or Amoxycillin-clavulanic acid 1.2gm 12 hourly, Gentamycin I/V 1.5 mg/Kg 8 hourly, Metronidazole 500 mg 8 hourly I/V

b) If already received antibiotics from outside, Piperacillin-Tazobactum 4.5 gm 8 hourly or Cefoperazone- Sulbactum 1-2 g IV 12 hourly till sensitivity report is available; then modify accordingly. Switch to oral preparation after patient is afebrile for 48 hrs. Total duration of antibiotics for a minimum of 7 days. (Use of Carbapenems for empiric therapy not recommended)

9. Septic shock- Piperacillin-Tazobactum 4.5 gm 8 hourly till sensitivity report is available, then modify accordingly: Antibiotics for 7-14 days guided by severity of infection, offending pathogens and patient's clinical progress. (Use of Carbepenums for empiric therapy not recommended)

10. Puerperal sepsis/Endomyometritis/septic pelvic thrombophlebitis

    a) Ampicillin I/V 2gm 6 hourly or Ceftriaxone I/V 2gm 24 hourly or Amoxycillin-clavulanic acid I/V 1.2gm 8 hourly+ Gentamycin I/V 1.5 mg/Kg 8 hourly + Metronidazole 500 mg 8 hourly IV till culture reports are obtained; Switch to oral preparations after patient is afebrile for 48hrs: Total duration of a minimum of 7 days

    b) Alternative-Clindamycin I/V 600-900 mg 8 hourly + Gentamycin 1.5 mg/Kg 8 hourly

11. Surgical site Infection-Clindamycin PO 300 mg 8 hourly or Ampicillin + clavulanic acid PO 625 mg 8 hourly or Cloxacillin PO 500 mg 6 hourly

12. Episiotomy

    a) Inj Ampicillin 1 g IV stat within 1 hr before delivery (Antibiotic Sensitivity Test to be done at admission) or Cap Amoxycillin 500mg 8 hourly for 48 hrs to be given.

    b) If sensitive to Ampicillin-Tab Erythromycin 500mg 6 hourly for 48hrs

13. Elective LSCS/Emergency LSCS (with no risk of sepsis) –Ampicillin 2g stat or Cefazolin 2gm I/V or Cefuroxime 1.5 gm I/V within 1 hr before surgery

14. Emergency LSCS-with low risk of sepsis - Ampicillin I/V 2gm 6 hourly + Metronidazole 500 mg 8 hourly I/V for 48 hrs

15. Emergency LSCS-with high risk of sepsis - Ampicillin I/V 2gm 6 hourly + Gentamycin I/V 1.5 mg/Kg 8 hourly + Metronidazole 500 mg 8 hourly I/V for 48 hrs then oral Amoxycillin for total for 7 days. Gentamicin to be continued according to patient's condition and Day 3 counts.

Gynaecologic surgeries

1. Hysterectomy-Cefuroxime 1.5g IV/ Augmentin 1.2 g IV/Cefazolin Ig IV stat (within 1 hour before surgery)

2. Laparoscopy/hysteroscopy/Endometrial Biopsy/Dilatation and Curettage-NONE; Azithromycin Ig PO STAT if risk factors for sexually transmitted infections; treat for appropriate STI

3. Laparoscopy/hysteroscopy with any operative procedure- Amoxyxillin + clavulonic acid 1.2 g IV/Cefuroxime 1.5g IV/Cefazolin Ig IV stat (within 1 hour before surgery)

4. Hysterosalpingography/ Chromopertubation- NONE; Patient selection to be done appropriately; Doxycycline 100 mg twice a day for 5 days OR Azithromycin 1g PO STAT (if risk factors for sexually transmitted infections or report suggestive of dilated tubes) after the procedure.
5. Therapeutic abortion - Doxycycline 100mg 1 hr before and 200 mg after procedure; Doxycycline 100 mg 12 hourly x 5 days in case of abnormal discharge at the time of abortion
6. Incomplete abortion - Ampicillin1 g IV stat followed by Amoxycillin 500mg 8 hourly for 48 hrs or 5 days if bleeding per vaginum > 24 hrs.
7. Minilap/Tubal Recanalization - Cefuroxime 1.5g IV/Augmentin 1.2 g IV/ Cefazolin Ig (within 1 hour before surgery)
8. Medical Termination of Pregnancy/Intrauterine Contraceptive Device insertion - None
9. Circlage-none
10. Perineal Tear (recommended for 3rd/4th degree tears involving sphincter/rectal mucosa)
    a) Cefuroxime 750mg IV 12 hrly PLUS Metronidazole 500mg IV 8 hrly,
    b) ALTERNATIVE-Clindamycin 600mg IV 6hrly, After 24 hours IV switch to oral: Cefuroxime axetil 500mg 12hrly PLUS Metronidazole 400mg 8hrly for 5 days: Anaphylaxis to penicillin: Clindamycin 300-450mg PO 6hrly for 5 days
11. Manual removal of placenta - Cefuroxime 1.5g IV/Augmentin 1.2 g IV/Cefazolin Ig (within 1 hour before surgery)
12. Postpartum Retained Products of Conception (RPOC)
    a) Cefuroxime 1.5g IV Metronidazole 500mg IV STAT
    b) Alternative- Clindamycin 600mg IV STAT; switch to oral preparation for total of 7 days
13. Balloon Tamponade
    a) Cefuroxime 1.5g IV 12 hourly + Metronidazole 500mg IV 8 hourly for duration balloon is in situ;
    b) Alternative-Clindamycin 600mg IV 6htly for duration balloon is in situ
14. Mesh/Vaginoplasty
    a) Ciprofloxacin IV 200mg + Metro IV 500 mg + Gentamicin IV 1.5mg/kg (within 1 hour before surgery);
    b) Alternative: Clindamicin IV 600 mg + Gentamicin IV 1.5mg/kg stat

INTENSIVE CARE UNIT

SKIN AND SOFT-TISSUE INFECTIONS

- For moderate non-purulent SSTI→ I.V. Penicillin or clindamycin (first choice of antibiotics).
- Severe non-purulent SSTI → combination of piperacillin-tazobactam along with coverage for MRSA.
- Empiric therapy should attempt to provide antimicrobial activity against the most likely pathogens based upon clinical features along with local patterns of infection and resistance.
- Duration of therapy is 7 to 10 days; longer courses may be appropriate in patients with slow response.

BILIARY SEPSIS

- Either beta-lactam/beta-lactamase inhibitor (such as cefoperazone-sulbactam or piperacillin/tazobactam) or carbapenems (imipenem/meropenem) → monotherapy in patients with moderate to severe cholangitis.
- Biliary drainage should be considered in all patients with cholangitis in addition to empirical antibiotic therapy.

ABDOMINAL INFECTIONS IN ICU

Acute Pancreatitis and Infected Pancreatic Necrosis

- Routine use of prophylactic antibiotics to prevent pancreatic infection following acute pancreatitis of any severity is not recommended
- Empirical antibiotic regimen in patients with infected pancreatic necrosis according to local microbiological data, susceptibility pattern, the pharmacokinetic property of antibiotics and previous antibiotic exposure.
- Empirical treatment with either carbapenems, piperacillin-tazobactam or cefoperazone-sulbactam.
- In patients not responding or already exposed to the piperacillin-tazobactam, cefoperazone-sulbactam or carbapenems, colistin should be added to the empirical regime.
- Duration of antibiotic therapy should be guided by
- Patients not responding to antibiotics should undergo necrosectomy and drainage.

URINARY AND UROGENITAL INFECTIONS IN ICU

- The initial choice of antibiotics should cover for ESBL producing gram-negative organisms and includes aminoglycosides, beta-lactam along with a beta-lactamase inhibitor or carbapenems.
- In the initial empirical regimen for UTI, antibiotics against gram-positive organisms are not recommended.
- Antifungals to be considered in empirical regimen, in appropriate clinical settings.

PERITONITIS

- Third-generation cephalosporins (such as cefotaxime and ceftriaxone) for 7 to 10 days in patients with primary peritonitis.
- Beta-lactam/beta-lactamase inhibitor or carbapenems with an anaerobic cover (using metronidazole) for the treatment of secondary peritonitis.
- For secondary peritonitis antibiotic treatment is required for 4 days after an adequate source control

CATHETER-RELATED BLOODSTREAM INFECTIONS

- Empirical antibiotic regimen for CRBSI should include coverage for both gram-positive and gram-negative organisms.
- Vancomycin or teicoplanin → recommended first-line drug for the empiric treatment of CRBSI for MRSA and MR-CONS while linezolid and daptomycin are good alternative agents.
- An echinocandin or fluconazole should be used as empirical antifungal agents for the treatment of suspected central line-associated candidemia.
- Minimum 2 weeks antibiotics should be given for uncomplicated and 4 to 6 weeks for complicated Staphylococcus aureus CRBSI and infective endocarditis.
- Minimum 7 days of antibiotics should be given for gram-negative CRBSI.
- Five to seven days antibiotics are recommended for CONS bacteremia.
- For suspected fungal CRBSI, antifungal therapy for at least 14 days is recommended.

VENTILATOR ASSOCIATED PNEUMONIA

- In ICUs where the distribution of pathogen and antibiotic resistance pattern is known, empiric treatment should be designed accordingly, based upon patient risk factors for MDR pathogens.
- Serum procalcitonin may be used to guide the de-escalation of antibiotics in VAP when the anticipated duration of therapy is >7 to 8 days.
- Short course (7-8 days) of antibiotic therapy should be used, in the case of VAP with good clinical response to therapy
- Longer duration (14 days) of antibiotic therapy should be considered, in case of VAP caused by NF-GNBs or is associated with severe immunodeficiency, structural lung disease (COPD, bronchiectasis, and interstitial lung disease), empyema, lung abscess, necrotizing pneumonia, and inappropriate initial antimicrobial therapy
- Among patients with VAP who are not at high risk of MDR pathogens and are in ICUs with a low prevalence of MRSA (<15%) and resistant gram-negative organisms (<10%), single antibiotic active against both MSSA and Pseudomonas is preferred over combination antibiotic.
- Among patients with VAP who are at high risk of MDR pathogens or are in ICU with a high prevalence of MRSA (> 15%) and resistant gram-negative organisms (> 10%), an agent active against MRSA and at least two agents active against gram-negative organisms including P. aeruginosa is recommended.

- Among patients with VAP who are not at high risk of MDR pathogens and are in ICU with a high prevalence of resistant gram-negative organisms (>15%) but low prevalence of MRSA (<10%), two agents active against gram-negative organism including P. aeruginosa is recommended.
- Colistin may be used upfront in the ICUs if there is a high prevalence of carbapenem-resistant Enterobacteriaceae.
- Empirical antibiotic regimen for VAP should not include coverage for anaerobic organisms routinely.
- In patients with risk factors for anaerobic organisms, clindamycin or metronidazole should be added to empirical antibiotics regimen for VAP, if it does not include carbapenems (meropenem or imipenem) or piperacillin-tazobactam in the ongoing empirical regimen
- Empirical antibiotic regimen for VAP should not include coverage for atypical organisms routinely.
- In the presence of risk factors for VAP due to atypical bacterial pathogens, atypical antimicrobial coverage should be added to the empirical regimen.
- The preferred atypical coverage in combination antibiotics regimen is fluoroquinolones (levofloxacin or moxifloxacin) or macrolides (azithromycin or clarithromycin).

SEPSIS OF UNKNOWN CAUSE IN ICU

- Empirical antimicrobial therapy with a combination of ceftriaxone and doxycycline or macrolide for community-acquired sepsis of unknown origin in ICU.
- Empirical antimicrobial therapy with a combination of beta-lactam/beta-lactamase inhibitor and a fluoroquinolone or aminoglycoside for nosocomial sepsis of unknown origin in ICU.
- Duration of therapy is 7–10 days, though longer courses may be appropriate in patients with slow response.

EMPIRICAL ANTIFUNGALS FOR NON-NEUTROPENIC PATIENTS IN ICU

- No recommendation for routine use of empirical antifungals in non-neutropenic patients in ICU
- Empirical antifungals may be considered in critically ill patients with a high risk of invasive fungal infections to reduce the incidence of subsequent invasive fungal infection.
- Fluconazole or caspofungin preferred empirical antifungal agents in non-neutropenic ICU patients at risk for invasive fungal infection.
- Caspofungin preferred in areas with high prevalence of fluconazole resistance.
- Micafungin or anidulafungin may be used as alternative agents.
- Recommended duration of empirical antifungal therapy is 2 weeks

NEONATOLOGY

Indications for starting antibiotics

A. Early onset neonatal sepsis:

1. Risk factor based approach

- ELBW babies with 2 or more risk factors for early onset sepsis -

a) Maternal fever > 100.4 degree F

b) Foul smelling and/or meconium stained liquor

c) Rupture of membranes >>24hours

d) Single unclean or >3 sterile vaginal examinations during labour

e) Perinatal asphyxia (Apgar score 4 at Imin)

- Clinical chorioamnionitis in the mother.

2. Clinical/Sepsis work up based approach

*Strong clinical suspicion of sepsis (Shock/Sclerema neonatorum/Sepsis in the co-twin etc)

Any baby with at least two risk factors for sepsis and a positive Sepsis screen

B. Late onset neonatal sepsis

- Strong clinical suspicion of sepsis and/or
- Positive septic screen with consistent symptomatology

Choice of antibiotics: Antibiotics, started empirically should be modified according to the culture sensitivity reports. Guidelines for empirical antibiotic therapy have been provided in Table 1

Table1. Empirical choice of antibiotics for treatment of neonatal sepsis

Clinical situation	Antibiotics
1 line	Piperacillin - Tazobactam and Amikacin
2nd line	Meropenem & Amikacin; Metronidazole to be added in cases of NEC II or more
3d line	Colistin & Amikacin or Vancomycin (MRSA)

"In case of meningitis, change piperacillin-tazobactam to meropenem

Table 2. Duration of antibiotic therapy in neonatal sepsis Diagnosis

Diagnosis	Duration
Meningitis (with or without positive blood CSF culture)	21 days
Blood culture positive but no meningitis	14 days
Culture negative sepsis and screen positive	7-10 days
Culture negative sepsis and screen negative	5-7 days
Risk factor based approach	Stop if the blood culture report is sterile

Dose and administration

1. Piperacillin-Tazobactam: 50 to 100 mg/kg per dose IV infinion by syringe pump over 30 minutes

Dosing interval chart

PMA(wks)	Dose (mg/kg dose)	Post natal(days)	Interval(hrs)
<29	50-100	0-28 >28	12 8
30-36	50-100	0-14	12
37-44	50-100	0-7 >7	12 8
>45	50-100	All	8

2. Meropenem:

Indication	Dose (mg/kg/dose)	Interval(hrs)
Sepsis	20	12
Meningitis/Pseudomonas	40	8

2. Amikacin: IV infusion by syringe pump over 30 minutes

Dosing interval chart

PMA(w)	Post natal(days)	Dose (mg/kg/dose)	Interval(hrs)
< 29	0-7 8-28 >28	18 15 15	48 36 24
30-34	0-7 >8	18 15	36 24
>35	All	15	24

Antibiotic upgradation

Unwarranted ranted upgradation of antibiotics should not be done. The indications for upgrading antibiotics include

1. Clinical deterioration-Shock/sclerema neonatorum/respiratory deterioration (not explained by other factors such as PDA, Collapse) feed intolerance despite being on therapy with current antibiotics (1st line) for a minimum duration of 48 hours

2. Based on BACTEC sensitivity-

If there is no clinical improvement. In cases where there is no clinical improvement with a particular antibiotic, but the BACTEC shows a different sensitivity pattern, change antibiotics as per sensitivity report.

If there is clinical improvement- In such cases, there is no need to change antibiotics and a repeat a BACTEC is a be sent

Sepsis screen alone should not be used as a guide to revise antibiotics. Sepsis screens or

BACTEC reports have to be evaluated along with the clinical condition of the neonate. Unwanted usage of antibiotics can result in the permanent alterations of the normal microbiota of the baby making the baby prune for NEC, nosomial bacterial and fungal sepsis It can also result in the emergence of new multi drug resistant strains in the NICU.

NEUROLOGY

1. CNS infections:

   a. Bacterial meningitis: Depending on the age of the patient:

1. Adults<50 years- Ceftriaxone (2 g iv q12h)/ Cefotaxime (2 g iv q4hourly) + Vancomycin (10-15 mg/kg per dose iv 12 hourly)
2. Adults> 50 years- Vancomycin (10-15 mg/kg per dose iv 12 hourly) + ampicillin (50 mg/kg iv q6h) + Ceftriaxone (2 g iv q12h)/ Cefotaxime (2 g iv q4hourly)
3. Specific scenarios:
   a) Recurrent meningitis Ceftriaxone (2 g iv q12h)/Cefotaxime (2 g iv q4hourly) + Vancomycin (10-15 mg/kg per dose iv 12 hourly)
   b) Basilar fractures- Ceftriaxone (2 g iv q12h)/Cefotaxime (2 g iv q4hourly) + Vancomycin (10-15 mg/kg per dose iv 12 hourly)
   c) Head trauma, Ventriculoperitoneal shunts, Neurosurgery patients- Vancomycin (10-15 mg/kg per dose iv 12 hourly) + Ceftazidime (2 g iv q8h)/ Cefepime (1-2 g iv 8-12h)/ Meropenem (1g iv q8h)

b. Viral meningitis
   i. HSV meningitis- Inj. Acyclovir (10 mg/kg q8h) x 14 days
   ii. CMV meningitis- Ganciclovir- 5 mg/kg iv q12h x 21 days loading followed by 5 mg/kg q24h; Foscarnet 60 mg/kg iv q8h x 21 d and Maintenance of 90-120 mg/kg q24h
   iii. Japanese encephalitis- None recommended. Conservative treatment.

c. Cryptococcal meningitis- Inj. Amphotericin B (0.7-1 mg/kg/d iv) x 2 weeks with or without Flucytosine (100 mg/kg orally) in 4 divided doses+ Fluconazole (400 mg/day) x 8 weeks then 200 mg/day (long term maintenance)

d. Tubercular meningitis
   i. Isoniazid(H)-5 mg/kg
   ii. Rifampicin(R)-10 mg/kg
   iii. Pyrazinamide (Z)-25mg/kg
   iv. Ethambutol(E)-15 mg/kg
   v. Streptomycin(S)- 15 mg/kg

Duration of treatment 12 months

e. Syphilitic meningitis- Inj. Benzathine Penicillin G (2-4 million units/d iv every 4h x 10-14 days)

f. Parasitic meningitis- Primary Amoebic Meningoencephalitis- IV intrathecal Amphotericin B or miconazole and rifampicin

g. Lyme's meningitis- Inj. Ceftriaxone 1g iv q12h x 14-28 d(Alternative-Doxycycline 100 mg iv q12h x 14-28 d)

2. Parasitic infestations
   i) Neurocysticercosis (upto 2)- Oral Albendazole (15mg/kg) x 14 days
   ii) Neurocysticercosis (2-10)-Albendazole(15 mg/kg) + Praziquantel (50-100 mg/kg) x 14 days

3. Antibiotic policy for treatment of Muscle biopsy/Nerve biopsy prophylaxis
   i) Cap Amoxicillin + Clavulunate (625mg TDS x 5-7 days)
   ii) Ointment/Cream Mupirocin LA BD x 5-7 days

4. Treatment of sepsis/septic shock/nosocomial infections or ICU acquired infections such as VAP etcetera- According to the hospital/institutional guidelines,

OPHTHALMOLOGY

TOPICAL

TOPICAL	1ST LINE	2ND LINE
CONJUNCTIVITIS CORNEAL ULCER LID INFECTIONS PRE/POST OPERATIVE	CIPROFLOXACIN TOBRAMYCIN	GATIFLOXACIN MOXIFLOXACIN CEFAZOLIN
TRACHOMA BLEPHARITIS	AZITHROMYCIN	

SYSTEMIC

SYSTEMIC	1ST LINE	2ND LINE
ORAL		
POST -OPERATIVE	CIPROFLOXACIN	AMOXICILLIN +CLAVULANATE
LID/ADNEXAL CONDITION	AMOXICILLIN +CLAVULANATE	CIPROFLOXACIN
I/V, I/M		
VARIOUS OCULAR AND PERIOCULAR BACTERIAL INFECTIONS	AMOXICILLIN +CLAVULANATE	VANCOMYCIN CEFTAZIDIME CEFAZOLIN IMIPENEM

ORTHOPEDICS

1. For Elective Surgeries

Clean cases (cases involving soft tissue procedures or bony procedures without implants): Inj Cefazolin 2g IV or Inj Cefuroxime 1.5g IV or Inj Ceftriaxone 1g IV at induction of anaesthesia and continued for 48 hours

Clean cases involving implants (Trauma): Inj Cefazolin 2g IV or Inj Cefuroxime 1.5g IV or Inj Ceftriaxone 1g IV and Inj Amikacin 500 mg IV at induction of anaesthesia and continued for 48 hours

Clean cases involving implants (Arthroplasty): Inj Cefazolin 2g IV or Inj Cefuroxime 1.5g IV at induction of anaesthesia and continued for 48 hours

2. Contaminated Wounds/Open Fractures:

The patient should be started on a combination of intravenous antibiotics comprising of 3rd generation Cephalosporin to cover gram positive organisms, an aminoglycoside to cover gram negative organisms and a nitroimidazole to cover anaerobic organisms. This should be started as soon as possible following trauma and continued for 3 days.

Recommended combination :

- Inj Ceftriaxone 1g IV Twice Daily
- Inj Amikacin 500 mg IV Twice Daily
- Inj Metronidazole 500 mg IV Thrice Daily

3. Septic Arthritis :

Prompt antibiotic therapy should be started on the basis of culture/sensitivity reports. While these reports are awaited following empirical parenteral antibiotic therapy may be initiated.

Age < 3 months	Ceftriaxone / Cefotaxime / Oxacillin + Gentamicin
Age > 3 months	Clindamycin
Sepsis or Septic Shock	Vancomycin + Clindamycin

4. Musculoskeletal Infections

In Lady Hardinge Medical College and associated hospitals, the most common organisms isolated from pus samples (in decreasing order of frequency) are Staphylococcus aureus, Escherichia coli, Klebsiella spp., Acinetobacter spp., Pseudomonas spp., and Enterococcus spp.

	Staphylococcus aureus	*Escherichiacoli*	*Klebsiella spp*	*Acinetobacter spp*
First Line	Vancomycin	Colistin	Colistin	Colistin
Second Line	Linezolid	ESBL (Negative Profile)	ESBL (Negative Profile)	ESBL (Negative Profile)
Third Line	Minocycline	Chloramphenicol	Chloramphenicol	Doxycycline

OTORHINOLARYNGOLOGY

S. No.	Condition/Pathogens	Recommendations
1.	Acute Otitis Media S. pneumoniae, H.influenzae, M. catarrhalis	Amoxycillin 20-50 mg/kg per day PO in 2 or 3 divided dose x 5-7days or Amoxycillin + Clavulanic acid 25-40 mg/kg per day PO in 2 or 3 divided dose x 5-7days
2.	Chronic Otitis Media S. aureus, Enterobacteriaceae, Pseudomonas Spp, anaerobes	Topical antibiotics Amoxycillin + Clavulanic acid 25-40 mg/kg per day PO in 2 or 3 divided dose x 5-7days or Ciprofloxacin 500 mg PO BD x 7 days (not given in children) Alternative: Cefuroxime 250/ 500mg PO BD x 7 days
3.	Otomycosis Aspergillosis Candida	Aural toilet Clotrimazole ear drops x 5-7 days
4.	Otitis Externa S. aureus	Amoxycillin + Clavulanic acid 625 mg PO TDS x 7 days Ear packing with glycerine + 10% icthammol Alternative Doxycycline 10 0 mg PO BD x 5 days Ciprofloxacin 500 mg PO BD x5days
5.	Necrotising Otitis Externa/ (Skull Base Osteomyelitis) Pseudomonas Aspergillosis	Ceftazidime 1 g IV 8 hourly or Ciprofloxacin 750mg IV 12 hourly Alternative: Piperacillin-Tazobactam 4.5 g IV 8 h ourly + Aminoglycosides 500mg IV once a day+ Local Ciprofloxacin drops Local debridement usually required.
6.	Acute mastoiditis S. pneumoniae, P. Aeruginosa, H influenzae	Cefotaxime 1-2g IV TDS Ceftriaxone 1g IV BD Duration: 5-7 days
7.	Chronic mastoiditis Polymicrobial	Cefotaxime 1-2g IV TDS Ceftriaxone 1g IV BD Duration: 5-7 days Alternative: Meropenem 1g IV TDS Piperacillin Tazobactam 4.5g IV TDS Duration: 5-7 days
8.	Acute sinusitis Mainly viral Rarely bacterial 0.5-2%	Supportive care if viral Amoxyclav 625mg PO TDS/1g PO BD Duration: 10-14 days Alternative: Clarithromycin 250mg PO BD

S. No.	Condition/Pathogens	Recommendations
		Levofloxacin 500 mg PO OD Duration: 7 days Remarks: Levofloxacin not indicated in children
9.	Chronic sinusitis	Low dose macrolides/Clarithromycin 250mg PO BD
10.	Allergic fungal rhinosinusitis(AFRS)	Prednisolone 1mg/kg per day in tapering doses over 10-15 days pre operatively Antihistaminics, Topical Steroid, Saline Nasal Douching Surgical debridement (If Required)
11.	Mucormycosis	Serial Debridement Liposomal Amphotericin B IV 3-5mg/kg per day in limited disease 5-10 mg/kg per day in intracranial spread Maintenance therapy: Posaconazole PO 300mg BD on first day followed by 300mg OD
12	Acute Pharyngitis Viral Group A beta hemolyticstreptococcus	Supportive care if viral Amoxycillin + Clavulanic acid 625 mg PO TDS or Azithromycin 500 mg PO ODDuration: 5-7 days Alternative: Doxycycline 100 mg PO BD Or Cefuroxime axetil 500 mg PO BD Or Cefpodoxime 100 mg PO BD Duration- 5-10 days
13.	Diphtheria C. diphtheria	Aqueous benzyl penicillin (penicillin G): administer IM or slow IV All persons: 100,000 units/kg/day administer in divided dose of 25 000 IU/kg every 6hours. Or IV Erythromycin (if allergic to penicillin) All persons: 40 -50 mg/kg/day (maximum, 2 gm/day). Administer in divided dose Duration: 14 days. Or Piperacillin/Tazobactam 300-400mg/kg per day IV in three divided dose + Anti-diphtheria serum Anti-diphtheria serum for children: Laryngeal: 20-40,000 U Nasopharyngeal: 40-60,000 U Extensive disease: 60-80,000 U- 1,00,000U Duration: 14 days or Until patient is able to swallow Remarks: Penicillin should be administered only after test dose.

S. No.	Condition/Pathogens	Recommendations
14.	Oral Candidiasis Candida spp	Fluconazole 150-200 mg PO OD & Clotrimazole LA BD Duration: 2 weeks Remarks: If additional oesophageal candidiasis detected, continue for 3-4 weeks.
15.	Acute Epiglottis (Supraglotitis) H. influenzae, Anaerobes	Amoxycillin + Clavulanic acid 25-40 mg/kg per day PO in 2 or 3 divided dose Metronidazole 15 -30 mg/kg per day PO in 3 divided dose Duration: 10 -14 days Alternative: Ceftriaxone 50 -75mg/kg per day IV in 2 divided dose Duration: 7 -10 days
16.	Laryngotracheobronchitis Paramyxovirus, Parainfluenza A/B	Supportive care No antibiotics indicated
17.	Acute laryngitis Mainly viral M. catarrhalis	Supportive care No antibiotics indicated
18.	Peritonsillar abscess Group A beta hemolyticus streptococcus, MRSA	Amoxycillin + Clavulanic acid 50 -100mg/kg per day IV in 3 divided dose + Metronidazole 15mg/kg per day IV in 3 divided dose Duration : 1 -2 weeks Surgical drainage as indicated
19.	Parapharyngeal abscess Strep viridans, K. pneumonia, Pseudomonas, Strep pyogenes	Amoxycillin + Clavulanic acid 50 -100mg/kg per day IV in 3 divided dose + Metronidazole 15mg/kg per day IV in 3 divided dose Duration : 1-2 weeks 2nd line: Clindamycin 25-40mg/kg per day IV in 3 divided dose or Vancomycin 40-60mg/kg per day IV in 4 divided dose Surgical drainage as indicated
20.	Retropharyngeal abscess Strep viridans, K. pneumonia, staph aureus, MRSA, Enterobacter	Amoxycillin + Clavulanic acid 50 -100mg/kg per day IV in 3 divided dose + Metronidazole 15mg/kg per day IV in 3 divided dose Duration : 1 -2 weeks 2nd line: Clindamycin 25-40mg/kg per day IV in 3 divided dose or Vancomy cin 40-60mg/kg per day IV in 4 divided dose Surgical drainage as indicated
21.	Pre-operative prophylaxis head and neck surgery	Amoxycillin + Clavulanic acid 1.2 gm IV BD or Ceftriaxone 1g IV BD

PEDIATRICS

Disease	Likely organism	Empirical antibiotic choice	Dose route	Duration of treatment
Sepsis with/without shock (IPD)	*Klebsiella, E coli, Pseudomonas, Acinetobacter, Staphylococcus, Enterococcus, Pneumococcus*	Age <2 months: Cefotaxime **AND** Amikacin	200 mg/kg/day Q8 H, IV 15 mg/kg/day Q 24H, IV	21 days
Sepsis without shock (IPD)	*S. pneumoniae, Haemophilus influenza, Staphylococcus aureus*	=2 months: Ceftriaxone*	100 mg/kg/day Q12 H, IV	10-14 days
Sepsis with shock (IPD)	*S. pneumoniae, Haemophilus influenza, Staphylococcus aureus*	=2 months: Ceftriaxone **AND** Vancomycin	100 mg/kg/day Q12 H, IV 60-80 mg/kg/day Q 6H, IV	10-14 days
Acute bacterial meningitis (IPD)	*Klebsiella, E coli, Pseudomonas, Acinetobacter, Staphylococcus, Enterococcus, Pneumococcus* *S. pneumoniae, Haemophilus influenzae, Meningococcus*	<2months: Ceftriaxone **AND** Amikacin =2 months: Ceftriaxone#*	100 mg/kg/day Q12 H, IV 15 mg/kg/day Q 24H, IV 100 mg/kg/day Q12 H, IV	14-21days = 10 days
Acute encephalitis syndrome, IPD	*S. pneumoniae, Haemophilus influenzae, Meningococcus Viruses (HSV 1,2,HHV 6,7, Varicella, mumps, Measles, Japanese encephalitis,Dengue, Influenza, Enteroviruses), Rickettsia, Leptospira,P. falciparum, P. vivax*	Ceftriaxone# **AND** Acyclovir **AND** Artesunate ^(Add IV Doxycycline if Rickettsial infection is suspected)	100 mg/kg/day Q12H, IV 3m-12 y: 500mg/m² Q 8H, IV >12 y:30 mg/kg/dayQ 8H, IV =20 kg-2.4 mg/kg IV <20 kg-3 mg/kg IV At 0,12 & 24 hr f/b Q 24H, IV (can change to oral artemisin-combination therapy after 24 h)	14 days (Acyclovir to be given for 21 days only to confirmed casesof Herpes encephalitis) (IV artesunate for at least 24 h followed by 3 days of ACT to be given only to confirmed cases of cerebral malaria)
Community-acquired pneumonia **Uncomplicated**	*Pneumococcus, H. influenzae, S. aureus, S. pyogenes, gram negative bacilli*	0-3 months, IPD: Ampicillin **AND** Gentamicin	150 mg/kg/day Q 6H, IV 7.5 mg/kg/d Q 8H, IV	7-10 days

Disease	Likely organism	Empirical antibiotic choice	Dose route	Duration of treatment
Complicated pneumonia (empyema/pneumothorax/necrotising pneumonia)	*Pneumococcus, S. aureus, S. pyogenes and sometimes Klebsiella or other gram negative bacilli*	>3 months, OPD: Amoxicillin >3 months, IPD* Ampicillin Amoxicillin-clavulanic acid$	40-50mg/kg/d Q8-12 H, per oral 150 mg/kg/day Q 6H, IV 50-100 mg/kg/day Q 8H, IV	5 days 7-10 days 2-4 weeks (switch to oral amoxyclav as soon as afebrile)
Hospital-acquired pneumonia	*S. aureus*, Enterobacteriacea, *P seudomonas aeruginosa*, and anaerobes	Piperacillin-tazobactam/ Meropenem **AND** Vancomycin (if MRSA is a consideration)	300 mg/kg/day Q 6H, IV 60 mg/kg/day IV Q8 Hr 60-80 mg/kg/dayQ 6H, IV	10-14 days
Bacillary dysentery	*Shigella, Campylobacter, Salmonella, E. coli*	OPD: Cefixime IPD: Ceftriaxone	12-15 mg/kg/day Q 12H, per oral 80-100 mg/kg Q 24H, IV	5-7 days 5-7 days
Enteric fever	*Salmonella Typhi, Salmonella paratyphi*	OPD: Cefixime IPD: Ceftriaxone	20mg/kg/day Q 12H, per oral (up to a maximum of 400 mg per day) 50 to 100 mg/kgQ 12-24 H, IV (maximum 4 g per day)	10 to 14 days 10 to 14 days
Liver abscess	*S. aureus, S. pneumoniae*, Enterobacteriacea, anaerobes	Amoxicillin/clavulanate	50-100 mg/kg/day Q 8H, IV	2-4 weeks with early drainage and good response to antibiotics 4-6 weeks if incomplete drainage
Urinary Tract Infection **Acute febrile UTI**	*E. coli, Klebsiella spp, Proteus spp, Citrobacter, Enterococcus species, Non-fermenting gram-negative bacilli, Staphylococcus aureus*	OPD: Cefixime/Amoxicillin-clavulanic acid IPD:Ceftriaxone/ Cefotaxime	10mg/kg/day Q12H, per oral 40mg/kg/day amoxicillin Q12H, per oral	7-10 days

Disease	Likely organism	Empirical antibiotic choice	Dose route	Duration of treatment
Suspected lower UTI or cystitis		OPD: Cephalexin/ Cefadroxil/ Amoxicillin-clavulanic acid	75-100mg/kg/day Q12-24H, IV 100-150 mg/kg/day Q8-12H, IV 50-70 mg/kg/day Q8-12H, per oral 30 mg/kg/day Q12H, per oral 40 mg/kg/day amoxicillin Q12H, per oral	7 - 10 days (switch to oral therapy as soon as afebrile) 3-5 days
Spontaneous Bacterial Peritonitis, IPD	*S. pneumoniae, S. pyogenes, E. coli*	Ceftriaxone/ Cefotaxime/ Ampicillin with **Gentamicin OR **Amikacin	75-100 mg/kg/day Q12-24 H, IV 100-150 mg/kg/day Q8-12 H, IV 100-200 mg/kg/day Q6H, IV 7.5 mg/kg/day Q8H, IV/ 15mg/kg/day Q8H, IV	7-10 days
Septic arthritis, IPD	*S. aureus, S. pyogenes, Enterobacteriac eae*	Ceftriaxone/ Cefotaxime **AND** Vancomycin	75-100 mg/kg/day Q12-24 H, IV 100-150 mg/kg/day Q 8-12 H, IV 60 mg/kg/day Q 6H, IV	6 weeks

*Add injection Amikacin, IV to children with severe acute malnutrition or other immunocompromised states

#Injection Vancomycin may be added in following situations:

1) Suspected Staphyloccal infection-presence of pneumatocele/pneumothorax/pleural effusion on chest x ray, large skin boils/abscess, post measles pneumonia
2) Hemodynamically unstable patient
3) Prior antibiotic exposure for meningitis

^Doxycycline dose:

<40 kg: 4.5 mg/ kg/day Q 12H, IV/oral for 7 days

>40 kg: 200 mg/day Q 12H, IV/oral for 7 days

Azithromycin in the dose of 10 mg/kg/day, IV/oral for five days, is an alternative.

$Use IV ceftriaxone/cefotaxime (to cover H.influenzae) **AND** IV vancomycin in case of hemodynamic compromise or possibility of meningitis.

** Discontinuation of aminoglycosides should be considered as soon as culture report is available, to avoid nephrotoxicity.

PEDIATRIC SURGERY

1. Clean surgeries

S. No	Disease	Preop Antibiotics	Post op antibiotics	Duration
1	**Uncomplicated Hernia, cyst excision, hydrocele, undescended testis**	Single dose of Inj Cefotaxime /Ceftriaxone(50mg/kg) 30 mins before incision	Not prescribed	NA
2	**Circumcision**	Single dose of Inj Cefotaxime /Ceftriaxone(50mg/kg) 30 mins before incision	Local Neosporin ointment	5days

2. Clean surgeries likely to be contaminated-

S.No	Disease	Preop Antibiotics	Post op antibiotics	Duration
1	**Urological Procedures**	Single dose of Inj Cefotaxime /Ceftriaxone(50mg /kg) 30 mins before incision	Inj Cefotaxime /Ceftriaxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily **(avoid in patients with CKD)** Followed by Oral Cefixime @ 4mg/kg till implant (catheter/stent) removal	3-5days
2	**Gastro-intestinal Surgeries/ Non GI major trans abdominal surgeries**	Single dose of Inj Cefotaxime /Ceftriaxone(50mg /kg) 30 mins before incision	Inj Cefotaxime/Ceftriaxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily **(avoid in patients with CKD)** Inj metronidazole 7.5mg/kg 8 hourly	3-5 days

3. Contaminated/dirty surgeries or peritonitis-

S.No	Disease	Preop Antibiotics	Post op antibiotics 1st line	2nd line	Duration
1	**Perforation Peritonitis**	Single dose of Inj Cefotaxime /Ceftriaxone(50mg/kg) 30 mins before incision	Inj Cefotaxime/ Ceftriaxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily Inj metronidazole 7.5mg/kg 8th hourly	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin and Metronidazole Or depending upon antibiotic sensitivity pattern.	3-5days

S.No	Disease	Preop Antibiotics	Post op antibiotics 1st line	2nd line	Duration
2	**Empyema thoracis**	Single dose of Inj Cefotaxime /Ceftriaxone(50mg/kg) 30 mins before incision	Inj Cefotaxime /Ceftriaxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin 15mg/kg once daily	5-7days
3	**Necrotising fascitis**	Single dose of Inj amoxicillin with clavulanic acid 30mg/kg /Ceftriaxone(50mg/kg) 30 mins before incision	Inj amoxicillin with clavulanic acid 30mg/kg in 3 divided doses Inj Amikacin 15mg/kg once daily (ensure normal renal function) Inj metronidazole 7.5mg/kg 8th hourly	Inj Meropenem 20mg/kg 8th hourly and Inj Vancomycin 15mg/kg 8th hourly Or Inj Clindamycin 20-40mg/kg/day 8th hourly	Duration depends on clinical response Antibiotics changed/ upgraded based on culture and sensitivity
4	**Cellulitis / abscess**	Single dose of Inj Amoxicillin with clavulanic acid 30mg/kg/ Ceftriaxone (50mg/kg) 30 mins before incision	Inj Amoxicillin with clavulanic acid 30mg/kg in 3 divided doses Inj Amikacin 15mg/kg once daily	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin 15mg/kg once daily	Duration depends on clinical response Antibiotics changed/ upgraded based on culture and sensitivity

4. Hepatobiliary surgeries-

S. No	Disease	Preop Antibiotics	Post op antibiotics 1st line	2nd line	Duration
1	**Biliary atresia**	Single dose of Inj Ceftriaxone(50mg/kg) 30 mins before incision	Inj Piperacillin/ Tazobactum 100 mg/kg 8 hrly Inj Amikacin 15mg/kg once daily Inj Metronidazole 7.5mg/kg 8th hourly	Inj Meropenem 20mg/kg 8th hourly Amikacin and Metronidazole	5days

S. No	Disease	Preop Antibiotics	Post op antibiotics 1st line	2nd line	Duration
			Followed by oral cefixime 8mg/kg in two divided doses OR Oral Cotrimoxazole 10mg/kg in two divided doses		6weeks 6 weeks (alternatively till 6-12months)
2	**Choled ochalcyst**	Single dose of Inj Ceftrioxone(50mg /kg) 30 mins before incision	Inj ceftrioxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily Inj metronidazole 7.5mg/kg 8th hourly	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin and Metronidazole	5-7days
3	**Cholelithiasis**	Single dose of Inj Ceftrioxone(50mg /kg) 30 mins before incision	Inj ceftrioxone 100mg/kg in two divided doses Oral cefixime 8mg/kg twice a day		3-5 days

5. Neonatal surgeries-

S. No	Disease	Preop Antibiotics	Post op antibiotics 1st line	2nd line	Duration
1	**Esophageal atresia/ Diaphragmatic eventeration / hernia Congenital lung cysts**	Single dose of Inj Cefotaxime /Ceftriaxone (50mg /kg) 30 mins before incision	Inj Cefotaxime /Ceftriaxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily Inj Metronidazole 7.5mg/kg 8thhourly	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin and Metronidazole Or Inj Meropenum 20mg/kg 8th hourly and Inj Vancomyc in 15mg/kg 8th Hourly	5-7 days

S. No	Disease	Preop Antibiotics	Post op antibiotics 1st line	2nd line	Duration
2	**Ano rectal malformation Pouch colon Hirschsprung disease**	Single dose of Inj Cefotaxime /Ceftriaxone (50mg /kg) 30 mins before incision	Inj Cefotaxime /Ceftriaxone 100mg /kg in two div ided doses Inj Amikacin 15mg/kg once daily Inj Metronidazole 7.5mg/kg 8th hourly	Inj Piperacillin/Tazobactum 100mg/kg 8 hourly plus Amikacin and Metronidazole Or Inj Meropenem 20mg/kg 8th hourly and Inj Vancomycin 15mg/kg 8th hourly	3-5days
3	**NEC Intestinal perforation atresia Malrotation / midgut volvulus**	Single dose of Inj Cefotaxime /Ceftriaxone (50mg /kg) 30 mins before incision	Inj Cefotaxime 100mg/kg in two divided doses or Inj Ampicillin 100mg/kg 8th hourly+ Inj Amikacin 15mg/kg once daily+ Inj metronidazole 7.5mg/kg 8th hourly	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin and Metronidazole Or Inj Meropenem 20mg/kg 8th hourly and Inj Vancomycin 15mg/kg 8th hourly	Duration depends on clinical response Antibiotics changed/ upgraded based on report of culture and sensitivity

6. Paediatric neurosurgery

S. No	Disease	Preop Antibiotics	Post op antibiotics	Duration
1	**Ventriculo Peritoneal Shunt**	Inj Ceftriaxone 50mg/kg single dose 30mins before incision	Inj Ceftriaxone 100mg/kg in two divided doses Inj Amikacin15mg/kg once daily Followed by oral cefixime 4mg/kg/day	5-7days 15days
2	**MMC/encephalocele excision**	Inj Ceftriaxone 50mg/kg single dose 30mins before incision	Inj Ceftriaxone 100mg/kg in two divided doses Inj Amikacin15mg/kg once daily	5days

7. Special Conditions (needing long term chemoprophylaxis)

S. No	Disease	Preop Antibiotics	Post op antibiotics 1st line	2nd line	Duration
1	**Biliary atresia**	Single dose of Inj Ceftriaxone(50mg /kg) 30 mins before incision	Inj Ceftriaxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily Inj metronidazole 7.5mg/kg 8thhourly Followed by oral cefixime 8mg/kg in two divided doses Oral Cotrimoxazole 10mg/kg in two divided doses	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin and Metronidazole	5 days 6 weeks 6 weeks (alternatively till 6-12months)
2	**Splenectomy**	Single dose of Inj Cefotaxime /Ceftriaxone(50 mg/kg) 30 mins before incision Vaccination for Hemophilus, Pneumococci and Meningococci 1month before surgery	Inj Cefotaxime /Ceftriaxone 100mg/kg in two divided doses Inj Amikacin 15mg/kg once daily Inj metronidazole 7.5mg/kg 8th hourly Oral antibiotic prophylaxis with Amoxycillin 100mg/kg in two divided doses	Inj Piperacillin/ Tazobactum 100mg/kg 8 hourly plus Amikacin and Metronidazole	3-5days Till 10 years of age or 1year post-surgery whiche ver is earlier
3	**Vesicouret eric reflux (on conservative management)**	Oral Cotrimoxazole (4mg of TMP component) /kg/day OR Nitrofurantoin 2mg/kg/day	-	-	Till 5 years of age or till resolution of VUR

8. Other urological Conditions-

S.No	Disease	Antibiotics	Duration
1	**Uncomplicated Lower UTI (age> 2 months)**	Oral Cotrimoxazole (8-10mg of TMP component) /kg/day oral BD (Not below 6 months of age) OR Cefixime (8-10 mg/kg/day BD) to be given for OR Co Amoxycillin+Clavulanic Acid (30-50 mg of Amoxicillin)	7-10 days
2	**Complicated / Severe UTI (Febrile UTI, Systemic toxicity) and all UTI in children less than 2 months**	Inj. Cefotaxime (150-200mg/kg/day 8h OR Inj. Ceftriaxone (100mg/kg/day OD OR Inj. Amikacin 15mg/kg OD	10-14 days

PLASTIC SURGERY

This antibiotic policy provides guidance on the appropriate use of antibiotics in patients managed for plastic surgery-related infections. The goal is to ensure effective treatment, reduce antimicrobial resistance, and improve patient outcomes.

1. General Principles:

- Using culture-directed therapy whenever possible.
- Avoiding prolonged antibiotic use without clinical justification.
- Considering patient-specific factors (e.g., immune status, renal function, allergies).
- Emphasizing surgical debridement, wound care, and infection control measures.
- No antibiotics are being used in clean minor surgeries such as scar revision, finger contracture release, and facial aesthetic surgeries.

2. Antibiotic Guidelines for Common Conditions

A. Post-Cellulitis Raw Area

Management Approach:

- Primary treatment: Serial debridement and appropriate wound dressings.
- Antibiotics are being used only if there are signs of secondary infection.
- Culture-directed therapy is being used if infection is suspected.

Definitive Therapy (Based on Culture Results):

- MRSA: Vancomycin
- Gram-negative bacteria: Cefepime OR Piperacillin-tazobactam
- Anaerobes: Metronidazole

Wound Care:

- Serial surgical debridement as needed.
- Advanced wound dressings (e.g., negative pressure wound therapy if indicated).
- Optimization of comorbidities (e.g., diabetes control, nutritional support).

Duration:

- If infection is present: 7-14 days of targeted antibiotics.
- If no infection: No antibiotics required; continuing wound care.

B. Diabetic Foot Ulcers

Management Approach:

- Primary treatment: Serial debridement and appropriate wound dressings.
- Antibiotics are being used only if there are signs of infection.
- Culture-directed therapy is being used if infection is suspected.

Definitive Therapy (Based on Culture Results):

- MRSA: Vancomycin
- Gram-negative bacteria: Cefepime OR Piperacillin-tazobactam
- Anaerobes: Metronidazole

Wound Care:

- Serial surgical debridement as needed.
- Advanced wound dressings (e.g., negative pressure wound therapy if indicated).
- Optimization of comorbidities (e.g., blood sugar control, nutritional support).

Duration:

- If infection is present: 7-14 days of targeted antibiotics.
- If no infection: No antibiotics required; continuing wound care.

C. Chronic Osteomyelitis with Raw Area

Management Approach:

- Serial debridement and wound care are the primary treatments.
- Antibiotics are being used based on culture results.

Definitive Therapy (Based on Culture Results):

- MRSA: Vancomycin
- Gram-negative rods: Cefepime OR Meropenem

Duration:

- 4-6 weeks IV antibiotics followed by oral suppression if needed.

D. Antibiotic Prophylaxis for Cancer Flap Reconstruction Surgeries

Preoperative Prophylaxis:

- Standard prophylaxis: Beta-lactams within 60 minutes before incision.
- If anaerobic coverage needed: Beta-lactams + Metronidazole OR Ampicillin-sulbactam
- High MRSA risk: Vancomycin (if MRSA colonization is suspected or confirmed).
- Penicillin allergy (non-severe): Cefuroxime + Metronidazole
- Penicillin allergy (severe): Clindamycin + Gentamicin

Postoperative Antibiotic Use:

- Uncomplicated cases: No further antibiotics beyond 24 hours.
- High-risk cases (e.g., extensive flap procedures, contamination, prolonged surgery):
- First 24-48 hours: Beta-lactams
- If MRSA risk or signs of infection: Vancomycin + Piperacillin-tazobactam

Duration:

- Routine cases: Single dose preoperatively, possibly extended to 24 hours.
- Complicated cases: Up to 48 hours, reassessing for infection.

3. Antibiotic Stewardship Strategies:

1. De-escalation based on culture results.
2. Avoiding unnecessary broad-spectrum antibiotics.
3. Regular review of antimicrobial resistance patterns.
4. Implementing infection control measures (e.g., hand hygiene, MRSA screening).

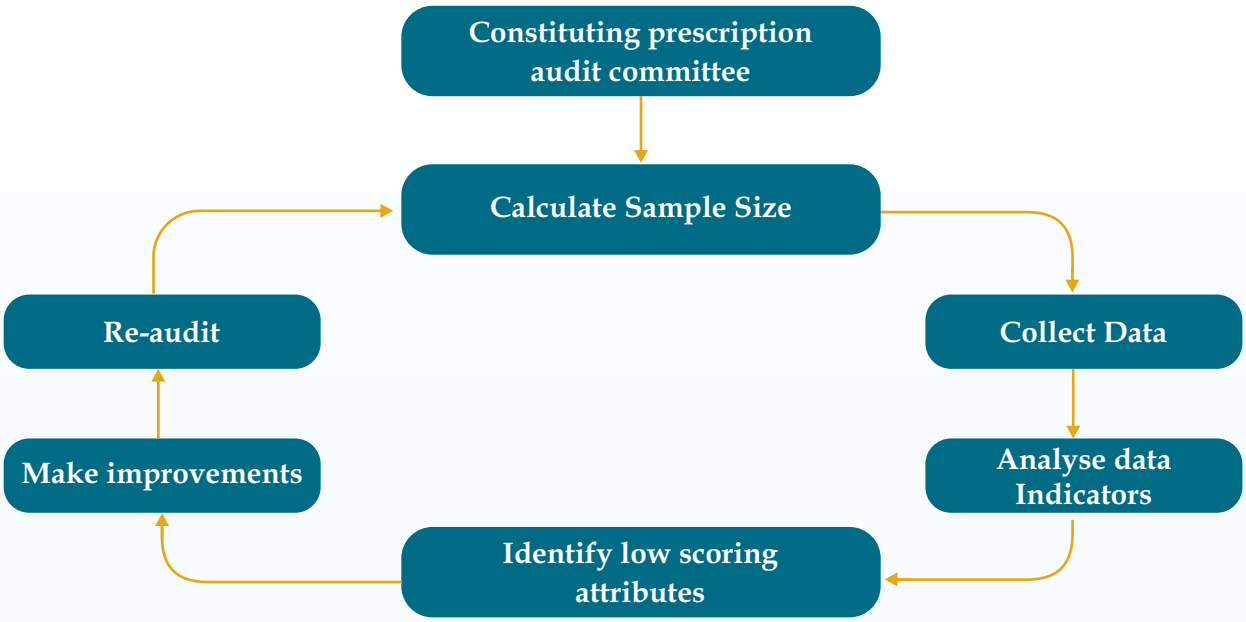
4. Duration of Therapy Guidelines:

- Post-cellulitis raw area: No antibiotics unless infected; 7-14 days if infected.
- Diabetic foot ulcer: No antibiotics unless infected; 7-14 days if infected.
- Osteomyelitis: 4-6 weeks.
- Cancer flap reconstruction surgery prophylaxis: Single dose preoperatively, up to 24-48 hours in high-risk cases.
- Postoperative infections: 7-14 days (adjust per clinical response).

5. Conclusion:

This antibiotic policy ensures effective infection management while preventing antimicrobial resistance. Serial debridement and advanced wound care are being prioritized over unnecessary antibiotic use.

PRESCRIPTION AUDIT METHODOLOGY



ia/ Attributes

Audit points

1) OPD Registration Number mentioned?
2) Complete Name of the patient is written?
3) Age in years (≥ 5 in years) in case of < 5 years (in months)
4) Weight in Kg (only patients of paediatric age group)
5) Date of consultation - day / month / year
6) Gender of the patient:
7) Handwriting is Legible in Capital letter
8) Brief history Written
9) Allergy status mentioned
10) Salient features of Clinical Examination recorded
11) Presumptive / definitive diagnosis written
12) Medicines are prescribed by generic names
13) Medicines prescribed are in line with STG
14) Medicine Schedule / doses clearly written
15) Duration of treatment written
16) Date of next visit (review) written

17) In case of referral, the relevant clinical details and reason for referral given.

18) Follow-up advise and precautions (do's and don'ts) are recorded

19) Prescription duly signed (legibly)

20) Medicines Prescribed are as per EML/ Formulary

21) Medicines advised are available in the dispensary

22) Vitamins, Tonics or Enzymes prescribed

23) Antibiotics prescribed?

24) Antibiotics are prescribed as per facility's Antibiotic Policy

25) Investigations advised?

26) Injections prescribed

27) Number of Medicines prescribed.

Indicators to Check the completeness of Prescription

i) Patient details- name, age, gender, address, reported allergy, Date of consultation/registration in OPD date.

ii) Chief Complaint- History

iii) Diagnosis

iv) Medicine information- Name of medicines prescribed in full or abbreviation, strength of formulation, dose, advisory (before/after food, at bedtime, etc.) duration of therapy, medicine interactions

v) Non-pharmacological treatment description

vi) Signature and information about the prescriber– doctor's name, qualification, registration no

Indicators for Legibility and Rationality of the Prescription

i) % of prescription with legible handwriting.

ii) % of prescription where medicines prescribed are in line with STG.

iii) % of prescription where allergies are mentioned.

iv) % of prescription with brief history written.

v) % of prescription with provisional or Final Diagnosis

vi) % of prescription where salient features of clinical examination are recorded.

vii) % of prescription where schedule/Dosages are written.

viii) % of prescription with Vitamins, Tonics, or Enzymes.

ix) % of prescription wherein Antibiotics are prescribed as per Hospital Antibiotic Policy.