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ID Practices:

Right Diagnosis and Treatment

(Version 3.0, An integrated antimicrobial stewardship bedside manual)

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Antimicrobial resistance (AMR) poses a serious health problem. In recent Lancet paper, it says this AMR will cause >39 million deaths during 2025-2050. Most important factor for increasing AMR is irrational use of these highly effective antimicrobial drugs. It is thus a need of hour to empower health care providers with a guide to antimicrobial therapy. This guide is known as 'antimicrobial stewardship' where we all have to be optimal while using antimicrobials. "START SMART - THEN FOCUS" Guidance for stewardship in hospitals (England) is a very good way of communication to all hospital staffs. Do not start antibiotics in the absence of evidence of bacterial infection is 'START SMART'. Once antibiotics started 'THEN FOCUS' applies by reviewing the diagnosis and deciding in STOP/SWITCH/CHANGE/CONTINUE/OPAT of antibiotic therapy. If we can practice right diagnosis and right drug at all times, >50% work is done. I'm sure this version of this booklet "ID Practices: Right Diagnosis and Treatment" will pave a long way to treat most infectious diseases. Latest versions will be brought out from time to time to enable health professionals tackle problem of AMR.

As a head of this institution, I support this stewardship activity. And let all of us pledge to practice integrated antimicrobial stewardship at all moments.

Prof. Meenu Singh

Medical Superintendent

Antimicrobial stewardship is the responsible use of antimicrobials. Over 30% of prescriptions for antimicrobials could be improved or are not even indicated. This widespread misuse has contributed to the rise of drug resistance. Discovery of antimicrobials is being followed by development of their resistance, for example penicillin was introduced in 1942, its resistance detected in 1945. Now-a-days multi-resistant bacteria are even more common. Misuse also puts patients at unintended risk of drug-drug interactions, side effects, and adverse events. Antimicrobial Stewardship has a proven impact. Studies show that hospital antimicrobial stewardship programs improve the safety and quality of patient care by reducing antibiotic resistance, reducing adverse events, and reducing costs. With this aim we here at AIIMS conceive the idea of spreading the awareness regarding antimicrobial resistance and their protection though this stewardship.

I'm confident this version of this booklet "ID Practices: Right Diagnosis and Treatment" will help to treat most infectious diseases in the hospital and to enable health professionals to tackle the problem of antimicrobial resistance in an integrated way combining HICC, AMSP, and diagnosis stewardship.

As a head of the hospital section, I support this stewardship activity. And let all of us pledge to practice integrated antimicrobial stewardship during daily patient care.

Prof. Sanjeev Kumar Mittal

Secretary AMSP Committee

Antimicrobial resistance poses a serious health problem. Most important factor for increasing antimicrobial resistance is lack of integrated works among various health care workers including patients. It is thus a need of hour to work in a team. A growing body of evidence demonstrates that Integrated Antimicrobial Stewardship (IAS) Practice can optimize the outcomes by improving understanding towards right hospital infection prevention and control activities (ISP), right microbial diagnostic steps (DSP), and right use of antimicrobials (ASP). One of the core components of IAS practice is evidence-based practice guideline to incorporate. This is first and essential element to be practiced by all health professionals. This will optimize right Do's (1st D) and Don'ts (2nd D) of ISP, Right Diagnosis (3rd D) of DSP, Right Drug (4th D), Dose (5th D), Delivery (6th D), Decision on follow-up (7^{th} D), and Duration (8th D) of ASP. This is the right time to integrate these practices in hospital workings. I'm confident this version of this booklet "ID Practices: Right Diagnosis and Treatment" will help to treat most infectious diseases in the hospital and to enable health professionals to tackle the problem of antimicrobial resistance. As a head of the hospital section, I support this stewardship activity. And let all of us pledge to practice integrated antimicrobial stewardship during daily patient care.

Prof (Addl). Prasan Kumar Panda

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Author in Previous edition V2.0

Clinician's core competencies to become bedside IAS steward

C1: Understands the patient and HCW, practices standard precaution, and makes right diagnosis

C2: Understands the treatment options and chooses right drug/dose

C3: Liaisons with other healthcare professionals to execute right dose, delivery, decision on follow- up, and duration

C4: Monitors and reviews the patient's response to treatment

C5: Ensures infection prevention & control practices

C6: Communicates the diagnosis, treatment, and prevention plan and its rationale clearly to the patient and other healthcare professionals

C7: Documents in detail and analyse precisely in infectious disease meets

C8: Does research and makes the society healthier

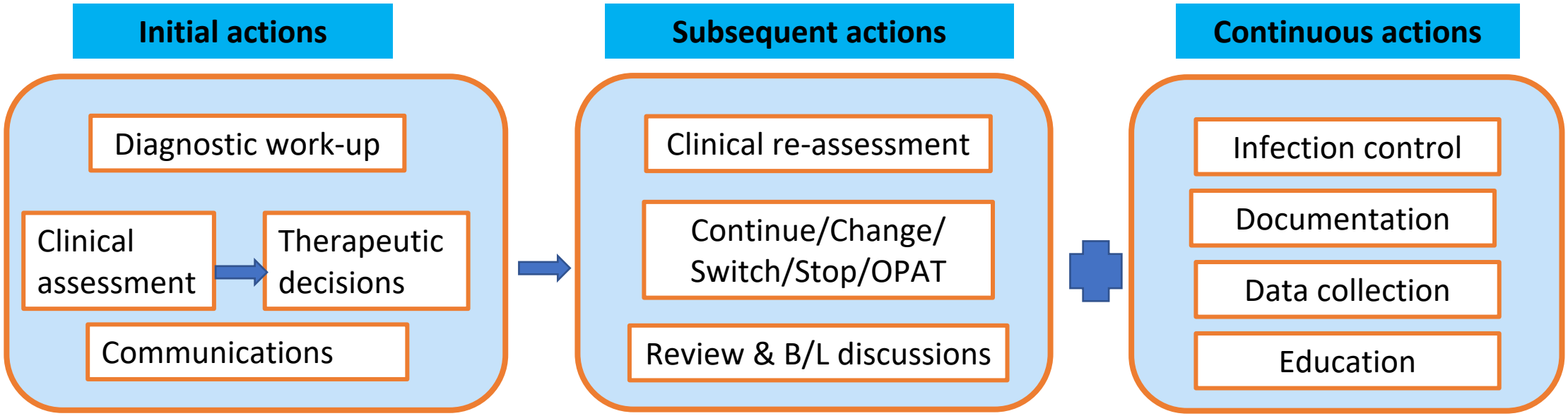
Introduction

Definition Of Antimicrobial Stewardship -The right antimicrobial, for the right patient, at the right time, with the right dose, and the right route, causing the least harm to the patient and future patients.

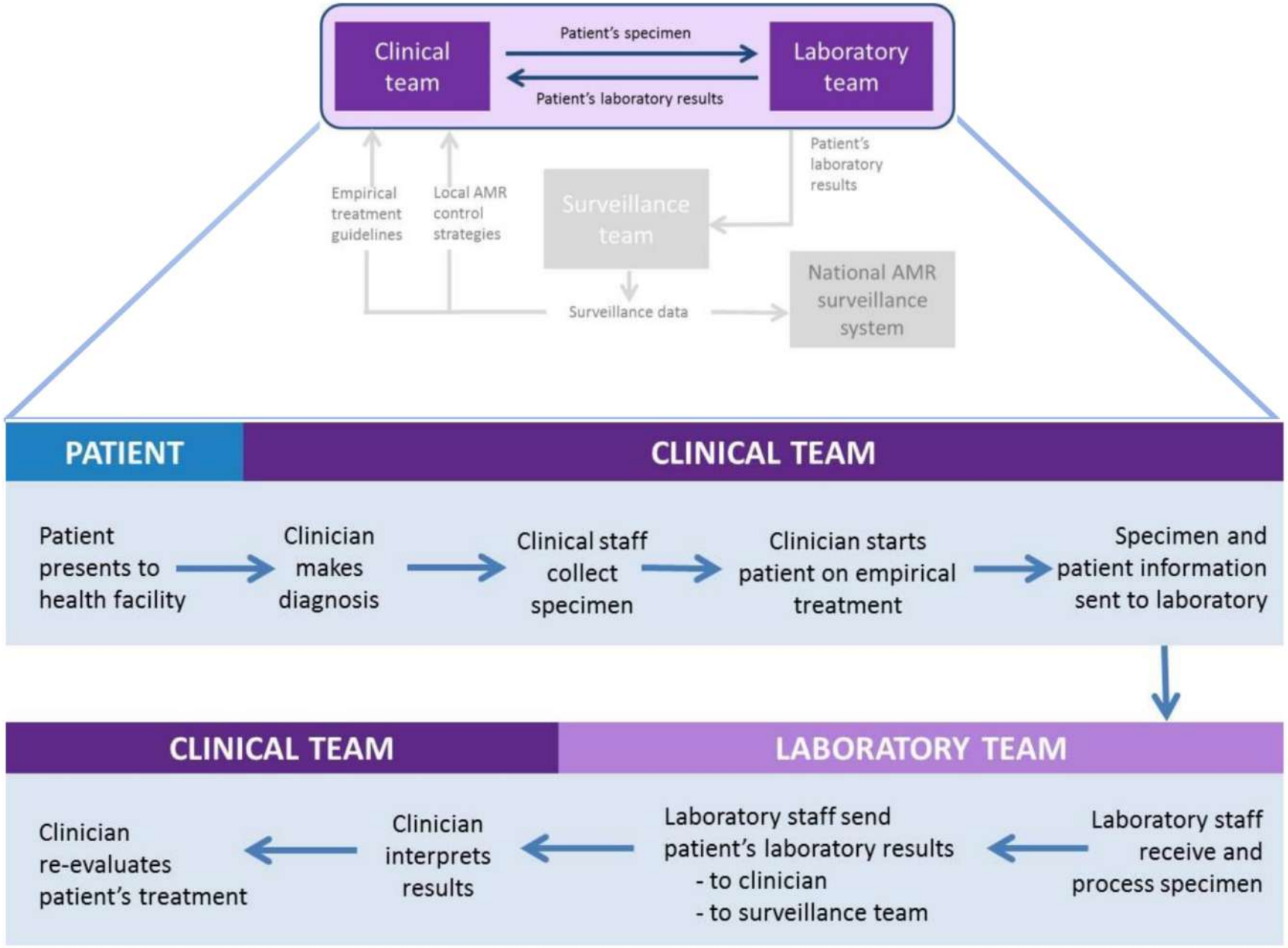
INTEGRATED ANTIMICROBIAL STEWARDSHIP (IAS) PRACTICE - 8D's

Right Do's and Don'ts of Infection Prevention → Right Diagnosis → Right Drug → Right Dose → Right Delivery → Right Decision on follow-up → Right Duration

Decision Making in Right Diagnosis & Treatment



Diagnostic Pathway



RIGHT DIAGNOSIS – APPROACH TO FEVER

Prasan K Panda, Abhishek Rai

Fever of duration less than 3 days

Step 1: Rule out sepsis (Calculate MEWS score)

Step 2: Look for localizing signs and symptoms (CNS/ respiratory/ gastrointestinal/ urinary tract/ skin, etc)

Step 3: Look for typical exanthems and rule out exanthematous fever

Step 4: Test patient for Malaria and Dengue
(MP ICT, PS for malaria, NS1/IgM dengue)

If negative: No further investigation required.
Given only Tab PCM and oral fluids

MEWS Score Interpretation:

1. A score >5 is statistically linked to increased likelihood of death or ICU admission
2. For any single physiological parameter scored +3, consider higher level of care for patient

Fever of duration more than 3 days

Follow all 4 steps as for fever of duration < 3 days

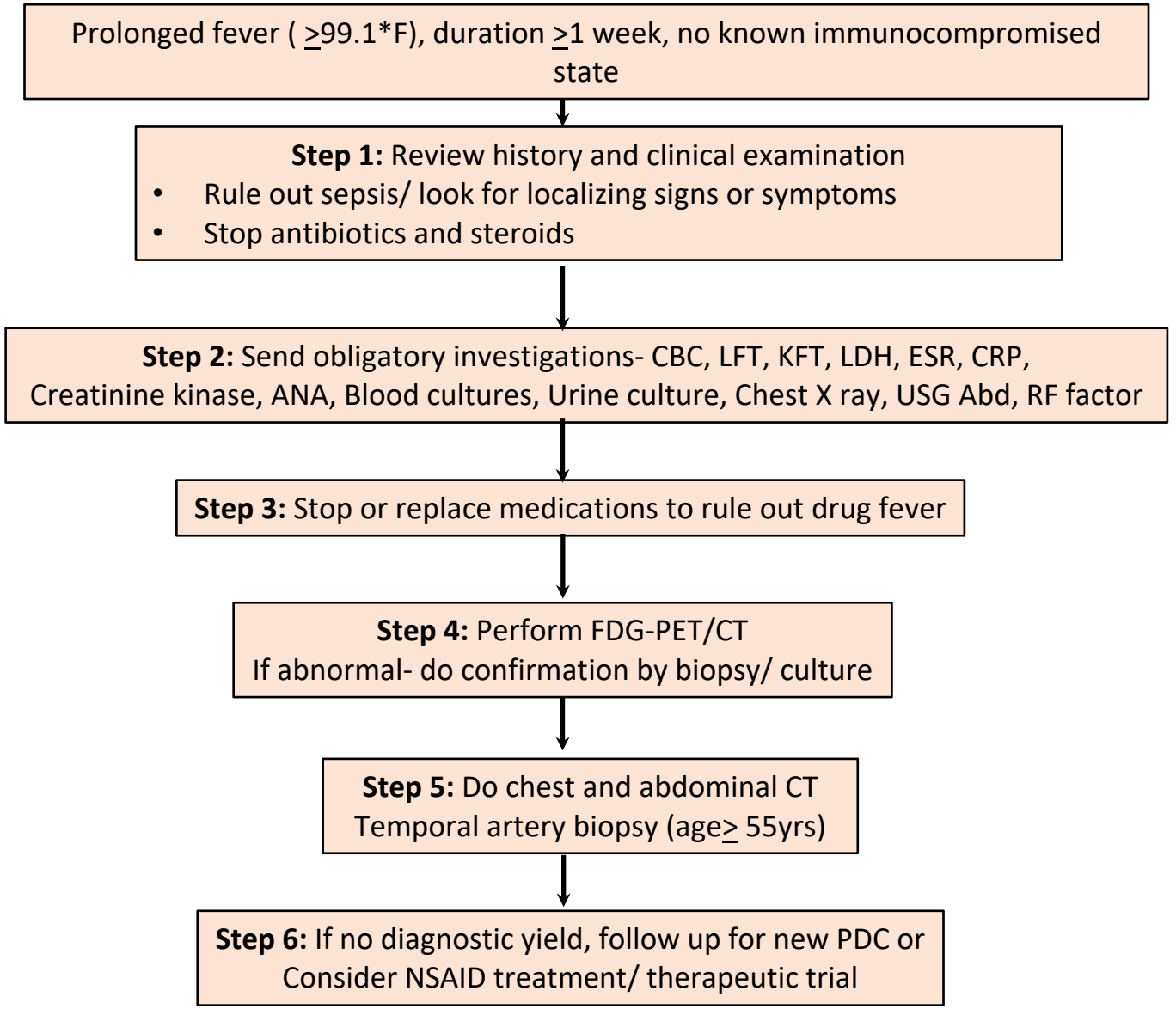
Step 5: Send Cultures (Blood/ Urine) and Initiate antibiotics for enteric fever- Ceftriaxone or Azithromycin
If suspicion of Scrub typhus- Give Doxycycline

Step 6: If cultures positive- modify treatment as per report. If cultures negative and duration of fever > 1week: follow FUO algorithm

MEWS SCORE	3	2	1	0	1	2	3
SYSTOLIC BP	<70	71-80	81-100	101-199		>200	
HR		<40	41-50	51-100	101-110	111-129	>130
RR		<9		9-14	15-20	21-29	>30
TEMPER-ATURE		<95F		95-101.2 F		>101.3	
AVPU SCORE				ALERT	VOICE	PAIN	UN-RESPONSIVE

1. *Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022.*
2. *Gardner-Thorpe et al.,(2006). The Value of Modified Early Warning Score (MEWS) in Surgical In-Patients: A Prospective Observational Study. Annals of The Royal College of Surgeons of England, 88(6), 571-575.*

RIGHT DIAGNOSIS – APPROACH TO PROLONGED FEVER/FUO



1. *Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022.*
2. *2 Fernandez, C. et al (2018). Pyrexia of unknown origin. Clinical Medicine, 18(2), 170-174. 3.Panda pk, et al. Definition of Fever of Unknown Origin in Indian Patients. JASPI. 2024;2(1):1-4.*

RIGHT DIAGNOSIS - SEPSIS AND SEPTIC SHOCK

Prasan K Panda, Ashish Sharma, Chackappen A, Mukesh Bairwa

SEPSIS: A life-threatening organ dysfunction caused by a dysregulated host response to infection.

THREE STEP SEPSIS CLASSIFICATION MODEL:

- Step 1 involves the use of the NEWS-2 score to detect dysregulated host responses indicative of sepsis when the score is ≥6 and prompts further evaluation
- Step 2 evaluates the presence of risk factors that predispose patients to infections.
- Step 3 involves determining evidence of infection

Interpretation	Outcome
(i) Step-1 = negative (ii) Step-1= positive with step-2 & 3 = negative	Asepsis
Step-1, 2 & 3(a) = positive	Possible sepsis
Step-1, 2 & 3(b) = positive	Probable sepsis
Step-1, 2 & 3(c) = positive	Confirmed sepsis

SEPTIC SHOCK: Suspected (or documented) infection AND vasopressor therapy needed to maintain mean arterial pressure at ≥65 mmHg and serum lactate>2.0 mmol/L despite adequate fluid resuscitation

NEWS 2 Score (Or any score like SOFA/MEWS can be used):

Improves the detection and response to clinical deterioration in adult patients.

Physiological parameter	Score 3	2	1	0	1	2	3
Respiration rate (per minute)	≤8		9–11	12–20		21–24	≥25
SpO_2 Scale 1 (%)	≤91	92–93	94–95	≥96			
SpO_2 Scale 2 (%)	≤83	84–85	86–87	88–92 ≥93 on air	93–94 on oxygen	95–96 on oxygen	≥97 on oxygen
Air or oxygen?		Oxygen		Air			
Systolic blood pressure (mmHg)	≤90	91–100	101–110	111–219			≥220
Pulse (per minute)	≤40		41–50	51–90	91–110	111–130	≥131
Consciousness				Alert			CVPU
Temperature (°C)	≤35.0		35.1–36.0	36.1–38.0	38.1–39.0	≥39.1	

STEP	DESCRIPTION
Step 1: Evidence of Dysregulated Host Response	Assessed using the National Early Warning Score-2 (NEWS-2) ≥6
Step 2: Risk factors for infection	Evaluated based on the presence of risk factors such as chronic illnesses, malnutrition, unhygienic living conditions, immunosuppressive states, age, trauma, structural diseases, recent surgery, travel history, animal bites, and previous hospitalizations
Step 3: Evidence of Infection	Determined through -
3a. Clinical Evidence	Syndromic diagnosis including pyelonephritis, infective endocarditis, intra-abdominal infections, skin and soft tissue infections, meningitis, cerebrospinal fluid shunt infections, catheter-related infections, osteomyelitis, abscesses, and pneumonia
3b. Supportive/ Suggestive Evidence	Imaging (X-ray, ultrasound, computed tomography, magnetic resonance imaging, positron emission tomography) and biomarkers (blood, urine, other fluids)
3c. Confirmatory Evidence	Direct visualization, endoscopic evidence, microscopy and culture growth, polymerase chain reaction/gene detection, and immunological methods

1. Evans et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. Critical Care Medicine: November 2021 - Volume 49 - Issue 11 - p e1063-e1143.

2. Pilania J, Das A, Panda PK, Chauhan U. 3-step Model- An Explorative Novel Approach to Classify Sepsis: A Longitudinal Study. JASPI. 2024;2(3):- 15-21 DOI: 10.62541/jaspi046

RIGHT DIAGNOSIS - SEPSIS AND SEPTIC SHOCK

Suspected site	Symptoms/signs	Initial microbiologic evaluation
Upper respiratory tract	Pharyngeal inflammation + exudate ± swelling/ lymphadenopathy	Throat swab for aerobic culture
Lower respiratory tract	Productive cough, pleuritic chest pain, consolidative auscultatory findings	Sputum of good quality, rapid influenza testing, urinary antigen testing (eg, pneumococcus, legionella; not recommended in children), quantitative culture of protected brush or bronchoalveolar lavage
Urinary tract	Urgency, dysuria, loin, or back pain	Urine culture and microscopy showing pyuria
Vascular catheters: arterial, CVC	Redness or drainage at insertion site	Culture of blood (from the catheter and a peripheral site), culture catheter tip (if removed)
Pleural catheter	Redness or drainage at insertion site	Culture of pleural fluid (through catheter)
Skin/soft tissue	Erythema, oedema, lymphangitis	Culture blister fluid or draining pus; role of tissue aspirates not proven
CNS	Signs of meningeal irritation	CSF cell count, protein, glucose, Gram stain, and culture
Gastrointestinal	Abdominal pain, distension, diarrhoea, and vomiting	Stool culture for Salmonella, Shigella, or Campylobacter; detection of Clostridium difficile toxin
Intra-abdominal	Specific abdominal symptoms/signs	Aerobic and anaerobic culture of percutaneously or surgically drained abdominal fluid collections
PD catheter	Cloudy PD fluid, abdominal pain	Cell count and culture of PD fluid
Genital tract	Women: Low abdominal pain, vaginal discharge Men: Dysuria, frequency, urgency, urge incontinence, cloudy urine, prostatic tenderness	Women: Endocervical and high vaginal swabs onto selective media Men: Urine Gram stain and culture
Bone	Pain, warmth, swelling, decreased use	Blood cultures, MRI, bone cultures at surgery or by interventional radiology
Joint	Pain, warmth, swelling, decreased range of motion	Arthrocentesis with cell counts, Gram stain, and culture
Wound or burn	Inflammation, edema, erythema, discharge of pus	Gram stain and culture of draining pus, wound culture not reliable

RISK FACTORS FOR MULTI-DRUG RESISTANT ORGANISMS

MRSA

Previous infection/colonization by MRSA in the last 12 months
Hemodialysis/peritoneal dialysis/central venous catheters
Administration of multiple antibiotics in the last 30 days
Immunosuppression/IV Drug addiction
Rheumatoid arthritis
Patients coming from long-term care facilities or who have undergone hospital stay in the last 12 months

Pseudomonas aeruginosa

Previous infection/colonization with P. aeruginosa in the last 12 months,
Cystic fibrosis/Poorly controlled Diabetes
Administration of multiple antibiotics in the last 30 days
Pulmonary anatomic abnormalities with recurrent infections
Elderly (>80 years), Presence of permanent urinary catheter,
Prolonged steroid use (>6 weeks),
Neutropenic fever

ESBL

Previous infection/colonization with ESBL in the last 12 months
Prolonged hospitalization (>10 days, in particular in ICU/hospice/long-term care facilities)
Presence of permanent urinary catheter
Patients with percutaneous endoscopic gastrostomy
Administration of multiple antibiotics in the last 30 days

Candida

Immunosuppression
Presence of central venous catheters or intravascular devices/TPN
Prolonged hospitalization (>10 days, particularly in an ICU)
Recent surgery (particularly abdominal surgery),
Prolonged wide-range antibiotic administration,
Previous necrotizing pancreatitis
Recent fungal infection/colonization

1. Guarino M, Perna B, Cesaro AE, Maritati M, Spampinato MD, Contini C, et al. 2023 Update on Sepsis and Septic Shock in Adult Patients: Management in the Emergency Department. JCM. 2023 Apr 28;12(9):3188.

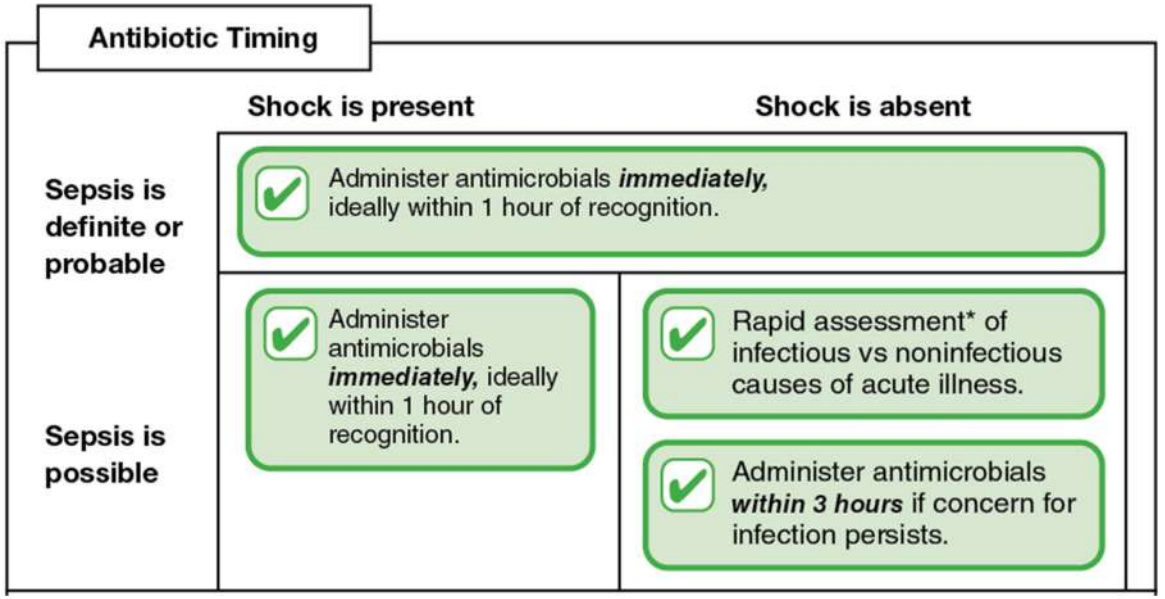
RIGHT TREATMENT - SEPSIS AND SEPTIC SHOCK

Category	Best practice statement
Possible sepsis/ septic shock	**Continuously re-evaluate** Discontinue empiric antimicrobials if alternative cause of illness is demonstrated
Possible/Probable sepsis without shock	Rapid assessment of the **likelihood** of infectious vs non-infectious causes
High risk of infection with MDR Organism	Empiric antimicrobials with MDR coverage (as per chapter on MDR organisms)
Sepsis with septic shock	**Hour - 1 Bundle of Care** Optimising dosing strategies of antimicrobials based on **PK/PD principles** Rapidly identifying or excluding a specific anatomical diagnosis of infection that requires emergent **source control** Prompt removal of IV access devices that are a possible source of sepsis after other vascular access has been established Use of pharmacologic venous thromboembolism (**VTE) prophylaxis** (LMWH over UFH) unless a contraindication to such therapy exists

Hour-1 Bundle of Care: Initial Resuscitation for Sepsis/Septic Shock

1. Measure lactate level*
2. Obtain blood cultures before administering antibiotics
3. Administer broad-spectrum antibiotics
4. Begin rapid administration of 30mL/kg **crystalloid** **over 3 hours** for hypotension or lactate level ≥ 4 mmol/L
5. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mm Hg

- Remeasure lactate if initial lactate is elevated (> 2 mmol/L).



1. Evans et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. Critical Care Medicine: November 2021 - Volume 49 - Issue 11 - p e1063-e1143

2. Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022.

RIGHT TREATMENT - SEPSIS AND SEPTIC SHOCK

IN IMMUNOCOMPETENT PATIENT

- **Piperacillin – Tazobactam** 4.5g q6h/ **Cefepime** 2g q8h/ **Meropenem** 1g q8h/
- If the patient is allergic to beta lactam-**Aztreonam** (2 Gm q8h)/ **Levofloxacin** (750 Mg q24h)
- Add **Vancomycin** (loading dose of 25–30 mg/kg, then 15–20 mg/kg q8–12h) **if** MRSA suspected
- High risk for MDR; two antimicrobials with gram-negative coverage for empiric treatment over one gram-negative agent

NEUTROPENIC PATIENT (ANC <500)

- **Cefepime** (2 Gm 8qh) or **Meropenem** (1 Gm 8qh) or **Piperacillin-tazobactam** (3.375 Gm 4qh)
- Add **vancomycin** - if suspected CRBSI, severe mucositis, skin/soft tissue infection, or hypotension

POST SPLENECTOMY PATIENTS

- **Ceftriaxone** (2 g q24h or 2gm 12h in meningitis)
- Add **Vancomycin -** if local prevalence of Cephalosporin-resistant pneumococci is high
- If the patient is allergic to β-lactam antibiotics: **Levofloxacin** (750 mg q24h) plus **Vancomycin**

- ❖ All antimicrobials are administered through IV route (Beta lactam by continuous infusion)
- ❖ Modify antimicrobial regimen in 48-72 hours based on results of culture & susceptibility reports, the site of infection and the clinical status of the patient
- ❖ In case of deterioration in spite of hiking of antibiotics consider multidrug resistance or sepsis by other organisms (MRSA) - Add Vancomycin if not before
- ❖ With high risk of fungal infection (e.g.: immunocompromised patients or patients with febrile neutropenia), add empiric antifungal therapy
- ❖ No recommendation on the use of antiviral agents.

SOURCE CONTROL METHODS IF SOURCE IDENTIFIED

Source	Interventions
Pneumonia	Chest physiotherapy, suctioning
Urinary tract	Drainage of abscesses, relief of obstruction, removal or changing of infected catheters
Catheter-related bacteraemia	Removal of catheter
Peritonitis	Resection, repair, or diversion of ongoing sources of contamination, drainage of abscesses, debridement of necrotic tissue
Pancreatic infection	Drainage or debridement
Soft tissue infection	Debridement of necrotic tissue and drainage of discrete abscesses
Septic arthritis	Joint drainage and debridement
Endocarditis	Valve replacement
Prosthetic device infection	Device removal
Empyema	Drainage, decortication
Sinusitis	Surgical decompression of the sinuses
Cholangitis	Bile duct decompression

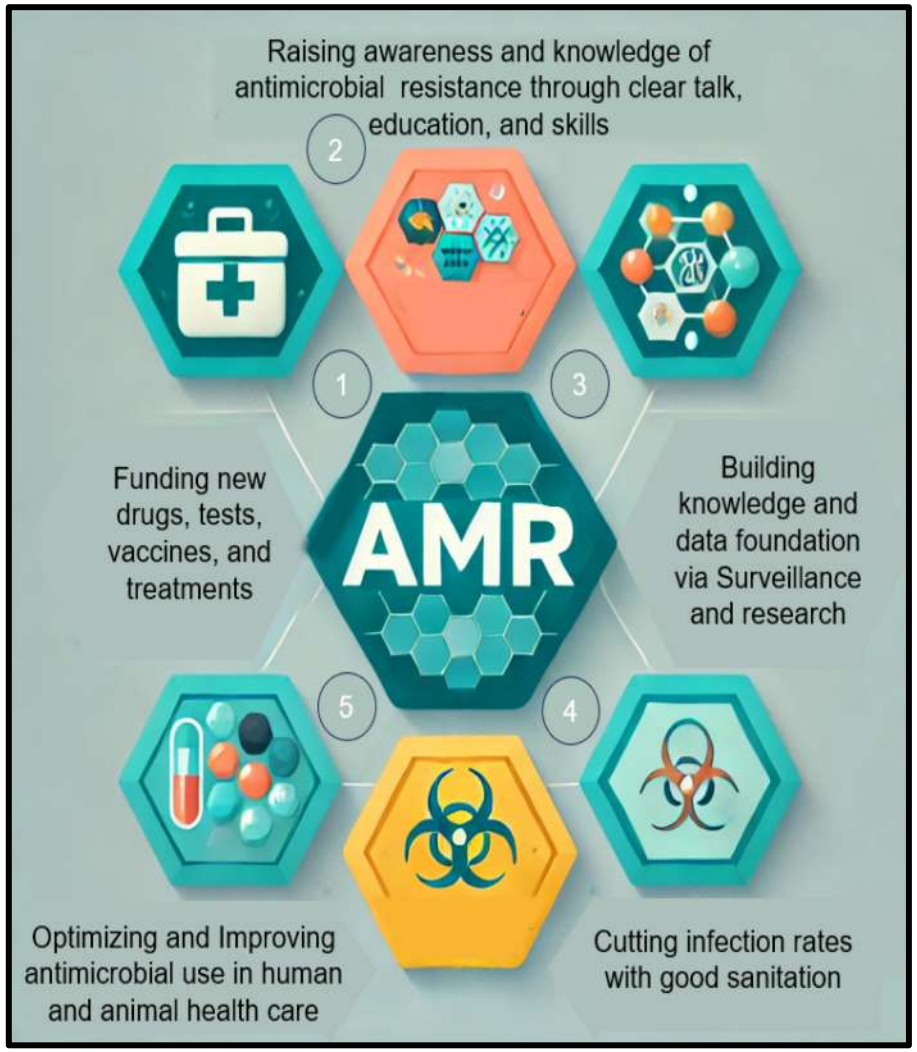
1. Evans et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. Critical Care Medicine: November 2021 - Volume 49 - Issue 11 - p e1063-e1143
2. Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022.

ANTIMICROBIAL RESISTANCE (AMR)

Prasan K Panda, Monika Saran, Shiv Narayan Sahu, Balachandra R

BACTERIA POSING A MAJOR THREAT OF AMR

1. ESBL-E(Extended-spectrum β-lactamase-producing Enterobacterales)
1. AmpC-E(AmpC β-lactamase-producing Enterobacterales)
1. CRE(Carbapenem-resistant Enterobacterales)
1. DTR P. aeruginosa (difficult-to-treat resistance)
1. CRAB(carbapenem-resistant Acinetobacter baumannii)
1. Stenotrophomonas maltophilia.



Strategic Objectives of the Global Action Plan on Antimicrobial Resistance

Understanding Antimicrobial Resistance (AMR)

Antimicrobial resistance (AMR) is one of the top global public health and development threats In 2021, it has been estimated that 4·71 million (95% UI 4·23–5·19) deaths were associated with bacterial AMR, including 1·14 million deaths attributable to bacterial AMR (1). Super-regions with the highest all-age AMR mortality rate in 2050 are forecasted to be South Asia, Latin America, and the Caribbean(1).

India, in particular, faces alarming rates of ABR, both in community and healthcare settings, and has reported resistance rates of up to 70% to first-line antibiotics like cephalosporins and carbapenems in Gram-negative bacteria.(2).

Under the better care scenario, across all age groups, 92·0 million deaths (82·8–102·0) could be cumulatively averted between 2025 and 2050, through better care of severe infections and improved access to antibiotics, and under the gram-negative drug scenario, 11·1 million AMR deaths (9·08–13·2) could be averted through the development of a gram-negative drug pipeline to prevent AMR deaths.(1)

Role of Vaccines in Combating AMR

Vaccination strategies are essential in combating antimicrobial resistance (AMR) by preventing infections, limiting transmission, and reducing antibiotic misuse. Implementing these measures has the potential to save millions of antibiotic doses and cut healthcare costs by up to $30 billion. Vaccines should be integrated into AMR strategies, existing vaccine use should be accelerated, new vaccine development supported, and global regulatory frameworks strengthened (4)

1.Christopher J L Murray, Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050, Lancet 2024; 404: 1199–226/doi.org/10.1016/ S0140-6736(24)01867-1
2.Gandra S, Joshi J, Trett A, Lamkang AS, Laxminarayan R. Scoping report on antimicrobial resistance in India. Center for Disease Dynamics, Economics & Policy: Washington, DC, USA. 2017 Nov;2017:1-46.
3.Vekemans J, ET AL. Leveraging vaccines to reduce antibiotic use and prevent antimicrobial resistance: a World Health Organization action framework. Clinical Infectious Diseases. doi.org/10.1093/cid/ciab062.
4.Mendelson M, Matsoso MP. Guest Editorial: The World Health Organization Global Action Plan for antimicrobial resistance. South African medical journal DOI:10.7196/SAMJ.9644

APROACH TO MULTIDRUG RESISTANT ORGANISMS

GROUP	ORGANISM		INFECTIONS		RECOMMENDATION REGARDING TREATMENT	
					PREFERRED	**ALTERNATIVE**
ENTEROBACTERICAE	**Extended-spectrum β-lactamase-producing Enterobacterales (ESBL-E)** **(**CTX-M-1 mainly Others- TEM and SHV , PER-1, VEB-1, VEB-2, GES-1/2**)**		**UTI**	**Cystitis**	**Nitrofurantoin**(100 mg BD) and **TMP-SMX** (160 mg TMP BD)	Oral Fosfomycin(3 gm PO)
				Pyelonephritis and cUTI	**TMP-SMX , FQs –levofloxacin**(750 mg iv od) when resistance or toxicities of TMP-SMX or fluoroquinolones – Carbapenems can be given	Aminoglycosides (amikacin – 15 mg/kg iv od)
			Non UTI		**Carbapenems**(Meropenem- 1 gm iv TDS) After clinical response- **Switching** to oral fluoroquinolones or TMP-SMX (8-12 mg/kg/day TMP) **(PIPTAZ- Not suggested for infections outside of the urinary tract, even if susceptibility is demonstrated)**	
	AMPC β-Lactamase-producing Enterobacterales **(**K. aerogenes, and C. freundii - most common **)**		**UTI**	**Cystitis**	Nitrofurantoin, TMP-SMX	Aminoglycoside (amikacin – 15 mg/kg iv od)
				Pyelonephritis and cUTI	TMP-SMX or **FQs (levofloxacin)**	Aminoglycoside (amikacin – 15 mg/kg iv od)
			Non UTI		**Cefepime**(2 gm iv tds) (weak inducer of ampC and withstands hydrolysis)	• Carbapenem (when the cefepime MIC is ≥4 µg/mL) • If carbapenem resistance- Ceftazidime-avibactam
	Carbapenem Resistance Enterobacterales (CRE) Resistant to at least 1 carbapenem antibiotic or producing a carbapenemase enzyme	**KPC-1/2**	**UTI**	**Cystitis**	**Nitrofurantoin, TMP-SMX, FQs (levofloxacin)**	• Single dose aminoglycoside • Oral fosfomycin
				Pyelonephritis and cUTI	**Ceftazidime-avibactam** (2.5 gm iv tds)	Aminoglycosides
			Non-UTI (if KPC +nt)		**Ceftazidime-avibactam**(2.5 gm iv tds) **+ Aztreonam**(2 gm iv tds)	Cefiderocol (If carbapenem resistance)
		OXA – 48 like	**UTI**		Same as KPC	Same as KPC
			Non-UTI		**Ceftazidime-avibactam**	Cefiderocol
		NDM	**Non UTI**		**Ceftazidime-avibactam**(2.5 gm iv tds) **+ Aztreonam**(2 gm iv tds)	• Ceftazidime- avibactam • Meropenem-vaborbactam (if available)
		Polymyxin B and colistin are not suggested for the treatment of infections caused by CRE				

Tamma PD, and ET AL. Infectious diseases Society of America 2024 guidance on the treatment of antimicrobial-resistant gram-negative infections. Clinical infectious diseases. doi.org/10.1093/cid/ciae403.

APROACH TO MULTIDRUG RESISTANT ORGANISMS

ORGANISM	INFECTIONS	RECOMMENDATION REGARDING TREATMENT	
		PREFERRED	**ALTERNATIVE**
Pseudomonas (GES, VES, PER,KPC, PDC, MexAB-OprM)	**Resistant to routine sensitivity pattern ***	**Meropenem** (1 gm iv tds)	
	DTR or CRPA- Resistant to all of the above and carbapenems	**Ceftazidime-avibactam** (2.5 gm iv tds) **Cefiderocol (2 gm iv tds) is preferred for MBL.**	• Tobramycin or amikacin(15 mg/kg od) (for complicated UTI*) • Ceftolozane-tazobactam(3 gm iv tds), or Cefiderocol (2 gm iv tds) • **Newer drugs- Cefepime-Zidebactam** (2+1 gm iv tds)
A. baumannii OXA-23, OXA-24/40,	**Carbapenem resistant A. baumanii – CRAB ****	At least one sulbactam-based agent is preferred Nebulized antibiotics are not indicated. **Sulbactam-durlobactam** (1+1 gm iv qid) **+ either imipenem-cilastatin or meropenem (if available)**	**High dose Ampicillin-sulbactum** (6+3 gm iv tds)
	Difficult-to-treat resistance (DTR) or Carbapenem-resistant P. aeruginosa (CRPA) (Resistant to all of the above and carbapenems)	Ceftazidime-avibactam(2.5 gm iv tds) imipenem-cilastatin-relebactam, ceftolozane-tazobactam, or cefiderocol (if available) Tobramycin(7 mg/kg iv od) or amikacin in DTR pseudomonas for complicated UTI	
S. maltophilia (L1 B- Lactamase ,L2 serine B- Lactamase)		Any two of - minocycline, TMP-SMX, or levofloxacin, cefiderocol**,** ceftazidime-avibactam + aztreonam	
Methicillin-resistant Staphylococcus aureus		Vancomycin (15-20 mg/kg TDS)	TMP-SMX, clindamycin
Vancomycin-resistant staphylococcus aureus (VRSA)		• Daptomycin (4 mg/kg iv od) **(Except in Pneumonia)** • Teicoplanin (400 mg iv od) • Linezolid (600 mg iv bd)	• Rifampin (600 mg iv/po od) • Tigecycline, • Ceftaroline
Enterococcus and Enterococcus faecalis **Vancomycin resistant Enterococcus (VRE)**		**Synergistic therapy (one cell wall active and one protein synthesis inhibitor) is more effective** • Ceftriaxone/Ampicillin + Gentamicin(1 mg/kg iv tds) • Daptomycin + Ampicillin (12 gm/day iv)/Linezolid,	• Tigecycline • Ceftaroline

Routinely tested for Pseudomonas aeruginosa:

- Piperacillin-tazobactam
- Cefoperazone-sulbactam, Ceftazidime, cefepime
- Aztreonam
- Fluoroquinolones (i.e levofloxacin)
- Fosfomycin

Routinely tested for A.baumannii:

- Meropenem
- Cefepime
- Minocycline
- Ampicillin-sulbactam

Tamma PD, and ET AL. Infectious diseases Society of America 2024 guidance on the treatment of antimicrobial-resistant gram-negative infections. Clinical infectious diseases. doi.org/10.1093/cid/ciae403.

RIGHT DIAGNOSIS OF CIED INFECTIONS (PACEMAKERS, ICD AND CRT DEVICES)

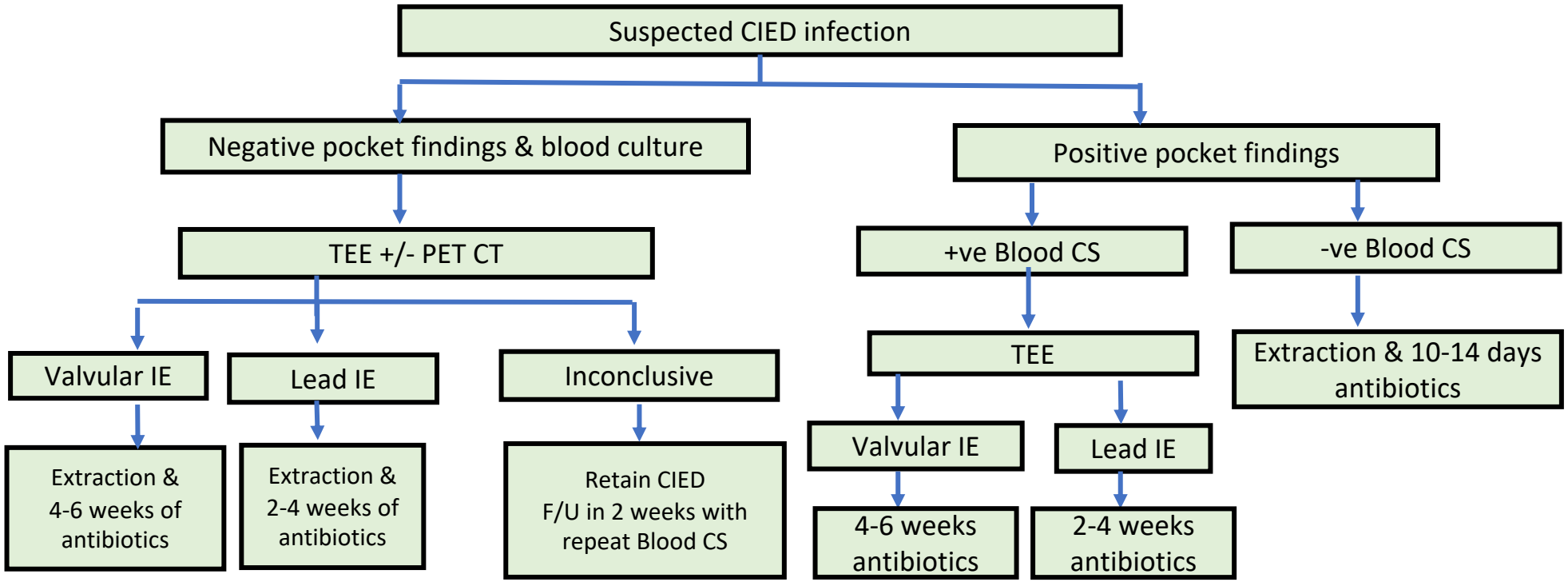
Bhanu Duggal, Abhinavya Egala

RISK FACTORS:

Patient-related factors: ESRD, History of device infection, fever prior to implantation, Corticosteroid use, Renal insufficiency, COPD, NYHA Class ≥2, Skin disorders, malignancy, Diabetes mellitus, heparin bridging, CHF, oral anticoagulants

Procedure-related: Procedure duration, hematoma, lead poisoning, inexperienced operator, temporary pacing, device replacement/revision/upgrade, generator change, antibiotic prophylaxis

Device related: Epicardial leads, Abdominal pocket, ≥2 leads, Dual chamber device



DeSimone DC, Sohail MR. Approach to diagnosis of cardiovascular implantable-electronic-device infection. Journal of clinical microbiology. 2018 Jul 1;56(7):e01683-17.

RIGHT TREATMENT - CIED INFECTION

Empirical Antibiotic Therapy

Targeted organism: Staphylococcus (mainly) and/or Gram-negative bacteria

First Choice: Inj Vancomycin 20-35 mg/kg loading dose followed by 15-20 mg/kg/day divided in BD/TDS.

Add on: Piperacillin-Tazobactam, Cefepime, carbapenem or Gentamicin.

Device removal indications:

- TEE demonstrating valve or lead vegetation
- Blood cultures demonstrating S. Aureus, candida species
- High-grade bacteremia (defined as two or more separate blood cultures positive for the same organism, drawn ≥1 hour apart) with Coagulase-negative staphylococci, *Cutibacterium*, other high-grade bacteremia without clear portal of entry
- A single positive blood culture for coagulase-negative staphylococci or *Cutibacterium* species
- Presence of pocket infection with or without positive culture of pocket drainage or bacteremia.

Empirical Antifungal Therapy (Positive Fungal blood culture)

Primary Treatment: Liposomal amphotericin B (3 to 5 mg/kg IV daily) +/- flucytosine (25 mg/kg orally four times daily); **OR** High-dose echinocandin (Caspofungin 150 mg IV daily, micafungin 150 mg IV daily, or anidulafungin 200 mg IV daily).

Step Down:

a. Oral fluconazole 400 to 800 mg (6 to 12 mg/kg) daily
b. Oral voriconazole 200 to 300 mg (3 to 4 mg/kg) twice daily or Posaconazole tablets 300 mg daily.

Note: Removal of entire device is recommended in case of fungal infection.

Duration: 4 to 6 weeks of IV antibiotics, depending upon implicated pathogen

Duration of antifungals: 4 weeks for CIED pocket infection and 6 weeks for CIED systemic infection following device removal.

Carina et al 2019 EHRA International Consensus Document on How to Prevent, Diagnose, and Treat Cardiac Implantable Electronic Device Infections

RIGHT DIAGNOSIS - HEMODIALYSIS CATHETER-RELATED BLOOD STREAM INFECTION (CRBSI)

Sharon Kandari, Anshuman Biswal

Diagnosis:

Clinical manifestations (fever, chills, and/or hypotension)

+

at least 1 positive blood culture from a peripheral source (dialysis circuit or vein) and no other apparent source

+

either positive semiquantitative (>15 CFU/catheter segment – hub or tip) or quantitative (>10^2 CFU/ catheter segment e.g. hub or tip) culture, whereby the same organism (species and antibiogram) is isolated from the catheter segment (e.g. hub or tip) and a peripheral source (dialysis circuit or vein) blood sample

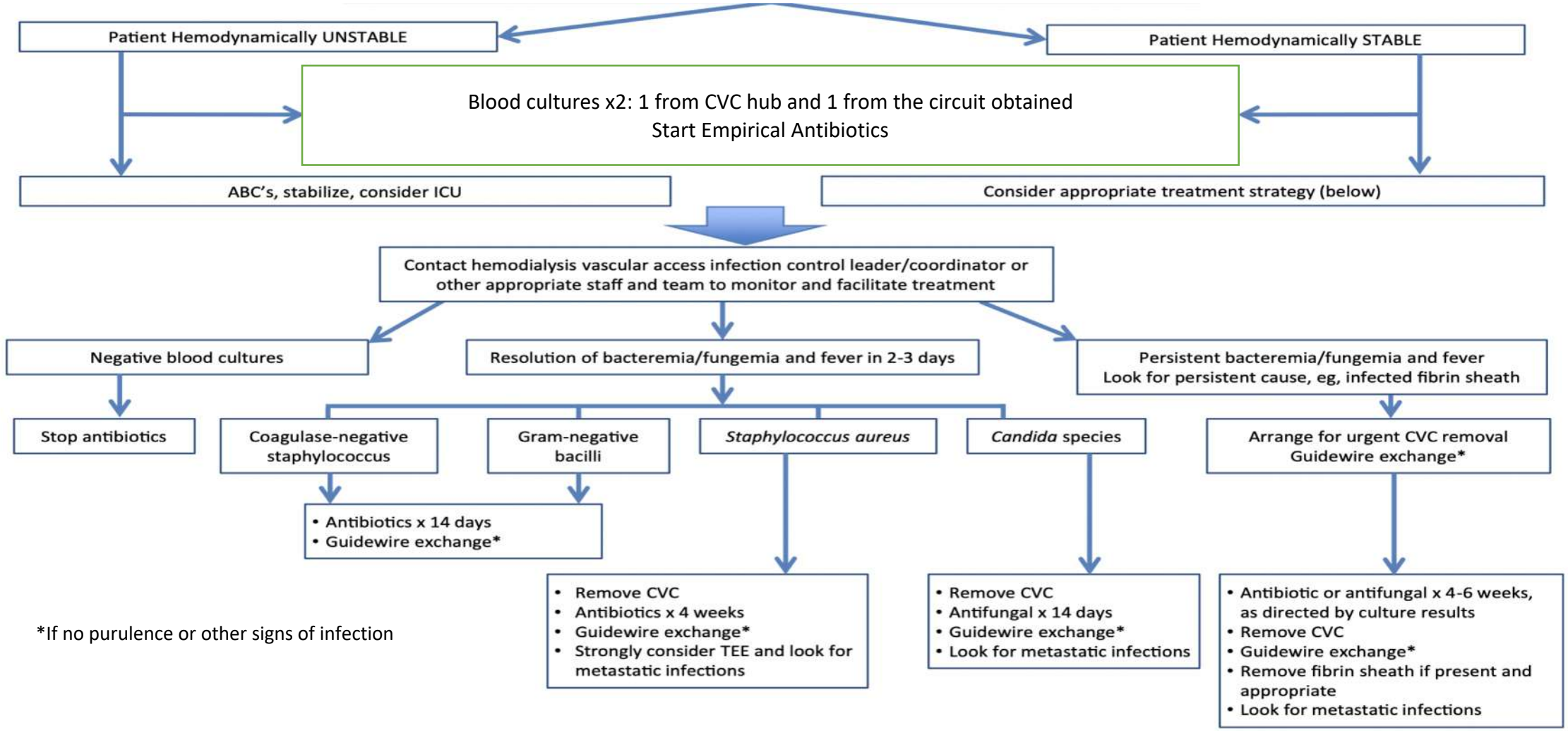
Supportive diagnosis:

Simultaneous quantitative cultures of blood samples with a ratio of ≥3:1 (catheter hub/tip vs peripheral [dialysis circuit/vein]); Differential period of catheter culture versus peripheral BC positivity of 2 hours.

Lok CE et al. KDOQI clinical practice guideline for vascular access: 2019 update. American Journal of Kidney Diseases. 2020 Apr 1;75(4):S1-64.

CRBSI – RIGHT TREATMENT

Fulfilling definition of CVC related infection
Other possible infection source ruled out



*If no purulence or other signs of infection

Lok CE et al. KDOQI clinical practice guideline for vascular access: 2019 update. American Journal of Kidney Diseases. 2020 Apr 1;75(4):S1-64.

CVC EXIT SITES AND TUNNEL INFECTIONS; CRBSI - EMPIRICAL ANTIBIOTICS IN CKD

	CVC Exit Site infection	CVC Tunnel Infection
Definition	Hyperaemia, induration, and/ or tenderness ≤2 cm from the catheter exit site	Tenderness, hyperaemia, and/ or induration that extends along the subcutaneous tunnel
	(Both may or may not be associated with blood stream infection)	
Investigation	Culture from drainage Blood culture if systemic signs	Culture from drainage and Blood culture
Manage-ment	Empirical gram-positive coverage for 7-14 days Further modified based on culture	Empirical gram-positive and gram-negative coverage for 10-14 days If not treated- CVC removal

Treatment	Dose and schedule for adult patients
Vancomycin	High flux: 25 mg/kg IV loading dose, then 10 mg/kg IV post HD Low flux: 25 mg/kg IV loading dose, then 7.5 mg/kg IV post HD
Ceftazidime	IV: 500 mg to 1 g every 24 hours; administer after hemodialysis on dialysis days
Cefepime	IV: Initial: 1 g (single dose) on day 1. Maintenance: 500 mg to 1 g every 24 hours
Piptaz	IV: 4.5 g stat loading dose followed by 4.5 g every 12 hours or 2.25 g every 8 hours
Gentamicin	Loading dose of 2 to 3 mg/kg followed by 2 to 3 mg/kg/dose 3 times weekly after dialysis on HD days
Meropenem	1 g IV stat followed by 1 g every 24 hours

Lok CE et al. KDOQI clinical practice guideline for vascular access: 2019 update. American Journal of Kidney Diseases. 2020 Apr 1;75(4):S1-64.

CRBSI - ANTIBIOTIC LOCK THERAPY

Antibiotic	Antibiotic Concentration	Heparin Concentration	Reference
With anticoagulant			
Vancomycin	5 mg/mL	5000 units /mL	Lee et al., 2006 [31]
Gentamycin	1 mg/mL	2500 units/mL	Krishnasami et al., 2002 [30]
Ceftazidime	0.5 mg/mL	100 units/mL	Rijinders et al., 2005 [33]
Cefazolin	5 mg/mL	5000 units/mL	Krishnasami et al., 2002 [30] Vercaigne et al., 2000 [34]
Without anticoagulant			
Teicoplanin	10 mg/mL	-	Lee et al., 2006 [31]
Amikacin	1 mg/mL	-	Lee et al., 2007 [32]

Used in long-term CVC who are at high risk of CRSBI (e.g, multiple prior CRSBI), especially in facilities with high rates of CRBSI (eg, >3.5/1,000 patient days)

Same lock therapy can be used for PD/EVD/Any device related infection if device is not intended to remove

Lok CE et al. KDOQI clinical practice guideline for vascular access: 2019 update. American Journal of Kidney Diseases. 2020 Apr 1;75(4):S1-64.

RIGHT DIAGNOSIS FEBRILE NEUTROPENIA *Amit Sehrawat, Mayank Kapoor*

- Febrile neutropenia is defined as a single oral temperature measurement of >38.3°C (101°F) or a temperature of >38.0°C (100.4°F) sustained over a 1-h period with an ANC of <500 cells/uL or an ANC that is expected to decrease to <500 cells/uL during the next 48h
- Profound neutropenia is defined as ANC < 100/uL
- The period of neutropenia is considered protracted if it lasts for ≥7 days

- Investigations

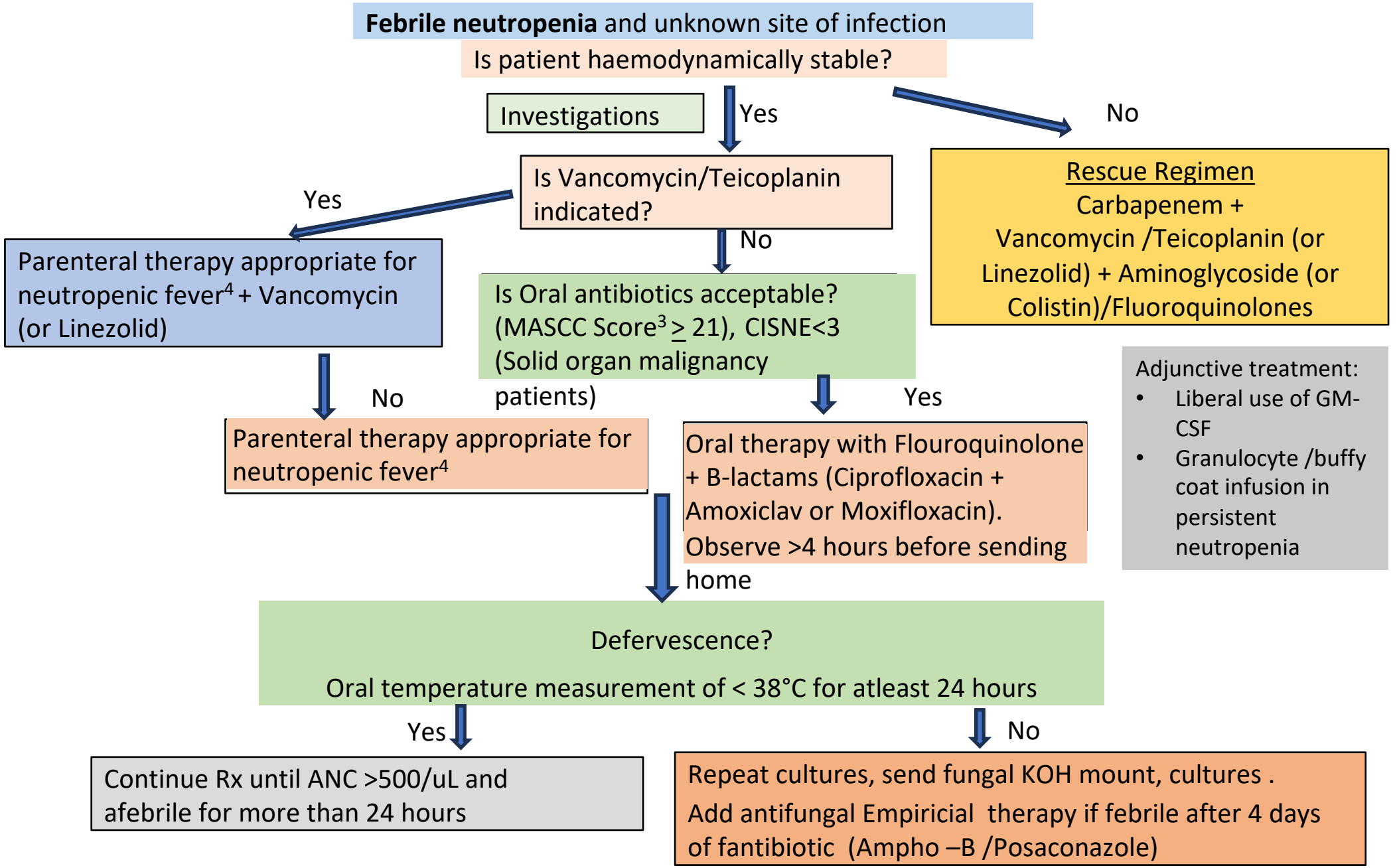
KFT, LFT, CBC, Serum lactate, CXR,
Blood C/S (2 sets from 2 different sites), Urine C/S
As guided by symptoms : Stool C/S,
Sputum C/S, CSF C/S, BAL C/S
Skin aspiration and biopsy, CXR (Low Risk)
or CT Thorax (High Risk) if respiratory symptoms are present Viral diagnostics – PCR and direct fluorescence antibody-based tests for symptomatic patient.

Burden of febrile neutropenia with no or mild symptoms	5
No hypotension (systolic blood pressure >90 mmHg)	5
No chronic obstructive pulmonary disease	4
Solid tumor or hematologic malignancy with no previous fungal infections	4
No dehydration requiring parenteral fluids	3
Burden of febrile neutropenia with moderate symptoms	3
Outpatient status	3
Age < 60 years	2

MASCC Risk index
< 21 = High risk ≥ 21 = Low risk

MASCC- Multinational Association for Supportive Care in Cancer (**MASCC**) Risk Index

RIGHT TREATMENT



RIGHT TREATMENT

[2] Indications for Vancomycin

- Colonization with resistant Gram + bac (MRSA or PRSP)
- Catheter/ Soft tissue infection
- Blood culture positive for Gram + organism
- High risk for viridans group Streptococcal infection (prior quinolone prophylaxis, mucositis associated with cytarabine-containing regimen

[3]Parenteral therapy appropriate for neutropenic fever:

- Initial Abx based on institute antibiogram (to start with Ceftazidime Avibactam if CRE prevalent)

OR

- B-lactams (Piptaz, Imipenem, Cefepime, Meropenem)

Patients at high risk* for developing Febrile neutropenia:

- Anti-bacterials : Fluoroquinolones prophylaxis
- Antifungals : Oral triazole (Fluconazole) or parenteral echinocandin (Caspofungin) prophylaxis
- During the period of expected neutropenia
  A mold-active triazole (Posaconazole) is recommended where the risk of invasive aspergillosis is > 6%, such as in patients with AML/ MDS during the neutropenic period associated with chemotherapy
- Cotrimoxazole prophylaxis for patients receiving chemotherapy regimens associated with > 3.5% risk for pneumonia from Pneumocystis jirovecii (≥ 20 mg Prednisone equivalents daily for ≥ 1 month or those receiving purine analogs
- Antiviral prophylaxis (Acyclovir) for HSV seropositive patients undergoing HSCT or leukaemia induction therapy
- If Clostridium difficile infection is suspected, add oral vancomycin

* High risk – to refer to ASCO – IDSA clinical practice guideline update (Randy A – JCO – 2018)

Antimicrobial Prophylaxis for Adult Patients With Cancer-Related Immunosuppression: ASCO and IDSA Clinical Practice Guideline Update. J Clin Oncol. 2018 Oct 20;36(30):3043-3054. doi: 10.1200/JCO.18.00374.

RIGHT DIAGNOSIS & TREATMENT - ENTERIC FEVER

Prasan K Panda, Rajat Sharma

RIGHT DIAGNOSIS

When to suspect enteric fever?

- Any patient with a history of acute undifferentiated fever, or fever of more than 3 days duration with abdominal symptoms: pain abdomen, initial constipation followed by diarrheal illness
- May present with neuropsychiatric manifestations later in the course of disease

*REMEMBER:

BASU

1. B- Blood culture (1st week)
2. A- Antibody testing or serology (2nd week)
3. S- Stool culture (3rd week)
4. U- Urine culture (4th week)

INVESTIGATIONS

- Blood culture: *sensitivity- 50-70%. Should be done in all suspected patients.*
- Stool culture: *sensitivity 30-40% (mainly in the 3rd week onwards).*
- Serology: *Includes Widal test and Typhidot. Discouraged by the WHO. If used, paired sera to be tested to look for rising titers. To be done 2nd week onwards.*
- Bone marrow culture: *sensitivity- >90%. Usually not done due to invasive nature*

RIGHT TREATMENT

1. Optimal treatment:
   - Inj Ceftriaxone 1g IV BD for 10-14 days OR
   - Inj/Tab. Azithromycin 1g on day 1 f/b 500mg OD for 5 days
2. Other options:
   - Tab Cefixime 400mg BD for 10-14 days
   - Inj Cefotaxime 2g IV q8h for 10-14 days
   - Inj Meropenem 1g IV q8h for 10-14 days (only to be used in XDR typhoid)

PREVENTION- INDICATIONS FOR TYPHOID VACCINE

- Travel to Endemic Areas
- Close Contact with Typhoid Carriers
- Occupational Exposure
- Immunization Programs in Endemic Areas

Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022.

RIGHT DIAGNOSIS & TREATMENT - SCRUB TYPHUS

Prasan K Panda, Rajat Sharma

RIGHT DIAGNOSIS

- Scrub typhus is a disease caused by the bacteria Orientia tsutsugamushi, transmitted through bites of infected chiggers (larval mites).
- Symptoms begin within 10 days after being bitten by the infected larval mite.
- Symptoms and signs:
  - Fever with chills
  - Generalized body aches
  - Eschar- a dark, scab-like lesion at the site of chigger bite
  - Variable Organ involvement:
    - Respiratory- Pneumonitis/ARDS
    - CNS- meningoencephalitis
    - Cardiovascular- myocarditis
    - Acute liver and kidney injury, etc
- Blood tests for antibodies i.e. IgM scrub typhus should be sent after 5 days of illness. (ICT has sensitivity of 60-70% and specificity >90%, ELISA has variable sensitivity, and specificity of 90-100%)

DETERMINING DISEASE SEVERITY:

- **Mild to moderate disease** – Patients with mild to moderate disease typically present with fever, myalgia, and headache as well as a rash (with or without eschar) and/or cough.

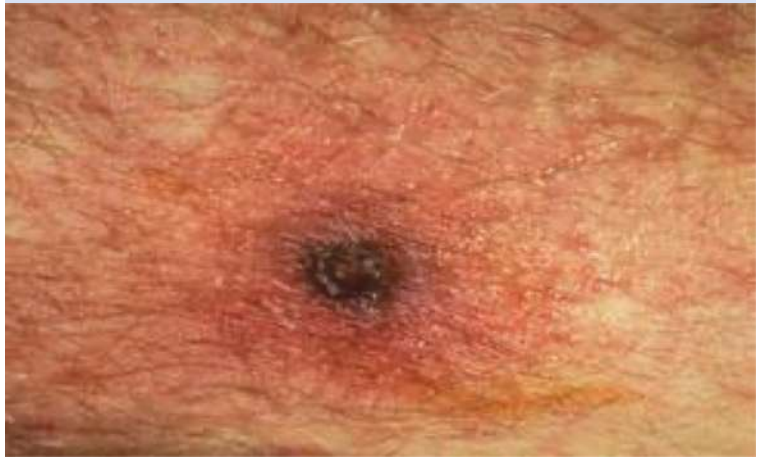
- **Severe** – Patients with severe disease typically present with the findings above in combination with clinical or laboratory manifestations that indicate end-organ damage. These include hyperbilirubinemia, renal failure, cardiovascular collapse (hypotension/shock), acute respiratory distress syndrome (ARDS), and meningoencephalitis.

RIGHT TREATMENT

- Mild to moderate Disease: Monotherapy with Doxycycline (100 mg BD oral/IV) or Azithromycin (500 mg OD oral/IV) for 7 Days

- Severe Disease: Combination therapy of Inj. Doxycycline 200 mg BD on day 1 f/b 100 mg BD for 6 days. **PLUS** Inj. Azithromycin 500 mg BD on day 1 followed by 500 mg OD for 6 days, Along with supportive measures for organ failures.

- In pregnancy- Azithromycin 500mg OD for 5 days



Varghese GM, Dayanand D, Gunasekaran K, Kundu D, Wyawahare M, Sharma N, et al. Intravenous Doxycycline, Azithromycin, or Both for Severe Scrub Typhus. N Engl J Med [Internet]. 2023 Mar 2 [cited 2024 Nov 15];388(9):792–803. Available from: http://www.nejm.org/doi/10.1056/NEJMoa2208449

RIGHT DIAGNOSIS & TREATMENT - LEPTOSPIROSIS

Prasan K Panda, Rajat Sharma

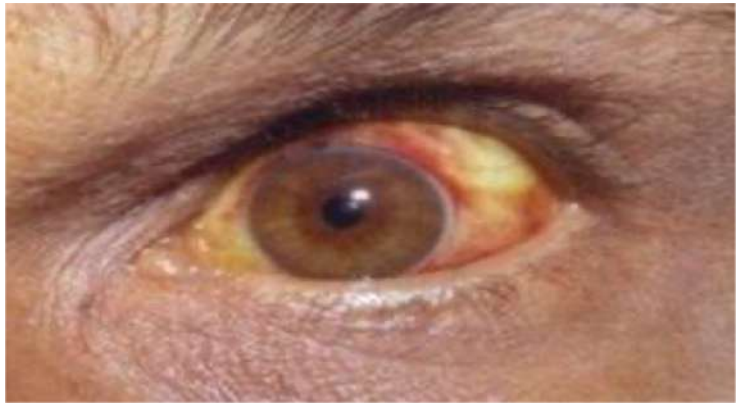
RIGHT DIAGNOSIS

- Causative organism – Spirochetes belonging to Leptospira species
- Transmission to humans occur through cuts, abraded skin, or oral mucosa by direct contact with urine, blood, or tissue from an infected animal (cattle, rodent) or exposure to environmental contamination (water in rice fields, ponds, or flood areas).
- Symptoms start within 1 month of the exposure.
- Presentation – Often mild disease- a flu-like illness with fever, chills, myalgia, headache, nausea, vomiting, abdominal pain, and conjunctival suffusion. Usually resolves within 7-10 days.
- Can present as severe form with multiorgan failure: severe bleeding (pulmonary hemorrhage, GI bleeding, etc), AKI, jaundice, shock, or even expanded leptospira syndrome; case fatality in such cases is as high as 50%.
- Investigation: Hyponatremia ,Hypokalemia , Thrombocytopenia , elevated creatinine
  Specific - Initial febrile phase - PCR testing of blood. Serology - useful after day 7 of illness (sensitivity is very low in the initial phase). Serological tests include MAT (done in specialized labs) and ELISA.

RIGHT TREATMENT

1. Mild leptospirosis
   - Doxycycline 100mg BD
   - Amoxicillin 500mg TDS
   - Ampicillin 500mg TDS
2. Severe leptospirosis
   - Penicillin 1.5 million units IV or IM q6h
   - Ceftriaxone 2g/d IV or
   - Cefotaxime 1g IV q6h or
   - Doxycycline loading dose of 200mg IV , then 100mg IV q12h

(All regimens to be given for 7 days)



Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022.

RIGHT DIAGNOSIS & TREATMENT - MALARIA

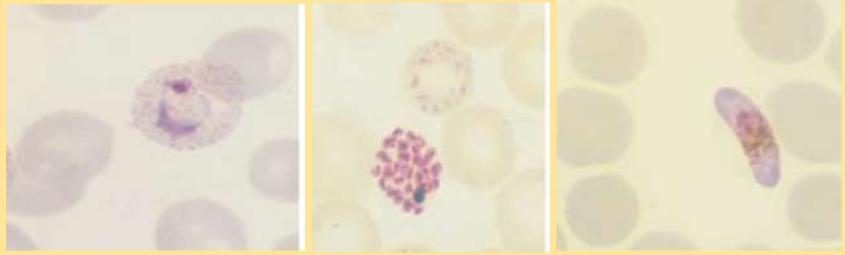
Prasan K Panda, Rajat Sharma

RIGHT DIAGNOSIS

- Symptoms may be mild and include- fever with chills and rigor, headache, myalgia; or may be severe and associated with organ failures.
- Severe malaria – defined by the presence of any one of the following without alternative explanation .

Impaired consciousness GCS < 11	Severe Prostration
Multiple convulsions > 2 in 24 hours	Acidosis- Base deficit >8, HCO3 < 15, Plasma lactate ≥ 5 mmol/L
Hypoglycaemia < 40 mg/dl	
Severe Anaemia < 7 gm/dL (5 in children) with parasite > 10,000/uL	S Creatinine > 3mg/dL or Blood Urea > 120 mg/dL
Bilirubin > 3 mg/dL with parasitemia	Pulmonary edema
Significant bleeding	Shock
Hyperparasitemia	

- Diagnosis is made either by demonstration of the parasite in peripheral blood film or by rapid card tests (PfHRP2 or Plasmodium LDH). Rapid card tests are quite sensitive (95%) in detecting malaria.



RIGHT TREATMENT

Uncomplicated malaria: non-severe

- *Vivax malaria:* Tab Chloroquine 10mg/kg/day on day 1, and 2 followed by 5mg/kg on day3; with Tab Primaquine 0.25mg/kg/day for 14 days (after G6PD testing).
  - If Patient has G6PD Deficiency: chloroquine prophylaxis (300 mg [base] po once a week) for one year from the acute infection

- *Non-Vivax Malaria (i.e. Falciparum malaria and other species)*: Artemisinin Combination Therapy (ACT) for 3 days with doses as below with Tab Primaquine 0.75mg/kg single dose on day 2 (G6PD not required)

  Examples of ACT: Artemether-lumefantrine (AL)/ Artesunate-amodiaquine (AS+AQ)/Artesunate-mefloquine (ASMQ) /Artesunate + Sulfadoxine-Pyrimethamine (AS+SP)

Other Alternative: Quinine sulfate plus Doxycycline

Dosage of ACT:

Body Weight (kg)	ACT-AL Dose (mg)	FREQUENCY AND DURATION
15 to <25	40 + 240	TWICE DAILY FOR 3 DAYS
25 to <35	60 + 360	
≥35	80 + 480	

Complicated malaria: severe

- Inj Artesunate 2.4mg/kg IV stat followed by 2.4mg/kg at 12 and 24hrs and then daily if necessary.
  OR
- Inj Quinine dihydrochloride 20mg/kg over 4hr f/b 10mg/kg over 2-8 hrs every 8hourly
- To shift to oral ACT and give full oral regimen once patient can take orally.

Malaria in Pregnancy:

- Falciparum Malaria in all trimesters: ACT-AL with single dose primaquine as above
- Vivax/ Ovale to be treated with Chloroquine and primaquine as above

Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022
World Health Organization. Guidelines for the treatment of malaria. 2023. Available from: https://www.who.int/publications/i/item/guidelines-for-the-treatment-of-malaria-2023

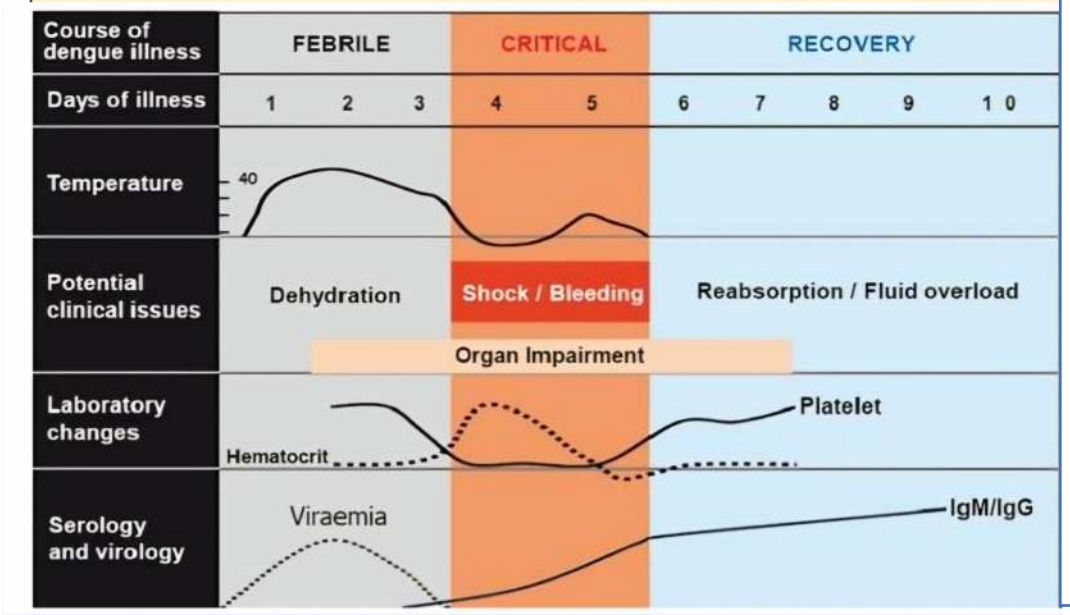
DENGUE FEVER - RIGHT DIAGNOSIS AND CLASSIFICATION *Prasan K Panda, Darshan B*

CASE DEFINITION
PROBABLE DENGUE FEVER
Acute **febrile illness of 2-7 days** duration with 2 or more of the following-
Headache ,Retro-orbital pain,
Myalgia , Arthralgia, Rash
Hemorrhagic Manifestations, Thrombocytopenia, Leukopenia ,Warning signs and symptoms.

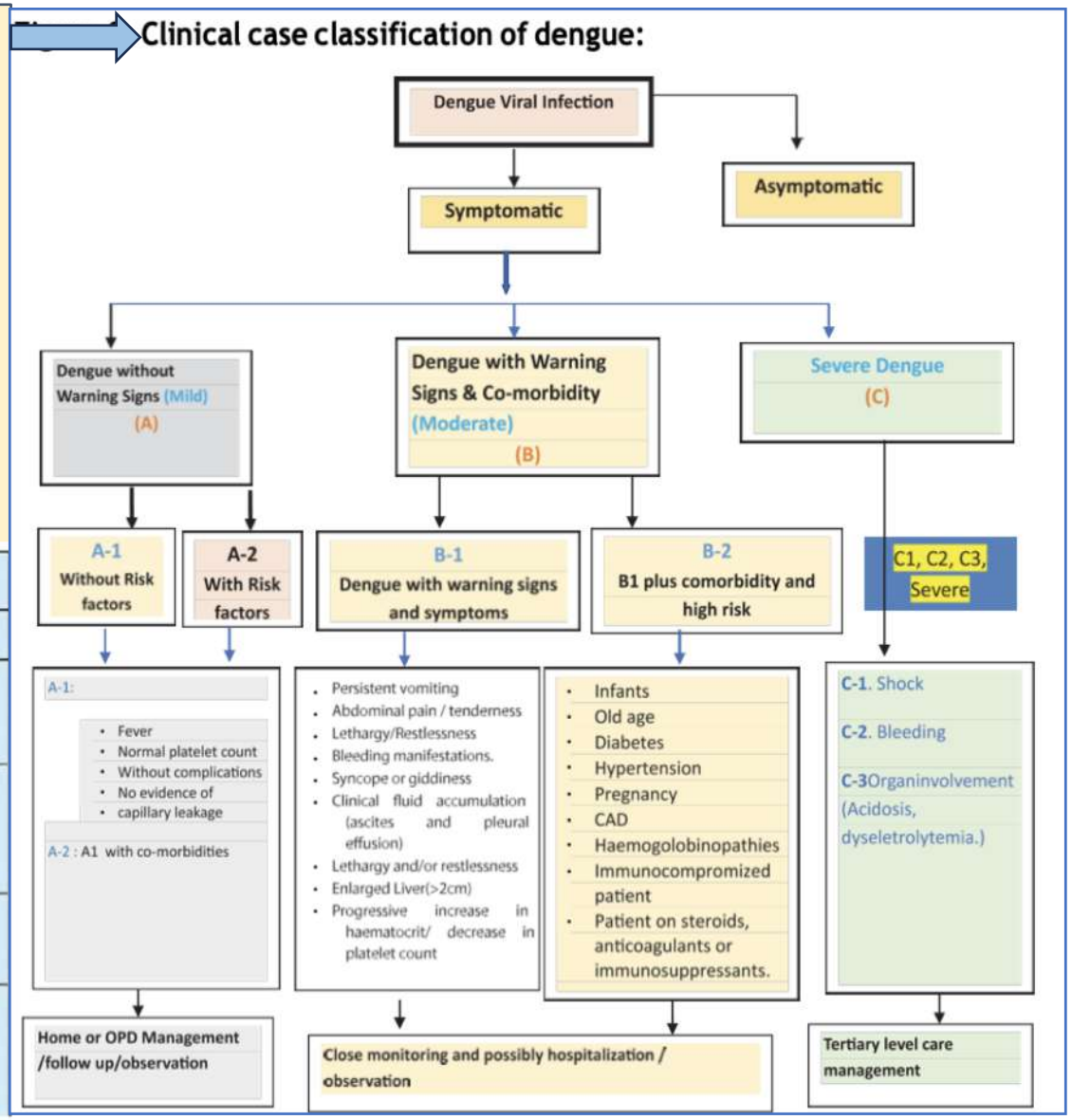
OR

Non-ELISA based NS 1 antigen/IgM Positive

Confirmed Dengue Fever: Probable dengue fever with **one** of the following
- Isolation of dengue virus.
- Demonstration of IgM antibody.
- Demonstration of NS1 antigen by ELISA



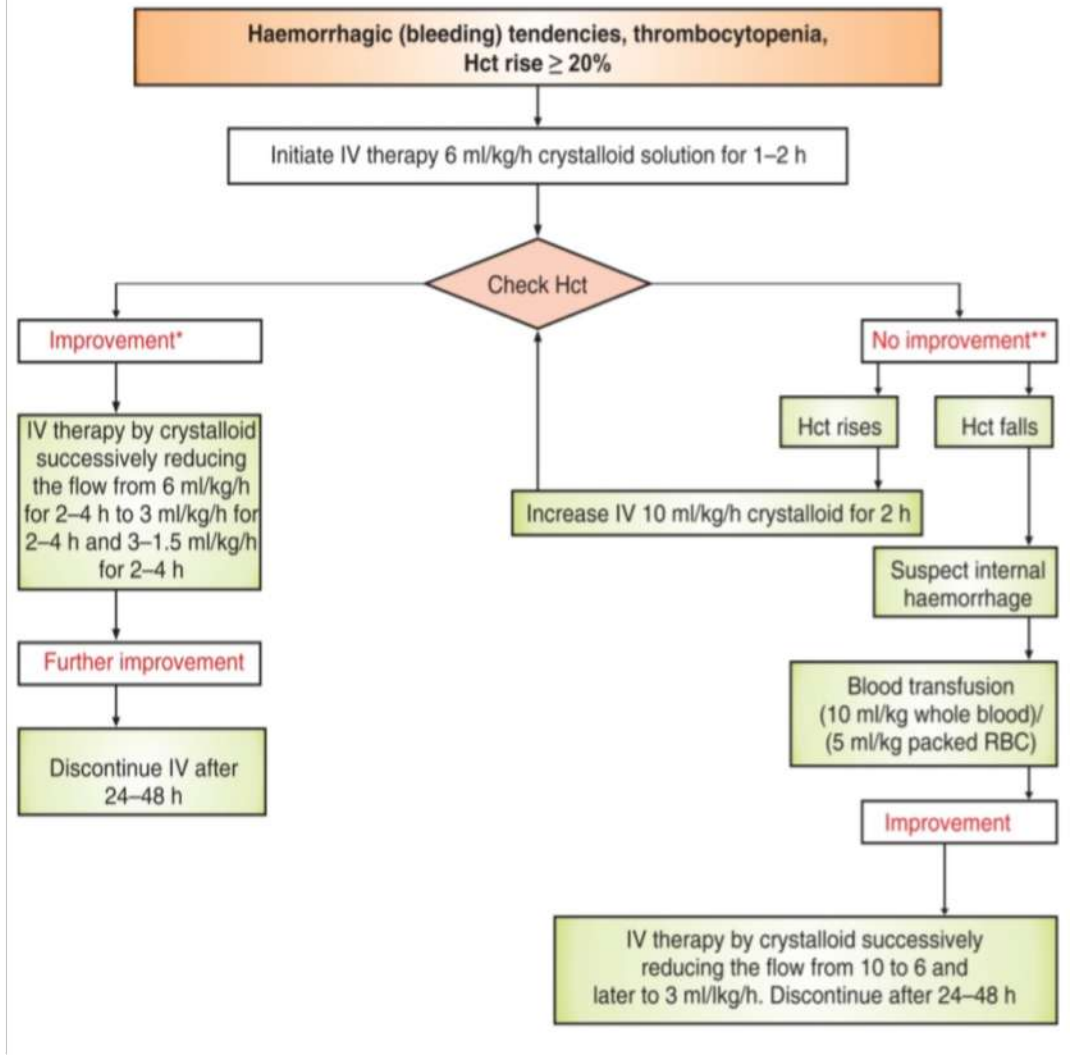
Clinical Phases of Dengue infection



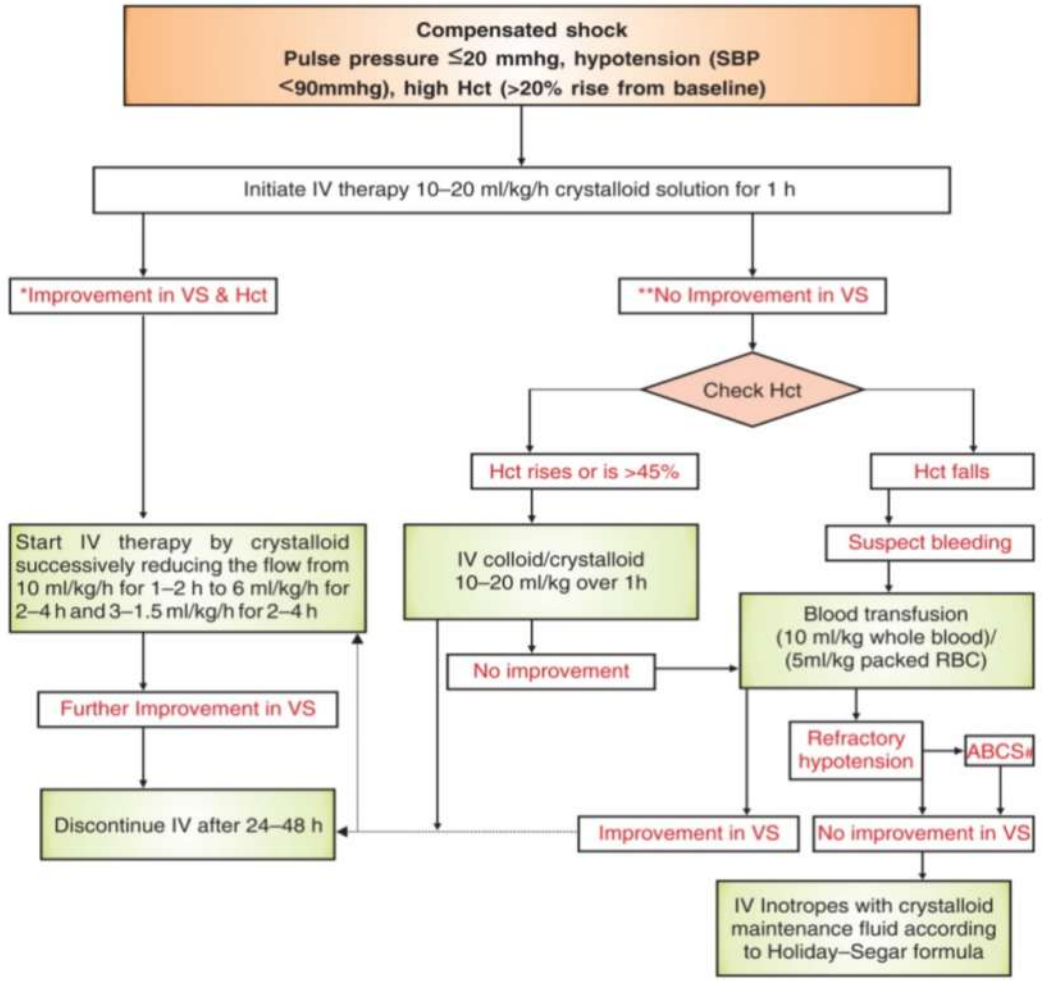
National guidelines for clinical management for dengue fever, 2023

DENGUE - RIGHT TREATMENT

Moderate dengue with warning signs



Severe dengue with compensated shock

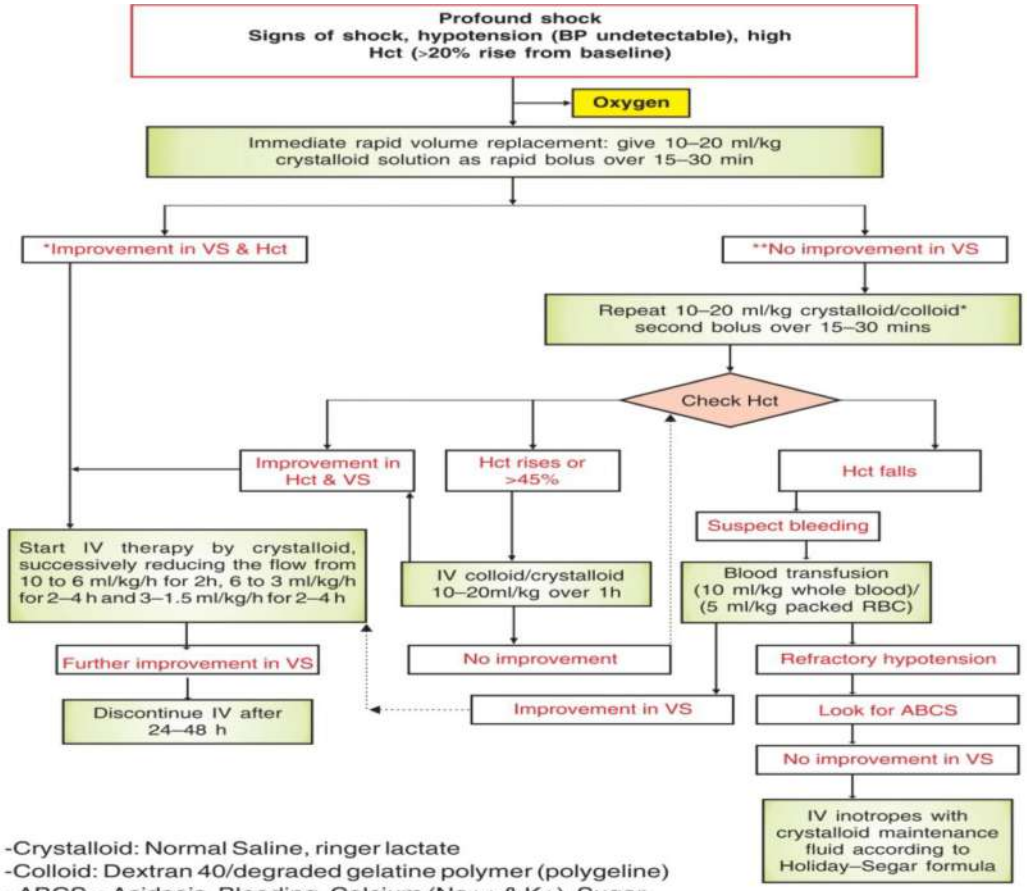


*improvement and **no improvement criteria mentioned in next page

National guidelines for clinical management for dengue fever, 2023

DENGUE - RIGHT TREATMENT

Severe dengue with decompensated shock



-Crystalloid: Normal Saline, ringer lactate
-Colloid: Dextran 40/degraded gelatine polymer (polygeline)
- ABCS = Acidosis, Bleeding, Calcium (Na++ & K+), Sugar

Notes:

*Improvement: Hct falls, pulse rate and blood pressure stable, urine output rises

**No Improvement: Hct or pulse rate rises, pulse pressure falls below 20 mmHg, urine output falls

- Unstable vital signs: Urine output falls, signs of shock
- In cases of acidosis, hyperosmolar or Ringer's lactate solution should not be used
- Serial platelet and Hct determinations: drop in platelets and rise in Hct are essential for early diagnosis of DHF
- Cases of DHF should be observed every hour for vital signs and urine output

When to stop IV Fluids

1) Normal blood pressure, pulse and peripheral perfusion
2) Decrease in hematocrit
3) Apyrexia (without the use of antipyretics) for more than 24–48 hours
4) Resolving bowel/abdominal symptoms; Improving urine output.

Indication of platelet transfusion

1) Transfuse platelet only if bleeding is present
2) Prophylactic platelet transfusion may be considered for counts < 10,000/cumm without bleed and those who may need emergency surgery.

Criteria for discharge

1) Afebrile for more than 24 hours
2) normal blood pressure,no respiratory distress,adequate urine output
3) persistent platelet count >50,000/cu.mm

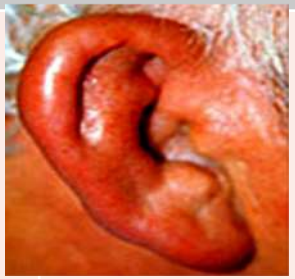
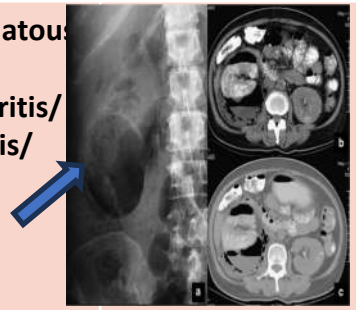
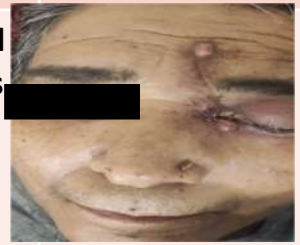
Indications for blood transfusion

1) Loss of blood – 10% or more of total blood volume
2) Refractory shock despite adequate fluid administration
3) If fluid overload is present PCV is to be given

National guidelines for clinical management for dengue fever, 2023

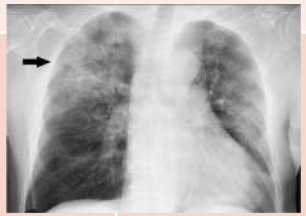
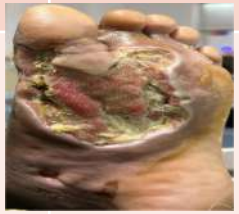
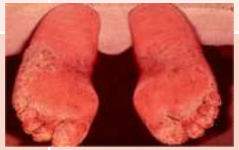
INFECTIONS IN DIABETES- RIGHT DIAGNOSIS & TREATMENT *Ravikant, Anushka G, Rifika Bansal*

EXCLUSIVE INFECTIONS IN DIABETICS

Infection	Causative Organism	Symptoms and Signs / Diagnosis	Treatment
Malignant otitis externa 	P. aeruginosa	• Severe ear pain, purulent discharge, 0/E- granulation tissue in ear canal • Diagnosis- swab collection of ear canal drainage, ct/ mri	• Oral antibiotic of choice- fluoroquinolones ciprofloxacin (750 mg bd), iv antibiotics- (anti pseudomonal beta lactams- cefepime, ceftazidime, piperacillin tazobactam) • Surgical debridement if needed
Emphysematous forms of pyelonephritis/ cholecystitis/ cystitis 	E. coli/ Enterobacter/ Klebsiella/ Proteus/ Streptococcus/ Candida	• Fever, severe pain and local site tenderness • Diagnosis- gas in plain films (IOC- CT scan)	• IV antibiotics (empirical-carbapenems, 3rd or 4th gen. cephalosporins, fluoroquinolones) • Percutaneous drainage (incase of emphysematous pyelonephritis) • Cholecystectomy if necessary (in case of emphysematous cholecystitis)
Rhino cerebral Mucormycosis 	Mucorales (Rhizopus, mucor, absidia)	• Facial pain, sinusitis, black necrotic eschars, vision changes • Diagnosis- KOH stain/ CT scan/ biopsy	• Surgical debridement, • IV antifungals (liposomal amphotericin B- 5 to 10 mg/ kg OD; duration- weeks to months depending on clinical or radiological response)
Fournier's gangrene 	E. coli/ Klebsiella/ Streptococcus/ Clostridium	• Pain, erythema, swelling in perineum • Diagnosis- gas in tissue on imaging (CT/ MRI)	• Surgical debridement • Broad spectrum antibiotics (carbapenems, piperacillin tazobactam, metronidazole)

INFECTIONS IN DIABETES - RIGHT DIAGNOSIS & TREATMENT

COMMON INFECTIONS IN DIABETICS

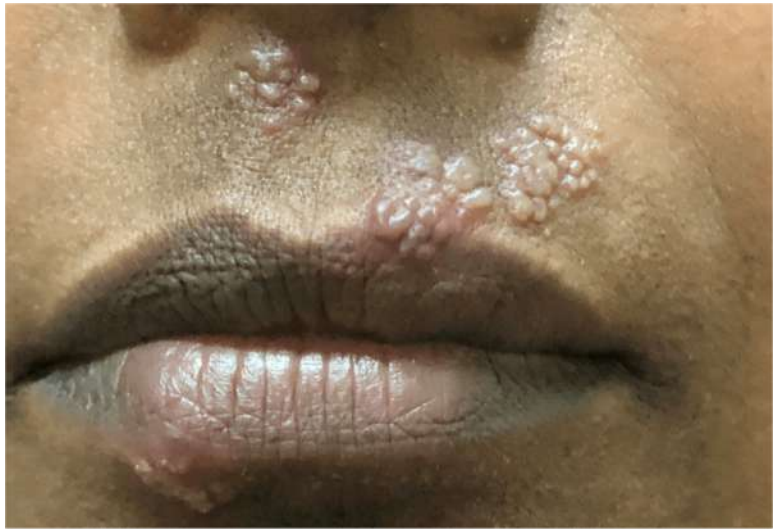
Infection	Causative organism	Symptoms and signs / Diagnosis	Treatment
Urinary Tract Infections 	E. coli, Klebsiella, Proteus	• Dysuria, frequent urination, hematuria • Diagnosis- urine routine, urine culture and sensitivity test	• Empirical- Uncomplicated- oral fluoroquinolones (ciprofloxacin 500 mg BD, levofloxacin 750 mg OD) Complicated- IV standard spectrum gram neg- (ceftriaxone 1 gm OD, or fluoroquinolones)/ broad spectrum gram neg (cefepime or piperacillin tazobactam or meropenem)/ broad spectrum gram neg including ESBL (meropenem + vancomycin) • Followed by oral or IV antibiotics based on culture sensitivity
Pneumonia 	Streptococcus Pneumoniae, Hemophilus Influenzae, Legionella	• Cough, fever, dyspnea, chest pain • Diagnosis- chest x ray, sputum culture, blood culture	• Antibiotics (macrolides, beta- lactams) • Encourage vaccination
Diabetic Foot Infections 	Staphylococcus Aureus, Streptococcus, Pseudomonas	• Redness, warmth, ulceration, purulent discharge • Diagnosis- wound culture, imaging if osteomyelitis suspected	• Debridement and surgery • Antibiotics (oral- amoxyclav 875 mg BD, levofloxacin 750 mg OD; IV- piperacillin tazobactam 4.5 gm TDS+ vancomycin 15 to 20 mg ever 8 to 12 hourly) • Ischemia management, Glycemic control
Fungal Infections (candidiasis) 	Candida albicans, Candida glabrata	• Itching, rash, white discharge in oral or genital areas • Diagnosis- clinical exam, KOH or fungal culture if needed	• Antifungal medications (topical clotrimazole, oral- fluconazole 400 mg OD) • Maintain dry skin, control blood glucose

HERPES SIMPLEX VIRUS INFECTIONS

Naveen Kumar Kansal, Riti Bhatia ,Sushantika Namrata Sarkar

Right diagnosis

- Small closely grouped vesicles on an inflamed base.
- Vesicles rupture to form polycyclic erosions



Right Treatment

Primary herpetic gingivostomatitis	• **First line**: Tab Acyclovir 200mg 5times/day, or 800mg BD for 5 days/ Tab Valacyclovir 500mg BD for 5 days • **Second line**: Acyclovir, IV, 5mg/kg 8 hourly
Recurrent herpes labialis	• Acyclovir, topical, 5times/day or more, for 5 days • Tab Acyclovir 200mg 5 times/days for 5 days/ Tab Valacyclovir 2g BD for 1 day
Primary herpes genitalis	• Tab Acyclovir 200mg 5times/day, or 400mg TDS for 7-10 days • Tab Valacyclovir 1gm BD for 7-10 days
Recurrent genital herpes	• **First line:** Tab Acyclovir 200mg 5times/days or 400mg TDS for 5 days • **Second line:** Tab Valacyclovir 500mg BD for 3 days

Harwood CA, Sterling JC. Viral Infections. In: Griffiths CEM, editor. Rook's Textbook of Dermatology. 10th ed. Oxford: Wiley-Blackwell; 2024. p. 25.1-25.129

RIGHT DIAGNOSIS & TREATMENT - VARICELLA/CHICKEN POX

Early lesions-macules/ papules with scarlatiniform/ morbilliform erythema

Lesions develop into vesicles filled with clear fluid on erythematous base in centripetal distribution

Lesions are in different stages of development

For Children (2-18years age): Symptomatic treatment, or Acyclovir 20mg/kg orally 4 times a day for 5 days

For Adults and/or Immunocompromised: Tab Acyclovir 800 mg five times a day for 7 days OR Valacyclovir 1g three times a day for 7 days

Severe varicella/ Pneumonia/ Severe immunocompromise: Acyclovir 10mg/kg IV every 8 hour for 7-10 days

Levin MJ, Schmader KE, Oxman MN. Varicella and Herpes Zoster. In: . In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 3035-64

RIGHT DIAGNOSIS & TREATMENT – HERPES ZOSTER

Right diagnosis

- Segmental eruption, striking midline demarcation
- Develop in a continuos or interrupted band in the area of one, occasionally two dermatomes
- Rarely, more contiguous dermatomes
- Associated pain, which may be severe

Closely grouped red papules

↓

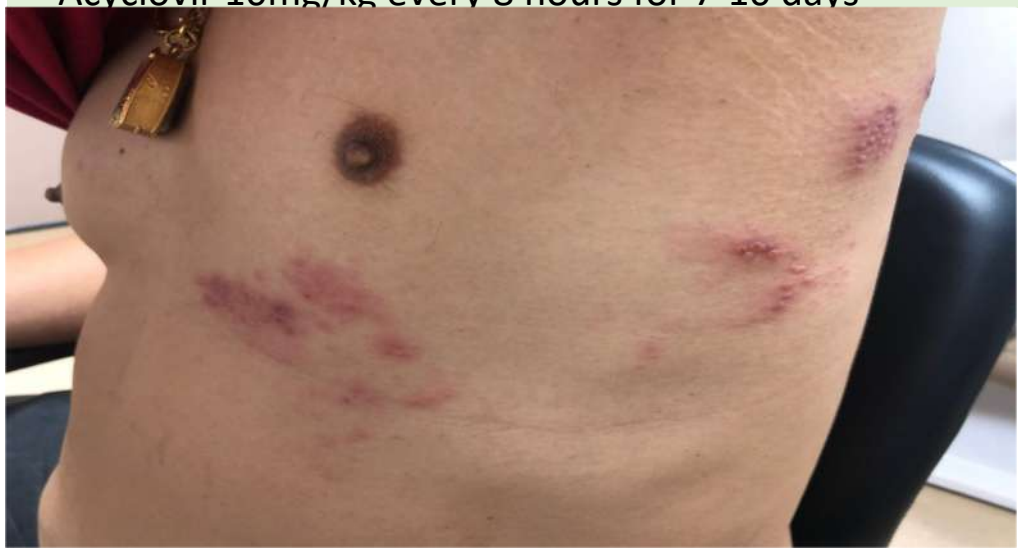
Vesicular

↓

Pustular

Right treatment

- **First line:** Tablet Acyclovir 800 mg five times a day for 7days OR Tablet Valacyclovir 1 g OR Tablet famciclovir 500 mg three times a day for 7 days
- **Second line / In severe immunocompromise:** IV Acyclovir 10mg/kg every 8 hours for 7-10 days



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RIGHT DIAGNOSIS & TREATMENT - SUPERFICIAL FUNGAL INFECTION

Naveen Kumar Kansal, Riti Bhatia ,Sushantika Namrata Sarkar

Dermatophytosis: Tinea cruris/ corporis

Clinical Features

- Annular or serpiginous plaque with scale across the entire active erythematous raised border, which may be vesicular, advances centrifugally

Diagnosis

- KOH mount (scales from edge): septate and branching hyphae without constriction

Treatment

- Localized/ Recent onset- Topical azole twice daily for 2-4 weeks
- Extensive- Oral Itraconazole 100 mg/day for 2-4 weeks OR Oral terbinafine 250 mg/day for 2-3 weeks

Candidal paronychia

Clinical Features

- Cuticles lost and proximal nail fold becomes red and rolled, upon pressing, small bead of pus can come out from under proximal nail fold. The adjoining nail plate becomes yellow-brown and ridged over period of time.

Diagnosis

- KOH mount: budding yeast and pseudohyphae

Treatment

- Clotrimazole 1% solution twice daily application for 2-4 weeks ± betamethasone valerate 0.1% lotion on nail fold one daily (in chronic cases)

Hay RJ. Fungal Infections. In: Griffiths CEM, editor. Rook's Textbook of Dermatology. 10th ed. Oxford: Wiley-Blackwell; 2024. p. 32.1-32.95

RIGHT DIAGNOSIS & TREATMENT - SUPERFICIAL FUNGAL INFECTION

Dermatophytosis: Tinea unguium

Clinical Features

- Yellow brown discoloration with crumbling and **tunnelling** of nail plate (distal part) ± collection of friable debris under the nail **(subungual hyperkeratosis)** ± separation of nail plate from nail bed **(onycholysis)**

Diagnosis

- KOH mount (clipping of discoloured nail plate/subungual debris): septate and branching hyphae without constriction

Treatment

- First line – Itraconazole 400mg/day for 1 week, monthly (2-3 months for fingernails, for 3-4 months for toenails)
- Topical treatment (Amorolfine/ Ciclopirox olamine)

Dermatophytosis: Tinea pedis

Clinical Features

- Interdigital scaling seen most frequently in the lateral 2 interdigital spaces or well defined scaly plaque on the sole, usually unilateral or recurrent vesiculation of soles

Diagnosis

- KOH mount: septate and branching hyphae without constriction

Treatment

- Topical: Luliconazole 1% cream BD for 4 weeks
- Oral: Tab Terbinafine 250 mg/day for 2 weeks, OR Oral Itraconazole 200mg twice daily for 1 week

Craddock LN, Schieke SM. Superficial Fungal Infection. In: . In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 2925-51

RIGHT DIAGNOSIS & TREATMENT - SUPERFICIAL FUNGAL INFECTION

Dermatophytosis: Tinea manuum (hands)

Clinical Features

- Unilateral well-defined plaques or as diffuse erythema of the palms with accumulation of fine scales in the creases

Diagnosis

- KOH mount: septate and branching hyphae without constriction

Treatment

- Topical: Topical Luliconazole 1% cream BD for 4 weeks
- Oral: Tab Terbinafine 250 mg/day for 2 weeks, OR Oral Itraconazole 200mg twice daily for 1 week

Dermatophytosis: Non-inflammatory tinea capitis

Clinical Features

- Partially bald area with scaling most marked at the periphery with lustre less hair which may break 3-4 mm from the scalp and can be easily plucked

Diagnosis

- KOH mount: arthroconidia within the hair shaft (endothrix), or small/large arthroconidia forming a sheath around the hair shaft (ectothrix)

Treatment

- Oral griseofulvin 20-25mg/kg/day of the micro size form or 15mg/kg/day in divided doses of the ultramicrosize form with food for 8 weeks + topical ketoconazole 2% as adjuvant

Craddock LN, Schieke SM. Superficial Fungal Infection. In: . In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 2925-51

RIGHT DIAGNOSIS & TREATMENT - SUPERFICIAL FUNGAL INFECTION

Dermatophytosis: Inflammatory tinea capitis (kerion)

Clinical Features

- Boggy swelling with postulation with easily and painlessly pluckable hair ± Lymphadenopathy (especially occipital)

Diagnosis

- KOH mount: endothrix or ectothrix pattern

Treatment

- Oral griseofulvin: 20–25 mg/kg/day of the microsize form or 15 mg/kg/day in divided doses of the ultramicrosize form with food for 8 weeks + Topical ketoconazole 2% as adjuvant

Dermatophytosis: Tinea capitis (Favus)

Clinical Features

- Foul-smelling, yellowish cup-shaped crusts entangling many scalp hair; scarring alopecia

Diagnosis

- KOH mount: hyphae arranged lengthwise around and within the hair shaft, rarely arthroconidia, and vacant air spaces

Treatment

- Oral griseofulvin 20-25mg/kg/day of the micro size form or 15mg/kg/day in divided doses of the ultramicrosize form with food for 8 weeks + topical ketoconazole 2% as adjuvant

Craddock LN, Schieke SM. Superficial Fungal Infection. In: . In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 2925-51

RIGHT DIAGNOSIS & TREATMENT - SUPERFICIAL FUNGAL INFECTION

Pityriasis Versicolor

Clinical Features

- Hypopigmented (less frequently erythematous) or hyperpigmented scaly, and perifollicular macules which frequently coalesce

Diagnosis

- KOH mount: mixture of short, branched hyphae and spores (spaghetti and meatball appearance)

Treatment

- Ketoconazole 2% shampoo twice weekly for 2-3 weeks
- Second line : oral itraconazole 200mg daily for 5 days

Flexural candidiasis (candidal intertrigo)

Clinical Features

- Moist glazed area of erythema and maceration. The edges show frayed scaling and satellite sub corneal pustule (inframammary area, axilla, groins, natal cleft and in between digits)

Diagnosis

- KOH mount: budding yeast and pseudohyphae

Treatment

- Localized: Topical Clotrimazole 1% or ketoconazole 2% cream twice daily
- Severe cases Tab Fluconazole 150mg weekly for several doses
- Avoid moisture retention

Hay RJ. Fungal Infections. In: Griffiths CEM, editor. Rook's Textbook of Dermatology. 10th ed. Oxford: Wiley-Blackwell; 2024. p. 32.1-32.95

RIGHT DIAGNOSIS & TREATMENT- CANDIDIASIS

Oral Candidiasis

Clinical Features

- White adherent plaques, which are difficult to remove, but on removal red base is seen

Diagnosis

- KOH mount: budding yeast and pseudo hyphae

Treatment

- Clotrimazole mouth paint for local application 3-5 times daily
- Severe/ Immunocompromised: Fluconazole 100-200mg daily for 1-2 weeks

Genital candidiasis

Clinical Features

- Vulvovaginitis: intense itching in the vulva, white curdy discharge.
- Balanoposthitis: fragile papulo-pustules which rupture to form well-defined, erythematous erosions, which may show a collarette of white scales

Diagnosis

- KOH mount: budding yeast and pseudohyphae

Treatment

- Topical Miconazole 2% / Clotrimazole 1% cream
- Tablet fluconazole 150 mg oral stat (2-3 doses 72 hours apart for more severe cases)

Ahronowitz I, Leslie K. Yeast Infections. In: . In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 2952-64

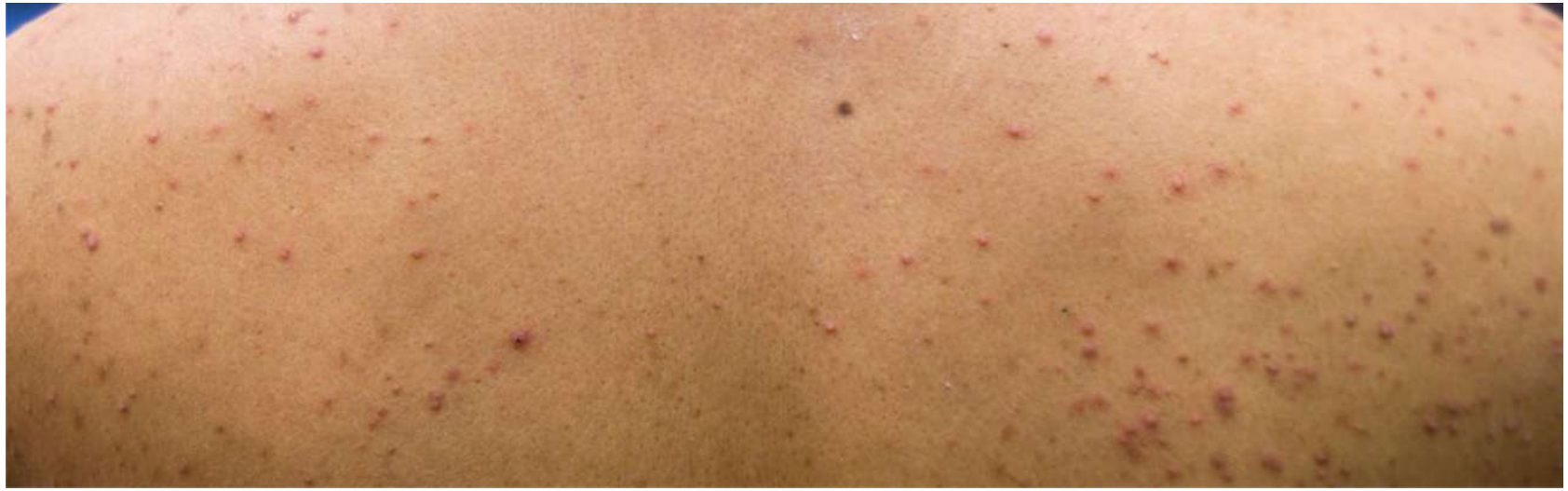
RIGHT DIAGNOSIS & TREATMENT - FUNGAL FOLLICULITIS

RIGHT DIAGNOSIS

- Multiple pruritic monomorphic papules and pustules on face, trunk, upper arms
- KOH examination –fungal hyphae, yeast forms can be seen

RIGHT TREATMENT

- Topical Ketoconazole 2% ± Propylene glycol (keratolytic)
- Oral itraconazole 200mg /day for 3 weeks (Malassezia folliculitis)



Ahronowitz I, Leslie K. Yeast Infections. In: . In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 2952-64

RIGHT DIAGNOSIS & TREATMENT - BACTERIAL FOLLICULITIS

Naveen Kumar Kansal, Riti Bhatia ,Sushantika Namrata Sarkar

RIGHT DIAGNOSIS

- Small, fragile, pustule at the ostium of hair follicle
- H/o acute eruption of lesions after a hot tub bath – pseudomonas infection
- Recent prolonged intake of antibiotics (eg. For acne) – gram negative folliculitis

RIGHT TREATMENT

- 1st line agents
  - Topical mupirocin 2% twice daily / Topical fusidic acid 1% 2-4 times daily for 5-7 days
- Extensive skin involvement (7 days course of oral antibiotics)
  - Cephalexin 500 mg four times a day
- Suspected/ cultured MRSA infection (7 days course of oral agents)
  - Trimethoprim/sulphamethoxazole 1 double strength tab twice daily
  - Clindamycin 300 mg four times daily
  - Doxycycline 100 mg twice daily

Miller LS. Superficial Cutaneous Infections and Pyodermas. In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 2719-45.

RIGHT DIAGNOSIS & TREATMENT - IMPETIGO

Naveen Kumar Kansal, Riti Bhatia ,Sushantika Namrata Sarkar

Types

Non- Bullous Impetigo -
Papules, vesicles, pustules that breakdown to form honey-colored crusts on erythematous background

Bullous Impetigo-
Flaccid large bullae – rupture to form crusted, erythematous erosions with collarette of scale

Diagnosis-
Gram stain and pus culture – Staph. aureus/ streptococcus

Medication	Adult dose	Child dose
Impetigo (localized and simple)	Mupirocin 2% oint twice daily Fusidic acid 1%cream 2-4 times daily	Twice daily 2-4 times daily
MSSA		
Cephalexin	500 mg four times per day	50-100mg/kg per day in 3-4 divided doses
If MRSA is suspected or confirmed		
Clindamycin or	300 to 450 mg four times per day	20-40mg/kg per day in 3-4 divided doses
Trimethoprim-sulfamethoxazole or	1 double strength tablet twice per day	8 to 12 mg/kg (trimethoprim) per day in 2 divided doses
Doxycycline	100 mg twice per day	Not for children <8 years old

Miller LS. Superficial Cutaneous Infections and Pyodermas. In: Kang S, editor. Fitzpatrick's Dermatology, 9th ed. United States of America: McGraw Hill Education; 2019. p. 2719-45.

RIGHT DIAGNOSIS –MODIFIED DUKES CRITERIA FOR INFECTIVE ENDOCARDITIS

Bhanu Duggal, Abhinavya E.

Major Criteria

1. POSITIVE BLOOD CULTURE

a) Typical microorganism for infective endocarditis from two separate blood cultures: Oral streptococci, Streptococcus gallolyticus (formerly S. bovis), HACEK group, S. aureus, E. faecalis

b) Persistently positive blood culture, defined as recovery of a microorganism consistent with infective endocarditis from:

- Blood cultures drawn >12 h apart; or
- All of 3 or a majority of ≥4 separate blood cultures, with first and last drawn at least 1 h apart or

c) Single positive blood culture for Coxiella burnetii or phase I IgG antibody titer of >1:800

2. IMAGING POSITIVE FOR IE: Valvular, perivalvular/periprosthetic and foreign material anatomic and metabolic lesions characteristic of IE detected by any of the following imaging techniques:

a) Echocardiography (TTE and TOE):

- 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; or abscess; or new partial dehiscence of prosthetic valve.
- New valvular regurgitation (worsening or change in preexisting murmur not sufficient)

b) Cardiac CT c)[18F]-FDG-PET/CT(A) d) WBC SPECT/CT.

Minor Criteria

1. Predisposition: Predisposing heart conditions or intravenous drug use
2. Fever ≥38.0°C (≥100.4°F)
3. Vascular phenomena: major arterial emboli, septic pulmonary infarcts, mycotic aneurysm, intracranial hemorrhage, conjunctival hemorrhages, and Janeway lesions
4. Immunologic phenomena: Glomerulonephritis, Osler's nodes, Roth's spots, and Rheumatoid factor
5. Microbiologic evidence:

a) Positive blood culture but not meeting major criterion, as noted above (excludes single positive culture findings for coagulase-negative staphylococci and organisms that do not cause endocarditis) or

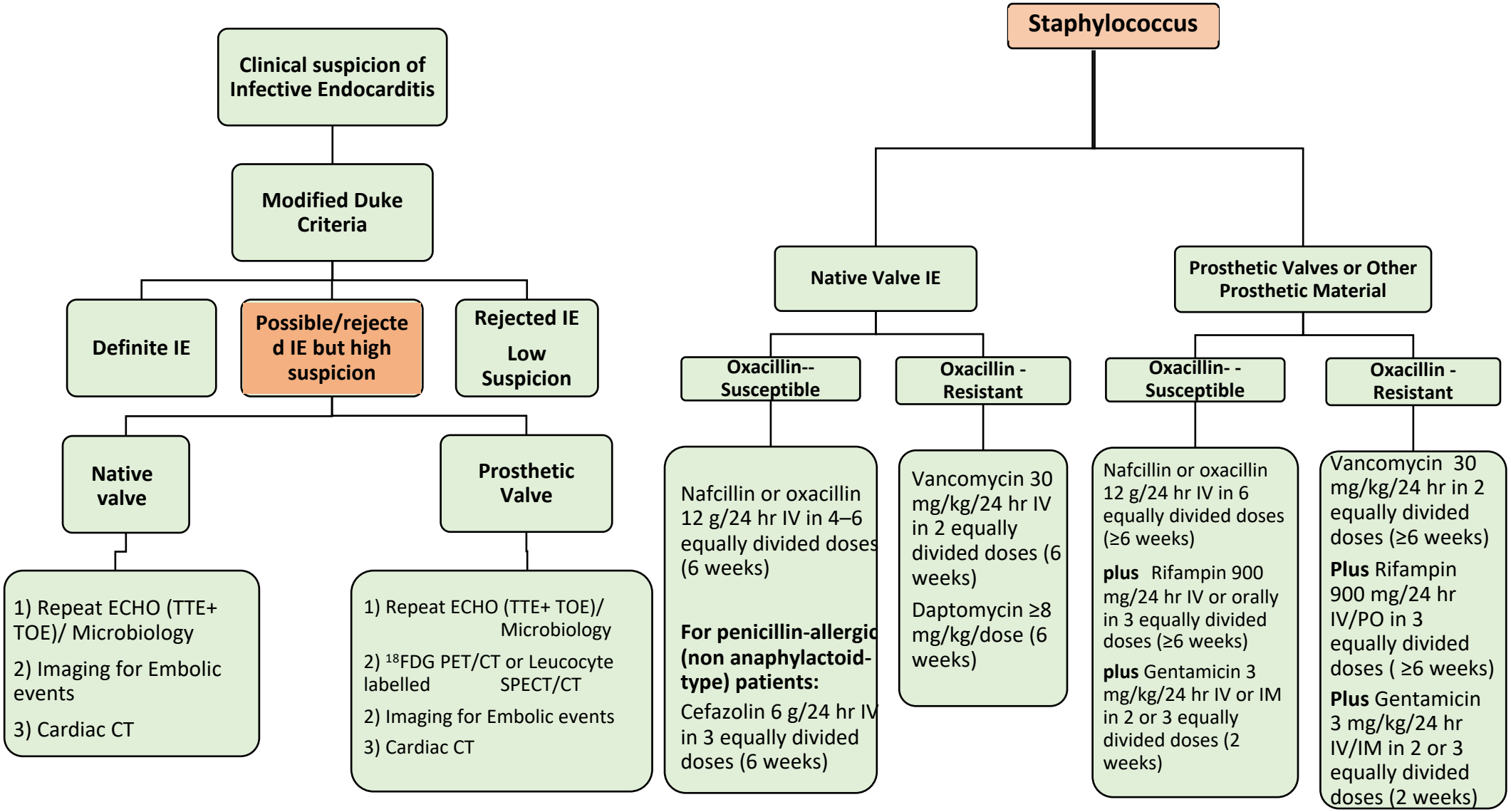
b) Serologic evidence of active infection with an organism consistent with infective endocarditis

Criteria Defining Infective Endocarditis

- DEFINITE INFECTIVE ENDOCARDITIS
  - **Pathologic Criteria**
    - Microorganisms demonstrated by results of cultures or histologic examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or
    - Pathologic lesions; vegetation, or intracardiac abscess confirmed by results of histologic examination showing active endocarditis
  - **Clinical Criteria**
    - 2 major criteria, or
    - 1 major criterion and 3 minor criteria, or 5 minor criteria

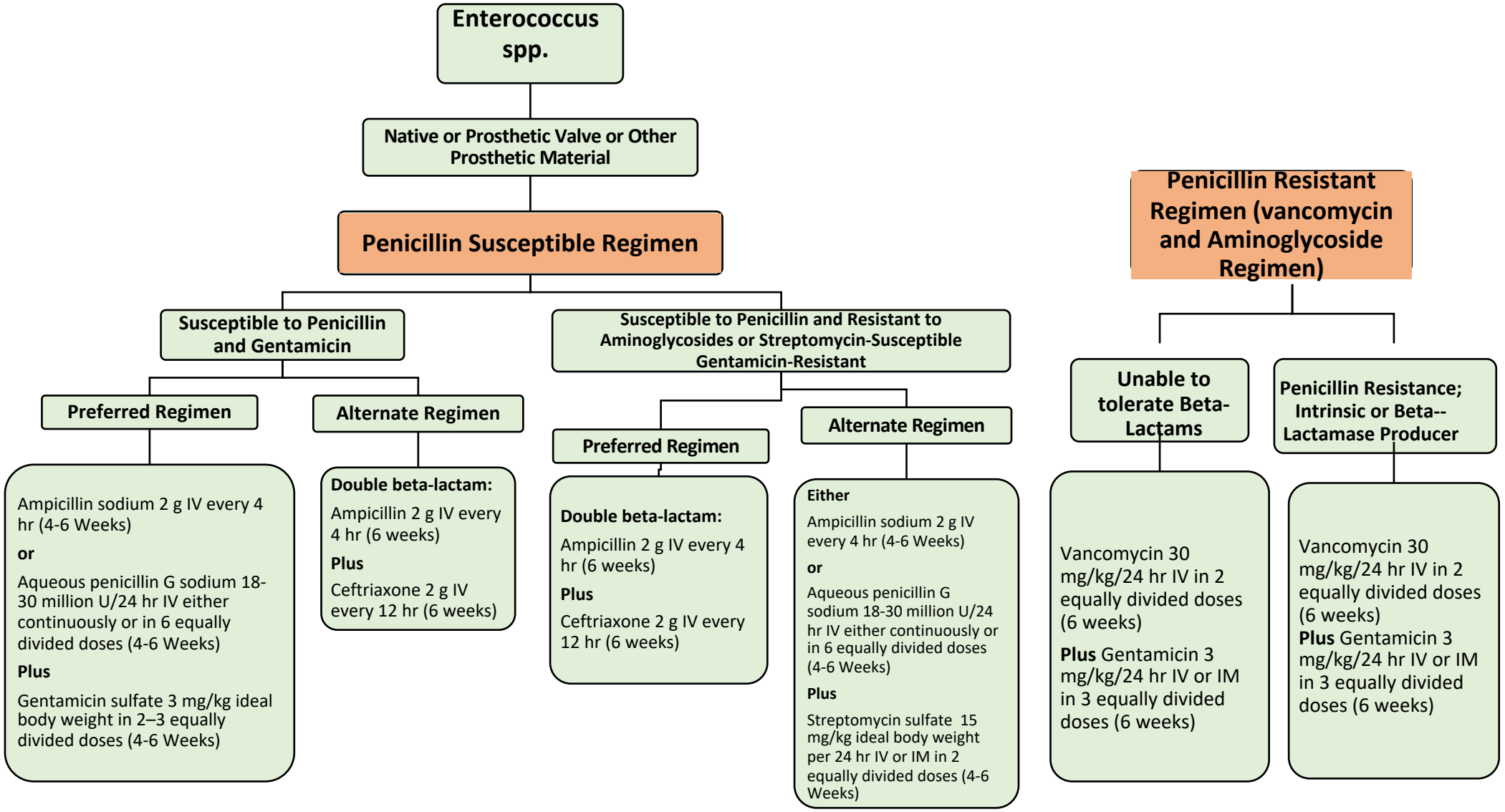
- **POSSIBLE INFECTIVE ENDOCARDITIS**
  - 1 major criterion and 1 minor criterion, or
  - 3 minor criteria
- **REJECTED DIAGNOSIS OF INFECTIVE ENDOCARDITIS**
  - Firm alternate diagnosis explaining evidence of suspected IE, or
  - Resolution of IE syndrome with antibiotic therapy for ≤4 days, or
  - No evidence of IE at surgery or autopsy, on antibiotic therapy for ≤4 days, or
  - Does not meet criteria for possible IE

RIGHT APPROACH & ORGANISM WISE RIGHT TREATMENT



Delgado et al, ESC Scientific Document Group, 2023 ESC Guidelines for the management of infective endocarditis: Developed by the task force on the management of endocarditis of the European Society of Cardiology (ESC) Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS) and the European Association of Nuclear Medicine (EANM), European Heart Journal, Volume 44, Issue 39, 14 October 2023, Pages 3948–4042, https://doi.org/10.1093/eurheartj/ehad193

INFECTIVE ENDOCARDITIS – ORGANISM WISE RIGHT TREATMENT



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INFECTIVE ENDOCARDITIS – RIGHT PREVENTION

High Risk Population		
Patients with any prosthetic valve, including a transcatheter valve, or those in whom any prosthetic material was used for cardiac valve repair	Patients with a previous episode of IE	Patients with CHD: (a) Any type of cyanotic CHD. (b) Any type of CHD repaired with a prosthetic material, whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if residual shunt or valvular regurgitation remains.

Non-specific measures

a. Strict dental and cutaneous hygiene. Dental follow-up should be performed twice a year in high-risk patients and yearly in the others.
b. Disinfection of wounds.
c. Eradication or decrease of chronic bacterial carriage: skin, urine.
d. Curative antibiotics for any focus of bacterial infection.
e. No self-medication with antibiotics.
f. Strict infection control measures for any at-risk procedure.
g. Discourage piercing and tattooing.
h. Limit the use of infusion catheters and invasive procedure when possible. Favour peripheral over central catheters, and systematic replacement of the peripheral catheter every 3–4 days. Strict adherence to care bundles for central and peripheral cannulae should be performed.

Antibiotic Regimens for Prophylaxis

Standard oral regimen	**Inability to take oral medication**	**Penicillin allergy**	**Penicillin allergy, inability to take oral medication**
Amoxicillin: 2 g PO 1 h before procedure	Ampicillin: 2 g IV or IM within 1 h before procedure	1. Clarithromycin or azithromycin: 500 mg PO 1 h before procedure 2. Cephalexin: 2 g PO 1 h before procedure 3. Doxycycline: 100 mg PO 1 h before procedure	Cefazolin or ceftriaxone: 1 g IV or IM 30 min before procedure (Cephalosporins not to be used in patients with immediate hypersensitivity to penicillin, eg urticaria, angioedema, anaphylaxis)

Delgado et al, ESC Scientific Document Group, 2023 ESC Guidelines for the management of infective endocarditis: *Developed by the task force on the management of endocarditis of the European Society of Cardiology (ESC) Endorsed by the European Association for Cardio-Thoracic Surgery (EACTS) and the European Association of Nuclear Medicine (EANM), European Heart Journal, Volume 44, Issue 39, 14 October 2023, Pages 3948–4042, https://doi.org/10.1093/eurheartj/ehad193*

SEPTIC ARTHRITIS - RIGHT DIAGNOSIS AND RIGHT TREATMENT

Pankaj Kumar Kandwal , Aman Verma

Risk Factors:

- Rheumatoid arthritis (RA) or osteoarthritis
- Prosthetic joints
- Low socio-economic status
- I.v. drug abuse
- HIV infection
- Immuno suppressive drugs
- Alcoholism
- Diabetes
- Previous Intraarticular corticosteroids
- Cutaneous ulcers

Clinical Features:

- Hot, swollen, tender joint or joints with a reduced range of movement
- Large joints are more commonly reported than small joints and in up to 60% of cases the joints affected are the hip or the knee
- Gonococci and meningococci have an increased tendency, compared with other causative organisms, to affect more than one joint
- Streptococci and Staphylococci responsible for 91% of septic arthritis

Investigations:

- ❖ Synovial fluid analysis-
  - TLC, DLC, crystals, Protein, Glucose, Uric acid, Gram stain, AFB, Culture sensitivity.
  - Synovial fluid TLC is not sufficiently reliable a measure to exclude or confirm a diagnosis of septic arthritis.
  - PCR can be done if atypical organisms are suspected like Borrelia where culture yield is low.
- ❖ Blood cultures, CBC, ESR, CRP can be helpful.
- ❖ Plain radiography, although not useful for imaging of the joint, may be performed routinely to exclude underlying osteomyelitis.
  - No radiological technique is currently sufficiently sensitive or specific to be diagnostically useful in suspected septic arthritis.

Antibiotic Therapy for Suspected Septic Arthritis

- Empiric systemic antibiotics should be initiated after obtaining synovial fluid if clinical concern for septic arthritis.
- Antibiotic treatment should be based on results of a synovial fluid Gram stain or suspicion of a pathogen from the clinical scenario

Gram Stain result	Antibiotics
Empiric antibiotics based on Gram stain result	
Gram- positive cocci	Vancomycin or daptomycin, plus a cephalosporin, carbapenem, or fluoroquinolone
Gram-Negative cocci	Ceftriaxone
Gram-Negative rods	Ceftazidime, cefepime, piperacillin/tazobactam or carbapenem Penicillin or cephalosporin allergy: IV Aztreonam or fluoroquinolone
Negative result on gram stain but strong clinical suspicion	Vancomycin plus ceftazidime or an aminoglycoside

- Surgical drainage: closed needle aspiration or open arthroscopy or arthrotomy in selected cases

Mathews CJ, Kingsley G, Field M, et al. Management of septic arthritis: a systematic review. Ann Rheum Dis. 2007;66(4):440-5
Horowitz DL, Katzap E, Horowitz S, et al. Approach to septic arthritis. Am Fam Physician. 2011;84(6):654

RIGHT TREATMENT SEPTIC ARTHRITIS

Isolated species	Antibiotics
Antibiotic based on culture, acid fast stain, RNA probe or antibody findings	
Borrelia burgdorferi	Oral Doxycycline, Amoxicillin or cefuroxime; IV ceftriaxone if no resolution after oral therapy
Mycobacterium tuberculosis	Multidrug regimen (ATT)
Neisseria gonorrhoeae	IV ceftriaxone or cefotaxime; switch to oral after 2 days, for at least 7 days

- Antibiotics should initially cover gram-positive cocci because they are most common
- (in particular *Staphylococcus* and *Streptococcus* species)
- Gram-negative coverage considered for - older age, immunosuppression, or bacteremia from a urinary or gastrointestinal source.
- Oral antibiotics were not inferior to intravenous antibiotics when started within one week of surgery or arthrocentesis
- Clindamycin-based therapy safer and more effective alternate to the traditional regimen of vancomycin or daptomycin plus a cephalosporin, carbapenem, or fluoroquinolone

Duration of Treatment-

- Non-Gonococcal septic arthritis-
  - at least 2 weeks- for small joints
  - 6 weeks for other joints
- MRSA- 3-4 weeks along with surgical debridement

Earwood JS, Walker TR, Sue GJC. Septic Arthritis: Diagnosis and Treatment. Am Fam Physician. 2021;104(6):589-597.

EAR INFECTIONS

Amit Kumar Tyagi, Ankita Semwal

Otitis externa

❑**Clinical features**

Pain, itching, edema and erythema of external auditory canal with purulent otorrhea and debris in the meatus

❑**Right diagnosis: Clinical**

❑**Right antibiotic:**

Otic drops/ointments containing a mixture of aminoglycoside and corticosteroids, such as neomycin sulfate and hydrocortisone.

Refractory cases, particularly if there is cellulitis of adjacent periauricular tissue, oral fluoroquinolones such as ciprofloxacin 500mg twice a day can be used. In place of ciprofloxacin, ofloxacin can also be used.

- **Perichondritis of external ear**

❑ Clinical features

- Pain, swelling, erythema of pinna (cartilaginous part) with lobule sparing

❑ Right diagnosis: Clinical

❑ Right antibiotic-

- Mildest form- topical and oral antibiotics fluoroquinolones.
- Intravenous antibiotics for severe forms like ceftazidime to cover P.aeruginosa

Chronic otitis media

❑ Clinical features

- Intermittent painless otorrhea, hearing loss, cholesteatoma, perforated ear drum, polypoidal changes, retraction pockets.

❑ Right diagnosis: Clinical, HRCT temporal bone

❑ Right antibiotic

- Fluoroquinolones topical ear drops (like ciprofloxacin) with steroids like beclomethasone.
- Chloramphenicol ear drops with steroids in resistant cases.

Acute Otitis Media

- Clinical features
  Pain, aural fullness, fever, otorrhea, congested tympanic membrane, signs of middle ear fluid
- Right diagnosis: Clinical
- Right antibiotic
  - Amoxicillin – 1st choice (80 mg/kg/day)
  - Combined with macrolides if drug resistant pneumococci are common
  - Oral Amoxicillin-clavulanate or cefuroxime
  - If patient is sensitive to penicillin then switch to 2nd or 3rd generation cephalosporins, macrolide, clindamycin

- When to start antibiotic:
  - Under 6 months of age
  - Under 2 years of age with recurrent episodes
  - Failure to improve after 2 days of "wailful watching"
  - More severe symptoms including pyrexia, vomiting, irregular course , or sign of complication
  - All 'high-risk' children e.g. Down syndrome, craniofacial abnormalities, congenital inner ear abnormalities, immunodeficiencies
  - Failure to improve after 2-3 days treatment should lead to change of antibiotic

Malignant otitis externa

- Clinical features
  - Severe aural pain, discharge not relieved by usual measure, patient is immunocompromised mostly with diabetes . peri auricular tissue edema and tenderness, granulations at the osseocartilaginous junction. 7th cranial nerve palsy most commonly involved
- Right diagnosis: Clinical
  - Routine blood investigations, serial ESR, histopathology of granulation tissue, Technetium 99m scans, MRI with gadolinium enhancement, HRCT temporal bone
- Right antibiotic
  - Oral therapy
  - Fluoroquinolones (i.e- ciprofloxacin).
  - Fluoroquinolones or 3rd/4th generation cephalosporins +aminoglycosides
  - Cephalosporins (ceftazidime, cefepime), penicillin (ticarcillin, clavulanate)and aminoglycosides either in combination or as monotherapy are suitable alternative in the context of resistance
  - Ceftazidime monotherapy is used when aminoglycoside is contraindicated due to nephrotoxicity.

RIGHT DIAGNOSIS & TREATMENT OF URTI

Amit K Tyagi, Darab Singh, Drupad Das, Gaurav

Acute Bacterial Rhinosinusitis

- Major Symptoms:-
  - Purulent anterior or posterior nasal discharge
  - Nasal congestion or obstruction
  - Facial congestion/fullness/pain
  - Hyposmia or anosmia
  - Fever (for acute sinusitis only)
- Minor Symptoms:-
  - Headache, Ear pain, pressure or fullness
  - Halitosis, Dental Pain, Cough
  - Fever (for subacute or chronic sinusitis)
- ❖ Clinical Diagnosis:- Presence of at least 2 Major and >/= 2 Minor Symptoms
- Radiology:- NCCT PNS
- Laboratory Investigations- Leucocytosis, Microbiological testing
- Diagnosis- Clinical + NCCT PNS + Laboratory
- Treatment:- Antibiotic treatment indicated if symptoms persist for >7 days-
  - Amox + Clavulanate (625 mg TDS) OR Cefixime (400 mg/d) OR Co-trimoxazole-DS (160+800 mg) OR Doxycycline (100 mg BD) OR Macrolide (Azithromycin)
- ❖ In previously treated patients
  - Levofloxacin (750/500 mg/d) OR Moxifloxacin (400 mg/d) for 2-4 weeks

Chronic Rhinosinusitis

- Duration >/= 4 weeks
- Clinical Features- Facial pain or pressure, nasal obstruction, Purulent nasal discharge, headache, fatigue, nasal polyps, edema of nasal mucosa
- Danger Signs- Diplopia, Proptosis, Severe Headache, Meningeal signs, Sudden increased periorbital edema, High fever, Ophthalmoplegia
- Diagnosis:- Clinical + NCCT PNS + Endoscopy + Laboratory Investigations
- Treatment:-Antibiotic therapy should be culture directed
- Empirical Antibiotics:- Amoxicillin-clavulanate (500mg TDS/ 875 mg BD/ 1000mg ER BD); For Penicillin allergic patients - Clindamycin (300 mg QID/ 450 mg TDS) OR Moxifloxacin (400 mg OD)
- Mupirocin for local application in vestibule

Acute Pharyngitis

- Clinical Features-
  - Acute onset sore throat with chills
  - Malaise
  - Headache
  - Anorexia
  - Painful cervical lymphadenopathy
  - Thick grey membrane in Diphtheria, which is difficult to remove
- Diagnosis:-Clinical
- Treatment:- Amoxicillin +/- Clavulanate (625 mg TDS) for 10 days

OR

Oral Cephalosporins for 10 days

1. ***Anthony W. et al, IDSA Clinical Practice Guideline for Acute Bacterial Rhinosinusitis in Children and Adults, Clinical Infectious Diseases, Volume 54, Issue 8, 15 April 2012, Pages e72–e112***

2. Stanford T. et al, Clinical Practice Guideline for the Diagnosis and Management of Group A Streptococcal Pharyngitis: 2012 Update by the Infectious Diseases Society of America, Clinical Infectious Diseases, Volume 55, Issue 10, 15 November 2012, Pages e86–e102

RIGHT DIAGNOSIS & TREATMENT OF URTI

Amit K Tyagi, Gaurav

Acute Laryngitis

❖ Clinical Diagnosis:- by clinical Examination only

- Change or loss of voice;
- Difficulty in breathing/stridor;
- Sore throat after talking and otalgia;
- Dry irritating cough worse at night
- Difficult or painful swallow;
- Tender larynx with/without cervical lymphadenopathy

❖ Treatment:- Right antibiotic - Only in Infected cases with toxemia- Amoxycillin and Analgesic

Acute Epiglottitis

❖ Diagnosis:- by clinical Examination only

- Abrupt Onset with Rapid progression
- Sore Throat, dysphagia and odynophagia.
- Drooling, respiratory distress
- Hoarseness and oedema of the palatine arches and uvula
- Stridor in Children
- Fever upto 40 ^{0}C when there is septicaemia

❖ Send Blood culture and a throat swab culture

❖ A plain lateral soft-tissue radiograph of the neck

❖ Treatment:-Hospitalisation - IV antibiotics of second- and 3rd-generation cephalosporins or Ampicillin

Acute Laryngo-tracheobronchitis

❖ Diagnosis:- Clinical, Xray Showing Steeple Sign

- URTI with Hoarseness and Croupy Cough;
- Fever 39-40 C;
- Inspiratory Stridor
- Difficult or painful swallow;

❖ Treatment:- Hospitalization with Humidification; IV Ampicillin, Steroids, Analgesic

Laryngeal Diphtheria

❖ Diagnosis:- by clinical Examination only

- Low grade fever
- Sore Throat, Malaise, odynophagia
- H/O improper immunization
- Drooling, respiratory distress, Bull neck lymphadenopathy
- White Patches over tonsils bleeds on removal
- Stridor

❖ Treatment:-

- Neutralization of unbound toxin with DAT;
- Antibiotics to prevent further bacterial growth
- Monitoring and supportive care to prevent and treat complications, e.g. airway obstruction, myocarditis.

Peritonsillar Abscess

❖ Diagnosis:- by clinical Examination + Pus culture, Throat swab, & Blood culture

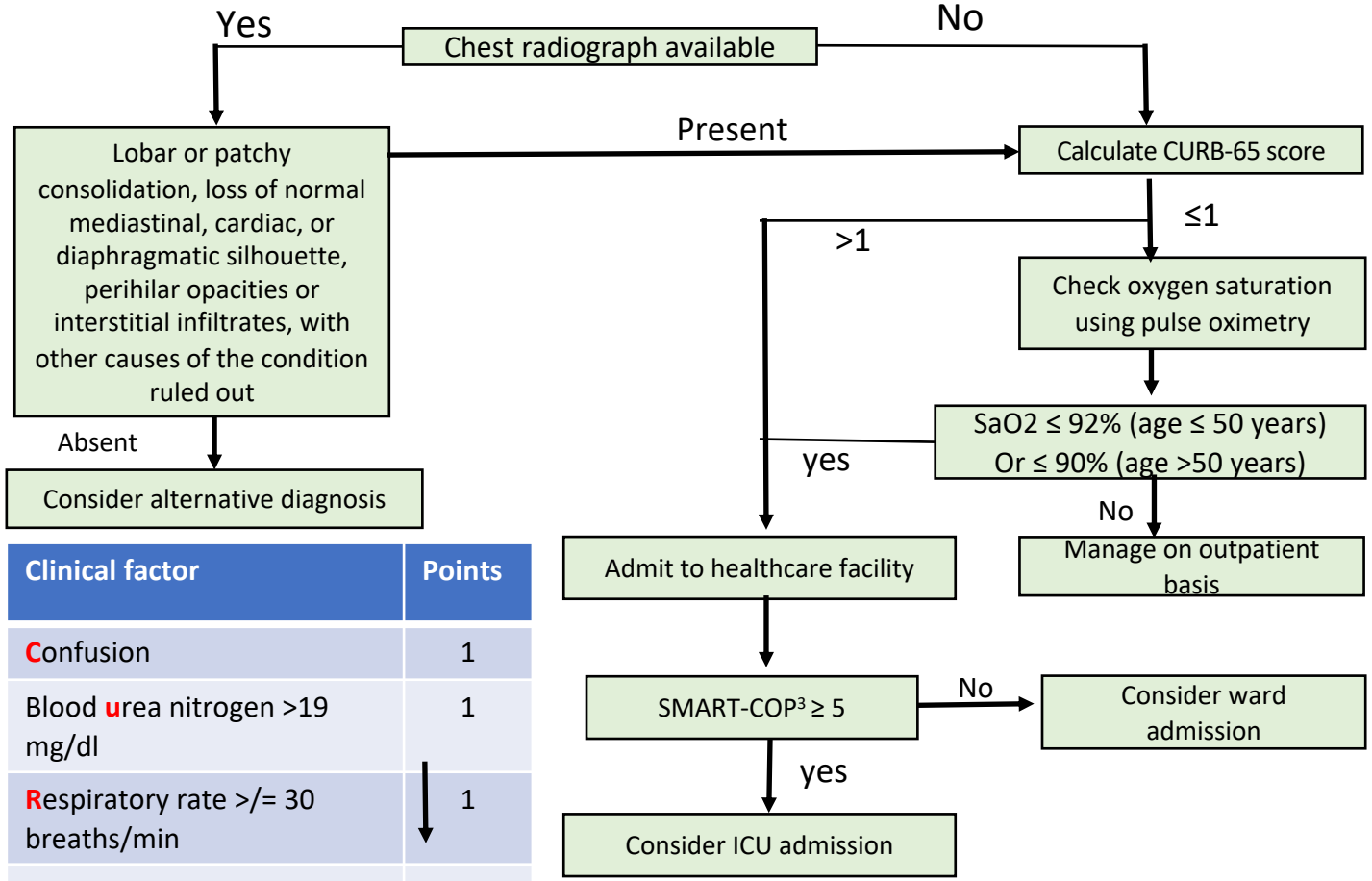
- Pyrexia, sore throat
- Painful swallowing,
- Severe pharyngitis lateralized to one or other side,
- Severe trismus
- Painful cervical adenopathy
- Airway compromise
- Dehydration
- Send Blood culture and a throat swab culture

❖ Treatment:- Hospitalisation - IV antibiotics of Penicillin or a cephalosporin + metronidazole

RIGHT DIAGNOSIS – COMMUNITY ACQUIRED PNEUMONIA

Prakhar Sharma ,Shivam Garg

- Cough with or without expectoration, shortness of breath, pleuritic chest pain for less than one week WITH
- At least one systemic feature (temperature >37.7 C, chills and rigors and/or severe malaise) AND
- New focal signs on examination (bronchial breath sounds and/or crackles) WITH
- No other explanation for the illness



Clinical factor	Points
Confusion	1
Blood **u**rea nitrogen >19 mg/dl	1
Respiratory rate >/= 30 breaths/min	1
SBP <90 mmHg or DBP ≤ 60 mmhg	1
Age >/= 65 years	1

Stratify Risk:

- Use severity scales: CRB-65
  Decide OPD/IPD treatment

Consider co-morbidities/risk factors:

CLD/CKD/COPD/CHF/Diabetes/Alcoholic/Malignancy/asplenia

Risk factors: Prior respiratory isolation of MRSA or MDR GNB or recent hospitalization AND receipt of parenteral antibiotics (in the last 90 d)

Validated definition for SEVERE PNEUMONIA includes either one major criterion or three or more minor criteria

Minor criteria
• Respiratory rate ≥ 30 breaths/min
• Pa_{O2}/F_{IO2} ratio ≤ 250
• Multilobar infiltrates
• Confusion/disorientation
• Uremia (blood urea nitrogen level ≥ 20 mg/dl)
• Leukopenia (white blood cell count < 4,000 cells/µl)
• Thrombocytopenia (platelet count < 100,000/µl)
• Hypothermia (core temperature < 36°C)
• Hypotension requiring aggressive fluid resuscitation
Major criteria
• Septic shock with need for vasopressors
• Respiratory failure requiring mechanical ventilation

1. Gupta D, et al. Guidelines for diagnosis and management of community-and hospital-acquired pneumonia in adults: Joint ICS/NCCP(I) recommendations. Lung India 2012;29, Suppl S2:27-62

2. Metlay JP, et al. Diagnosis and treatment of adults with community-acquired pneumonia. an official clinical practice guideline of the ATS and IDSA. Am J Respir Crit Care Med 2019; 200(7):e45–e67.

RIGHT EMPIRICAL ANTIBIOTIC OF CAP

OPD

No comorbidities or risk factors for MRSA or MDR GNB	Amoxicillin or doxycycline or macrolide (if local pneumococcal resistance is <25%)
With comorbidities	Combination therapy with amoxicillin/clavulanate or cephalosporin AND macrolide or doxycycline

IPD

	Standard Regimen	Prior Respiratory Isolation of MRSA and/ or MDR GNB	Recent Hospitalization and Parenteral Antibiotics and Locally Validated Risk Factors for MRSA	Recent Hospitalization and Parenteral Antibiotics and Locally Validated Risk Factors for MDR GNB
Non-severe inpatient pneumonia	β-Lactam + macrolide	Add MRSA and/ or MDR GNB coverage and obtain cultures/nasal PCR to allow de escalation or confirmation	Obtain cultures and PCR but withhold MRSA coverage unless culture/PCR results are positive.	Obtain cultures but initiate coverage for MDR GNB only if culture results are positive
Severe inpatient pneumonia	β-Lactam + macrolide	-do-	Add MRSA coverage and obtain cultures/nasal PCR to allow de-escalation or confirmation	Add coverage for MDR GNB and obtain cultures to allow de-escalation or confirmation

Duration: OPD - 5 days

\- IPD - 7 days

Antibiotics may be continued beyond this period **(depending upon response)** in patients of:

- Bacteremic pneumococcal pneumonia
- Staphylococcus aureus pneumonia
- Legionella pneumonia
- Gram-negative bacilli pneumonia
- Those with meningitis or endocarditis complicating pneumonia
- With lung abscess
- With empyema
- If the initial therapy was not active against the identified pathogen

Adjunctive glucocorticoids (hydrocortisone 200 mg daily for 4 to 7 days) followed by a taper in patients with severe CAP[2].

1. Metlay JP, et al. Diagnosis and treatment of adults with community-acquired pneumonia. an official clinical practice guideline of the ATS and IDSA. Am J Respir Crit Care Med 2019; 200(7):e45–e67.
2. Dequin PF, Meziani F, Quenot JP, Kamel T, Ricard JD, Badie J, et al. Hydrocortisone in Severe Community-Acquired Pneumonia. New England Journal of Medicine. 2023 May 24;388(21):1931–41.

RIGHT DIAGNOSIS OF AE-BRONCHIECTASIS

Prakhar Sharma ,Shivam Garg

In a known case of bronchiectasis, acute deterioration or worsening of below mentioned symptoms:

- ❑ Cough
- ❑ Increased sputum volume or change of viscosity
- ❑ Increased sputum purulence with or without increasing wheeze
- ❑ Breathlessness
- ❑ Hemoptysis
- ❑ And/or systemic upset

Consider:

- **Comorbidities:** CLD/ CKD/ CHF/ Diabetes/ Alcoholism/ Malignancy/ Asplenia/ GERD
- **Risk factors:** Prior history of exacerbation, Prior respiratory isolation of MRSA or MDR GNB/ Recent hospitalization and receipt of parenteral antibiotics (in last 90 days), GERD, High baseline neutrophil elastase, poor adherence to treatment

Assess severity of bronchiectasis acute exacerbation FACED SCORE

Variable	Values	Points
FEV1 (% predicted)	≥ 50%	0
	<50%	2
Age	< 70 years	0
	≥ 70 years	2
Chronic colonization by pseudomonas aeruginosa	Yes	1
	No	0
Extension (number of pulmonary lobes affected)	1-2 lobes	0
	> 2 lobes	1
Dyspnea (mMRC)	0- II	0
	III- IV	1

FACED SCORE INTERPRETATION

Score	Interpretation
0-2	Mild bronchiectasis
3-4	Moderate bronchiectasis
5-7	Severe bronchiectasis

1. *Dhar R et al. Bronchiectasis in India: results from the European Multicentre Bronchiectasis Audit and Research Collaboration (EMBARC) and Respiratory Research Network of India Registry. The Lancet Global Health. 2019 Sep;7(9):e1269–79.*
2. *Martinez-Garcia MA et al. Predicting high risk of exacerbations in bronchiectasis: the E-FACED score. COPD. 2017 Jan;Volume 12:275–84.*

RIGHT TREATMENT FOR AE-BRONCHIECTASIS

- ❑ Look **for previous culture and sensitivity** pattern
- ❑ **Rule out** non-bacterial causes of exacerbation (*viral infections/ ABPA etc.*)
- ❑ Prompt **collection of sputum for C/S** (*prior to antibiotic initiation*)
- ❑ Initiate **empirical antibiotic** based on suspected organism (*as shown in **side table***)
- ❑ **Modify antibiotic** as required once a pathogen is isolated (*if there is no clinical improvement*)
- ❑ **E-Faced score/ BSI** – to decide frequency of follow up and chronic antibiotic therapy

Duration: 14 days. **Empirical (if CS not feasible / doubt in suspected organism)** – Fluoroquinolone (ciprofloxacin/ moxifloxacin/ levofloxacin). **Route**: Oral preferred (*IV route if patient appears unwell/ resistant organism isolated or oral therapy fails*).

1) Suspect and confirmation → 2) Severity assessment → 3) Treatment → 4) Prevention

Procedures

- Confirm clinically and radiologically significant bronchiectasis
- Evaluate worsening lung symptoms
- Exclude and/or search for other causes of deterioration

Assess

- Respiratory failure Haemoptysis
- Systemic deterioration
- Burden of symptoms
- Comorbidities
- Social support

Decide site of care (home, hospital)

- i.v./oral antibiotics
- Inhaled and/or steroids
- Bronchodilators
- Optimise ACT
- Chest physiotherapy
- Manage haemoptysis
- Remove endogenous or exogenous triggers
- Look for treatable traits

- Assess clinical stability
- Assess comorbidities
- Optimise home ACT
- Assess compliance
- Investigate aetiology
- Consider: Macrolide Inhaled antibiotics

Investigations:

- History and physical examination Chest imaging
- ABG/ Pulse oximetry
- Laboratory exams

Microbiological investigations (sputum culture, nasal swabs)

Arrange a MDD if needed

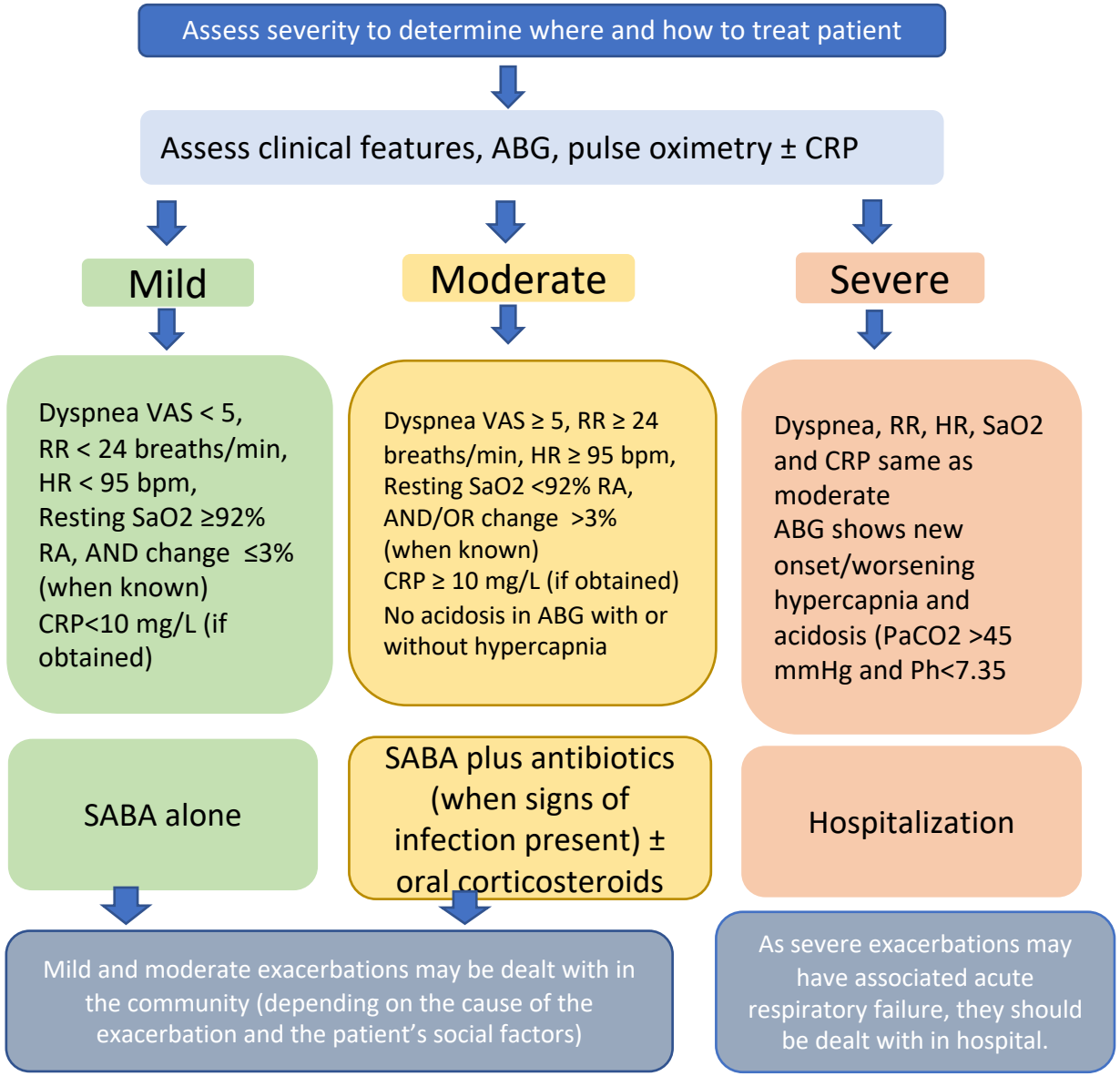
ECG/ECHO
HbA1C
Osteometabolic panel
Nutritional assessment

Streptococcus pneumoniae/ Haemophilus influenzae beta lactamase Negative/ Moraxella catarrhalis	
First choice Amoxicillin 500mg q8h Amoxicillin-clavulanic acid 625mg q8h	**Second choice** Doxycycline 100mg q12h/ Ciprofloxacin 500mg q12h/ Ceftriaxone 2gm q24hr
Staphylococcus aureus (MRSA)	
First choice Doxycycline 100mg q12h/ Vancomycin 15mg/kg q12h	**Second choice** Doxycycline 100mg q12h/ Clarithromycin 500mg q12h/ Linezolid 600mg q12h
Pseudomonas aeruginosa	
First choice Oral ciprofloxacin 500g q12h	**Second choice** Ceftazidime 2gm q8H/ Piperacillin with tazobactam 4.5gm q8h/ Meropenem 2gm q8h ***WITH*** Gentamicin/ Tobramycin – 15mg/kg Colistin – 50000-100000U/kg q12h

1. De Angelis A, Johnson ED, Sutharsan S, et al. Exacerbations of bronchiectasis. Eur Respir Rev 2024; 33: 240085 [DOI: 10.1183/16000617.0085-2024. 2. Hill AT et al. Thorax 2019;74(Suppl 1):1–69. doi:10.1136/thoraxjnl-2018-212463. 3. Hill AT et al. Pulmonary exacerbation in adults with bronchiectasis: a consensus definition for clinical research. Eur Respir J. 2017 Jun;49(6):1700051.

RIGHT DIAGNOSIS OF AE-COPD

Prakhar Sharma ,Shivam Garg



DEFINITION (by Rome proposal) Characterised by increased dyspnea and/or cough and sputum that worsens in <14 days

Clinical features- Tachypnea and/or Tachycardia and

Often associated with increased local and systemic inflammation.

Triggers: Infection, pollution, or other insult to the airways.

Rule out	Investigation
Pneumonia	CXR/ CRP/ PCT
Pneumothorax	CXR/ Lung ultrasound
Pulmonary embolism	D-dimer/ DVT scan/ CTPA
Pulmonary edema	ECG/ ECHO/ Cardiac enzymes
Pleural effusion	CXR/ Lung ultrasound
Cardiac arrhythmias	ECG
Myocardial infarction	ECG/Cardiac enzymes

1. GOLD 2024 Guidelines, https://goldcopd.org/2024-gold-report Management of Acute Exacerbations 2. Celli BR, Fabbri LM, Aaron SD, Agusti A, Brook R, Criner GJ, Franssen FME, Humbert M, Hurst JR, O'Donnell D, Pantoni L, Papi A, Rodriguez-Roisin R, Sethi S, Torres A, Vogelmeier CF, Wedzicha JA. An Updated Definition and Severity Classification of Chronic Obstructive Pulmonary Disease Exacerbations: The Rome Proposal. Am J Respir Crit Care Med. 2021 Dec 1;204(11):1251-1258. doi: 10.1164/rccm.202108-1819PP. PMID: 34570991. 3. Management of COPD Exacerbations, NICE guidelines, Published: 5 December 2018 www.nice.org.uk/guidance/ng114

RIGHT TREATMENT FOR AE-COPD

Choice of Antibiotic:

- ❑ Route: Oral antibiotics preferred (*I.V if risk of lower bioavailability i.e. frail patient, shock, gastric upset, drug based*)
- ❑ Dose: Usual adult doses
- ❑ Usual choice: *Empirical antibiotics as per local antibiogram*

First choice oral	Second choice oral
• Amoxicillin 500mg q6h • Doxycycline 100mg q12h • Clarithromycin 500mg q12h	• Co-amoxyclav 625mg q8h • Co-triamoxazole 160/800mg q12h • Levofloxacin 500mg OD
First choice IV	**Second choice IV**
• Amoxycillin 500mg q6h • Co-amoxyclav 625mg q8h • Clarithromycin 500mg q12h • Piperacillin-tazobactam 4.5gm IV q6h	• *As per the culture and sensitivity pattern of respiratory sample*

Duration: Short Course i.e. 5-7 days

***(Unless there is a specific reason/ culture/ complication that warrants extending duration)**

Stratify Risk:

- ❑ Use severity scales: DECAF or BAP-65
- ❑ Decide OPD/ IPD treatment

Consider:

- ❑ ***Comorbidities***: CLD/ CKD/ CHF/ Diabetes/ Alcohol/ Malignancy/ Asplenia
- ❑ ***Risk factors***: Co-morbidities: Prior respiratory isolation of MRSA or MDR GNB/ Recent hospitalization and receipt of parenteral antibiotics (in last 90 days)

GOLD 2024 Guidelines, https://goldcopd.org/2024-gold-report, Management of Acute Exacerbations
Management of COPD Exacerbations, NICE guidelines, Published: 5 December 2018 www.nice.org.uk/guidance/ng114

RIGHT DIAGNOSIS - HOSPITAL ACQUIRED PNEUMONIA

Prakhar Sharma ,Shivam Garg

When to suspect? [*Anytime beyond 48 hours in a non-ventilated hospitalized patient*]

- New onset of fever or hypothermia, purulent sputum, decline in oxygenation
- Leukocytosis
- New lung infiltrate on chest imaging

CPIS points	0	1	2
Tracheal secretions	None	Abundant	Abundant and purulent
Chest x-ray infiltrate	No infiltrate	Diffuse	Localized
Temperature °C	≥36.5 and ≥38.4	≥38.5 and ≤ 38.9	≤ 36.5 or ≥ 39.0
Leukocytes (mm^3)	>4,000 and <11,000	<4,000 and >11,000	<4,000 or >11,000 and band forms ≥500
PaO2/Fio2 (mmHg)	>240 or ARDS		≤ 240 and no ARDS
Microbiology	Negative	Pathogenic bacteria cultured > 1+	Pathogenic bacteria cultured > 1+ plus same pathogenic bacteria on gram stain

ARDS= Acute respiratory distress syndrome, PaO2/FiO2= ratio of partial pressure of arterial oxygen to fraction of inspired oxygen

CPIS Score (Score>6 indicates Pneumonia)

Torres A et al. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia. Eur Respir J 50[3]:2017

RIGHT DIAGNOSIS - HOSPITAL ACQUIRED PNEUMONIA

Assess risk factor for MDR Pathogens

RISK FACTORS FOR MDR VAP

- **Prior IV antibiotic use within 90 days**
- **Septic shock at the time of VAP**
- **ARDS preceding VAP**
- **5 or more days of hospitalization prior to the occurrence of VAP**
- **Acute renal replacement therapy prior to VAP onset**

RISK FACTORS FOR MDR HAP

- **Prior IV antibiotic use within 90 days**

Assess risk factor for MRSA:

- Intravenous antibiotic treatment during the prior 90 days
- Treatment in a unit where the prevalence of MRSA among S. Aureus isolates is not known Or is >20%.
- Prior detection of MRSA by culture or non-culture screening

Assess risk of mortality

Risk for mortality:

- Need of ventilatory support due to pneumonia
- Septic shock

Duration: 7 days

Antibiotics may be continued **beyond this period** in: Meningitis or endocarditis complicating pneumonia/ Lung abscess / Empyema

Torres A et al. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia. Eur Respir J 50[3]:2017

RIGHT TREATMENT – HOSPITAL ACQUIRED PNEUMONIA (EMPIRIC)

Antibiotic class	Not At High Risk of Mortality and no Factors Increasing the Likelihood of MRSA Duration (7days, Extend if other risk factors/complications/nonresponse)	Not At High Risk of Mortality but with Factors Increasing the Likelihood of MRSA Duration (7days, Extend if other risk factors/complications/nonresponse)	High Risk of Mortality or Receipt of Intravenous Antibiotics During the Prior 90d Duration (7days, Extend if other risk factors/complications/nonresponse)
	One of the following	One of the following	Two of the Following (Different antibiotic classes)
Beta lactamase positive	Piperacillin-tazobactam 4.5 g IV q6h or Cefepime 2 g IV q8h or Ceftazidime/avibactam 2.5 g IV q8h or Ceftolozane/tazobactam 3 g IV q8h	Piperacillin-tazobactam 4.5 g IV q6h or Cefepime 2 g IV q8h or Ceftazidime/avibactam 2.5 g IV q8h or Ceftolozane/tazobactam 3 g IV q8h	Piperacillin-tazobactam 4.5 g IV q6h or Cefepime 2 g IV q8h or Ceftazidime/avibactam 2.5 g IV q8h or Ceftolozane/tazobactam 3 g IV q8h
Fluoroquinolones	Levofloxacin 750 mg IV daily	Levofloxacin 750 mg IV daily or Ciprofloxacin or 400 mg IV q8h	Levofloxacin 750 mg IV daily or Ciprofloxacin or 400 mg IV q8h
Carbapenems	Imipenem 500 mg IV q6h or Meropenem 1 g IV q8h	Imipenem 500 mg IV q6h or Meropenem 1 g IV q8h	Imipenem 500 mg IV q6h or Meropenem 1 g IV q8h
		Aztreonam 2g IV q8h	Aztreonam 2g IV q8h
Aminoglycosides			Amikacin 15–20 mg/kg IV daily or Gentamicin 5–7 mg/kg IV daily or Tobramycin 5–7 mg/kg IV daily
Others		Plus: Vancomycin 15 mg/kg IV q8 –12h with goal to target 15–20 mg/mL (trough level) (consider a loading dose of 25–30 mg/kg × 1 for severe illness), or Linezolid 600 mg IV q12h	Plus: Vancomycin 15 mg/kg IV q8 –12h with goal to target 15–20 mg/mL (trough level) (consider a loading dose of 25–30 mg/kg × 1 for severe illness), or Linezolid 600 mg IV q12h

Torres A, Niederman MS, Chastre J, et al. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia. Eur Respir J 50[3]:2017

RIGHT DIAGNOSIS – VENTILATOR ASSOCIATED PNEUMONIA

Prakhar Sharma ,Shivam Garg

When to suspect?

[*Anytime beyond 48 hours in a ventilated hospitalized patient*]

- New onset of fever or hypothermia
- Purulent sputum
- Requirement of higher Fio2/ PEEP
- Leukocytosis or leuckopenia
- New lung infiltrate on chest imaging

Investigations:

- Tracheal aspirate for gram stain and cultures
- Nares PCR for MRSA
- Blood culture
- Chest imaging
- Procalcitonin (*optional*)

Threshold values for cultured specimen

Specimen	Values
ET aspirate	$>10^5$ CFU/ml
Bronchoalveolar lavage	$>10^4$ CFU/ml
Protected specimen brushing	$>10^3$ CFU/ml

Features that argue against VAP:

- PCT<0.5 in immunocompetent patient/ sputum shows no inflammation and doesn't grow bacterial pathogen/ repeat CXR (after 48-72 hours of suspect) shows rapid resolution of infiltrate

1. Torres A et al. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia. Eur Respir J 50[3]:2017
2. Fartoukh M, Maître B, Honoré S, Cerf C, Zahar JR, Brun-Buisson C. Diagnosing Pneumonia during Mechanical Ventilation: The Clinical Pulmonary Infection Score Revisited. Am J Respir Crit Care Med. 2003 Jul15;168(2):173–9.
3. Clinical Infectious Diseases, Volume 63, Issue 5, 1 September 2016, Pages e61–e111, https://doi.org/10.1093/cid/ciw353

RIGHT TREATMENT – VENTILATOR ASSOCIATED PNEUMONIA

Suggested Empiric Treatment options for Clinical VAP in conditions where MRSA and Pseudomonas coverage are appropriate

Gram-Positive antibiotics with MRSA activity (A)	Gram Negative Antibiotics with Anti-pseudomonal activity: ß-lactam antibiotics (B)	Gram Negative Antibiotics with Anti-pseudomonal activity: Non ß-lactam antibiotics (C)
Glycopeptides: Vancomycin 15mg/kg IV q8-12h (consider a loading dose of 25-30mg/kg 1 dose for severe illness)	Antipseudomonal Penicillins: Piperacillin-tazobactam 4.5 g IV q6h	Fluoroquinolones: Levofloxacin 750 mg IV daily or Ciprofloxacin or 400 mg IV q8h
Oxazolidinones: Linezolid 600mg IV q12h	Cephalosporins: Cefepime 2 g IV q8h or Ceftazidime/avibactam 2g IV q8h	Aminoglycosides: Amikacin 15–20 mg/kg IV daily or Gentamicin 5–7 mg/kg IV daily or Tobramycin 5–7 mg/kg IV daily
	Carbapenems: Imipenem 500 mg IV q6h or Meropenem 1 g IV q8h	Polymixins: Colistin 5mg/kg x 1 (loading dose) followed by 2.5mg/kg IV q12h Maintenance dose Polimixin B 2.5-3.0 mg/kg/d divided in 2 doses IV
	Monobactams: Aztreonam 2g IV q8h	

Note: **Choose one gram-positive option from column A, one gram-negative option from column B, and one gram-negative option from column C.** Note that the initial doses suggested in this table may need to be modified for patients with hepatic or renal dysfunction.

Organism	Gene associated	Antibiotic
Carbapenemase Resistant Acinetobacter baumannii (CRAB)	NDM, OXA-23, 24,51 and 58	Ampicillin-Sulbactam/Cefoperazone-Sulbactam (High dose Sulbactam, even if not susceptible) + Polymyxin B or, Minocycline / High dose tigecycline or, Extended Infusion of High dose meropenem & 3rd Agent# or Cefiderocol
Extended Spectrum Beta-Lactam Producing Enterobacterales (ESBL-E)	CTX-M	Meropenem, Imipenem-cilastatin or Ertapenem
Amp-c Beta-lactamase producing Enterobacterals	Amp C	Cefepime
Carbapenemase Resistant Enterobacterales (CRE) E. Coli, Klebsiella, Enterobacter, Proteus, Serratia	KPC (Class A), NDM (Class B), VIMs, IMPs, OXA-48 –like (Class C)	Ceftazidime-Avibactam + Aztreonam* or Cefiderocol* or Meropenem-Vaborbactam, or Imipenem-Cilastatin-Relebactam
Difficult to treat Pseudomonas (DTR-P)		Ceftolozane-tazobactam, Ceftazidime-avibactam, Imipenem-cilastatin-relebactam

1. *Torres A et al. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia. Eur Respir J 50[3]:2017*
2. *Fartoukh M, Maître B, Honoré S, Cerf C, Zahar JR, Brun-Buisson C. Diagnosing Pneumonia during Mechanical Ventilation: The Clinical Pulmonary Infection Score Revisited. Am J Respir Crit Care Med. 2003 Jul15;168(2):173–9.*
3. *Clinical Infectious Diseases, Volume 63, Issue 5, 1 September 2016, Pages e61–e111, https://doi.org/10.1093/cid/ciw353*
4. *Infectious Diseases Society of America 2024 Guidance on the Treatment of Antimicrobial-Resistant Gram-Negative Infections, Clinical Infectious Diseases, 2024*

DIAGNOSIS - INVASIVE PULMONARY FUNGAL DISEASE

Prakhar Sharma ,Shivam Garg

Host factors

Recent history of neutropenia (10 days)
Hematologic malignancy
Receipt of an allogeneic stem cell/solid organ transplant
Prolonged use of corticosteroids at a therapeutic dose of ≥0.3 mg/kg corticosteroids for ≥3 weeks in the past 60 days
Treatment with other recognized T-cell/B-cell immunosuppressants
Acute graft-versus-host disease grade III or IV

Mycological evidence

Any mold, recovered by culture from sputum, BAL, bronchial brush, or aspirate
Microscopical detection of fungal elements in sputum, BAL, bronchial brush, or aspirate indicating a mold

Galactomannan antigen

Antigen detected in plasma, serum, BAL, or CSF
Any 1 of the following:

- Single serum or plasma: ≥1.0 *(>0.5 ODI for critically ill*)
- BAL fluid: ≥1.0 *(>1 ODI for critically ill*)
- Single serum or plasma: ≥0.7 and BAL fluid ≥0.8
- CSF: ≥1.0

Aspergillus PCR

- Plasma, serum, or whole blood 2 or more consecutive PCR tests positive
- BAL fluid 2 or more duplicate PCR tests positive

Clinical features

Pulmonary aspergillosis

1 of the following 4 patterns on CT:

- Dense, well-circumscribed lesions(s) with or without a halo sign
- Air crescent sign
- Cavity
- Wedge-shaped and segmental or lobar consolidation

Other pulmonary mold diseases

As for pulmonary aspergillosis but also including a reverse halo sign **Tracheobronchitis**
Tracheobronchial ulceration, nodule, pseudomembrane, plaque, or eschar seen on bronchoscopic analysis

Proven

Histopathological confirmation/ Candidemia/ Culture from sterile site

Probable IFD

Presence of at least 1 host factor, a clinical feature and mycologic evidence and is proposed for immunocompromised patients only, whereas **Possible IFD (*NOT IN CRITICALLY ILL*) c**ases that meet the criteria for a host factor and a clinical feature but for which mycological evidence has not been found are considered

*(1,3)-beta-D glucan was not considered to provide mycological evidence of any invasive mold disease

Donnelly JP, Chen SC, Kauffman CA, Steinbach WJ, Baddley JW, Verweij PE, et al. Revision and Update of the Consensus Definitions of Invasive Fungal Disease From the European Organization for Research and Treatment of Cancer and the Mycoses Study Group Education and Research Consortium. Clinical Infectious Diseases. 2020 Sep 12;71(6):1367–76.

RIGHT TREATMENT- INVASIVE PULMONARY FUNGAL DISEASE

Patient	Drug of choice
Patients with suspected invasive mold infection without confirmation of Aspergillus	Liposomal amphotericin B 3-5mg/kg once daily
Patients with suspected invasive mold infection when azole resistance is suspected	Liposomal amphotericin B 3-5mg/kg once daily
Invasive Pulmonary aspergillosis	Voriconazole 6 mg/kg IV every 12 hours on day 1 followed by 4 mg/kg IV every 12 hours thereafter
Pulmonary mucormycosis	Liposomal amphotericin 5-10mg/kg once daily
Invasive Candidiasis	Echinocandin (Caspofungin 70mg loading dose then 50mg IV once daily)

Duration

Depending upon the location of the infection, the patient's underlying disease, the need for further immunosuppression, and the response to therapy.

Generally continued until all signs and symptoms of the infection have resolved and often longer in patients with persistent immune defects.

The minimum duration of therapy is 6 to 12 weeks.

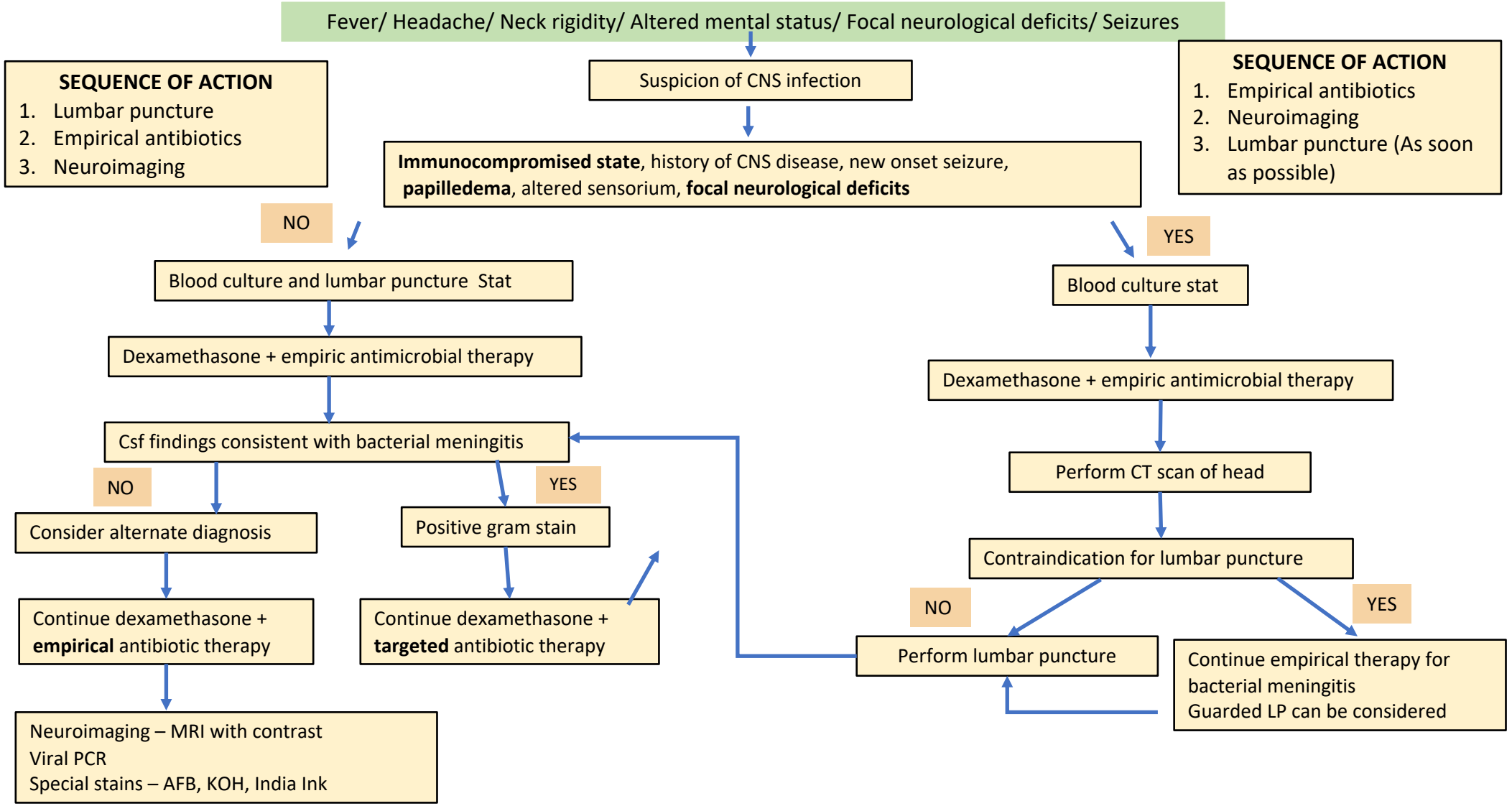
* **PREFERABLE TO GET AN ID CONSULTATION**

1. Patterson TF, Thompson GR 3rd, Denning DW, Fishman JA, Hadley S, Herbrecht R, Kontoyiannis DP, Marr KA, Morrison VA, Nguyen MH, Segal BH, Steinbach WJ, Stevens DA, Walsh TJ, Wingard JR, Young JA, Bennett JE. Practice Guidelines for the Diagnosis and Management of Aspergillosis: 2016 Update by the Infectious Diseases Society of America. Clin Infect Dis. 2016 Aug 15;63(4):e1-e60. doi: 10.1093/cid/ciw326. Epub 2016 Jun 29.

2. Cornely OA, Alastruey-Izquierdo A, Arenz D, Chen SCA, Dannaoui E, Hochhegger B, et al. Global guideline for the diagnosis and management of mucormycosis: an initiative of the European Confederation of Medical Mycology in cooperation with the Mycoses Study Group Education and Research Consortium. The Lancet Infectious diseases. 2019 Nov 5;19(12):e405.

RIGHT DIAGNOSIS - MENINGITIS/MENINGOENCEPHALITIS/ ENCEPHALITIS

Mrityunjai Singh, Muneesh R



1. *Allan R Tunkel et al, Clinical Infectous diseases 2004;39:1267-84*
2. *Dorsett M, Liang SY. Diagnosis and treatment of central nervous system infections in the emergency department. Emergency Medicine Clinics. 2016 Nov 1;34(4):917-42.*

RIGHT TREATMENT - MENINGITIS

- **Empirical antibiotics** should be administered **within 1 hour** of presentation.
- Lumbar puncture **can be done without imaging except** in presence of altered consciousness, new onset seizure, focal neuro deficit and papilledema.
- Start empirical antibiotic based on predisposing factors modify as per CSF culture/ sensitivity report, which may take 48-72 hours.
- In presence of risk factors like alcoholism, altered immune status start with-Vancomycin+3rd generation cephalosporin (ceftriaxone)+ampicillin.
- In case of suspected anaerobic bacterial etiology (like associated abdominal sepsis): consider addition of metronidazole.
- In case of nosocomial meningitis and suspected pseudomonal etiology, escalate ceftriaxone to meropenem/ ceftazidime.
- Initiate Dexamethasone before or with first dose of antibiotic.
- In case of chronic meningitis always consider for tubercular etiology and possibility of fungal origin should be ruled out by obtaining KOH mount/India ink staining before initiating steroid.

PREDISPOSING FACTORS	**EMPIRICAL ANTIBIOTIC USED**
2–50 years	Vancomycin plus a third-generation cephalosporin
>50 years	Vancomycin plus ampicillin plus a third-generation cephalosporin.
Basilar skull fracture	Vancomycin plus a third-generation cephalosporin
Penetrating trauma	Vancomycin plus cefepime, or vancomycin plus ceftazidime, or vancomycin plus meropenem
Postneurosurgery	Vancomycin plus cefepime, or vancomycin plus ceftazidime, or vancomycin plus meropenem
CSF shunt	Vancomycin plus cefepime, or vancomycin plus ceftazidime, or vancomycin plus meropenem

1.Rodrigo Hasbun et al, Current Opinion in Infectious diseases June 2022, 35:231-237
2. Allan R Tunkel et al, Clinical Infectous diseases 2004;39:1267-84

BRAIN ABSCESS - RIGHT TREATMENT

Mrityunjai Singh, Muneesh R

Predisposing Condition	**Empirical antibiotics**
Otitis Media or mastoiditis	3rd generation cephalosporin + metronidazole + anti-staphylococcal penicillin
Paranasal sinusitis	Penicillin/3rd generation cephalosporin + metronidazole
Dental infection	Vancomycin + 3rd generation cephalosporin + metronidazole
Cyanotic heart disease **Bacterial endocarditis** **Pyogenic lung disease** **Gastrointestinal source**	3rd generation cephalosporine + vancomycin Vancomycin + ampicillin/gentamycin + anti-staphylococcal penicillin 3rd generation cephalosporin + metronidazole 3rd generation cephalosporin + meropenem
Trauma/Neurosurgery	Vancomycin/ Linezolid + 3rd generation cephalosporin/Meropenem + Rifampin
Immunocompromised	3rd generation cephalosporin + metronidazole with voriconazole + TMP-SMX

Moscote-Salazar LR. Brain abscess: Current management. J Neurosci Rural Pract. 2013 Aug;4(Suppl 1):S67-81. doi: 10.4103/0976-3147.116472.
Bodilsen, Jacob, et al. "European society of Clinical Microbiology and Infectious Diseases guidelines on diagnosis and treatment of brain abscess in children and adults." Clinical Microbiology and Infection 30.1 (2024): 66-89

RIGHT DIAGNOSIS CRYPTOCOCCAL MENINGITIS

Prasan K Panda, Anika Malviya, Rajshekhar Lohar

Risk Factors for Cryptococcosis

1. HIV (CD4<200 cells)
2. Elevated IL-10 levels
3. Serum albumin (<3.5 g/dl)
4. Decompensated liver cirrhosis
5. Diabetes mellitus
6. Chronic kidney disease
7. Hematological malignancy
8. Transplant recipients
9. Steroid therapy /CMI-suppressive regimens

Symptoms

1. Fever
2. Malaise
3. Headache
4. Stiff neck
5. Photophobia
6. Vomiting
7. Visual loss
8. Hearing loss

- **Symptoms suggestive of Disseminated Cryptococcosis**

-Cough /Dyspnea /Skin lesions

Examination

1. Lethargy
2. Confusion
3. Altered mental status
4. Focal neurological deficits
5. Kernig's sign
6. Brudzinski's sign

Disseminated disease :

1.Tachypnea

2.Skin lesions - multiple umbilicated papules

3.Increased diastolic hypertenion - suggestive of raised Intracranial pressue (ICP)

Suspected Cryptococcal Meningitis

↓

CT head /MRI Brain

↓

Raised ICP +/- mass lesions

↓

Lumbar puncture(LP) with consideration of Risks of brain herniation and benefits

↓

1. Measure opening pressure
2. CSF Biochemistry -Low WBC (<50 cells/microL) monomorphs predominant , slighlty raised protein
3. CSF India Ink staining
4. CSF Cryptococcal Antigen(CrAg)
5. CSF culture
6. CSF Cryptococcal PCR

If LP is contraindicated

Other tests

1. Serum / Plasma /Whole Blood Cryptococcal Antigen(CrAg)
2. Extraneural cultures - Blood/ Urine /Sputum

Cryptococcus-associated Hydrocephalus

↓

VP shunting

Mass lesions

↓

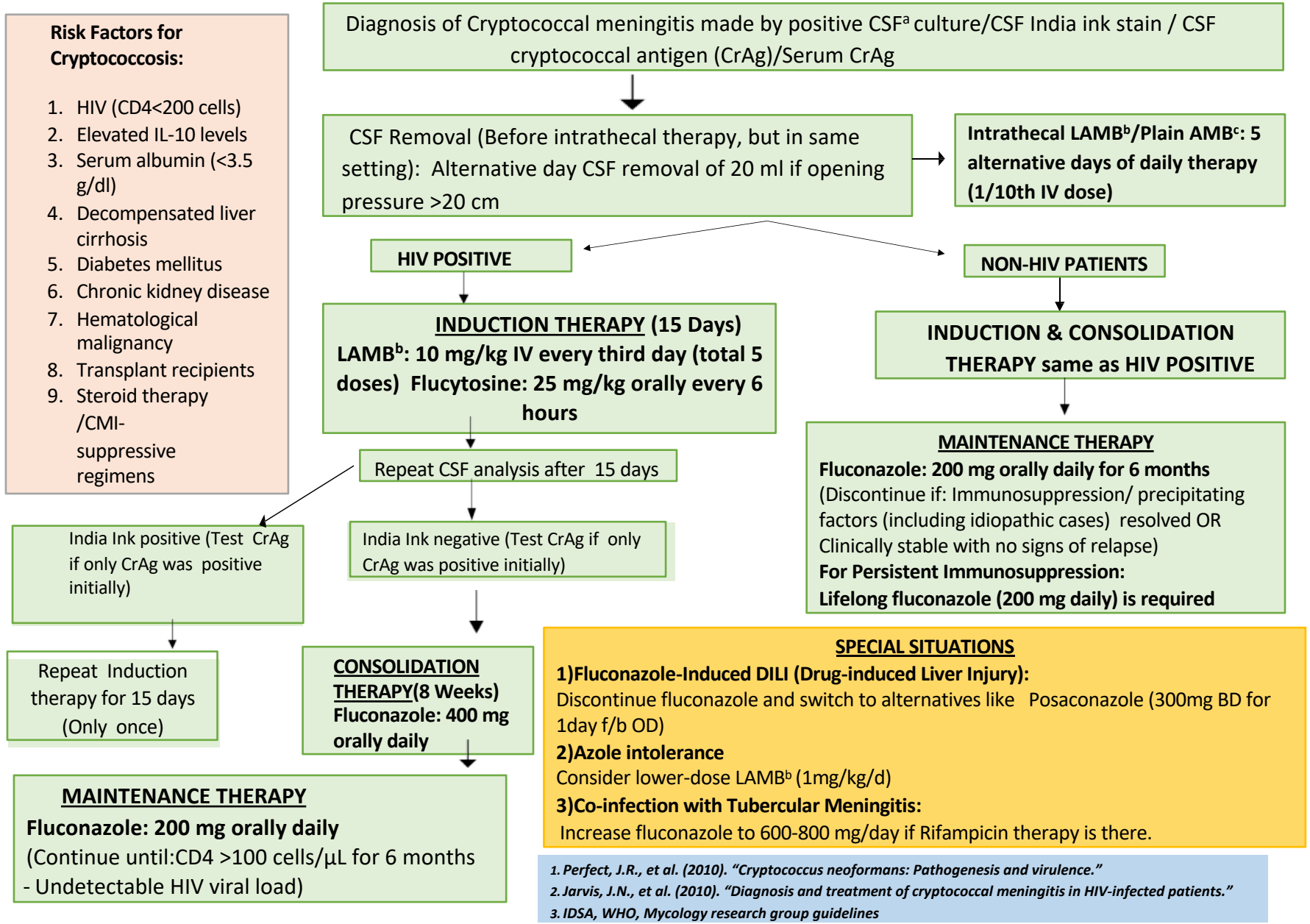
Consider alternative diagnosis - e.g. Toxoplasmosis, Lymphoma, Tuberculosis

Resource Limited Settings

- Serum /Plasma / Whole Blood CrAg (If results available within 24 hours)
  1. Positive - Start antifungals
  2. Negative (or test not available) - Refer to higher centre

Guidelines for diagnosing, preventing and managing cryptococcal disease among adults, adolescents and children living with HIV. Geneva: World Health Organization; 2022.
UpToDate. (2023). Epidemiology, clinical manifestations, and diagnosis of Cryptococcus neoformans meningoencephalitis in patients with HIV. Retrieved October 17, 2024

RIGHT TREATMENT – CRYPTOCOCCAL MENINGITIS



1. Perfect, J.R., et al. (2010). "Cryptococcus neoformans: Pathogenesis and virulence."
2. Jarvis, J.N., et al. (2010). "Diagnosis and treatment of cryptococcal meningitis in HIV-infected patients."
3. IDSA, WHO, Mycology research group guidelines

RIGHT DIAGNOSIS : RABIES

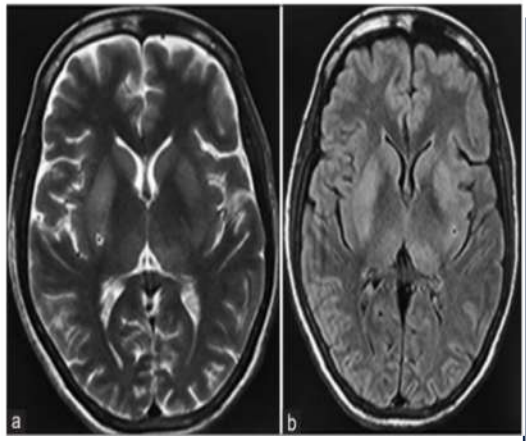
Prasan K Panda, Aneesh G, Abhishek Rai

TRANSMISSION

- Direct contact[bite] with infected tissue/secretions
- No human to human transmission
- Not transmitted through contaminated surfaces like bedding

RISK GROUP

- Healthcare professionals
- Veterinarians
- Animal handlers, dog catchers
- Wildlife wardens, Quarantine officers



MR imaging showing bilateral basal ganglia hyperintensities

CLINICAL DIAGNOSIS

1. Animal bite exposure[dog/cat/livestock, wildlife]
2. Incubation period may last weeks to months[depends upon location of bite, severity of bite, age of patient , prophylaxis for rabies]
3. Prodrome of symptoms: fever, headache, weakness, flu-like symptoms, tingling and burning sensation in bite site
4. Clinical rabies has 2 presentations
   - **Furious rabies** : hyperactivity, hallucination, hydrophobia, aerophobia, cardiorespiratory arrest
   - **Paralytic rabies** : gradual paralysis starting from bite site, coma and death
5. Mortality after onset of clinical disease is almost 100%
6. **Negative indicators** : improvement or no change in neurological status after several weeks of illness/illness lasting more than 4 weeks /alternate cause of encephalitis

LABORATORY DIAGNOSIS

1. <u>Antemortem sampling</u>

- **Saliva** : 4 samples collected over 24h : test for RNA by RT PCR
- **Skin biopsy** : 5-6mm diameter of punch skin biopsy **from posterior neck at hairline** to include minimum of 10 hair follicles including cutaneous nerves at base of follicles, placed in sterile gauze moistened with sterile water in sealed container : test for RT PCR / Immunofluorescence staining for viral antigen
- **Serum and CSF 0.5ml each**: indirect fluorescent antibody and viral neutralization test
- Brain biopsy: rarely performed :RT-PCR and immunofluorescent staining for viral antigen in touch impressions

2. <u>Postmortem diagnosis:</u> Immunofluorescent staining of viral antigen in touch impressions of the medulla (brain stem),cerebellum, and the hippocampus

WHO EXPERT CONSULTATION ON RABIES THIRD REPORT
NATIONAL GUIDELINES FOR RABIES PROPHYLAXIS 2019: NATIONAL RABIES CONTEOL PROGRAMME
HUMAN RABIES PREVENTION RECOMMENDATIONS OF THE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES : CDC

RIGHT TREATMENT : RABIES

TREATMENT (Modified Milwaukee protocol)

	DAYS	TREATMENT
STEP 1	DAY OF ADMISSION	1. Do not administer vaccine/immunoglobulin to confirmed rabies case 2. Shift patient to Critical care unit preferably in isolation
STEP 2	First 7 days	1. Intubate and aggressive sedation with **Ketamine**(0.5-1 mg/kg/h infusion) and **Midazolam**(4mg/kg/h infusion) 2. Ventilate using normal parameters and avoid hypocarbia 3. Insert CVP line, NG tube and foley's catheter 4. VAP Bundle of care to be provided 5. Isotonic solution 0.9% NS/RL to maintain euvolemia 6. Methylprednisolone pulse therapy 1g/day for 5 days followed by Oral dexamethasone 8mg PO TDS with tapering **7. Fludrocortisone 0.1mg PO TDS** **8. Low dose insulin infusion** with 0.5U/h with continuous dextrose infusion with RBS monitoring **9. Amantadine[250MG BD]** is recommended due to its neuroprotective mechanism 10. CAP Vitamin C 250mg PO BD 11. Ulcer prophylaxis: INJ PANTOPRAZOLE 40MG IV BD 12. DVT Prophylaxis: LMWH SC 40mg OD [UFH if AKI present 5000 units SC TDS
STEP 3	Day 8-14	1. Reduce sedation and attempt weaning every 12h 2. Tracheostomy to be performed 3. VAP Bundle of care to be continued 4. Continue insulin infusion, amantadine, Fludrocortisone, taper dexamethasone, isotonic fluids to maintain hypovolemia
STEP 4	After 2 weeks	1. Rehabilitation , however first step towards rehabilitation should begin on day of admission

TARGETS

1. MAP> 80mmHg and CVP 8-12mmHg
2. O2 saturation >94%
3. PaCO2 : 35-40mmHg
4. Hb >10g/dl
5. Serum Sodium : 145-155meq/L
6. Serum K : 3.5 -5.5 meq/L
7. Serum glucose : 70-110mg/dl
8. Maintain diuresis: >0.5cc/kg/min
9. Maintain core body temperature : 35-37 degree Celsius

MONITORING

1. **Laboratory monitoring**
   -Serum sodium twice daily and K 6th hourly
   -Arterial blood gas analysis twice daily
   -Serum Magnesium daily and 2nd hourly random blood glucose
   -MRI brain at admission and after weaning in 2-3rd week
   -ECG daily
2. **Virological monitoring**
   -Serum every weekly for first 2 weeks and then fortnightly till sterile
   -CSF once weekly for cells and chemistry including lactate

Milwaukee protocol version 6 updated November 2018
Nadeem M, Panda PK. Survival in human rabies but left against medical advise and death followed-Community education is the need of the hour.J Family Med Prim Care.2020 Mar26.9
Kumar SK, Gupta P, Panda PK. Death from rabies: The reason being poor compliance to vaccination or it's failure. J Family Med Prim Care. 2020 Aug 25;9(8):4437-4440

RABIES IMMUNIZATION AND PROPHYLAXIS

VACCINES AVAILABLE IN INDIA

1. Abhayrab[PVRV]
2. Indirab[PVRV]
3. Rabipur [PCECV]
4. Rabivax[HDCV]

Pre exposure prophylaxis :
For high-risk individuals

- **3 doses** IM route : Day 0,7, 21 or 28 ID route : 0.1ml single site on day 0,7,21 or 28
- To check neutralizing antibody titers every 6 months with target level> 0.5IU/ml
- Booster dose recommended if antibody level below the target

POST EXPOSURE PROPHYLAXIS

Potential Rabies Exposure

Cat I → No PEP needed

	Category II	Category III
Unvaccinated	Vaccination only : **4 doses** [Day 0,3,7,14] IM route 5th dose recommended in immunocompromised cases	Wound care **Rabies immunoglobulin** [Human -20IU/KG or Equine 40IU/KG] entire dose at wound/exposure site[not given beyond 7 th day of vaccination] Vaccination: **4 doses** 0,3,7,14[IM Route] 5th dose in immunocompromised
Previously Vaccinated*	Vaccination with wound care# **Total 2 doses** Days 0 and 3 IM route [# in category III]	

Category of bite Description
Category- I [No Risk] -Touching or Feeding -Lick on intact skin -Contact of saliva on intact skin
Category- II [Minor exposure] -Nibbling of uncovered skin -Minor scratch or abrasion without bleeding
Category III [High risk exposure] -Transdermal bite -Lick on broken skin -Contamination of mucus membrane with saliva

*Only adequate wound washing is required in cases of re-exposure where victim has documented proof of complete PEP or PrEP **in last 3 months**
*Victim who cannot document complete previous PEP or PrEP or has received neural tissue vaccine, should be given full PEP

WHO EXPERT CONSULTATION ON RABIES THIRD REPORT
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PUERPERAL SEPSIS – RIGHT DIAGNOSIS

Amrita Gaurav, Ramya Mishra, Akanksha Deshwali**

CLINICAL FEATURES OF SEPSIS

(if any one of the symptoms mentioned are present, sepsis must be suspected in the obstetric patient)

- Fever or rigors
- Diarrhoea or vomiting
- Rash
- Abdominal/pelvic pain and tenderness
- Offensive vaginal discharge
- Productive cough
- Urinary symptoms
- Breast engorgement/redness
- Wound infection
- Delay in uterine involution, heavy lochia
- General, non-specific signs such as lethargy, reduced appetite

INVESTIGATIONS

- Serially conducted Blood investigations (CBC, LFT, KFT, ABG, Serum Lactate, Serum Electrolytes, RBS, Coagulation profile
- Cultures –Urine, High vaginal Swab, Wound swab, Blood
- Chest X ray PA view
- Ultrasound whole abdomen and pelvis for intrauterine, pelvic and peritoneal collections
- CT/MRI to be done only when indicated

CLINICAL ASSESSMENT AT THE TIME OF ADMISSION

1. Detailed history taking: quality of antenatal care received, date of time of delivery, mode of delivery (supervised/unsupervised), Indication of Caesarean section , Use of antibiotic prophylaxis in case of Caesarean section to be enquired

1. General and Physical examination :Vitals, Urine Output, Localizing signs of any systemic infection

1. Gynecological examination
   - Look for episiotomy wound infection in case os vaginal delivery, wound gape, foul smelling discharge
   - Abdominal wound in case of LSCS
   - Any foul smelling vaginal discharge upon per speculum examination
   - Per vaginal examination to look for uterine size, tenderness, sub-involution, any other peri uterine collection
   - Per rectal examination to look for any POD collection

1.Royal College of Obstetricians and Gynecologists. Bacterial sepsis in pregnancy. Green-top guideline No. 64a, 2012.
2. World Health Organisation. The prevention and management of puerperal infections

PUERPERAL SEPSIS – RIGHT TREATMENT

MANAGEMENT

1. Alert Obstetrician, medical staff, Anesthesiologist and Critical care team, microbiologist. Early recognition and treatment is must.
2. Establish intravenous (IV) access, Blood cross match, oxygen support
3. Transfusion of blood/ Blood products
4. Multidisciplinary team consultation
5. Start Broad spectrum Antibiotics immediately after collection of cultures.
6. Strict Input Output monitoring
7. ICU care when needed
8. Acute kidney injury to be managed in conjunction with nephrologist. Dialysis if indicated

ANTIBIOTIC PREFERRED FOR VARIOUS CLINICAL CONDITIONS

A) Surgical site infections

INTRAVENOUS (For infections with systemic symptoms)

Cephalosporin 1–2 g q8 h + Clindamycin 900 mg q8 h + Gentamicin 5 mg/kg q24 h

ORAL (For infections without systemic symptoms)

1. Cephalexin 500 mg QID
2. Doxycycline 100 mg BID + Metronidazole 500 mg BID
3. Amoxicillin-clavulanate 625 mg PO QID

B) Endometritis

INTRAVENOUS

1. Clindamycin 900 mg q8 h + Gentamicin 5 mg/kg q24 h + Ampicillin 2 g iv QID
2. Ampicillin 2 g then 1 g q4 h + Gentamicin 5 mg/kg q24h + Metronidazole 500 mg q8 h

ORAL

1. Doxycycline 100 mg BID + Metronidazole 500 mg BID
2. Amoxicillin-clavulanate 625 mg po QID

C) Septic thrombophlebitis

INTRAVENOUS

1. Clindamycin 900 mg q8 h + Gentamicin 5 mg/kg q24 h + Ampicillin 2 g iv QID
2. Ampicillin 2 g iv QID + Gentamicin 5 mg/kg q24 h + Metronidazole 500 mg q8 h.

1. Royal College of Obstetricians and Gynecologists. Bacterial sepsis in pregnancy. Green-top guideline No. 64a, 2012.
2. Report of a technical working group. Division of Family Health, Maternal Health and Safe Motherhood Programme Geneva

RIGHT DIAGNOSIS & TREATMENT OF PELVIC INFLAMMATORY DISEASES

Amrita Gaurav, Ramya Mishra, Akanksha Deshwali**

Syndrome associated with ascending spread of microorganisms from vagina/cervix to endometrium/ fallopian tubes /contiguous structures, (not associated with pregnancy or surgery)

INVESTIGATIONS

- ESR, TLC,CRP
- Tests for gonorrhea & Chlamydia
- Endometrial Biopsy-Endometritis
- USG Pelvic organs-T.O mass may be present.
- Laparoscopy-Confirmation

Definitive criteria:

- Endometrial biopsy with histopathologic evidence of endometritis
- Transvaginal sonography or MRI showing thickened fluid filled tubes with or without free pelvic fluid or tubo-ovarian complex/ doppler studies suggesting pelvic infection
- Laparoscopic findings consistent with PID

Minimum criteria

- Adnexal tenderness
- Cervical motion tenderness
- Uterine tenderness

Additional criteria:

1. Oral temperature >101* F
2. Abnormal cervical mucopurulent discharge or cervical friability
3. Presence of abundant numbers of WBC on saline microscopy of vaginal fluid
4. Elevated ESR
5. Elevated CRP
6. Laboratory documentation of cervical infection with N gonorrhea or C. trachomatis

Mild to moderate PID

↓

Oral antibiotics (for 72hrs)

↓

If no response, re-evaluate the patient

↓

Treat on IPD/OPD

Oral Therapy-Regimen-A	Parenteral Therapy-Regimen-B
• **Levofloxacin** 500mg OD x 14 days OR • **Ofloxacin** 400mg OD x 14 days • ± **Metrogyl** 500mg BD x 14 days	• **Ceftriaxone** (250 mg IM single dose)/**cefoxitin** (2 gm IM) or any 3rd gen. cephalosporin **+** • **Doxycycline** 100 mg BD X 14 days **+** • **Metrogyl** 500 mg BD x 14 days

##Oral **Ofloxacin** is more effective against Neisseria & Chlamydia, though lack of anaerobic coverage is a major problem.
Addition of Metronidazole provides this coverage

Jeffcoate Norman and V. R Tindall. Jeffcoate's Principles of Gynaecology. 8th ed. Butterworths 2014.

RIGHT DIAGNOSIS & TREATMENT – URINARY TRACT INFECTION

V.S. Pai, Akshita Makkar

DIAGNOSTIC TOOLS

- History
- Urine Dipstick - Leukocyte esterase (pyuria) and Nitrite (By Enterobacteriaceae except Enterococci/ pseudomonas)
- Urine R/M - > 10 Pus cells/mcL in unspun voided midstream urine
- Urine Culture -$\geq 10^5$ CFU/ml
- Imaging (USG/CT)

Asymptomatic Bacteriuria

$>10^5$CFU/ml of urine.
No Sign and symptoms

Prostatitis

Dysuria, frequency, urgency, genitourinary pain, pelvic pain

Acute Cystitis

Dysuria/Frequency/ Urgency/ Haematuria in non-pregnant healthy women without any systemic symptoms

Pyelonephritis

fever/rigors/nausea & vomiting , flank or loin pain.
High Spiking Picket Fence Fever which resolves over 72 hrs

Catheter-associated Urinary Tract Infection (CAUTI)

- Indwelling catheter in place >2 consecutive days
- Urine culture with no > 2 organisms present and 1 bacterium >10 power 5 CFU
- Presence of at least 1 of the- fever, suprapubic tenderness, renal angle tenderness, urinary urgency, frequency or dysuria.

Acute prostatitis

- Tab Ciprofloxacin 500 mg PO BD or Tab Levofloxacin 750 mg OD for upto 2-4 weeks
- Tab Septran DS BD for upto 2-4 weeks

Acute Cystitis

❖ **FIRST LINE -**

- *Nitrofurantoin* monohydrate/ macrocrystals 100 mg bid X 5 days
- *Trimethoprim-sulfamethoxazole* 160/800 mg (one DS tablet) bid X 3 days
- *Fosfomycin* 3 gm single dose

❖ **SECOND LINE -**

- *Oral B Lactams*- Amoxlcillin-clavulanate acid 500/125 mg BD for 5-7 days
- Fluoroquinolones- Ciprofloxacin 250 BD for 3 days

Acute Pyelonephritis

- Ciprofloxacin 500 mg PO BD or Levofloxacin 750 mg PO OD for 5-7 days
- Meropenem 1 gm IV every 8 hrs over 4 hrs for 5-10 days

Pregnancy and UTI

- Nitrofurantoin 100 mg PO BD for 5-7 days (for cystitis)- avoid in T3
- Amoxicillin-clavulanate 500 mg TDS / 875 mg BD for 5-7 days.
- Piptaz 3.375 mg iv QID (pyelonephritis)
- Meropenem 1 g iv TDS (pyelonephritis)

Bonkat G, et al. EAU Guidelines on Urological Infections. Eur Assoc Urol 2021. 2021;(March):18–20.

ACUTE DIARRHEA – RIGHT DIAGNOSIS

Prasan K Panda, Partha S Sahu, Rajat Ranka

WHO defines diarrhea as passage of ≥ 3 loose stools/ day or more than what is usual for a person.

Frequent passage of formed stools = not diarrhea.

Acute < 7 days, Prolonged = 7 to 13 days, Persistent = 14 to 29 days, Chronic ≥ 30 days

In all patients

CBC, LFT, KFT, Stool Routine Microscopy

Stool culture & Stool Multiplex PCR

- Fever ≥38.5°C (101.3°F)
- Signs or symptoms of hypovolemia
- ≥6 unformed stools per 24 hours
- Severe abdominal pain, High-risk host features
- Age ≥70 years
- Serious comorbidities, such as cardiac disease, immunocompromising condition (including advanced HIV infection)
- presence of dysentery
- or if Vibrio suspected (Large volume rice watery stools, exposure to brackish or salty water, consumption of undercooked or raw shellfish within last 3 days)

However no standard guidelines on the use of stool multiplex PCR. And it's interpretation of results require a high degree of clinical correlation

Blood culture

If Sepsis Suspected (possible and probable sepsis according to JASPI classification criteria for sepsis), or if enteric fever suspected, or in immunocompromised patient

Stool Wet Mount for Vibrio,ova and parasites

Large volume rice watery stools, exposure to brackish or salty water, consumption of undercooked or raw shellfish within last 3 days

Rapid card test for C difficile

History of antimicrobial use within last 8-12 weeks and in people with healthcare-associated diarrhea

Stool for modified AFB (Cryptosporidium, Cyclospora, Cystoisospora)

Primary or secondary immune deficiency, people with acquired immune deficiency syndrome (eg AIDS)

***Refer to Chapter on Right diagnosis & Right treatment – Sepsis and septic shock for classification criteria for sepsis**

ACUTE DIARRHEA – RIGHT TREATMENT

DIARRHEA TYPE	PATIENT TYPE	RECOMMENDATION REGARDING EMPIRICAL TREATMENT
1. All diarrhea patients		Rehydration [oral / IV / NG fluids (RL/ ORS)].
2. Acute watery diarrhea	Immunocompetent	No empirical antibiotic
	Immunocompromised	Empirical antibiotic therapy may be considered
3. Acute bloody diarrhea	Immunocompetent	Empirical antibiotic therapy to be considered if – 1. Likely bacillary dysentery (frequent scanty bloody stools, fever, abdominal cramps, tenesmus) i.e. presumptively due to Shigella. 2. Signs of possible or probable sepsis (Evidence/ suspicion of new organ dysfunction).
	Immunocompromised	Empirical antibiotic therapy recommended
4. Suspected enteric fever	Headache/ prolonged (>5 days) moderate to high grade fever/ abdominal pain/ anorexia, nausea, vomiting	Empirical antibiotic therapy recommended
•The empiric antibiotic should be Tab Azithromycin 1gm PO stat/ 500 mg PO OD x 3 days (preferred in dysentery) or Tab Ciprofloxacin 500 mg PO BID for 3-5 days. Azithromycin if favoured for patients with fever and in patients suspected to be at risk for a fluoroquinolone-resistant pathogen (eg during outbreaks of resistant pathogens)		
As soon as causative organism is identified, directed antibiotics must be started as per local sensitivity data/ DST.		

ANCILLARY MANAGEMENT

- **Probiotics** – may be administered in immunocompetent adults with infectious or antimicrobial-associated diarrhoea.
- If fever/ dysentery is present, give bismuth subsalicylate (2 tab/ 524 mg every 30 minutes upto 8 doses) or **racecadotril** (100 mg PO TDS X 3-5 days) may be given.
- **Antimotility agent** (Loperamide) – to be given for symptomatic relief only if fever and bloody diarrhea are ABSENT. Dose is 4 mg PO initially, then 2 mg after each loose stool upto < 16 mg/ day.
- **Maintain adequate oral nutrition.** Temporary avoidance of lactose containing dairy products and high fat food is reasonable.

1. *Andi L Shane et al., 2017 Infectious Diseases Society of America Clinical Practice Guidelines for the Diagnosis and Management of Infectious Diarrhea, Clinical Infectious Diseases. 2017. 65;12(15):e45–e80, https://doi.org/10.1093/cid/cix669*
2. *Fauci AS et al., editors. Harrison's principles of internal medicine. 21st ed. New York: McGraw Hill; 2022.*

APPENDICITIS – RIGHT DIAGNOSIS AND RIGHT TREATMENT

*Karamveer Singh, B Krishna Sai**

Presentation

- Right iliac fossa pain (McBurney point /periumbilical pain)
- Nausea / vomiting
- Loss of appetite
- Fever
- Local or gross peritonitis
- Migratory tenderness
- Rebound tenderness

Investigations

- CBC,LFT, KFT
- Viral markers, PT/ APTT
- Diagnosis is mostly clinical and may be supported by ultrasound abdomen or CT abdomen in doubtful cases

Initial Treatment

- IV fluid resuscitation: Initial bolus of NS followed by maintenance fluids N/2 saline + 2 mEq KCl/ 100 ml
- Nil per oral/nasogastric decompression is required in severe cases
- IV antibiotics:

Inj. Ceftriaxone 1 gm IV BD + Inj. Metronidazole 500 mg IV TDS + Inj. Amikacin 15 mg/ kg IV OD

OR

Inj. Piperacillin- Tazobactam 4.5 gm iv TDS, OR

Inj Meropenem 1 gm IV TDS

Further Management

- Based on severity/ hemodynamic stability/ cause of intestinal obstruction, surgical intervention may be planned .
- Duration of Metronidazole/Amikacin is usually for 5-7 days
- Antibiotics for gram positive coverage is continued for 10-12 days or till wound healing has taken place

Moris, Dimitrios et al. "Diagnosis and Management of Acute Appendicitis in Adults: A Review." JAMA vol. 326,22 (2021): 2299-2311. doi:10.1001/jama.2021.20502

CHOLANGITIS - RIGHT DIAGNOSIS AND RIGHT TREATMENT

Rohit Gupta, Rahul Yadav

A. Systemic inflammation
1. Fever and/or shaking chills
2. Laboratory data: Evidence of inflammatory response

B. Cholestasis
1. Jaundice
2. Abnormal liver function test

C. Imaging
1. Biliary dilatation
2. Evidence of etiology on imaging(Stricture stone, stent)

A-1. Fever , Body temperature >38*C
A-2. Evidence of inflammatory response: WBC<4 or >10 (x1,000/cumm), CRP(mg/dl) ≥1
B-1. Jaundice - T. Bilirubin ≥2mg/dL
B-2. Abnormal LFT - ALP >1.5xSTD, GGT >1.5xSTD, AST >1.5xSTD, ALT >1.5xSTD

Suspected diagnosis: One item in A + One item in B or C
Definite diagnosis: One item in A+ One item in B+ One item in C

Severity assessment criteria for acute cholangitis

GRADE III: Severe acute cholangitis
- Cardiovascular dysfunction: Hypotension requiring dopamine>5ug/kg/min or any dose of epinephrine
- Neurological: Disturbance of consciousness
- Respiratory dysfunction: PaO2/FiO2<300
- Renal dysfunction: Oliguria, Creatinine>2mg%
- Hepatic dysfunction: INR>1.5
- Hematological dysfunction: Plt<1lac/cumm

GRADE II: Moderate acute cholangitis
- Age≥75 years
- High fever(≥39C)
- Leukocytosis(>12000 or <4000/cmm)
- Bilirubin≥5mg%
- Hypoalbuminemia(<STDx0.7)

GRADE I: Mild acute cholangitis
- Does not meet the criteria of moderate or severe cholangitis

Antimicrobial agents	Grade I	Grade II	Grade III
Penicillin based	Ampicillin/Sulbactam . Not recommended if >20% resistance	Piperacillin/Tazobactam	Piperacillin/ Tazobactam
Cephalosporin based	Ceftriaxone/ Cefazolin/Cefotetan/ Cefotaxime ±Metronidazole, Cefoperazone-Sulbactam	Cefotaxim/Ceftriaxone/Ceftazidime ±Metronidazole, Cefoperazone/Sulbactam	Cefepime/ Ceftazidime/ Cefozopran ±Metronidazole
Carbapenem based	Ertapenem	Ertapenem	Imipenem/Cilastatin, Meropenem, Ertapenem
Monobactam based	_____	_____	Aztreonam± Metronidazole
Fluoroquinolone based	Ciprofloxacin, Levofloxacin ± Metronidazole, Moxifloxacin	Ciprofloxacin, Levofloxacin ± Metronidazole, Moxifloxacin	_____

Duration of antibiotics: 7-10 days, **Continued beyond if:** Incomplete drainage, sepsis, cholangiolar abscess

Kiriyama S, et al. Tokyo Guidelines 2018: diagnostic criteria and severity of acute cholangitis. J Hepat Biliary Pancreat Sci; 2017; 25: 17-30

ACUTE PANCREATITIS –RIGHT DIAGNOSIS AND RIGHT TREATMENT

Rohit Gupta, Rahul Yadav

Diagnosis of Acute Pancreatitis: 2 out of 3

- abdominal pain consistent with the disease,
- serum amylase and/or lipase greater than three times the upper limit of normal, and/or
- characteristic findings from abdominal imaging

Organ system	Modified Marshall Score				
	0	1	2	3	4
PaO2/FiO2	>400	301-400	201-300	101-200	101-200
S.Creatinine (mg%)	<1.4	1.4-1.8	1.9-3.6	3.6-4.9	>4.9
SBP(mm Hg)	>90	<90, fluid responsive	<90, not fluid responsive	<90, pH< 7.3	<90, pH< 7.2

Severity in Acute Pancreatitis: Revised Atlanta Criteria

- **Mild:** No local complications or organ failure.
- **Moderate:** Local complications like peri-pancreatic fluid collections, pancreatic/ peri-pancreatic necrosis or transient organ failure for <48hrs.
- **Severe:** Persistent organ failure for >48hrs (Modified Marshall score 2 or more in any system, GI bleed >500ml/24hrs)

Imaging in Acute Pancreatitis

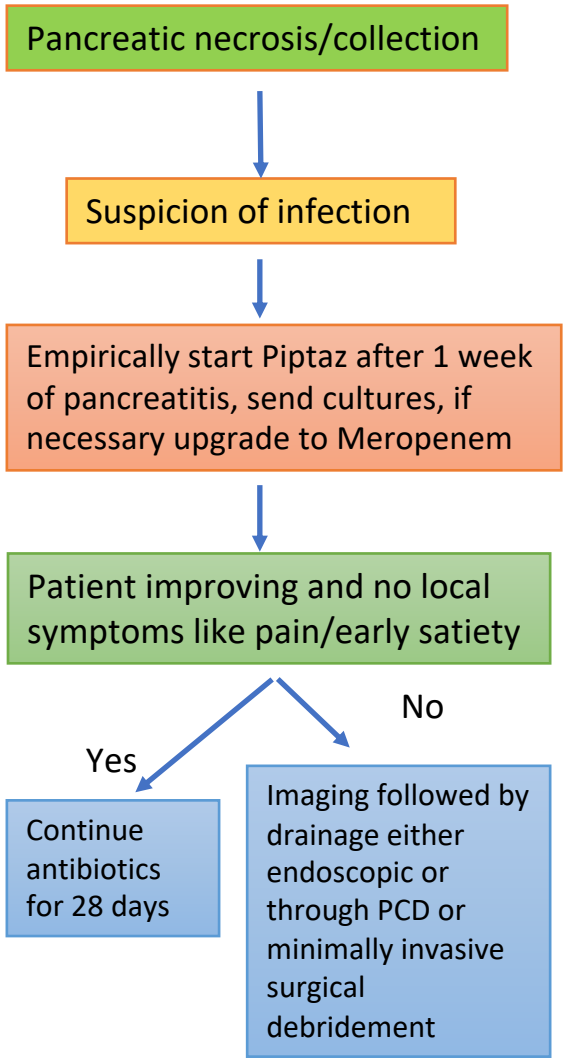
- Transabdominal USG in all patients
- CECT abdomen or CEMRI abdomen to be done when diagnosis is doubtful, or patients fails to improve within 48-72 hours of admission

Indication of antibiotics:

- Extra pancreatic infection, such as cholangitis, catheter-acquired infections, bacteraemia, urinary tract infections, pneumonia
- Infected necrosis; necrotizing pancreatitis patients failing to improve 7 to 10 days after hospitalization to be started on empirical antibiotics

Choice of antibiotics: Antibiotics penetrating pancreatic necrosis

- Fluoroquinolones
- Carbapenems
- Metronidazole
- Piperacillin- tazobactam*



Tenner et al. ACG Guidelines: Management of Acute Pancreatitis.The American Journal of Gastroenterology 119(3):p 419-437, March 2024.
**Otto W et al. Efficacy of antibiotic penetration into pancreatic necrosis. HPB (Oxford). 2006;8(1):43-8*

AMOEBIC LIVER ABSCESS – RIGHT DIAGNOSIS

Prasan K Panda, Krishna C , Prativa Sethi

Presentation

- **Risk factors-** male (particularly between 18-50 years of age), alcohol consumption, contaminated food or water, immunocompromised state, malnutrition, preexisting liver conditions like cirrhosis, metabolic liver diseases etc.

❖ **Most common symptoms**
- Fever
- Right upper quadrant pain, sometimes referring to epigastrium, right chest or shoulder
- Cough
- On examination- Vomiting- Bilious/ non bilious
- Nausea
- Abdominal distension, diarrhoea, constipation

❖ **Less common symptoms**
- Loss of appetite, weight loss, hiccup, sweating
- Sepsis and shock
- Jaundice (<10% cases)

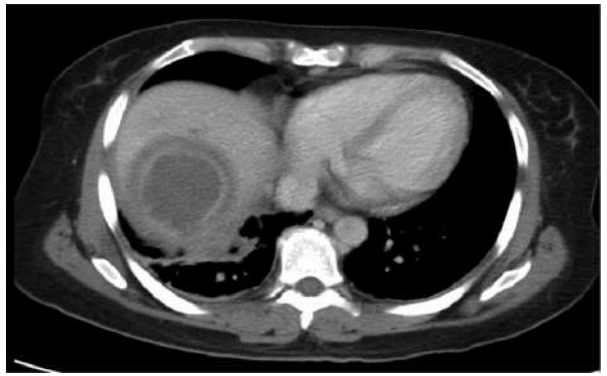
❖ **Signs**
- Icterus
- Hepatomegaly
- Point tenderness over liver, below the ribs, or intercostal spaces

DIFFERENTIATION POINTS

	Pyogenic	Ameobic
Age	Elderly	Young adults
Gender	M=F	M>F
History	Gall stones, Diabetes	Unhygeinic living condition
Left shift on WBC	Often +	Often -
S.Bil	Often elevated	Usually normal

Investigations

-CBC, LFT, KFT, urine R/M, hs-CRP, Procalcitonin
-Viral markers (HIV, Hep B, Hep C), PT/ INR
-**Serology (IgG ELISA) for E. histolytica (sensitivity 97%); May be negative in first 7 days**
-X-ray abdomen: AP erect and supine
-USG/CT abdomen



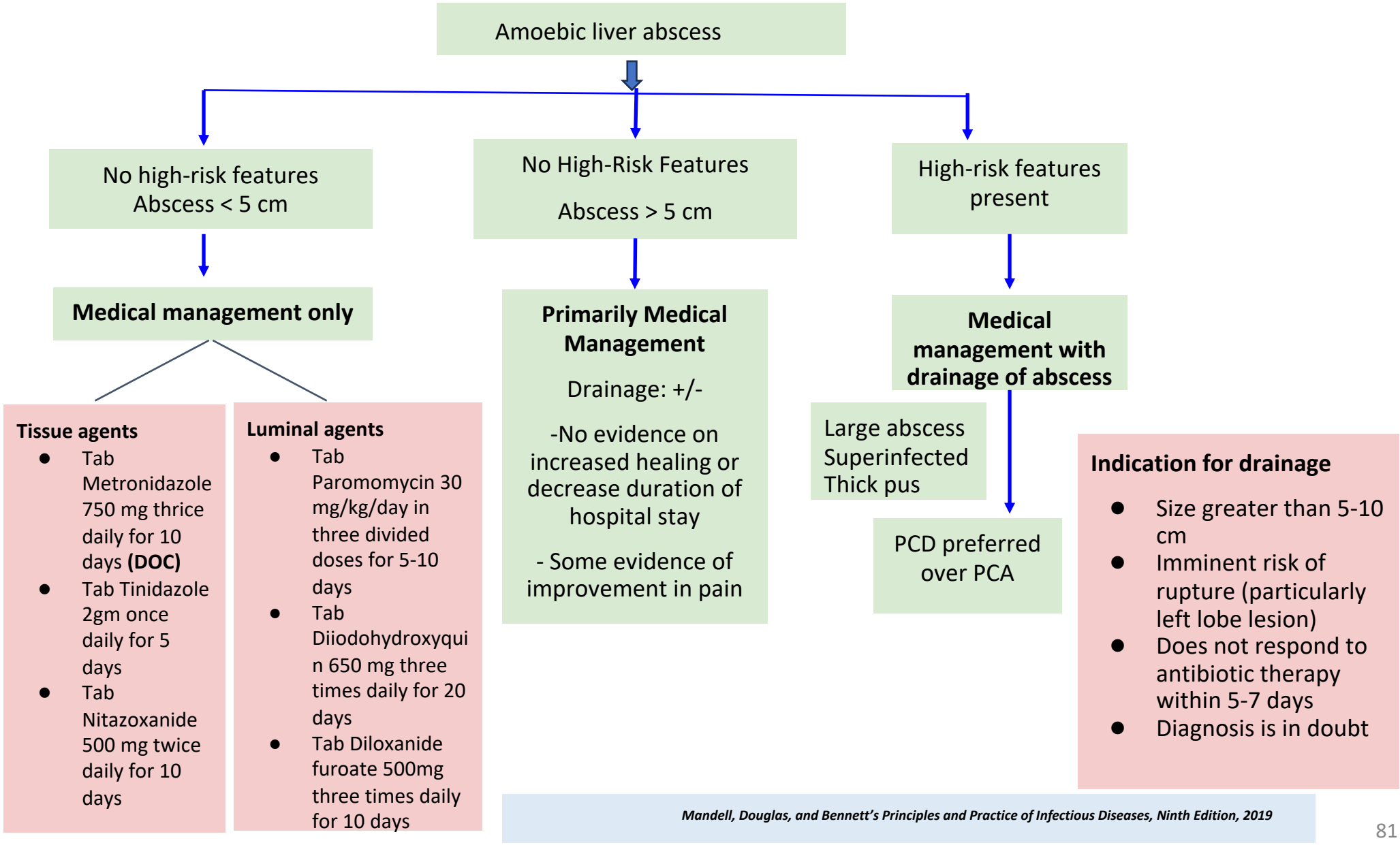
Complications

Local complications-
- Pleural effusion
- Rupture: empyema, peritonitis/abdominal collection, pyopericardium, into biliary tree spontaneously or after catheter drainage
- Compression- biliary tree: jaundice, inferior vena cava: ascites, pedal edema
- Vascular thrombosis- Hepatic and portal venous thrombosis

Systemic complications -
- Systemic inflammatory response syndrome
- Encephalopathy
- Shock
- Acute kidney injury
- Acute respiratory distress syndrome

Sayek I et al. Pyogenic and amebic liver abscess. In: Holzheimer RG, Mannick JA, editors. Surgical Treatment: Evidence-Based and Problem-Oriented. Munich: Zuckschwerdt; 2001.

AMOEBIC LIVER ABSCESS - RIGHT TREATMENT



Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases, Ninth Edition, 2019

PERITONITIS – RIGHT DIAGNOSIS AND RIGHT TREATMENT

*Karamveer Singh, B Krishna Sai**

Presentation

- Vomiting- Bilious/ non bilious
- Feed intolerance
- Abdominal distension
- Dehydration
- Constipation/ Obstipation
- Pain abdomen with guarding and rigidity
- h/o recent loose stools
- Malena
- Blood in stool
- h/o previous abdominal surgery
- Sepsis and shock

Investigations

- CBC,LFT , KFT
- Viral markers, PT/INR
- X-ray abdomen: AP erect and supine
- USG/CT abdomen

Initial Treatment

- Nasogastric decompression
- Urinary catheterization
- IV fluid resuscitation: Initial bolus of NS/RL(25-30ML/KG)/ followed by maintenance fluids N/2 saline + 1 ml KCl/ 100ml
- IV antibiotics:

1. Inj. Ceftriaxone 1 gm IV BD + Inj. Metronidazole 500 mg IV TDS + Inj. Amikacin 15 mg/ kg IV OD **OR**
2. Inj. Piperacillin- Tazobactam 4.5 gm iv TDS, **OR**
3. Inj Meropenem 1 gm IV TDS

Further Management

- Based on severity/ hemodynamic stability/ cause of intestinal obstruction, surgical intervention may be planned.
- Similar antibiotics may be continued or escalated based on severity and intra-operative findings.
- Inj. Metronidazole usually is continued for 5-7 days
- Inj. Amikacin is usually continued for up to 5-7 days
- Antibiotics for gram positive coverage is continued for 10-12 days or till wound healing has taken place

Holzheimer RG. Management of secondary peritonitis. In: Holzheimer RG, Mannick JA, editors. Surgical Treatment: Evidence-Based and Problem-Oriented. Munich: Zuckschwerdt; 2001.

SPONTANEOUS BACTERIAL PERITONITIS - RIGHT DIAGNOSIS AND RIGHT TREATMENT

Rohit Gupta, Rahul Yadav

DIAGNOSIS OF SBP

- High SAAG, low protein ascites i.e portal hypertensive ascites
- Absolute neutrophil count >250/cumm

Indications for ascitic fluid analysis

- Fever
- Any patient of cirrhosis deteriorating with jaundice, AKI, HE, shock
- Any hospitalised patient of cirrhosis with clinically detectable ascites
- Any patient of cirrhosis with clinically detectable ascites on first OPD visit

Primary Prophylaxis:

- Variceal bleed - Inj Ceftriaxone 1g iv OD for 5 to 7 days
- Low protein ascites (<1.5g%) with
  - S.Cr>1.2mg% or BUN>25mg% or Sodium<130meq/l
  - Child Pugh C and Bilirubin>3mg%

Antibiotics of choice

- **Community Acquired SBP**
  - Inj Cefotaxime 2g iv eight hourly
- **Nosocomial SBP**
  - Inj Piperacillin-Tazobactam 4.5g iv eight hourly +/- Inj Vancomycin 20 mg/kg iv over 1hr or Daptomycin (if VRE in past or evidence of GI colonization)
- **Duration:** 5-7 days followed by secondary prophylaxis with Norfloxacin 400mg OD
- **Response:** If <25% decrease in ANC after 48 hrs, addition of higher antibiotic and secondary peritonitis to be ruled out.

***ALBUMIN**- 1.5g/kg on day 1, 1g/kg on day 3

Community acquired SBP: Within 48 hours of admission and no health care contact within 90 days
Nosocomial SBP: After 48 hrs of admission or within 90 days of last health care contact

Biggins SW, et al. AASLD guidelines. Hepatology 2021; 74(2): 1014-48`

PERITONEAL DIALYSIS (PD) ASSOCIATED PERITONITIS - RIGHT DIAGNOSIS & TREATMENT

Sharon Kandari, Anshuman Biswal

DIAGNOSIS: (Two out of three)

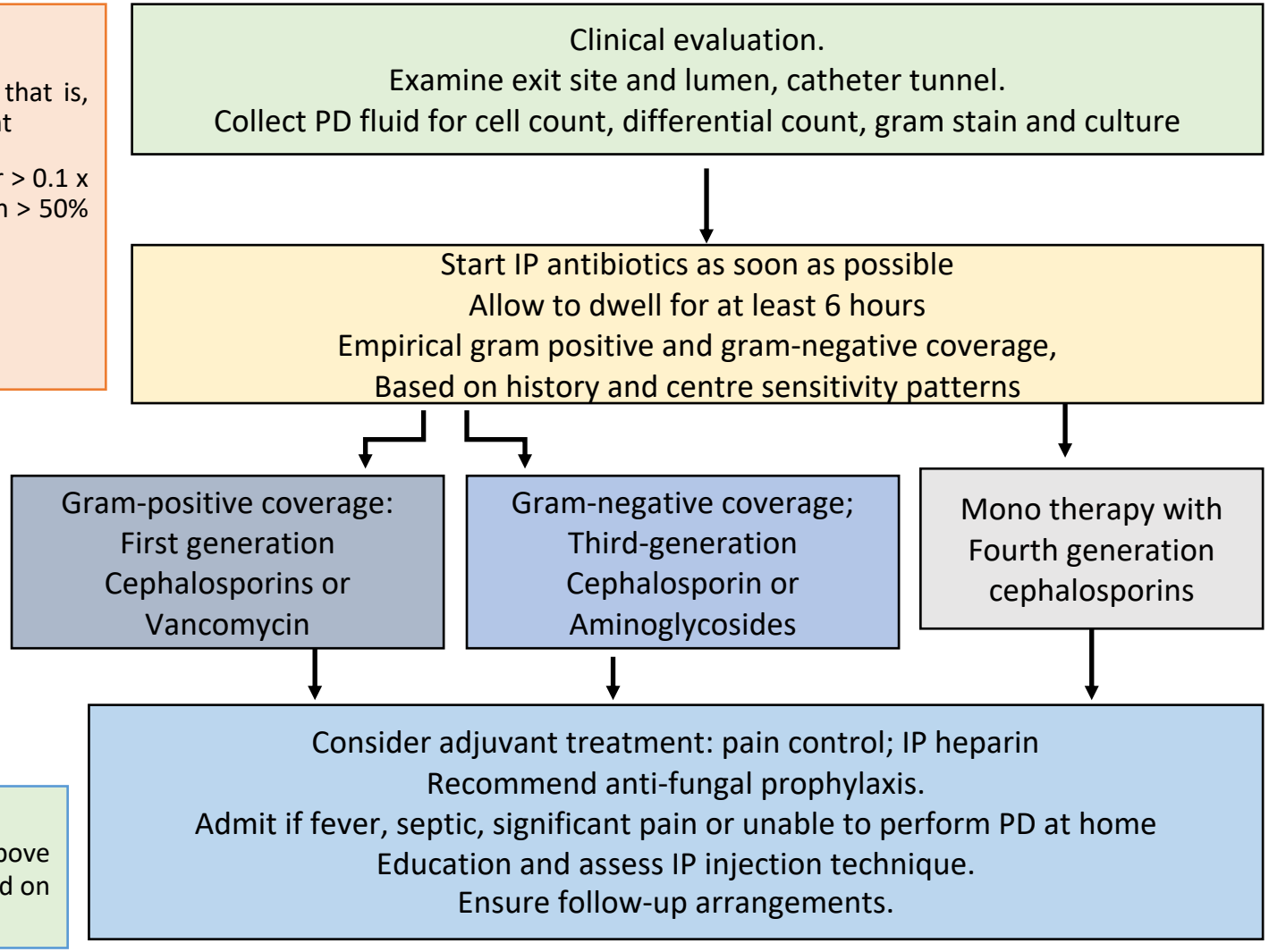
1. Clinical features consistent with peritonitis, that is, abdominal pain and/or cloudy dialysis effluent
2. Dialysis effluent white cell count > 100/mL or > 0.1 x 10^9/L (after a dwell time of at least 2 h), with > 50% polymorphonuclear leukocytes (PMN);
3. Positive dialysis effluent culture

Catheter-related peritonitis

Peritonitis that occurs in temporal conjunction (within 3 months) with a catheter infection (either exit-site or tunnel) with the same organism at the exit-site or from a tunnel collection and in the effluent or one site sterile in the context of antibiotic exposure

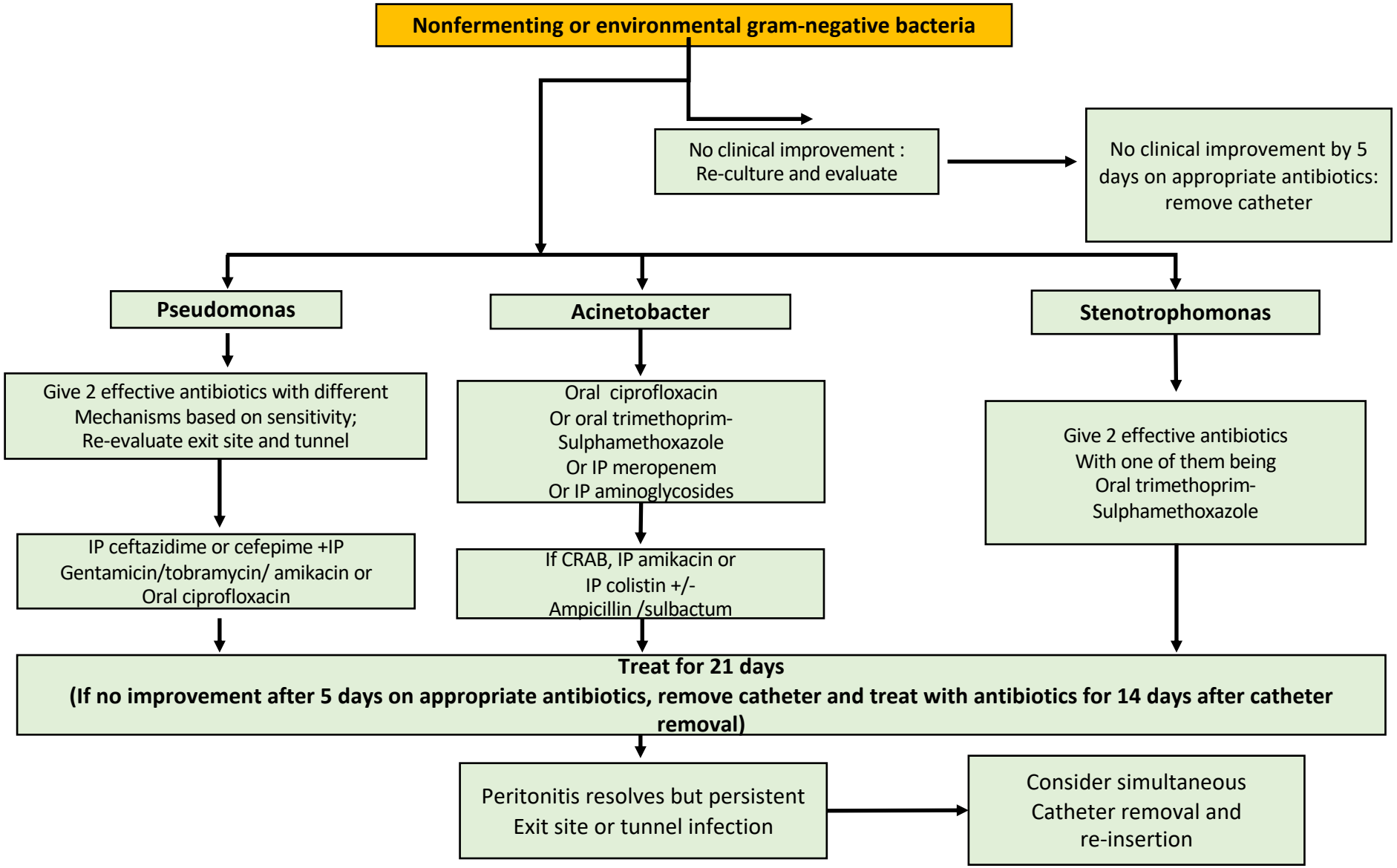
Culture-negative peritonitis

Peritonitis is diagnosed using the criteria above (criteria one and two), but no organism is identified on culture of dialysis effluent



Li PK-T et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Peritoneal Dialysis International. 2022;42(2):110-153. doi:10.1177/08968608221080586

RIGHT TREATMENT OF PD ASSOCIATED PERITONITIS – GRAM NEGATIVE BACTERIA



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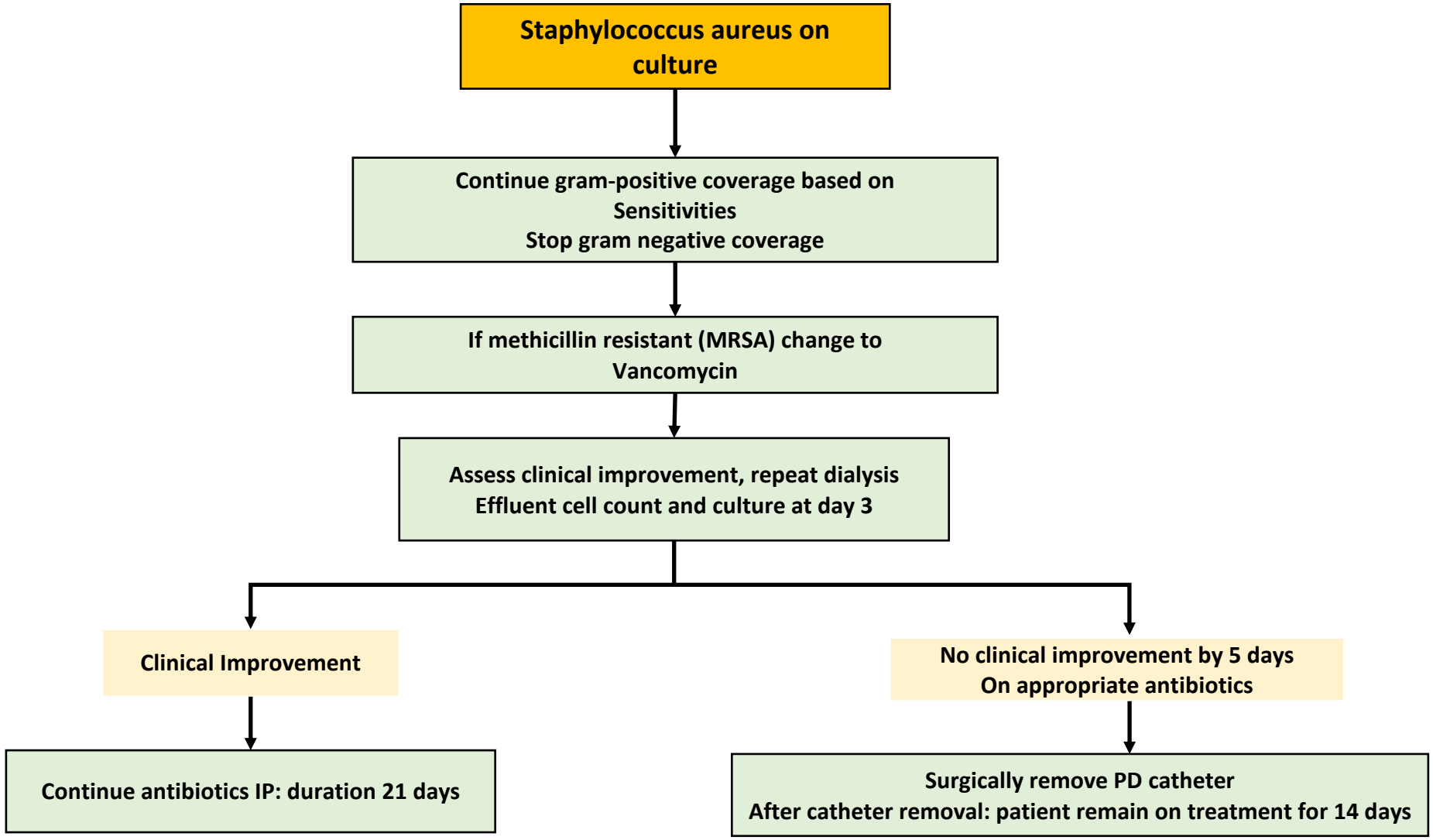
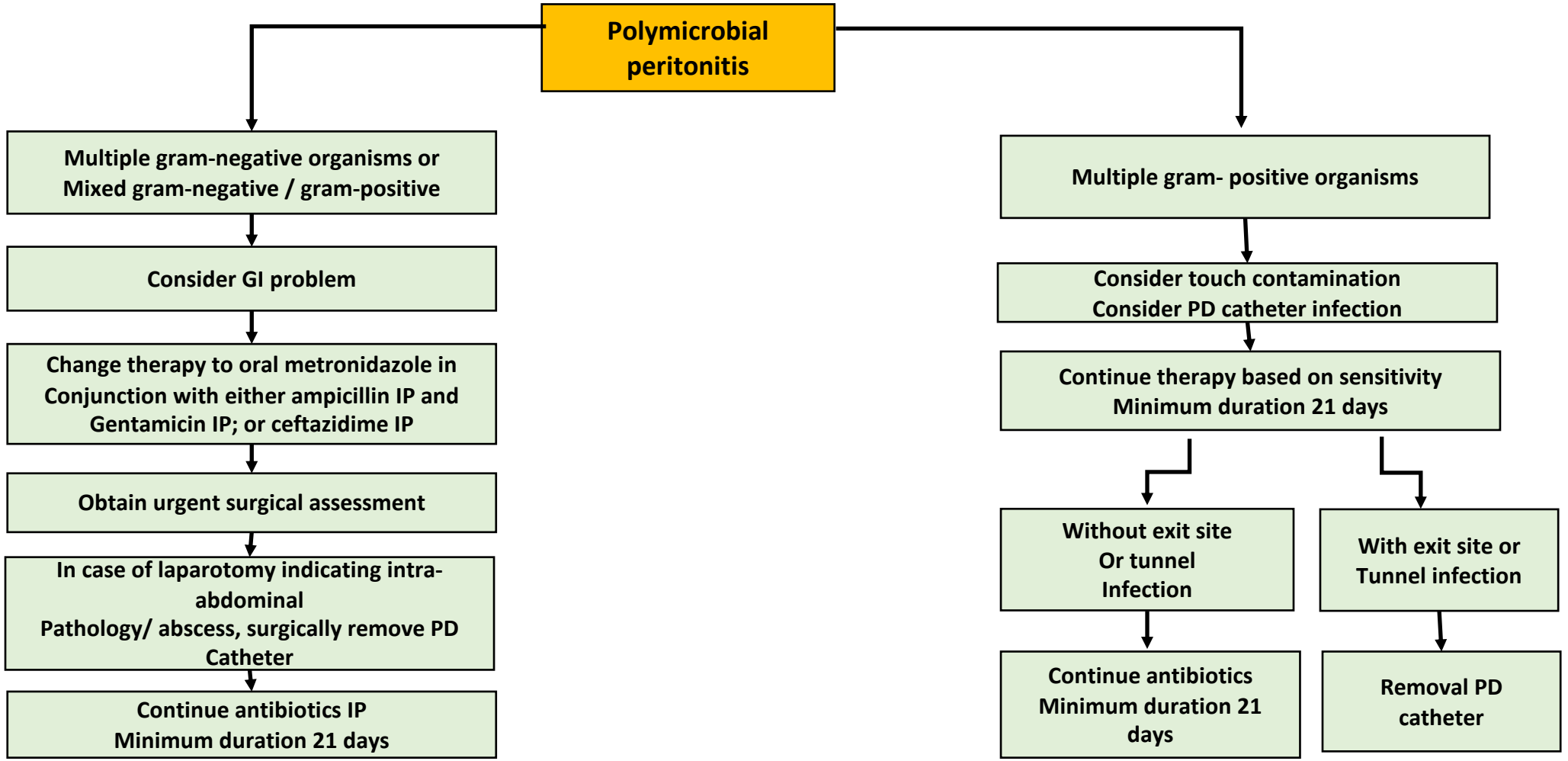
RIGHT TREATMENT OF PD ASSOCIATED PERITONITIS - STAPHYLOCOCCUS AUREUS



Li PK-T et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Peritoneal Dialysis International. 2022;42(2):110-153. doi:10.1177/08968608221080586

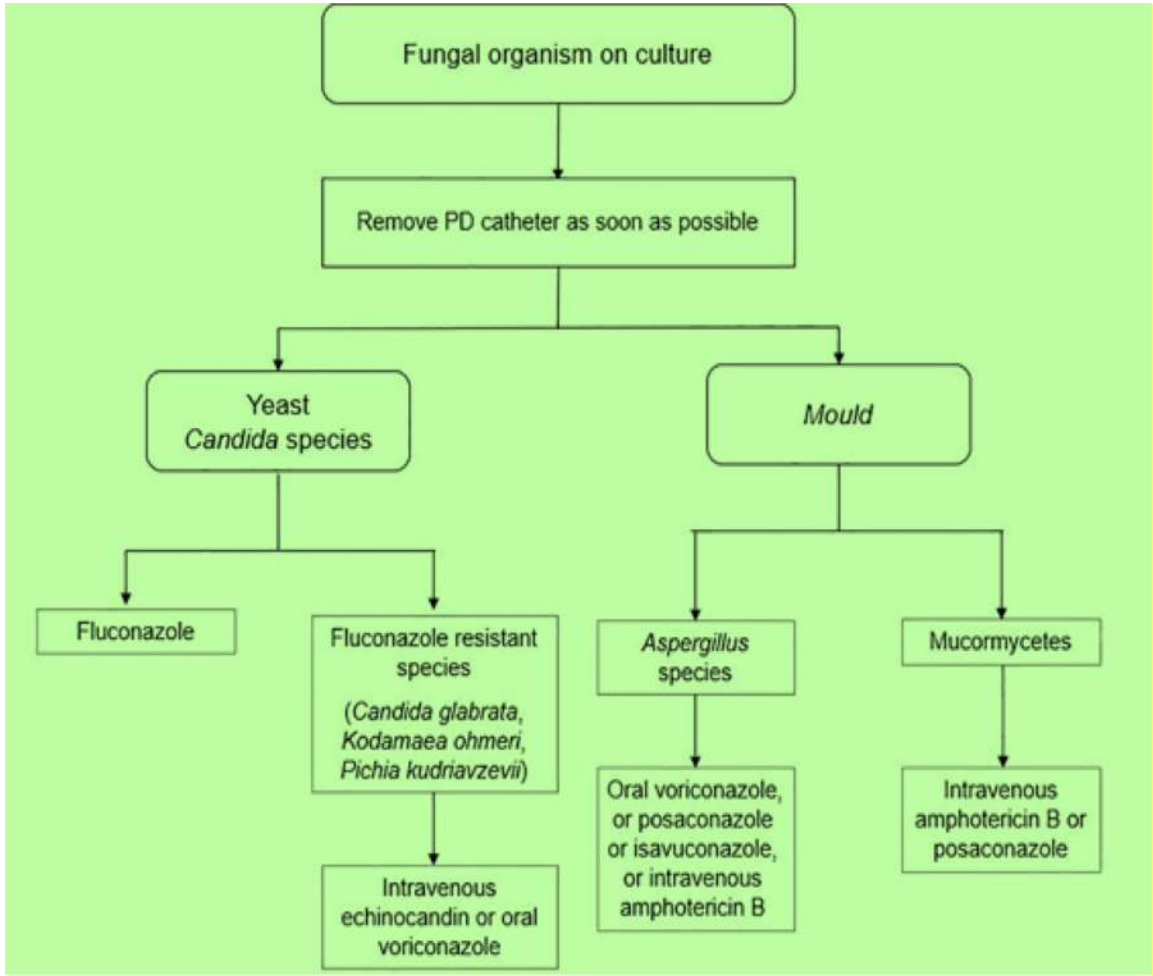
RIGHT TREATMENT OF PD ASSOCIATED PERITONITIS – POLYMICROBIAL

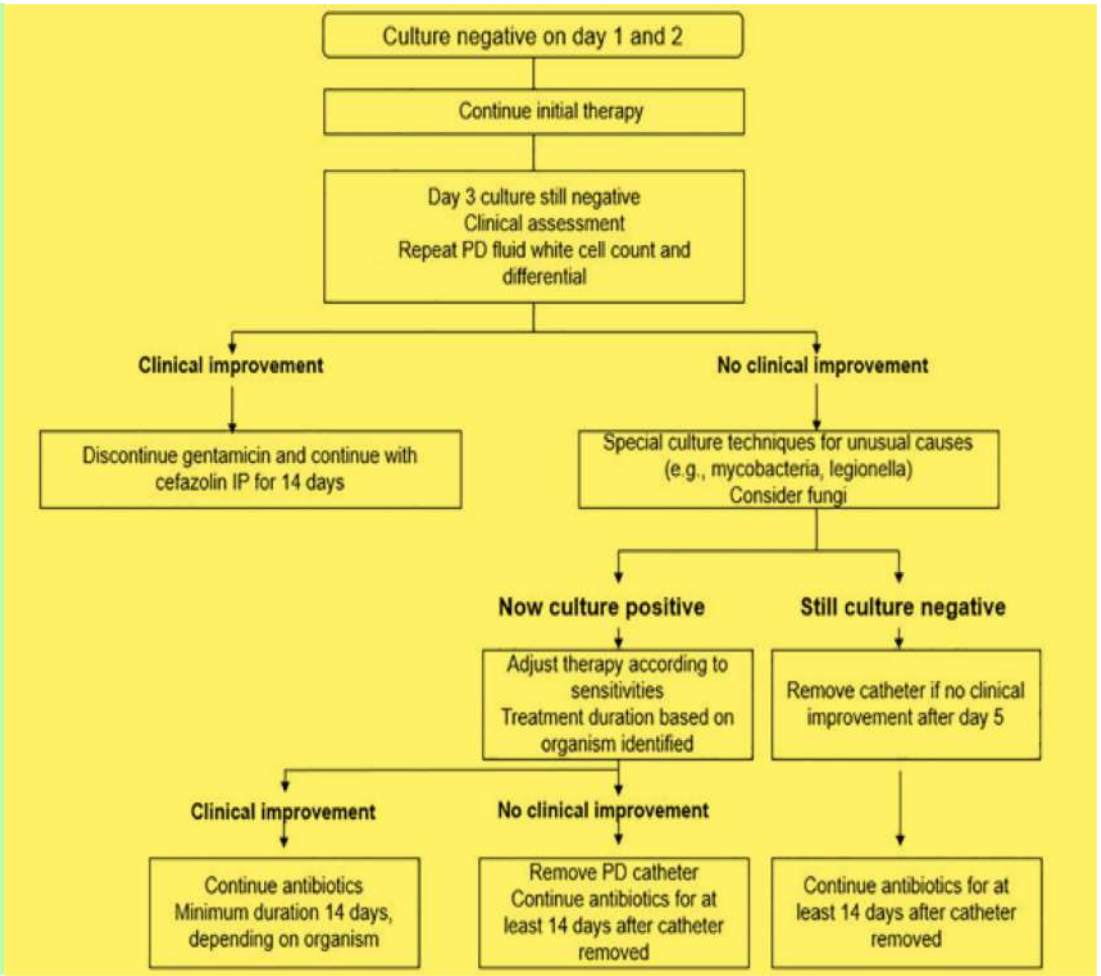


Prolonged treatment with gentamicin should be avoided and treatment >7 days should *only* proceed following direct advise from nephrologist or Infectious disease specialist

Li PK-T et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Peritoneal Dialysis International. 2022;42(2):110-153. doi:10.1177/08968608221080586

RIGHT TREATMENT OF PD ASSOCIATED PERITONITIS – FUNGAL / CULTURE NEGATIVE





Li PK-T et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Peritoneal Dialysis International. 2022;42(2):110-153. doi:10.1177/08968608221080586

OPAT: OUTPATIENT PARENTERAL ANTIMICROBIAL THERAPY

Prasan K Panda, Amit Kumar

What is OPAT:
Outpatient parenteral antimicrobial therapy (OPAT) refers to administration of intravenous antimicrobial therapy on at least two separate days without an intervening hospitalization

OPAT CHECKLIST CRITERIA [All must be present]

1. Patient does not require hospitalization for any intervention
2. Patient is vitally stable or clinically improved to a state of discharge
3. Patient is capable of safe & effective IV/IM drug administration
4. Therapeutic monitoring is feasible over phone/OPD basis
5. Drug storage is feasible with patient
6. Patient is willing to start & did participate in a sharing

Select right patient receiving parenteral antibiotics, who met OPAT checklist criteria and committed to post-discharge follow-up

Demonstrate [in ward] the right technique of IV cannula insertion and antibiotic infusion under aseptic conditions to patient/attendants

At discharge, counsel/educate the patient regarding IV cannula care and change cannula every 3rd day, when to stop OPAT and come for follow-up, to remain in contact with treating doctor

Discharge after ensuring IV access, follow daily telephonically, deal with complications and record outcome and feedback

Right practice of OPAT

- **OPAT benefits** patients and health care systems by facilitating outpatient follow-up care, reducing the length of inpatient stays, and limiting exposure to nosocomial pathogens, reducing costs
- Infections most commonly treated via OPAT are infective endocarditis and other cardiovascular infections, osteoarticular infections, skin and soft tissue infections, abdominal, respiratory, genitourinary, and central nervous system infections

Role of OPAT in antimicrobial stewardship:

- By enabling the use of appropriate antimicrobials outside of hospital settings, OPAT reduces the risk of hospital acquired infections and the subsequent need for broad-spectrum antibiotics, which are often overused in inpatient settings
- OPAT allows for the continuation of therapy with narrow-spectrum agents, aligning with the principles of antimicrobial stewardship by minimizing the selection pressure for resistant organisms

Norris AH, Shrestha NK, Allison GM, et al. 2018 Infectious Diseases Society of America Clinical Practice Guideline for the Management of Outpatient Parenteral Antimicrobial Therapy. Clin Infect Dis 2019; 68:e1
Lai KK, Nguyen HH, Winstead PS. OPAT and antimicrobial stewardship: Reducing hospital-acquired infections. Antimicrob Resist Infect Control. 2022;11(1):93.
Humphries RM, McKinnell JA, Boucher HW. Narrow-spectrum antibiotics in OPAT: A stewardship perspective. Clin Microbiol Rev. 2023;36(2)

RIGHT PROPHYLACTIC USE OF ANTIBIOTICS - CARDIOLOGY PROCEDURES

Bhanu Duggal, Abhinavya E.

- Cardiac procedures do not require anti-biotics prophylaxis for IE.
- Antibiotics prophylaxis required to prevent SSI including mediastinitis and thoracic wound infection in cardiac surgery
- Routine cardiac catheterization and angioplasty do not require any anti-microbial prophylaxis.

Pre-Operative Dose Timing:
Within 60 minutes before the surgical Incision
Redosing:
If the duration of the procedure exceeds two half-lives of the antimicrobial or there is excessive blood loss (i.e. >1500 mL)
Postoperative: Less than 24 hours irrespective of whether indwelling drains and intravascular catheters are removed

Recommended Dose: Cefazoline- 2 gm, Clindamycin- 900 mg, Cefuroxime- 1.5 gm, Vancomycin- 15 mg/kg

Type Of Procedure	Rationale	Recommended Agent	Alternative Agent In Patient with Beta- Lactam Allergy
Coronary Artery Bypass	To Prevent SSI	Cefazoline or Cefuroxime	Clindamycin or Vancomycin
Cardiac Device Insertion Procedure (Pacemaker Implantation)		Cefazoline or Cefuroxime	Clindamycin or Vancomycin
Ventricular Assist Device		Cefazoline or Cefuroxime	Clindamycin or Vancomycin
Congenital heart repair procedures requiring an open sternum postoperatively		Cefazoline	Vancomycin

1. Dajani AS et al. Prevention of bacterial endocarditis: recommendations by the American Heart Association. Circulation. 1997 Jul 1;96(1):358-66.
2. Bratzler DW et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Surgical infections. 2013 Feb 1;14(1):73-156.

RIGHT PROPHYLACTIC USE OF ANTIBIOTICS - GI ENDOSCOPIC PROCEDURES

Rohit Gupta, Rahul Yadav

Scenario for Prophylaxis	Rationale	Antibiotics	Dose/Route
1.Patients with valvular heart disease, valve replacement, and/or surgically constructed systemic-pulmonary shunt or conduit, or vascular graft	Prevention of infective endocarditis or conduit/graft infection	Not indicated	Not indicated
2. ERCP a. Ongoing cholangitis or sepsis anywhere b. Bilary obstruction/cbd stones and/or straightforward stent exchange c. ERCP when complete biliary obstruction unlikely to resolve(PSC, hilar CCA) d. Biliary complications following LT e. Communicating cyst or pseudocyst	 Prevention of procedure related bacteremia Prevention of cholangitis Prevention of cholangitis Prevention of cholangitis Prevention of cholangitis	 Based on culture reports or ongoing antibiotics Not indicated unless biliary decompression not achieved; If so then like cholangitis Ciprofloxacin As c. plus vancomycin As c.	 750mg orally 60-90mins before procedure 20mg/kg iv over 1 hr As c.
3. Variceal bleeding	Prevention of bacterial peritonitis	Ceftriaxone	1g iv OD for 5 days
4. Percutaneous endoscopic gastrostomy(PEG)	Prevention of peristomal infection	Coamoxiclav or Cefuroxime	1.2g iv just before procedure 750mg iv just before procedure
5. Endoscopic ultrasound guided intervention: a. FNA solid lesions b. FNA of cystic lesions in or near pancreas, or drainage of cyst	 Prevention of local infection Prevention of cyst infection	 Not indicated Co-amoxiclav or Ciprofloxacin	 --------- 1.2g iv single dose 750mg oral one dose
6. Profound immunocompromise(eg. neutropenia <500/cumm or hematological malignancy	Prevention of procedure-related bacteremia	Only indicated in patients with high risk of bacteremia (eg. Sclerotherapy, dilatation, ERCP with obstructed system)	Discuss with hematologist and clinical microbiologist

Allison MC, et al. Antibiotic prophylaxis in gastrointestinal endoscopy: BSG guidelines.Gut 2009; 58: 869-80

Right Procedural Prophylaxis – Obstetrics & Gynaecology

Amrita Gaurav, Ramya Mishra, Akanksha Deshwali**

PROCEDURE	ANTIBIOTICS	DOSE (single dose within 1 hour before procedure)
Caesarean section	Cephazolin	1 gm (adult 80 kg or more; 2gm) IV
Termination of pregnancy (surgical)	Metronidazole Doxycycline	500mg IV 400 mg PO
Manual Removal of Placenta	Metronidazole Cephazolin	500mg IV 1gm IV
3rd and 4th degree vaginal tears	Metronidazole Cephazolin	500mg IV 1gm IV

- If allergic to cephalosporin/penicillin, Clindamycin 600 mg can be given.
- There is insufficient evidence regarding antibiotic prophylaxis in cases of cervical cerclage.
- Administration of antibiotics solely to prevent endocarditis is **not recommended** for patients who undergo a genitourinary procedure.

Procedure	Antibiotic	Dose (Single dose within 1 hour before procedure)
Hysterectomy Vaginal Abdominal Laparoscopic Robotic	Cefazolin	2 grams IV
Uterine evacuation (Suction D&C or D&E)	Doxycycline	200 mg orally
Colporrhaphy	Cefazolin	2 grams IV
Vaginal sling placement	Cefazolin	2 grams IV
Laparotomy without entry into bowel/vagina	Cefazolin	2 grams IV

- If a procedure is lengthy (i.e., >3 hours), or if estimated blood loss is >1500 mL, an additional dose of prophylactic may be given 3-4 hours after the initial dose.
- In patients with morbid obesity (BMI > 35 kg/m2), doubling of antibiotic dose may be considered.

Committee on Practice Bulletins-Obstetrics. ACOG Practice Bulletin No. 199: Use of Prophylactic Antibiotics in Labour and Delivery.
ACOG Practice Bulletin No. 195: Prevention of Infection After Gynecologic Procedures. Obstet Gynecol. 2018 Jun;131(6):e172-e189. doi: 10.1097/AOG.0000000000002670. PMID: 29794678.

Right Procedural Prophylaxis - Gynaecology

- If allergic to cephalosporin/penicillin, Clindamycin 600 mg IV and Erythromycin 500 mg IV can be given.
- Antibiotic prophylaxis is **not recommended** for:

❑ Cervical tissue excision procedures like LEEP, biopsy
❑ Cystoscopy
❑ Endometrial biopsy
❑ Laparoscopic procedures without entry into bowel/vagina
❑ Hysteroscopy
❑ Intrauterine device insertion
❑ Oocyte retrieval

- Antibiotic prophylaxis is **not recommended** for hysterosalpingogram or chromopertubation unless there is a history of PID.
- Administration of antibiotics solely to prevent endocarditis is **not recommended** for patients who undergo a genitourinary procedure.

- If a procedure is lengthy (i.e., >3 hours), or if estimated blood loss is >1500 mL, an additional dose of prophylactic may be given 3-4 hours after the initial dose.
- In patients with morbid obesity (BMI > 35 kg/m2), doubling of antibiotic dose may be considered.

ACOG Practice Bulletin No. 195: Prevention of Infection After Gynecologic Procedures. Obstet Gynecol. 2018 Jun;131(6):e172-e189. doi: 10.1097/AOG.0000000000002670. PMID: 29794678.

SURGICAL PROPHYLAXIS IN ORTHOPAEDICS

Pankaj Kumar Kandwal, Aman Verma

❖ Organisms of concern:

- Aerobic Gram Positive Cocci: Staph aureus, CONS- Staph epidermidis, MRSA

○ Recommendations for Clean / Clean contaminated wounds-

- Cephalosporins Group of choice-2nd generation- Cefuroxime 1.5gm
- Current or prior MRSA colonization –Vancomycin 1gm
- True beta-lactam allergy: Vancomycin 1gm or Clindamycin 600mg

Timing of Administration

- For Clindamycin/ Cephalosporin
  - To start 30 mins before surgery or
  - 10 mins before inflating the tourniquet
- For Gentamicin/ Metronidazole-
  - to start infusion 2 hour prior to skin incision
  - to be completed at the time of skin incision/ inflation of tourniquet

No benefit of giving the antibiotic after Skin Incision

❑ Repeat Dosing-

- Prolonged surgery (>4 hours)
- Major blood loss (>1.5 litres)

Surgery	Recommendation	Hight risk/ Penicillin/ Cephalosporin allergy
Primary Arthroplasty (THR/TKR)/ Spinal procedures/ Open reduction and internal fixation of fractures	Cefuroxime 1.5gm IV single dose **High risk of MRSA infection:** ADD Vancomycin 1gm IV	Vancomycin 1gm IV (1.5gm for patients >80kg body weight)
Revision Arthroplasty	Cefuroxime 1.5gm IV **PLUS** Vancomycin 1gm IV	Vancomycin 1gm IV (1.5gm for patients >80kg body weight) Continue post op- 12 hours after initial dose
Lower limb amputation	Cefuroxime 1.5gm IV **If Limb is Ischemic:** ADD Metronidazole 500mg IV **High risk of MRSA infection:** ADD Vancomycin 1gm IV	vancomycin 1g IV **PLUS** gentamicin 2mg/kg IV **If limb is ischaemic:** ADD metronidazole 500mg IV infusion

If Pen allergy - Vancomycin IV + Gentamicin IV , Decreased renal function (on dialysis or eGFR <30ml/min- Flucloxacillin IV + Azteronam IV ; Pen allergy and decreased renal function - Vancomycin IV + Aztreonam IV; MRSA positive - Vancomycin IV + Gentamicin IV; MRSA positive and decreased renal function – Vancomycin IV + Aztreonam IV

Yeap JS., et al. "Prophylactic antibiotics in orthopaedic surgery: Guidelines and practice". Medical Journal of Malaysia 61.2 (2006): 181-188. South Australian Surgical antimicrobial prophylaxis clinical guidelines. 2021 South Australian Surgical antimicrobial prophylaxis clinical guidelines. 2021SAPG Recommendations for Re-dosing Antibiotics for Surgical Prophylaxis.

RIGHT PROCEDURAL PROPHYLAXIS – GENERAL SURGERY

*Karamveer Singh, B Krishna Sai**

Procedure	Likely organism	Recommended antibiotic	dosage
Oesophageal surgery	Gram positive cocci and gram negative bacilli	Cefazolin	1 to 2g intravenously
Gastroduodenal surgery	Gram positive cocci and gram negative bacilli	Cefazolin	1 to 2g intravenously
Colorectal surgery	Gram negative bacilli, anaerobes	Oral: neomycin and erythromycin base	1g orally
		Parenteral: cefotetan or cefoxitin	1-2g intravenously
Appendicectomy	Gram negative bacilli, anaerobes	Cefotetan or cefoxitin	1-2 g i.v.
Hepato-biliary surgery	Gram negative bacilli	Cefazolin.	1-2 g i.v.

Crader MF, et al. Preoperative Antibiotic Prophylaxis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan.

POST EXPOSURE HIV/HBV PROPHYLAXIS

Mukesh Bairwa, Sarthak Gaur, Abhishek Rai

Management of Exposure site	
Skin if pierced by needlestick or sharp instrument	• Immediately wash with soap and water. • Do not use antiseptics , alcohol, betadine. • Do not scrub.
Eye	• Irrigate exposed eye immediately with water or normal saline. • If wearing contact lenses, leave them in place while irrigating. • Do not use soap or disinfectant on eye.

Baseline investigations after needle stick injury	**CBC , LFT , KFT , Viral markers**
Follow up	Repeat CBC , LFT, KFT , Viral markers at 6 ,12 and 24 weeks.

HIV PEP Guidelines	**Details**
Initiation	As soon as possible preferably within 72 hours post-exposure
Duration	28 days
Recommended Regimen	Tenofovir(300 mg) + Lamivudine (300 mg) + Dolutegravir (50 mg) FDC 1 tab OD
Follow up	HIV serology at 6,12 and 24 weeks.

HBsAg PEP Guidelines (never/ incompletely vaccinated)	**Details**
Initiation	Prefrerably within 24 hours of exposure , can be given upto 72 hours.
Treatment	HBIG: 0.06 mL/kg IM Hepatitis B Vaccine: 3 doses (1 ml IM at 0,1,6 months)
Follow-Up	Check seroconversion (Anti HBS titre) at 1-2 months after final vaccine dose.

Previously vaccinated	**Details**
Anti- Hbs titre < 10 IU/L	HBIG: 0.06 mL/kg IM Hepatitis B Vaccine: 3 doses (1 ml IM at 0,1,6 months)
Anti- Hbs titre > 10 IU/L	Nothing required

To prevent mother to child transmission	
Initiation	Within 12 hours of child birth.
Treatment	Hepatitis B vaccine (0.5 ml intramuscular) Hepatitis B immunoglobulin (0.5 ml Intramuscular at a different anatomical site

RIGHT PROPHYLACTIC USE OF ANTIMICROBIALS IN MEDICAL CONDITIONS

Prasan K Panda, Vinay Tulsian , Gaurav Karna

Disease	Indication	Antimicrobial agent	Dose and duration of therapy
Exposure(pre/post) prophylaxis			
Diphtheria	Close contacts exposed to oral or respiratory secretions	Erythromycin	250 mg QID for 7 to 10 days
Anthrax	Documented or suspected exposure to aerosolized B. anthracis	Doxycycline	100mg BD for 42 to 60 days
Meningococcus	Close contacts of sporadic cases of N. meningitidis	Rifampicin	600 mg BD for 2 days
H1N1	High risk population (pregnant women, age >65 years, chronic steroid use, lung, heart, liver or kidney disease, diabetes, cancer or HIV/AIDS)	Oseltamivir	75 mg OD for 10 days
Bite wound infection	High risk bites (puncture wound, immunocompromised patients, crush injuries, involving deeper structure, bone or joint)	Amoxicillin- clavulanate	500/125mg TDS for 3 to 5 days
Needle stick injury (HIV)	Exposure code 1 or more with positive or unknown Source person's HIV status (see also needle stick injury chapter)	Tenofovir 300mg + lamivudine 300 mg + dolutegravir 50 mg	28 days
Sexually transmitted infections	Gay and bisexual men and transgender women who have had chlamydia, syphilis, or gonorrhoea in the last 12 months	Doxycycline	200mg single dose
Malaria (Travel to endemic areas)	Travel to a malaria endemic region	Atovaquone-praguanil Doxycycline 100 mg daily Chloroquine 300mg once daily	2 days before travel; till 4 wks after travel 2 days before travel; till 4 wks after travel 2 wks before travel; till 4 wks after travel
Traveler's diarrhoea	Short term (e.g., <2 weeks) travellers with underlying medical condition (severe inflammatory bowel, immunocompromised state or vascular, severe cardiac or renal disease)	Rifaximin	200 mg thrice daily
Chronic systemic glucocorticoid use	Glucocorticoids doses above 20 mg/day equivalent for > 4 weeks and have another cause of immunocompromise (haematological malignancy or another immunosuppressive agent)	Cotrimoxazole (trimethoprim-sulfamethoxazole)	Double strength tablet once daily as long as risk factors present

Enzler MJ, Berbari E, Osmon DR. Antimicrobial prophylaxis in adults. InMayo Clinic Proceedings 2011 Jul 1 (Vol. 86, No. 7, pp. 686-701). Elsevier.

RIGHT PROPHYLACTIC USE OF ANTIMICROBIALS IN MEDICAL CONDITIONS

DISEASE	INDICATION	ANTIMICOBIAL	DOSE/DURATION
Immunocompromised patient prophylaxis			
People Living with HIV (PLHIV)	**1. Pneumocystis pneumonia** - **CD4 count <350 cells/mm3** - **WHO clinical stage 3 and 4** - **After PCP treatment till CD4 count >350 for 6 months**	**Cotrimoxazole (trimethoprim-sulfamethoxazole)**	1 DS tablet OD, Till CD4 >350 cells/mm 3 on 2 occasions 6 months apart with an ascending trend and No WHO clinical stage 3 and 4 conditions
	2. Tuberculosis **- All adults with negative 4s** **- Children >1 year, with –ve 4s symptoms** **- Children <1 year, in contact with TB but unlikely to have active TB**	**Isoniazid**	10mg/kg (max 300mg) plus pyridoxine 50 mg daily for 6 months
	3. Cryptococcal disease (if CrAg test is not available, may be given to HIV-positive whose CD4 cell count <100 cells/mm3)	**Fluconazole**	100mg OD for 12 months
Neutropenia	**High risk for Febrile Neutropenia or profound, protracted neutropenia (eg, most patients with AML/myelodysplastic syndromes)**	**Fluoroquinolone plus oral triazole or parenteral echinocandin**	During period of expected neutropenia

Enzler MJ, Berbari E, Osmon DR. Antimicrobial prophylaxis in adults. InMayo Clinic Proceedings 2011 Jul 1 (Vol. 86, No. 7, pp. 686-701). Elsevier.

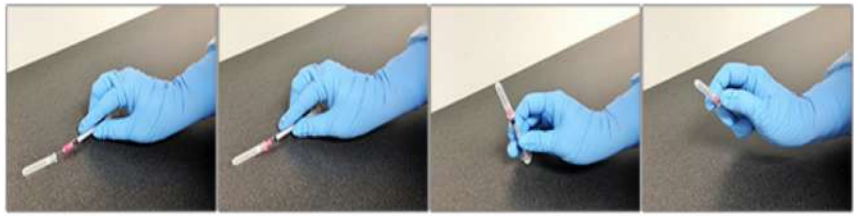
RIGHT PROPHYLACTIC USE OF ANTIMICROBIALS IN MEDICAL CONDITIONS

Disease	Indication	Antimicrobial agent	Dose and duration of therapy
Preventive prophylaxis in chronic/recurrent/ latent conditions			
Rheumatic fever	1. Rheumatic fever without carditis	Benzathine penicillin G 1.2 MU every 3 to 4 weeks or Erythromycin 250 mg BD	For 5 years after last attack or 21 years of age (whichever is longer)
	2. With carditis but no residual valvular disease		For 10 years after last attack or 21 years of age
	3. With persistent valvular disease, evident clinically or on ECHO		For 10 years after last attack or 40 years of age
Infective endocarditis	Dental procedures where manipulation of gingival tissue or the periapical region or perforation of oral mucosa in high-risk cardiac lesions	Amoxicillin	2 grams orally one hour before procedure
COPD	COPD with frequent exacerbations (≥2 per year) despite optimal medical management	Azithromycin	250 mg three times per week for 12 months
Bronchiectasis	Recurrent exacerbations (≥3 per year)	Azithromycin	500 mg thrice weekly for 6/12 months or indefinitely
Asplenic or hyposplenic individuals	1. Sickle cell disease	*Penicillin V/ Erythromycin	*250mg BD until age 5 years (125 mg BD for age < 3years)
	2. Concurrent immunocompromised state	Penicillin V/ Erythromycin	Until age 18 years and often as long as immunocompromised state lasts
	3. History of sepsis/ severe infection caused by encapsulated organisms	Penicillin V/ Erythromycin	Lifelong prophylaxis
Spontaneous bacterial peritonitis	1. Acute gastrointestinal bleeding	*Ceftriaxone (ciprofloxacin/Cotrimoxazole)	*1 gram IV BD for 7 days
	2. Ascitic fluid protein <1.5gm/dl with any one of impaired renal (S. creatinine ≥1.2mg/dl or BUN ≥25mg/dl) or liver function (CTP ≥9 + bilirubin ≥3mg/dl) or S. sodium <130 mEq/L	Ciprofloxacin/ norfloxacin	500 mg OD/ 400 mg OD as long as ascites present
	3. Prior history of SBP	Ciprofloxacin/ norfloxacin	500 mg OD/ 400 mg OD for Lifelong
Recurrent Hepatic Encephalopathy	Adjunct to lactulose as secondary prophylaxis following ≥1 additional episodes of overt HE within 6 months of the first one	Rifaximin	550mg BD (discontinue after improvement of liver function and precipitating factor)
Recurrent urinary tract infection	Non pregnant women with recurrent (≥3 per year), uncomplicated UTIs	Nitrofurantoin, cotrimoxazole or fluroquinolones	6 to 12 months
Tuberculosis infection/ LTBI	1. People living with HIV; TB hypersensitivity diseases like Poncet	Refer to section on PLHIV	
	2. Household contacts (HHC) < 5 years of PTB patients	Isoniazid	10mg/kg (max 300mg) plus pyridoxine 50 mg daily for 6 months
	3. HHC (> 5 years) of PTB patients (among positive TST/IFRA after ruling out TB disease)	Isoniazid and Rifapentine (HP) Isoniazid	Once weekly for 3 months Daily for 6 months
	4. Others risk groups- immunosuppressive therapy, silicosis, anti TNF treatment, dialysis, transplantation (among positive TST/IFRA)	Isoniazid and Rifapentine (HP) Isoniazid	Once weekly for 3 months Daily for 6 months

DO's & DON'Ts OF NEEDLE STICK INJURY PREVENTION *Amber Prasad*

- Keep sharps visible.
- Avoid distractions.
- Never hand off or leave needles or sharps for others to dispose.
- Loudly say "Sharps" when handling sharps. Maintain a safe zone around sharps being used.
- Store sharps containers out of the reach of others not needing access
- Always activate the safety device on needles immediately after each use.
- Be aware of staff nearby.
- Secure used sharps containers during transport to prevent spilling
- Investigate all sharps-related injuries and provide post-exposure medical evaluations
- Follow standard precautions, infection prevention, and general hygiene practices consistently.
- Participate in your employer's blood borne pathogens training program.
- Report any needle stick and other sharps injury immediately to your employer

- Avoid using needles whenever safe and effective alternatives are available.
- Avoid recapping or bending needles that might be contaminated.
- Plan for the safe handling and disposal of needles before use.
- Don't empty, handle or transfer used sharps between containers.
- Do not recap before disposal.
- Don't discard sharps in bins which are open and with wide mouth



First, place cap on a level horizontal surface; gently slide needle half-way into cap...

Then, slowly tip up needle end of the device and allow cap to slide over needle...

Finally, use the thumb of the hand holding the device to secure the cap on the syringe.

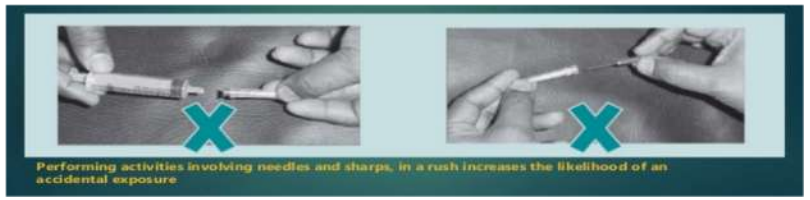
ONE HAND SCOOP TECHNIQUE

Sharp container

Needle destroyer

Improper sharp disposal

Improper use of needle



DO NOT RECAP

ADULT IMMUNIZATION

Darab Singh, Prasan K Panda, Rashi Mittal

NEED FOR ADULT IMMUNIZATION

1. Vaccine Preventable Diseases and Herd Immunity
2. Antibody titers/ Immunity decreases over time
3. Travel to endemic areas
4. Elderly Population
5. Vaccination for Emerging Infections
6. New Strains and Vaccine Technology Advancements
7. People with Comorbidities
8. Healthcare Workers

MANDATORY VACCINATION FOR HCWs

VACCINE	DOSE/ROUTE	SCHEDULE	REMARKS
Hepatitis B	1 ml; Deep i.m.	0,1,6 months	All adults(19-59) + >65- All at risk (CLD;CKD; HIV; iv drug abuse etc.) CKD- double dose at 0,1,12,6 months
Tdap/Td	0.5 ml i.m.	1 dose then Td/Tdap 10 yearly	All adults 1 dose Tdap during each pregnancy
MMR	0.5 ml s.c.	1 dose 2 doses- 0, 4 wks	if no evidence of immunity HCW, HIV with CD4 >200 C/I in pregnancy, immunocompromised
Varicella	0.5 ml s.c.	1 dose 2 doses- 0,4-8 weeks	if no evidence of immunity HCW C/I in pregnancy, immunocompromised
COVID-19	0.5 ml i.m.	2 doses- 0, 4 weeks	Age >18 yrs
Influenza	0.5 ml i.m.	1 dose annually	Age> 18 yrs; LAIV C/I - in Age>65, Pregnancy, Immunocompromised
Herpes Zoster	0.5 ml i.m.	2 doses 2-6 months apart	All adults with >50 yrs age; All HIV pts

Selective Vaccination for special groups- Kindly See next page

HCW-Health care worker , CLD- Chronic liver disease , CKD-chronic kidney disease , LAIV- live attenuated influenza vaccine, C/I-contraindication

ADULT VACCINATION FOR SPECIAL GROUPS

CLD/CKD
1. Hepatitis B
2. Tdap/Td
3. MMR
4. Varicella
5. COVID-19
6. Influenza
7. Pneumococcal
8. Hepatitis A(for CLD)

Heart/ Lung disease
1. Tdap/Td
2. COVID-19
3. MMR
4. Influenza
5. Varicella
6. Pneumococcal

Hemoglobino-pathies
1. Tdap/Td
2. MMR
3. Varicella
4. COVID-19
5. Influenza
6. Pneumococcal
7. Hib
8. Meningococcal

HIV
1. Hepatitis B
2. Tdap/Td
3. MMR(C/I CD4<200)
4. Varicella(C/I CD4<200)
5. COVID-19
6. Influenza
7. Pneumococcal
8. Hepatitis A
9. Herpes Zoster
10. Meningococcal

Pregnancy
Recommended-
1. Hepatitis B
2. Tdap(27-36 weeks)
3. COVID-19
4. Influenza

Contraindicated-
1. 1. MMR
2. Varicella
3. LAIV
4. HPV

LAIV- live attenuated influenza vaccine, C/I-contraindication, MMR-measles mumps and rubella , PCV-pneumococcal conjugate vaccine , PPSV- Pneumococcal Polysaccharide vaccine, Tdap-Tetanus ,diphtheria ,acellular pertussis, Hib-H. influenza

VACCINE	DOSE/ ROUTE	SCHEDULE	TARGETED POPULATION	REMARKS
HPV Cervarix/ Gardasil	i.m.	2/3 dose series	Up to age 26 year- all adults; Age 27-45 years- based on shared clinical decision	
Pneumococcal	PCV- i.m. PPSV-23 s.c./i.m.	PCV13 dose 1dose PPSV-23 1year later	All adults >65 years All at risk in age group 19-64 years (CLD;CKD; HIV; i.v. drug abuse etc.)	PPSV23 booster at 5 yrs in high-risk individuals
Hepatitis A	1 ml i.m.	2 doses 6-12 m apart	At risk (CLD; HIV; iv drug abuse etc.)	
Hib	0.5 ml i.m.	1 dose 3 dose series 4 weeks apart	Anatomical/functional Asplenia Hematopoietic stem cell transplant	If elective splenectomy, 1 dose at least 14 days before splenectomy
Meningococcal		2 doses 8 weeks apart		

CLINICAL ANTIBIOGRAM

Vanya Singh, Prasan K Panda, Chackappen, Minakshi Singh

What is a Clinical Antibiogram?

Summarizes antimicrobial susceptibility, right ID diagnosis, and clinical response data for bacterial isolates recovered by a microbiology laboratory over a defined period

Why is it required ?

For the clinician

- Deciding empirical therapy, while waiting for C/S reports
- Provides knowledge on prevalence of most common pathogens
- Provides guidance which therapy to choose in MDR, XDR, PDR pathogens

For the microbiologist

- Helps in antibiotic resistance monitoring and infection control
- Monitoring changes in susceptibility and resistance from year to year

For the administrator

- Policy formulation
- Optimizing resources

HOW TO MAKE A CLINICAL ANTIBIOGRAM

Components of Antibiogram

Time Frame :- 6 months (June 24 –Nov 24)

Name of Facility :- Department of General Medicine (ICU)

Number of Isolates analyzed—30

Percent susceptibility(Range 0 - 100%)

STEP1

- Data Collection of all pathogens
- Obtain culture and sensitivity data from the patient's lab records. –(Laboratory Antibiogram)

Step 2

- See and record clinical response to ongoing empirical antibiotics
  - ❖YES: Record these antibiotics as First Line antibiotic for the disease
  - ❖No: See list of Culture-sensitive antibiotics, and see their responses, then record

Step 3

- Calculation of total number of patient responded or not, to the given antibiotics

Step 4

- **Calculation of percentage susceptibility to given antibiotics**

$$\frac{\text{Total No of Pts susceptible + Pts responded to invitro resistant antibiotics – pts not responded to invitro susceptible antibiotics}}{\text{Total No of isolates}}$$

AIIMS RISHIKESH HOSPITAL ANTIBIOGRAM (POCKETGUIDE)

% susceptibility of organisms in BLOOD samples

Vanya Singh, Minakshi Singh

			Penicillins		BL-BLIs		Cephalosporins				Carbapanems			Mono-bactum	Quinolones		Anti-folate	Aminoglycoside			Tetracyclines			Poly myxins	Macrolide		Anti-Staph		Lincosamides	Glycopeptides		Others		
Gram Negative Organisms	Location	Total Number of Isolates	Penicillin	Ampicillin	Piperacillin Tazobactum	Amoxycillin Clavulonate	Cefuroxime	Ceftriaxone	Ceftazidime	Cefepime	Meropenem	Imipenem	Ertapenem	Aztreonam	Ciprofloxacin	Levofloxacin	Cotrimoxazole	Amikacin	Gentamycin	High-level Gentamycin	Tetracycline	Tigecycline	Minocycline	Colistin (%I)	Erythromycin	Azithromycin	Cefoxitin	Oxacillin	Clindamycin	Vancomycin	Teicoplanin	Linezolid	Daptomycin	Chloramphenicol
Acinetobacter baumani complex	IPD	219	x	x	14	x	x	x	28	13	16	14	x	x	17	17.3	28	17	17	x	x	x	54	97	x	x	x	x	x	x	x	x	x
Escherichia coli	OPD *	25*	x	x	52	NT	5	11	67	17	71	72	58	x	9	NT	28	76	42	x	x	x	x	100	x	x	x	x	x	x	x	x	x	x
	IPD	124	x	x	27	22	2.6	3.4	x	14	47	51	41	x	2	NT	22.2	65	66	x	x	x	x	99	x	x	x	x	x	x	x	x	x	x
Klebsilella pneumoniae	OPD *	14*	x	x	21	17	20	22	x	23	15	17	20	x	14	NT	21.4	21	21	x	x	x	x	93	x	x	x	x	x	x	x	x	x	x
	IPD	233	x	x	21	16	8.5	8.3	x	16	28	25	30	x	9	NT	17.5	25	22	x	x	x	x	93	x	x	x	x	x	x	x	x	x	x
Pseudomonas aerogenosa	OPD	9*	x	x	44	x	x	x	75	67	50	63	x	20	75	42.9	x	64	x	x	x	x	x	93	x	x	x	x	x	x	x	x	x	x
	IPD	78	x	x	43	x	x	x	59	53	45	52	x	36.4	43	38	x	50	x	x	x	x	x	91	x	x	x	x	x	x	x	x	x	x
Burkholderia cepacia complex	IPD	32	x	x	x	x	x	x	56	x	67	x	x	x	x	86.7	87.6	x	x	x	x	x	62	x	x	x	x	x	x	x	x	x	x	x
Enterobacter cloacae complex	IPD	33	x	x	55	x	x	x	40	50	64	64	x	x		x				x	x	x	x		x	x	x	x	x	x	x	x	x	x
Salmonella Typhi	OPD & IPD	45	x	89	x	x	x	83	x	x	100	x	x	x	0	0	95.5	x	x	x	x	x	x	x	x	62.1	x	x	x	x	x	x	x	
Stenotrophomas maltopholia	IPD	41	x	x	x	x	x	x	x	x	x	x	x	x	x	57.9	71.1	x	x	x	x	x	88	x	x	x	x	x	x	x	x	x	x	x
Gram Positive Organisms																																		
Staphylococcus aureus	OPD & IPD	34	2.9	x	x	x	x	x	x	x	x	x	x	x	3	2.9	50	x	44	x	79	100	x	x	38.2	x	18	16	x	100	100	100	100	x
Enterococcus faecium	IPD	50	2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	22	x	100	x	x	x	x	x	x	x	55	x	58	x	x

*Less than 30 isolates; Values in boxes above represent % susceptible; X indicates not tested or intrinsically resistant or minimal isolates tested

HIGHLY SUSCEPTIBLE	> 80%	MODERATE SUSCEPTIBLE	50-80 %	LESS SUSCEPTIBLE	< 50%

AIIMS RISHIKESH HOSPITAL ANTIBIOGRAM (POCKETGUIDE)

% susceptibility of organisms in URINE samples

Vanya Singh, Minakshi Singh

		Penicillins		BL-BLIs		Cephalosporins				Carbapanems			Mono-bactum	Quinolones		Anti-folate	Aminoglycoside			Tetracyclines			Poly myxins	Macrolide		Anti-Staph	Lincosamides	Glycopeptides		Others					
Gram Negative Organisms	Total Number of Isolates	Penicillin	Ampicillin	Piperacillin Tazobactum	Amoxycillin Clavulonate	Cefuroxime	Ceftriaxone	Ceftazidime	Cefepime	Meropenem	Imipenem	Ertapenem	Aztreonam	Ciprofloxacin	Levofloxacin	Cotrimoxazole	Amikacin	Gentamycin	High-level Gentamycin	Tetracycline	Tigecycline	Minocycline	Colistin (%I)	Erythromycin	Azithromycin	Cefoxitin	Clindamycin	Vancomycin	Teicoplanin	Linezolid	Daptomycin	Chloramphenicol	Fosfomycin	Nitrofurantoin
Acinetobacter baumani complex	OPD 55	x	x	60	x	x	x	45	30	67.50	56	x	x	29	34.1	37	60	54	x	x	x	74	100	x	x	x	x	x	x	x	x	x	x	x
	IPD 106	x	x	24	x	x	x	24	11	23.2	24	x	x	11	14.9	20	27	32	x	x	x	61	93	x	x	x	x	x	x	x	x	x	x	x
Escherichia coli	OPD 1033	x	x	46	34	31	20	27	17	71.3	67	66	x	9	NT	27	57	61	x	x	x	x	99	x	x	x	x	x	x	x	x	x	94	87.2
	IPD 1106	x	x	33	25	15	10	16	12	56.8	54	44	x	7	NT	22	53	50	x	x	x	x	98	x	x	x	x	x	x	x	x	x	96	86.50
Enterobacter cloacae complex	OPD 45	x	x	38	x	x	x	33	34	60.6	53	49	x	30	x	48	52	57	x	x	x	x	96	x	x	x	x	x	x	x	x	x	NA	NA
	IPD 55	x	x	35	x	x	x	22	31	51.1	37	x	x	35	x	36	37	31	x	x	x	x	95	x	x	x	x	x	x	x	x	x	82	62.5
Klebsilella pneumoniae	OPD 583	x	x	27	30	30	18	19	17	45.5	45	40	26.5	15	NT	24	37	43	x	x	x	x	94	x	x	x	x	x	x	x	x	x	72	49.9
	IPD 938	x	x	19	24	19	9	12	11	24.5	26	21	15.7	9	NT	16	25	27	x	x	x	x	63	x	x	x	x	x	x	x	x	x	72	51.6
Pseudomonas aeruginosa	OPD 283	x	x	48	x	x	x	43	31	51.7	49	x	37.1	28	28	x	50	x	x	x	x	x	NT	x	x	x	x	x	x	x	x	x	x	x
	IPD 430	x	x	31	x	x	x	28	19	30.2	32	x	25.9	17	17.4	x	32	x	x	x	x	x	96	x	x	x	x	x	x	x	x	x	x	x
Proteus mirabilis	OPD 51	x	13	84	30	17	23	32	26	84.1	NT	80	x	20	NT	13	43	29	x	x	x	x	x	x	x	x	x	x	x	x	x	x	93	x
	IPD 41	x	4.8	78	30	13	10	19	15	74.4	NT	68	x	14	NT	14	29	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	na
Gram Positive Organisms																																		
Staphylococcus aureus	OPD 19 IPD 17		x	x	x	x	x	x	x	x	x	x	x	15	18	52	x	50	x	80	x	x	x	50	x	66	73	89	x	86	100	x	x	100
CONS	OPD 30	11	57	x	x	x	x	x	x	x	x	x	x	33	40	76	x	86	x	67	x	x	x		x	40	44	97	x	100	100	x	x	100
	IPD 29	17	x	x	x	x	x	x	x	x	x	x	x	46	48.1	58	x	65	x	70	x	x	x	NA	x	50	55	93	x	96.3	100	x	x	100
Enterococcus faecium	OPD 51	43	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	20	x	x	x	x	x	x	x	x	80	x	80	x	x	x	NA
	IPD 304	22	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	21	x	x	x	x	x	x	x	x	66	x	71.4	x	x	x	18.9
Enterococcus faecalis	OPD 110	95	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	30	x	x	x	x	x	x	x	x	98	x	94.3	97	x	x	96.2
	IPD 176	92	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	26.2	x	x	x	x	x	x	x	x	99	x	98.3	88	x	x	96.8

*Less than 30 isolates; Values in boxes above represent % susceptible; X indicates not tested or intrinsically resistant or minimal isolates tested

HIGHLY SUSCEPTIBLE	> 80%	MODERATE SUSCEPTIBLE	50-80 %	LESS SUSCEPTIBLE	< 50%

AIIMS RISHIKESH HOSPITAL ANTIBIOGRAM (POCKETGUIDE)

% susceptibility of organisms in PUS samples

Vanya Singh, Minakshi Singh

			Penicillins		BL-BLIs		Cephalosporins				Carbapanems			Mono-bactum	Quinolones		Anti-folate	Aminoglycoside			Tetracyclines			Polymyxins	Macrolide		Anti-Staph		Lincosamides	Glycopeptides		Others	
Gram Negative Organisms	Location	Total Number of Isolates	Penicillin	Ampicillin	Piperacillin Tazobactum	Amoxycillin Clavulonate	Cefuroxime	Ceftriaxone	Ceftazidime	Cefepime	Meropenem	Imipenem	Ertapenem	Aztreonam	Ciprofloxacin	Levofloxacin	Cotrimoxazole	Amikacin	Gentamycin	High-level Gentamycin	Tetracycline	Tigecycline	Minocycline	Colistin (%I)	Erythromycin	Azithromycin	Cefoxitin	Oxacillin	Clindamycin	Vancomycin	Teicoplanin	Linezolid	Daptomycin
Acinetobacter baumani complex	OPD	51	x	x	40	x	x	x	54	44	42	32	x	x	29.8	28.9	41.7	41.2	40.8	x	x	x	51.4	99	x	x	x	x	x	x	x	x	x
	IPD	197	x	x	11.3	x	x	x	26	11	6.2	7.1	x	x	6.4	7.6	14.2	14.6	12.1	x	x	x	44.6	96.7	x	x	x	x	x	x	x	x	x
Escherichia coli	OPD	86	x	x	51.9	35	16	19	17	24	71.6	74.4	67.5	x	1.3	x	22.2	71.9	62.6	x	x	x	x	98.6	x	x	x	x	x	x	x	x	x
	IPD	300	x	x	21	12	7.5	6.7	12	13	41.1	45.4	33.7	x	2.2	NA	18.6	52.7	50.9	x	x	x	x	99.6	x	x	x	x	x	x	x	x	x
Klebsilella pneumoniae	OPD	59	x	x	37.9	35	25	32	na	31	58.2	50	56.9	x	10.9	NA	39.2	56.3	51.9	x	x	x	x	100	x	x	x	x	x	x	x	x	x
	IPD	359	x	x	11.8	9.2	9.8	6.3	x	8.5	20.4	20.1	18.4	6.9	4.5	x	16.7	24.3	25.3	x	x	x	x	95.5	x	x	x	x	x	x	x	x	x
Pseudomonas aerogenosa	OPD	136	x	x	47.3	x	x	x	59	62	55.4	62.3	x	53.4	39.4	40.6	x	36.8	x	x	x	x	x	9.8	x	x	x	x	x	x	x	x	x
	IPD	250	x	x	32	x	x	x	39	40	34.4	34.6	x	32.2	28.2	29.6	x	30.8	x	x	x	x	x	94.8	x	x	x	x	x	x	x	x	x
Proteus mirabilis	IPD	43	x	x	90.5	41	36	29	x	34	66.7	25.6	78.3	x	11.9	NA	14.3	26.2	30.6	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Enterobacter cloacae complex	OPD	53	x	x	28.3	x	x	x	21	27	44	39.6	38.5	x	13.7	x	34.6	49	34.6	x	x	x	x	100	x	x	x	x	x	x	x	x	x
Gram Positive Organisms																																	
Staphylococcus aureus	OPD	75	4.1	x	x	x	x	x	x	x	x	x	x	x	1.4	2.7	39	x	48.6	x	73	100	x	x	31.3	x	35	58	76	96	100	97	100
	IPD	38	3.3	x	x	x	x	x	x	x	x	x	x	x	5.8	3.8	48.6	x	45.2	x	89	100	x	x	22.9	x	48	51	81	100	100	97	100
CONS	OPD	94	5.9	x	x	x	x	x	x	x	x	x	x	x	27.3	23.3	45.4	x	48.2	x	61	100	x	x	19.1	x	29	25	56	95	100	96	96
	IPD	158	4.7	35	x	x	x	x	x	x	x	x	x	x	17.2	17.5	40	x	48.2	x	66	100	x	x	9	x	18	13	40	96	100	97	98

*Less than 30 isolates; Values in boxes above represent % susceptible; X indicates not tested or intrinsically resistant or minimal isolates tested

HIGHLY SUSCEPTIBLE	> 80%	MODERATE SUSCEPTIBLE	50-80 %	LESS SUSCEPTIBLE	< 50%

GENERAL MEDICINE ICU CLINICAL ANTIBIOGRAM (POCKETGUIDE)

Prasan K Panda, Chackappen

PERCENTAGE SUSCEPTIBILITY															
DISEASE	ORGANISM	Piperacillin-tazobactam	Meropenem	Cotrimoxazole	Amikacin	Colistin	Ceftriaxone	Imipenem	Ceftazidime	Gentamicin	Ertapenem	Ciprofloxacin	Levofloxacin	Tigecycline	Minocycline
		PERCENTAGE SUSCEPTIBILITY													
HAP/ VAP	Acinetobacter baumanii (MC) N = 30	0	46.66	3.33	0	46.67	3*	0	0	0	0	0	6.6	-	-
	Klebsiella pneumonia** N= 30	3.33*	6.66*	3.33	3.33	33.33	0	0	0	3.33	0	0	0	0	3.33

Note: * Marked antibiotics can be given as empirical antibiotics for VAP as clinically responded despite invitro resistance, but only when susceptible ones are not available/contraindicated
**** Among 30 isolates of Klebsiella pneumonia , 2 were pan-resistant**

LEGEND	HIGHLY SUSCEPTIBLE (>80%)	MODERATELY HIGH SUSCEPTIBLE (60-80%)	LESS SUSCEPTIBLE (<60%)	SENSITIVE BUT OTHER C/S ANTIBIOTIC WAS GIVEN

RIGHT SAMPLE COLLECTION

Vanya Singh, Sukriti Yadav, Pratiksha Kamboj

Collection of BLOOD for Conventional/BACTEC CULTURE:

1. Wash hands thoroughly and wear sterile gloves.
2. After selecting the vessel site, disinfect 5 cm areas of skin with 70% alcohol and **allow to dry**.
3. Clean once again with 10% povidone iodine and **allow to dry**.
4. Again, wipe the area with 70% alcohol (with or without 2% chlorhexidine) and **allow to dry**.
5. Collect 7-10 ml blood for adults (green cap), 4ml in children and 1 ml in neonate (yellow cap)
6. Remove the cap from the bottle and wipe with 70% alcohol and inject the blood directly into bottle. Do not put label over Bar code.

#ALWAYS COLLECT 2 SAMPLES FROM 2 DIFFERENT SITES

Collection Swabs/Pus Samples for AEROBIC CULTURE

1. Clean the site thoroughly with **sterile normal saline**.
2. Collect from the healthy part of the wound/ulcer (necrosed areas are to be avoided).
3. One swab at a time (total two swabs) to collect sample in a 'Roll over method".
4. Avoid skin or environmental contamination while handling of swabs during collection.
5. TISSUE is a preferable sample than swab in any deep-seated wound (burn/gas gangrene/diabetic ulcer) where colony count is required.
6. Tissue to be sent in STERILE NORMAL SALINE only (not in formalin)

Collecting Samples for MYCOBACTERIAL CULTURE

1. In case of sample collected from unsterile sites, collect and send the specimen to the lab within 4 hours (PREFERABLY IN THE MORNING) to avoid overgrowth of normal flora.
2. Fill the RNTCP form of the patients whose specimen are submitted for Tuberculosis workup.

Collecting SPUTUM

1. Collect EARLY MORNING sputum in a sterile container after thoroughly rinsing the mouth with plain water.
2. Instruct the patient to take a deep breath 2-3 times, and then to cough out the sputum (**NOT** to spit out saliva)
3. Salivary samples will be rejected.

OTHER GENERAL INSTRUCTIONS

1. Transport specimens immediately to the laboratory for processing within **2 HOURS** of collection with **SRF form**.
2. Urinary catheter tip is **not** a proper sample so will be rejected.
3. If there is delay in transport, refrigerate the specimen (**EXCEPT** CSF, blood for culture, blood and urine for *Leptospira* spp. and specimen for anaerobic culture)
4. **Do not** use formalin for any specimen intended for Microbiological work-up.

A SUMMARY OF GOOD PRACTICE

B) USING NEEDLE AND SYRINGE

Conventional needles and syringes should be replaced wherever possible with winged blood collection sets, which are safer.[58-60]

They should only be used if prevention measures to Accidental Blood Exposure are strictly applied*. Needles must not be recapped, purposely bent or broken by hand, removed from disposable syringes or otherwise manipulated by hand.

1 PREPARE BLOOD COLLECTION KIT

Confirm the patient's identity and gather all required materials before beginning the collection process.

Do not use blood culture bottles beyond their expiration date, or bottles which show signs of damage, deterioration or contamination.

It is recommended to identify the Fill-to Mark or mark the target fill level on the blood culture bottle label about 10 mL above the media level.




2 PREPARE BOTTLES FOR INOCULATION

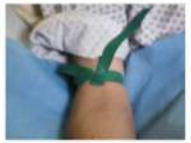
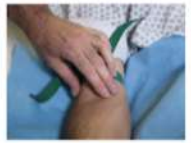
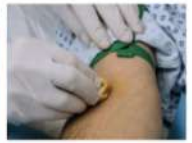
Wash hands with soap and water then dry, or apply an alcohol hand rub or another recognized effective hand rub solution.

Remove the plastic "flip-cap" from the blood culture bottles and disinfect the septum using an appropriate and recognized effective disinfectant, including chlorhexidine in 70% isopropyl alcohol, tincture of iodine, povidone-iodine in swab or applicator form. Use a fresh swab/applicator for each bottle. **Allow bottle tops to dry in order to fully disinfect.**


3 PREPARE VENIPUNCTURE SITE

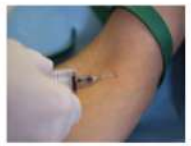
If skin is visibly soiled, clean with soap and water. Apply a disposable tourniquet and palpate for a vein. **Apply clean examination gloves** (sterile gloves are not necessary).

Cleanse the skin using an appropriate disinfectant, including chlorhexidine in 70% isopropyl alcohol, tincture of iodine, povidone-iodine in swab or applicator form. **The venipuncture site is not fully clean until the disinfectant has fully evaporated.**

4 VENIPUNCTURE

Attach the needle to a syringe. **To prevent contaminating the puncture site, do not re-palpate the prepared vein before inserting the needle.**

Insert the needle into the prepared vein.

5 CULTURE BOTTLE INOCULATION

Collect the sample. Transfer the blood into the culture bottles. Hold the bottle upright, and add up to 10 mL of blood per adult bottle and up to 4 mL per pediatric bottle. Ensure the bottle is correctly filled to the Fill-to Mark or target fill level.



6 FINISH THE PROCEDURE

Discard the needle and syringe into a sharps container and cover the puncture site with an appropriate dressing. Remove gloves and wash hands before recording the procedure, including indication for culture, date, time, site of venipuncture, and any complications.

Ensure that additional labels are placed in the space provided on the bottle label and do not cover the bottle barcodes, and that the tear-off barcode labels are not removed. If additional labels contain a barcode, they should be positioned in the same manner as the bottle barcode. Inoculated bottles should be transported to the laboratory for testing as quickly as possible, preferably within 2 hours per CLSI.[1] If delays are expected, it is important to refer to the manufacturer's Instructions for Use for guidance.

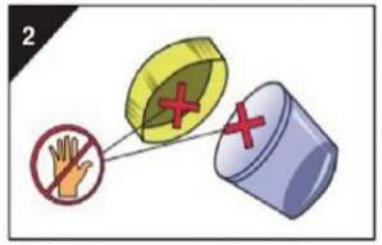

** Refer to recognized guidelines such as those issued by the WHO or CDC:*
https://www.who.int/infection-prevention/tools/injections/ToolC-revised.pdf?ua=1
http://www.cdc.gov/niosh/docs/2000-108/pdfs/2000-108.pdf

These recommendations illustrate the best practices for blood culture collection based on the World Health Organization recommendations (WHO guidelines on drawing blood: best practices in phlebotomy. 2010. ISBN 978 92 4 159922 1). Best practices may vary between healthcare facilities; refer to guidelines applicable in your facility.

Midstream-Clean-Catch Urine Collection

1. Wash your hands well with soap and water

2. Unscrew the collection cup. Do not touch the inside of the cup of lid



3.Make sure cup is labeled with your name and date of birth.

WOUND SWAB COLLECTION

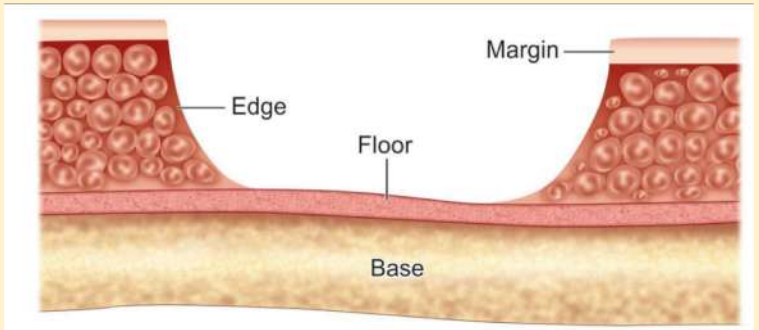
- Site: deepest portion, and advancing edge or base
- Rolling swab with gentle pressure
- Superficial debris: thoroughly removed by irrigation or cleansing with saline
- Apply pressure on edge/base:
- For wounds visibly devoid of purulent materials

For draining sinuses and fistula:

(i) applying pressure

(ii) rubbing swab at orifice of tract and collecting oozing material by intruding swab into tract

##Moistening: Useful for dry wound; Else, use dry swabs, as it absorbs more pus; Swabs not appropriate for Mycobacterial, fungal, and anaerobic culture



Ref:Midstream-Clean-Catch-BDPAS0027-CB.pdf

https://main.icmr.nic.in/sites/default/files/guidelines/Bacteriology_SOP_2nd_Ed_2019.pdf%0A

PK-PD Characteristics of Commonly used Antimicrobials

Bhupinder Solanki, Puneet Dhamija, NPK Teja

S.No.	Drug	PK	PD /Spectrum	ADRs	Dosing
1.	**Ceftriaxone**	Good CSF penetration. No dosage adjustment required for hepatic & renal disease	More active against Gram negative	Most common ADR is allergy. C. difficle colitis with 3rd gen.	2 gm once daily IV
	Cefotaxime	Dose reduced if CrCl<50 ml/min. No hepatic dose adjustment	More active against Gram negative		2 gm thrice daily IV
	Cefixime	Dose reduced if CrCl<60 ml/min. No hepatic dose adjustment	Activity against respiratory tract pathogens: Streptococci, H. influenza, M. catarrhalis		400 mg p.o q24h
2.	**Amoxicillin - Clavulanate**	Increased absorption with food. Dose adjusted if CrCl<30ml/min. No hepatic dose adjustment	RTIs, Skin & Soft tissue infections, Surgical prophylaxis, Intra-abdominal infections etc	Diarrhoea, rashes	1 gm twice daily/ 625 mg thrice daily oral 1.2 gm IVq8h
3.	**Piperacillin - Tazobactam**	Dose adjusted if CrCl <40 ml/min. No hepatic dose adjustment.	Anti-pseudomonal penicillin. Good activity against Klebsiella, Enterobacteriaceac e	Diarrhoea, rashes	4.5 gm thrice daily
4.	**Imipenem - Cilastatin**	Prolonged infusion for resistant organisms. Reduce the dose if CrCl <60 ml/min.	Broad spectrum including ESBLs. Not reliable for MRSA, VRE & E. faecium	Propensity to induce seizures	500 mg IV q6h or 1g q8h; If bacteria intermediate susceptible then1 g IV q6h
5.	**Meropenem**	Prolonged infusions for serious/ severe infections. Dose to be halved(or even less) if CrCl <50ml/min.	Reserve drug. Effective against Gram positive & negative.	Hypersensiti vity reactions.	1gm IV q8h; For meningitis 2 gm IV q8h
6.	**Colistin**	Urinary concentrations are high. Hence, preferred for UTI. Routes: IV or inhalational. Dose adjusted if CrCl < 90ml/min.	Reserve drug. Effective only in Gram negative infections.	Highly nephrotoxic.	9million units iv stat, then 4.5 million units iv over 30 minutes to 1 hour q12h

PK-PD Characteristics of Commonly used Antimicrobials

S.No.	Drug	PK	PD /Spectrum	ADRs	Dosing
7.	Polymyxin -B	Preferred over colistin except for UTI. Routes: IV or Intrathecal. Dose modification not required with renal insufficiency	Reserve drug. Only for extensively drug resistant infections (Acinetobacter etc).	Highly nephrotoxic	Loading dose: 2.5 mg/kg (over 2 hours) Maintenance dose: After 12 hrs 1.5 mg/kg over 1 hour) repeat q12h
8.	Vancomycin	Dose reduced if CrCl < 50 ml/min.No hepatic dose adjustment.	Effective against MRSA, Strep. viridans, Enterococcus, Cl.difficile	Nephro/oto- toxicity, flushing	15 mg/kg IV over 60 min q8–12h
9.	Amikacin	For severe / MDR infections, Extended interval dosing preferred ifCrCl < 50 ml / min.	Mainly against Gram negative including pseudomonas. Limited against Gram positive(Staphylococci & Listeria). Usually in combination with beta lactams.	Nephro/oto- toxicity	15 mg/kg IV q24h (Extended interval dosing) or7.5 mg/kg every 12 hours (Conventional dosing)
10.	Gentamicin	Routes: IV, Topical. For severe/MDR infections, high-dose extended infusion preferred. Dose reduced if CrCl < 60 ml / min.	Not recommended for Pseudomonas infections. Low therapeutic index.	Nephro/oto- toxicity	5.1 mg/kg q24h (extended interval dosing) or 1.7 mg/kg IV q8h (conventional dosing)
11.	Tobramycin	Dose reduced if CrCl < 60 ml / min.	More active against Pseudomonas & Proteus. Reserved for serious infections of Pseudomonas	Similar to amikacin	Extended interval: 5 mg/kg IV q24h Conventional: 1.7 mg/kg IV q8h
12.	Linezolid	Excellent bioavailability. Similar oral and IV dose. No dosage adjustment for renal impairment	Activity against MSSA, MRSA, VRE and Strep. pneumoniae	Reversible myelosuppr ession, lactic acidosis, peripheral neuropathy. Risk of serotonin syndrome with SSRIs.	600 mg po/IV q12h
13.	Tigecycline	Low plasma concentration s. No renal / hepatic dose adjustments required	Reserve drug. Activity against MDRs like A.baumannii, MRSA Carbapenem resistant E.coli & Klebsiella. Use in hospital - acquired pneumonia associated with higher mortality.	High incidence of nausea (20%), photosensitivity, rarely acute pancreatitis	IV: 100 mg initially, then 50 mg every 12 hours

PK-PD Characteristics of Commonly used Antimicrobials

S.No.	Drug	PK	PD /Spectrum	ADRs	Dosing
14.	**Azithromycin**	No renal / hepatic dose adjustments required. Long half-life. Once daily dosing.	High activity against respiratory pathogens. Not effective against MRSA.	QTc prolongation potential. Rarely neutropenia, thrombocyto penia etc.	500 mg daily (PO or IV)
15.	**Levofloxacin**	Routes: Oral, IV, Topical. Avoid concomitant multivalent cations. Dose needs to be reduced if CrCl < 50 ml/min. No hepatic dose adjustment.	Effective against Gram positive & Gram-negative bacteria. Effective against M. tuberculosis.	Potential for QTc prolongation , may exacerbate muscle weakness.	750 mg once daily PO or IV
16.	**Ciprofloxacin**	Routes: Oral, IV, Topical. Poor CSF penetration. Dose needs to be reduced if CrCl < 50 ml/min. No hepatic dose adjustment.	Greatest potency vs Gram negative bacilli.	Similar to levofloxacin	200-400 mg IV q8-12 h
17.	**Fluconazole**	High oral bioavailability. Good CSF penetration. CrCl ≤50 mL/minute: R educe dose by 50%.No hepatic dose adjustment needed but discontinue if hepatotoxicity occurs.	Effective against Cryptococci, Candida, Coccidioides.	Possible QTc prolongation, alopecia, rarely hepatotoxicity. Significant drug-drug interactions exist. (CBZ, Statins, warfarin, phenytoin etc.)	Usual dose 100-200 mg Q24h
18.	**Amphotericin - B**	No dosage adjustment necessary for any degree of kidney impairment. No hepatic dose adjustment.	Broad-spectrum anti-fungal (Candida, crytococcus, aspergillus, Mucorales, histoplasma, sporothrix.)	Highly Nephrotoxic Pre-hydrate the patient to reduce nephrotoxicity.	Deoxycholate (Conventional): IV: 0.3 to 1 mg/kg/day as Single infusion Liposomal: IV: 3 to 5mg/kg/d as single infusion.
19.	**Caspofungin**	Cannot enter CSF. No renal dose adjustment. Dose reduced in hepatic diseases (Child- Pugh Class B).Often reduced dose is sub- optimal.	Effective against Candida & Aspergillus. Preferred for invasive Candidiasis.	Remarkably non-toxic. Pruritis at infusion site may occur.	70 mg IV on day 1, then 50 mg IV q24h
20.	**Voriconazole**	No renal dose adjustment required. Reduce dose by 50% in hepatic diseases.	Broad-spectrum Triazole.Preferred in Invasive Aspergillosis(including Amphotericin resistant strains)	Photosensiti vity,visual disturbance rarely hepatotoxici ty can occur.	IV :6 mg/kg IV twice daily for 2 doses, then 3 to 4 mg/kg IV or orally twice daily 200 mg oral BD.

SOCIETY OF ANTIMICROBIAL STEWARDSHIP PRACTICES (SASPI) IN INDIA

Integrated Antimicrobial Stewardship (IAS) Practice Statements for Indian Hospitals

Sr.	Integrated Antimicrobial Stewardship (IAS) Practice statements for each tertiary care Indian hospitals
1.	The hospital administration should ensure an actively running IAS program, either in its totalitarian or fragmented form including diagnosis, infection prevention, and antimicrobial stewardships but with the intention of integration.
2.	The hospital should set accountability levels to educate, to advocate, to execute, and to monitor, for various defined updated IAS activities by these committees of HIC (or ISP), AMSP (or ASP), and DSP.
3.	All clinical departments should have defined accountability for rational antimicrobial use by having own antimicrobial policy and its utilization check points.
4.	Regular educational programs should be held for prescribers and other relevant staff including patients/public on IAS Practices with examples of hospital data for the same.
5.	The hospital should ensure a Compulsory Induction Program on diagnostic stewardship, good IPC & AMS practices for newly recruited Postgraduates, Interns, Junior Residents, Nurses, and other HCWs.
6.	The Clinical Microbiology Diagnostic Laboratory must be in the close vicinity or preferably in the same hospital premises to reduce Specimen transportation time.
7.	The hospital should have a fully functional 24x7 Clinical Microbiology Diagnostic Laboratory with competent manpower and signatory authority with Sunday and Holiday reporting.
8.	The hospital should have guidance procedures for the right investigation, right patient and right time and must ensure the right report interpretation, right antimicrobial and right time.
9.	All Clinical Diagnostic Laboratory should ensure that Critical Alerts have been displayed and a Notification is sent each time any critical result is observed.
10.	The Clinical Microbiology Laboratory should ensure that all proper protocols of Antimicrobial Susceptibility testing are being followed as per own, CLSI, and or EUCAST guideline.
11.	Clinical Microbiology Diagnostic Laboratory should ensure the AMR data digitalization on WHONET or MS Excel.
12.	The hospital should have documented SOP for Specimen Collection, Storage, Transportation and Processing Protocols and mandatory Culture Collection Protocol as the first specimen to be collected from the patient before the commencement of antimicrobials. These SOPs should be circulated to all the clinical departments involved in patient care time to time.
13.	The Hospital should ensure that at least Automated Culture, Identification, and Susceptibility equipment are present, which can provide MIC values, with Breakpoint to MIC Quotients whenever and wherever possible.
14.	The hospital should ensure proper supply chain management to avoid break in the Diagnostic Services.
15.	The Laboratory must have a documented policy to communicate Preliminary Grams stain findings and relevant critical alert reports and Test Interpretation must be communicated within specified turnaround time.
16.	The Laboratory must ensure that advisory footnotes, interpretation, and knowledge dissemination on Intrinsic resistance are communicated in the report.
17.	Wherever possible the Laboratory should ensure that Personalized AST Reporting including MIC values with breakpoints (R/I/S) is being performed especially in critically ill patients.
18.	The Clinical Microbiology Diagnostic Laboratory should employ rapid diagnostic tests, molecular or phenotypic, for detecting resistance mechanisms (like CRE, MRSA, ESBL, etc) so as to provide directed treatment.

19.	The hospital should have a functional HICC, with full-time appointed infection control officers and infection control nurses along with their roles and responsibilities.
20.	The hospital should adopt national guidelines and prepare a hospital-specific hospital infection control policy document.
21.	The hospital should conduct HICC meetings regularly (e.g. Monthly/quarterly).
22.	The hospital should conduct a hand hygiene audit on a monthly basis at least in all critical areas. The reports should be communicated to the respective departments.
23.	The hospital should conduct a biomedical waste segregation audit regularly.
24.	The hospital should conduct care bundle audits on a monthly basis at least in all critical areas.
25.	The hospital should conduct HAI surveillance on a monthly basis at least in all critical areas along with root cause analysis and CAPA.
26.	The hospital should have a needle-strict injury prevention and management program through NSI surveillance.
27.	The hospital should have a policy that specifies adhering to adult vaccinations by HCWs.
28.	The hospital should provide hepatitis B vaccine to all HCWs including the temporary staff and students and check anti-HB titers subsequently.
29.	The hospital should perform environmental disinfection according to standard CDC/NABH/Kayakalp/other guidelines regularly.
30.	The hospital should have an updated policy that specifies dealing with locally transmitted infections including MDRs.
31.	The hospital should set various methods of monitoring by the pharmacologist or pharmacist for ensuring rational antimicrobial use.
32.	The AMS Committee should perform antimicrobial prescription audit in all critical areas, whole hospitals preferably, and inform the report to clinicians regularly.
33.	Specific teams should perform prospective audits and feedbacks for specific antimicrobial agents regularly.
34.	Preauthorization of restricted antimicrobial agents for specific infections should be done.
35.	The hospital should have practicing documents on PK/PD of specific antimicrobial agents.
36.	The hospital should have updated facility-specific ID treatment recommendations, based on national guidelines and local antibiograms, preferably once a year.
37.	The hospital should have a policy that requires prescribers to document in the medical record or during order entry - dose (including loading dose), creatinine clearance, route, duration, stop date, and indication for all antimicrobial prescriptions.
38.	The hospital should have a policy that specifies IV to oral switch practices.
39.	The hospital should have a policy that specifies antimicrobials timeout practices.
40.	The hospital should have a policy that specifies antimicrobials ADR/SAE reporting' practices along with root cause analysis and CAPA.
41.	The hospital should have a policy that specifies OPAT practices.
42.	The hospital should track (record, review and report) on antimicrobial use on a regular basis, may be through DOT and AWaRe uses, and if required report to national or state authorities.

Note: *IAS - Integrated Antimicrobial Stewardship, HCWs - Healthcare Workers, HIC - Hospital Infection Control, ISP - Infection Stewardship Program, AMSP - Antimicrobial Stewardship Program, ASP - Antimicrobial Stewardship Program, DSP - Diagnostic Stewardship Program, MIC - Minimum Inhibitory Concentration, CLSI - Clinical and Laboratory Standards Institute, EUCAST - European Committee on Antimicrobial Susceptibility Testing, AMR - Antimicrobial Resistance, WHONET - World Health Organization Network, SOP - Standard Operating Procedure, AST - Antimicrobial Susceptibility Testing, CRE - Carbapenem-Resistant Enterobacterales, MRSA - Methicillin-Resistant Staphylococcus aureus, ESBL - Extended-Spectrum Beta-Lactamase, HAI - Healthcare-Associated Infection, CAPA - Corrective And Preventive Measures, NSI - Needle Stick Injury, HB - Hepatitis B, CDC - Centers for Disease Control and Prevention, NABH - National Accreditation Board for Hospitals, MDRs - Multidrug-Resistant Organisms, PK/PD - Pharmacokinetics/Pharmacodynamics, ID - Infectious Diseases, IV – Intravenous, OPAT - Outpatient Parenteral Antimicrobial Therapy, ADR/SAE - Adverse Drug Reaction/Serious Adverse Event, DOT - Days of Therapy, AWaRe - Access, Watch, and Reserve (WHO classification of antibiotics).*

(Integrated Antimicrobial Stewardship (IAS) Practice Addendums)

18-24th November 2024

Oath

As a healthcare professional, I recognize that antimicrobials are vital in saving lives. I also acknowledge the alarming rise of antimicrobial resistance, threatening global health.

I (We/Hospital) Pledge to:

1. Accept antimicrobial resistance is rising, and I am here to decrease it.
2. Promote integrated antimicrobial stewardship practices by preventing and controlling infections, doing right investigation and treatment for right patient at right time.
3. Foster source control and always follow standard precautions for all patients.
4. Audit my hand hygiene and environment cleaning practices.
5. Advocate and use adult vaccination.
6. Adhere to facility-specific treatment recommendations for infectious diseases based on national guidelines and local antibiograms.
7. Use standard operating procedures for specimen collection, storage and transportation.
8. Prescribe or use antimicrobials judiciously, considering the diagnosis, severity, and local resistance patterns.
9. Restrict to backfoot the reserved antimicrobials.
10. Optimize antimicrobial use through regular documentation and review.
11. Educate myself, my family members, patients and their caregivers on ID diseases, their chain of transmission, and their cure with antimicrobials.
12. I acknowledge one health, caring for others, I care for myself.

By taking this pledge, I commit to being a responsible healthcare professional and protecting human beings from antimicrobial resistance.

Regards: AMSP Committee, AIIMS, Rishikesh.

All India Institute of Medical Sciences (AIIMS) Rishikesh

World Health Organization

"World AMR Awareness Week" Celebration

18 – 24 November 2024

Events (All days)
Integrated Antimicrobial Stewardship (IAS) Practice Addendums

Resolutions

Theme
Educate. Advocate. Act Now.

Committed HCW	Targets to achieve by next year
Clinician	• Disease specific updated guidelines including sepsis and OPAT guideline; Circulation of Antibiotic audit form for >5days of antibiotics in a patient • Pre-authorization to Reserve antimicrobials by departments; Dept specific faculty steward to be identified.
Microbiologist	• Circulation of Isolation and Adult vaccination policy, antibiogram and SRF form; MDR isolation and control by reporting MDR list to concerned faculty on daily basis. • Pathogen/non-pathogen Comments in daily reporting; Integration of interfacing of Reporting in eoffice.
Pharmacist/ pharmacologist	• Documenting indication of antimicrobial' while indenting in e-pharmacy; Circulation of antimicrobial utilization report. • Antimicrobial ADR/SAE reporting awareness; Circulation of Duration of therapy, Redundant antimicrobials, IV-Oral switch, and PK-PD of specific antimicrobials.
Nurse	• IV antimicrobials to oral switch' available option, documenting in nurse note and add a Column in Hand over book for reminder. • Reminder for 'Antimicrobials timeout' after each 5days of therapy to resident and writing in nurse note and adding Antibiotic audit form in patient file; Educating residents and faculties of hand hygiene and transmission based precautions weekly.
Public/ Community	• Integrated Stewardship awareness involving Community Health Officers and Pharmacists. • Adult vaccination awareness of patients and HCWs; Vaccination of Canteen and Mess Staff; MMR, HBV, TD and Tdap vaccination to all HCWs.

Organizer: AMSP Committee (+ MS office and Dept - Med, Micro, Pharm, CFM, Nursing, all clinical dept)

ID Practices: Right Diagnosis and Treatment

(Version 3.0, An integrated antimicrobial stewardship bedside manual)

PK Panda
Professor (Additional)
Dept of Medicine, AIIMS Rishikesh

Printed in Rishikesh.

Book Citation: *In. Prasan kumar Panda. ID Practices (**Version 3.0, An integrated antimicrobial stewardship bedside manual)**. Third Edition. AMSP Committee. AIIMS Rishikesh; 2024. P1-116. (Individual chapter citation as Authors at al.)*

A growing body of evidence demonstrates that Integrated Antimicrobial Stewardship (IAS) practices play a crucial role in optimizing infection treatment while minimizing adverse events linked to antimicrobial use, including the development of resistance. AIIMS Rishikesh is committed to advancing IAS, with a focus on improving our understanding of essential practices such as infection prevention and control, accurate microbial diagnostics, and the optimal use of antimicrobials.

A key element of effective antimicrobial stewardship is the use of evidence-based practice guidelines. These guidelines are vital for all healthcare professionals to ensure the right diagnosis and selection of the most appropriate treatment. Whenever antimicrobials are prescribed, decisions should be grounded in these guidelines, as well as the broader principles of the ”8 D's" of stewardship: the right **do’s** and **don'ts** in infection prevention, the right **diagnosis**, right **drug**, right **dose**, the right **delivery**, the right **duration**, and the right **decision** during follow-up care.

The **third edition** of the IAS book will prioritize these two primary principles of right diagnosis and right treatment, with updates based on the most current evidence available. This edition has been developed with contributions from all departments where antimicrobials are routinely used, ensuring a comprehensive approach to stewardship across disciplines.

Let us remain steadfast in our commitment in practicing IAS, incorporating these evidence-based principles in every antimicrobial prescription we make.

AMSP Committee

AIIMS, Rishikesh

Acknowledgement: Our sincere thanks to those who helped during preparation of this book directly and indirectly. We dedicate this text to all departments where antimicrobials are used. We hope you find it useful.