Preventing Antimicrobial Resistance Together

ID Practice Document:

Right Diagnosis and Treatment

(Version 2.0, An integrated antimicrobial stewardship practice)

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A growing body of evidence demonstrates that Integrated Antimicrobial Stewardship (IAS) Practice can both optimize the treatment of infections and reduce adverse events associated with antimicrobial use including their resistance. AIIMS Rishikesh is promised to practice IAS that targets to improve understanding towards right hospital infection prevention and control practices, right microbial diagnostic steps, and optimal use of antimicrobials. One of the core components of stewardship is evidence-based practice guideline. This is an essential element to be practiced by all health professionals. This will make right diagnosis and choose right drug to manage the infection. Wherever antimicrobials are prescribed, it should be based on these two components apart from other right 6D's (right do and don't of infection prevention, right dose, right delivery, right duration, right decision on follow-up).

This second version of IAS book will be based on these two primary D's. This is based on available updated evidence and prepared with help of all departments where antimicrobials are used regularly.

Let's be determined in practicing the IAS in all our prescription.

WAAW 2022 Team

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.

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Executive Director & CEO

Antimicrobial resistance poses a serious health problem. Most important factor for increasing antimicrobial resistance 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. For example, single dose 1st generation cephalosporin (Inj. Cefazolin) for surgical prophylaxis is right drug we all should practice. I’m sure this version of this booklet “ID Practice Document: 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 antimicrobial resistance. As a head of this institution, I support this stewardship activity. And let all of us pledge to practice antimicrobial stewardship at all moments.

Prof. Meenu Singh

Medical Superintendent

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 (7th 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 Practice Document: 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. Sanjeev Kumar Mittal

HOD Department of Medicine

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. We are very pleased to our Director, without her guidance and vision this task seemed to be unrealistic. I am glad that Department of Internal Medicine has taken this initiative and responsibility especially Dr. PK Panda along with other concerned departments. This booklet will give an insight into proper use of antimicrobials and most clinicians will find it very useful.

Prof (Addl). Minakshi Dhar

Contents

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

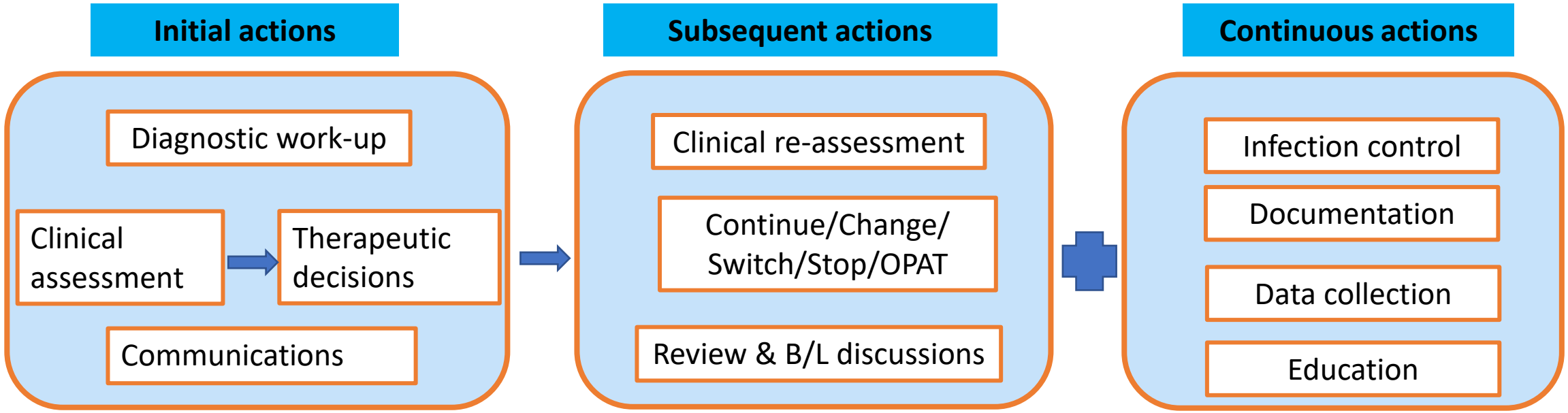
Introduction

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.

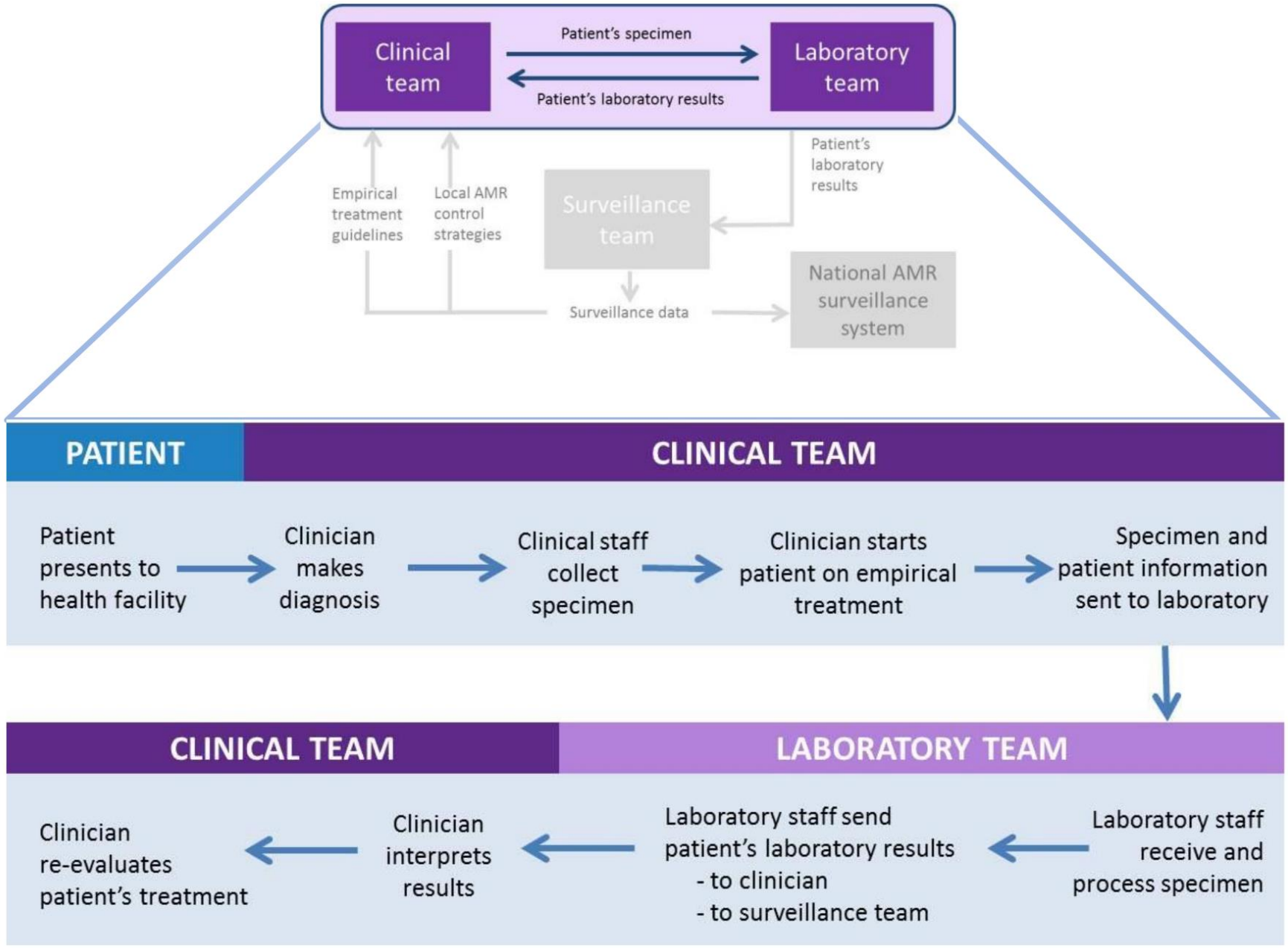
INTEGRATED ANTIMICROBIAL STEWARDSHIP (IAS) PRACTICE - 8D's

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

Fever of duration less than 3 days

Step 1: Rule out sepsis
(See MEWS/SOFA score)

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

Step 3: Look for typical exanthema, 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, mostly viral infections that subside spontaneously.
- ✓ Sometimes, non-infective causes like **Drug fever** to be searched if indicated.
- ✓ Give only Tab paracetamol and oral fluids.

Fever of duration more than 3 days

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

Step 5: Send Cultures (Blood and 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> 3 weeks: follow **PUO algorithm**

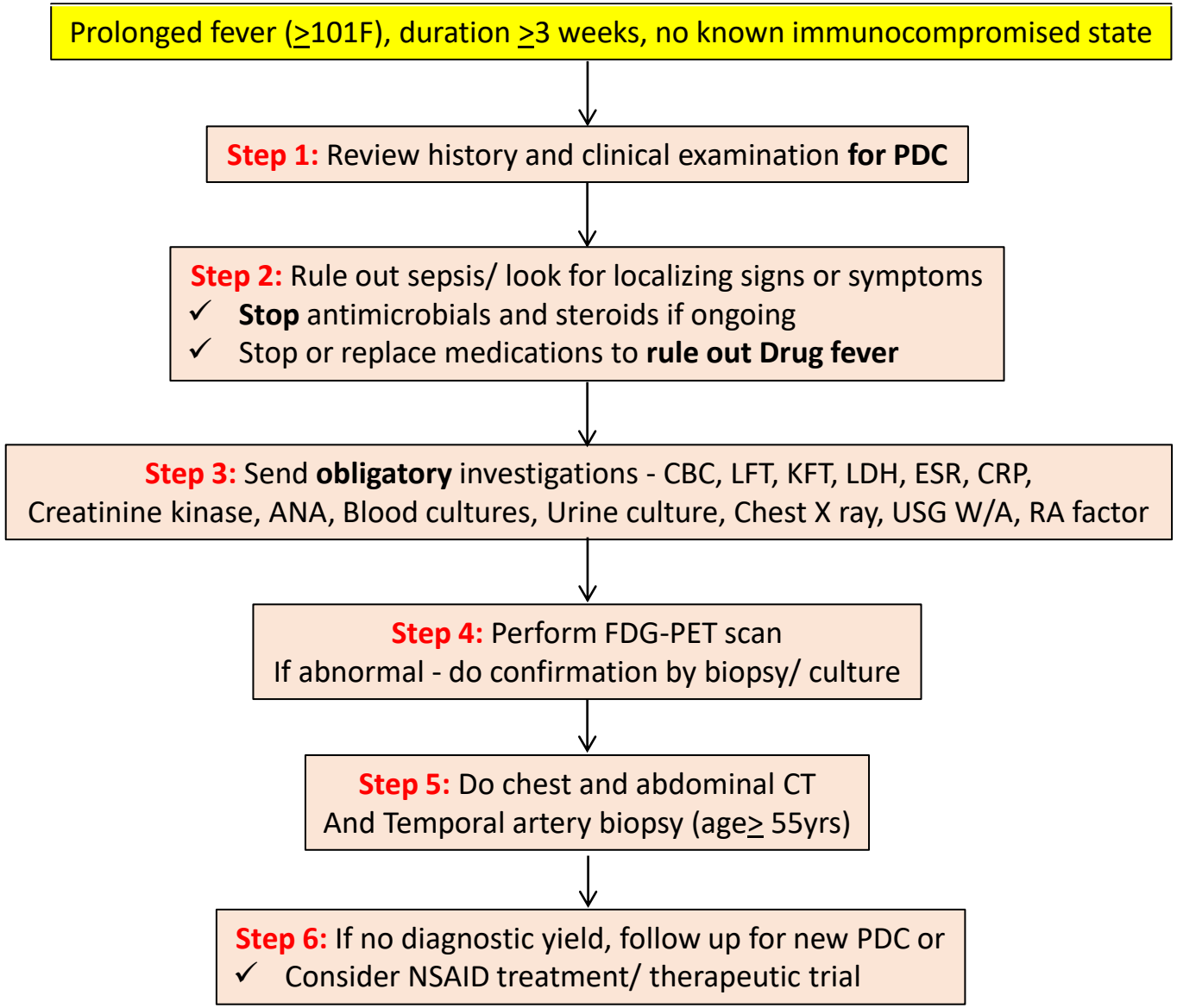
MEWS Score Interpretation:

1. Any body dysfunction is reflected with a score; if infection is suspected, a score is sepsis
2. A score >5 is statistically linked to increased likelihood of death or ICU admission
3. For any single physiological parameter scored +3, consider higher level of care for patient

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 FEVER



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.

Right Diagnosis - Sepsis and Septic shock

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

- ✓ Suspected (or documented) infection AND an acute change in total **SOFA score ≥2 points**
- ✓ The baseline SOFA score can be assumed to be zero in patients not known to have preexisting organ dysfunction
- ✓ A **SOFA score** ≥2 reflects an overall mortality risk of approximately 10% in sepsis and 40% in septic shock

	Score				
System	0	1	2	3	4
Respiration					
PaO_2/FiO_2, mm Hg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory support
Coagulation					
Platelets, $\times 10^3/\mu L$	≥150	<150	<100	<50	<20
Liver					
Bilirubin, mg/dL (μmol/L)	<1.2 (20)	1.2-1.9 (20-32)	2.0-5.9 (33-101)	6.0-11.9 (102-204)	>12.0 (204)
Cardiovascular	MAP ≥70 mm Hg	MAP <70 mm Hg	Dopamine <5 or dobutamine (any dose)[b]	Dopamine 5.1-15 or epinephrine ≤0.1 or norepinephrine ≤0.1[b]	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1[b]
Central nervous system					
Glasgow Coma Scale score[c]	15	13-14	10-12	6-9	<6
Renal					
Creatinine, mg/dL (μmol/L)	<1.2 (110)	1.2-1.9 (110-170)	2.0-3.4 (171-299)	3.5-4.9 (300-440)	>5.0 (440)
Urine output, mL/d				<500	<200

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

Suspected site	Symptoms/signs	Initial microbiologic evaluation
Upper respiratory tract	Pharyngeal inflammation plus exudate ± swelling and 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, central venous	Redness or drainage at insertion site	Culture of blood (from the catheter and a peripheral site), culture catheter tip (if removed)
Indwelling 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
Central nervous system	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

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

Category	Best practice statement
Suspected sepsis/ septic shock but unconfirmed	✓ **Continuously re-evaluate** ✓ Discontinue empiric antimicrobials if alternative cause of illness is demonstrated
Possible sepsis without shock	Rapid assessment of the **likelihood** of infectious vs noninfectious causes
Sepsis or septic shock at high risk of MRSA	Empiric antimicrobials with MRSA coverage
With sepsis /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** for hypotension or lactate level ≥ 4 mmol/L
5. Apply vasopressors if hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mm Hg

* Re-measure 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.

Acute Diarrhea – Right Diagnosis

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**

INVESTIGATION	PATIENT GROUPS IN WHICH TO SEND THE INVESTIGATION
CBC, LFT, KFT, Stool Routine Microscopy	ALL PATIENTS
Stool culture	Fever (>/=101*f), bloody or mucoid stools, severe abdominal cramping or tenderness, or signs of sepsis, 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)
Blood culture	If Sepsis Suspected (sepsis 3 criteria), or if enteric fever suspected, or in immunocompromised patient
Stool Wet Mount for Vibrio	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)
Stool Multiplex PCR	No standard guidelines on its use. Interpretation of results require a high degree of clinical correlation. Can be used in essentially those indications where stool culture is warranted.

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*, Volume 65, Issue 12, 15 December 2017, Pages e45–e80, https://doi.org/10.1093/cid/cix669

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	**Empirical antibiotic therapy not recommended**
	Immunocompromised	Empirical antibiotic therapy may be considered
3. Acute bloody diarrhea	Immunocompetent	Empirical antibiotic therapy to be considered if – 1. Likely bacillary dysentery (frequent scant bloody stools, fever, abdominal cramps, tenesmus) i.e. presumptively due to Shigella. 2. Signs of sepsis (Evidence/ suspicion of new organ dysfunction).
	Immunocompromised	Empirical antibiotic therapy recommended
4. Suspected enteric fever	Headache/ prolonged moderate to high grade fever/ abdominal pain/ anorexia, nausea, vomiting	Empirical antibiotic therapy recommended
•The empiric antibiotic (if indicated) should be Tab Azithromycin 1gm PO stat/ 500 mg PO OD x 3 days (preferred in dysentery).		
• **As soon as causative organism is identified**, directed antibiotics must be started as per local sensitivity data/ DST.		

✓ REHYDRATION REMAINS THE MAINSTAY OF DIARRHEA MANAGEMENT
✓ ORS REMAINS THE MAINSTAY OF REHYDRATION STRATEGY

ANCILLARY MANAGEMENT

- **Probiotics** – may be administered in immunocompetent adults with infectious or antimicrobial-associated diarrhea.
- **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.
- 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.
- **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.

Right Diagnosis of AE-Bronchiectasis

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
- **Risk factors:** Co-morbidities: Prior respiratory isolation of MRSA or MDR GNB/ Recent hospitalization and receipt of parenteral antibiotics (in last 90 days)

Bronchiectasis Severity Index (BSI)	
Age	<50 50-69 70-79 >80
BMI	<18.5 >18.5
Previous hospital admission	
No of Exacerbations in previous year	0 1-2 >3
MRC Breathlessness score	
Pseudomonas colonisation	Yes/No
Radiological Severity	>3 lobes <3 lobes

Assess severity of bronchiectasis acute exacerbation E-FACED SCORE

Variable	Values	Points
At least one severe exacerbation in previous year	No	0
	Yes	2
FEV1 (% predicted)	At least 50%	0
	<50%	2
Age	< 70 years	0
	At least 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
	Range	0-9

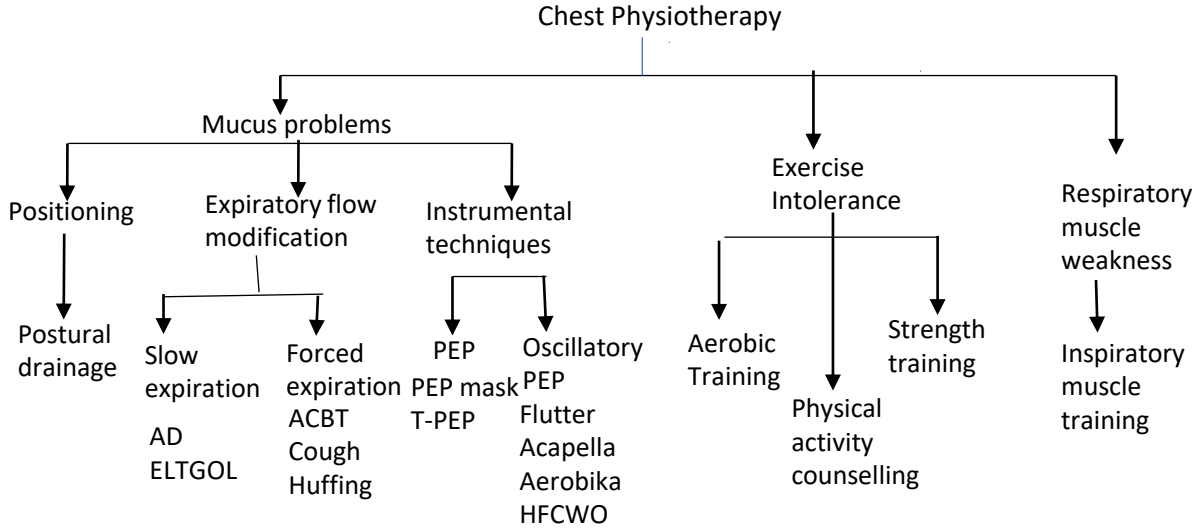
1. Dhar R et al. Bronchiectasis in India: results from the European Multicentre Bronchiectasis Audit and Research Collaboration (EMBARC) and Respiratory Research Network of India Registry. The Lancet Global Health. 2019 Sep;7(9):e1269–79.
2. Martinez-Garcia MA et al. Predicting high risk of exacerbations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

Right Treatment for AE-Bronchiectasis

- **Rule out** non-bacterial causes of exacerbation (*viral infections/ ABPA etc.*)
- Look **for previous culture and sensitivity** pattern
- 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*).

Other management measures for AE-Bronchiectasis



Streptococcus pneumoniae/ Haemophilus influenzae beta lactamase Negative/ Moraxella catarrhalis	
First choice Amoxicillin 500mg q6h Amoxicillin-clavulanic acid 625mg q8h	**Second choice** Doxycycline 100mg q12h/ Ciprofloxacin 500mg q12h/ Ceftriaxone 2gm q8h
Staphylococcus aureus (MRSA)	
First choice Doxycycline 100mg q12h/ Vancomycin 15mg/kg q12h	**Second choice** Doxycycline/ Clarithromycin 500mg q12h/ Linezolid 600mg q12h
Pseudomonas aeruginosa	
First choice Oral ciprofloxacin 500g q12h	**Second choice** Ceftazidime 1gm q12h/ Piperacillin with tazobactam 4.5gm q6h/ Meropenem 1gm q8h ***WITH*** Gentamicin/ Tobramycin – 15mg/kg Colistin – 50000-100000U/kg q12h

1. Laska IF et al. Treatment to prevent exacerbations in bronchiectasis: macrolides as first line? Eur Respir J. 2019 Jul;54(1):1901213. 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

Assess severity to determine where and how to treat patient

Use pulse oximetry and ABG to help determine severity of an exacerbation, acknowledging values will need to be compared against the patient's baseline.
When assessing severity, you should also take into account frailty, as well as cardiorespiratory complications and other co-morbidities.

Mild	Moderate	Severe
NICE Increased need for medication, which they can manage in their own normal environment.	NICE A sustained worsening of respiratory status that requires treatment with systemic corticosteroids and/or antibiotics.	NICE A rapid deterioration in respiratory status that requires hospitalization
GOLD Treated with short-acting bronchodilators only	GOLD Treated with short-acting bronchodilators plus antibiotics and/or oral corticosteroids	GOLD Requires hospitalisation or presents to emergency department. May be associated with acute respiratory failure

Mild and moderate exacerbations may be dealt with in the community (depending on the cause of the exacerbation and the patient's social factors)

As severe exacerbations may have associated acute respiratory failure, they should be dealt with in hospital.

DEFINITION (by Anthonisen) - Acute exacerbation definition is based on 3 cardinal exacerbation symptoms:

- Increased breathlessness
- Increased sputum volume
- Sputum purulence (*most important factor to consider initiating antibiotics*)

Supporting symptoms are:

- Cough
- Wheezing
- Fever without an obvious source
- Upper respiratory tract infection in the past 5 days
- Respiratory rate increase or heart rate increase 20% above baseline

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

GOLC 2022 Guidelines, www.gold2022.org, Management of Acute Exacerbations
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 x 5days • Levofloxacin 500mg qd
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 2022 Guidelines, www.gold2022.org, Management of Acute Exacerbations
Management of COPD Exacerbations, NICE guidelines, Published: 5 December 2018 www.nice.org.uk/guidance/ng114

Appendicitis – Right Diagnosis and Right Treatment

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 + 2mEq KCl/ 100ml
- Nil per oral/nasogastric decompression is required in severe cases
- 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 .
- 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

Brain Abscess - Right Treatment

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**	3rd generation cephalosporine + vancomycin
• **Bacterial endocarditis**	Vancomycin + ampicillin/gentamycin + anti-staphylococcal penicillin
• **Pyogenic lung disease**	3rd generation cephalosporin + metronidazole
• **Gastrointestinal source**	3rd generation cephalosporin + meropenem
• **Trauma/Neurosurgery**	Vancomycin+3rd generation cephalosporin + metronidazole

Moscote-Salazar LR. Brain abscess: Current management. J Neurosci Rural Pract. 2013 Aug;4(Suppl 1):S67-81. doi: 10.4103/0976-3147.116472.

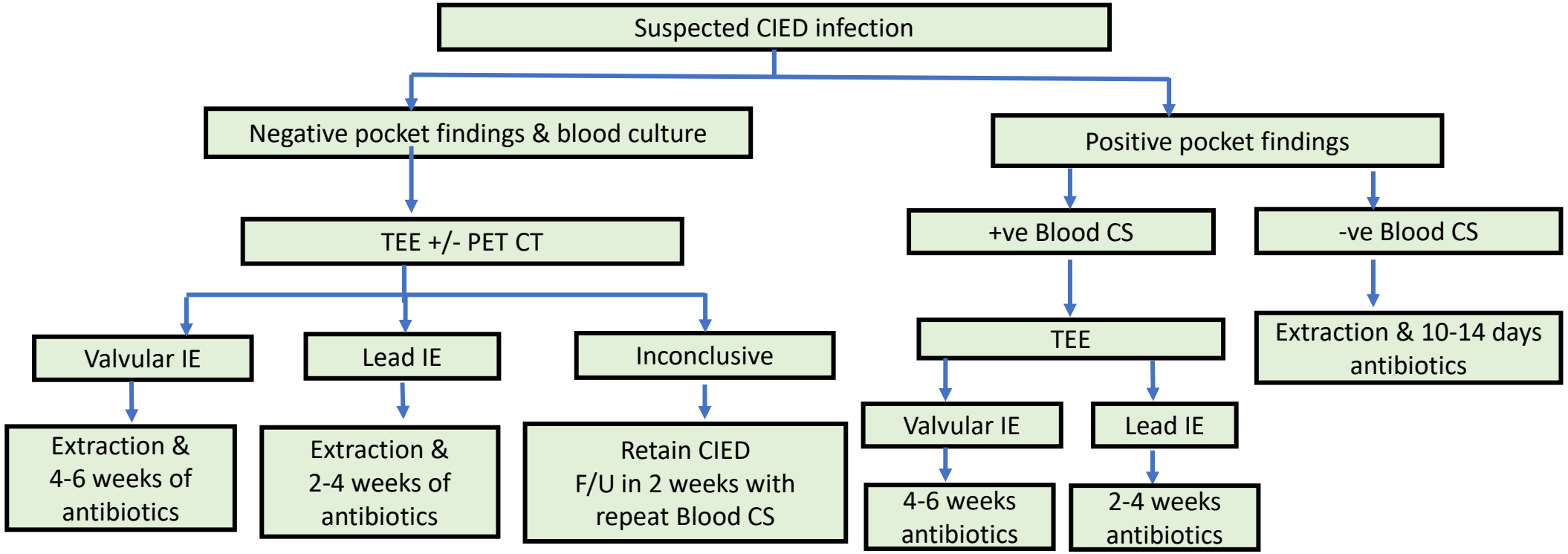
Right Diagnosis of CIED Infections (Pacemakers, implantable cardiac defibrillators, and cardiac resynchronization therapy devices)

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

Cholangitis: Right Diagnosis

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		BT>38C
A-2. Evidence of inflammatory response.	WBC(x1,000/cmm)	<4 or >10
	CRP(mg/dl)	≥1
B-1. Jaundice		T.Bilirubin≥2mg%
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

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

Cholangitis – Right Treatment

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)
- Leucocytosis(>12000 or <4000/cmm)
- Bilirubin≥5mg%
- Hypoalbuminaemia(<STDx0.7)

GRADE I: Mild acute cholangitis

- Does not meet the criteria of moderate or severe cholangitis

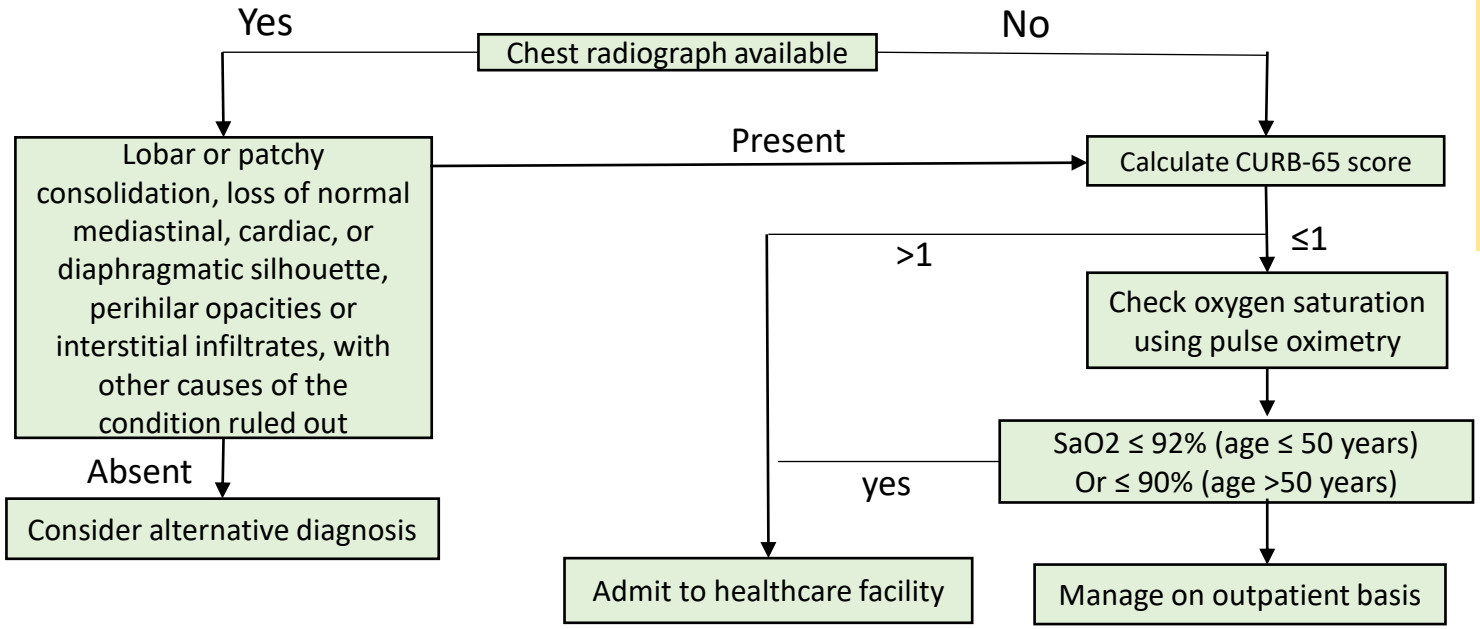
Antimicrobial agents	Grade I	Grade II	Grade III
Penicillin based	Ampicillin/Sulbactam. Not recommended if >20% resistance	Piperacillin/Tazobactam	Piperacillin/Tazobactam
Cephalosporin based	Ceftriaxone/ Cefazolin/Cefotetan/ Cefotaxime ±Metronidazole, Cefoperazone-Sulbactam	Cefotaxim/Ceftriaxone /Ceftazidime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

Gomi H, et al.Tokyo Guidelines 2018.: antimicrobial therapy for acute cholangitis. J Hepatobiliary Pancreat Sci 2018; 25: 3-16

Right Diagnosis – Community Acquired Pneumonia

- 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 CURB 65	Points
Confusion	1
Blood urea nitrogen >19 mg/dl	1
Respiratory rate >/= 30 breaths/min	1
SBP <90 mmHg or DBP ≤ 60 mmhg	1
Age >/= 65 years	1
Total points :	

Stratify Risk:

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

Consider co-morbidities/risk factors:

- Co-morbidities: 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}/FI_{O2} 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 Antibiotic* (empirical) 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/clavulinate 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

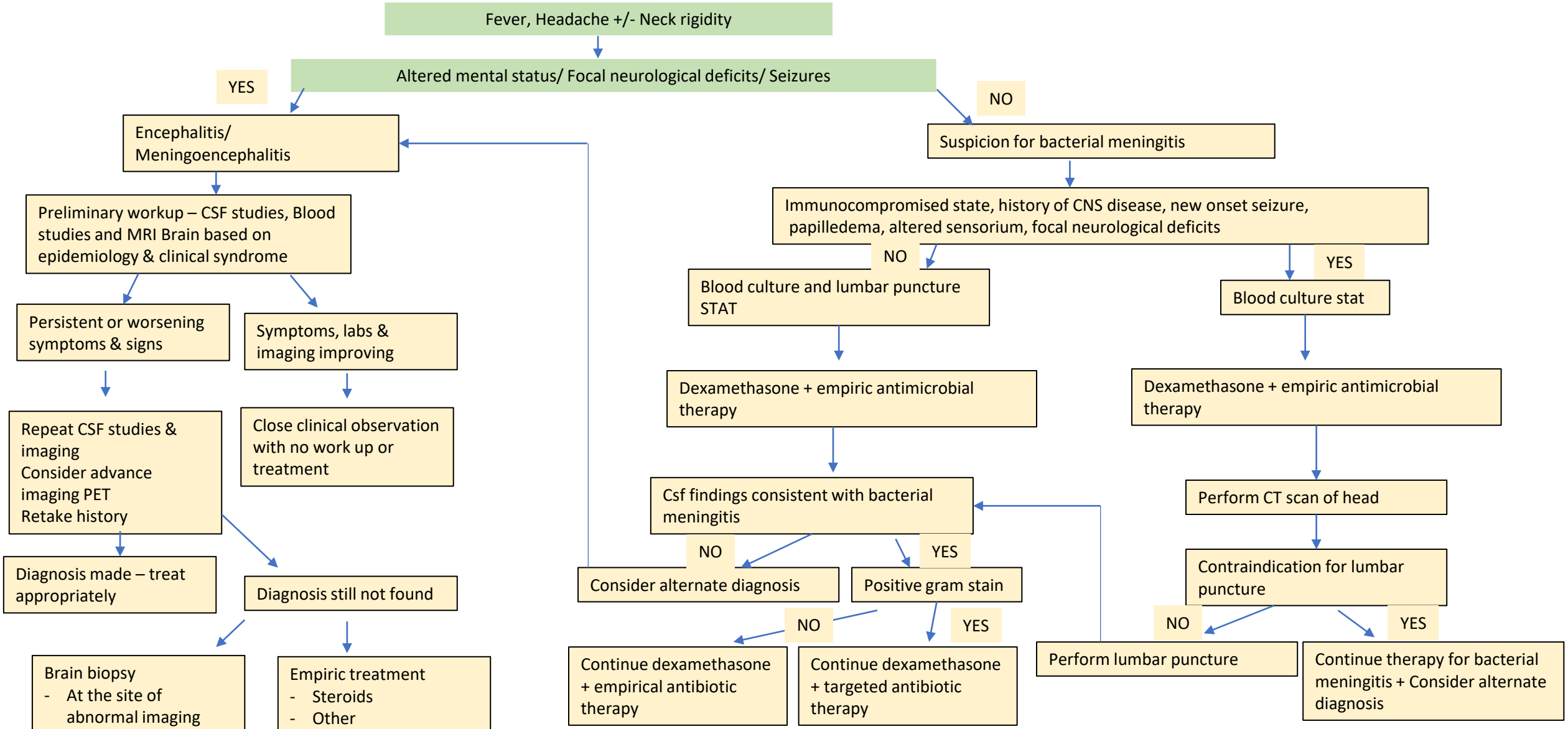
Antibiotics may be continued **beyond this period** in patients of:

- 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

*No fluoroquinolones for any empirical therapy

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 Diagnosis - Meningitis/Meningoencephalitis



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

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

Right Diagnosis- Hospital Acquired Pneumonia

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	Rare	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
PaO2/Fio2 (mmHg)	>240 or ARDS		≤ 240 and no ARDS
Microbiology	Negative		Positive

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

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 MDR Pathogens

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

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*)

CPIS points	0	1	2
Tracheal secretions	Rare	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 (mm3)	>4,000 and <11,000	<4,000 and >11,000	<4,000 or >11,000 and band forms
PaO2/Fio2 (mmHg)	>240 or ARDS		≤ 240 and no ARDS
Microbiology	Negative		Positive

CPIS Score (Score>6 indicates Pneumonia)

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

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 Pseudomonal 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	**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.

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 Diagnosis - Hemodialysis Catheter-Related Blood Stream Infection (CRBSI)

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

+

same organism growth in the catheter segment, hub or tip, either semiquantitative (>15 CFU) or quantitative (>10^2 CFU)

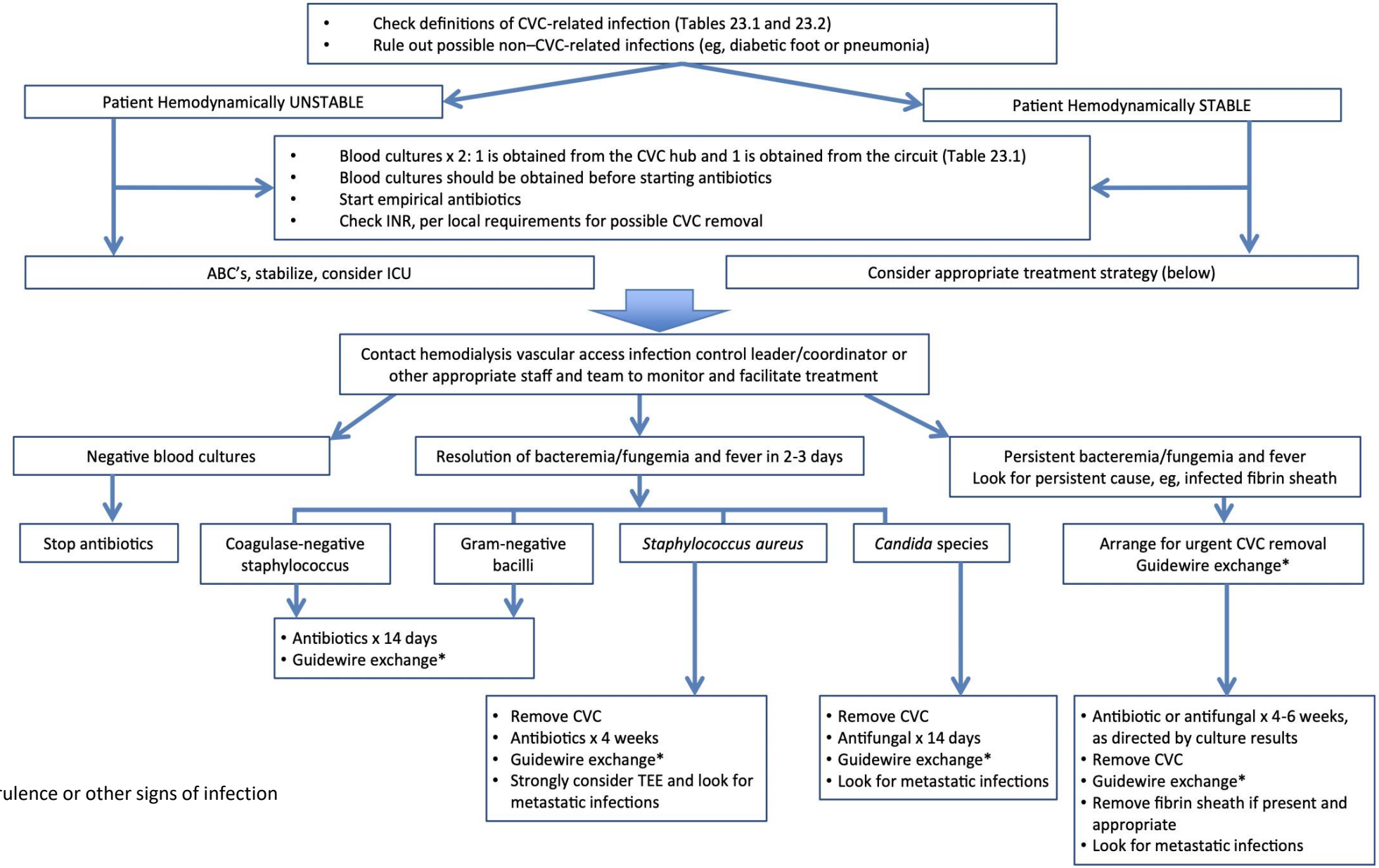
Supportive diagnosis:

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.

Right Treatment - CRBSI



*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

	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)	
Investiga-tion	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

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 - Empirical Antibiotics

Treatment	Dose and schedule for adult patients
Vancomycin	High flux: 20 mg/kg IV loading dose, then 1 g IV in last hour of each HD session Low flux: 500 mg in last hour of each HD session
Ceftazidime	1 g IV post-HD
Cefepime	1.5 to 2 g IV post-HD
Cefazolin	2 g IV post-HD
Gentamicin or tobramycin	1 to 2 mg/kg IV in last hour of each HD session (not to exceed 100 mg per dose)
Daptomycin	High flux: 9 mg/kg IV in last hour of each HD session Low flux: 7 mg/kg in last hour of each HD session

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

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

Volume of components (mL)*				Final concentration
Vancomycin 5 mg/mL	Ceftazidime 10 mg/mL	Cefazolin 10 mg/mL	Heparin¶ 1000 units/mL	
Vancomycin-ceftazidime-heparin lock				
1	0.5	0	0.5	▪ 2.5 mg/mL vancomycin ▪ 2.5 mg/mL ceftazidime ▪ 250 units/mL heparin
Vancomycin-heparin lock				
1	0	0	1	▪ 2.5 mg/mL vancomycin ▪ 500 units/mL heparin
Ceftazidime-heparin lock				
0	1	0	1	▪ 5 mg/mL ceftazidime ▪ 500 units/mL heparin
Cefazolin-heparin lock				
0	0	1	1	▪ 5 mg/mL cefazolin ▪ 500 units/mL heparin

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.

Infective Endocarditis – Right Diagnosis

MAJOR CRITERIA	MINOR CRITERIA
1. POSITIVE BLOOD CULTURE a) Typical microorganism for infective endocarditis from two separate blood cultures • Viridans streptococci, Streptococcus gallolyticus, HACEK group organisms, Staphylococcus aureus, or • Community-acquired enterococci in the absence of a primary focus, or 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 • Single positive blood culture for Coxiella burnetii or phase I IgG antibody titer of >1:800 2. EVIDENCE OF ENDOCARDIAL INVOLVEMENT a) Positive echocardiogram: Oscillating intracardiac mass on valve or supporting structures or in the path of regurgitant jets or in implanted material, in the absence of an alternative anatomic explanation, or Abscess, or New partial dehiscence of prosthetic valve, or b) New valvular regurgitation (worsening or change in preexisting murmur not sufficient)	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

A. DEFINITE INFECTIVE ENDOCARDITIS

Pathologic Criteria

a. Microorganisms demonstrated by results of cultures or histologic examination of a vegetation, a vegetation that has embolized, or an intracardiac abscess specimen; or

b. Pathologic lesions; vegetation, or intracardiac abscess confirmed by results of histologic examination showing active endocarditis

Clinical Criteria

a. 2 major criteria, or

b. 1 major criterion and 3 minor criteria, or

c. 5 minor criteria

POSSIBLE INFECTIVE ENDOCARDITIS

a. 1 major criterion and 1 minor criterion, or

b. 3 minor criteria

REJECTED DIAGNOSIS OF INFECTIVE ENDOCARDITIS

a. Firm alternate diagnosis explaining evidence of suspected IE, or

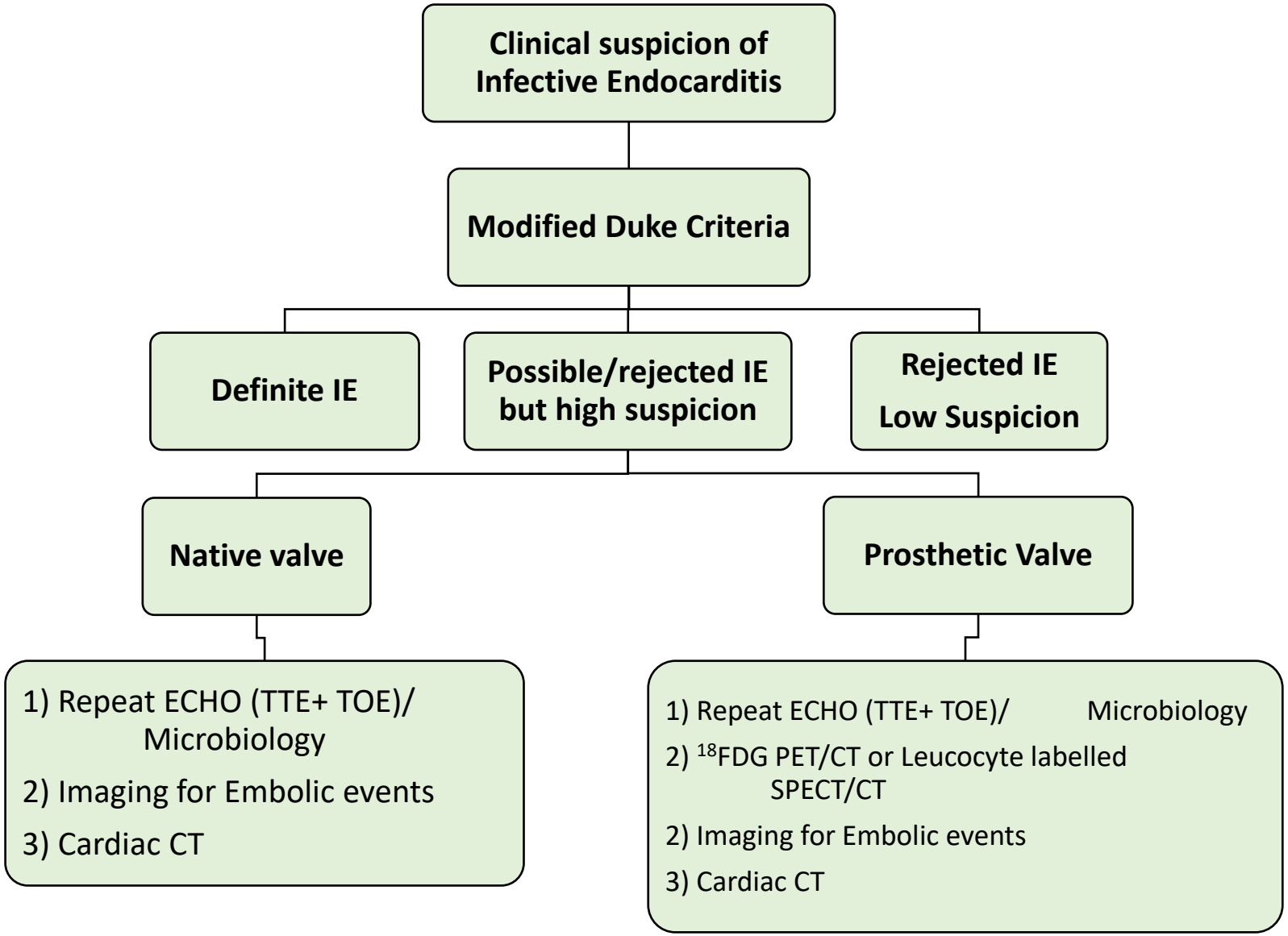
b. Resolution of IE syndrome with antibiotic therapy for ≤4 days, or

c. No evidence of IE at surgery or autopsy, on antibiotic therapy for ≤4 days, or

d. Does not meet criteria for possible IE

Gilbert et al, ESC Scientific Document Group, 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC), European Heart Journal, Volume 36, Issue 44, 21 November 2015, Pages 3075–3128, https://doi.org/10.1093/eurheartj/ehv319

Right Approach to IE based on Clinical suspicion



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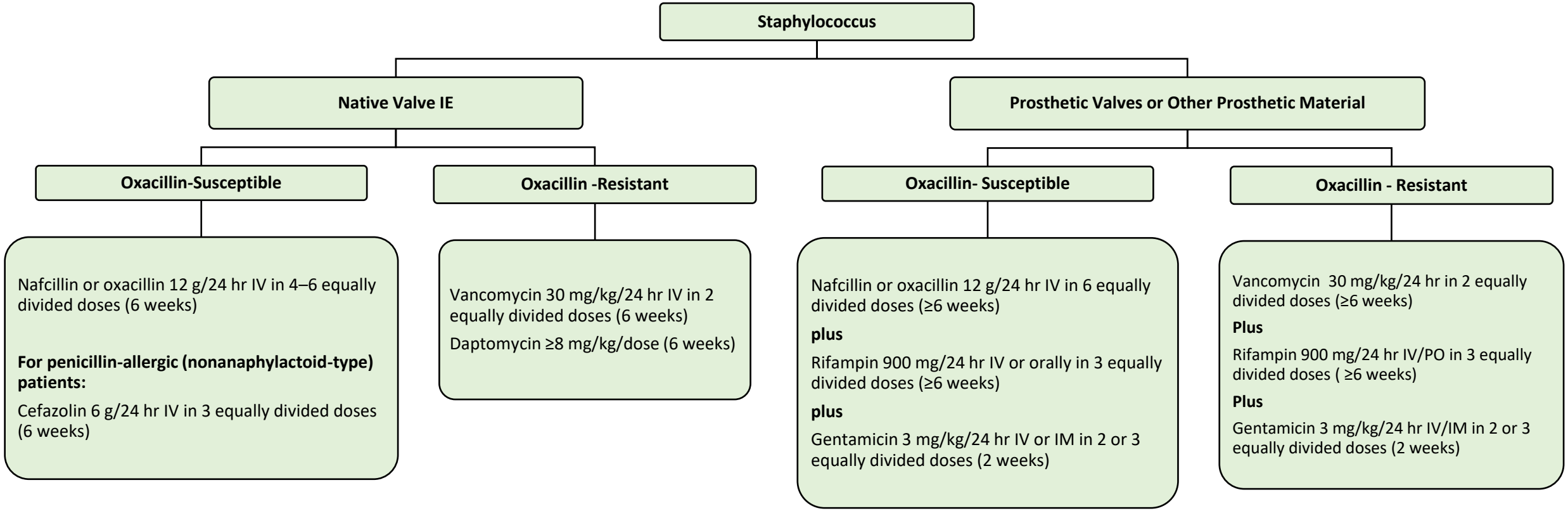
Infective Endocarditis – Organism Wise Right Treatment



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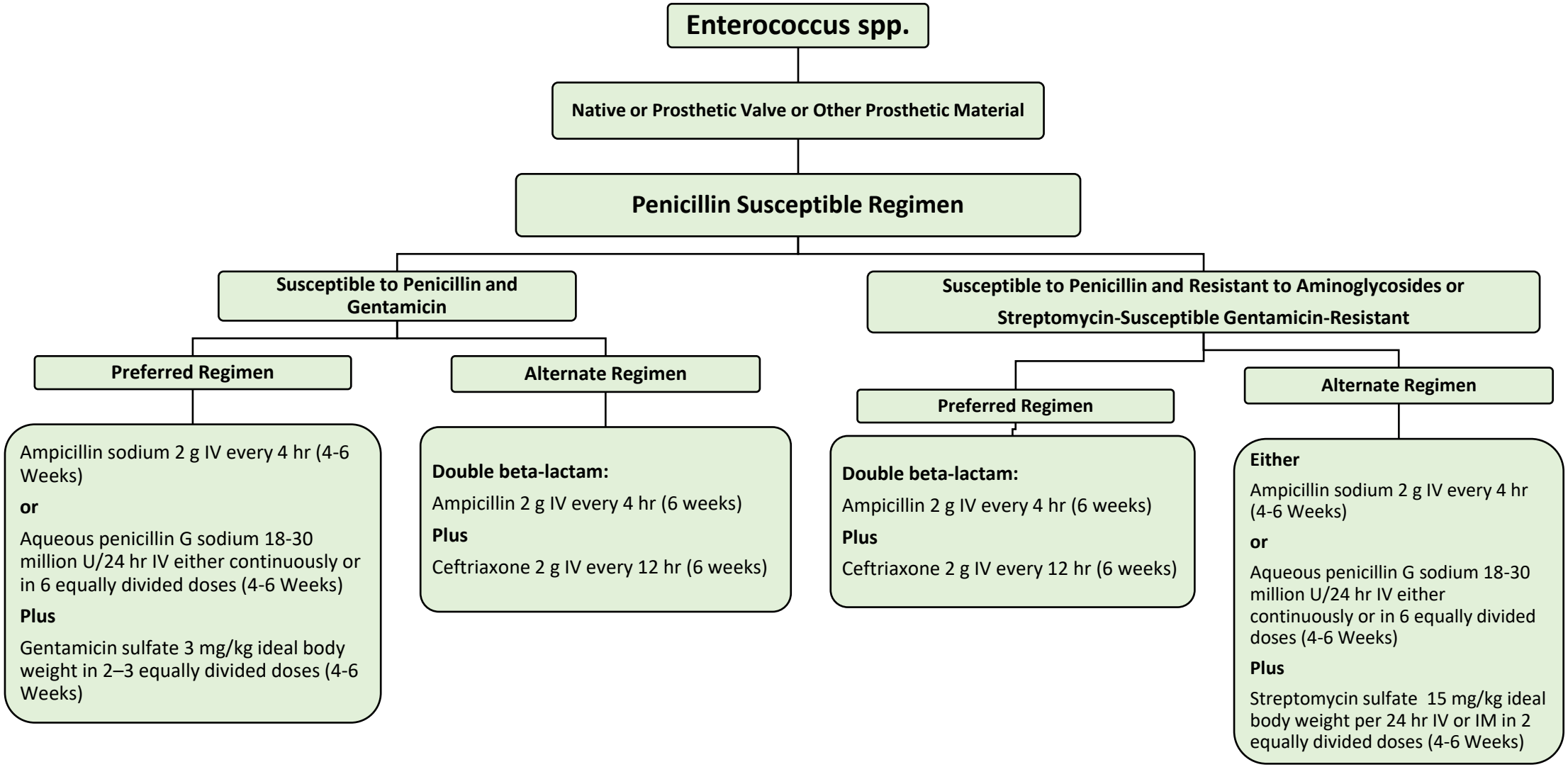

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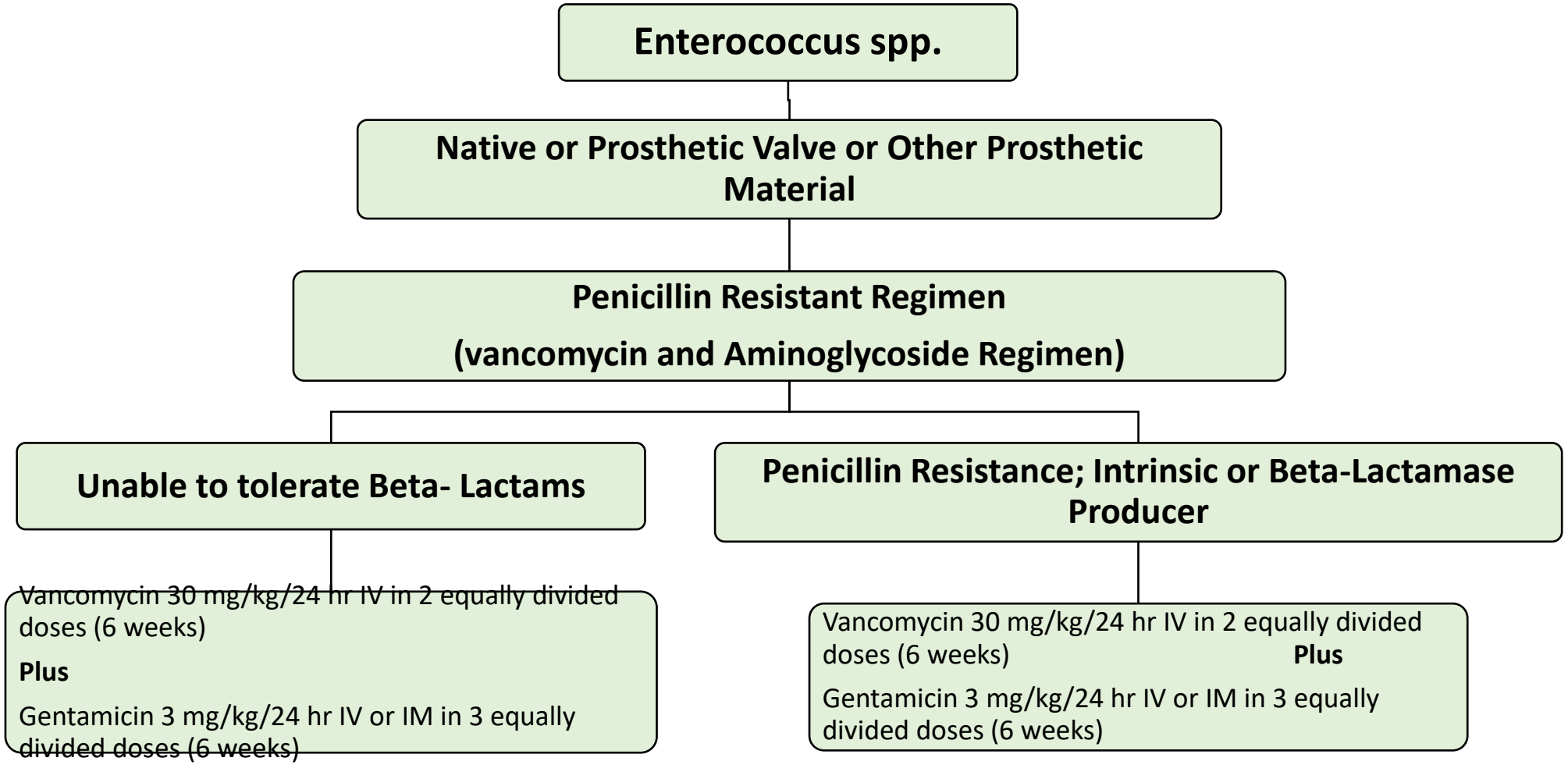
Infective Endocarditis – Organism Wise Right Treatment



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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)

Gilbert et al, ESC Scientific Document Group, 2015 ESC Guidelines for the management of infective endocarditis: The Task Force for the Management of Infective Endocarditis of the European Society of Cardiology (ESC), European Heart Journal, Volume 36, Issue 44, 21 November 2015, Pages 3075–3128, https://doi.org/10.1093/eurheartj/ehv319

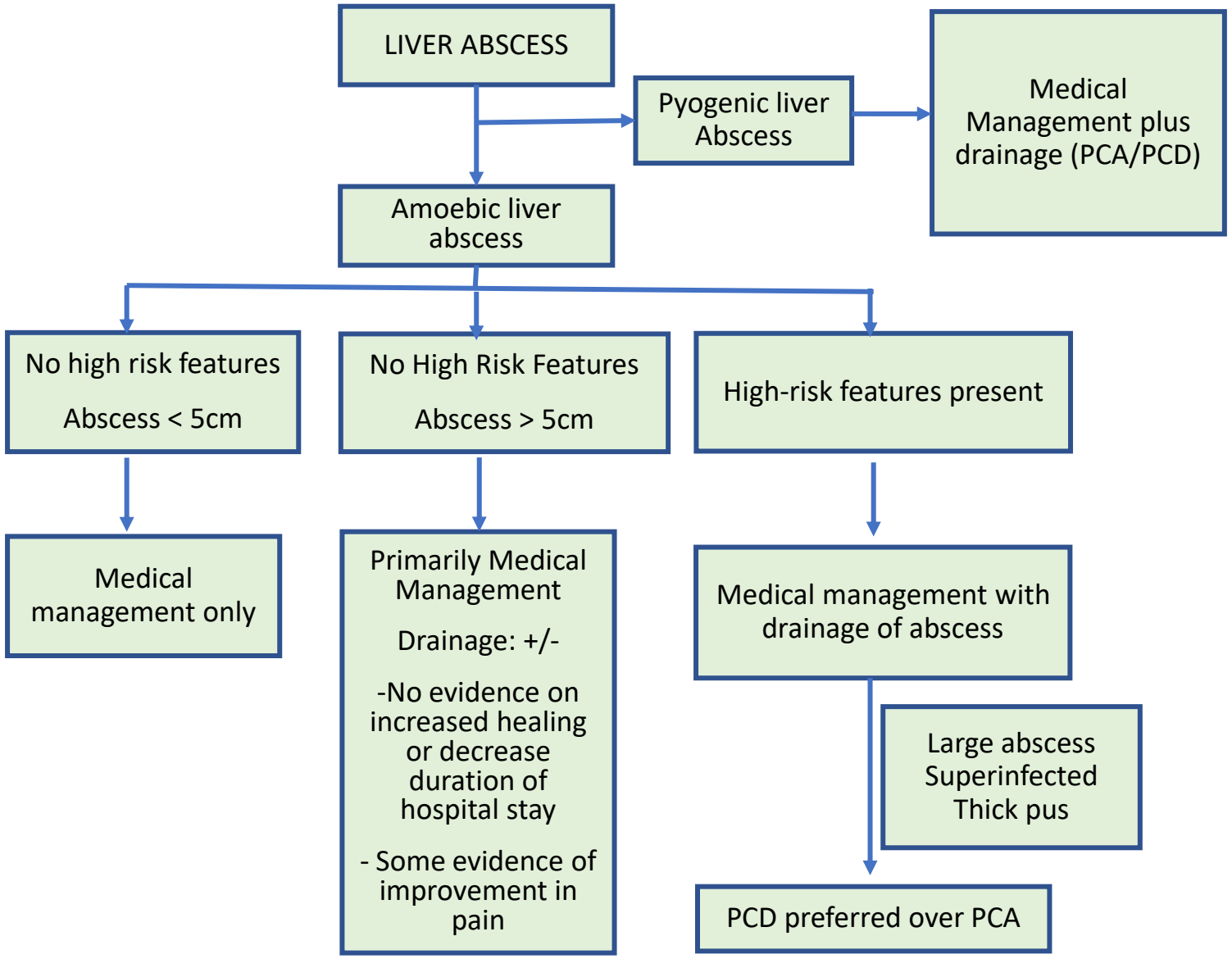
Liver Abscess – Right Diagnosis

Presentation

- Vomiting- Bilious/ non bilious
- Nausea
- Fever
- Diarrhea
- Pain abdomen with guarding and rigidity
- H/o recent loose stools
- Loss of appetite
- 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



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.

Liver Abscess - Right Treatment

Initial Treatment

- Pigtail catheter insertion for liver abscess of size greater than 5 cm
- Aspiration of liver abscess if size less than 5 cm
- IV fluid resuscitation: Initial bolus of NS/RL(25-30ML/KG)/ followed by maintenance fluids N/2 saline + 2 mEq KCl/ 100ml

IV Antibiotics

- Inj Ampicillin 2gm iv every 4-6 hrly + Inj Gentamicin 6 mg/kg iv OD+ Inj Metronidazole 500 mg iv TDS OR
- Inj. Levofloxacin 500/750 mg iv OD + Inj. Metronidazole 500 mg iv TDS OR
- Inj. Ceftriaxone 1gm iv BD + Inj. Metronidazole 500 mg iv TDS OR
- Inj. Piperacillin-Tazobactam 4.5 gm iv QID OR
- Inj Meropenem 1gm iv TDS

Further Management

- Based on severity/ hemodynamic stability/ content of the abscess and culture sensitivity, the antibiotics are changed.
- Surgical intervention may be planned in case of ruptured or complicated liver abscess.
- Similar antibiotics may be continued or escalated based on severity and intra-operative findings.
- Metronidazole double dose usually is continued for 14 days for amoebic liver abscess and discontinued for pyogenic liver abscess
- Rest antibiotics are given for a period of 14 days
- Once the patient improves medications are converted to oral forms.

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.

Acute Pancreatitis – Right Diagnosis

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 in any system)

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

Tenner S, et al. ACG Guideline on Pancreatitis Management. Am J Gastroenterol 2013; 108: 1400-15

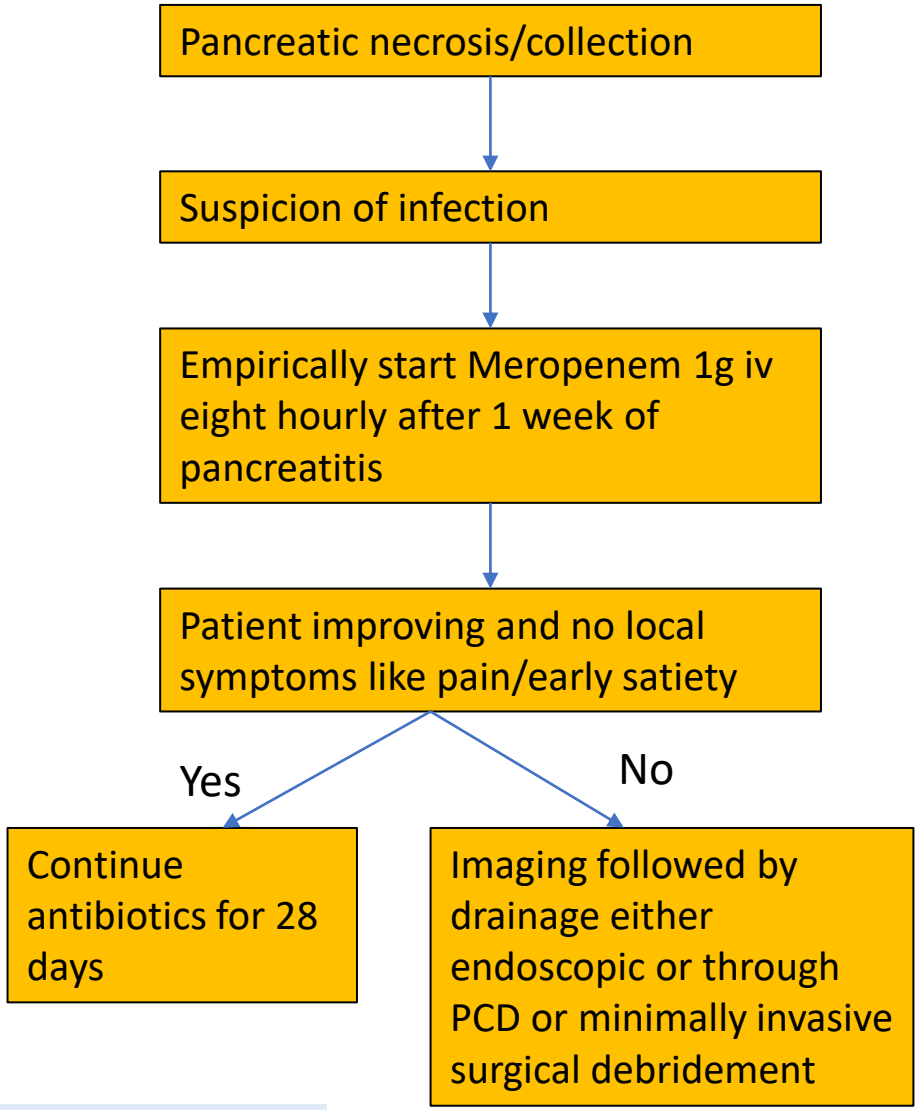
Acute Pancreatitis – Right Treatment

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 with or without an EUS FNA for culture

Choice of antibiotics: Antibiotics penetrating pancreatic necrosis

- Fluoroquinolones
- Carbapenems
- Metronidazole



Tenner S, et al. ACG Guideline on Pancreatitis Management. Am J Gastroenterol 2013; 108: 1400-15

Pelvic Inflammatory Disease-Right Diagnosis

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

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

Pelvic Inflammatory Disease-Right Treatment

Mild to moderate PID

↓

Oral antibiotics (for 72hrs)

↓

If no response, re-evaluate the patient

↓

Treat on IPD/OPD

Oral Therapy-Regimen-A

- **Levofloxacin** 500mg OD x 14 days OR
- **Ofloxacin** 400mg OD x 14 days
- ± **Metrogyl** 500mg BD x 14 days

Parenteral Therapy-Regimen-B

- **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: Peritoneal dialysis (PD)-associated peritonitis

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.

Culture-negative peritonitis

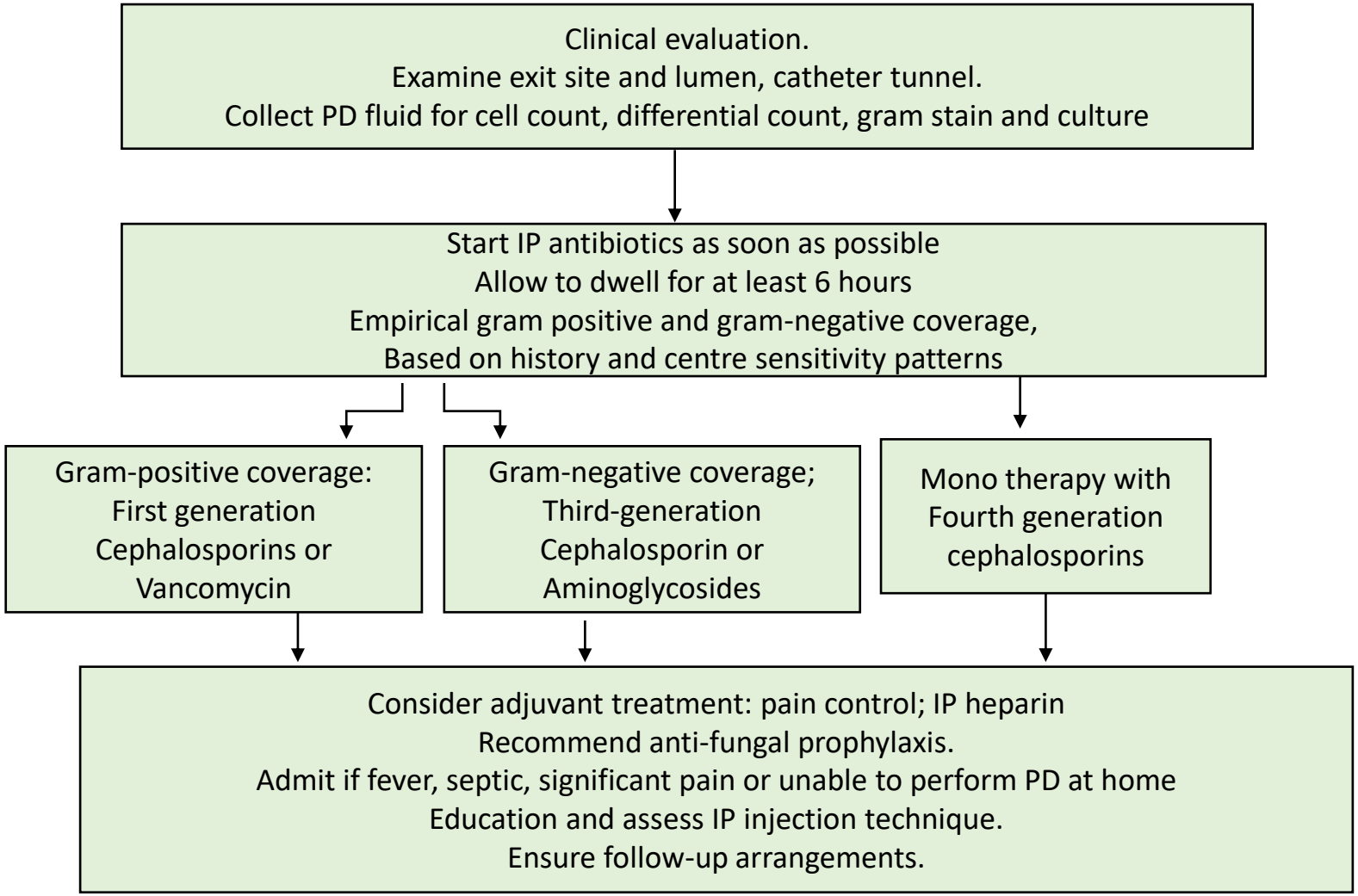
Peritonitis is diagnosed using the criteria above (criteria one and two), but no organism is identified on culture of dialysis effluent

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

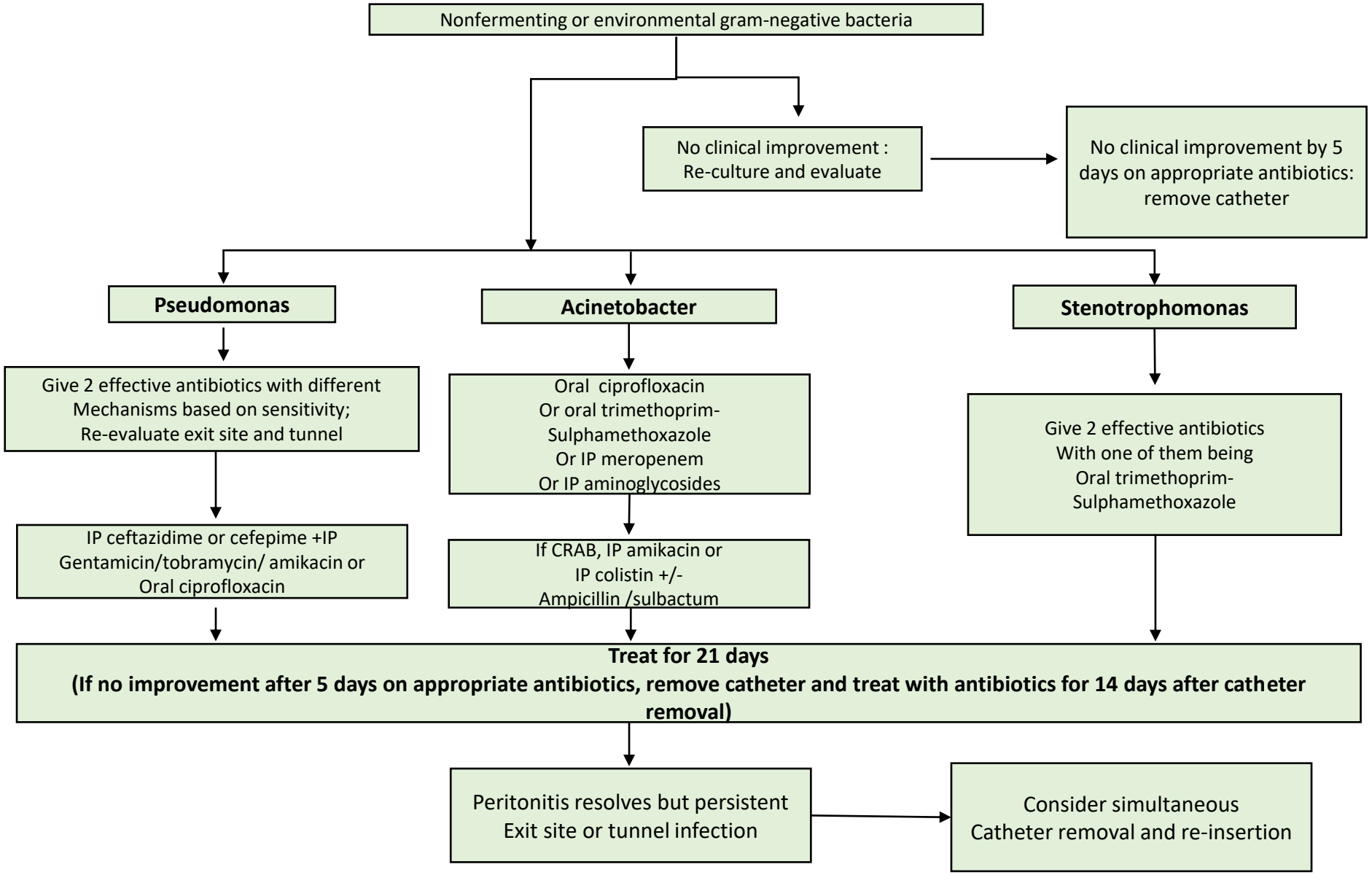
Li PK-T et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Peritoneal Dialysis International. 2022;42(2):110-153. doi:10.1177/08968608221080586

Right Treatment of PD– associated peritonitis



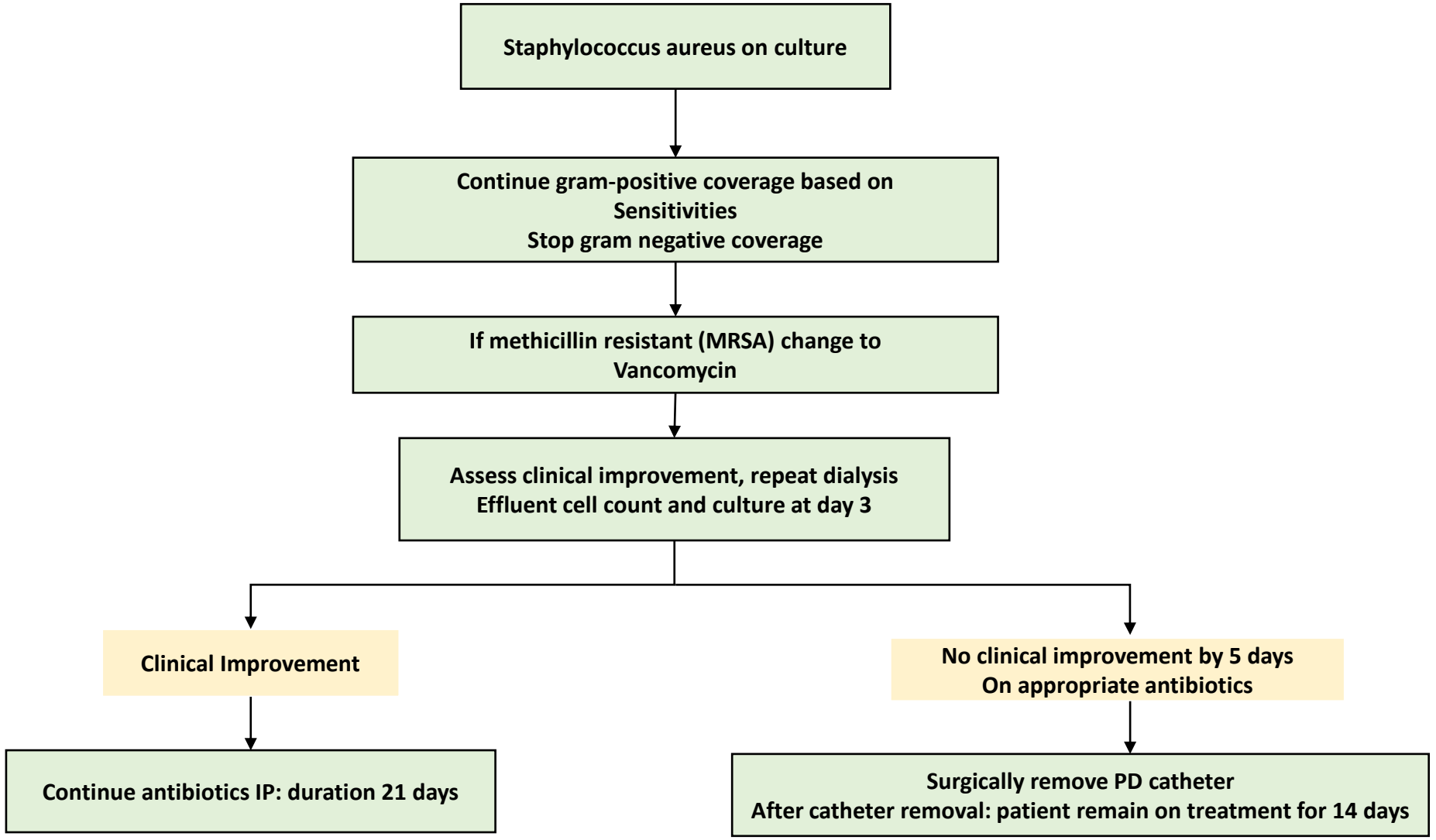
Li PK-T et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Peritoneal Dialysis International. 2022;42(2):110-153. doi:10.1177/08968608221080586

Rt Treatment of PD Associated Peritonitis– Gram Negative Bacteria



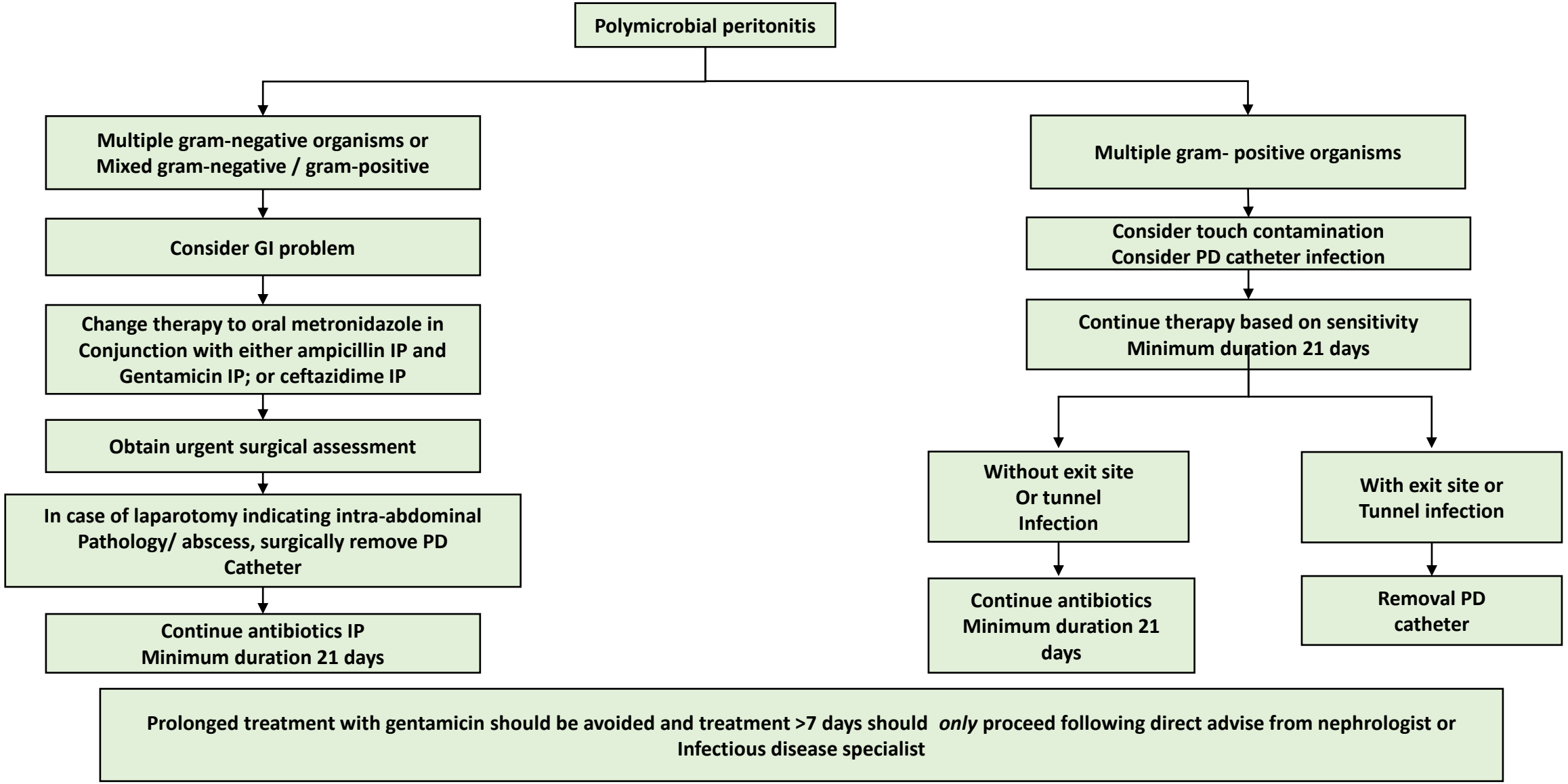
Li PK-T et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Peritoneal Dialysis International. 2022;42(2):110-153. doi:10.1177/08968608221080586

Rt 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

Rt Treatment of PD associated peritonitis –Polymicrobial



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

Peritonitis – Right Diagnosis

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

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

Peritonitis – Right Treatment

Initial Treatment

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

Right Prophylactic use of Antibiotics - Cardiology Procedures

- 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

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 - Cardiology Procedures

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

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

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

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	Prevention of procedure related bacteremia	Based on culture reports or ongoing antibiotics	
b. Bilary obstruction/cbd stones and/or straightforward stent exchange	Prevention of cholangitis	Not indicated unless biliary decompression not achieved. If so then like cholangitis	
c. ERCP when complete biliary obstruction unlikely to resolve(PSC, hilar CCA)	Prevention of cholangitis	Ciprofloxacin	750mg orally 60-90mins before procedure 20mg/kg iv over 1 hr
d. Biliary complications following LT	Prevention of cholangitis	As c. plus vancomycin	As c.
e. Communicating cyst or pseudocyst	Prevention of cholangitis	As c.	
3. Variceal bleeding	Prevention of bacterial peritonitis	Ceftriaxone	1g iv OD for 5 days

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

Right Prophylactic use of Antibiotics - GI Endoscopic Procedures

Scenario for Prophylaxis	Rationale	Antibiotics	Dose/Route
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 – General Surgery

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.
Bile duct 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.

Right Procedural Prophylaxis – Obstetrics

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.

- 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.

Right Procedural Prophylaxis - Gynaecology

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

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.

Puerperal Sepsis – Right Diagnosis

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

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

3. 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

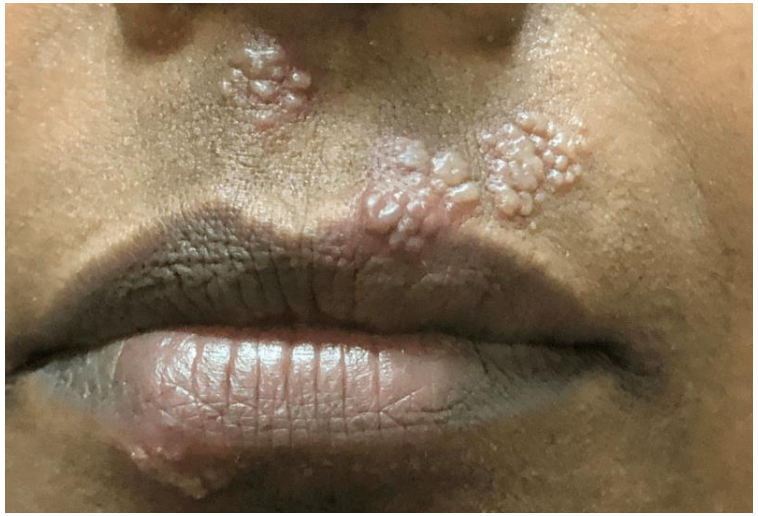
1. Clindamycin 900 mg q8 h + Gentamicin 5 mg/kg q24 h + Ampicillin 2 g iv QID
2. Ampicillin 2 g iv QID + Gentamicin 5 mg/kg q24 h + Metronidazole 500 mg q8 h.

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

Herpes Simplex Virus Infections

Right diagnosis

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



Right treatment

- Tablet Acyclovir 400 mg three times daily for 5 days

OR

- Tablet Valacyclovir 1000 mg two times a day for 5-7 days
- In case of Primary Herpes Simplex (defined by absence of Immunoglobulins prior to the present infection), the drugs should be continued for 10 – 14 days

Downing C. Herpes Virus Infections. In Dermatology.2016; pg: 1400-1412

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: No antivirals routinely recommended

For Adults and/or Immunocompromised: Tab Acyclovir 800 mg five times a day for 7 to 10 days

Alternatively, Tab Valacyclovir 800 mg five times a day

For Immunocompromised: Till all vesicles have scabbed

Downing C et al. Herpes Virus Infections. In Dermatology.2016; pg: 1400-1412

Right Diagnosis & Treatment – Herpes Zoster

Right diagnosis

- Segmental eruption
- Continuous or interrupted band in the area of one, occasionally two
- Rarely, more contiguous dermatomes
- Associated pain, which may be severe

Closely grouped red papules

↓

Vesicular

↓

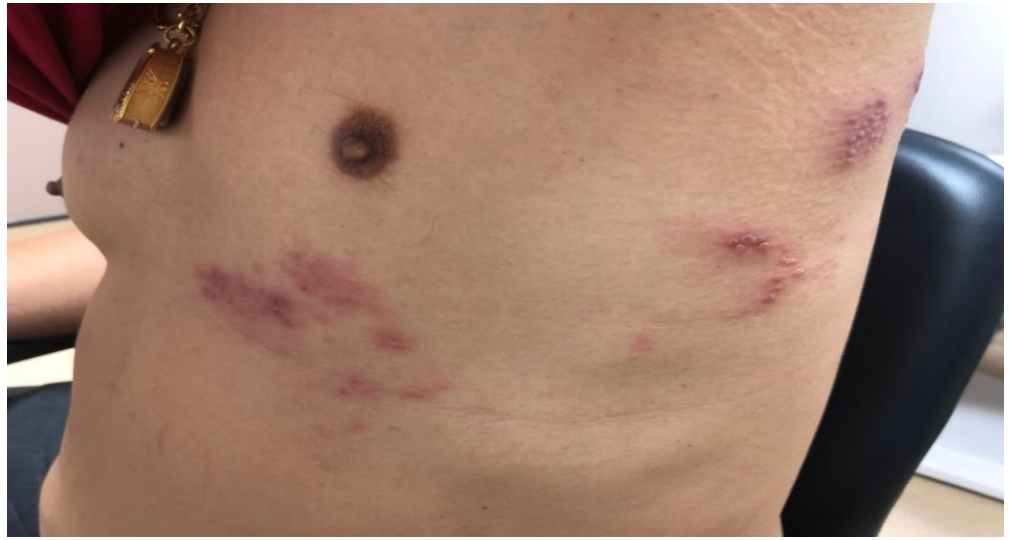
Pustular

Right treatment

- Tablet Acyclovir 800 mg five times a day for 7–10 days

OR

- Tablet Valacyclovir 1 g or Tablet famciclovir 250 or 500 mg three times a day for 7 days



Downing C. Herpes Virus Infections. In Dermatology.2016; pg: 1400-1412

Right Diagnosis & Treatment - Superficial Fungal Infection

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/ Short duration- Topical Luliconazole 1% BD for 4 weeks
- Extensive- Oral Itraconazole 100 mg for 2-4 weeks + Topical Luliconazole 1% BD for 4 weeks as adjuvant

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

- Solution clotrimazole for local application twice daily ± oral amoxicillin + clavulanic acid thrice daily

Elewski et al. Fungal Infections. In Dermatology. 2016; pg 1329-1340

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

- One Nail- Topical Amorolfine 5% nail lacquer twice weekly for 6-12 months
- Multiple Nails- Oral Itraconazole 200 mg BD for 1 week/month (2 months for finger nails and at least 3 months for toenails)

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

- Mild- Topical Luliconazole 1% BD for 4-6 weeks
- Extensive- Oral Itraconazole 100 mg BD for 4 weeks + Topical Luliconazole 1% BD for 6 weeks

Elewski et al. Fungal Infections. In Dermatology. 2016; pg 1329-1340

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

- Mild- Topical Luliconazole 1% BD for 4-6 weeks
- Extensive- Oral Itraconazole 100 mg BD for 4 weeks + Topical Luliconazole 1% BD for 6 weeks

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 ne 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

Elewski et al. Fungal Infections. In Dermatology. 2016; pg 1329-1340

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

Elewski et al. Fungal Infections. In Dermatology. 2016; pg 1329-1340

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

- Few lesions: Shampoo ketoconazole 2% daily for 4 weeks
- Extensive lesions/frequent recurrences: Tablet fluconazole 400mg oral stat and repeat after 1 week + topical adjuvant

Flexural candidiasis (candida intertrigo)

Clinical Features

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

Diagnosis

- KOH mount: budding yeast and pseudohyphae

Treatment

- Tablet fluconazole 150 mg oral stat and repeat after 1 week + topical adjuvant (cream clotrimazole)

Elewski et al. Fungal Infections. In Dermatology. 2016; pg 1329-1340

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 thrice daily
- Recurrent: Fluconazole 150 mg orally stat, repeat after 1 week + Clotrimazole mouth paint for local application thrice daily

Genital candidiasis

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

Diagnosis
- KOH mount: budding yeast and pseudohyphae

Treatment
- Tablet fluconazole 150 mg oral stat

Elewski et al. Fungal Infections. In Dermatology. 2016; pg 1329-1340

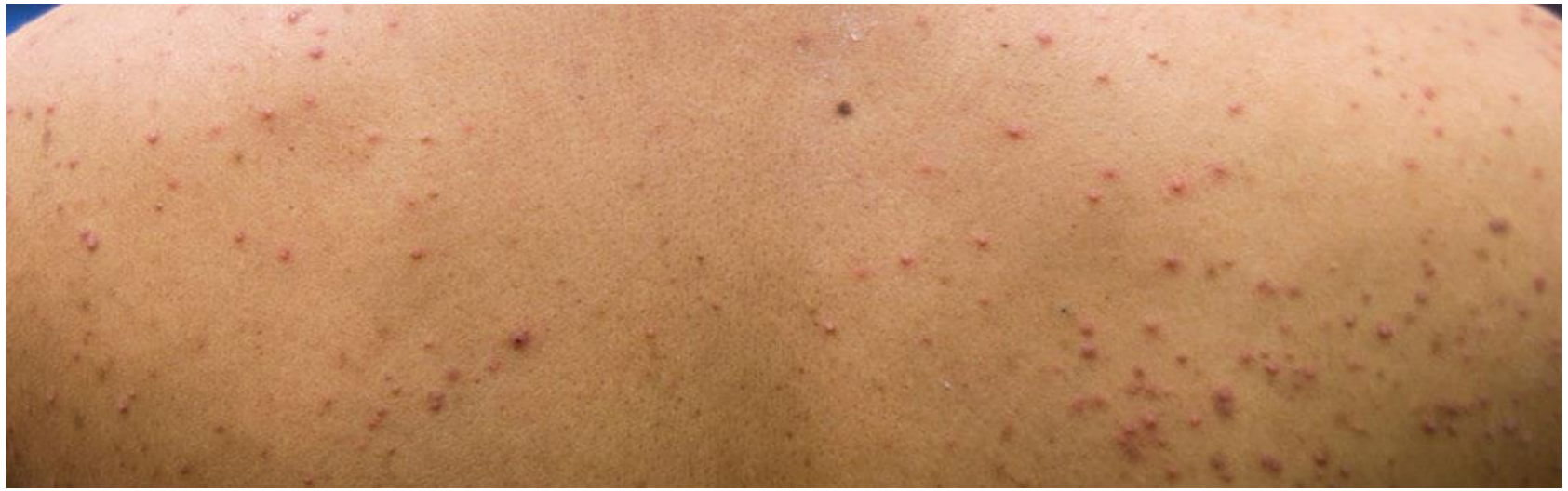
Right Diagnosis & Treatment - Fungal Folliculitis

RIGHT DIAGNOSIS

- Multiple pruritic monomorphic papules and pustules on back, shoulders, chest
- KOH examination – fungal hyphae, yeast forms can be seen

RIGHT TREATMENT

- Oral itraconazole 200mg X 7days (Malassezia infection)
- Oral itraconazole 100mg twice daily X 2-3weeks (dermatophytosis, candidal)



Elewski et al. Fungal Infections. In Dermatology. 2016; pg 1329-1340

Right Diagnosis & Treatment - Bacterial Folliculitis

RIGHT DIAGNOSIS

- Follicular based papules or pustules
- H/o acute eruption of lesions after a hot tub bath – pseudomonas infection
- Recent prolonged intake of antibiotics (eg. For acne) – gram negative folliculitis
- Limited to scalp/face – Staph aureus
- Gram stain and culture of contents (pus)– yield the causative organism

RIGHT TREATMENT

- 1st line agents
  - Topical mupirocin 2% twice daily for 5-7 days/ Topical clindamycin/ Topical fusidic acid 2%
- Extensive skin involvement (7-10 days course of oral antibiotics)
  - Dicloxacillin 250-500 mg four times a day
  - Cephalexin 250-500 mgfour times a day
- Suspected/ cultured MRSA infection (7-10 days course of oral agents)
  - Trimethoprim/sulphamethoxazole
  - Clindamycin 300 mg four times daily
  - Doxycycline 100 mg twice daily
- Gram negative folliculitis
  - Resolves spontaneously in 7-10 days
  - Severe cases – oral ciprofloxacin 250-750 mg twice daily

Samner L. Bacterial Infections. In Dermatology.2016; pg: 1269-1290

Right Diagnosis & Treatment - Impetigo

Types

Non- Bullous Impetigo-
Papules, vesicles, pustules that breakdown to form golden crusts

Bullous Impetigo-
Flaccid large bullae – rupture to form thin brown crusts

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

Medication	Adult dose	Child dose
Preferred-		
Cephalexin or	250 to 500 mg four times per day	25 to 50 mg/kg per day in three to four divided doses
Dicloxacillin	250 to 500 mg four times per day	25 to 50 mg/kg per day in four divided doses
If MRSA is suspected or confirmed		
Clindamycin or	300 to 450 mg four times per day	20mg/kg per day in three divided doses
Trimethoprim-sulfamethoxazole or	1 to 2 double strength tablets twice per day	8 to 12 mg/kg (trimethoprim) per day in two divided doses
Doxycycline	100 mg twice per day	2 to 4 mg/kg per day in two divided doses

Samner L. Bacterial Infections. In Dermatology.2016; pg: 1269-1290

Spontaneous Bacterial Peritonitis
Right Diagnosis and Right Treatment

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 or 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:** 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.

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

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

Right Diagnosis & Treatment - Enteric Fever

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
   - 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)

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

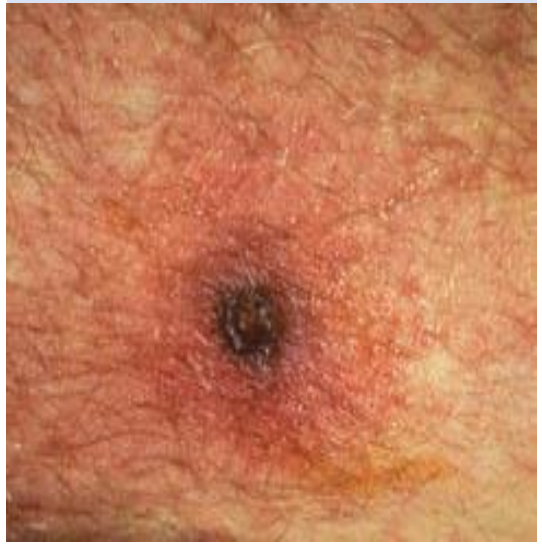
Right Diagnosis & Treatment - Scrub Typhus

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%)

RIGHT TREATMENT:

- Doxycycline 100mg BD for 7-14 days (except pregnancy)
- In pregnancy- Azithromycin 500mg OD for 5 days
- Along with supportive measures for organ failures.



Singh OB, et al. Scrub Typhus. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan

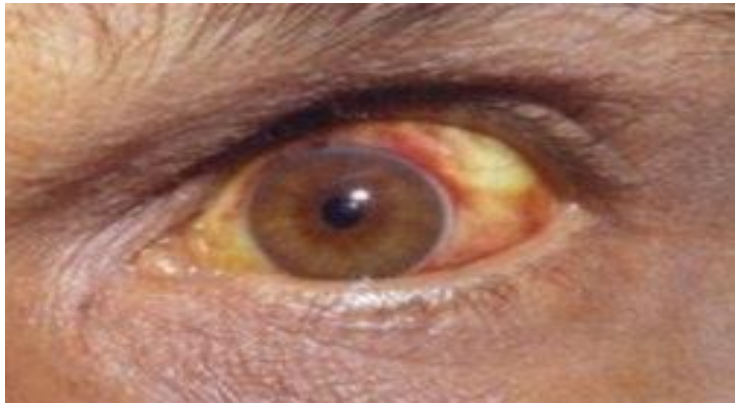
Right Diagnosis & Treatment - Leptospirosis

- **RIGHT DIAGNOSIS**
- It occurs due to infection with bacteria of the Leptospira species which is transmitted to humans 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.
- It may cause mild disease- a flu-like illness with fever, chills, myalgia, headache, nausea, vomiting, abdominal pain, and conjunctival suffusion. Usually resolves within 7-10 days.
- Often the infection can present a severe form which includes multiorgan failure: severe bleeding (pulmonary hemorrhage, GI bleeding, etc), AKI, jaundice, shock, etc. Case fatality in such cases is as high as 50%.
- The infection can be identified in the initial febrile phase by PCR testing of blood. Serology is useful after day 7 of illness and the 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

- **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).
- *Falciparum malaria*: Tab Artesunate 4mg/kg OD for 3 days ;with Tab sufadoxine (25mg/kg)-Pyrimethamine (1.25mg/kg) as single dose; with Tab Primaquine 0.75mg/kg single dose on day 2 (G6PD not required)
- ***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:***
- In 1st trimester- Tab Quinine 650mg TDS + Tab Clindamycin 600mg TDS for 7 days
- In 2nd and 3rd trimester- ACT as above
- Vivax/ Ovale to be treated with Chloroquine in all trimesters

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

Right Diagnosis of URTI

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

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

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

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 Treatment (Empirical) of URTI

Acute Rhinosinusitis:

- Antibiotic treatment indicated if symptoms persist for >7 days-
  - Amoxicillin + 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:

- 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:-

- 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 – Urinary Tract Infection

DIAGNOSTIC TOOLS:

- History
- Urine Dipstick - Leukocyte esterase (pyuria) and Nitrite (Enterobacteriaceae)
- Urine R/M - 3 or more Pus cells/HPF in unspun voided midstream urine)
- Urine Culture -$\geq 10^5$ CFU/ml
- Imaging

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

Acute uncomplicated Cystitis- Dysuria/Frequency/ Urgency/ Haematuria in non pregnant healthy women

Complicated Pyelonephritis - fever/rigors/N&V, flank or loin pain. High Spiking Picket Fence Fever which resolves over 72 hrs

Dysuria, frequency, urgency in men- Rule out prostatitis, genitourinary pain, pelvic pain

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

Right Treatment – Urinary Tract Infection

Acute Uncomplicated UTI

- 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
- Pivmecillinam 400 mg bid x 5 days

Acute Pyelonephritis

- Ciprofloxacin 500 mg PO BD or Levofloxacin 750 mg PO OD for 5-7 days.
- Piperacillin-Tazobactam 3.375 g IV QID for 5-10 days
- Meropenem 1 gm IV every 8 hrs over 8 hrs for 5-10 days

Pregnancy and UTI

- Nitrofurantoin 100 mg PO BD for 5-7 days (for cystitis)
- 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)

Acute/Chronic bacterial prostatitis

Tab Ciprofloxacin 500 mg PO BD or Tab Levofloxacin 750 mg OD for upto 6 weeks

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

OPAT (Outpatient parenteral antimicrobial therapy)

Rational (Educate)

- OPAT is defined as administration of intravenous antimicrobial therapy on at least two separate days without hospital admission
- It has become standard of care for management of infective conditions like infective endocarditis, osteomyelitis, prosthetic joint infections, skin and soft tissue infections.
- It reduces hospital stay, hospital associated infection, and cost-effective

Patient with infection warranting antimicrobial therapy

YES

Does the patient require intravenous antimicrobial therapy?

YES — NO → Give oral Rx

Does the patient meet OPAT criteria? (All to be ticked as satisfied)

- ❑ Patient party does not require hospitalization for any intervention
- ❑ Patient party is vitally stable or clinically improved to a state of discharge
- ❑ Patient party is capable of safe & effective IV/IM drug administration
- ❑ Therapeutic monitoring is feasible over phone/OPD basis
- ❑ Drug storage is feasible with patient party
- ❑ Patient party is willing to start & did participated in a sharing decision resulting a signed (patient & doctor) page of this

YES

Initiate OPAT

When to stop OPAT (Explain):

- ✓ Any adverse reaction or drug reaction
- ✓ Catheter related thrombosis and infections like local site pain and swelling, fever with chills and rigor
- ✓ After completion of the duration of therapy
- ✓ Desired commitment is not possible by the Patient party

Document

Demonstrate

Practice

Articulate

What OPAT criteria fulfilled in patient file including in discharge slip

How to attach the antimicrobial infusion to the IV catheter and deliver the antimicrobial

How to conduct sterile technique to reduce catheter-related thrombosis and infection

The signs of potential problems associated OPAT as above along with whom to contact when OPAT to be stopped

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.
Rucker RW, Harrison GM. Outpatient intravenous medications in the management of cystic fibrosis. Pediatrics. 1974;54:358–360.

All India Institute of Medical Sciences (AIIMS) Rishikesh

"World Antimicrobial Awareness Week" Celebration

18 - 24 November 2022

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

Program Schedules

Theme
Preventing Antimicrobial Resistance Together

18.11.2022	Workshop on 'One health Approach towards Integrated Antimicrobial Stewardship (IAS) Practices' to create TOT	Hospital premises/Virtual
19.11.2022	Walkathon for awareness regarding Antimicrobial resistance	Aastha Path
19.11.2022	Adult vaccination for HCWs – a massive drive assessment-cum-awareness	Hospital premises/Virtual
20.11.2022	Community IAS awareness among various PHC under AIIMS Rishikesh	As per selection
21.11.2022	Role play by Students (Medical and Nursing) on WAAW 2022 theme and Pharmacovigilance awareness of HCWs	Hospital premises/Virtual
22.11.2022	Ice break sessions with ground working Nurses/residents/faculties to set-up bedside IAS stewardship	Various hospital wards and ICUs
23.11.2022	Ideal IAS ward identification and award to IAS champion of block B, C and D areas	As per selection
24.11.2022	Round table meeting with community Nursing prescribers (CHO) and Pharmacists (inhouse and community) to set-up Pharmacy IAS stewardship	Hospital Premises and online

Venue: Virtual, AIIMS Rishikesh, and Community area

Organizer: Dept of Medicine and Nursing College (+ other Dept)

1) Antimicrobial is running out: save it
2) Antimicrobial can be saved: Do not take without order of a doctor
3) Antimicrobial resistance is increasing: acknowledge it
4) Resistance can be curtailed: Do not use where not indicated like viral infection, Do not under use antimicrobials, Do not use leftover antibiotics
5) Best method to save Antimicrobial and curtailed Resistance: Use of Hand hygiene, Cough hygiene, Effective waste treatment, and timely Vaccination

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Resolutions

Theme
Preventing Antimicrobial Resistance Together

Committed HCW	10 Targets to achieve by next year
Clinician	1. Disease specific updated guidelines including sepsis and OPAT guideline 2. Pre-authorization to Reserve antimicrobials by departments
Microbiologist	1. 'MDR isolation and control' by reporting MDR list to concerned faculty on daily basis 2. 'Pathogen/non-pathogen Comments' in daily reporting
Pharmacist/pharmacologist	1. 'Documenting indication of antimicrobial' while indenting in e-pharmacy 2. 'Antimicrobial ADR/SAE reporting' awareness
Nurse	1. 'IV antimicrobials to oral switch' discussion documenting in nurse note 2. Reminder for 'Antimicrobials timeout' after each 5days of therapy in nurse note
Public/ Community	1. 'Integrated Stewardship awareness involving Community Health Officers and Pharmacists' 2. 'Adult vaccination awareness of HCWs'

Venue: Virtual, AIIMS Rishikesh, and Community area

Organizer: Dept of Medicine and Nursing College (+ other Dept)