

ANTIBIOTIC USE CLINICAL PROTOCOL

INFECTIONS

1. PULMONARY

1.1. Effusion/Empyema

Classification and Treatment Scheme for Parapneumonic Effusions and Empyema ^{*} _{*}

Table 1 Classification and Treatment Scheme for Parapneumonic Effusions and Empyema [*] _*	
Class 1	Small
Nonsignificant	<10 mm thick on decubitus x-ray
Parapneumonic effusion	No thoracentesis indicated
Class 2	>10 mm thick
Typical	Glucose >40 mg/dL, pH>7.20
Parapneumonic effusion	Gram stain and culture negative Antibiotics alone
Class 3 Borderline complicated	7.00<pH<7.20 and/or LDH>1,000 and glucose>40 mg/dL
Parapneumonic effusion	Gram stain and culture negative Antibiotics plus serial thoracentesis
Class 4	pH <7.00 and/or glucose <40 mg/dL and/or
Simple complicated	Gram stain or culture positive
Not loculated not frank pus	
Parapneumonic effusion	Tube thoracostomy plus antibiotics
Class 5	pH <7.00 and/or glucose <40 mg/dL and/or
Complex complicated	Gram stain or culture positive
Multiloculated	
Parapneumonic effusion	Tube thoracostomy plus thrombolytics (Rarely require thoracoscopy or decortication)
Class 6	Frank pus present
Simple empyema	Single locule or free flowing Tube thoracostomy decortication
Class 7	Frank pus present Multiple locules
Complex empyema	Tube thoracostomy+thrombolytics of Ten require thoracoscopy or decortication

For empirical treatment, use pneumonia treatment protocol ⁽¹⁾, then follow culture-guided treatment

1.2. Aspiration pneumonia

Length of treatment – 5 days

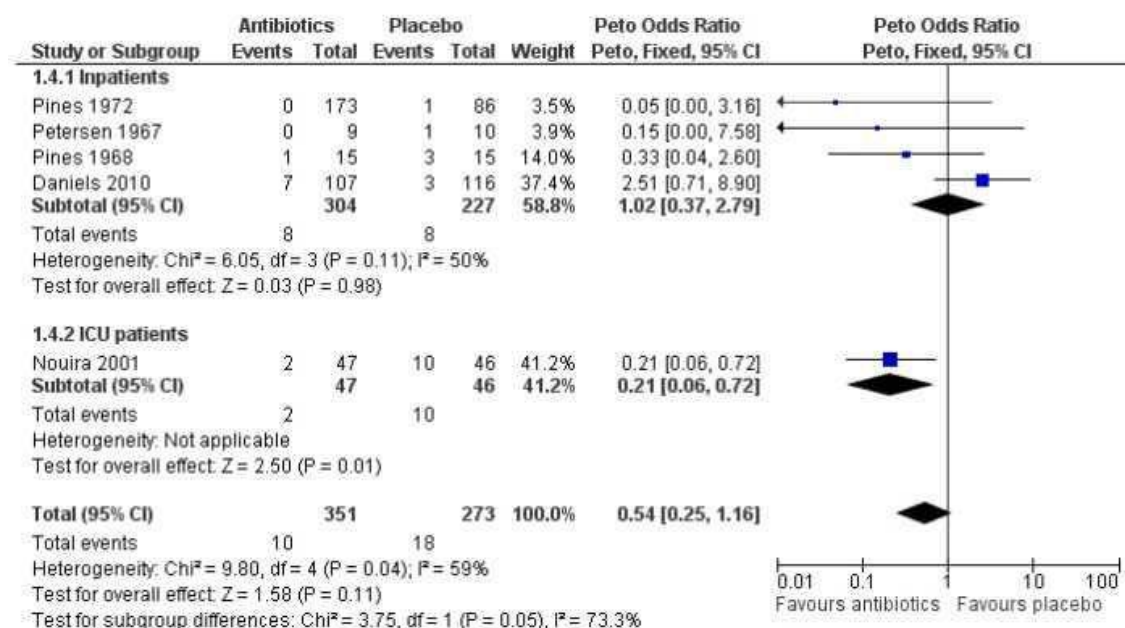
CLINDAMYCIN 600mg (IV)

Interval: q6h ⁽²⁾

1.3. COPD exacerbation

Length of treatment – 5 days

* Antibiotic is not indicated for COPD exacerbation, only for ICU or severe patients.



1.3.1. ICU or severe patients

Mild or Moderate (less than 3 exacerbations per year; recent antibiotic use)

AMOXICILLIN/CLAVULANATE 500/125mg (PO)

Interval: q8h

Severe (more than 3 exacerbations/year; recent antibiotic use; corticosteroid use)

CEFTRIAXONE 1000mg (IV)

Interval: q24h ^(3, 4)

1.4. Cystic Fibrosis Exacerbation

AMIKACIN 15mg/kg (IV)

Interval: q24h

+

CEFTAZIDIME 1000mg (IV)

Interval: q8h

OR

LEPOFLOXACIN 500mg (IV)

Interval: q12h

+

CEFTAZIDIME 1000mg (IV)

Interval: q8h

1.5. Lung abscess

Length of treatment - at least 14 days

CLINDAMYCIN 600mg (IV)

Interval: q6h

OR

AMOXICILLIN/CLAVULANATE 500/125mg (PO)

Interval: q8h

1.6. Hospital pneumonia

IMPORTANT

- Patient on antibiotic who has the possibility to change to per oral formulation. If stable, without clinical signs of SIRS, afebrile for 48 hours and with possibility of oral ingestion, consider switching to the same or equivalent spectrum oral drug according to guidelines.

- Tracheobronchitis associated to mechanical ventilation has no indication for treatment with antibiotics.

Early without risk factors (less than 7 days)

Length of treatment - 5 days

AMOXICILLIN/CLAVULANATE 500/150mg (PO)

Interval: q8h

OR

LEVOFLOXACIN 500mg (PO)

Interval: q24h

Late (more than 7 days) not associated with mechanical ventilation

Length of treatment - 5 days

LEPOFLOXACIN 500mg (IV)

Interval: q24h

Associated with mechanical ventilation (less than 5 days)

Length of treatment - 5 to 7 days

LEPOFLOXACIN 500 mg (IV)

Interval: q24h

Associated with mechanical ventilation (more than 5 days)

Length of treatment - 5 to 7 days

AMIKACIN 15mg/kg (IV)

Interval: q24h

SULFAMETOXAZOLE/TRIMETOPRIM 1440mg (IV)

Interval: q12h

1.7. Community pneumonia

Define Severity (CURB-65)

- 0 and 1 - Consider home treatment
- 1 - Consider hospitalization

Laboratory Tests

Suggested Routine Tests: Blood Count, Creatinine, Urea, Electrolytes, Arterial Blood Gas

If clinical improvement there is no indication to repeat laboratory tests.

Chest X-ray

When to repeat chest x-ray? After 6 weeks if symptoms continue or clinical worsening.

Microbiological tests

Blood culture if signs of sepsis. Sputum or bronchoalveolar lavage if no response to empirical treatment.

Thoracentesis for all patients with puncturable pleural effusion.

Prophylaxis

Consider pneumococcal vaccine for selected patients (see below).

Indications for pneumococcal vaccine:

- HIV/AIDS.
- Removed spleen and related diseases.
- Chronic lung diseases, except intermittent or mild persistent asthma.
- Moderate or severe persistent asthma.
- Chronic heart disease.
- Chronic kidney diseases/hemodialysis/nephrotic syndrome.

- Solid organs or hematopoietic stem cells (bone marrow) transplantation.
- Immunodeficiency due to cancer or therapeutic immunosuppression.
- Diabetes mellitus.
- Cerebrospinal fluid fistula.
- Cystic fibrosis (mucoviscidosis).
- Disabling chronic neurological diseases.
- Cochlear Implant.
- Trisomies.
- Congenital immunodeficiencies.
- Chronic liver diseases.
- Deposit diseases ⁽⁵⁾.

TREATMENT

LOW SEVERITY INPATIENT (CURB 0-1)

AMOXICILLIN 500 MG (PO) - 5 days

Interval: q8h

MODERATE SEVERITY INPATIENT (CURB 2)

AMOXICILLIN/CLAVULANATE 500/125MG (PO) - 5 days

Interval: q8h

+

AZITHROMYCIN 500mg (PO) - 3 days

Interval: q24h

HIGH SEVERITY INPATIENT (CURB > 2)

CEFTRIAZONE 1G (IV) - 5 days

Interval: q24h

+

AZITHROMYCIN 500mg (PO) - 3 days

Interval: q24h

SEQUENTIAL THERAPY – ORAL SWITCH

Patient on antibiotic who has the possibility to change to per oral formulation. If stable, without clinical signs of SIRS, afebrile for 48 hours and with possibility of oral ingestion, consider switching to the same or equivalent spectrum oral drug according to guidelines.

ALTERNATIVE (ALLERGY OR ADVERSE REACTION)

LEVOFLOXACIN 500mg (PO OR IV) - 5 days

Interval: q24h

2. CENTRAL NERVOUS SYSTEM

2.1. Cerebrospinal fluid collection

Required amount of CSF to be collected according to exams:

Culture + Bacterioscopy + Routine = 3mL

PCR = 2mL

Lacen = 1mL

HC = 1mL

Total = 7mL

* If further tests other than those mentioned above are required, it is necessary to forward to the laboratory another aliquot of at least 5mL.

2.2. Brain abscess

Length of treatment - approximately 6 weeks, varying according to surgical approach, size, amount and evolution. Discuss case with infectious disease physician.

Contiguous or hematogenous.

CEFTRIAXONE 2000mg (IV)

Interval: q12h

+

METRONIDAZOLE 1500mg (IV)

Interval: q24h

Post-surgery

CEFEPIME 2000mg (IV)

Interval: q8h

+

VANCOMYCIN 20mg/kg (IV) - LOADING DOSE: 40mg/kg

Interval: q12

2.3. Hospital Meningitis / Ventriculitis

Length of treatment - 7 to 14 days according to etiology and severity.

CEFEPIME 2000mg (IV)

Interval: q8h

+

VANCOMYCIN 4g in 1000mL 5% glucose solution (IV). Loading dose: 40mg/kg

Interval: 42mL/h in continuous infusion pump.

Notes

1. Ventricular drains withdrawal or exchange;
2. If positive culture, associate intrathecal treatment.

ANTIBIOTIC/INTRATHECAL DOSE

Amikacin 30mg

Gentamycin 8mg

Polymyxin 50,000UI

Vancomycin 20mg

2.4. Community Meningitis

Length of treatment - 7 to 14 days depending on etiology.

- Add dexamethasone 0.15mg/kg q6h.
- Risk factors for *Listeria sp.*: Age > 50 years; Immunosuppression (lymphoma, corticosteroid use...) - Add AMPICILLIN 1000mg (IV) q4h for 14 days.

CEFTRIAZONE 2000mg (IV)

Interval: q12h.

3. HEAD AND NECK

3.1. Abscess after dental procedure

Length of treatment - 10 days.

AMOXICILLIN/CLAVULANATE 500/125mg (PO)

Interval: q8h

OR

CEFTRIAZONE 1G

Interval: q24h

+

METRONIDAZOLE 1G

Interval: q24h.

3.2. Chronic Mastoiditis

Length of treatment - 28 days.

NOTE: Surgical drainage for treatment and identification of infectious agent are necessary.

AMOXICILLIN/CLAVULANATE 500/125mg (PO)

Interval: q8h.

OR

AMPICILLIN/SULBACTAM 2000/1000mg (IV)

Interval: q12h.

3.3. Bacterial parotitis

Length of treatment - 10 days.

AMOXICILLIN/CLAVULANATE 500/125mg (PO)

Interval: q8h.

OR

AMPICILLIN/SULBACTAM 2000/1000mg (IV)

Interval: q12h.

3.4. Retropharyngeal Space

Length of treatment - 14 days.

CEFTRIAZONE 2000mg (IV)

Interval: q24h

+

METRONIDAZOLE 1500mg (IV)

Interval: q24h.

OR

AMPICILLIN/SULBACTAM 2000/1000mg (IV)

Interval: q12h.

3.5 External otitis

Length of treatment - 28 days.

CIPROFLOXACIN 500mg (PO)

Interval: q8h.

OR

CEFTAZIDIME 1000mg (IV).

Interval: q8h.

4. CARDIOVASCULAR

4.1. Endocarditis

Length of treatment: 14 to 42 days according to etiology.

Native valve or late prosthetic valve (> 12 months)

AMPICILLIN/SULBACTAM 2000/1000 mg (IV)

Interval: q6h.

*** The addition of GENTAMICIN 80mg (IV) every 08 hours is controversial when no etiological agent is identified.**

Early prosthetic valve (<12 months)

VANCOMYCIN 20mg/kg (IV) – Loading dose: 40mg/kg.

Interval: q12h

+

RIFAMPICIN 300mg (PO)

Interval: q8h

+

GENTAMICIN 80mg (IV) - 3 to 5 days

Interval: q8h.

OR

DAPTOMYCIN 8mg/kg (IV)

Interval: 24h

+

RIFAMPICIN 300mg (PO)

Interval: q8h.

5. INVASIVE MEDICAL DEVICES

5.1. Central venous catheter

Short-term central venous catheter

Length of treatment - According to etiology

- Negative blood culture or Gram-negative bacilli = 7 days.
- Blood culture with non-aureus Staphylococci = 5 days.
- Blood culture with *Staphylococcus aureus* = 14 days.

Empirical Treatment:

VANCOMYCIN 20mg/kg (IV) – Loading dose: 40mg/kg.

Interval: q12h.

+

CEFEPIME 1000mg (IV)

Interval: q8h.

Culture for tunnel infection or entry site procedures:

- A. Collect the secretion with an inoculation loop or swab.

Culture for central venous catheter-related bloodstream infection procedures:

- If maintaining the catheter
 - a. Collect two peripheral blood samples. Contact infectious disease physician for differentiated conduct (collection by CVC).
- If removing the catheter
 - b. Collect two peripheral blood sample and send catheter for culture.

* There is no indication to send catheter without suspected infection related to this site.

* Discordant culture of venous access from peripheral puncture will not be released except for *S. aureus*.

* If the blood culture is negative or if there is no blood culture collection within 5 days after catheter removal, it will be discarded.

Treatment by species:

Non-aureus Staphylococci (negative coagulase) - Remove catheter and treat for 5 days. If maintaining the catheter maintain treatment for 14 days.

Staphylococcus aureus - Remove catheter. Treatment for 14 days and request transesophageal echocardiogram.

Gram-Negative Bacilli - Remove catheter. Treatment for 7 Days.

Candida spp. - Remove catheter. Treatment for 14 days after first negative blood culture.

"Cost Saving Policy" in HUC

* Every catheter sent to the laboratory is stored in the refrigerator for up to 5 days. If there is no positive blood culture the catheter will be discarded. If positive blood culture, the catheter will be cultured, and the result will be released only if the same etiological agent identified in blood culture.

5.2 Pacemaker

Length of treatment – It varies after pacemaker removal.

* **Always remove the device.**

VANCOMYCIN 20mg/kg (IV) – Loading dose: 40mg/kg.

Interval: q12h ⁽⁷⁾.

5.3 Peritoneal Dialysis

Tunnel infection:

SULFAMETOXAZOLE/TRIMETOPRIM (PO)

Interval: According to renal function

Peritonitis:

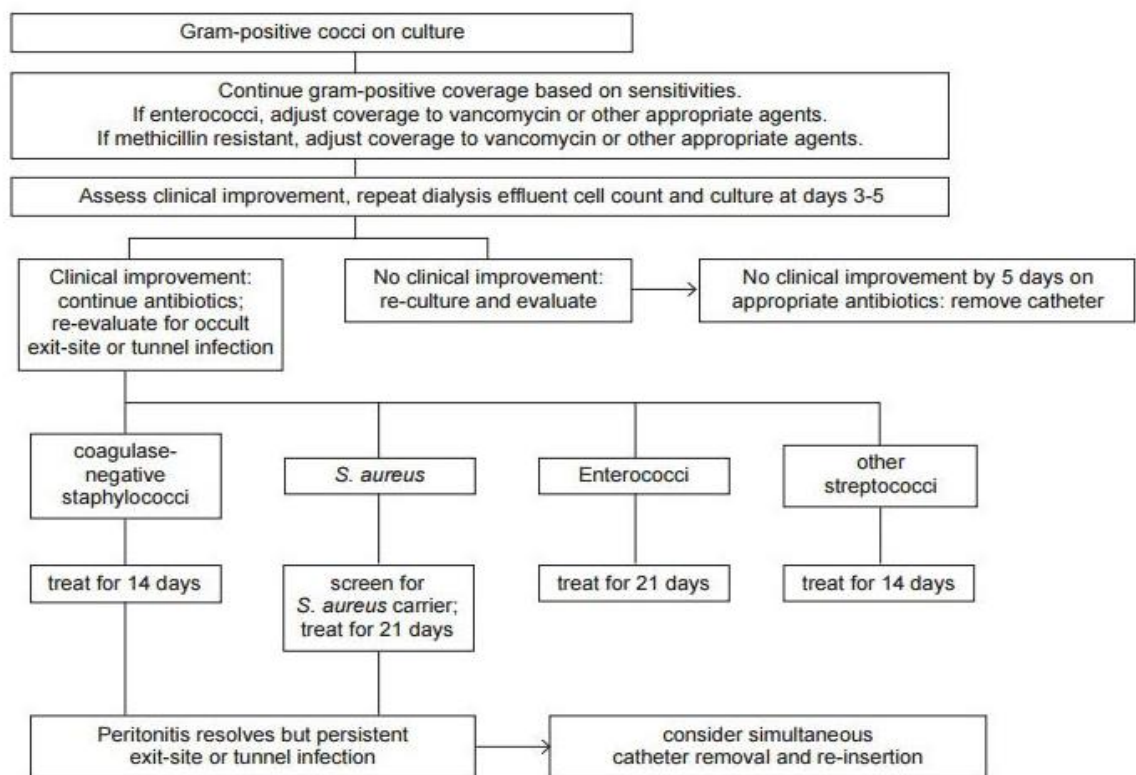
VANCOMYCIN (IP)

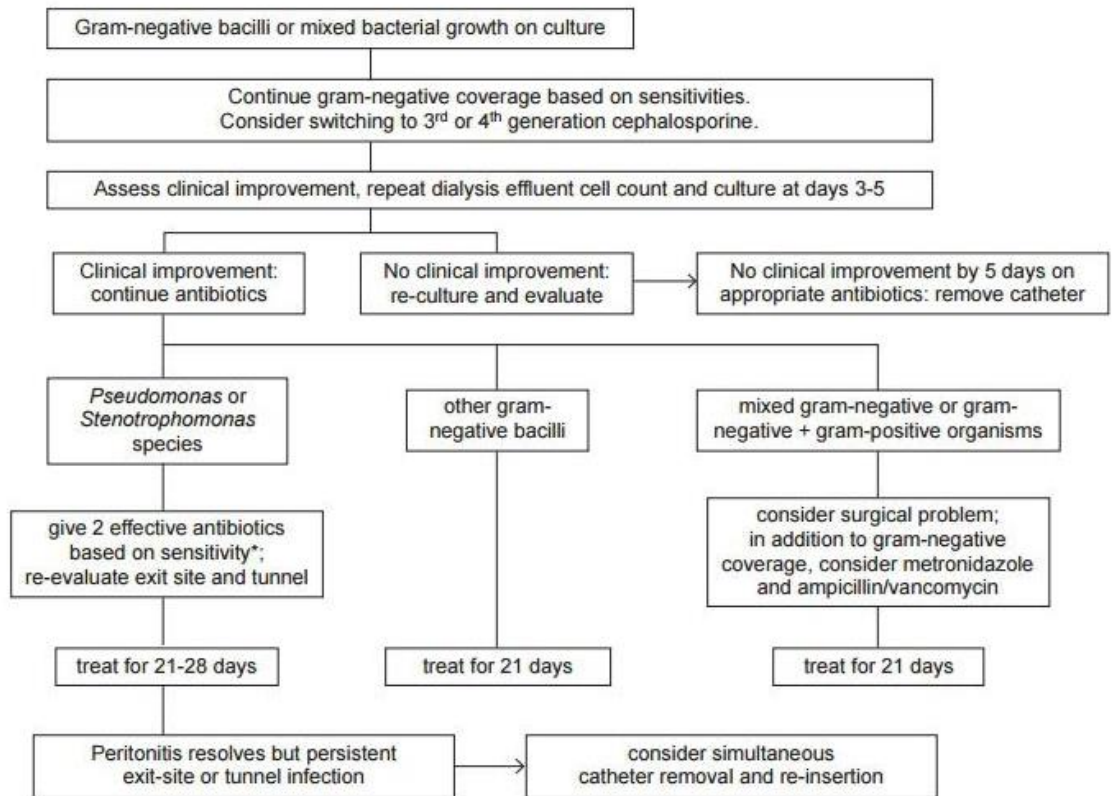
+

GENTAMICIN (IP)

Interval: 30 mg/kg every 5 to 7 days (VAN)* + 0.6 mg/kg/day (GEN).

Length of treatment: According to etiological agent.





6. GENITOURINARY

6.1 Pyelonephritis

Length of treatment - 7 to 10 days and switch to PO as soon as cultures results.

AMIKACIN 15MG/KG (IV)

Interval: q24h

OR

CEFTRIAZONE 1000mg (IV)

Interval: q24h ⁽⁸⁾

6.2 Acute prostatitis

Length of treatment - 21 to 28 days and switch to PO as soon as cultures results.

CEFTRIAZONE 1000mg (IV)

Interval: q24h

OR

LEVOFLOXACIN 500MG (IV)

Interval: q24h ^(9.10)

6.3 Urethritis

CIPROFLOXACIN 500mg (PO)

Interval: single dose

+

AZITHROMYCIN 1000mg (PO)

Interval: single dose

+

METRONIDAZOLE 1000mg (PO)

Interval: single dose.

OR

CEFTRIAXONE 250mg (IM)

Interval: single dose

+

Doxycycline 200mg (PO)

Interval: q24h (7 days)

+

METRONIDAZOLE 1000mg (PO)

Interval: single dose.

6.4 Orchiepididymitis

CIPROFLOXACIN 500mg (PO)

Interval: single dose

+

AZITHROMYCIN 1000mg (PO)

Interval: single dose.

OR

CEFTRIAXONE 1000mg (IV)

Interval: single dose

+

Doxycycline 200mg (PO)

Interval: q24h (10 days).

6.5 Endomyometritis and septic abortion

CEFTRIAXONE 1000mg (IV)

Interval: q24h

+

AZITHROMYCIN 1000mg (PO)

Interval: Single dose

+

METRONIDAZOLE 1500mg (IV)

Interval: q24h.

OR

AMPICILLIN/SULBACTAM 2000/1000mg (IV)

Interval: q12h

+

AZITHROMYCIN 1000mg (PO)

Interval: Single dose.

6.6 Pelvic inflammatory disease

Length of treatment - 7 to 14 days.

CEFTRIAXONE 1000mg (IV)

Interval: q24h

+

AZITHROMYCIN 1000mg (PO)

Interval: Single dose

+

METRONIDAZOLE 1500mg (IV)

Interval: q24h.

OR

AMPICILLIN/SULBACTAM 2000/1000mg (IV)

Interval: q12h

+

Doxycycline 200mg (PO)

Interval: q24h.

6.7 Hospital UTI

If a urinary catheter is present, the device must be removed. It reduces mortality. Urine sample collection after tube replacement.

Length of treatment - 5 days

GENTAMICIN 3mg/Kg (IV)

Interval: q24h.

6.8 Cystitis

Length of treatment - 1 to 5 days.

NITROFURANTOIN 100MG (PO)

Interval: q6h (5 days)

OR

SULFAMETHOXAZOLE/TRIMETHOPRIM 400/80MG (PO)

Interval: q12h (3 days) ⁽⁸⁾

7. Skin and Soft Tissues/Osteoarticular Infections

7.1. Celulitis

Length of treatment – 7 days

Vancomycin 1g (IV) q12h

Notes:

1. Consider hidrocortisone 100mg q8h to control inflammatory response
2. Do not use ciprofloxacin nor macrolides
3. Switch to Amoxiciclin/Clavulanate 500/125mg q8h PO after 48h
 1. Patient without SIRS
 2. Patient without nausea/emesis
 3. Therapeutical response

7.2 Necrotizing fasciitis

Length of treatment: 7 fays

Ceftriaxona 1g (IV) q 24h + Clindamycin 600mg (IV) q6h

Duração do tratamento – 7 dias

Notes: surgery with debridment

7.3. Animal bite

Length of treatment: 5 days

Ampicillin/Sulbactam 2/1g (IV) q12h

Notes

1. Switch to Amoxicillin/Clavulanate 500/125mg (PO) after 48h
2. Tetanus and Rabies vaccine according established criteria
3. Do not use cefalexin

Alternative treatment:

Clindamycin 600mg (IV) q 6h + Levofloxacin 500mg (IV) q24h

7.4 . Surgical wound infection

Length of treatment: 5-7 days

Notes

1. Wound debridment must be done in all cases with abcess drainage
2. If sepsis, drainage must be done until 6h of diagnosis
3. Switch to ciprofloxacin 500mg (PO) q12h + metronidazole 500mg (PO) q8h after 3 days IF possible oral intake

- Less than 48h from surgery: Clindamycin 600mg (IV) q8h
- Patient without SIRS nor Gastrointestinal surgery: Cefalexin 500mg (PO) q6h
- Patient without SIRS but with Gastrointestinal surgery: Amoxicillin/clavulanate 500/125mg (PO) q8h

- Patient with SIRS: Ceftriaxone 1g (IV) q24h + Metronidazole 400mg (IV) q8h (Metronidazole if gastrointestinal or genitourinary surgery)

- Patient with SEPSIS: Cefepime 1g (IV) q8h + Vancomycin 20mg/kg (IV) q12h + Metronidazole 400mg (IV). (Vancomycin loading dose 40mg/kg; Metronidazole if gastrointestinal or genitourinary surgery)

7.5. Arthritis

Length of treatment: 21 days.

Vancomycin 1g (IV) q12h

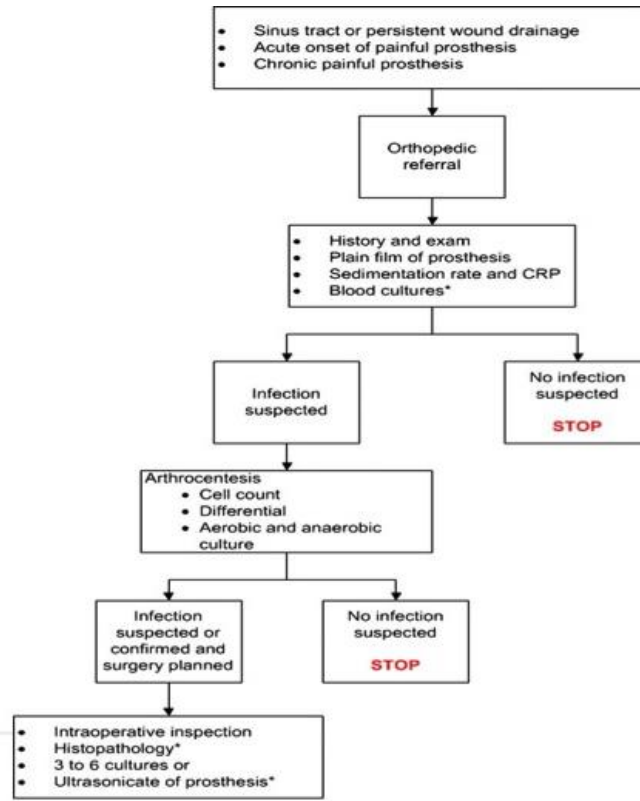
Note:

- Oral switch as soon as culture results available

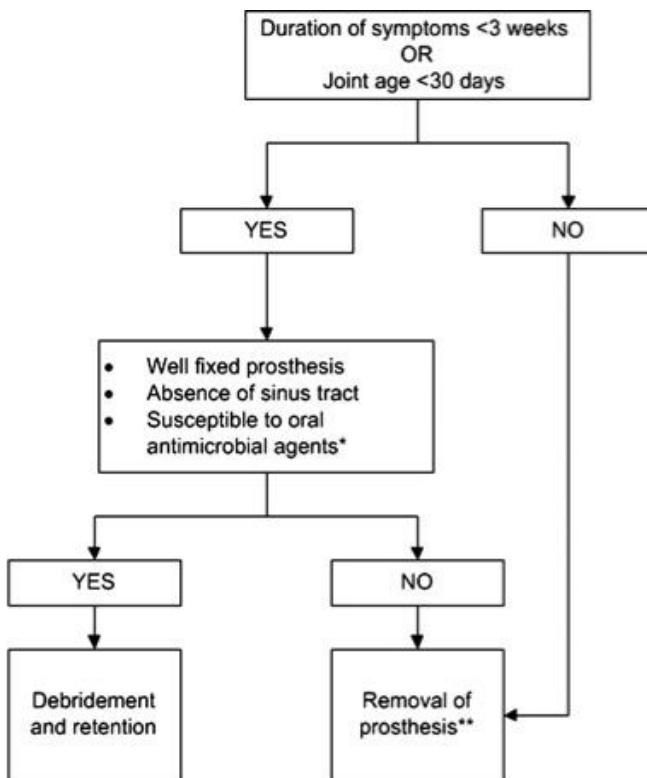
7.6. Prosthesis Joint Infection

Empirical treatment is not indicated.

Medical team must try to micro-organism identification with cultures: follow IDSA flowcharts bellow.



* see text for details, definitions



*Antimicrobial agents that are recommended for prolonged use for chronic suppression or treatment of biofilm bacteria (see text for details)

- The patient has:**
- THA
 - Good soft tissue
 - Identity of the organisms determined preoperatively
 - Good bone stock
 - Susceptible to oral agents with high oral bioavailability
 - Use of antibiotics impregnated bone cement for fixation
 - No bone grafting required

One-stage exchange*

- The patient has:**
- Poor soft tissue, OR
 - Difficult to treat micro-organisms, AND
 - No prior two-stage exchange for infection or prior two-stage exchange and reason for failure AND
 - Delayed reimplantation technically feasible, AND
 - Anticipated good functional outcome

YES

Two-stage exchange

NO

See Figure 4

*Uncommonly performed in the U.S.
**Relative indications see text

7.7 Osteomyelitis

Acute onset

Length of treatment: 21 days

Vancomycin 1g (IV) q12h

Oral switch as soon as cultures results available

Chronic onset

Empirical treatment is not indicated.

Medical team must try to micro-organism identification with cultures

7.8. Diabetic foot

Mild

Length of treatment – 7-14 days

Amoxicillin/Clavulante 500/125mg (PO) q8h

Moderate without previous antibiotic use

Length of treatment: 7-14 days

Sulfamethoxazole-trimethoprim 800/160mg (PO) q12h + Ciprofloxacin (PO) 500mg (PO) q12h

Moderate after antibiotic use OR Severe without previous antibiotic use

Length of treatment: 7-14 days

Levofloxacin 500mg (PO) q24h + Clindamycin 300mg (PO) q6h + Sulfamethoxazole-trimethoprim 800/160mg (PO) q8h

Severe after antibiotic use

Length of treatment: 7-14 days

Cefepime 1g (IV) q8h + Vancomycin 1000mg (IV) q12h

8. TRAUMA

8.1 Abdominal

Ceftriaxone 1g (IV) q 24h + Metronidazole 1500mg (IV) single dose

8.2 Thorax

Vancomycin 1g (IV) q12h

8.3. Orthopedical

Gustilo I & II

Cefazolin 2g (IV): single dose

Gustilo III

Clindamycin 600mg (IV) q6h for 72h

Do not associate aminoglycosides

9. GASTROINTESTINAL

9.1. Acute appendicitis

- Without perforation:

Ceftriaxone 1g (IV) single dose + Metronidazole 1500mg (IV) single dose

- **Perforation**

Maintain antibiotic for 24h after surgery

Ceftriaxone 1g (IV) q24h + Metronidazole 1500mg (IV) q24h

- **Diffuse peritonitis**

Maintain antibiotic for 96h after surgery (11,12)

Ceftriaxone 1g (IV) q24h + Metronidazole 1500mg (IV) q24h

Oral swith after 24h: Ciprofloxacin + Metronidazole

9.2. Acute diverticulitis

Length of treatment: 4-7 days

Mild:

Ciprofloxacin 500mg (PO) q12h + Metronidazole 500mg (PO) q8h

Moderate-Severe

Ceftriaxone 1g (IV) q24h + Metronidazole 1500mg (IV) q24h

Alternative treatment:

Ampicillin/Sulbactam 3g (IV) q 12h

9.3. Spontaneous peritonitis

Ceftriaxone 1000mg (IV) q24h

Alternative treatment

Ciprofloxacin 500mg (PO) q12h

9.4. Clostridium difficile

Length of treatment: 7-14 days

Mild-Moderate

Metronidazole 500mg (PO) q 8h

Alternative treatment

Vancomycin 125mg (PO) q6h

Severe

Vancomycin 125mg (PO) q6h

+

Metronidazole 1500mg (IV) q24h

Severe with paralytic ileus

Vancomycin 125mg (PO) q6h

+

Metronidazole 1500mg (IV) q24h

+

Vancomycin enema

9.5. Secondary peritonitis

Ceftriaxone 1g (IV) q24h + Metronidazole 1500mg (IV) q24h

Alternative treatment:

Ampicillin/Sulbactam 3g (IV) q 12h ⁽¹³⁾

Notes

1. Four days with antibiotics if performed surgical control (NEJM 2015)
2. Consider oral switch with equivalent spectrum if patient stable, without SIRS and afebrile for 48h. Possible option: ciprofloxacin + metronidazole

9.6. Bacterial gastroenteritis

Ciprofloxacin (PO) 3-5 days ⁽¹⁴⁾

Notes

*It's not routinely indicated antibiotic to infectious diarrhea

Except in severe immunocompromised with sanguinolent diarrhea OR *C. difficile* confirmed according hospital protocol.

9.7. Duodenal ulcer

Length of treatment: 10 days

Levofloxacin 500mg (PO) q24h +

Amoxicillin/Clavulanate 1g/125mg (PO) q12h +

Proton-pump inhibitor

9.8. Cholangitis & Cholecystitis

Ceftriaxone 1000mg (IV) q24h

Notes

- After surgical treatment with infection control and without complications: maintain antimicrobial treatment for 24h post surgery.
- There is no need to anaerobic antimicrobial spectrum, except if enteric fistula.
- In case of secondary peritonitis, extend antimicrobial treatment for more 3 days.
- In case of biliodigestive derivation, associate Metronidazole 1500mg q 24h (IV) ⁽¹⁵⁾

9.9. Necrotizing pancreatitis

Ceftriaxone 1g (IV) q24h + Metronidazole 1500mg (IV) q24h

9.10. Liver abscess

Length of treatment: usually 14 days after drainage procedure

Ceftriaxone 1g (IV) q24h + Metronidazole 1500mg (IV) q24h

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