NATIONAL ANTIBIOTIC GUIDELINES 2018

National Antibiotic Guidelines 2018

Department of Health
Manila, Philippines

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MESSAGE

The discovery of antibiotics, considered as "Miracle Drugs" in the 1920s revolutionized man's ability to treat many infectious diseases and save countless lives. However, with their misuse, an increasing number of microorganisms are now resistant to them, thus the emergence of antimicrobial resistance. This public health threat intensifies the risk of falling into more severe and prolonged illness leading to increased mortality and health care costs.

The *Philippine Action Plan to Combat AMR: One Health Approach* in 2015 has set a strategic direction towards preventing the spread and potential harm caused by AMR, unifying and linking all relevant sectors in the country, to strengthen the prudent use of antibiotics.

The Department of Health created the National Antibiotic Guidelines Committee (NAGCom), a body composed of infectious disease experts and other relevant fields to develop the *National Antibiotic Guidelines* (NAG). The guidelines aim to strengthen our program implementation on the rational use of antimicrobials. This contains the therapeutic recommendations for the common infectious diseases in the community setting and hospitals that will supplement the knowledge of our physicians on optimizing antibiotic treatment. The NAG will help improve quality of care in the country, improve patient outcomes and lower health care costs.

We all have a responsibility to protect our people from the threat of antimicrobial resistance. As we move to achieve the Philippine Health Agenda, let us harmonize our efforts in the pursuit of better health care system. Together, we can win the war against AMR!

FRANCISCO T. DUQUE III, MD, MSc
Secretary of Health

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ABBREVIATIONS AND ACRONYMS

ABECB	Acute bacterial exacerbation of chronic bronchitis
ABP	Acute bacterial prostatitis
ABRS	Acute bacterial rhinosinusitis
ABSSSI	Acute bacterial skin and skin structure infections
AL	Artemether-lumefantrine
ALT	Alanine aminotransferase
AOM	Acute otitis media
ARSP	Antimicrobial Resistance Surveillance Program
ART	Antiretroviral therapy
AS	Artesunate
ASB	Asymptomatic bacteriuria
AUC	Acute uncomplicated cystitis
BMI	Body mass index
BUN	Blood urea nitrogen
CAMRSA	Community-associated MRSA
CAP	Community-acquired pneumonia
CBP	Chronic bacterial prostatitis
CHD	Congenital heart disease
CMV	Cytomegalovirus
CNS	Central nervous system
CRP	C-reactive protein
CRS	Chronic rhinosinusitis
CSF	Cerebrospinal fluid
CSOM	Chronic suppurative otitis media
CT	Computed tomography
CVC	Central venous catheter
CVS	Cardiovascular system
DAIR	Debridement and retention of prosthesis
DEC	Diethylcarbamazine
DFI	Diabetic foot infections
EIA	Enzyme immunoassay
ELISA	Enzyme-linked immunosorbent assay
ENT	Ears, nose and throat
EPTB	Extra pulmonary tuberculosis
ESBL	Extended spectrum beta-lactamase
ESR	Erythrocyte sedimentation rate
ETEC	Entero-toxigenic *Escherichia coli*
FDC	Fixed dose combination
FQ	Fluoroquinolone
FTA-ABS	Fluorescent treponemal antibody absorption test
GIT	Gastro-intestinal tract
GABHS	Group A Beta-hemolytic Streptococci

GAS	Group A Streptococcus
GCSF	Granulocyte colony stimulating factor
GNB	Gram-negative bacteria
GUT	Genitourinary tract
HACEK	*Haemophilus sp., Aggregatibacter sp., Cardiobacterium hominis, Eikinella corrodens,* and *Kingella sp.*
HAI	Hospital-associated infections
HAP	Hospital-acquired pneumonia
HBIG	Hepatitis B Immunoglobulin
HBeAg	Hepatitis B envelope antigen
HBsAg	Hepatitis B surface antigen
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HR	Isoniazid + Rifampicin
HRZE/S	Isoniazid + Rifampicin + Pyrazinamide + Ethambutol/Streptomycin
HSV	Herpes simplex virus
HIV	Human immunodeficiency virus
ICT	Immunochromatographic test
IDSA	Infectious Diseases Society of America
IE	Infective Endocarditis
I & D	Incision and drainage
IRIS	Immune reconstitution inflammatory syndrome
ISPD	International Society for Peritoneal Dialysis
LBW	Low birth weight
LP	Lumbar puncture
MAP	Mean arterial pressure
MDR-TB	Multipledrug resistant tuberculosis
MDT	Multidrug therapy
MIC	Minimum inhibitory concentration
MMR	Mumps, Measles, Rubella
MRI	Magnetic resonance imaging
MSSA	Methicillin-susceptible *Staphylococcus aureus*
MRSA	Methicillin-resistant *Staphylococcus aureus*
MTB	Mycobacterium tuberculosis
NAAT	Nucleic acid amplification testing
NBE	Nocturnal blood examinations
NT	Neutralization test
OC	Oral contraceptive
OGTT	Oral glucose tolerance test
PANDAS	Pediatric Autoimmune Neuropsychiatric Disorder Associated with Group A Streptococcus Infections
PCAP	Pediatric community acquired pneumonia
PCR	Polymerase chain reaction
PHN	Post-herpetic neuralgia

PICC	Peripherally inserted central catheter
PID	Pelvic Inflammatory Disease
PLHIV	People living with HIV
PMDT	Programmatic Management for Drug-resistant Tuberculosis
PT	Prothrombin time
PVL	Panton-Valentine leukocidin
PWID	People who inject drugs
RHD	Rheumatic Heart Disease
RPR	Rapid plasma reagin
RSV	Respiratory syncytial virus
SIRS	Systemic inflammatory response syndrome
SLDs	Second line drugs
SLE	Systemic Lupus Erythematosus
SOFA	Sequential organ failure assessment
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infections
TALF	Treatment after lost to follow up
TB	Tuberculosis
TMP-SMX	Trimethoprim-sulfamethoxazole (Co-trimoxazole)
TCA	Trichloroacetic acid
TSS	Toxic shock syndrome
TEE	Transesophageal echo
TPHA	*Treponema pallidum* haemagglutination
TTE	Transthoracic echocardiogram
ULN	Upper limit of normal
UTI	Urinary tract infection
VAP	Ventilator-associated pneumonia
VDRL	Venereal Disease Research Laboratory
VP	Ventriculoperitoneal
VSD	Ventricular septal defect
VZIG	Varicella zoster immunoglobulin
VZV	Varicella zoster virus
WHO	World Health Organization

INTRODUCTION

The National Antimicrobial Stewardship (AMS) Program, an integral component of the Philippine Action Plan to Combat Antimicrobial Resistance (AMR), gives structure and direction to healthcare facilities to adopt a proactive multidisciplinary approach to promote rational antimicrobial use. One of the six core elements of AMS is the development and implementation of policies, guidelines and clinical pathways to improve antimicrobial prescribing and dispensing. Specifically, Core Element 2 states that "all hospitals shall adopt or adapt to their local context the **National Antibiotic Guidelines**" to optimize antimicrobial use and help improve the quality of patient care and patient safety. Armed with enhanced knowledge provided by the **Guidelines,** health practitioners at all levels of healthcare are then empowered to appropriately treat common infectious disease syndromes seen among children and adults (e.g. respiratory and urinary tract infections, diarrhea, skin and soft tissue infections, tuberculosis) as well as other diseases for which much irrational antibiotic use prevails in the country.

The challenging task of formulating the **Guidelines** was given by the Department of Health to the National Antibiotic Guidelines Committee (NAGCom), a multidisciplinary group of experts in the fields of infectious diseases, epidemiology, pharmacology and public health program management. It was decided from the outset that there would be no need to reinvent the wheel. Divided into subgroups, the NAGCom reviewed existing evidence-based local and international guidelines and relevant literature, with priority given to guidelines that utilized the GRADE (Grading of Recommendations Assessment, Development and Evaluation) system. Adaptations of available guidelines and treatment recommendations were made taking into consideration the latest national Antimicrobial Resistance Surveillance Program resistance rates, list of approved drugs in the National Formulary, quality of the evidence, balance of potential benefits and harm, cost-effectiveness, availability of diagnostic tests, feasibility and resource implications. Interim recommendations were discussed *en banc* and a consensus was usually reached. The interim guidelines were then sent to the specialty/subspecialty societies for their inputs prior to finalizing the **Guidelines**. Consultations with external technical experts and public health program implementers were also done as needed.

The **Guidelines** in this handbook contain treatment recommendations for infectious diseases grouped by organ systems and presented in a tabular format for ease of use. Brief descriptions of disease categories with their etiologic agents, corresponding antibiotic regimens (dose, route, frequency and duration) for pediatric and adult patients, relevant comments and key references are presented. A section on surgical prophylaxis, although not treatment-focused, has been added since antibiotic misuse to prevent surgical site infections also needs urgent attention. The regimens do not include adjustments for renal impairment and optimization strategies (e.g., extended intravenous infusion of beta-lactams). Such dose modifications may be accessed at https://www.medbox.org/antibiotic-guideline-2015-2016/download.pdf.

How should the **Guidelines** be used in health facilities? The AMS program stipulates that hospitals should have facility-specific antibiotic guidelines. Depending on local antibiotic susceptibilities, formulary options, costs, and available resources, the AMS Committee of a health facility can adopt or adapt portions of the **Guidelines.** There are several other ways by which the Guidelines, adopted or adapted, can be used in AMS including: creation of clinical pathways, development of educational modules (print and electronic) for healthcare professionals, implementation of point-of-care interventions (e.g. dose optimization, de-escalation), prospective audit and feedback, and performance evaluation.

The **Guidelines** are not intended to supersede a healthcare provider's sound clinical judgment. Variations in a patient's clinical presentation (such as presence of co-morbidities), patient's preferences and availability of resources may require judicious adaptation of the **Guidelines** by individual users.

General Principles of Antimicrobial Therapy

The fundamental questions to ask in anti-infective therapy are:

A. WHAT am I treating? *Microbiologic Factors*
B. WHO am I treating? *Host-related Factors*
C. WHICH antimicrobial/s is/are most appropriate? *Drug-related Factors*
D. HOW do I administer the appropriate antimicrobial/s? *Dosing Regimen*

A. Microbiologic Factors

The disease/clinical syndrome and the likely/proven pathogen(s) determine the choice of therapy. Thus, it is important to know the following:

- Site of infection – attain adequate concentration of the antibiotic at the site of infection;
- Severity of infection – obtain appropriate specimens to determine the pathogen because serious life-threatening infections e.g., sepsis, meningitis, endocarditis, etc. require early empiric therapy;
- Bacterial load (inoculum size), virulence, regrowth pattern and susceptibility pattern of the pathogen
- Infection at sequestered sites – some like nasopharyngeal carriage may not be reached by significant levels of the principal antibiotic being used;
- Prior antimicrobial therapy – exert selection pressure for microorganisms resistant to the antibiotic previously given to outgrow the rest of the microflora, invade and cause infection;
- Local factors – consider factors that may impair penetration of antibiotic into the affected area such as presence of pus, devitalized tissue, foreign body and pH changes.

B. Host-related Factors

The patient's demographic, clinical and behavioral characteristics influence the efficacy and toxicities of antimicrobials.

- Age – influences gastric acidity, renal function and hepatic function and propensity to develop hypersensitivity.
- Genetic factors – causes adverse reactions to specific antimicrobials, e.g., glucose-6-phosphate dehydrogenase deficiency leads to hemolytic anemia and jaundice with the administration of primaquine, sulfonamides, sulfones, nitrofurans, chloramphenicol, etc.; and aplastic anemia is an idiosyncratic reaction from chloramphenicol.
- Hepatic and renal function - determines ability of the patient to metabolize/inactivate or excrete the antimicrobial especially when high serum or tissue levels are potentially toxic.
- Pregnancy and nursing status (Refer to Pregnancy Risk Categories by the US FDA)
- Host defense mechanism – both humoral and cellular; immunocompetent vs. immunocompromised host e.g., HIV infection, recipients of cytotoxic drugs, transplanted organs, burn patients, with vascular abnormalities, impaired localized phagocytosis, etc.
- Co-morbid conditions - HIV/AIDS, diabetes mellitus and other metabolic disorders, atopy, pre-existing organ dysfunction, obesity, etc.
- Previous history of adverse drug reactions – e.g., allergy, intolerance, etc.

C. Drug-related Factors

- Pharmacodynamics – "what the drug does to the pathogen and to the body" – antimicrobial spectrum; bacteriostatic vs. bactericidal; concentration-dependent vs. time-dependent bacterial killing.
- Pharmacokinetics – "what the body does to the drug" – includes the processes of absorption, distribution, biotransformation/metabolism, excretion; the relationship between the antimicrobial concentration at the site of action and the minimum inhibitory concentration for the pathogen is the major determinant of successful therapy; poor antimicrobial penetration of the blood-brain barrier, intraocular tissues and prostate, but increased with inflammation.
- Adverse effects – risk/benefit ratio.
- Drug interactions – may be pharmaceutical, pharmacodynamic or pharmacokinetic in nature.
- Cost/benefit ratio – consider the total cost of the regimen not only the unit cost of the drug.
- Others – ease and accuracy of dosing, stability and acceptability.

General Steps in Appropriate Antimicrobial Therapy

1. Formulate a clinical diagnosis of microbial infection.
2. Obtain appropriate specimen for laboratory exam when applicable.
3. Formulate a specific microbiologic diagnosis.
4. Determine the need for empiric therapy.
5. Institute pharmacologic treatment considering **microbial**, **host** and **drug factors** and using **efficacy**, **safety**, **suitability** and **cost** of the antimicrobial options in the selection process, and following the "**rules of right**".
6. Institute adjunctive and non-pharmacologic therapy.
7. Adjust antimicrobial regimen according to the isolated pathogen and its susceptibility pattern, correlated with the patient's clinical response (directed or targeted antimicrobial therapy). Sound clinical judgment/assessment remains the most important method to determine the efficacy of the treatment.

Antibiotic Combination Therapy

Antibiotic combinations provide a broader spectrum coverage than single agents; hence, the physician is often tempted to use a combination of 2 or more for the sense of security they provide. However, when inappropriately used, antibiotic combination can lead to deleterious effects.

Rationale for Antibiotic Combined Therapy

- Provide broad-spectrum empiric therapy in the initial therapy of critically ill patients and neutropenic patients with severe life-threatening infections, e.g. beta-lactam antibiotic plus aminoglycoside for sepsis in neonates.
- Treat polymicrobial infection (e.g., use of anti-aerobes and anti-anaerobes for intraabdominal abscess, diabetic foot infection; however, newer generation **Fluoroquinolones**, **Carbapenems**, or beta-lactam plus beta-lactamase inhibitor combinations can be employed as monotherapy).
- Prevent/delay emergence of resistance (e.g., diseases due to *Mycobacterium tuberculosis*, *M. leprae*, *Pseudomonas aeruginosa*, etc.).
- Decrease dose-related toxicity (e.g. flucytosine plus amphotericin B in cryptococcal meningitis).

- Obtain enhanced inhibition/killing (synergism) (e.g., penicillin plus aminoglycoside in enterococcal endocarditis and *Streptococcus viridans* endocarditis; sulfamethoxazole plus trimethoprim, etc.).

General Adverse Reactions to Chemotherapeutic Agents:

- Hypersensitivity reaction – ranges from mild skin rash to severe anaphylactic reactions; not dose-related.
- Idiosyncratic reaction – may be genetic in origin; not dose-related.
- Toxicity reactions – augmented reactions (dose-related); e.g., ototoxicity, hepatotoxicity, nephrotoxicity, neurotoxicity, etc.
- Biologic and metabolic reactions in the host (e.g., alteration of normal microflora; superinfections).
- Treatment failure/relapse.
- Masking effect.
- Adverse drug interactions with other drugs – e.g. metabolic enzyme inhibition or induction, protein binding displacement, etc.

Causes of Failure in Antimicrobial Therapy:

a. DRUG FACTORS such as wrong choice of antimicrobial, wrong dose, route, intervals and duration of administration; drug interactions; deterioration during storage.
b. HOST FACTORS such as poor host defense, inadequate absorption, distribution, impaired elimination, presence of foreign body, anatomic defects, etc.
c. MICROBIAL FACTORS such as wrong microbiologic diagnosis, drug resistance, superinfection, bacterial load, dual or mixed infection not detected, etc.

Misuse/Abuse of Antimicrobials:

- Use in untreatable (viral) infection.
- Empiric use on fever of undetermined origin.
- Complete reliance on chemotherapy with omission of surgical drainage and other non-pharmacologic therapy when necessary.
- Inappropriate chemoprophylaxis.
- Inappropriate antibiotic combination.
- Inappropriate choice of antibiotic dosage, route, intervals and duration of administration.
- Lack of appropriate bacteriologic information when indicated.
- Over-the-counter sale of antibiotics.
- Recycling antibiotic prescription and/or self-medication.
- Use of antimicrobials as growth promoters in farm animals, use in agriculture and aquaculture.

Factors that Lead to Inappropriate Use of Antimicrobials:

- Good intention – to give the best treatment without regard to spectrum of activity of the antibiotic and its cost.
- Inappropriate dosing – e.g. beliefs that higher doses or more prolonged administration is better.
- Inappropriate chemoprophylaxis – timing and duration of surgical prophylaxis and a variety of other prophylactic purposes in hospitalized patients, which are not evidence-based.

- Pressure from patients/parents to be treated with antimicrobials.
- Time constraint – more time required to explain why antibiotic is not needed than simply writing the prescription.
- Use of multiple/broad-spectrum antibiotics to cover the possibility of infection from numerous microorganisms as a substitute for appropriate diagnostic evaluation.
- Cost and availability of diagnostic test.
- Inadequacy of knowledge of diagnostic procedures and management of infectious diseases.
- Malpractice considerations and fear of litigation.
- Concern about increasing prevalence of antibiotic resistance.
- Easy solution provided by pharmaceutical companies and aggressive promotion.

Unwanted Consequences of Misuse/Inappropriate Use of Antimicrobials:

- Adverse drug reactions.
- Increased cost of therapy.
- Increased length of hospital stay.
- Emergence of drug-resistant organisms.
- Predisposition to secondary infections, complications and even death.

BLOOD-BORNE INFECTIONS AND OTHER SYSTEMIC SYNDROMES

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td colspan="3">Sepsis in Children</td></tr>
<tr><td colspan="3">Sepsis: SIRS in the presence of or caused by suspected or proven infection.

Systemic inflammatory response syndrome (SIRS) in the presence of 2 or more of the following criteria, one of which must be the first 2:

(1) Core temperature (rectal, bladder, oral, or central catheter probe) >38.5°C (101.3°F) or <36°C (96.8°F); (2) Abnormal WBC count or >10% immature neutrophils; (3) Tachycardia or bradycardia; (4) Mean RR >2 standard deviations for age or mechanical ventilation for an acute process not related to an underlying neuromuscular disease or to general anesthesia.</td></tr>
<tr><td colspan="3">Potentially Septic</td></tr>
<tr><td>Asymptomatic ≤28 days old with documented maternal risk factors like history of UTI during the last trimester, membranes ruptured >18 hours before delivery, fever >38°C before delivery or during labor and/or foul-smelling or purulent amniotic fluid</td><td>
Ampicillin PLUS (Gentamicin OR Amikacin)
<table>
<tr><td>Gestational Age</td><td colspan="3">Ampicillin (25-50 mg/kg IV/IM)</td></tr>
<tr><td>≤ 29 weeks</td><td>0-28 postnatal days: q12h</td><td colspan="2">>28 postnatal days: q8h</td></tr>
<tr><td></td><td>0-14 postnatal days: q12h</td><td colspan="2">>14 postnatal days: q8h</td></tr>
<tr><td>37-44 weeks</td><td>0-7 postnatal days: q12h</td><td colspan="2">>7 postnatal days: q8h</td></tr>
<tr><td>≥45 weeks</td><td colspan="3">ALL: q6h</td></tr>
<tr><td>Gestational Age</td><td>Postnatal days</td><td>Gentamicin IV/IM</td><td>Amikacin IV/IM</td></tr>
<tr><td>≤ 29 weeks</td><td>0-7 days
8-28 days
≥29 days</td><td>5mg/kg q48h
4mg/kg q36h
4mg/kg q24h</td><td>18mg/kg q48h
15mg/kg q36h
15mg/kg q24h</td></tr>
<tr><td>30-34 weeks</td><td>0-7days
≥8-days</td><td>4.5mg/kg q36h
4mg/kg q24h</td><td>18mg/kg q36h
15mg/kg q24h</td></tr>
</table>
</td><td>For infants who remain asymptomatic and whose initial blood cultures are negative after 48-72 hours of incubation, antimicrobial therapy can be discontinued.

If no pathogen has been isolated but bacterial sepsis cannot be excluded, a negative CRP test at 72 hours can help support decision to discontinue antibiotics.</td></tr>
</table>

Etiology	Regimen				Comments
	≥35 weeks	0-7 days ≥ 8 days	4mg/kg q24h 4mg/kg q24h	15mg/kg q24h 15mg/kg q24h	
Neonatal Sepsis					
Gram-negative bacilli, Group B streptococci, *S. pneumoniae,* *S. aureus* Neonates with bacterial sepsis may present non-specific signs and symptoms or focal signs of infection. <u>Clinical criteria:</u> Neurologic: convulsions, drowsy or unconscious, decreased activity, bulging fontanel Respiratory: respiratory rate >60 breaths/min, grunting, severe chest indrawing, central cyanosis Cardiac: poor perfusion, rapid and weak pulse Gastrointestinal: jaundice, poor feeding, abdominal distention	**1st line: (Cefotaxime *OR* Ceftriaxone) *PLUS* (Gentamicin *OR* Amikacin) *WITH OR WITHOUT* (Oxacillin *OR* Vancomycin)**				**Precautions for Ceftriaxone**: Because of its extensive protein binding, **Ceftriaxone** can displace bilirubin from albumin-binding sites, with the potential risk of inducing kernicterus. Thus, its use should be avoided in jaundiced neonates. Likewise, neonates should not receive ceftriaxone intravenously if also receiving intravenous calcium in any form, including parenteral nutrition, because of the risk for precipitation of **Ceftriaxone** calcium salt. Add **Oxacillin** or **Vancomycin** (MRSA) if with skin/soft tissue infections (refer to the Skin and Soft Tissue Infections guidelines).
	Weight (kg)	*Age (days)*	**Cefotaxime** IV/IM	**Ceftriaxone** IV/IM	
	≤2 kg	≤7 days	50mg/kg q12h	50mg/kg q24h	
	≤2 kg	8-28 days	50mg/kg q8-12h	50mg/kg q24h	
	<1.2 kg	>7 days	50mg/kg q12h	50mg/kg q24h	
	1.2-2 kg	>7 days	50mg/kg q8h	50mg/kg q24h	
	>2 kg	>7 days	50mg/kg q6-8h	50mg/kg q24h	
	Gestational Age	*Postnatal days*	**Gentamicin** IV/IM	**Amikacin** IV/IM	
	≤29 weeks	0-7 days 8-28 days ≥29 days	5mg/kg q48h 4mg/kg q36h 4mg/kg q24h	18mg/kg q48h 15mg/kg q36h 15mg/kg q24h	
	30-34 weeks	0-7days ≥8 days	4.5mg/kg q36h 4mg/kg q24h	18mg/kg q36h 15mg/kg q24h	
	≥35 weeks	0-7 days ≥ 8 days	4mg/kg q24h 4mg/kg q24h	15mg/kg q24h 15mg/kg q24h	
	Weight (kg)	*Age (days)*	**Oxacillin** IV/IM		
	<1.2 kg	<7 days	25mg/kg q12h		

Etiology	Regimen				Comments
Dermatologic: skin pustules, periumbilical erythema or purulence Musculoskeletal: edema or erythema overlying bones or joints Temperature: >37.7°C (99.9°F; or feels hot) or <35.5°C (95.9°F; or feels cold)	1.2 -2 kg	<7 days	25-50mg/kg q12h		
	≥2 kg	<7 days	25-50mg/kg q8h		
	<1.2 kg	≥7 days	25mg/kg q12h		
	1.2 -2 kg	≥7 days	25-50mg/kg q8h		
	≥2 kg	≥7 days	25-50mg/kg q6h		
	Vancomycin (for MRSA) *Meningitis*: 15mg/kg/dose IV; *Bacteremia*: 10mg/kg/dose IV	*Gestational Age (weeks)*	*Postnatal (days)*	*Interval (hours)*	
		≤29	0-14; >14	18; 2	
		30 to 36	0-14; >14	12; 8	
		37 to 44	0 to 7; >7	12; 8	
		≥45	ALL	6	
	2nd line: Ceftazidime *PLUS* (Gentamicin *OR* Amikacin) *WITH OR WITHOUT* (Oxacillin *OR* Vancomycin)				Use **Ceftazidime** if *Pseudomonas* or *Burkholderia* is suspected.
	Weight (kg)	*Age (days)*	**Ceftazidime** IV/IM		
	<2 kg	≤7 days	50mg/kg q12h		
	≥2 kg	≤7 days	50mg/kg q8-12h		
	<1.2 kg	>7 days	50mg/kg q12h		
	>1.2 kg	>7 days	50mg/kg q8h		
	Weight (kg)	*Age (days)*	**Oxacillin** IV/IM		
	<1.2 kg	<7 days	25mg/kg q12h		
	1.2 -2 kg	<7 days	25-50mg/kg q12h		

Etiology	Regimen			Comments
	≥2 kg	<7 days	25-50mg/kg q8h	
	<1.2 kg	≥7 days	25mg/kg q12h	
	1.2 -2 kg	≥7 days	25-50mg/kg q8h	
	≥2 kg	≥7 days	25-50mg/kg q6h	
	Duration: 10-14 days for uncomplicated blood stream infections. Duration is longer in patients with meningitis; 2-3 weeks for Gram-positive meningitis and at least 3 weeks for Gram-negative meningitis			
Immunocompetent Children				
Clinical Sepsis without focus				
S. pneumoniae, S. aureus (MSSA & MRSA), *H. influenzae* type b, Meningococci	**Ceftriaxone** 100mg/kg/day IV/IM div q12-24h (Max: 2-4g/day) ***OR*** **Cefotaxime** 200-225mg/kg/day IV/IM div q4-6h (Max: 8-12g/day) ***WITH OR WITHOUT*** **Oxacillin** 150-200mg/kg/day IV/IM div q4-6h (Max: 4-12g) ***OR*** **Vancomycin** 40-60mg/kg/day IV/IM div q6h (for MRSA) (Max: 2-4g/day) **Duration:** 10-14 days or longer depending on established foci of infection			Check on immunization status against *Pneumococcus* and *H. influenzae* type b. Provide coverage for *S. aureus* if with concomitant skin/soft tissue infections or previous trauma. May use **Oxacillin** only if culture-proven sensitive.
Urinary Source (See UTI, Complicated)				
Enterobacteriaceae, *P. aeruginosa,* Enterococci	**Ceftriaxone** 100mg/kg/day IV/IM div q12-24h (Max: 2-4g/day) ***OR*** **Cefotaxime** 200-225mg/kg/day div q4-6h (Max: 8-12g/day) ***PLUS*** **Gentamicin** 6-7.5mg/kg/day div q8h or 5-7.5mg/kg/day IV/IM ***OR*** **Amikacin** 15-22.5mg/kg/day IV/IM div q8-12h or 15-20mg/kg/day IV/IM			

Etiology	Regimen	Comments
	Duration: 10-14 days or longer depending on established foci of infection	
Intra-abdominal Source		
Enterobacteriaceae, *Bacteroides sp.*, Enterococci, *P. aeruginosa*	**1st line: Ampicillin** 200-400mg/kg/day IV/IM div q8h (Max: 6-12g/day) ***PLUS* Gentamicin** 6-7.5mg/kg/day div q8h ***or*** 5-7.5mg/kg/day IV/IM ***OR* Amikacin** 15-22.5mg/kg/day IV div q8-12h ***or*** 15-20mg/kg/day IV/IM ***PLUS* Metronidazole** 30-50mg/kg/day IV/PO q6h (Max: 1.5g/day) ***OR* Clindamycin** 20-40mg/kg/day IV/IM div q6-8h (Max: 1.8-2.7g/day) **2nd line: Ampicillin-sulbactam** 200mg/kg/day IV/IM div q6h (ampicillin component) (Max: 8g/day) ***OR* Piperacillin-tazobactam** 300mg/kg IV div q6-8h (piperacillin component) (Max: 9-16g/day) ***WITH OR WITHOUT* Gentamicin** 6-7.5mg/kg/day IV div q8h ***or*** 5-7.5mg/kg/day IV/IM ***OR* Amikacin** 15-22.5mg/kg/day IV div q8-12h ***or*** 15-20mg/kg/day IV/IM ***OR* Ceftriaxone** 100mg/kg/day IV/IM div q12-24h (Max: 2-4g/day) ***OR* Cefotaxime** 200-225mg/kg/day IV/IM div q4-6h (Max: 8-12g/day) ***PLUS* Metronidazole** 30-50mg/kg/day IV/PO div q8h (Max: 1.5g/day) ***OR* Clindamycin** 20-40mg/kg/day IV/IM div q6-8h (Max: 1.8-2.7g/day) **Duration:** 10-14 days or longer depending on established foci of infection	

Etiology	Regimen	Comments
Post-Splenectomy/ Functional Asplenia		
S. pneumoniae, H. influenzae, N. meningitidis	**Ceftriaxone** 100mg/kg/day IV/IM div q12-24h (Max: 2-4g/day) ***OR*** **Cefotaxime** 200-225mg/kg/day IV/IM div q4-6h (Max: 8-12g/day)	
Healthcare-Associated Sepsis		
Gram-negative bacilli, *S. aureus*	**Ceftazidime** 150-200mg/kg/day IV/IM div q8h (Max: 6g/day) ***OR*** **Cefepime** 100-150mg/kg/day IV/IM div q8h (Max: 4-6g/day) ***OR*** **Piperacillin-tazobactam** 300mg/kg/day IV div q6-8h (piperacillin component) (Max: 9-16g/day) ***OR*** **Meropenem** 60-120mg/kg/day IV div q8h (Max: 1.5-6g/day) ***WITH OR WITHOUT*** **Amikacin** 15-22.5mg/kg/day IV/IM div q8-12h ***or*** 15-20mg/kg/day ***WITH OR WITHOUT*** **Vancomycin** 40-60mg/kg/day IV div q6h (Max: 2-4g/day)	Choice of empiric antibiotic therapy should be based on current antimicrobial susceptibility pattern within an institution. For severe infections with *Pseudomonas* and/or if antimicrobial resistance is suspected, ***ADD*** aminoglycosides. If with previous surgery, IV therapy or other instrumentation and staphylococcal infection is suspected, add Vancomycin.
Severe Sepsis and Septic Shock		
Severe Sepsis: Sepsis plus one of the following: cardiovascular organ dysfunction, acute respiratory distress syndrome *or* 2 or more other instances of organ dysfunction as defined in the consensus statement	**Piperacillin-tazobactam** 300mg/kg/day IV div q8h (piperacillin component) (Max: 9-16g/day) ***OR*** **Meropenem** 60-120mg/kg/day IV div q8h (Max: 1.5-6g/day) ***PLUS*** **Vancomycin** (See ***Dosing Interval Chart*** in Neonatal Sepsis) ≤28 days old: *Meningitis:* 15mg/kg/dose; *Bacteremia:* 10mg/kg/dose Child: 40-60mg/kg/day div q6h (Max dose: 2-4g/day) **Duration:** 10-14 days in the absence of complications	The initial assessment and treatment of the pediatric shock patient should include stabilization of airway, breathing, and circulation (the ABC's) plus early administration of broad-spectrum antibiotics. The choice of antimicrobial agents depends on the predisposing risk factors, clinical situation,

Etiology	Regimen	Comments
Septic Shock: Sepsis and cardiovascular organ dysfunction		and the antibiotic resistance patterns in the community and/or hospital setting. Modify antibiotic regimen based on culture and sensitivity.
Infant 0-28 days old	**Ampicillin** 50mg/kg IV ***PLUS*** **Cefotaxime** 50mg/kg IV ***PLUS*** **Gentamicin** 2.5mg/kg IV initial dose If highly suspecting MRSA, give **Vancomycin** 15mg/kg IV instead of **Ampicillin.** For subsequent doses, see ***Dosing Interval Chart*** in Neonatal Sepsis	The initial assessment and treatment of the pediatric shock patient should include stabilization of airway and breathing, and rapid fluid resuscitation. The choice of antimicrobial agent depends on the predisposing risk factors, clinical situation, and the antibiotic resistance patterns in the community and/or hospital setting. Administer first dose of empiric antimicrobial therapy within the 1st hour of presentation, preferably after obtaining appropriate cutures. Give subsequent doses as scheduled. Establish two sites of IV access: one for fluid resuscitation and the other for antimicrobial delivery. When treating empirically, administer antibiotics which can be given by rapid IV bolus (eg, beta-lactam agents or

Etiology	Regimen	Comments
		cephalosporins) first, followed by antibiotics (that are infused more slowly (Vancomycin). Modify antibiotic regimen based on culture and sensitivity.
Normal child >28 days old	**Cefotaxime** 100mg/kg IV initial dose (Max: 2g), then q6-8h ***OR*** **Ceftriaxone** 75mg/kg IV initial dose (Max: 2g), then q12-24h If *Pseudomonas* is highly suspected, give **Ceftazidime** 50mg/kg IV initial dose (Max: 2g), then q8h instead of **Cefotaxime** or **Ceftriaxone** If MRSA is highly suspected, ***ADD*** **Vancomycin** 15mg/kg IV initial dose (Max:1-2g), then q6h FOR POSSIBLE GENITOURINARY SOURCE: **Cefotaxime** 100mg/kg IV initial dose (Max: 2g), then q6-8h ***OR*** **Ceftriaxone** 75mg/kg IV initial dose (Max: 2g), then q12-24h ***PLUS*** **Gentamicin** 2.5mg/kg IV initial dose, then q8h FOR POSSIBLE GASTROINTESTINAL SOURCE: **Cefotaxime** 100mg/kg IV initial dose (Max: 2g), then q6-8h ***OR*** **Ceftriaxone** 75mg/kg IV initial dose (Max: 2g), then q12-24h	

Etiology	Regimen	Comments
	PLUS **Gentamicin** 2.5mg/kg IV initial dose, then q8h ***PLUS*** **Plperacillin-tazobactam** <2 months: 80mg/kg IV initial dose (Max: 3g), then q6h 2-9 months: 80mg/kg IV initial dose (Max: 3g), then q6-8h >9 months:100mg/kg IV initial dose (Max: 3g), then q6-8h ***OR*** **Clindamycin** 10mg/kg IV initial dose (Max: 600mg), then q6-8h ***OR*** **Metronidazole** 10mg/kg IV initial dose (Max: 500mg), then q8h	
Immunocompromised Child >28 days old at risk for infection with *Pseudomonas sp.*	**Vancomycin** 15 mg/kg IV initial dose (Max: 1-2g), then q6h ***PLUS*** **Cefipime** 50mg/kg IV initial dose (Max: 2g), then q8h ***OR*** **Ceftazidime** 50mg/kg IV initial dose (Max: 2g), then q8h ***OR*** **Meropenem** 20-40mg/kg IV initial dose (Max: 2g), then q8h Add an aminoglycoside **Gentamicin** 2.5mg/kg IV initial dose, then q8h ***OR*** **Amikacin** 5mg/kg IV initial dose, then q8h if resistance is considered	Use carbapenems (eg, imipenem, meropenem) in settings where extended-spectrum beta-lactamase (ESBL) resistant organisms are prevalent or if with recent (within two weeks) treatment with broad-spectrum antibiotics (eg, third-generation cephalosporin, or fluoroquinolone).
Children who cannot receive penicillin or who have recently received broad-spectrum antibiotics	**Vancomycin** 15mg/kg IV initial dose (Max: 1-2g) ***PLUS*** **Meropenem** 20-40mg/kg IV initial dose (Max: 2g), then q8h ***OR*** **Vancomycin** 15mg/kg IV initial dose (Max: 1-2g) ***PLUS*** **Aztreonam** 30-40mg/kg IV initial dose (Max: 2g), then q6-8h ***PLUS*** **Clindamycin** 10mg/kg IV initial dose (Max: 600mg), then q6-8h	

Etiology	Regimen	Comments
	OR **Vancomycin** 15mg/kg IV initial dose (Max: 1-2g) ***PLUS*** **Ciprofloxacin** 10mg/kg IV initial dose (Max: 400mg), then q8-12h ***PLUS*** **Clindamycin** 10mg/kg IV initial dose (Max: 600mg, then q6-8h	
Patients at increased risk of fungal infection (eg, identified fungal source, immunocompromised with persistent fever on broad spectrum antibiotics)	***ADD*** **Amphotericin B Deoxycholate** Test dose: 1mg IV infusion over 20-30 min without prior premedication (Use final concentration of 0.1mg/mL in 5% dextrose solution) then observe for possible adverse effects up to 3 hours. If initial dose is tolerated, the next dose should be started at 0.25mg/kg/dose over 2-6 hours and increased with increments of 0.25mg/day until the target dose is obtained. Maintenance dose: 0.5-1mg/kg once daily IV infusion over 2-6 hours **Amphotericin B Liposomal** Systemic fungal infections: 3-5mg/kg/dose once daily IV infusion over 2 hours Empiric therapy for febrile neutropenia: 3mg/kg/dose once daily IV infusion over 2 hours Test dose: An initial test dose of 1mg should be infused intravenously over 15 minutes.	Caution: Incompatible with sodium chloride. Monitor K, Mg, BUN, Cr, alkaline phosphatase, SGOT, once daily or every other day until dosage is stabilized, then every week. Monitor CBC every week. Discontinue if BUN over 40mg/dL or if Cr >3mg/dL or if liver function tests are abnormal. Observe IV site for irritation; phlebitis is common. Nephrotoxic; however usual dosing is administered to patients with pre-existing renal impairment. If creatinine increases during therapy, the total daily dose can be decreased by 50% or the dose can be given every other day. Administration: For intravenous infusion, reconstitute each vial with 10mL sterile water for injection and shake immediately to produce

Etiology	Regimen	Comments
	(Using the final concentration of 1-2mg/mL). Infusion should then be stopped, and the patient be observed for 30 minutes for adverse reactions. If without hypersensitivity reaction, the infusion may be continued Max: 5mg/kg/dose once daily IV infusion over 2 hours	a 5mg/mL colloidal solution; dilute further in 5% dextrose to a concentration of 0.1mg/mL (in fluid restricted children, up to 0.4mg/mL may be given via a central line); pH of the dextrose solution must not be below 4.2 (check literature for details of buffer); infuse over 4-6 hours, or if tolerated over a minimum of 2 hours (initial test dose given over 20-30 minutes); begin infusion immediately after dilution and protect from light; incompatible with sodium chloride solutions - flush existing intravenous line with 5% dextrose prior to infusion or use separate line.
Staphylococcal Toxic Shock Syndrome		
Clinical Findings: • Fever: Temperature ≥38.9°C (102°F) • Rash: Diffuse macular erythroderma • Desquamation: 1-2 weeks after onset of illness, on palms, soles, fingers, and toes • Hypotension • Negative results on the following tests, if obtained: Blood, throat, or cerebrospinal fluid cultures (blood culture may be positive for *S. aureus*, Serologic tests for Rocky Mountain spotted fever, leptospirosis, or measles)	• Involvement of ≥3 of the following organ systems: – GIT: Vomiting or diarrhea at onset of illness – Muscular: Severe myalgia or creatinine phosphokinase >2x the upper limit of normal – Mucous membrane: Vaginal, oropharyngeal, or conjunctival hyperemia – Renal: BUN or serum creatinine >2x upper limit of normal or ≥5 wbc/hpf in the absence of UTI – Hepatic: Total bilirubin, AST, or ALT >2x upper limit of normal for the laboratory – Hematologic: platelets <100,000/mm^3 – CNS: disorientation or alterations in consciousness without focal neurologic signs when fever and hypotension are absent	

Etiology	Regimen	Comments
Case Classification: ***Probable**:* A case with 5 of the 6 clinical findings above ***Confirmed**:* A case with all 6 of the clinical findings above, including desquamation, unless the patient dies before desquamation could occur.		
	Oxacillin150-200mg/kg/day IV/IM div q4-6h (Max: 4-12g/day) ***OR*** **Cefazolin** 75-100mg/kg/day IV/IM div q8h (Max: 3-6g/day) ***OR*** **Vancomycin** (for MRSA): 40-60 mg/kg/day IV div q6h drip x 1h (Max: 2-4g/day) ***PLUS* Clindamycin** 30-40mg/kg/day IV div q6-8h (Max: 1.8-2.7g/day) ***PLUS* IV IG** 150-400mg/kg x 5 days or 1 dose of 1-2 g/kg **Duration:** 10-14 days in the absence of a complication	Immediate aggressive fluid management; surgical debridement; anticipatory management of multisystem organ failure. Intravenous immunoglobulin (**IV IG**) can be considered in severe staphylococcal TSS unresponsive to other therapeutic measures.
Streptococcal Toxic Shock Syndrome		
Clinical Criteria: Hypotension plus 2 or more of the following: renal impairment, coagulopathy, hepatic involvement, adult respiratory distress syndrome, generalized erythematous macular rash, and soft-tissue necrosis. Case definition: Clinical criteria plus Group A streptococcus ***Definite:*** from a normally sterile site ***Probable:*** from a nonsterile site	**Penicillin G Na** 200,000-300,000 U/kg/day IV div q4-6h (Max: 12-24 MU/day) ***OR* Ceftriaxone** 100mg/kg/day IV/IM div q12-24h (Max: 2-4g/day) ***PLUS* Clindamycin** 30-40mg/kg/day IV/IM div q6-8h (Max: 1.8-2.7g/day) ***PLUS* IV IG** 1g/kg on day 1, followed by 500mg/kg on days 2-3 **Duration**: 10-14 days or longer depending on established foci of infection	Immediate aggressive fluid management. Surgical debridement. Anticipatory management of multisystem organ failure. Intravenous immunoglobulin (**IV IG**) may be considered if refractory to several hours of aggressive therapy or in the presence of undrainable focus or persistent oliguria with pulmonary edema.

Etiology	Regimen	Comments
Febrile Neutropenia in Children		
Neutropenia is defined as an ANC of <500 cells/mm^3 or an ANC that is expected to decrease to <500 cells/mm^3 during the next 48h. Staphylococci including MRSA, Streptococcus, Enterococci, *P. aeruginosa* and other Gram-negative bacilli, Fungi	**Cefepime** 150mg/kg/day IV/IM div q8h ***OR*** **Piperacillin-tazobactam** 300mg/kg/day IV div q6h (piperacillin component) ***OR*** **Meropenem** 60-120mg/kg/day IV div q8h (Max: 2-4g) If antimicrobial-resistant pathogens are suspected, consider adding **Amikacin** 15-20mg/kg/day IV/IM. In cases of suspected catheter-related infection, or skin or soft-tissue infection, pneumonia, or hemodynamic instability consider adding **Vancomycin** 40-60mg/kg/day IV q6h (Max: 2-4g/day). If with abdominal symptoms (pain or blood per rectum) or suspected *C. difficile* infection, consider adding **Metronidazole** IV: 22.5-40mg/kg/day q8h (Max: 1.5g/day) PO: 30-50mg/kg/day q8h (Max: 2.25g/day). Empiric antifungal coverage should be considered in high-risk patients who have persistent fever after 4-7 days of a broad-spectrum antibacterial regimen and no identified fever source. Treatment is continued until patient is afebrile and ANC >500 cells/μL.	Start empiric antibiotics as soon as possible after taking blood cultures and refer to an ID specialist. Baseline laboratory tests to request for are: 1. CBC with differential leukocyte count and platelet count 2. creatinine and BUN; 3. electrolytes; 4. hepatic transaminase enzymes; 5. bilirubin; 6. blood cultures, at least 2 sets of which are recommended, with a set collected simultaneously from each lumen of an existing central venous catheter (CVC), if present, and from a peripheral vein site; 2 blood culture sets from separate venipunctures should be sent if no central catheter is present. 7. Culture of specimens from other sites of suspected infection should be obtained as clinically indicated. 8. CXR for patients with respiratory signs and symptoms. GCSFs are not routinely recommended.

Etiology	Regimen	Comments
Sepsis in Adults		
Sepsis is defined as presence of suspected or documented infection associated with life-threatening organ dysfunction represented by a quick SOFA (Sequential Organ Failure Assessment) score of 2 or more of the following: 1) respiratory rate ≥22/min; 2) altered mentation; 3) systolic BP ≤ 100 mmHg *Septic Shock* is defined as sepsis plus need for vasopressor to increase MAP to >65 mmHg and lactate >2mmol (18 mg/dL).		
Sepsis, Non-Neutropenic		
Source is unclear.	**1st line:** **Piperacillin-tazobactam** 4.5g IV q6-8h ***PLUS*** **Vancomycin** 25-30mg/kg loading dose then 1g IV q8h **2nd line:** **Meropenem** 1g IV q8h ***PLUS*** **Vancomycin** 25-30mg/kg loading dose then 1g IV q8h	Do source control, if possible. Intravenous antibiotics should be given as soon as sepsis or septic shock is recognized and within the 1st hour. Initial fluid resuscitation of crystalloid at 30mL/kg should be given in the first 3 hours. Target MAP to >65mmHg in patients receiving vasopressors. Appropriate routine microbiologic cultures (including blood) should be obtained before starting antimicrobial therapy in patients with suspected sepsis or septic shock if doing so results in no substantial delay in the start of antimicrobials.
Suspect Intra-abdominal Source		
Aerobic and anaerobic Gram-negative bacilli	**1st line:** **Piperacillin-tazobactam** 4.5g IV q8-6h **2nd line:** **Ceftriaxone** 2g IV q12h ***PLUS*** **Metronidazole** 1g loading dose then 500mg IV q6h or 1g IV q12h ***OR***	Base recommendation on local/ hospital antibiogram results. Always assess for risk factors for antibiotic resistance (e.g. ESBL production). Use **Ertapenem** if with risk for antibiotic resistance.

Etiology	Regimen	Comments
	Ciprofloxacin 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h ***PLUS*** **Metronidazole** 1g loading dose then 500mg IV q6h or 1g IV q12h	
Suspect Urinary Tract Infection		
Aerobic Gram-negative bacilli (*E. coli*), Enterococci	**1st line: Piperacillin-tazobactam** 4.5g IV q8-6h **2nd line: Ceftriaxone** 1g IV q24h ***OR*** **Ertapenem** 1g IV q24h	
Suspect Community-Acquired Pneumonia (*See treatment of high-risk pneumonia*)		
Suspect Illicit IV Drug Use Source		
S. aureus	**Vancomycin** 25-30mg/kg loading dose then 1g IV q8h ***PLUS*** **Piperacillin-tazobactam** 4.5g IV q8-6h	
Suspect Meningococcemia		
N. meningitidis	**Ceftriaxone** 2g IV q12h	
Septic Shock, Post Splenectomy		
	Ceftriaxone 2g IV q12h	Increase dose if considering meningitis
Staphylococcal Toxic Shock		
	Vancomycin 25-30mg/kg loading dose then 1g IV q8h ***PLUS*** **Clindamycin** 900mg IV q8h ***PLUS*** **IV IG** 1g/kg on day 1 then 500mg/kg daily for 2-3 days	Intravenous Immunoglobulin has the potential to neutralize super antigen and to mitigate subsequent tissue damage.
Streptococcal Toxic Shock		
	1st line: Penicillin G 24 MU daily IV in 4-6 div doses ***PLUS*** **Clindamycin** 900mg IV q8h	If with Penicillin allergy: **Clindamycin** 900mg IV q8h ***PLUS*** **Vancomycin** 25-30mg/kg

Etiology	Regimen	Comments
	2nd line: **Ceftriaxone** 2g IV q24h ***PLUS*** **Clindamycin** 900mg IV q8h ***PLUS*** **IV IG** 1g/kg on day 1 then 500mg/kg on days 2-3 **Duration:** individualized; Min of 14 days if with bacteremia.	loading dose then 1g IV q8h. Also start **IV IG** 1g/kg on day 1 then 500mg/kg on days 2-3 for patients unresponsive to vasopressor.
Febrile Neutropenia in Adults		
Febrile neurtropenia is defined as an oral temperature of >38.3°C or 2 consecutive readings of >38.0°C for >1h and an absolute neutrophil count (ANC) of <500/µL, or <1000/µL and expected to fall below 500/µL over the next 48h. Assess for risk (low or high risk) of complication for severe disease at presentation of fever.		
Low risk Gram-positive organisms (predominantly coagulase negative staphylococci and *S. aureus*), Gram-negative bacilli; fungal infection uncommon	**Ciprofloxacin** 750mg PO bid ***OR*** **Levofloxacin** 750mg PO daily ***PLUS*** **Co-amoxiclav** 625mg tid If with Penicillin allergy: **Ciprofloxacin** 750mg PO bid ***OR*** **Levofloxacin** 750mg PO daily ***PLUS*** **Clindamycin** 300mg PO q6h **Duration:** Until patient is afebrile and absolute neutrophil count >500cells/µL	Those with anticipated <7 days of neutropenia, no medical co-morbidities, no significant liver or renal dysfunction, and able to take oral medications. Start empiric antibiotic Rx ASAP after taking blood cultures. Patients with FQ-based antibacterial prophylaxis should be given an IV regimen as recommended for high risk patients and not an FQ. GCSFs are not routinely recommended as an adjunct to antibiotic Rx.
High risk Gram-positive (staphylococci, streptococci, enterococci) and Gram-negative bacteria w/ GNB (e.g. *P. aeruginosa*) causing the	Initial therapy for fever: Monotherapy with **Cefepime** 2g IV q8h ***OR*** **Meropenem** 1-2g IV q8h ***OR*** **Piperacillin-tazobactam** 4.5g IV q6h	Patients with the following should be admitted in the hospital: profound neutropenia of <100 cells/µL and anticipated fever >7 days and/or significant medical comorbidities, hemodynamic instability, hepatic or renal insufficiency, uncontrolled or progressive

Etiology	Regimen	Comments
more serious infections; fungi (esp. *Candida* and *Aspergillus*)	***PLUS*** **Aminoglycoside** ***OR*** **Fluoroquinolone** ***OR*** **Vancomycin** if with suspected central line infection, severe mucositis, skin and soft tissue infection, pneumonia, hypotension ***PLUS*** **Antifungal treatment** if fever continues beyond 4-7 days and no source is identified **Duration:** should be dictated by particular organism and site: Treat Staphylococcus bacteremia for at least 2 weeks after negative blood culture; prolonged (4-6 weeks) if disseminated or deep infection. Other infections may be treated for 14 days. In patients with unexplained fever, initial regimen should be continued until marrow recovery.	cancer, pneumonia or other complex infections, mucositis grade 3 or 4, new onset neurologic/mental changes, IV catheter infection, inpatient status at time of development of fever, and GI symptoms. Start empiric antibiotic Rx ASAP after blood cultures. Continue treatment until patient is afebrile and absolute neutrophil count is >500 cells (some >1000 cells). Modify initial antibiotic regimen guided by clinical and microbiologic data. Use of CSF is controversial; may be considered in the presence of serious infectious complications such as progressive course, pneumonia, and invasive fungal infection.
Antibacterial Prophylaxis		
For high risk patients with expected duration of neutropenia of >7 days and ANC ≤100 cells/mm^3	**1st line: Levofloxacin** 500-750mg PO/IV daily **2nd line: Ciprofloxacin** 500-750mg PO or 400mg IV q12h	Not routinely recommended for low risk patients.
Anticandidal Prophylaxis		
Allogeneic hematopoietic stem cell transplant (HSCT) recipients, acute	**Fluconazole** 400mg IV/PO daily ***OR*** **Micafungin** 150mg IV daily ***OR*** **Itraconazole** 200mg PO bid **Duration**: until recovery of neutropenia	For high risk patients with expected duration of neutropenia of >7 days and ANC ≤100 cells/mm^3

Etiology	Regimen	Comments
leukemia undergoing intensive remission-induction or salvage therapy.		
Anti-Aspergillus Prophylaxis		
Patients undergoing chemotherapy for AML/MDS with neutropenia and allogeneic HSCT recipients	**Voriconazole** 200mg PO/IV bid ≥13 years: **Posaconazole** oral suspension 200mg tid	Prophylaxis against aspergillus infection in pre-engraftment allogeneic or autologous transplant recipients has not been shown to be efficacious.
Antiviral Prophylaxis		
HSV seropositive patients undergoing allogeneic HSCT or induction for acute leukemia	**Aciclovir** 800mg PO bid ***OR*** **Aciclovir** 400mg PO tid-qid	
Typhoid Fever		
Uncomplicated Typhoid Fever		
Based on 2017 ARSP data, resistance of *Salmonella typhi* remained at <5% for **Ampicillin, Chloramphenicol**, **Co-trimoxazole** and **Ciprofloxacin**.The use of second line antibiotics should be reserved for suspected or proven **Multi-drug resistant typhoid fever (MDRTF).** MDRTF is defined as typhoid fever caused by *S. typhi* strains which are resistant to the first-line recommended drugs for treatment namely **Chloramphenicol**, **Ampicillin** and **Co-trimoxazole**. **MDRTF** should be suspected in any of the following situations: • Failure to respond after 5-7 days treatment with a first line antibiotic; • Household contact with a documented case or during an epidemic of MDRTF; and/or • Clinical deterioration or development of complications during conventional antibiotic treatment.		
	Pediatric:	

Etiology	Regimen	Comments
	1st line: **Amoxicillin** 75-100mg/kg/day PO div q8h x 14 days (Max: 500mg 2 caps q6h) ***OR*** **Ampicillin** 100-200mg/kg/day IV/IM div q6h x 14 days (Max: 12g/24h) ***OR*** **Chloramphenicol** 50-75mg/kg/day IV/PO div q6h x 14-21 days (Max: 500mg 2 caps q6h) ***OR*** **Co-trimoxazole** 8mg/kg/day (trimethoprim component) PO div q12h x 14 days (Max: 160/800mg PO q12h) **2nd line:** **Cefixime** 15-20mg/kg/day PO div q12h x 10-14 days (Max: 200mg PO q12h) ***OR*** **Azithromycin** 10-20mg/kg/day x 5-7 days (Max: 500mg 1-2 tabs q24h) ***OR*** **Ciprofloxacin** 30mg/kg/day div q12h x 7-10 days (Max: 500mg PO q12h) Adult: **1st line:** **Amoxicillin** 1g q6h x 14 days ***OR*** **Co-trimoxazole** 160/800mg PO q12h x 14 days ***OR*** **Chloramphenicol** 1g PO q6h x 14 days ***OR*** **Ciprofloxacin** 500mg PO q12h x 7-10 days **2nd line:** **Cefixime** 200mg PO q12h x 7-10 days ***OR*** **Azithromycin** 500mg-1g PO daily x 5-7 days	Serious and fatal blood dyscrasias (aplastic anemia, hypoplastic anemia, thrombocytopenia and granulocytopenia) are known to occur after the administration of **Chloramphenicol**. An irreversible type of marrow depression leading to aplastic anemia with a high rate of mortality may occur after short or long-term use of chloramphenicol. **Ciprofloxacin** is not recommended for pregnant women. It can be used among children if the benefits outweigh the potential harms. High–dose parenteral **Ampicillin** can be used if FQ is not well tolerated. Stepping down to an oral antibiotic may be done if patient is afebrile for 48 hours and is able to tolerate oral medications. De-escalation to oral antibiotics should be based on results of culture and sensitivity if available.
Severe/Complicated Typhoid Fever		
Gastrointestinal bleeding, intestinal perforation, typhoid encephalopathy, etc.	Pediatric **1st line:** **Ceftriaxone** 75mg/kg/day IV/IM x 10-14 days (Max: 2-3g q24h) ***OR*** **Ciprofloxacin** 30mg/kg/day IV div q12h x 7-10 days (Max:	

Etiology	Regimen	Comments
	500mg/dose q12h) ***OR*** **Azithromycin** 10-20mg/kg/day IV x 5-7 days (Max: 1g/day) **Step down:** **Cefixime** 15-20mg/kg PO q12h x 7-10 days (Max: 200mg PO q12h) ***OR*** **Azithromycin** 10-20mg/kg PO q24h x 5-7 days (Max: 500mg 1-2 tabs q24h) ***OR*** **Ciprofloxacin** 30mg/kg PO q12h x 7-10 days (Max: 500mg PO q12h) Adult: **1st line:** **Ceftriaxone** 1-2g IV x 10-14 days ***OR*** **Ciprofloxacin** 400mg IV q12h x 7-10 days **Step down:** **Cefixime** 200mg PO q12h x 7-10 days ***OR*** **Azithromycin** 500mg 1-2 tabs q24h x 5-7 days ***OR*** **Ciprofloxacin** 500mg PO q12h x 7-10 days	
Chronic Carrier		
Defined as asymptomatic shedding of typhoidal *S. enterica* for 1 year or more		
	Pediatric: **1st line:** **Ciprofloxacin** 30mg/kg/day PO div q12h x 4 weeks (Max: 1-1.5g/day) **2nd line:** **Ampicillin** 100-200mg/kg/day IV div q6h x 4 weeks (Max: 12g/day) Adult: **Ciprofloxacin** 500-750mg PO q12h x 28 days	
Nontyphoidal Salmonellosis		
Indications for antibiotic treatment include any of the following:		

Etiology	Regimen	Comments
• ≤3 months old • HIV/AIDS • Other immunodeficiencies and chronic granulomatous disease • Immunosuppressive and corticosteroid therapies • Malignancies, especially leukemia and lymphoma • Hemolytic anemia, including sickle cell disease, malaria, and bartonellosis • Collagen vascular disease • Inflammatory bowel disease • Achlorhydria or use of antacid medications • Impaired intestinal motility • Schistosomiasis, malaria • Malnutrition Based on ARSP 2017, nontyphoidal *Salmonella* is also susceptible to **Chloramphenicol** and **Ciprofloxacin**.		
Salmonella gastroenteritis	**1st line: Cefotaxime** 100-200mg/kg/day IV/IM div q6h x 5-14 days (Max: 8-12g/day) ***OR* Ceftriaxone** 75mg/kg/day IV/IM x 7 days (Max: 2-4g/day) ***OR* Cefixime** 15mg/kg/day PO div q12h x 7-10 days (Max: 400mg/day) **2nd line: Ciprofloxacin** 10-20mg/kg/day PO div q12h x 7-10 days (Max:1-1.5g/day) ***OR* Chloramphenicol** 50-75mg/kg/day IV/PO div q6h x 7 days (Max: 2-4g/day)	Antibiotics are not generally recommended for the treatment of uncomplicated Salmonella gastroenteritis because these may suppress normal intestinal flora and prolong both the excretion of Salmonella and the remote risk for creating the chronic carrier state.
Extra-Intestinal Infections *S. typhi*	**Ceftriaxone** 100mg/kg/day IV/IM div q12-24h (Max: 2-4g/day) **Duration:** *Bacteremia*: 10-14 days; *Meningitis*: 4 weeks; *Osteomyelitis*: 4-6 weeks	Revise antibiotics depending on the susceptibility pattern.
Leptospirosis		
Suspected leptospirosis case: • Fever of at least 2 days • Either residing in a flooded area or has high-risk exposure (wading in floods or contaminated water, contact with animal fluids, swimming in flood water or ingestion of contaminated water with or without cuts or wounds);		

Etiology	Regimen	Comments
• At least 2 of the following: myalgia, calf tenderness, conjunctival suffusion, chills, abdominal pain, headache, jaundice or oliguria		
Mild Leptospirosis: A suspected case of leptospirosis with stable vital signs, anicteric sclera, good urine output, no evidence of meningismus/ meningeal irritation, sepsis/ septic shock, difficulty of breathing, jaundice, and can take oral medications.	**1st line:** **Amoxicillin** 30-50mg/kg/day div q8h x 7 days (Max: 500mg q8h) ***OR*** **Doxycycline** 2mg/kg bid x 7 days (Max: 200mg/day) **2nd line: Azithromycin** 10mg/kg PO (Max: 500mg/day) followed by 5mg/kg/day PO (MaxK 250mg/day) for 2 days	**Precautions for Doxycycline:** children <8 years, pregnancy, interaction with birth control pills, photosensitivity, diarrhea, GI upset and interaction if co-administered with iron, supplements, statins, other antibiotics and laxatives. Take **Doxycycline** with food or after a meal.
Moderate to Severe Leptospirosis: A suspected case of leptospirosis with unstable vital signs, jaundice/ icteric sclera, abdominal pain, nausea, vomiting and diarrhea, oliguria/anuria, meningismus/ meningeal irritation, sepsis/ septic shock, altered mental states or difficulty of breathing, hemoptysis	**1st line: Penicillin** 250,000-400,000 U/kg/day IV div q4-6h x 7 days (Max: 1.5 MU q6-8h) **2nd line: Cefotaxime** 100-150mg/kg/day IV/IM div q6-8h x 7 days (Max: 1g q6h) ***OR*** **Ceftriaxone** 80-100mg/kg/day IV/IM div q24h x 7 days (Max: 2g q24h) ***OR*** **Azithromycin** 10mg/kg IV q24h (Max: 500mg/day) followed by 5mg/kg/day IV (Max: 250mg/day) q24h	Step-down therapy can be instituted once patient is clinically stable and able to tolerate oral medication. Any oral antibiotic under mild leptospirosis can be selected.
Antibiotic Prophylaxis **Pre-exposure prophylaxis** is not routinely recommended except for travelers, soldiers, those engaged in water-related recreational and	**Doxycycline** 4mg/kg x 1 dose (Max: 200mg regardless of age) Take 100mg bid if 200mg daily is not tolerated.	The most effective preventive measure is avoidance of high-risk exposure. If unavoidable, use protective measures such as boots, goggles, over-alls, and rubber gloves. Antibiotic prophylaxis is not 100% effective; protective measures should still be used. Post-

Etiology	Regimen	Comments
occupational activities in highly endemic areas. **Post-exposure prophylaxis** depends on type of risk.		exposure doses may be repeated once weekly if with continued exposure to risk factors (e.g. staying in a constantly flooded area).

REFERENCES

Ahmed NM, et al. Fever in children with chemotherapy–induced neutropenia. Available at: http://www.uptodate.com/contents/fever-in-children-with-chemotherapy-induced-neutropenia.

American Academy of Pediatrics, In: Kimberlin DW, Brady MT, etal.eds. Red Book 2015 Report of the Committee on Infectious Diseases, 30th ed. Elk Grove Village. 2015.

Antimicrobial Resistance Surveillance Program Report. Manila: Department of Health; 2017.

Bradley JS, et al. Intravenous ceftriaxone and calcium in the neonate: assessing the risk for cardiopulmonary adverse events. Pediatrics.2009;123 (4): e609-e613.

Cherry JD, Harrison GJ, Kaplan SL, Steinbach WJ, Hotez PJ. Feigin and Cherry's Textbook of Pediatric Infectious Diseases. Philadelphia: Elsevier Inc., 2014.

Dellinger RP, et al. Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012. Available at: www.ccmjournal.org.

Emma Lappin et al. Gram-positive toxic shock syndrome. The Lancet Infectious Dis. 9 (5): May 2009.

Freifeld A, et al. Clinical Practice Guideline for the Use of Antimicrobial Agents in Neutropenic Patients with Cancer: 2010 Update by the Infectious Diseases Society of America. Clin Infect Dis. 2011 Feb 15;52(4): e56-93.

Integrated Management of Childhood Illness Chart Booklet. Geneva: World Health Organization; March 2014.

Kliegman RM, et al., eds. Nelson Textbook of Pediatrics. 20th ed. Philadelphia, PA: Elsevier, 2016.

Pediatric Infectious Diseases Society of the Philippines. PIDSP Core Group Recommendation: Clinical Practice Guidelines on Childhood Leptospirosis 2019 (DRAFT).

Weiss SL and Pomerantz WJ.Septic shock in children: Rapid recognition and initial resuscitation (first hour).Randolph GR,Torrey SB,Kaplan SL, ed. UpToDate. : UpToDate Inc. http://www.uptodate.com

BONE AND JOINT INFECTIONS - PEDIATRIC

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td colspan="3">Osteomyelitis (Hematogenous)</td></tr>
<tr><td>0 to <4 months

S. aureus, Group B Streptococci, Enterobacteriaceae

4 months to adolescents

S. aureus, Group A Streptococci,

Enterobacteriaceae are uncommon

Salmonella sp. should be considered in developing countries or among patients with sickle cell disease. Infections caused by Kingella kingae is increasingly recognized in children under age 4 years.</td><td>1st line: Vancomycin PLUS Cefotaxime OR Ceftriaxone

Duration: For 0-28 days old is not well-defined but 3 weeks is considered adequate. For other age groups, 3-6 weeks.

<table><tr><th>Post conceptual age (weeks)*</th><th>Vancomycin dose</th></tr><tr><td>≤26</td><td>10-15mg/kg/day in 1 dose</td></tr><tr><td>27-34</td><td>10-15mg/kg q18h**</td></tr><tr><td>35-41</td><td>20-30mg/kg/day in 2 doses**</td></tr><tr><td>≥ 42</td><td>40-60mg/kg/day in 3-4 doses**</td></tr><tr><td>7 days</td><td>100-200mg/kg/day in 4 doses</td></tr></table>*Post conceptual age = gestational age + weeks of life
**at 28 days of life, Vancomycin is administered at 20 mg/kg/dose; interval remains the same.

<table><tr><th>Weight (g)</th><th>Age</th><th>Cefotaxime dose</th></tr><tr><td><1,200</td><td>0-4 weeks</td><td>100mg/kg in 2 doses daily</td></tr><tr><td rowspan="2">1,200- 2,000</td><td>0-7 days</td><td>100mg/kg/day in 2 doses daily</td></tr><tr><td>>7 days</td><td>150mg/kg/day in 3 doses daily</td></tr><tr><td rowspan="2">>2,000</td><td>0-7 days</td><td>100mg/kg/day in 2 doses daily</td></tr><tr><td>>7 days</td><td>150-200mg/kg in 3-4 doses daily</td></tr></table></td><td>Select antibiotics appropriate for the patient age. Revise quickly to specific therapy according to culture results. Osteomyelitis of the long bones is more common in children. Vertebral osteomyelitis is most common in adults. Other bones are less commonly involved.

The ARSP 2017 showed increased resistance of S. aureus to Oxacillin at 57%. Start empiric therapy with antibiotics against MRSA after collection of blood and joint fluid for culture; review Gram stain of joint fluid.

When either Gram-positive or Gram-negative bacilli are possible pathogens, Vancomycin is typically used to cover MRSA and high-dose beta-lactams are given to cover Gram-negative organisms. Clindamycin is an alternative if there are no signs of sepsis. If cultures grow MSSA, shift to Oxacillin. In the primary regimens, use Cefotaxime only when P. aeruginosa is deemed unlikely.

An antibiotic active against MRSA is recommended for the following:</td></tr>
</table>

<table>
<tr><th>Etiology</th><th colspan="3">Regimen</th><th>Comments</th></tr>
<tr><td></td><td colspan="2">>28 days and older children</td><td>100-200mg/kg in 1-2 doses daily (Max: 8g/day)
Meningitis: max: 12g/day</td><td>• Patients who have failed initial recommended antibiotic treatment against MSSA
• Those with markedly impaired host defences
• Those with SIRS and hypotension</td></tr>
<tr><td></td><td>Weight (g)</td><td>Age</td><td>Ceftriaxone dose</td><td rowspan="6">Precautions for Ceftriaxone: Because of its extensive protein binding, Ceftriaxone can displace bilirubin from albumin-binding sites, with the potential risk of inducing kernicterus. Thus, avoid its use in jaundiced neonates. Likewise, neonates should not receive Ceftriaxone intravenously if also receiving intravenous calcium in any form, including parenteral nutrition, because of the risk for precipitation of Ceftriaxone-calcium salt.</td></tr>
<tr><td></td><td><2,000</td><td>0-4 weeks</td><td>50mg/kg in 1 dose daily</td></tr>
<tr><td></td><td>>2,000</td><td>0-7 days</td><td>50mg/kg in 1 dose daily</td></tr>
<tr><td></td><td><1,200</td><td>>7 days</td><td>75mg/kg in 1 dose daily</td></tr>
<tr><td></td><td colspan="2">>28 days and older children</td><td>100-200mg/kg in 1-2 doses daily (max: 4g/day)</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td></td><td colspan="3">2nd line: Clindamycin IV PLUS Cefotaxime+ OR Ceftriaxone+</td><td>See regimen under 1st line treatment.</td></tr>
<tr><td></td><td>Weight (g)</td><td>Age</td><td>Clindamycin IV daily dose</td><td rowspan="7"></td></tr>
<tr><td></td><td><1,200</td><td>0-4 weeks</td><td>10mg/kg in 2 doses</td></tr>
<tr><td></td><td rowspan="2">1,200-2,000</td><td>0-7 days</td><td>10mg/kg in 2 doses</td></tr>
<tr><td></td><td>>7 days</td><td>15mg/kg in 3 doses</td></tr>
<tr><td></td><td rowspan="2">>2,000</td><td>0-7 days</td><td>15mg/kg in 3 doses</td></tr>
<tr><td></td><td>>7 days</td><td>20mg/kg in 4 doses</td></tr>
<tr><td></td><td colspan="2">>28 days and older children</td><td>25-40mg/kg in 3-4 doses (Max: 2.7g/day)</td></tr>
</table>

Etiology	Regimen	Comments
	Option 2: **Vancomycin** ***PLUS*** **Ciprofloxacin** 20-30mg/kg/day IV in 2-3 doses (Max: 1.2g/day) *Option 3:* **Linezolid IV** <u><12 years:</u> 30mg/kg/day in 3 doses <u>≥12 years:</u> 1.2g/day in 2 doses ***PLUS*** **Ciprofloxacin** 20-30mg/kg/day in 2-3 doses (Max: 1.2g/day) *Option 4:* **Co-trimoxazole** 8-12mg/kg/day in 2 doses (trimethoprim component) (Max: 320mg/day) ***PLUS*** **Ciprofloxacin** 20-30mg/kg/day in 2-3 doses (Max: 1.2g/day)	
Osteomyelitis, Contiguous Focus		
S. aureus, Coagulase-negative staphylococci, Enterobacteriaceae, *Streptococcus sp., P. aeruginosa*	**1st line:** **Clindamycin** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***OR*** **Vancomycin** 45-60mg/kg/day in 3-4 doses (Max: 4g/day) ***PLUS*** **Ceftazidime** 100-150mg/kg/day div in 3 doses (Max: 6g/day) ***OR*** **Cefepime** 100-150mg/kg/day in 2-3 doses (Max: 6g/day) <u>Specific therapy based on culture results:</u>	The ARSP 2017 showed increased resistance of *S. aureus* to **Oxacillin** at 57%. Start empiric therapy with antibiotics against MRSA after collection of blood and joint fluid for culture; review Gram stain of joint fluid. **Clindamycin** is an alternative if there are no signs of sepsis. If cultures grow MSSA, shift to **Oxacillin**. Involves long bone or post internal fixation of fracture. Empiric therapy is indicated in septic patients. Otherwise, await culture results. It may be necessary to remove hardware and use
Susceptible Gram-negative bacillus	**Ciprofloxacin** 20-30mg/kg/day in 2-3 doses (Max: 1.2g/day)	
Methicillin-sensitive staphylococci	**Oxacillin** *Mild to moderate infections:* 100-150mg/kg/day in 4 doses (Max: 4g/day) *Severe infections:* 150-200mg/kg/day in 4-6 doses (Max: 12g/day)	

Etiology	Regimen	Comments
Methicillin-resistant staphylococci Methicillin-susceptible or methicillin-resistant staphylococci (culture-proven)	***OR* Cefazolin** *Mild to moderate infections:* 50mg/kg/day in 3 doses (Max: 3g/day) *Severe infections:* 100-150mg/kg/day in 3 doses (Max dose: 6g/day) **2nd line:** **Linezolid** (Empiric) <12 years: 30mg/kg/day IV in 3 doses >12 years: 1200mg/day IV in 2 doses ***PLUS* Ceftazidime** 100-150mg/kg/day in 3 doses (Max: 6g/day) ***OR* Cefepime** 100-150mg/kg/day in 2-3 doses (Max: 6g/day) **Ciprofloxacin** 20-30mg/kg/day IV in 2-3 doses (Max: 1.2g/day) ***PLUS* Rifampin** 10-20mg/kg/day in 1-2 doses (Max: 600mg/day) **Duration:** Not well defined but 6 weeks is generally recommended, longer if hardware retained.	external fixation if there is persistent bone non-union. Early hardware infection (symptoms <4 weeks): If hardware is removed, treat for 6 weeks. If hardware is retained, treat until bony fusion or hardware removal. Late infection: Remove the hardware, if possible and treat for 6 weeks. If the hardware is retained, treat for 3-6 months or until the hardware removed.
Chronic Osteomyelitis		
Chronic osteomyelitis usually occurs in adults following trauma or surgery. It implies a long-standing infection and the presence of dead bone. *S. aureus*, Enterobacteriaceae, *P. aeruginosa,* Streptococci	Empiric therapy is not recommended. Treatment should be guided by valid cultures and sensitivity studies **Duration:** Optimal unknown. Prolonged course of therapy is typically recommended but 6 weeks may be adequate if surgical debridement is performed. Consider intermittent therapy or chronic suppressive therapy for relapses if surgical debridement was unsuccessful or not feasible.	Important therapeutic adjuncts include: • Removal of orthopaedic hardware • Surgical debridement (critical) • Vascularized muscle flaps • Distraction osteogenesis (Ilizarov) techniques

Etiology	Regimen	Comments
Suppurative Arthritis		
<u>*<3 months old*</u> *S. aureus,* Group B Streptococci, Enterobacteriaceae, *N. gonorrhoeae* In most neonates, no fever, toxemia or leucocytosis is present. Infants with septic arthritis may present with fever and irritability; subtle symptoms such as pain with diaper change may be the only sign. Pseudoparalysis can occur.	**1st line:** Refer to OSTEOMYELITIS (HEMATOGENOUS) **2nd line:** Refer to OSTEOMYELITIS (HEMATOGENOUS) Option 1 Modify regimen to treat specific pathogen based on results of blood or joint fluid culture. Blood cultures are frequently positive. Adjacent bone is involved in 2/3 of patients. See comments on precautions for **Ceftriaxone**. **Clindamycin** is an alternative if with no signs of sepsis. If cultures grow MSSA, shift to **Oxacillin**.	ARSP 2017 showed increased resistance of S. aureus to **Oxacillin** at 57%. Start empiric therapy with antibiotics against MRSA after collection of blood and joint fluid for culture; review Gram stain of joint fluid. Treatment of septic arthritis requires both adequate drainage of purulent joint fluid and appropriate antimicrobial therapy. There is no need to inject antimicrobial agents into joints because of their excellent penetration.
<u>*3 months to 14 years*</u> *S. aureus* (27%), *S. pyogenes or S. pneumoniae* (14%), *H. influenzae* (3%), Gram-negative bacilli (6%), Others (including *N. gonorrhoeae, N. meningitidis*) (14%), Unknown (36%)	**1st line:** <u>If Gram-stain is negative OR if Gram stain is positive for Gram-positive cocci:</u> **Vancomycin** 40-60mg/kg/day in 3-4 doses (Max: 4g/day) ***PLUS*** **Cefotaxime** 100-200mg/kg/day in 3-4 doses (Max: 12g/day) ***OR*** **Ceftriaxone** 100mg/kg/day in 1-2 doses (Max: 4g/day) <u>If Gram stain is positive for Gram-negative organisms:</u> **Cefotaxime** 100-200mg/kg/day in 3-4 doses (Max: 12g/day) ***OR*** **Ceftriaxone** 100mg/kg/day in 1-2 doses (Max: 4g/day)	Drainage of purulent joint fluid (needle aspiration sufficient in most cases, repeated as needed for re-accumulated fluid) is a critical component of therapy. ARSP 2017 showed increased resistance of *S. aureus* to **Oxacillin** at 57%. Start empiric therapy with antibiotics against MRSA after collection of blood and joint fluid for culture; review Gram stain of joint fluid. Beyond the neonatal period, infections with Enterobacteriaceae are rare occurrences. No need to inject antimicrobial agents into joints because of their excellent penetration. Mark

Etiology	Regimen	Comments
	Duration: After initial response, therapy is usually completed with oral therapy for a total of 2-3 weeks. **2nd line: Clindamycin** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***OR* Linezolid IV** <u><12 years:</u> 30mg/kg/day in 3 doses <u>≥12 years:</u> 1200mg/day in 2 doses ***PLUS* Cefotaxime** 100-200mg/kg/day in 3-4 doses (Max: 12g/day) ***OR* Ceftriaxone** 100mg/kg/day in 1-2 doses (Max: 4g/day) **Duration**: 3-6 weeks. Minimum duration should be 3 weeks because some cases may actually have coincident bone infection.	decrease in *H. influenzae* since use of conjugate vaccine. Septic arthritis due to *Salmonella* has no association with sickle cell disease, unlike Salmonella osteomyelitis. **Clindamycin** is an alternative if with no signs of sepsis. If cultures grow MSSA, shift to **Oxacillin**.

REFERENCES

Bravo L, et al. Handbook of Pediatric Infectious Disease an Easy Guide 5th ed. Manila: Philippine Pediatric Society.

Feigin R, Cherry J, et al. Textbook of Pediatric Infectious Diseases, 6th ed. New York: Elsevier; 2009.

The Sanford Guide to Antimicrobial Theraphy 2014. Available at http://webedition.sanfordguide.com/.

Liu C, Bayer A, Cosgrove SE, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America for the Treatment of Methicillin-Resistant *Staphyloccocus aureus* Infections in Adults and Children. Clin Infect Dis 2011:52; e18-55.

MIMS Philippines 1/2016, 147th edition. Makati: MIMS; 2016.

BONE AND JOINT INFECTIONS - ADULT

Etiology	Regimen	Comments
Osteomyelitis (Hematogenous)		
Long bones *S. aureus*, Group A streptococci, Gram-negative bacilli rarely	MRSA likely: **Vancomycin** 15-20mg/kg IV q8-12h If Gram-negative bacilli seen on Gram stain: ***PLUS*** **Ceftazidime** 2g IV q8h ***OR*** **Ceftriaxone** 2g IV q24h ***OR*** **Levofloxacin** 750mg IV q24h **Duration**: 4-6 weeks	Not common in adults. Etiologic diagnosis is essential. Collect blood and bone cultures before giving empiric antibiotic therapy. Adjust treatment based on culture and sensitivity results. Surgical intervention, other than obtaining tissue specimen, usually not required.
Vertebral, including disc space infections, and other sites *S. aureus* most common, streptococci, Gram-negative bacilli	**Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** (**Ceftriaxone** 2g IV q24h ***OR*** **Ceftazidime** 2g IV q8h ***OR*** **Levofloxacin** 750mg IV q24h) **Duration:** Optimal is unknown; usually 6-12 weeks. Do not start antibiotics until etiologic diagnosis is established EXCEPT in the following situations: sepsis, hemodynamic instability, severe or progressive neurological signs and symptoms.	Perform image-guided aspiration biopsy for histopathology or appropriate cultures when etiologic diagnosis is not established by blood cultures. The MRI is the optimal diagnostic imaging. Consider tuberculous etiology when course is subacute and the following characteristic radiologic findings are seen: • Destruction of 2 or more vertebrae and opposed endplates • Spread along the anterior longitudinal ligament • Disk infection with or without paraspinal mass or fluid collection • Spondylitis without disc involvement

Etiology	Regimen	Comments
Osteomyelitis (Contiguous without Vascular Insufficiency)		
Usually follows trauma, bone or joint surgery		
Foot bone (calcaneus) following puncture wound *P. aeruginosa*	**1st line: Ciprofloxacin** 750mg PO bid ***OR*** **Levofloxacin** 750mg PO q24h **2nd line: Ceftazidime** 2g IV q8h ***OR*** **Piperacillin-tazobactam** 4.5g IV q8h	Obtain bone biopsy culture (gold standard). Adjust antibiotic based on susceptibility results. Needs debridement and removal of foreign body.
Long bone, post-internal fixation of fracture *S. aureus*, Gram-negative bacilli, *P. aeruginosa*	**Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** (**Ceftazidime** 2g IV q8h ***OR*** **Piperacillin-tazobactam** 4.5g IV q8h)	Removal of internal fixation hardware is necessary even without bone union because of biofilm formation on metal implant. External fixation can be done to stabilize fracture.
Sternum, post-surgery *S. aureus*, Gram-negative bacilli less often	**Vancomycin** 15-20mg/kg IV q8-12h	Debridement is needed. If Gram-negative bacilli is likely, add appropriate antibiotic based on local susceptibility profile.
Spinal implant *S. aureus,* Gram-negative bacilli	**Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** (**Ceftazidime** 2g IV q8h ***OR*** **Piperacillin-tazobactam** 4.5g IV q8h)	Onset within 30 days: early debridement, retention of implant, and definitive antibiotic x 3 months Late onset (>30 days): implant removal, debridement, and definitive antibiotic x 6 weeks
Osteomyelitis (Contiguous with Vascular Insufficiency)		
Mostly seen in diabetics (See *Diabetic Foot*) Usually polymicrobial in etiology (aerobic and anaerobic)	Empiric treatment is not indicated unless acutely ill. Choose antibiotic treatment based on culture/sensitivity results. **Duration**: (IV to oral): Approximately 6 weeks from the last debridement	Bone/tissue biopsy culture essential. Culture of swab of overlying ulcer unreliable. Osteomyelitis more likely: ulcer >2 cm², positive probe to

Etiology	Regimen	Comments
		bone, ESR >70, abnormal X-ray. MRI – best imaging. Revascularize, if possible.
Osteomyelitis (Chronic)		
Staphylococci, Enterobacteriaceae, *P. aeruginosa*	Empiric treatment is not recommended. Antibiotics must be chosen based on culture/sensitivity results. Usually occurs by contiguous spread, present for weeks to months, associated with dead bone. Surgical resection of necrotic or infected bone and removal of orthopaedic hardware, together with antibiotic therapy, is standard of care. The optimal treatment duration and route is uncertain; antibiotic treatment is usually prolonged (usually 6 weeks). Treatment adjuncts include: • Antibiotic-impregnated cement for local antibiotic delivery- allows higher concentration of antibiotics without systemic toxic effects • Hyperbaric oxygen • Rifampin combined w/ another active agent for chronic staphylococcal and orthopedic implant infections	

Etiology	Regimen	Comments
Joint Infections		
Acute Bacterial Arthritis		
Joint fluid WBC count usually >50,000/mm³ but lower counts do not exclude the diagnosis.		
S. aureus and *Streptococcus spp.* predominate. Gram-negative bacilli in 5-20%	**Consider as an emergency**. Collect blood and joint fluid for culture before starting empiric antibiotic treatment. Empiric antibiotic choices should be based on joint fluid Gram stain. Adjust treatment based on culture/sensitivity results. **Joint drainage is essential.**	
Monoarticular		
At risk for sexually transmitted infection (STI): *N. gonorrhoeae* likely	**Ceftriaxone** 1g IV q24h Treat presumptively for concomitant Chlamydia infection: **Azithromycin** 1g PO x 1 dose **Duration**: 7 days minimum	May manifest as disseminated gonococcal infection, presenting with the classic triad of dermatitis, tenosynovitis, and polyarthritis. Culture other sites: urethra, cervix, and throat.
Not at risk for STI: *S. aureus,* streptococci, Gram-negative bacilli	**Duration:** 2-4 weeks	Differentials for Gram-stain negative arthritis include gout and pseudogout. Look for crystals in joint fluid. If occurring after articular injection, treat based on joint fluid culture result. Empiric therapy is not recommended.
Gram-positive cocci	**Vancomycin** 15-20mg/kg IV q8-12h	
Gram-negative cocci	**Ceftriaxone** 1g IV q24h	
Gram-negative bacilli	**Ceftazidime** 2g IV q8h ***OR*** **Piperacillin-tazobactam** 4.5g IV q6-8h	
Negative on Gram stain	**Vancomycin** ***PLUS*** (**Ceftazidime** ***OR*** **Piperacillin-tazobactam**)	

Etiology	Regimen	Comments
Polyarticular		
N. gonorrhoeae, Acute rheumatic fever, Viruses	If sexually active, **Ceftriaxone** 1g IV q24h	Work up for other causes including reactive arthritis.
Septic Bursitis		
Usually involves olecranon, prepatellar and postpatellar bursae Diagnosis is based on aspiration of fluid from the bursa for WBC count (usually >1,000/mm³), Gram stain and culture/sensitivity.		
S. aureus in > 80%	**Duration**: 14-21 days	Treatment includes antibiotics and daily aspiration of bursa until sterile. Some cases may require bursectomy.
MSSA	**Oxacillin** 2g IV q4h ***OR*** **Cefazolin** 2g IV q8h	
MRSA	**Vancomycin** 15-20mg/kg IV q8-12h	
Prosthetic Joint Infections		
Definitive diagnosis: presence of a sinus tract communicating with the prosthesis or purulence (without another etiology) surrounding the prosthesis • Highly suggestive diagnosis: acute inflammation on histopathology examination of periprosthetic tissue obtained at the time of debridement or prosthesis removal. At least 3 and optimally 5-6 periprosthetic tissue specimens or the prosthesis itself should be sent for aerobic/anaerobic cultures. • Other diagnostic evidence: growth of the same organism in at least 2 intra-operative cultures or in a combination of pre-operative aspirate and intra-operative cultures; or growth of *S. aureus* (or other virulent organism) in tissue biopsy or synovial fluid.		
S. aureus (21-43%), Coagulase-negative staphylococci (17-39%), Streptococci (7-12%), Gram-negative bacilli (5-12%), Enterococci (1-8%), Anaerobes (2-6%), *Propionibacterium acnes*	**Referral to specialist. Empiric therapy is not recommended. Treat based on culture/ sensitivity results.** There is insufficient evidence to make a recommendation on the safety and efficacy of antibacterial cement spacers. Antibiotic cement	**Surgical strategies:** 1. Debridement and retention of prosthesis (DAIR): within 30 days of prosthesis implantation or symptoms <3 weeks, with a

Etiology	Regimen	Comments
associated with shoulder arthroplasty infection	spacers are used to deliver higher concentrations of local antibiotics without systemic side effects and to prevent joint contractures.	well-fixed prosthesis, low-virulence organism, and absence of a sinus tract 2. 1-stage/direct exchange 3. 2-stage exchange
Methicillin-susceptible *S. aureus* or *epidermidis*	DAIR ***PLUS*** (**Oxacillin** 2g IV q4h ***OR*** **Cefazolin** 2g IV q8h) ***PLUS*** **Rifampin** 300mg PO bid x 2-6 weeks (coverage for BIOFILM) ***FOLLOWED BY*** (**Levofloxacin** 750mg PO q24h ***OR*** **Ciprofloxacin** 750mg PO bid) ***PLUS*** **Rifampin** 300mg PO bid for 3 months (6 months for total knee arthroplasty) 1-stage: IV → PO regimen as for DAIR for 3 months 2-stage: IV → PO regimen as above for 4-6 weeks	Confirm isolate susceptibility to **Rifampin** and **Fluoroquinolones**.
Methicillin-resistant *S. aureus* or *S. epidermidis*	DAIR ***PLUS*** **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** **Rifampin** 300mg po bid x 2-6 weeks ***FOLLOWED BY*** (**Levofloxacin** 750mg PO q24h ***OR*** **Ciprofloxacin** 750 mg PO bid) ***PLUS*** **Rifampin** 300mg PO bid for 3 months (6 months for total knee arthroplasty) 1-stage: IV → PO regimen as for DAIR for 3 months 2-stage: IV → PO regimen as above for 4-6 weeks	Confirm isolate susceptibility to **Rifampin** and **Fluoroquinolones**.
Streptococci or *P. acnes*	DAIR ***PLUS*** **Penicillin G** 20-24 MU IV q24h continuously (or in 6 divided doses) ***OR*** **Ceftriaxone** 2g IV q24h x 4-6 weeks 1-/2-stage: as above x 4-6 weeks	
Enterococci (penicillin-susceptible)	DAIR ***PLUS*** **Penicillin G** 20-24 MU IV q24h continuously (or in 6 div doses) ***OR*** **Ampicillin** 2g IV q4h x 4-6 weeks	May add an aminoglycoside (optional).

Etiology	Regimen	Comments
	1-/2-stage: as above x 4-6 weeks	
Enterococci (penicillin-resistant)	DAIR ***PLUS*** **Vancomycin** 15mg/kg IV q12h x 4-6 weeks 1-/2-stage: as above x 4-6 weeks	May add an aminoglycoside (optional).
Enterobacteriaceae	DAIR ***PLUS*** **IV beta-lactam** ***OR*** **Fluoroquinolone** based on susceptibility results x 4-6 weeks 1-/2-stage: as above x 4-6 weeks	
P. aeruginosa	DAIR ***PLUS*** **Ceftazidime** 2g IV q8h ***OR*** **Cefepime** 2g IV q12h 1-/2-stage: as above x 4-6 weeks	May add an aminoglycoside (optional).

REFERENCES

Antimicrobial Resistance Surveillance Program. Manila: Department of Health; 2015.

Antibiotic Guidelines 2015-2016. Treatment Recommendations for Adult Inpatients. Available at: http://www.hopkinsmedicine.org/amp/guidelines/antibiotic_guidelines.pdf

Baek-Nam K, et al. Oral antibiotic treatment of staphylococcal bone and joint infections in adults. J Antimicrob Chemother 2014; 69: 309–322.

Berbari EF et al. 2015 Infectious Diseases Society of America (IDSA) Clinical Practice Guidelines for the Diagnosis and Treatment of Native Vertebral Osteomyelitis in Adults. Clin Infect Dis Advanced Access. Published July 29, 2015.

Liu C, Bayer A, Cosgrove SE, et al. Clinical practice guidelines by the Infectious Diseases Society of America for the treatment of methicillin-resistant *Staphylococcus aureus* infections in adults and children. Clin Infect Dis 2011; 52: e18.

Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases, 8th ed. New York: Elsevier; 2015.

Osmon DR, Berbari EF, Berendt AR, et al. Diagnosis and management of prosthetic joint infection: clinical practice guidelines by the Infectious Diseases Society of America. Clin Infect Dis 2013;56: e1.

Spellberg B, Lipsky B. Systemic Antibiotic Therapy for Chronic Osteomyelitis in Adults. Clin Infect Dis 2012;54(3):393–407.

The Sanford Guide to Antimicrobial Therapy 2016. Available at: http://webedition.sanfordguide.com/.

Tande A, Patel R. Prosthetic Joint Infections. Clin Microbiol Rev 2014;302-345.

Trampuz A, Zimmerli W. Diagnosis and Treatment of Implant-Associated Septic Arthritis and Osteomyelitis. Curr Infect Dis Rep 2008; 10:394-403.

Infective Endocarditis (IE)

Diagnostic Criteria (Modified Duke's Criteria)

A. Pathological criteria (any one):
1. Histology or culture of a cardiac vegetation, an embolized vegetation, or intracardiac abscess from the heart revealing microorganisms
2. Active endocarditis

B. Clinical Criteria:
1. Major criteria
   a. Positive blood culture with typical IE microorganism, defined as one of the following:
      - Typical microorganism consistent with IE from 2 separate blood cultures (viridans group streptococci, or *S. bovis* including nutritional variant strains, or HACEK group, or *S. aureus*, or community-acquired *enterococci*, in the absence of a primary focus)
      - Microorganisms consistent with IE from persistently positive blood cultures (at least two positive cultures of blood samples drawn >12 hours apart, or all of 3 or a majority of 4 separate cultures of blood, with first and last sample drawn > 1 hour apart)
      - *Coxiella burnetii* detected by at least one positive blood culture or IgG antibody titer for Q fever phase 1 antigen >1:800.
   b. Evidence of endocardial involvement with positive echocardiogram defined as oscillating intracardiac mass on valve or supporting structures, in the path of regurgitant jets, or on implanted material in the absence of an alternative anatomic explanation, or abscess, or new partial dehiscence of prosthetic valve or new valvular regurgitation (worsening or changing of pre-existing murmur not sufficient)
2. Minor criteria
   a. Predisposing factor: known cardiac lesion, recreational drug injection
   b. Fever >38°C
   c. Embolism evidence: arterial emboli, pulmonary infarcts, Janeway lesions, conjunctival/intracranial hemorrhages
   d. Immunological problems: glomerulonephritis, Osler's nodes, Roth spots, rheumatoid factor
   e. Microbiologic evidence: Positive blood culture (that doesn't meet a major criterion) or serologic evidence of infection with organism consistent with IE but not satisfying major criterion

Definitive: 2 major clinical criteria ***OR*** 1 major and 3 minor criteria ***OR*** 5 minor criteria ***OR*** 1 pathological criterion

Possible: 1 major and 1 minor criterion ***OR*** 3 minor criteria are fulfilled

Native Valve Infective Endocarditis		
Streptococcus viridans (30-40%), Other streptococci (15-25%), Enterococci (5-18%), Staphylococci (20-35%), *Haemophilus* sp., *Aggregatibacter* sp., *Cardiobacterium hominis*, *Eikenella corrodens*, and *Kingella* species (HACEK) (5%), Culture negative 10%	**Empiric Therapy** *Community-acquired* Pediatric: **Ampicillin-sulbactam** 200-300mg/kg/day IV div 4-6 doses (Max: 12g/day) ***PLUS*** **Gentamicin** 3-6mg/kg/day IV/IM div q8h Adult: **Ampicillin-sulbactam** 3g IV q6h ***PLUS*** **Gentamicin** 1mg/kg IV q8h *Healthcare-associated* Pediatric: **Vancomycin** 60mg/kg/day IV div q6h (Max: 2g/day) ***PLUS*** **Gentamicin** 3-6mg/kg/day IV q8h ***PLUS*** [**Cefepime** 100-150mg/kg/day div q8-12h (Max: 6g/day) ***OR*** **Ceftazidime** 100-150mg/kg/day IV div q8h (Max: 2-4g/day)] Adult: **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** **Gentamicin** 1mg/kg IV q8h ***PLUS*** (**Cefepime** 2g IV q8h ***OR*** **Ceftazidime** 2g IV q8h)	• Obtain at least 3 sets of blood cultures. • In all suspected cases, conduct transthoracic echocardiogram (TTE). • When TTE is negative if there is ongoing suspicion of IE or concern about intracardiac complications, conduct transesophageal echo (TEE). • **Once pathogen is identified, antibiotic Rx must be adapted to susceptibility pattern.**
	Pathogen-Specific Treatment	
S. viridans or *S. bovis* (*S. gallolyticus*) with Penicillin G MIC ≤0.12 mcg/mL	Pediatric: Aqueous crystalline **Penicillin G Na** 200,000-300,000 U/kg/day IV div q4h (Max: 12-24 MU/day) x 4 weeks ***OR*** **Ceftriaxone** 100mg/kg/day IV/IM div q12h or 80mg/kg/day (Max: 2g q12h) x 4 weeks	Suspect occult bowel pathology (e.g., tumor) in adults when the etiologic agent is *S. bovis*.

	Adult: [(**Penicillin G** 12-18 MU/day IV div q4h ***OR*** **Ceftriaxone** 2g IV q24h) x 2 weeks ***PLUS*** **Gentamicin** 3mg/kg/day x 2 weeks] ***OR*** **Penicillin G** 12-18 MU/day IV div q4h x 4 weeks ***OR*** **Ceftriaxone** 2g IV q24h x 4 weeks If unable to tolerate **Penicillin** or **Ceftriaxone**: **Vancomycin** 15mg/kg IV q12h x 4 weeks	A 2-week combination regimen is reasonable with uncomplicated IE, rapid treatment response and without renal disease. Treatment with **Vancomycin** must achieve trough concentration of 15-20 mcg/mL. Obtain the trough level before the 4th dose.
S. viridans or *S. bovis* (*S. gallolyticus*) with Penicillin G MIC >0.12 to ≤0.5mcg/mL	Pediatric: [**Ampicillin** 200-300mg/kg/day IV div q4-6h (Max: 12g/day) x 4 weeks ***OR*** **Ceftriaxone** 100mg/kg/day IV/IM div q12h or 80mg/kg/day (Max: 2g q12h) x 4 weeks] ***PLUS*** **Gentamicin** 3-6mg/kg/day IV div q8h x 2 weeks Adult: [**Penicillin G** 24 MU/day IV div q4h x 4 weeks ***PLUS*** **Gentamicin** 3mg/kg/day x 2 weeks] ***OR*** **Ceftriaxone** 2g/day IV x 4 weeks	Check susceptibility to **Ceftriaxone**. If unable to tolerate **Penicillin** or **Ceftriaxone:** **Vancomycin** 15mg/kg IV q12h x 4 weeks
S. viridans or *S. bovis* (*S. gallolyticus*) with **Penicillin G** MIC >0.5 mcg/mL and Enterococci susceptible to **Ampicillin**/ **Penicillin G**, **Vancomycin**, **Gentamicin** (synergy positive)	**1st line:** (**Penicillin G** 18-30 MU/day IV div q4h ***OR*** **Ampicillin** 12g/day IV div q4h x 4-6 weeks) ***PLUS*** **Gentamicin** 1mg/kg IV q8h x 4-6 weeks **2nd line: Ampicillin** 12g/day IV div q4h ***PLUS*** **Ceftriaxone** 2g IV q12h x 6 weeks **Duration:** if symptoms <3 months, 4 weeks; if symptoms >3 months, 6 weeks	Alternative double **beta-lactam** regimen (**Ampicillin** + **Ceftriaxone**) may be used when unable to use **Gentamicin** (ex. creatinine clearance <50 mL/min)

Enterococci, **penicillin**-susceptible, aminoglycoside-resistant (**Gentamicin** MIC >500 mcg/mL), streptomycin susceptible	Pediatric: **Ampicillin** 200-300mg/kg/day IV div q4-6h (Max dose 12g/day) ***PLUS*** **Ceftriaxone** 100mg/kg/day IV/IM div q12h or 80mg/kg/day (Max: 2g q12h) x 6 weeks Adult: **Ampicillin** 12g/day IV div q4h ***PLUS*** **Ceftriaxone** 2g IV q12h x 6 weeks	
Enterococci, **Penicillin**-resistant, aminoglycoside-sensitive	Pediatric: **Vancomycin** 60mg/kg/day IV div q6h (Max: 2g/day) ***PLUS*** **Gentamicin** 3-6mg/kg/day IV div q8h x 6 weeks Adult: **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** **Gentamicin** 1mg/kg IV q8h x 6 wks	Potential increased nephrotoxicity and ototoxicity with this combination. Dose must be adjusted to achieve **Vancomycin** target trough concentration of 15-20 mcg/mL. **Refer to specialist.**
Enterococci, **Penicillin**- and aminoglycoside-resistant or **Vancomycin**-resistant	**Refer to specialist.**	
Methicillin-susceptible *Staphylococcus aureus* (MSSA)	Pediatric: **Oxacillin** 200mg/kg/day IV div 4-6 doses (Max: 12g/day) x 6 weeks ***WITH or WITHOUT*** **Gentamicin** 3-6mg/kg/day IV/IM q8h x 3-5 days Adult: **Oxacillin** 2g IV q4h x 4-6 weeks ***OR*** **Cefazolin** 2g IV q8h x 6 weeks	
Methicillin-resistant *S. aureus* (MRSA)	Pediatric: **Vancomycin** 60mg/kg/day IV div q6h (Max: 2g/day) Adult: **Vancomycin** 15-20mg/kg IV q8-12h x 6 weeks	

Haemophilus sp., *Aggregatibacter sp.*, *Cardiobacterium hominis*, *Eikenella corrodens*, and *Kingella* species (HACEK)	Pediatric: **Ceftriaxone** 100mg/kg/day IV/IM div q12h or 80mg/kg/day (Max: 2g q12h) x 4 weeks *If beta-lactamase producing:* **Ampicillin-sulbactam** 200-300mg/kg q24h IV div 4 or 6 doses x 4 weeks Adult: **Ceftriaxone** 2g IV q24h x 4 weeks *If beta-lactamase producing:* **Ampicillin-sulbactam** 3g IV q6h x 4 weeks	
Prosthetic Valve IE		
	Empiric Therapy	
Early (<2 months post-surgery): *S. epidermidis* and *S. aureus* mostly **Late (>2 months post-surgery):** *S. epidermidis, S. viridans,* enterococci, *S. aureus*	Pediatric: **Vancomycin** 40-60mg/kg/day div q6-8h ***PLUS*** **Gentamicin** 3-6mg/kg/day IV div q8h ***PLUS*** **Rifampin** 20mg/kg/day IV/PO div 3 doses x 6 weeks (Max: 900mg/days) Adult: **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** **Gentamicin** 1mg/kg IV q8h ***PLUS*** **Rifampin** 600mg PO q24h **Duration:** 6 weeks	Early surgical consultation is recommended. Surgical indications: • Signs and symptoms of congestive heart failure due to valve dehiscence • Intracardiac fistula and prosthetic valve dysfunction • Persistent bacteremia despite 5-7 days of treatment • Heart block, annular or aortic abscess • Recurrent emboli • Caused by fungal or highly resistant organisms

	Pathogen-specific Treatment	
Methicillin-susceptible *S. aureus* (MSSA)	Pediatric: **Oxacillin** 200mg/kg/day IV div 4–6 doses x 6 weeks (Max: 12g/day) ***PLUS*** **Rifampin** 20mg/kg q24h IV/PO div 3 doses x 6 weeks (Max: 900mg/day) ***PLUS*** **Gentamicin** 3-6mg/kg/day IV/IM div 3 doses x 2 weeks Adult: **Oxacillin** 2g IV q4h ***PLUS*** **Rifampin** 300mg PO q8h x 6 weeks ***PLUS*** **Gentamicin** 1mg/kg IV q8h x 2 weeks	
Methicillin-resistant *S. aureus* (MRSA)	Pediatric: **Vancomycin** 60mg/kg/day IV div 4 doses x 6 weeks ***PLUS*** **Rifampin** 20mg/kg/day IV/PO div 3 doses x 6 weeks (Max: 900mg/day) ***PLUS*** **Gentamicin** 3-6mg/kg/day IV/IM div 3 doses x 2 weeks Adult: **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** **Rifampin** 300mg PO q8h x 6 weeks ***PLUS*** **Gentamicin** 1mg/kg IV q8h x 2 weeks **Duration:** 6 weeks	
Gram-negative enteric bacilli	Pediatric: [**Ceftazidime** 100-150mg/kg/day IV div q8h x 6 weeks (Max: 2-4g/day) ***OR*** **Cefotaxime** 200mg/kg/day IV div q6h x 6 weeks (Max: 12g/day) ***OR*** **Ceftriaxone** 100mg/kg/day IV div q12h or 80mg/kg/day IV div q12-24h x 6 weeks (Max: 2g/day)] ***PLUS*** **Gentamicin** 3-6mg/kg/day IV div q8h	Choice based on in vitro susceptibility.

Etiology	Regimen	Comments

Infective Endocarditis (IE) Prophylaxis

- Only an extremely small number of cases of IE might be prevented by antibiotic prophylaxis for dental procedures even if such prophylactic therapy was 100% effective.
- Only for patients with underlying cardiac conditions associated with the highest risk of adverse outcome from IE, IE prophylaxis for dental procedures is reasonable.
- For patients with these underlying cardiac conditions, prophylaxis is reasonable for all dental procedures that involve manipulation of the gingival tissue, or the periapical region of teeth, or perforation of the oral mucosa.
- Prophylaxis is not recommended based solely on an increased lifetime risk of acquisition of IE.
- For patients who undergo a genitourinary or gastrointestinal tract procedure, administration of antibiotics solely to prevent endocarditis is not recommended.

Cardiac conditions with the highest risk of adverse outcome from IE where prophylaxis for dental procedures is reasonable:

- Prosthetic cardiac valve or prosthetic material used for cardiac valve repair
- Previous IE
- Congenital heart disease or CHD (except for the conditions listed above, antibiotic prophylaxis is no longer recommended for any other form of CHD)
  - Unrepaired cyanotic CHD, including palliative shunts and conduits
  - Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure. Prophylaxis is reasonable because endothelialization of prosthetic material occurs within 6 months after the procedure.
  - Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)
- Cardiac transplantation recipients who develop cardiac valvulopathy

IE Prophylaxis is reasonable for patients with specified cardiac conditions (see above statements) for all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa (biopsies, suture removal, placement of orthodontic bands).

Procedures and events that do **NOT** need prophylaxis:

- Routine anaesthetic injections through non-infected tissue
- Dental radiographs
- Placement of orthodontic brackets
- Shedding of deciduous teeth

– Placement of removable prosthodontic or orthodontic appliances – Adjustment of orthodontic appliances			– Bleeding from trauma to the lips or oral mucosa	
Dental Prophylaxis				
	Single dose 30-60 min. before procedure			
Situation	**Agent**	**Pediatric**	**Adult**	
Oral	**Amoxicillin**	50mg/kg	2g	
Unable to take oral medication	**Ampicillin *OR*** **Cefazolin *OR*** **Ceftriaxone**	50mg/kg IM or IV 50mg/kg IM or IV 50mg/kg IM or IV	2g IM/IV 1g IM/IV 1g IM/IV	
Allergic to penicillins or ampicillin—oral	**Cephalexin *OR*** **Clindamycin *OR*** **Azithromycin *OR*** **Clarithromycin**	50mg/kg 20mg/kg 15mg/kg 15mg/kg	2g 600mg 500mg 500mg	Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage.
Allergic to penicillins or ampicillin and unable to take oral medication	**Cefazolin *OR*** **Ceftriaxone *OR*** **Clindamycin**	50mg/kg IM or IV 20mg/kg IM or IV	1g IM/IV 600mg IM/IV	Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillin or ampicillin.

Indications for Surgery

1. Congestive heart failure
   - Congestive heart failure caused by severe aortic or mitral regurgitation or, more rarely, by valve obstruction caused by vegetations
   - Severe acute aortic or mitral regurgitation with echocardiographic signs of elevated left ventricular end-diastolic pressure or significant pulmonary hypertension
   - Congestive heart failure as a result of prosthetic dehiscence or obstruction

   Note: Surgery should be performed immediately, irrespective of antibiotic therapy, in patients with persistent pulmonary edema or cardiogenic shock. If congestive heart failure disappears with medical therapy and there are no other surgical indications, intervention can be postponed to allow a period of days or weeks of antibiotic treatment under careful clinical and echocardiographic observation. In patients with well tolerated severe valvular regurgitation or prosthetic dehiscence and no other reasons for surgery, conservative therapy under careful clinical and echocardiographic observation is recommended with consideration of deferred surgery after resolution of the infection, depending upon tolerance of the valve lesion.
2. Periannular extension (Most patients with abscess formation or fistulous tract formation)
3. Systemic embolism
   - Recurrent emboli despite appropriate antibiotic therapy
   - Large vegetations (>10 mm) after 1 or more clinical or silent embolic events after initiation of antibiotic therapy
   - Large vegetations and other predictors of a complicated course
   - Very large vegetations (>15 mm) without embolic complications, especially if valve-sparing surgery is likely (remains controversial)

   Note: In all cases, surgery for the prevention of embolism must be performed very early since embolic risk is highest during the first days of therapy.
4. Cerebrovascular complications
   - Silent neurological complication or transient ischemic attack and other surgical indications
   - Ischemic stroke and other surgical indications, provided that cerebral hemorrhage has been excluded and neurological complications are not severe (e.g., coma)

   Note: Surgery is contraindicated for at least one month after intracranial hemorrhage unless neurosurgical or endovascular intervention can be performed to reduce bleeding risk.
5. Persistent sepsis
   - Fever or positive blood cultures persisting for >5 to 7 days despite an appropriate antibiotic regimen, assuming that vegetations or other lesions requiring surgery persist and that extracardiac sources of sepsis have been excluded
   - Relapsing IE, especially when caused by organisms other than sensitive streptococci or in patients with prosthetic valves
6. Difficult organisms
   - *Staphylococcus aureus* IE involving a prosthetic valve and most cases involving a left-sided native valve
   - IE caused by other aggressive organisms (*Brucella*, *Staphylococcus lugdunensis*)
   - IE caused by multiresistant organisms (e.g. methicillin-resistant *S. aureus* or vancomycin-resistant enterococci) and rare infections caused by Gram-negative bacteria
   - *Pseudomonas aeruginosa* IE
   - Fungal IE
7. Prosthetic valve endocarditis
   - Virtually all cases of early prosthetic valve endocarditis
   - Virtually all cases of prosthetic valve endocarditis caused by *S. aureus*
   - Late prosthetic valve endocarditis with heart failure caused by prosthetic dehiscence or obstruction, or other indications for surgery

Etiology	Regimen	Comments
Bacterial Purulent Pericarditis		
S. aureus, Group A Streptococcus, *S. pneumoniae,* Enterobacteriaceae	Pediatric: **Vancomycin** 60mg/kg/day div q6h (adjusted based on TDM) ***PLUS*** **Ceftriaxone** 100mg/kg/day IV div q12-24h (Max: 2 g q12h) Adult: **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** [**Ceftriaxone** 2g IV q24h ***OR*** **Levofloxacin** 750mg IV q24h ***OR*** **Aminoglycoside** (**Gentamicin** 5mg/kg/day ***OR*** **Amikacin** 15 mg/kg/day)]	Initial antibiotic regimen should consist of 2 or more drugs, when etiologic agent cannot be detected rapidly. Drainage is usually necessary.
Methicillin-resistant *S. aureus* is isolated and/or with history and clinical features for MRSA infection; *S. pneumoniae* resistant to extended-spectrum cephalosporins, or nosocomial infections	**Vancomycin** 60mg/kg/day q6h (adjusted based on TDM) **Duration**: Empiric and determined partly by the nature of concomitant infection. Once a pathogen is isolated and the antimicrobial susceptibilities are known, the most specific antimicrobial agent is continued IV for 3-4 weeks.	
Methicillin-sensitive *S. aureus*	**Oxacillin** 200mg/kg/day (Max: 4-12g/day)	
S. pneumoniae (including penicillin-resistant strains), *N. meningitidis, H. influenzae* type b (for children who may be inadequately immunized)	**Cefotaxime** 200-300mg/kg/day IV div q6-8h (Max: 12g/day) ***OR*** **Ceftriaxone** 100mg/kg/day IV div q12-24h (Max: 2g q12h)	An aminoglycoside should be added when: 1. purulent pericarditis occurs after surgery 2. in association with UTI in the immunocompromised

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td colspan="3">Acute Rheumatic Fever</td></tr>
<tr><td><u>Primary Prevention:</u> See section on Streptococcal Tonsillopharyngitis</td><td colspan="2">Therapy for acute rheumatic fever is symptomatic to control the inflammation, decrease the fever, and keep cardiac failure in check.</td></tr>
<tr><td><u>Secondary Prevention:</u> Prevention of recurrent attacks</td><td>Benzathine Penicillin G (every 3 weeks*)
≤27 kg: 600,000 U IM
>27 kg: 1,200,00 U IM
OR Penicillin V 250mg PO bid
<u>If with Penicillin allergy:</u> Erythromycin 20mg/kg/day bid (Max: 250mg bid) OR Azithromycin 5mg/kg/day (Max: 250mg)</td><td>Referral to a pediatric cardiologist is important. Prevention of recurrent episodes of Group A Streptococcus (GAS) pharyngitis is the most effective method to prevent severe RHD. An individual with a previous attack of rheumatic fever in whom GAS pharyngitis develops is at high risk for a recurrent attack of rheumatic fever.
Successful oral prophylaxis depends on patient adherence (compliance), and oral agents are more appropriate for patients at low risk for rheumatic fever recurrence.</td></tr>
<tr><td></td><td colspan="2">Duration of Secondary Rheumatic Fever Prophylaxis Category
<table>
<tr><th>**Clinical or echocardiographic findings</th><th>Duration of Last Attack</th></tr>
<tr><td>Rheumatic fever with carditis and residual heart disease (persistent valvular disease**)</td><td>10 years or until 40 years of age (whichever is longer)</td></tr>
<tr><td>Rheumatic fever with carditis but no residual heart disease (no valvular disease**)</td><td>10 years or 21 years of age (whichever is longer)</td></tr>
<tr><td>Rheumatic fever without carditis</td><td>5 years or 21 years of age (whichever is longer)</td></tr>
</table></td></tr>
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Etiology	Regimen	Comments
Central Line-Associated Bloodstream Infection (CLABSI) In Children		
Coagulase-negative staphylococci (especially *S. epidermidis*), *S. aureus*, *Enterococcus* spp., *E. coli*, *Klebsiella* spp., Other enteric Gram-negative bacteria	**Vancomycin** 60mg/kg/day div q6h ***PLUS*** **Piperacillin-tazobactam** 200-300mg/kg/day IV div q8h ***PLUS*** **Aminoglycoside**	Once the causative organism is identified, targeted therapy should be selected based on susceptibility testing. A shorter 5- to 7-day treatment course is reasonable for CLABSI due to coagulase-negative staphylococci if the catheter is removed and blood cultures clear promptly.
Candida spp.	**Fluconazole** 12mg/kg PO/IV as loading dose, then 6mg/kg/day is an acceptable alternative if not critically ill and unlikely to have fluconazole-resistant *Candida spp.* **Duration:** up to 2 weeks after clearance of *candidemia* • If the catheter is retained: 10-14 days of systemic antibiotic therapy from the date of the first negative blood culture. • If the catheter is removed: 10–14 days of appropriate systemic therapy.	
Central Line-Associated Bloodstream Infection in Adults		
Diagnosis: Fever AND: 1) positive percutaneous blood culture and same organism cultured from central venous catheter (CVC) tip OR 2) positive blood cultures simultaneously drawn with CVC positive at least 2 hours earlier than the peripheral vein culture. Referral to specialist is recommended. Infection prevention of long-term IV lines includes components of both insertion and maintenance bundles: • Hand washing • Maximal sterile barrier precautions during catheter insertion • Daily review of line necessity and replacement • Disinfection of hubs • Strict asepsis for dressing changes		

Etiology	Regimen	Comments
• Use of >0.5% chlorhexidine prep with alcohol for skin antisepsis (chlorhexidine–alcohol provides greater protection against short-term catheter-related infections than povidone iodine–alcohol) • Avoidance of femoral vessels		• Standardized administration set changes
Non-Tunneled: central venous catheter (subclavian, internal jugular), peripherally inserted central catheter (PICC): *S. epidermidis*, *S. aureus* (MSSA/MRSA) Tunnel Type: indwelling venous catheters and ports (Broviac, Hickman, Groshong,), dual lumen hemodialysis catheters (Permacath): *S. epidermidis*, *S. aureus* (MSSA/MRSA), *Candida sp.*	**Vancomycin** 15-20mg/kg IV q8-12h **If *S. aureus***, remove catheter and treat for 2 weeks. Prolong to 4-6 weeks if transesophageal echocardiogram positive for vegetation or if there are other complications (e.g. septic thrombosis, osteomyelitis) **If *S. epidermidis***, may "save" catheter and treat for 10-14 days plus antibiotic lock therapy (in the absence of complications) For documented MSSA: **Oxacillin** 2g IV q4h ***OR*** **Cefazolin** 2g IV q8h	If subcutaneous tunnel infected, remove catheter. Do not insert new catheter over a guidewire.
Impaired Host (burn, neutropenic)		
S. epidermidis, S. aureus (MSSA/MRSA), *Candida sp., Pseudomonas sp.,* Enterobacteriaceae, *Corynebacterium jeikeium*, *Aspergillum, Rhizopus*	**Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** (**Cefepime** 2g IV q8h or **Ceftazidime** 2g IV q8h) ***OR*** **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** (**Piperacillin-tazobactam** 4.5g IV q6-8h ***OR*** **Cefepime** 2g IV q8h or **Ceftazidime** 2g IV q8h) ***PLUS*** **Amikacin** 15mg/kg/day	Often w/ associated septic thrombophlebitis; biopsy of vein recommended to rule out fungal etiology. If fungal, surgical drainage, ligation or removal often indicated + antifungal Rx.

Etiology	Regimen	Comments
Hyperalimentation		
S. epidermidis, S. aureus (MSSA/ MRSA), *Candida sp*.	See staphylococcal infections.	
If Candida:	An echinocandin (e.g. **Anidulafungin** 200mg IV loading dose then 100mg IV daily). **Fluconazole** 12mg/kg PO or IV as loading dose, then 6mg/kg/day is an acceptable alternative if not critically ill and unlikely to have fluconazole-resistant *Candida sp.* **Duration:** up to 2 weeks after clearance of candidemia	Remove venous catheter. Stop antimicrobial agents, if possible. Ophthalmologic consultation recommended when candidemia is suspected to detect early ophthalmic involvement. Treat all patients with positive blood cultures for *Candida.*

REFERENCES

Baddour LM, Wilson WR, Bayer AS, et al. Infective Endocarditis in Adults: Diagnosis, Antimicrobial Therapy, and Management of Complications: A Scientific Statement for Healthcare Professionals from the American Heart Association. *Circulation* 2015; 132:1435-1486.

Baltimore R, Gewitz M, Baddour L, et al. Infective Endocarditis in Childhood: 2015 Update A Scienti c Statement From the American Heart Association. Circulation. 2015; 132:1487-1515.

Ling ML, Apisarnthanarak A, Jaggi N, et al. APSIC guide for prevention of Central Line Associated Bloodstream Infections (CLABSI). *Antimicrob Resist Infect Control* 2016; 5:16.

Mermel LA, Allon M, Bouza E, et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America. *Clin Infect Dis*. Jul 1 2009; 49(1):1-45.

O'Grady NP, Alexander M, Burns LA, et al. Guidelines for the prevention of intravascular catheter-related infections. *Clin Infect Dis*. 2011 May;52(9): e162–193. Epub 2011 Apr 1.

Pappas PG, Kauffman CA, Andes DR, et al. Clinical Practice Guideline for the Management of Candidiasis: 2016 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2016;62: e1-50.

Prendergast BD, Tornos P. Surgery for Infective Endocarditis. Circulation 2010; 121:1141-1152.

Wilson W, Taubert CA, Gewitz M, et al. Guidelines from the American Heart Association: A Guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation* 2007;116(15):1736-54

CENTRAL NERVOUS SYSTEM INFECTIONS

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td colspan="3">Community Acute Bacterial Meningitis</td></tr>
<tr><td colspan="3">Acute bacterial meningitis is an inflammatory disease of the leptomeninges, the tissues surrounding the brain and spinal cord as proven by a positive bacterial CSF culture, PCR, Gram stain or antigen test; or suspected by clinical characteristics and/or CSF markers of inflammation (an abnormal number of white blood cells, elevated protein and low glucose levels).

In children, common signs and symptoms include fever, irritability, poor feeding, bulging fontanel, and seizures. In neonates, signs and symptoms are subtler and may resemble neonatal sepsis. There is no single or combination of signs which are diagnostic of bacterial meningitis. If bacterial meningitis is suspected, CSF analysis and culture should be performed to confirm the diagnosis.

In adults, the classic triad of acute bacterial meningitis consists of fever, nuchal rigidity, and a change in mental status.

Once suspected and awaiting laboratory results, empiric therapy should be started right away to prevent complications and mortality.</td></tr>
<tr><td>< 2 months old
Escherichia coli, Streptococcus pneumoniae, Klebsiella, Enterobacteriaceae, Group B Streptococcus (rare)</td><td>Ampicillin or Cefotaxime IV/IM
<table><tr><th>Body weight</th><th>Age 0-7 days</th><th>Age >7 days</th></tr><tr><td><2 kg</td><td>50mg/kg q12h</td><td>50mg/kg q8h</td></tr><tr><td>≥2 kg</td><td>50mg/kg q8h</td><td>50mg/kg q6h</td></tr></table>PLUS Amikacin 15mg/kg/day IV/IM q24h OR Gentamicin 5mg/kg/day IV/IM q24h

Duration: dependent on the etiology of bacterial meningitis.</td><td>Adjust therapy based on culture. Start antibiotic therapy immediately after a lumbar puncture or, if this is delayed, after obtaining blood cultures.

Early onset usually due to maternal transmission. May use Ceftriaxone if Cefotaxime is not available and the neonate is not jaundiced.

Repeat lumbar tap in the neonate is necessary to verify sterilization of the CSF in Gram-negative meningitis. Dexamethasone has no role in neonatal meningitis.</td></tr>
</table>

Etiology	Regimen	Comments
>2 months - 5 years: *S. pneumoniae, H. influenzae, N. meningitidis* (less common)	**Ceftriaxone** 100mg/kg/day IV div q12-24h (Max: 4g/day) ***OR*** **Chloramphenicol** 100mg/kg/day IV div q8h (Max: 4g/day) If penicillin- or cephalosporin-resistant *S. pneumoniae* is suspected: add **Vancomycin** 15-20mg/kg IV q8-12h. If *H. influenzae* type b meningitis is suspected: **Dexamethasone** is of proven value for at a dose of 0.15mg/kg/day (max: 10mg) div q6h x 4 days. ***ADD*** **Rifampin** prophylaxis to eradicate the carrier state. <3 years: 10mg/kg/day x 4 days; ≥3-5 years: 20mg/kg/day x 4 days (Max: 600mg/day)	**Do not use Cefuroxime** for treatment of bacterial meningitis because of delayed sterilization and greater incidence of hearing loss. It should be started along or shortly before the 1st antibiotic dose. The first dose should be administered within 4 hours of starting antibiotic. Do not start **Dexamethasone** >12h after starting antibiotics.
>5 to 18 years: *S. pneumoniae, N. meningitidis*	**Ceftriaxone** 100mg/kg/day IV div q12h (Max: 4g/day) ***OR*** **Chloramphenicol** 100mg/kg/day IV div q8h (Max: 4g/day) <10 years with confirmed Hib meningitis: ***ADD*** **Rifampin** prophylaxis 20mg/kg/day x 4 days (Max: 600mg/day) to eradicate the carrier state.	Repeat lumbar puncture (LP) is recommended in patients with poor clinical response despite 36 hours of appropriate antibiotic treatment or those with Gram-negative meningitis. For *H. influenzae* and *S. pneumoniae* meningitis, if the patient is improving, repeat LP is not necessary.
18 to 50 years: *S. pneumoniae, N. meningitidis*	**Ceftriaxone** 2g IV q12h	Start **Dexamethasone** before or give with the first dose of antibiotics at 0.15mg/kg q6h IV x 2-4 days.
>50 years: *S. pneumoniae, N. meningitidis, L. monocytogenes,* aerobic Gram-negative bacilli	**Ampicillin** 2g IV q4h ***PLUS*** **Ceftriaxone** 2g IV q12h	

Etiology	Regimen	Comments
For severe penicillin allergy	**Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** **Aztreonam** 2g IV q6-8h ***OR*** **Ciprofloxacin** 400mg IV q12h	
	Duration (regardless of age): *S. pneumoniae*: 10-14 days *H. influenzae*: 7 days *N. meningitidis*: 7 days *L. monocytogenes*: 21 days Gram-negative enteric bacilli: 21 days Culture-negative: 10-14 days	
Anatomic Defects, Neurosurgical Complications, and Open Head Trauma		
S. aureus, S. epidermidis, Gram negative bacilli including *Pseudomonas*	Pediatric: **Vancomycin** 60mg/kg/day IV/IM div q6h ***PLUS*** **Ceftazidime** 150mg/kg/day div q8h Adult: **Vancomycin** 15-20mg/kg IV/IM q8-12h ***PLUS*** **Ceftazidime** 2g/day q8h **Duration:** 3-6 weeks	
Brain Abscess		
• Brain abscess is a focal collection of pus within the brain parenchyma. The etiology may be trauma, direct spread of infection or hematogenous spread from a distant site of infection. • Imaging studies such as CT scan and MRI are necessary for diagnosis although this cannot determine the etiology. • Etiology and treatment depend on the source of infection.		
In the presence of dental infection		

Etiology	Regimen	Comments
Streptococci (*viridans* and anaerobic), *Fusobacterium*, *Bacteroides*	Pediatric: [**Penicillin G** 400,000 U/kg/day IV/IM div q6h ***PLUS*** **Ceftriaxone** 100mg/kg/day IV/IM div q12h (Max: 4g/day)] ***OR*** **Chloramphenicol** 100mg/kg/day IV/IM div q6h Adult: [**Penicillin G** 4 MU IV/IM q4h ***PLUS*** **Ceftriaxone** 2g IV q12h] ***OR*** **Chloramphenicol** 1g IV/IM q6h	Consult a neurosurgeon; aspiration of the abscess is usually required if the lesion is >2.5 cm. **Duration:** unclear, usually 6-8 weeks.
In the presence of chronic otitis media, sinusitis, or mastoiditis		
Streptococci (anaerobic and aerobic) *H. influenzae,* Gram-negative enteric bacilli, *Bacteroides spp., P. aeruginosa*	Pediatric: **Ceftazidime** 150mg/kg/day IV/IM div q8h ***PLUS*** **Metronidazole** 7.5mg/kg IV/IM q6h or 15mg/kg IV/IM q12h Adult: **Ceftazidime** 2g IV/IM q8h ***PLUS*** **Metronidazole** 7.5mg/kg IV/IM q6h or 15mg/kg IV/IM q12h	
In the presence of head trauma		
Streptococci (aerobic and anaerobic), *S. aureus, H. influenzae*, Gram-negative enteric bacilli, *Bacteroides* sp, *P. aeruginosa*	Pediatric: **Vancomycin** 60mg/kg/day IV q6h ***PLUS*** **Ceftriaxone** 100mg/kg/day IV/IM q12h (Max: 4g/day) Adult: **Vancomycin** 15-20mg/kg IV q8-12h ***PLUS*** **Ceftriaxone** 2g IV q12h	If methicillin-sensitive *S. aureus* is documented, shift to **Oxacillin.**
In the presence of Endocarditis (native valve)		
Strep viridans, other strep, Enterococci, *S. aureus*, Gram-negative enteric bacilli	Pediatric: **Ceftriaxone** 100mg/kg/day IV/IM div q12h (Max: 4g/day) ***PLUS*** **Gentamicin** 3-6mg/kg/day IV/IM q24h (If *E. faecalis* is documented, give q8h)	If methicillin-sensitive *S. aureus* is documented, shift to **Oxacillin**.

Etiology	Regimen	Comments
	Adult: **Ceftriaxone** 2g IV q12h ***PLUS*** **Gentamicin** 3-6mg/kg/day IV/IM (If *E. faecalis* is documented, div q8h)	
In the presence of Endocarditis (prosthetic valve)		
S. viridans, S. aureus	Pediatric: **Vancomycin** 60mg/kg/day IV div q6h ***PLUS*** **Gentamicin** 3-6mg/kg/day IV/IM (If *E. faecalis* is documented, div q8h) Adult: **Vancomycin** 15-20mg/kg q8-12h ***PLUS*** **Gentamicin** 3-6mg/kg IV/IM q24h (If *E. faecalis* is documented, div q8h)	
In the presence of congenital heart disease		
S. viridans, Haemophilus spp.	Pediatric: **Ceftriaxone** 100mg/kg/day IV/IM div q12h (Max: 4g/day) ***PLUS*** **Metronidazole** 7.5mg/kg IV q6h or 15 mg/kg IV q12h Adults: **Ceftriaxone** 2g IV q12h ***PLUS*** **Metronidazole** 7.5mg/kg IV q6h or 15 mg/kg IV q12h	
NO FOCUS S. *pneumoniae*, H. *influenzae*	Pediatric: **1st line: Ceftriaxone** 100mg/kg/day IV/IM div q12h (Max: 4g/day) ***PLUS*** **Metronidazole** 7.5mg/kg IV q6h or 15 mg/kg IV q12h **2nd line: Penicillin G** 400,000 U/kg/day IV div q6h ***PLUS*** **Chloramphenicol** 100mg/kg/day IV div q6h Adult: **1st line: Ceftriaxone** 2g IV q12h ***PLUS*** **Metronidazole** 7.5mg/kg IV q6h or 15mg/kg q12h	

Etiology	Regimen	Comments
	2nd line: Penicillin G 4 MU IV q4h ***PLUS* Chloramphenicol** 1g IV q6h	
Spinal Abscess		
S. aureus, Streptococci	**Vancomycin** 60mg/kg/day IVdiv q6h (pediatric) or 15-20mg/kg IV q8-12h (adult)	If methicillin-sensitive *S. aureus* is documented, shift to **Oxacillin**.
Encephalitis		
• Encephalitis is an inflammation of the brain usually caused by viral infections. The classic presentation is encephalopathy with diffuse or focal neurologic symptoms, including the following: behavioral and personality changes, with a decreased level of consciousness, neck pain, stiffness, photophobia, generalized or focal seizures. • Findings of herpes simplex virus (HSV) infection in neonates may include the following: herpetic skin lesions over the presenting surface from birth or with breaks in the skin, oropharyngeal involvement, keratoconjunctivitis, seizure, irritability, bulging fontanels. Severe signs include jaundice, hepatomegaly, and shock.		
Viral including, measles, influenza, enteroviruses, arboviruses	Supportive treatment Children should be immunized with measles vaccine at 9 months, and measles, mumps, rubella (MMR), and varicella vaccines at 12 months. A booster of MMR is given at 4-6 years old.	
Herpes simplex	**Aciclovir** Pediatric: (<12 years): 20mg/kg IV infused over 1 hour q8h Adults: 10mg/kg IV infused over 1 hour q8h **Duration:** 14-21 days	Early diagnosis and treatment are necessary.
Fungal Meningitis		
• *Candida* may enter the central nervous system by hematogenous spread, at the time of craniotomy, or through a ventricular shunt. Manifestations of *Candida* meningitis may be similar to those of acute bacterial meningitis. Culture of the CSF is the gold standard for diagnosis.		

Etiology	Regimen	Comments
• Infection with the encapsulated yeast *Cryptococcus neoformans* can result in harmless colonization of the airways, meningitis or disseminated disease, especially in persons with defective cell-mediated immunity. Cryptococcal meningitis is usually fatal without appropriate therapy, and death may occur from 2 weeks to several years after symptom onset. The most common symptoms include headache and altered mental status, personality changes, confusion, lethargy, obtundation, and coma.		
Candida Meningitis	**Amphotericin B deoxycholate** 0.6-1mg/kg/day IV once over 2-6 hours Start with a test dose of 0.1mg/kg/dose IV to a maximum dose of 1mg over 20-60 min. If tolerated, initiate with 0.25mg/kg over 2-6 hours, and increase by 0.25mg/kg/day **Duration:** several weeks until resolution of CSF, radiographic and clinical abnormalities	Monitor BUN, creatinine and K+ at least weekly. Removal of shunts is recommended.
Cryptococcal meningitis (non-AIDS)	Induction Phase: **Amphotericin B deoxycholate** 0.7-1mg/kg IV once daily over 2-6 hours until patient is afebrile and cultures are negative (approximately 6 weeks) Consolidation phase: **Fluconazole** 200mg PO qd **Duration:** 10-12 weeks after CSF culture is negative For less severely ill: **Fluconazole** 6-12mg/kg (pediatric); 400mg (adult) **Duration:** daily x 10-12 weeks after CSF culture is negative	The ideal regimen includes **Flucytosine** in the induction phase, but this drug is not available in the Philippines. If CSF pressure >25 cm H_20, repeat the lumbar tap to drain fluid and control pressure.
Cryptococcal meningitis associated with HIV/AIDS		
Induction Phase	**Amphotericin B deoxycholate** 0.7-1mg/kg/day IV once over 2-6 hours ***PLUS*** **Fluconazole** 6-12mg/kg/day IV q24h (pediatric); 800mg/day IV/PO (adult)	Defer ART to allow for 5 weeks of antifungal therapy. Repeat lumbar tap daily until signs and symptoms of increased intracranial pressure consistently improve.

Etiology	Regimen	Comments
	Duration: daily at least 2 weeks	
Consolidation phase	**Fluconazole** 6-12mg/kg/day IV/PO q24h (pediatric); 400mg IV or PO (adult) **Duration:** daily at least 8 weeks	Begin after successful induction therapy (defined as substantial clinical improvement and negative CSF culture on repeat tap).
Suppression (chronic maintenance therapy)	**Fluconazole** 3mg/kg/day PO q24h once daily (pediatric); 200mg PO (adult) **Duration:** daily at least 1 year	May stop once CD4 >100 cells/μL x at least 3 months and with undetectable viral load.

REFERENCES

Baddour LM, Flynn PM, Fekete T. Infections of central nervous system shunts and other devices. UptoDate 2016. Accessed at: www.uptodate.com/contents/infections-of-central-nervous-system-shunts-and-other-devices.

Bravo LC, Gatchalian SR, Gonzales ML, Maramba-Lazarte CC, Ong-Lim AT, Pagcatipunan MR, delos Reyes CA. Handbook of Pediatric Infectious Diseases 2012, 5th edition. Section of Infectious and Tropical Diseases, Manila 2012, pp 28-30.

Centers for Disease Control and Prevention. 2013. Prevention and Control of Meningococcal Disease. Recommendations of the Immunization Practices (ACIP). MMWR 2013; 62 (No.2).

Chaudhuri, A., Martin PM, Kennedy PGE, Seaton RA, Portegies P, Bojar M, Steiner I for the EFNS Task Force. 2008. EFNS guideline on the management of community meningitis: report of an EFNS Task Force on acute bacterial meningitis in older children and adults. Europ J Neurol 2008; 15: 649-659.

Edwards MS, Baker CJ. Bacterial meningitis in the neonate: Treatment and outcome. UptoDate 2016. Accessed from http://www.uptodate.com/contents/bacterial-meningitis-in-the-neonate-treatment-and-outcome on January 13, 2016.

Frazier JL, Ahn ES, Jallo GI, Management of Brain Abscesses in Children. Neurosurg. Focus 2008; 24:1-10.

Furyk, J.S., O. Swann, and E. Molyneux. Systematic review: neonatal meningitis in the developing world. Trop Med Int Health 2011;16(6): 672-679.

Gilbert DN, Chambers HF, Eliopoulis GM, Saag MS, Pavia AT, Black DB, Freedman DO, Kim K, Schwartz BS editors. Sanford Guide to Antimicrobial Therapy 2016

Kaplan SL, Bacterial meningitis in children older than one month: Treatment and prognosis. UptoDate 2016. Accessed from http://www.uptodate.com/contents/bacterial-meningitis-in-children-older-than-one-month-treatment-and-prognosis on January 13, 2016.

Maramba-Lazarte CC, Bunyi MAC, Gallardo EE, Lim JG, Lobo JJ, Aguilar CY. Etiology of neonatal sepsis in five urban hospitals in the Philippines. PIDSP J 2011; 12(2): 75-85.

DENTAL AND ORAL INFECTIONS

Etiology	Regimen	Comments
Buccal Cellulitis		
Seen in children <5 years old; Usually with a history of a recent upper respiratory tract infection or sinusitis.		
H. influenzae, S. pneumoniae	**1st line: Ceftriaxone** 50mg/kg IV q24h **2nd line: Co-amoxiclav** 45mg/kg/day (amoxicillin component) PO div q12h **Duration:** 7-14 days	There has been a marked decrease in incidence in areas with universal *H. influenzae* immunization. Manifests as marked cheek swelling with trismus and systemic symptoms.
Herpes Simplex Virus Gingivostomatitis		
This usually self-limiting disease may cause significant mouth discomfort, fever, lymphadenopathy, and oropharyngeal vesicular eruptions leading to difficulty in eating and drinking. This may lead to dehydration in young children and may require hospitalization.		
Herpes simplex virus 1 and 2	Pediatric: **Aciclovir** 15mg/kg/day q8h x 5-7 days >12 yrs and Adult: **Valaciclovir** 2g PO q12h x 2 doses **Duration:** 7 days	Treatment is generally not recommended in immunocompetent patients. Paracetamol may be used as an analgesic, but aspirin should be avoided to prevent Reye syndrome. One third would have recurrent lesions (cold sores).
Oral candidiasis		
Also called oral thrush, this condition is caused by an overgrowth of *Candida*. This may be triggered by any condition which would depress the immune system (diabetes, malignancy, immunodeficiency, AIDS, corticosteroids, radiation, etc.) or intake of antibiotics.		

Etiology	Regimen	Comments
Candida albicans	**Nystatin** oral suspension 100,000 U/mL, 4mL qid ***OR*** **Miconazole** oral gel 2%, apply to affected area qid Another option for adult: **Fluconazole** 100-200mg PO daily **Duration:** 7-14 days	Recurrent infections may be the first signs of HIV infection. **Fluconazole** is preferred for moderate to severe disease.
Odontogenic Infections		
Dentoalveolar infection or peri-apical abscess		
Abscesses may form because of extension of microorganisms through the root apex. Radiographic evidence of bone destruction may take 10-14 days to develop. Infections may spread through the tissues causing cellulitis and present with fever, swollen face, pain and malaise.		
S. mutans, Actinomyces, Fusobacterium, Prevotella sp., Poryphoromonas, and other Anaerobes	Pediatric: **1st line:** **Ampicillin-sulbactam** 200-400mg/day IV div q6h (ampicillin component) ***OR*** **Co-amoxiclav** 45mg/kg/day div q12h (amoxicillin component) **2nd line:** **Clindamycin** 20-40mg/kg/day PO div q8h Adults: **1st line:** **Ampicillin-sulbactam** 3g IV q6h ***OR*** **Co-amoxiclav** 875/125mg bid **2nd line:** **Clindamycin** 300mg PO q8h **Duration:** about 7-14 days, until local inflammation has resolved completely.	Dental consult is needed because deep periodontal scaling or extraction of the tooth is necessary to eliminate the infected pulp. Antibiotic treatment is only necessary if any of the following are present: acute onset facial or oral swelling, swelling inferior to the mandible, trismus, dysphagia, lymphadenopathy, fever >38.3°C, or osteomyelitis. Initial IV therapy is preferred and may step down to oral therapy once with clinical improvement in 3-5 days.

Etiology	Regimen	Comments
Acute gingivitis		
Rarely requires systemic antimicrobial therapy. Antiseptic rinses are adequate in most cases. In patients with rapidly advancing disease, severe pain or HIV infection, systemic therapy may be necessary.		
Oral anaerobes, *Spirochetes*	**Chlorhexidine** 0.12% oral rinse Pediatric: **Penicillin VK** **<12 years:** 50-75mg/kg/day PO div q6-8h **12 years:** 250-500mg/day PO q6-8h ***PLUS*** **Metronidazole** 30mg/kg/day PO div q6h (Max: 4g/day) Adult: (**Penicillin VK** 500mg PO q6h ***PLUS*** **Metronidazole** 500mg PO q8h) ***OR*** **Clindamycin** 300mg PO/IV q8h ***OR*** **Co-amoxiclav** 875/125mg bid **Duration:** 7-10 days, if systemic antibiotics are necessary	Acute gingivitis in children may be induced by plaque or associated with puberty, blood dyscrasias, nutritional deficiency, or other infections such as herpes or fungi. Antibiotic treatment is only necessary if any of the following are present: acute onset facial or oral swelling, swelling inferior to the mandible, trismus, dysphagia, lymphadenopathy, fever >38.3°C, or osteomyelitis.
Acute necrotizing ulcerative gingivitis		
Signs and symptoms include foul breath, gingival pain, malaise, and thick ropy saliva with or without fever. On examination of the oral cavity, the gingiva is edematous and ulcerated with a pseudomembrane on the interdental papillae. The condition is not contagious.		
Oral anaerobes, *Spirochetes*	(**Penicillin VK** 500mg PO q6h ***PLUS*** **Metronidazole** 500mg PO q8h) ***OR*** **Clindamycin** 300mg PO/IV q8h ***OR*** **Co-amoxiclav** 875/125mg bid **Duration:**10 days	Also called trench mouth or Vincent's angina. Usually found in older adolescents and adults. Antibiotic therapy should be followed within a few days by localized gingival curettage by a dentist and oral rinses with 0.5% hydrogen peroxide or 0.12% chlorhexidine.

Etiology	Regimen	Comments
Juvenile periodontitis		
Affects children 10-20 years old. This condition occurs in otherwise healthy children and is localized to the molar and incisor regions. Deep gingival pocketing and bone resorption occur and may cause tooth loss in this area.		
Aggregatibacter (Actinobacillus) *Actinomycetemcomitans*, *Capnocytophaga*	**<8 years: Metronidazole** 50mg/kg/day PO div q8h **≥8 years: Doxycycline** 200mg PO **Duration:** 7 days	Dental consult is necessary; it can usually be controlled with root debridement and plaque control only. If the condition does not respond to conservative management then antibiotics should be started.
Periodontal abscess		
This condition manifests as a red, fluctuant swelling of the gingiva, which is extremely tender to palpation. The abscess is always in communication with a periodontal pocket.		
Streptococcus mutans, Fusiform, Anaerobes	Pediatric: **1st line: Co-amoxiclav** 45mg/kg/day div bid (amoxicillin component) **2nd line: Clindamycin** 20-40mg/kg/day PO div q8h Adult: **1st line: Co-amoxiclav** 875/125mg bid **2nd line: Clindamycin** 150-300mg PO q8h **Duration:** 7 days	Dental consult is needed because drainage of loculated pus should be performed. After abscess resolution, infected pulpal tissues should be removed by subgingival scaling and root planing. Antibiotic treatment is only necessary if any of the following are present: acute onset facial or oral swelling, swelling inferior to the mandible, trismus, dysphagia, lymphadenopathy, fever >38.3ºC, or osteomyelitis.

Etiology	Regimen	Comments
Pericoronitis		
Microorganisms and debris may be impacted under the soft tissue overlying the crown of the tooth in a third molar or any erupting permanent teeth. If the natural drainage is blocked, this may lead to infection of adjacent soft tissues and fascial spaces.		
Prevotella, Porphyromonas sp., Treponema denticola	**Penicillin VK** 500mg q6h ***OR*** **Amoxicillin** 500mg q8h **Duration:** 7 days	Mainstays of treatment include saline gargle, maintenance of good oral hygiene, pain management and local incision and drainage by a dentist. Antibiotic treatment is only necessary for systemic signs such as fever and lymphadenopathy.
Ludwig's Angina		
It is an aggressive, rapidly spreading, bilateral cellulitis of the submandibular space which includes the sublingual space and the mylohyoid. The infection is life-threatening due to the possibility of asphyxia and aspiration pneumonia. The patient may present with fever, mouth pain, stiff neck, drooling, and dysphagia. Typically, there is no lymphadenopathy, but with tender, symmetric, "woody" induration.		
S. mutans, Actinomyces, Fusobacterium, Prevotella sp., Poryphoromonas and other anaerobes	Pediatric: **Ampicillin-sulbactam** 200-400mg/day IV div q6h (ampicillin component) ***OR*** (**Penicillin G** 250,000-400,000 U/kg/day IV div 4 doses ***PLUS*** **Metronidazole** 22.5-40mg/kg/day IV in q6-8h) ***OR*** **Clindamycin** 20-40mg/kg/day IV q6-8h equally div doses Adult:	Mainstays of treatment include management of the airway, empiric antibiotics. Surgery is necessary only if abscesses are identified by imaging. Antibiotic treatment is only necessary for systemic signs such as fever and lymphadenopathy. Immunocompromised patients may have MRSA or Gram-negative

Etiology	Regimen	Comments
	Ampicillin-sulbactam 3g IV q6h ***OR*** (**Penicillin G** 2-4 MU IV q4-6h ***PLUS*** **Metronidazole** 500mg IV q6-8h) ***OR*** **Clindamycin** 600mg IV q6-8h **Duration:** 2-3 weeks until clear evidence of clinical improvement is present, and fever and leukocytosis have disappeared. If complications arise, longer courses may be necessary.	infections. Broad spectrum coverage is required for these patients.

REFERENCES

Antimicrobial Resistance Surveillance Laboratory, Department of Health.Antimicrobial Resistance Surveillance Program 2015 Annual Report, Manila, Philippines 2016. Accessed at http://arsp.com.ph/wp-content/uploads/2016/06/2015-ARSP-annual-report-summary_1.pdf on September 7, 2016.

Bravo LC, Gatchalian SR, Gonzales ML, Maramba-Lazarte CC, Ong-Lim AT, Pagcatipunan MR, delos Reyes CA. Handbook of Pediatric Infectious Diseases 2012, 5th edition. Manila: Section of Infectious and Tropical Diseases; 2012.

Gilbert DN, Chambers HF, Eliopoulis GM, Saag MS, Pavia AT, Black DB, Freedman DO, Kim K, Schwartz BS editors. Sanford Guide to Antimicrobial Therapy 2016. VA: Antimicrobial Therapy, Inc.; 2016.

Simos C, Gonzalez BE. Infections of the Oral Cavity. Feign and Cherry's Textbook of Pediatric Infectious Diseases, 7th edition. Volume 1, Cherry JD, Harrison GJ, Kaplan SL, Steinbach WJ, Hotez PJ. Elsevier, Philadelphia, 2014. pp 140-155.

Levi ME, Eusterman VD. Oral Infections and Antibiotic Treatment.Otolaryngol Clin N Amer 2011; 44:57-78.

Do DHN, Martin JT. Common Dental Infections in the Primary Care Setting. Am Fam Physician 2008; 77(55): 797-802.

Pari A, Ilango P, Subbareddy V, Katamreddy V, Parthasarthy H. Gingival diseases in childhood—a review. Journal of clinical and diagnostic research 2014;8 (10): Ze01–4.

Chow AW. Complications, diagnosis, and treatment of odontogenic infections in UpToDate, Calderwoood SB, Bloom A (Eds), UpToDate, Waltham, MA. (Accessed on February 23 2017.)

Chow AW. Submandibular space infection (Ludwig's Angina) in UpToDate, Calderwoood SB, Bloom A (Eds), UpToDate, Waltham, MA. (Accessed on February 23 2017.)

Chow AW. Epidemiology, pathogenesis and clinical manifestations of odontogenic infections in UpToDate, Calderwoood SB, Bloom A (Eds), UpToDate, Waltham, MA. (Accessed on February 23, 2017).

GASTROINTESTINAL AND OTHER INTRAABDOMINAL INFECTIONS

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td colspan="3">Acute Diarrhea and Gastroenteritis</td></tr>
<tr><td colspan="3">Acute Diarrhea in Children</td></tr>
<tr><td colspan="3">Acute diarrhea is defined as diarrhea lasting less than 14 days. Mainstay of treatment is to give fluids, zinc supplements, and food.
Classification of dehydration status of children 2 months to 5 years of age (IMCI 2014):
Severe dehydration (when 2 of the following signs are present)
- Lethargic or unconscious
- Sunken eyes
- Not able to drink or drinking poorly
- Skin pinch goes back very slowly
Some dehydration (when 2 of the following signs are present)
- Restless, irritable
- Sunken eyes
- Drinks eagerly, thirsty
- Skin pinch goes back slowly
No dehydration (when there are not enough signs to classify patient's status as some or severe)
<u>Etiology by age:</u>
<12 months: Rotavirus, Enterotoxigenic Escherichia coli (ETEC), Cryptosporidium
12-23 months: Rotavirus, ETEC, Shigella
24-59 months: Rotavirus, Shigella, Vibrio cholerae</td></tr>
<tr><td>Suspected dysentery</td><td>Ciprofloxacin
0-5 years: 30mg/kg/day PO div 2 doses x 3 days</td><td rowspan="2">For children with severe dehydration living in an area with reported cases of cholera, give antibiotic for cholera. For cases of acute diarrhea with dysentery (blood in the stool),</td></tr>
<tr><td>Suspected cholera</td><td>Erythromycin 250mg PO qid x 3 days OR Tetracycline 250mg PO qid x 3 days</td></tr>
</table>

Etiology	Regimen	Comments
Suspected antibiotic-associated colitis presenting as severe disease or with prolonged symptoms	**Metronidazole** 30mg/kg/day IV or PO div 4 doses x 10-14 days ***OR*** **Vancomycin** 40mg/kg/day PO div 4 doses especially for patients with severe disease	give **Ciprofloxacin** for 3 days. For suspected antibiotic-associated colitis, mild disease does not warrant antibiotic treatment since symptoms resolve within 7-10 days after discontinuing precipitating antibiotics. Probiotic treatment of children with *C. difficile* diarrhea has not been well studied. Oral **Vancomycin** is not available locally. Immunization of infants starting at 6 weeks of age with either of 2 available live attenuated rotavirus vaccines is recommended to afford protection against severe rotavirus disease. The monovalent human rotavirus vaccine is given as a 2-dose series and the pentavalent human bovine rotavirus vaccine is given as a 3-dose series.
Suspected nontyphoidal *Salmonella* in the setting of severe diarrhea in infants <6 months old, malnourished and immunocompromised children	**Ciprofloxacin** 30mg/kg/day IV div 2 doses x 10-14 days ***OR*** **Azithromycin** 6mg/kg/day PO x 5 days ***OR*** **Ceftriaxone** 75-100mg/kg/day IV x 14 days	
Campylobacter	**Azithromycin** 10mg/kg/day PO x 3 days ***OR*** **Erythromycin** 40mg/kg/day PO div 4 doses x 5 days	
Entamoeba histolytica	**Metronidazole** 35-50mg/kg/day PO div 3 doses x 7-10 days	
Giardia	**Metronidazole** 15mg/kg/day PO div 3 doses x 5-7 days	
Cyclospora	**Co-trimoxazole** 10/50mg/kg/day PO div 2 doses daily x 7-10 days	
Gastroenteritis (infectious diarrhea) in Adults		
Mild Diarrhea (≤ 3 unformed stools/day; minimal associated symptomatology)	Oral Hydration	

Etiology	Regimen	Comments
Moderate Diarrhea (3-4 unformed stools/day; with or without systemic symptoms)	Oral or Parenteral Hydration	Try to make specific diagnosis, especially in patients with severe diarrhea or systemic symptoms.
Severe Diarrhea (≥ 6 unformed stools/day ± fever, tenesmus, blood or fecal leukocytes)		
Bacterial: *Shigella sp.*, *Salmonella sp.*, *C. jejuni, C. difficile* (Toxin positive) *E. coli* (enterotoxigenic, enteroaggregative, Shiga-toxin producing) *K. oxytoca* (Toxin producer) Parasitic: *Giardia lamblia, E. histolytica*, *Cryptosporidium*	Empiric therapy: **Ciprofloxacin** 500mg PO q12h ***OR*** **Levofloxacin** 500mg PO q24h x 3-5 days ***OR*** **Azithromycin** 500mg PO q24h for 3 days (preferred for *Campylobacter*) Specific therapy: *Entamoeba histolytica:* **Metronidazole** 500-750mg PO tid x 7-10 days ***OR*** **Tinidazole** 2g PO daily x 3 days *Vibrio cholerae*: **Doxycycline** 300mg x 1 dose ***OR*** **Tetracycline** 500mg qid x 3 days *Shigella species:* **Ciprofloxacin** 500mg PO bid x 3 days	
Primary spontaneous bacterial peritonitis (SBP)		
Characterized by a patient with cirrhosis, ascites, fever, and ≥ 250 neutrophils/μL of ascitic fluid		
Pediatric:*S. pneumoniae* (30-50%; most common), *E. coli* (25-40%), *Staphylococci* (2-4%), Group A	*S. pneumoniae*: **Cefotaxime** 200mg/kg/day IV div 4 or 6 doses ***OR*** **Ceftriaxone** 100mg/kg/day IV div 1-2 doses	

Etiology	Regimen	Comments
Streptococcus, *Enterococci*, *Klebsiella pneumoniae*	Penicillin-sensitive *S. pneumoniae*: aqueous **Penicillin G** 200,000-300,000 U/kg/day IV in 6 div doses x 10-14 days Gram-negative bacilli: (**Cefotaxime** 200mg/kg/day IV div 4-6 doses x 10 days to 3 weeks ***OR*** **Ceftriaxone** 100mg/kg/day IV div 1-2 doses x 10 days to 3 weeks ***WITH or WITHOUT*** **Gentamicin** 3-7.5mg/kg/day IV in 3 div doses) ***OR*** Monotherapy with **Piperacillin-tazobactam** 300mg/kg/day IV div 3 doses (piperacillin component) ***OR*** **Ampicillin-sulbactam** 100-200mg/kg/day div 4 doses (ampicillin component)	
Adult: *Enterobacteriaceae*, *S. pneumoniae*, *Enterococcus sp.*, Anaerobes, Extended spectrum beta-lactamase (ESBL) positive *Klebsiella sp.* reported	**1st line:** **Cefotaxime** 2g IV q8h (q4h, if life-threatening infection) ***OR*** **Ampicillin-sulbactam** 3g IV q6h ***OR*** **Piperacillin-tazobactam** 4.5g IV q6h (or 4-hour infusion of 4.5g q8h) ***OR*** **Ceftriaxone** 2g IV q24h ***OR*** **Ertapenem** 1g IV q24h **2nd line:** [Resistant *E. coli*, *Klebsiella* species (e.g., ESBL)] **Meropenem** 1g IV q8h **Duration:** Unclear. Treat at 5 days and perhaps longer if documented bacteremia. Depends on clinical course of the patient.	Perform analysis (check bleeding parameters first), Gram stain and culture of peritoneal fluid to distinguish primary from secondary peritonitis. **Ceftriaxone** may cause bile sludge in patients with jaundice or cirrhosis. Maintain fluid and electrolyte balance. Do surgical consult. Start antimicrobials as soon as possible. Generally managed medically. Probiotics have no use in the adjunctive treatment.
Antibiotic Prophylaxis		
Patients with cirrhosis: Variceal or upper GI bleeding Prophylaxis of SBP • Low protein ascites (< 15 g/L)	*Patients with cirrhosis:* **Norfloxacin** 400mg PO q12h x 7 days ***OR*** **Ceftriaxone** 1g IV daily x 7 days *Prophylaxis of SBP:* **Norfloxacin** 400mg/dose PO ***OR*** **Ciprofloxacin** 500 mg/dose PO	

Etiology	Regimen	Comments
• Advanced liver failure (Child-Pugh score > 9 points with serum bilirubin > 3 mg/dL) and/or renal dysfunction (serum creatinine > 1.2 mg/dL, BUN > 25 mg/dL and/or serum sodium < 130 mEq/L) • Prior episode of SBP	**Duration of Prophylaxis for SBP:** Until liver transplantation, death, resolution of ascites or improvement in liver function to a compensated state.	
Secondary peritonitis		
Usually polymicrobial consisting of anaerobes and facultative Gram-negative bacilli: *Bacteroides fragilis* group, *Peptostreptococcus*, *E. coli*, *Klebsiella, Pseudomonas aeruginosa,* Enterococcus	(**Metronidazole** 22.5-40mg/kg/day IV div 3 doses ***PLUS*** **Cefotaxime** 200mg/kg/day IV div 4-6 doses) ***OR*** **Piperacillin-tazobactam** 300mg/kg/day IV div 3 doses (piperacillin component) ***OR*** **Meropenem** 30-60mg/kg/day IV div 3 doses **DURATION:** Antibiotics are generally given for 5-10 days but the primary basis for duration of antibiotic treatment is the patient's clinical course.	Patient may require either immediate surgery to control the source of contamination and to remove necrotic tissue, blood and intestinal contents from the peritoneal cavity or a drainage procedure if a limited number of large abscesses can be shown.
CAPD-associated peritonitis		
Infectious complication of chronic ambulatory peritoneal dialysis (CAPD)		
CAPD-associated peritonitis in Children		
The following are the recommendations based on the Consensus Guidelines for Prevention and Treatment of Catheter-related infections and peritonitis in pediatric patients receiving peritoneal dialysis (2012 update):		

Etiology	Regimen	Comments
• Empiric diagnosis of PD-related peritonitis can be made if the effluent WBC count > 100/mm^3 and at least 50% of the WBCs are polymorphonuclear leukocytes. Effluent should be centrifuged and sediment should be cultured. • Antibiotics for the treatment of bacterial peritonitis should be administered by the intraperitoneal route. Beta-lactam antibiotics should be administered continuously. • Center-specific antibiotic susceptibility patterns should guide selection of empiric antibiotic therapy although the ISPD recommends cefepime as empiric treatment. Refer to a specialist for co-management.		
Gram-positive organisms, coagulase negative staphylococci, *S. aureus* (30-45%), Enterobacteriaceae (20-30%), *Pseudomonas* (6%), *Acinetobacter* (4%)	**Vancomycin** 45-60mg/kg/day IV or intraperitoneal in 3-4 doses ***PLUS*** **Gentamicin** 3-7.5mg/kg/day IV div 3 doses **Duration:** Generally, 10 days but the primary basis for duration of antibiotic therapy is the patient's clinical course.	A positive Gram stain will help guide initial therapy. If polymicrobic Gram-negative flora is cultured, consider possibility of catheter-induced bowel perforation, and/or concomitant underlying GI pathology (e.g., dead bowel). Infection almost always limited to abdominal cavity; complicating bacteremia is rare. Treated usually by adding drugs to dialysis fluid; if bacteremia is likely or is documented, treat via IV route.
CAPD-associated peritonitis in Adults		
Gram-positive cocci (45%),	**Vancomycin** added to the dialysis fluid.	
Gram-negative bacilli (15%), Mixture (1%), Fungi (2%), *M. tuberculosis* (0.1%)	**Cefepime** 2g IV q8–12h ***OR*** **Ceftazidime** 3g loading dose intraperitoneal (IP), then 1-2g IP q24h or 2g IP q48h ***OR*** **Meropenem** 1g IV q8h ***OR*** **Aztreonam** 1-2g IV q6-8h ***OR*** **Ciprofloxacin** 400mg IV q12h ***OR*** **Amikacin** 15-20mg/kg IV q24h	Add an antifungal only if yeast seen on Gram stain

Etiology	Regimen	Comments
Ventriculo-peritoneal shunt peritonitis		
Coagulase-positive/negative Staphylococci Gram-negative bacilli	**Vancomycin** 45-60mg/kg/day IV or intraperitoneal div 3-4 doses ***PLUS*** for Gram-negative infections: **Cefotaxime** 200mg/kg/day IV div 4-6 doses ***OR*** **Ceftriaxone** 100mg/kg/day IV div 1 or 2 doses ***OR*** **Ceftazidime** 200-300mg/kg/day IV div 3 doses ***OR*** **Meropenem** 30-60mg/kg/day IV div 3 doses **Duration:** Generally, 10 days but the primary basis for duration of the patient's antibiotic treatment is the patient's clinical course.	High cure rate is achieved with VP shunt removal
Hepatitis A		
Hepatitis A in Children	No antiviral treatment is recommended. Hepatitis A vaccine is given intramuscularly as a 2-dose series at a minimum age of 12 months. A second dose is given at least 6 months from the first dose.	
Hepatitis A in Adults	No antiviral treatment is recommended. Give supportive measures. If within 2 weeks of exposure, Hepatitis A vaccination: • **Monovalent Hepatitis A vaccine** - 720 ELISA units/mL IM – 2 doses 1 month apart - 1440 ELISA units/mL IM single dose • **Booster dose** between 6 & 12 months after initiation of primary course is recommended to ensure long term antibody titers.	

Etiology	Regimen	Comments
	A single dose of immunoglobulin 0.02mL/kg IM is protective if administered within 2 weeks of exposure but is not locally available. Immunoglobulin might be preferred over Hepatitis A vaccination among seronegative individuals with significant underlying liver disease.	
Hepatitis B		
Patients with Hepatitis B (HBV) are usually asymptomatic. When symptomatic, common complaints include fatigue, nausea, anorexia, myalgias, arthralgias, asthenia, weight loss (except where ascites). There is poor correlation between symptoms and disease stage or transaminase elevation		
Hepatitis B virus		
Hepatitis B in Children	Refer to a specialist. Hepatitis B vaccine is given intramuscularly. The first dose is given at birth or within the first 12 hours of life. The minimum interval between doses is 4 weeks. The final dose is administered not earlier than age 24 weeks. Another dose is needed if the last dose was given at age < 24 weeks. For preterm infants, if born to HBsAg (-) mothers and medically stable, the first dose of HBV may be given at 30 days of chronological age regardless of weight, and this can be counted as part of the 3 dose primary series. Another dose of HBV is needed for those < 2 kg whose 1st dose was received at birth. For infants born to HBsAg (+) mothers, administer HBV and HBIG (0.5mL) within 12 hours of life. HBIG should be administered not later than 7 days of age, if not immediately available.	
	For infants born to mothers with unknown HBsAg status, if birth weight is ≥2 kg, administer HBV within 12 hours of birth and determine mother's HBsAg status as soon as possible. If HBsAg (+), administer HBIG not later than 7 days of age. If with birth weight of <2 kg, administer HBIG in addition to HBV within 12 hours of life.	

Etiology	Regimen	Comments
	Referral to a specialist is recommended for management of hepatitis cases.	
Hepatitis B in Adults	Refer to a specialist. The following are key indicators for treatment: HBeAg status, HBV viral load (HBV DNA), elevated liver enzymes (ALT level), cirrhosis. For HBeAg+ patients, treatment is typically deferred for 3-6 months to observe spontaneous seroconversion from HBeAg+ to negative. **Vaccination:** **Recombinant Hepatitis B Vaccine** (20µg/mL) IM 3 doses at 0,1,6 months **Combined Hepatitis A** (720 ELISA units) and **B** (20µg/mL recombinant) – 3 doses IM at 0,1,6 months	
Hepatitis C		
Usually asymptomatic (elevated transaminases). When symptomatic, common complaints include fatigue, nausea, anorexia, myalgias, arthralgias, asthenia, weight loss (except if with ascites). If symptomatic, usually abates in days to weeks; rarely associated with hepatic failure. 75-85% of persons with acute infection progress to chronic HCV.		
Hepatitis C virus	Specialist referral recommended. No recommended prophylaxis; immune serum globulin not effective.	
Liver Abscess		
Fever, right upper quadrant tenderness Findings consistent with single or multiple abscesses on abdominal ultrasound or CT		

Etiology	Regimen	Comments
Liver Abscess in Children		
50% polymicrobial *S. aureus* *Streptococcus sp.* *E. coli* *K. pneumoniae,* *Salmonella* Anaerobic organisms In developing countries, may consider *E. histolytica* and *Toxocara canis*	**Ampicillin-Sulbactam** 100-200mg/kg/day IV div 4 doses (ampicillin component) (Max: 8g) ***OR*** **Piperacillin-tazobactam** 300mg/kg/day IV div 3 doses (piperacillin component) (Max: 9-16g/day) ***OR*** [**Ceftriaxone** 100mg/kg/day IV in 1-2 doses (Max: 2-4g/day) ***PLUS*** **Metronidazole** 30-50mg/kg/day IV div 3 doses (Max: 0.75-2.25g/day) for 2-3 weeks then shift to oral to complete 4-6 weeks] For hepatic abscess secondary to *E. histolytica*: **Metronidazole** 30-50mg/kg/day IV div 3 doses x 10 days ***FOLLOWED BY*** Intraluminal amoebicides such as **Diloxanide** (2nd line agent) to cure luminal infection.	
Liver Abscess in Adults		
*Enterobacteriaceae (*esp. *Klebsiella sp.)* *Bacteroides sp.* *Enterococcus sp.* *E. histolytica* *Fusobacteriumnecrophorum* (Lemierre's)	Pending determination of bacterial versus amoebic liver abscess: **Metronidazole** 30-40mg/kg/day IV div q8h or 500mg PO q6-8h ***PLUS*** (**Ceftriaxone** 1-2g q24h IV ***OR*** **Piperacillin-tazobactam** 4.5g IV q4-6h ***OR*** **Ciprofloxacin** 400mg IV q12h OR 750mg PO ***OR*** **Levofloxacin** 750mg PO/IV q24h ***OR*** **Ertapenem** 1g IV q24h) If amoeba serology is positive: **Metronidazole** 750mg IV/PO tid x 10 days	If MRSA is suspected, start on anti-MRSA regimen (refer to section on treatment of MRSA infections). **Ceftriaxone** may cause bile sludge in patients with jaundice or cirrhosis. Serological tests for amebiasis should be done on all patients. For anaerobic or mixed infections **Piperacillin-tazobactam**, **Ertapenem** (or other **Carbapenem**) are sufficiently active alone and **Metronidazole** may be discontinued.

Etiology	Regimen	Comments
Gallbladder Infection		
Acute acalculous cholecystitis is uncommon in children and usually caused by an infection secondary to Groups A and B *Streptococci*, Gram-negative bacilli (like *Salmonella*) and *Leptospirosis interrogans*. Antibiotic therapy should cover for gut luminal flora (*E. coli, Klebsiella*, Enterococcus).	**Piperacillin-tazobactam** 300mg/kg/day IV div 3 doses (piperacillin component) ***OR*** **Ampicillin-sulbactam** 100-200mg/kg/day div 4 doses (ampicillin component) ***OR*** **Cefotaxime** 200mg/kg/day IV div 4-6 doses ***WITH or WITHOUT*** **Gentamicin** 3.75mg/kg/day IV div 3 doses x 14-21 days ***OR*** **Amikacin** 15-22.5mg/kg/day div 3 doses x 14-21 days	Laparoscopic cholecystectomy is the most common surgical treatment for acute calculous or acalculouscholecystitis in over 95% of pediatric cases. Other treatment options when laparoscopic or open cholecystectomy is not feasible include cholecystostomy.
Complicated Intra-Abdominal Infections		
Complicated intra-abdominal infection extends beyond the hollow viscus of origin into the peritoneal space and is associated with either abscess formation or peritonitis. Contamination of peritoneal cavity by bowel flora due to bowel perforation, ruptured appendix, ruptured diverticula, ischemic bowel, leaking surgical anastomosis, intra-abdominal abscess or other like conditions. Common pathogens: *Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterobacter cloacae, Acinetobacter baumannii*		
Biliary complicated intra-abdominal infections		
Clinical Setting		

Etiology	Regimen	Comments
Community-acquired acute cholecystitis of mild-to-moderate severity	**Cefazolin** 1-2g IV q8h ***OR*** **Cefuroxime** 1.5g IV q8h ***OR*** **Ceftriaxone** 1-2g IV q12-24h	Obtain surgical consult for possible gallbladder removal. Patients undergoing cholecystectomy for acute cholecystitis should have antimicrobial therapy discontinued within 24 hours unless there is evidence of infection outside the wall of the gallbladder.
Community-acquired acute cholecystitis of severe physiologic disturbance, advanced age, or immunocompromised state	**1st line: Piperacillin-tazobactam** 4.5g IV q6h **2nd line: Metronidazole** 500mg IV q8-12h ***PLUS*** (**Ciprofloxacin** 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h ***OR*** **Cefepime** 2g IV q8-12h)	
Acute cholangitis following bilio-entericanastamosis of any severity Health care–associated biliary infection of any severity	**1st line: Meropenem** 1g IV q8h **2nd line: Metronidazole** 500mg IV q8-12h ***PLUS*** **Ciprofloxacin** 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h ***OR*** **Cefepime** 2g IV q8-12h	
Extra-biliary complicated intra-abdominal infections		
Mild-to-moderate severity: perforated or abscessed appendicitis and other infections of mild-to-moderate severity	**1st line: Cefoxitin** 2g IV q6h ***OR*** **Ertapenem** 1g IV q24h **2nd line: Metronidazole** 500mg IV q8-12h ***PLUS*** **Cefazolin** 1-2g IV q8h ***OR*** **Cefuroxime**1.5g IV q8h ***OR*** **Ceftriaxone** 1-2g IV q12-24h ***OR*** **Cefotaxime**1-2g IV q6-8h ***OR*** **Ciprofloxacin** 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h	Antimicrobial therapy of established infection should be limited to 4-7 days, unless it is difficult to achieve adequate source control. Longer durations of therapy have not been associated with improved outcome.
High risk or severity: severe physiologic disturbance, advanced age, or immunocompromised state	**1st line: Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Meropenem** 1g IV q8h **2nd line: Metronidazole** 500mg IV q8-12h ***PLUS***	

Etiology	Regimen	Comments
	Cefepime 2g IV q8-12h ***OR*** **Ceftazidime** 2g IV q8h ***OR*** **Ciprofloxacin** 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h	
Duration of therapy is variable and clinical trial data, especially for severe disease is sparse: • Mild or moderate peritonitis: clinical trial found comparable clinical outcomes in patients treated for 4 days vs those treated until vital signs and GI continuity had returned (mean of 8 days). All patients had "source control". Normalization of serum procalcitonin concentration may assist in customizing the duration of therapy. • Severe peritonitis: need source control and resolution of fever, leukocytosis and ileus. Some centers continue antibiotics until the serum procalcitonin serum concentration is <0.25 mg/mL or has decreased by 90% from its peak concentration. An appropriate source control procedure to drain infected foci, control ongoing peritoneal contamination by diversion or resection, and restore anatomic and physiological function to the extent feasible is recommended for nearly all patients with intra-abdominal infection.		
Acute Pancreatitis		
Patients with necrotizing pancreatitis who develop gas in the area of necrosis, rising inflammatory markers or persistent fever may be suspected of having infected pancreatic necrosis and would be candidates for antibiotic therapy. Post-Necrotizing pancreatitis, infected pseudocyst or pancreatic abscess		
Enterobacteriaceae, *Enterococcus* sp., *S. aureus, Staphylococcus epidermidis,* Anaerobes*, Candida sp.*	**Piperacillin-tazobactam** 4.5g IV q4-6h ***OR*** **Meropenem** 1g IV q8h	Current consensus is that use of prophylactic antibiotics is not advisable in pancreatitis, but that they should be employed when clinical factors point to infected pancreatic necrosis. Those with necrosis involving 30% or more of the pancreas are at greatest risk of developing infection.
	Ciprofloxacin 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h ***PLUS*** **Metronidazole** 500mg IV q8–12h	

REFERENCES

Carlos C, Saniel M. Etiology and epidemiology of diarrheas. Philipp J MicrobiolInfect Dis 1990;19(2): 51-53.

Cherry J, et al. Feigin and Cherry's Textbook of Pediatric Infectious Diseases, 7th Edition. Philadelphia: Elsevier; 2015.

Cherry JD, Harrison GJ, Kaplan SL, Steinbach WJ, Hotez PJ. Feigin and Cherry's Textbook of Pediatric Infectious Diseases. Philadelphia: Elsevier Inc., 2014.

Integrated Management of Childhood Illness Chart Booklet. Geneva: World Health Organization; March 2014

Jalan R, et al. Bacterial infections in cirrhosis; A position statement based on the EASL Special Conference 2013. J Hepatol2014; 60:1310-1324.

Kliegman RM, et al. Nelson's Textbook of Pediatrics, 20th edition, 2015. Philadelphia: Elsevier; 2015.

Kliegman RM, Stanton B, St. Geme J, Schor N. Nelson Textbook of Pediatrics, 20th edition, Philadelphia, Pennsylvania: Elsevier Inc, 2016.

Kurup A, et al. Antibiotic management of complicated intra-abdominal infections in adults: The Asian perspective, Annals of Medicine and Surgery 3 (2014) 85-91

Lucero M, Saniel M, Geronimo J, Ang C, Leano F, Mate R, Trajano E, Sanvictores E, Forbes Z, Tupasi T. Etiology of diarrhea in hospitalized children. Philipp J Microbiol Infect Dis 1984.

Nagel JL, Rarus RE, Crowley AW, Alaniz C, Pogue JM. Retrospective analysis of azithromycin versus fluoroquinolones for the treatment of legionella pneumonia. PT. 2014; 39:204-205.

Philippine Foundation for Vaccination and the Philippine Society for Microbiology and Infectious Diseases. Handbook on Adult Immunization for Filipinos 2012. Manila: Philippine Foundation for Vaccination; 2012.

Saniel M, Moriles R, Monzon O, Salazar N, Leano F, Trajano B, Sombrero L, Mat R, Villanueva J, Geronimo J, Balis A. The relative importance of various enteropathogen in the etiology of acute diarrhea: a hospital-based study in urban Philippines. SEAMIC Publication (1987).

Solomkin JS, et al. Diagnosis and Management of Complicated Intra-abdominal Infection in Adults and Children: Guidelines by the Surgical Infection Society and the Infectious Diseases Society of America. Clin Infect Dis. 2010;50(2):133-164.

The Sanford Guide to Antimicrobial Therapy 2016. Available at: http://webedition.sanfordguide.com/.

Warady BA, et al. Consensus guidelines for the prevention and treatment of catheter-related infections and peritonitis in pediatric patients receiving peritoneal dialysis: 2012 update. Perit Dial Int. 2012 Jun;32 Suppl2: S32-86

OCULAR INFECTIONS

Etiology	Regimen	Comments
Blepharitis		
Etiology unclear, but may include *S. aureus* and *S. epidermidis* as well as associated seborrhea, rosacea, dry eye	Pediatric: Usually, topical antibiotic ointment of no benefit Adult: Topical antibiotics may provide symptomatic relief. If associated acne rosacea: **Doxycycline** 100mg PO bid x 2 weeks and then q24h. Do lid margin care with baby shampoo and warm water (50:50 mixture) q24h using a clean washcloth, gauze pad, or cotton swab. Apply artificial tears if with associated dry eyes.	Avoid eyeliner, mascara, false eyelashes and eyelash extensions. Treatment involves patient education about disease chronicity and need for long term commitment to lid hygiene with regular application of warm compresses, gentle lid massage and lid washing. Topical antibiotic steroid combination during the acute phase for 2-4 weeks. Antibiotic alone to prevent recurrences for 3 to 6 months.
Hordeolum (Stye)		
External hordeolum		
External infection of the superficial sebaceous gland (eyelash follicle) *S. aureus*	No antibiotic. Warm moist compress (40-45ºC) continuously using cotton, gauze or face towel over the affected area for 10-15 minutes; may repeat as often as necessary.	
Internal hordeolum		
Infection of the meibomian glands and is also called meibomianitis.	Pediatric: **Cloxacillin** 100-150mg/kg PO div q6h	The decision to use an antibiotic-steroid combination will depend on the judgment call of the physician on the degree of inflammation

Etiology	Regimen	Comments
S. aureus, including methicillin-sensitive and resistant strains	Adults: For MSSA: **Cloxacillin** 250-500mg PO q6h ***PLUS*** hot packs For MRSA, community-associated: **Co-trimoxazole** 160/800mg PO 2 tabs bid For MRSA, hospital-acquired: **Linezolid** 600mg PO bid Topical antibiotic ointment (**Erythromycin**, **Tobramycin**) or topical antibiotic-steroid ointment (**Tobramycin-Dexamethasone**) 3-4 times a day.	involved. Incision and drainage if with pointing abscess. Incision and curettage for chalazion. Can be acute, subacute, or chronic. Rarely drain spontaneously and may need Incision and Drainage with culture.
Orbital Cellulitis		
Pediatric: *S. aureus,* Streptococci Grp A, B-hemolytic streptococcus *or S. pyogenes, S. pneumoniae, M. catarrhalis* Uncommon causes: *Aeromonas hydrophila, P. aeruginosa, Eikenella corrodens, H. influenzae* type b, Anaerobes (odontogenic source), Gram negative bacilli (post-trauma)	**1st line:** [**Vancomycin** 45-60mg/kg/day IV in 4 div doses (Max: 4g/day) ***PLUS*** **Ceftriaxone** 100mg/kg/day IV in 1-2 doses (Max: 4g/day) If with odontogenic source, ***ADD*** **Metronidazole** 30mg/kg/day IV/PO in 4 div doses (Max: 4g/day)] ***OR*** [**Vancomycin** 45-60 mg/kg/day IV in 4 div doses (Max: 4g/day) ***PLUS*** **Piperacillin-tazobactam** 240-300mg/kg/day IV in 3-4 doses (piperacillin component) (Max: 16g piperacillin/day)] For children with serious allergy to PCN and/or cephalosporins: **Vancomycin** 45-60mg/kg/day IV in 4 div doses (Max: 4g/day) ***PLUS*** [**Ciprofloxacin** 20-30mg/kg/day in 2 div doses (Max: 1.5g PO daily/800mg IV daily) ***OR*** **Levofloxacin**] ≥ 6 months to <5 years: 10mg/kg/dose q12h	Orbital cellulitis is serious and potentially life threatening. It is best to obtain specimen for culture and sensitivity testing prior to treatment initiation. Surgical consultation is recommended. ARSP 2017 showed increased resistance of *S. aureus* to **Oxacillin** at 57%. Orbital cellulitis is a serious infection with risk of cavernous sinus thrombosis. Antibiotics with MRSA coverage should be promptly started. For confirmed MSSA, shift to **Oxacillin**.

Etiology	Regimen	Comments
	≥ 5 years: 10 mg/kg/dose q24h (Max: 500mg) **2nd line: Linezolid** <12 years: 30mg/kg/day IV in 3 doses ≥12 years: 1200mg/day IV in 2 doses ***PLUS* Cefotaxime** 100-200mg/kg/day IV in 3-4 doses (Max: 2g/day) **Duration:** 7-14 days depending on clinical response	
Adult: **Stage I:** preseptal cellulitis, anterior lid swelling; CT normal. **Stage II:** edema, chemosis, proptosis, limited extra-ocular motion; CT with mucosal swelling but no fluid collection. **Stage III:** occasional visual loss, CT subperiosteal abscess, globe displacement, extraocular muscles involved. **Stage IV:** ophthalmoplegia with visual loss; CT with proptosis, abscess formation and periosteal rupture.		
S. pneumoniae, H. influenzae, M. catarrhalis, S. aureus, Anaerobes (odontogenic source), *Streptococcus sp.* (Group A), Gram-negative bacilli (post-trauma), Mucormycosis (in patients with diabetic ketoacidosis), Invasive *Aspergillus sp.* (severe neutropenia, HIV)	**Stage I: Co-amoxiclav** 500mg PO tid x 10-14 days **Stage II – IV:** If MRSA is not considered: (**Piperacillin-tazobactam** 4.5g IV q8h ***OR* Ciprofloxacin** 400mg IV q8-12h) ***PLUS* Clindamycin** 600mg IV q8h If MRSA is considered: **Vancomycin** 1g IV q12h ***PLUS* Ceftriaxone** 1g IV q12h If odontogenic source, ***ADD* Metronidazole** 1g IV q12h If **Vancomycin** intolerant, **Linezolid** 600mg IV q12h For serious allergy to penicillins and/or cephalosporins:	Close consultation with ophthalmology and /or ENT is required. Surgical debridement is warranted with abscesses or if medical management fails to lead to an improvement in the first 24-36 hours.

Etiology	Regimen	Comments
	Vancomycin 1g IV q12h ***PLUS*** (**Ciprofloxacin** 400mg IV q12h or 500 to 750 mg PO bid ***OR*** **Levofloxacin** 500 to 750 mg IV or PO daily) **Duration:** 10-21 days depending on clinical response; 4-6 weeks if bone changes are suggestive of osteomyelitis.	
Canaliculitis (Lacrimal apparatus)		
Actinomyces, Staphylococci, Streptococci; rarely *Arachnia fusobacterium*, *Nocardia sp.*, *Candida sp.* (all rare)	Apply hot packs to punctal area qid. Referral to ophthalmologist for removal of granules and local irrigation with an antibiotic solution.	
Dacryocystitis (Lacrimal Sac)		
Can be acute or chronic; due to obstruction of the lacrimal duct.		
Acute dacryocystitis: Alpha-hemolytic streptococci, *S. epidermidis, S. aureus* Chronic dacryocystitis: *S. pneumoniae, H. influenzae, P. aeruginosa, S. viridans,* Enterobacteriaceae	Pediatric: **Vancomycin** 40mg/kg/day IV in 4 div doses ***PLUS*** **Ceftazidime** 100mg/kg/day IV in 3 div doses (if Gram-negative dacryocystitis is entertained). Adult: *For mild infection limited to lacrimal sac and lid:* **Cephalexin** 500mg PO qid ***OR*** **Co-amoxiclav** 875mg PO bid ***OR*** **Co-trimoxazole** 160/800mg 2 tablets PO bid *With signs or symptoms of orbital cellulitis:* **Vancomycin** 15-20mg/kg/day IV q8-12h ***PLUS*** **Ceftriaxone** 2g IV q24h ***OR*** **Cefepime** 2g IV q6h if pseudomonal infection is suspected	Ophthalmologic consultation is needed and surgery may be required to do culture studies (to detect MRSA). Empiric systemic antibiotic therapy is based on Gram stain of the aspirate, age of the child, severity of the infection, presence and type of complications. Adjust therapy based on culture results. Hospitalization may be considered in cases of suppurative bacterial infection with associated

Etiology	Regimen	Comments
	Documented MSSA infection: **Oxacillin** 2g IV q6h ***OR*** **Cefazolin** 2g IV q8h **Duration:** 7-14 days	lacrimal gland abscess. Oral agents may be used for less severe cases.
Conjunctivitis		
Conjunctivitis of the Newborn (by day of onset post-delivery)		
Day 1: (1st day post-delivery) chemical due to silver nitrate prophylaxis	No antibiotic. Chemical conjunctivitis is rare since usual prophylaxis involves use of **Erythromycin** ointment 0.5% x 1 application ***OR*** **Tetracycline** 1% ointment x 1 application	
Days 2 to 4: *N. gonorrhoeae*	**Ceftriaxone** 25-50mg/kg IV x 1 dose not to exceed 125mg Topical **Gentamicin**, **Ciprofloxacin** 6-8x/day Irrigate conjunctiva with saline to remove discharge as often as needed	Hyperpurulent discharge is observed. Treat neonate for concomitant *Chlamydia trachomatis* infection. Treat the mother and sexual partner. Topical treatment is inadequate. Ophthalmologic consult is advised.
Days 3-10: *Chlamydia trachomatis*	**1st line: Erythromycin** base or ethylsuccinate syrup 12.5mg/kg q6h x 14 days **2nd line: Azithromycin** 20mg/kg PO q24h x 3 days	Diagnosed by antigen detection. Treat the mother and sexual partners. No topical treatment is needed.
Days 2-16: *Herpes simplex* types 1, 2	**Aciclovir** 60mg/kg/day IV div q8h x 14 days	Topical anti-viral therapy under the direction of an ophthalmologist

Etiology	Regimen	Comments
Viral Conjunctivitis (Pink eye)		
Adenovirus 3 and 7 in children	No antibiotic. Consider short course topical antibiotic-steroid drops, one to two drops every 3-4 hours for 7-14 days in cases with severe inflammation, membranes or epithelial defects. Highly contagious. If symptomatic, artificial tears may help. If with ocular pain and photophobia, suspect keratitis (rare). Cold moist compresses as often as needed. Although adenoviral conjunctivitis is self-limiting, topical antibiotic-steroid is given to those with severe symptoms marked swelling and with membrane formation which can lead to permanent conjunctival scarring (these cases have to be referred).	
Bacterial (non-gonococcal) conjunctivitis		
S. aureus, S. pneumoniae, S. viridans	Eye drops: **Levofloxacin** ***OR*** **Tobramycin** ***OR*** **Erythromycin** ***OR*** **Fusidic acid** 1 drop tid-qid x 5-7 days	Ointment is preferred over drops for children, in those with poor compliance, and those in whom it is difficult to administer eye medications. However, ointments blur vision for 20 minutes after the dose is administered. **Fluoroquinolones** offer the best spectrum of activity for empiric therapy. It is the preferred agent for contact lens wearers. Remove discharge by irrigating with saline.
H. influenzae, Moraxella sp.	Eye drops: **Tobramycin** ***OR*** **Levofloxacin** 2 drops qid x 5-7 days	
Gonococcal Conjunctivitis		
N. gonorrhoeae *Chlamydia trachomatis* (presumptive co-infection)	**Ceftriaxone** 1g IV/IM x 1 dose ***PLUS***	Ophthalmology consult recommended because it can progress to corneal perforation. Irrigate conjunctiva with saline to remove

Etiology	Regimen	Comments
	Azithromycin 1g PO x 1 dose for presumptive *Chlamydia* co-infection ***PLUS*** Topical **Levofloxacin** ***OR*** **Tobramycin** ***OR*** **Erythromycin** ointment qid x 2-3 weeks or until resolution of symptoms	discharge as often as needed. Test patient for HIV and syphilis. Treat sex partner.
Keratitis		
Herpes Keratitis		
Herpes simplex 1 and 2	**Ganciclovir** 0.15% or **Aciclovir** 3% ophthalmic ointment, 5x/day until corneal ulcer heals, then tid x 7 days For those aged 12 years and older with recurrent infections (>2x a year), **Aciclovir** 400mg bid for 12 months may be given to prevent recurrences.	Serious and often sight threatening so prompt ophthalmologic consultation is essential for diagnosis, antimicrobial, and adjunctive therapy. Thirty percent (30%) recur within 1 year. Oral antiviral drugs are not necessary.
Varicella zoster opthalmicus		
Varicella zoster virus	Pediatric: **Aciclovir** 10mg/kg IV (most effective within 72 hours from appearance of vesicles) Adult: **Famciclovir** 500mg PO tid ***OR*** **Valaciclovir** 1g PO tid ***OR*** **Aciclovir** 800mg PO 5x/day x 10 days Apply **Tobramycin-Dexamethasone** ointment 2-3x/day to lesions on the eyelids until resolution of lid lesions.	
Acute bacterial keratitis (no comorbidity)		
S. aureus, S. pneumoniae, S. pyogenes, Haemophilus sp.,	Pediatric: Gram-negative: **Tobramycin** eye drops 1-2 drops q4h	Obtain specimen for Gram stain and culture studies and adjust treatment accordingly.

Etiology	Regimen	Comments
Also for children: *P. aeruginosa, Moraxella spp.*	Gram-positive: **Levofloxacin** 0.5% eye drops Adult: Gram-positive: **Levofloxacin** 0.5% eye drops Consider systemic antibiotic for large (>6 mm) corneal ulcer, corneal perforation or scleritis due to *Pseudomonas aeruginosa* and other Gram-negative enteric bacteria.	Topical steroids are never used in isolation. NEVER patch the eye. Bacterial keratitis can be a vision-threatening disease. Prompt consultation with an ophthalmologist is essential.
Dry cornea/diabetes, immunosuppression: *S. aureus, S. epidermidis, S. pneumoniae, S. pyogenes,* Enterobacteriaceae, *Listeria sp.*	Refer to ophthalmologist.	
Bacterial Keratitis secondary to contact lens use		
P. aeruginosa	Pediatric: **Tobramycin** 0.3% ophthalmic solution 1-2 drops qh x 24h then taper based on clinical response. Adult: **Ciprofloxacin** 0.3% eye drops OR **Levofloxacin** 0.5% eye drops OR **Tobramycin** 0.3% solution. Give 1 drop qh x 24-72h then taper based on clinical response	Referral to ophthalmologist is recommended. Discontinue contact lens use.

Etiology	Regimen	Comments
Fungal keratitis		
Aspergillus, Fusarium, Candida	Refer to ophthalmologist. Obtain specimen for fungal wet mount and cultures. Empiric therapy is not recommended for fungal keratitis. It is important to try to identify organism from corneal scrapings. NEVER give topical steroid. NEVER patch the eye. Daily debridement is advised to enhance penetration of anti-fungal agents. Topical cycloplegic (atropine sulfate 1%) one drop 3 times a day until free of pain. **Use of powdered Itraconazole for topical use is not recommended.**	
Keratitis, Protozoan		
Acanthamoeba sp.	Refer to ophthalmologist. Corneal infection usually associated with trauma or soft contact lens use. NEVER patch the eye. Discontinue contact lens use. Topical broad-spectrum antibiotics to prevent secondary bacterial infection. Avoid topical and subconjunctival steroids. Topical cycloplegic (atropine sulfate 1%) one drop 3 times a day until free of pain.	
Keratitis, Non-tuberculous Mycobacterial (Post-Lasik surgery)		
Mycobacterium chelonae, M. abscessus, M. massiliense	Refer to ophthalmologist. Prolonged course of therapy. Treatment regimen is as for extrapulmonary tuberculosis (see *National Guidelines on Tuberculosis*).	
Endophthalmitis		
Endophthalmitis, Hematogenous		
S. pneumoniae or other streptococci, *N. meningitidis*. *S. aureus, K. pneumoniae* or other Gram-negative organisms, *Candida sp.* (rare), *Bacillus cereus* (heroin use)	Locally usually due to penetrating or perforating globe injury by pointed material e.g. BBQ stick, walis tingting, wires. Refer to ophthalmologist. Intravitreal administration of antimicrobials is essential. Immediate referral to vitreo-retinal surgeon.	

Etiology	Regimen	Comments
Endophthalmitis, Post-cataract surgery		
Early, acute: *S. epidermidis, S. aureus, Streptococcus sp., Enterococcus sp.,* Gram-negative bacilli, *Candida albicans* Low grade, chronic: *Propionibacterium acnes, S. epidermidis, S. aureus* (rare), Fungi	Refer to ophthalmologist.	Immediate ophthalmologic consult is needed. If only light perception or worse, perform immediate vitrectomy. May require removal of lens material.
Endophthalmitis, Candida		
Endogenous: occurs in ~15% of patients with candidemia Exogenous: occurs following ocular surgery or traumatic injury.		
Candida sp. Chorioretinitis without vitritis	**Fluconazole** 800mg PO (12mg/kg) loading dose, then 400-800mg (6-12mg/kg/day) ***OR*** **Voriconazole** 400mg IV bid for 2 doses loading dose (6mg/kg), then 300mg (4mg/kg) IV/PO bid	The extent of ocular infection (chorioretinitis with or without macular involvement and with or without vitritis) should be determined by an ophthalmologist.
For fluconazole-/voriconazole-susceptible isolates	Refer to ophthalmologist.	Vitrectomy should be considered to decrease the burden of organisms and to allow the removal of fungal abscesses that are inaccessible to systemic antifungal agents.
For fluconazole-/voriconazole-resistant isolates	Refer to ophthalmologist.	For flucanozole-susceptible isolates, fluconazole is preferred over voriconazole.
With macular involvement	Refer to ophthalmologist.	

Etiology	Regimen	Comments
Chorioretinitis with vitritis (Endophthalmitis)	Refer to ophthalmologist.	
Endophthalmitis, Post-traumatic		
Bacillus sp., S. epidermidis, Gram-negative bacilli, Streptococci, Fungi	Refer to ophthalmologist. Vitrectomy often necessary. Consider prophylactic administration of systemic + intravitreal antibiotics in high risk injuries (soil contamination, >24 hours delay in wound closure, intraocular foreign body).	
Retinitis		
Acute Retinal Necrosis		
Vision loss, usually in immunocompetent individuals, which progresses rapidly with retinal necrosis, vasculitis and uveitis; frequently results in retinal detachment. Begins unilaterally but may involve the other eye (up to 50% of cases).		
Varicella-zoster virus, *Herpes simplex*	**Aciclovir** 10-12mg/kg IV q8h x 7-10 days until disease stabilizes, then oral therapy for a min of 6 weeks with **Aciclovir** 800mg PO 5x/day ***OR*** **Valaciclovir** 1g PO tid ***OR*** **Famciclovir** 500mg PO tid	Ophthalmology consult imperative.
Retinitis, Cytomegalovirus (HIV/AIDS)		
Cytomegalovirus (CMV)	Refer to ophthalmologist. Watch for Immune Reconstitution Inflammatory Syndrome (IRIS) (e.g., Immune Recovery Uveitis) in those on anti-retroviral therapy (ART). ART should not be delayed owing to concern of IRIS.	

REFERENCES

Antibiotic Guidelines 2015-2016. Treatment Recommendations for Adult Inpatients. Available at: http://www.hopkinsmedicine.org/amp/guidelines/antibiotic_guidelines.pdf

Antimicrobial Resistance Surveillance Program 2017 Data Summary Report, Manila Philippines 2017 Accessed at http://arsp.com.ph/wp-content/uploads/2018/07/2017_annual report-summary.pdf on March 11, 2019

Guidelines for Prevention and Treatment of Opportunistic Infections in HIV-Infected Adults and Adolescents. Available at: http://aidsinfo.nih.gov/guidelines.

Liu C, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America for the Treatment of Methicillin-Resistant *Staphylococcus Aureus* Infections in Adults and Children. Clin Infect Dis 2011: 52;1–38.

Pappas P, et al. Clinical Practice Guideline for the Management of Candidiasis: 2016 Update by the Infectious Diseases Society of America. Clin Infect Dis 2016;62(4): e1–50.

The Sanford Guide to Antimicrobial Therapy 2014. Available at: http://webedition.sanfordguide.com/.

Etiology	Regimen	Comments
Pharyngitis or Tonsillitis		
Exudative or diffuse erythematous • Associated cough, rhinorrhea, hoarseness and/or oral ulcers suggest a viral etiology • The Rapid Strep Test may be used to diagnose Group A Streptococcus (GAS) pharyngitis. • Complications of GAS pharyngitis include: – Acute rheumatic fever (ARF) – follows Group A *S. pyogenes* infection, and is rare after Group C/G infection. The rationale for therapy is to eradicate GAS and prevent ARF. Benzathine penicillin G decreases the rate of ARF from 2.8% to 0.2%. For prevention, start treatment within 9 days of symptom onset. – Post-streptococcal glomerulonephritis in children <7 years old – Pediatric autoimmune neuropsychiatric disorder associated with Group A Streptococcus infection, or PANDAS – Peritonsillar abscess and suppurative phlebitis are also potential complications.		

Etiology	Regimen	Comments
Group A, C, G streptococci; *Fusobacterium* (in studies)	Pediatric: **1st line: Phenoxymethylpenicillin** *or* **Penicillin V** 25-50mg/kg/day PO div q6h x 10 days **2nd line: Amoxicillin trihydrate** 50mg/kg/day PO div q8-12h (Max: 1g/day) x 10 days If with Penicillin allergy: The primary choice is a macrolide, such as: **Erythromycin ethylsuccinate** 40mg/kg/day PO div q6h (Max: 1g/day) x 10 days ***OR*** **Clarithromycin** 15mg/kg/day PO div q12h x 10 days ***OR*** **Azithromycin** 12 mg/kg/day PO x 5 days *Alternative to the macrolides for severe penicillin allergy:* **Clindamycin** 20-30mg/kg/day PO div q8h (Max: 1.8g/day) x 10 days Adult: **1st line: Phenoxymethylpenicillin *OR* Penicillin V** 500mg q12h or 250mg PO q6h x 10 days ***OR*** **Benzathine Penicillin G** 1.2 MU IM x 1 dose **2nd line: Amoxicillin trihydrate** 500mg PO q12h x 10 days If with Penicillin allergy: the primary choice is a macrolide, such as: **Erythromycin ethylsuccinate** 400mg PO q6-12h x 10 days ***OR*** **Clarithromycin** 250mg PO q12h x 10 days ***OR*** **Azithromycin** 500mg x 1 dose and then 250mg PO qd x 4 days or 500mg PO qd x 3 days	**Penicillin V** should be given on an empty stomach because its absorption is impaired by food. To be taken 1 hour before or 2 hours after a meal. In throat infections caused by Epstein Barr virus (infectious mononucleosis), **Amoxicillin** or **Ampicillin** produces a non-allergic maculopapular rash, which does not preclude the future use of penicillins. **Co-trimoxazole, tetracyclines** and **fluoroquinolones** are not effective. Resistance of *S. pyogenes* to macrolides has been reported. **ALERT! Co-amoxiclav is not recommended.**

Etiology	Regimen	Comments
	Alternative to the macrolides for severe penicillin allergy: **Clindamycin** 300-450mg PO q6-8h x10 days	
Recurrent pharyngitis		
True Group A Streptococci (GAS) infection is difficult to distinguish from GAS carriage with repeated viral pharyngitis. Tonsillectomy is not recommended to decrease the occurrence of streptococcal infection.		
Group A Streptococci	Pediatric: **1st line: Phenoxymethylpenicillin *OR* Penicillin V** 25-50mg/kg/day PO div q6h x 10 days ***OR*** **Amoxicillin trihydrate** 50mg/kg/day PO div q8-12h (Max: 1g/day) x 10 days **2nd line: Cefuroxime axetil** 20mg/kg/day PO div q12h x 10 days ***OR*** **Co-amoxiclav**	GAS is able to enter the epithelial cells, and internalization is associated with the presence of certain fibronectin-binding proteins. Because Penicillin does not effectively penetrate epithelial cells, this internalization may contribute to persistence despite antibiotic therapy. In cases of persistent pharyngitis, antibiotic options include: **cephalosporins**,

Etiology	Regimen	Comments
	For 3 months and older and <40 kg: 20-40mg/kg/day PO div q8h (amoxicillin component) x 10 days ***OR*** 25-45mg/kg/day PO div q12h (amoxicillin component) x 10 days For 3 months and older and >40 kg: 500mg/125mg PO q12h x 10 days *PNF Preparations for BID dosing:* 200mg **Amoxicillin**/ 28.5mg **Potassium Clavulanate** /5mL (70mL); 400mg **Amoxicillin** / 57mg **Potassium clavulanate** /5mL (30mL, 70mL) *PNF Preparations for TID dosing:* 125mg **Amoxicillin**/ 31mg **Potassium Clavulanate** /5mL (30mL,60mL); 250mg **Amoxicillin** / 62.5mg **Potassium clavulanate** /5mL (60mL, 100mL)	**co-amoxiclav**, macrolides including **azalides (Azithromycin),** and **Clindamycin**. However, there are varied expert opinions on which therapy is most appropriate.
	Adult: **1st line: Phenoxymethylpenicillin *or* Penicillin V** 500mg q12h or 250mg PO q6h x 10 days ***OR*** **Amoxicillin trihydrate** 500mg PO q12h x 10 days **2nd line: Cefuroxime axetil** 500mg-1g/day PO q12h x 10 days ***OR*** **Co-amoxiclav** 500mg/125mg PO q12h x 10 days	
Peritonsillar abscess (Quinsy)		
Sometimes a serious complication of exudative pharyngitis. Surgical drainage is required in treatment.		

Etiology	Regimen	Comments
Fusobacterium necrophorum (44%), Group A Streptococci (33%), Group C/G Streptococci (9%), *Streptococcus anginosus* group	Pediatric: **1st line: Ampicillin-sulbactam** 100mg/kg/day (ampicillin component) IV/IM div q6h Step down to **Co-amoxiclav** 40mg/kg/day PO div q8h (amoxicillin component) x 10 days **2nd line: Ceftriaxone** 50-75mg/kg IV q12-24h ***PLUS*** **Metronidazole** 30mg/kg/day (Max: 4 g/day) IV q6h If with Penicillin allergy: **Clindamycin** 40mg/kg/day IV div q6-8h Adult: **1st line: Ampicillin-Sulbactam** 6-12g/day IV/IM div q6h (ampicillin component) (Max: 4g sulbactam/day) Step down to **Co-amoxiclav** 750mg- 1.5g/day (amoxicillin component) PO div q8h x 10 days **2nd line: Ceftriaxone** 2g IV q24h ***PLUS*** **Metronidazole** 500mg IV/PO q6-8h If with Penicillin allergy: **Clindamycin** 600-900mg IV q6-8h	*Fusobacterium* is resistant to macrolides, hence, macrolides are best avoided (not recommended). There are some reports of beta lactamase production by oral anaerobes.

Etiology	Regimen	Comments
Deep Neck Abscess/ Retropharyngeal Abscess		
Polymicrobial; *S. aureus; Streptococcus spp.; Bacteroides spp.*	Pediatric: **1st line: sepsis** **Ampicillin-sulbactam** 100mg/kg/day IV/IM div q6h (ampicillin component) – Step down to **Co-amoxiclav** 40mg/kg/day PO div q8h (amoxicillin component) ***OR*** **Cefuroxime Na** 100-150mg/kg/day IV div q8h – Step down to **Cefuroxime axetil** 20-30mg/kg/day PO div q12h ***PLUS*** **Metronidazole** 30mg/kg/day IV div q6h for at least 7 days (Max: 4g/day) – Step down to **Metronidazole** 30-50mg/kg/day PO q8h **2nd line: Ceftriaxone** 50-75mg/kg/day IV div q12-24h x 7 days ***PLUS*** **Metronidazole** 30mg/kg/day IV div q6h for at least 7 days (Max: 4g/day) Adult: **1st line: Ampicillin-sulbactam** 6-12g/day IV/IM div q6h (ampicillin component) (Max: 4g/day) – Step down to **Co-amoxiclav** 750mg-1.5g/day PO div q8h (amoxicillin component) ***OR*** **Cefuroxime Na** 750mg IV q8h – Step down to **Cefuroxime axetil** 500mg PO bid ***PLUS*** **Metronidazole** 500mg PO q8h for at least 7 days **2nd line: Ceftriaxone** 2g IV q24h x 10-14 days ***PLUS*** **Metronidazole** 500mg IV q8h for at least 7 days	Surgical drainage is required in treatment. If methicillin-resistant *S. aureus* (MRSA) is suspected (antibiotic therapy in the preceding 90 days, current hospitalization for 5 days or more, high frequency of antibiotic resistance in the community or in the specific hospital unit, presence of risk factors for health care-associated pneumonia, immunosuppressive disease and/or therapy, recent or prolonged hospitalization, exposure to antibiotics, or stay in an intensive care unit), **Clindamycin** or **Vancomycin** is recommended. Community-acquired MRSA has been reported in children without identified risk factors. These cases have a predominance of superficial infections, including subcutaneous abscesses, cellulitis, and recurrent skin infections. Step down antibiotic therapy should be guided by culture.

Etiology	Regimen	Comments
Membranous pharyngitis due to diphtheria		
• Intensive surveillance and immediate notification to DOH is necessary. • Supportive treatment is critical in management. Antibiotics are not the mainstay of treatment. • Ensure adequate airway. Perform cardiac assessment. • Administer diphtheria toxoid before discharge. • Culture contacts and treat accordingly. • Observe standard and droplet precautions (respiratory droplet isolation) for patients and carriers until 2 cultures from both nose and throat collected 24 hours after completing antibiotics are negative for *C. diphtheriae.*		• Persons recovering from diphtheria should begin or complete active immunization. Vaccine containing diphtheria toxoid is available in combination with tetanus and pertussis. It is given at a dose of 0.5mL IM. Routine pediatric immunization should include 5 doses given on ages 6 weeks, 10 weeks, 14 weeks, 12 months (provided there is a minimum interval of 6 months from dose 3) and 4-6 years before school entry. • Patients should be placed in isolation. • Obtain nasal and pharyngeal cultures (special media).
C. diphtheriae (human to human), *C. ulcerans* and *C. pseudotuberculosis* (animal to human, rare)	Pediatric: **1st line:** **Penicillin G crystalline** 100,000 to 150,000 U/kg/day IV q6h or **Procaine penicillin** 25,000 to 50,000 U/kg/day (Max: 1.2 MU) IM q12h – Step down to **Phenoxymethylpenicillin** 25-50mg/kg/day PO q6h x 14 days **2nd line:** **Erythromycin** 40-50mg/kg/day (Max: 2g/day) IV div q6h – Step down to **Erythromycin ethylsuccinate** 40-50mg/kg/day PO div q6h x 14 days (Max: 2g/day) Adult: **1st line:** **Penicillin G crystalline** 50,000 U/kg IV q12h (Max: 1.2 MU) – Step down to **Phenoxymethylpenicillin** 250mg PO q6h x 14 days **2nd line:** **Erythromycin** 500mg q6h IV x 14 days	Antibiotics decrease toxin production and decrease spread of organisms. Penicillin is superior to **Erythromycin**. Eradication of the organism should be documented 24 hours after completing treatment by 2 consecutive negative cultures from pharyngeal specimens taken 24 hours apart. If follow-up cultures are positive, **Erythromycin** should be given for an additional 10 days. Treatment of carrier state: **BW <30 kg:** **Benzathine Penicillin G** 600,000 U IM x 1 dose

Etiology	Regimen	Comments
	Step down to **Erythromycin ethylsuccinate** 500mg PO q6h x 7-10 days	**BW >30 kg: Benzathine Penicillin G** 1.2 MU IM or oral **Erythromycin** 40-50mg/kg/day PO q6h x 10days
Vesicular, ulcerative pharyngitis (viral)		
More common in patients <3 years Associated signs and symptoms: • Consistently present: Hoarseness, cough, colds, conjunctivitis, ulcerative stomatitis. • Mild or possibly absent: Systemic findings, pharyngeal erythema, sore throat, difficulty swallowing, exudates, palatal petechiae. • NO tender cervical lymph nodes.		
Coxsackie A9, B1-5 ECHO viruses (multiple types); Enterovirus 71; *Herpes simplex* virus (HSV) 1, 2	***For HSV 1 and 2 in immunocompromised host:*** Pediatric: **Aciclovir** q8h x 7-14 days as 1-3h IV infusion **<12 years:** 10mg/kg **>12 years:** 5mg/kg ***OR* Valaciclovir** 12 years: 4g/day q12h x 1 day Adult: **Aciclovir** 400mg PO 5x/day x 5 days ***OR* Valaciclovir** 500mg bid x 7 days ***Recurrent herpes labialis:*** Pediatric: **Valaciclovir** Children >12 years: 4g/day q12h x 1 day Adult: **Valaciclovir** 500mg PO bid x 7 days	For vesicular pharyngitis suspected to be caused by coxsackie A9, B1-5, ECHO viruses and enterovirus, antiviral therapy is not needed. Supportive therapy is recommended. For mild infections in immunocompetent host, supportive therapy is recommended.

Etiology	Regimen	Comments
Gonococcal pharyngitis		
N. gonorrhoeae	Pediatric: **Ceftriaxone** **<45 kg:** 125mg IM x 1 dose; **>45 kg:** 250mg IM x 1 dose Adult: **Ceftriaxone** 250mg IM x 1 dose	**Spectinomycin**, **Cefixime**, **Cefpodoxime** and **Cefuroxime** are not effective for pharyngeal gonococcal infections.
Parapharyngeal Space Infection; Peritonsillar Abscess		
May be due to poor dental hygiene, dental extractions, or foreign bodies (e.g., toothpicks, fish bones) Closely monitor the airway; one third of patients require intubation. Perform MRI or CT scan to identify the abscess. Perform surgical drainage. Complications include infection of the carotid (with possible rupture) and jugular vein phlebitis.		
Polymicrobial, including: *Streptococcus sp.*, Anaerobes (which outnumber aerobes 10:1)	Pediatric: **1st line: Ampicillin-sulbactam** 100mg/kg/day div q6h IV/IM (ampicillin component) ***THEN*** Step down to **Co-amoxiclav** 40mg/kg/day PO div q8h x 10 days **2nd line: Ceftriaxone** 50-75mg/kg/day IV div q12-24h ***PLUS*** **Metronidazole** 30mg/kg/day IV/PO div q6h (Max: 4g/day) Adult: **1st line: Clindamycin** 600-900mg IV q8h ***OR*** **Penicillin G** 24 MU/day by continuous infusion or IV div q4-6h ***PLUS*** **Metronidazole** 1g loading dose ***THEN*** 0.5g IV q6h or 1g IV q12h **2nd line: Ampicillin-sulbactam** 3g IV q6h ***OR*** **Piperacillin-tazobactam** 4.5g IV q6h or 4h infusion of 3.375g q8h ***OR*** (2nd or 3rd generation	**Clindamycin** may be used in pediatric patients with penicillin allergy.

Etiology	Regimen	Comments
	cephalosporins, e.g., **Ceftriaxone** 1g IV q24h ***PLUS*** **Metronidazole** 500mg IV q8h for at least 7 days)	
Jugular Vein Suppurative Phlebitis (Lemierre's Syndrome)		
Pulmonary and systemic emboli are common. Erosion into the carotid artery can occur.		
Fusobacterium necrophorum in the vast majority. Lemierre described *Fusobacterium* in 1936; other anaerobes and Gram (+) cocci are less common etiologies of suppurative phlebitis postpharyngitis.	**1st line: Piperacillin-tazobactam** 4.5g IV q8h ***OR*** **Metronidazole** 500mg PO/IV q8h ***PLUS*** **Ceftriaxone** 2g IV daily **2nd line: Clindamycin** 600-900mg IV q8h	Avoid macrolides due to *Fusobacterium* resistance. *Note:* If not a complication of pharyngitis, and if there is an internal jugular line, treat empirically for methicillin-resistant *Staphylococcus aureus* using **Vancomycin**.
Acute Epiglottitis		
Requires urgent hospitalization. May present with life-threatening upper airway obstruction, especially in pediatrics. Have tracheostomy set "at bedside." Use of steroids is controversial and is not recommended. *H. influenzae* type b immunization is recommended, given IM at a minimum age of 6 weeks with a minimum interval of 4 weeks in between doses. If given between 6 weeks to 6 months: Primary series of 3 doses, 1-2 months apart. Booster dose at 12-15 months. If given between 7-11 months: Primary series of 2 doses, 1-2 months apart. Booster dose at 18 months. If given between 12-59 months, give only 1 dose.		
H. influenzae type b; *S. pneumoniae*	Pediatric: **1st line: Ceftriaxone** 50-100mg/kg/day IV div q12-24h x 7-10 days **2nd line: Ampicillin-Sulbactam** 100mg/kg/day IV div q6h x 10 days	**Levofloxacin** is generally not recommended in patients <18 years. Avoid in patients with history of QT prolongation or with drugs that

Etiology	Regimen	Comments
	Adult: **1st line: Ceftriaxone** 2g q24h IV x 7-10 days **2nd line: Levofloxacin** 750mg IV q24h ***PLUS* Clindamycin** 600-900mg q6-8h IV x 7-10 days	prolong QT interval. Tendon rupture can occur during or after therapy.
Rhinosinusitis		
Acute bacterial rhinosinusitis (ABRS)		
S. pneumoniae; H. influenzae; M. catarrhalis; S. aureus; Anaerobic bacteria; Some other streptococcal species	Pediatric: **1st line: Co-amoxiclav** 45-50mg/kg/day PO q12h x 10-14 days **PNF Preparations for BID dosing:** 200mg **Amoxicillin**/ 28.5mg **Potassium Clavulanate** /5mL (70mL); 400mg **Amoxicillin** / 57mg **Potassium clavulanate** /5mL (30mL, 70mL) **2nd line: Co-amoxiclav** 90mg/kg/day PO div q12h x 10-14 days **PNF Preparation for HIGH DOSE Co-amoxiclav (ES 600)**: **Amoxicillin** 600mg/42.9mg/5mL in 5 mL ***OR* Cefuroxime** 30mg/kg/day div q12h x min 10 days **For pediatric patients with severe penicillin allergy:** Type 1: **Clarithromycin** 15mg/kg/day div q12h Type 2: **Cefuroxime** 30mg/kg/day div q12h x min 10 days	Antibiotics for bacterial sinusitis are recommended if: 1) with high fever and purulent nasal discharge or facial pain for >3 days; 2) still symptomatic after 10 days with no antibiotic; or 3) symptoms worsen after a typical viral illness that lasted 5 days and had initially improved. The use of **Erythromycin** and **Clindamycin** as single-drug therapy for ABRS is controversial. On its own, **Erythromycin** has poor coverage for Gram (-) bacteria and may not cover for *H. influenzae* and *M. catarrhalis* if used empirically. The same holds true for clindamycin; however, it makes up for this with the added coverage against anaerobic bacteria. These considerations should be

Etiology	Regimen	Comments
	Adult: **1st line: Amoxicillin** 1g TID ***OR*** **Co-amoxiclav** 875mg/125mg PO q12h x 5-7 days **2nd line: Doxycycline** 100mg bid x 5-7 days *For patients with severe penicillin allergy (adult):* **Type 1: Doxycycline** 100mg PO q12h x 5-7 days **Type 2: Cefuroxime** 500mg bid x 5-7 days	taken into account when prescribing these antibiotics. Avoid **Co-trimoxazole** because of increasing resistance. **Fluoroquinolones** are generally not recommended because the risks of serious side effects (tendinopathy, peripheral neuropathy, and prolongation of QT interval) outweigh the benefits. NOTE: Data not available for use of **Co-amoxiclav ES-600** in pediatric patients weighing 40kg and more. The 200mg/5mL and 400mg/5mL suspension should not be substituted with **Co-amoxiclav ES-600** as they are not interchangeable.
Acute sinusitis (clinical failure after 3 days) in adults		
S. pneumoniae; H. influenzae; M. catarrhalis; S. aureus; Anaerobic bacteria; Some other streptococcal species; consider diagnostic tap/aspirate	**1st line or mild/moderate disease: Cefuroxime axetil** 500mg bid PO x 7-10 days **2nd line or severe disease: Levofloxacin** 500mg/day PO x 5 days or 750mg/day IV x 7-10 days	
Mucormycosis: diabetes mellitus with acute ketoacidosis; neutropenia; deferoxamine therapy – adults only		

Etiology	Regimen	Comments
Early diagnosis is key to treatment success. Symptoms suggestive of fungal sinusitis (or lateral facial pain or numbness) should increase suspicion. Palatal ulcers and/or black eschars and unilateral blindness in immunocompromised or diabetic patients suggests mucor. Rapidly fatal without treatment. Diagnosis is by stain of tissue culture isolates, revealing wide ribbon-like, non-septated hyphae with variation in diameter and right-angle branching. Diabetics are predisposed to mucormycosis due to microangiopathy and ketoacidosis. Iron overload also predisposes to mucormycosis, as iron stimulates fungal growth.		
Rhizopus sp. (mucor), *Aspergillus*	**1st line:** **Amphotericin B** 1-1.5mg/kg/day IV ***OR*** **Liposomal Amphotericin B** 5-10mg/kg/day IV **2nd line:** **Posaconazole** 400mg PO bid with meals. If NPO, 200mg qid **Duration:** based on response Continue therapy until: 1) resolution of clinical signs and symptoms of infection; 2) resolution or stabilization of radiographic abnormalities; AND 3) resolution of underlying immunosuppression. **Posaconazole** may be used for secondary prophylaxis for those on immunosuppressive therapy.	**Amphotericin B** lipid complex monotherapy has 37% success rate against 72% for polyene-echinocandin combination therapy. **Posaconazole** (not in the PNF) is not included in the FDA-approved indications for **posaconazole**. Complete or partial response rates with **posaconazole** salvage protocol is from 60% to 80%. Prolonged use of **voriconazole** prophylaxis predisposes to mucormycosis infections.
Acute sinusitis in adult hospitalized patients with nasotracheal or nasogastric intubation		
Gram negative bacilli (*Pseudomonas, Acinetobacter, E. coli* common) in 47% of cases, Gram positive (*Staphylococcus aureus*) in 35%, Polymicrobial in 80%, Yeasts in 18%	**1st line:** **Piperacillin-tazobactam** 4.5g IV q6-8h ***OR*** **Meropenem** 1g IV q8h If methicillin-resistant *S. aureus* is suspected: ***ADD*** **Vancomycin** loading dose 25-30mg/kg IV followed by 15mg/kg IV q8h or q12h	After 7 days of nasotracheal or nasogastric tubes, 95% have X-ray "sinusitis" (fluid in sinuses), but on transnasal puncture only 38% culture positive. For patients requiring mechanical ventilation with nasotracheal tube for >1 week, bacterial sinusitis occurs in <10%.

Etiology	Regimen	Comments
	2nd line: Ceftazidime 2g IV q8h ***PLUS* Vancomycin** loading dose 25-30mg/kg IV followed by 15mg/kg IV q8h or q12h ***OR*** **Cefepime** 2g IV q12h ***PLUS* Vancomycin** loading dose 25-30mg/kg IV followed by 15mg/kgIV q8h or q12h	May need fluconazole if yeast cells seen on Gram stain of sinus aspirate.
Chronic rhinosinusitis (CRS)		
Symptoms > 6 weeks Defined as drainage, blockage, facial pain or decreased sense of smell PLUS mucopurulence on endoscopy or CT scan changes. Serum IgE levels may be tested if allergy is suspected.		Perform CT scan of the maxillary bone if an odontogenic source is suspected. Culture and sensitivity testing is important.
Multifactorial, e.g., damage to the ostiomeatal complex during acute bacterial disease; allergy with or without polyps; occult immunodeficiency; and/or odontogenic disease (periodontitis in maxillary teeth)	No persuasive evidence of benefit from antibiotics. Otolaryngology consultation is recommended. Treatment is usually with antibiotic therapy for 3 to 6 or up to 10 weeks with appropriately selected agents, but the efficacy of this approach is controversial. The benefit of antifungal agents for CRS is unproven and not currently recommended. Pediatric: Evaluate children for allergy. Adjuvant therapy includes nasal saline washes (twice daily per nostril), antihistamines, anti-inflammatory agents, and topical (intranasal) corticosteroids. Functional endoscopic sinus surgery can be considered for children with failed, extensive, prolonged, and adequate medical management.	
Otitis		
Otitis externa		
Usually secondary to chronic seborrhea. Control seborrhea with dandruff shampoo containing selenium sulphide OR ketoconazole shampoo plus medium-potency steroid solution (e.g., triamcinolone 0.1%). Treatment of choice should be based on factors such as patient allergy, risk of ototoxicity, bacterial resistance, availability, cost, and dosing schedule.		

Etiology	Regimen	Comments
Usually secondary to seborrhea (chronic)	Pediatric: **Ofloxacin** ear drops **<1 year:** no recommendation **1-12 years:** 5 drops bid in the affected ear **>12 years:** 10 drops bid **Duration:** 7-10 days or 3 days after cessation of symptoms. Adult: **Ofloxacin** ear drops 10 drops/day x 7 days	Do not use neomycin drops if the tympanic membrane is punctured. For chronic otitis externa (symptoms 6 weeks to >3 months), treatment involves debridement and application of topical anti-inflammatory agents, e.g., corticosteroids.
Fungal otitis externa / otomycosis		
Aspergillus; Candida spp.; Actinomyces spp.; Phycomycetes	Pediatric: **Clotrimazole** 1% solution 2-3 drops q8-12h up to 10-14 days ***OR* Gentian violet** may be used and is well tolerated (as recommended by the WHO IMCI Guidelines). Adult: **Clotrimazole** 1% solution 2-3 drops q8-12h up to 10-14 days	Debridement and dry ear hygiene are crucial in otomycosis. Thorough cleaning with removal of matted fungal debris is warranted. Assess for perforation of tympanic membrane because antifungals are ototoxic. Clean the canal of detritus. Place a wick if edema prevents drug delivery. A white vinegar + isopropyl alcohol solution (1:1) may be instilled in the external ear canal after swimming to restore proper acidic pH and to dry residual water.
Necrotizing otitis externa		
Very high erythrocyte sedimentation rates are typical. Debridement is usually required. Rule out osteomyelitis with a CT or MRI scan. If bone is involved, treat for 4-6 weeks.		
P. aeruginosa in >95%;	Pediatric:	Duration of therapy is prolonged for at least 4-6 weeks if bone is involved. Treat until clinical

Etiology	Regimen	Comments
P. aeruginosa, Proteus mirabilis in pediatric patients	**1st line: Ceftazidime** 100-150mg/kg/day IV div q8h **2nd line: Piperacillin-tazobactam** 300mg/kg/day IV div q8h Adult: **1st line: Piperacillin-tazobactam** 4.5g IV q8h **2nd line: Piperacillin-tazobactam** 4.5g IV q6h ***WITH OR WITHOUT*** **Gentamicin *OR* Amikacin** daily	and radiographical improvement has been achieved. Obtain cultures from the ear canal or from surgical debridement. Treatment from other etiologies should be guided by antibiotic susceptibility results. Do not use neomycin drops if the tympanic membrane is ruptured. Give analgesics for severe pain.
Acute diffuse otitis externa / swimmer's ear		
May also be caused by occlusive devices (earphones); contact dermatitis; and psoriasis		
S. epidermidis in 46%; *S. aureus* in 11%; *Pseudomonas sp.* in 11%; Anaerobes in 2%; *Candida* in 8%	Pediatric: **Ofloxacin** ear drops **<1 year:** no recommendation **1-12 years:** 5 drops 2x/day in the affected ear **>12 years:** 10 drops 2x/day **Duration:** 7-10 days or 3 days after cessation of symptoms. Adult: **Ofloxacin** ear drops 10 drops 1-2x/day x 7 days	Ointments should not be used in the ear. Do not use neomycin drops if the tympanic membrane is punctured. Perform surgical debridement. Avoid submerging head in water x 7-10 days. A white vinegar + rubbing alcohol solution (1:1) may be instilled in the external ear canal after swimming to restore proper acidic pH to the ear canal and to dry residual water.

Etiology	Regimen	Comments
	For chronic otitis externa (symptoms 6 weeks to >3 months), treatment involves debridement and application of topical anti-inflammatory agents, e.g., corticosteroids.	
Acute otitis media (AOM)		
Prevention includes immunization against invasive pneumococcal disease and *Haemophilus influenzae* type b. Pneumococcal conjugate vaccine is given IM in children aged at least 6 weeks. Primary vaccination involves 3 doses with an interval of 4 weeks in between doses. Booster is given 6 months after the 3rd dose. *Influenzae* b conjugate vaccine is given IM in children aged at least 6 weeks. Primary vaccination involves 3 doses with an interval of 4 weeks in between doses. Booster is given at age 12-15 months, with an interval of 6 months after the 3rd dose. For patients above 2 years old with no fever and ear pain with a negative or questionable exam, consider analgesic treatment without antimicrobials. There may be favorable results in mostly afebrile patients with waiting for 48 hours before deciding to use antibiotics. For patients allergic to beta-lactam drugs: • If history unclear or if with rash, may give effective oral cephalosporin • If with IgE-mediated allergy (e.g., anaphylaxis), avoid cephalosporins		
Viruses cause up to 6% of middle ear infections. Bacterial pathogens account for 85% of middle ear infections: *S. pneumoniae* in 49%; *H. influenzae* in 29%; *M. catarrhalis* in 28%.	*No antibiotic use in the prior month* Pediatric: **1st line:** **Amoxicillin** 80-90mg/kg/day PO div q12h **Duration:** <2 years: 10 days**;** 2-5 years: 7 days**;** >5 years: 5-7 days **2nd line:** With anaphylaxis: **Clarithromycin** 15mg/kg/day PO q12h	**Co-trimoxazole** has a high failure rate if etiology is drug-resistant *S. pneumoniae* or *H. influenzae*. Up to 50% of *S. pneumoniae* are resistant to **macrolides** and 0-5% are resistant to **penicillins**. Macrolide resistance of *S. pneumoniae* has been reported. **Clindamycin** is not effective against *H. influenzae* and *M. catarrhalis*. Spontaneous resolution occurred

Etiology	Regimen	Comments
In children aged 6 months to 3 years, there may be 2 episodes of AOM per year, and 63% are virus-positive.	No anaphylaxis: **Cefuroxime axetil** 30mg/kg/day q12h **Duration:** <2 years: 10 days**;** 2-5 years: 7 days**;** >5 years: 5-7 days ***OR*** **Ceftriaxone** 50mg/kg/day IM/IV x 3 days Adult: **1st line: Amoxicillin** 1g q8h x 10 days (high dose) **2nd line:** No penicillin allergy: **Co-amoxiclav** 875mg/125mg PO q12h x 10 days If with penicillin allergy: With anaphylaxis: **Levofloxacin** 750mg PO q24h x 5 days No anaphylaxis: **Cefuroxime axetil** 500mg-1g/day PO div q12h x 7 days ***OR*** **Ceftriaxone** 2g/day IV/IM x 3 days	in 90% of patients infected with *M. catarrhalis*, 50% with *H. influenzae*, and 10% with *S. pneumoniae* (overall, 80% resolve within 2-14 days). For severe disease, appropriate duration of treatment is unclear, but 5 days may be inadequate. For pediatric patients: **Co-amoxiclav** and **Ceftriaxone** may be used as a first-line agent if at the onset, the child presents with high fever >39ºC and/or if with severe otalgia. If infection is non-responsive to antimicrobial therapy, tympanocentesis or myringotomy may be necessary. Placement of a tympanostomy tube is an option for some. Adenoidectomy at time of tympanostomy tubes decreases future hospitalization for AOM. Persistent middle ear effusion for 2-3 months after therapy is expected and does not require retreatment.
Acute otitis media (clinical failure after 3 days)		
Drug-resistant *S. pneumoniae*	**1st line: Co-amoxiclav** for ≥3 months old and BW <40 kg 90mg/kg/day div q12h x 10 days (<2 years old); x 5-7 days (>2 years) using 600/42.9mg/5mL preparation **PNF Preparation for HIGH DOSE Co-amoxiclav (ES 600)**:	**Clindamycin** is not active against *H. influenzae* or *M. catarrhalis*. *S. pneumoniae* resistant to Macrolides are usually also resistant to **Clindamycin**.

Etiology	Regimen	Comments
	Amoxicillin 600mg/42.9mg/5mL in 5 mL ***OR* Cefuroxime** 30mg/kg/day PO div q12h x 10 days (<2 years old OR severe symptoms regardless of age); x 5-7 days (>2 years with mild or moderate disease) ***OR* Ceftriaxone** 50mg/kg/day IM x 3 days **2nd line:** Mild penicillin allergy: **Cefuroxime**15mg/kg/day div q12h ***OR*** **Ceftriaxone** 50mg/kg IM/IV x 3 days Severe penicillin allergy: **Levofloxacin** 750mg PO bid x 5 days	**Definition of failure:** no change in ear pain, fever, bulging tympanic membrane or otorrhea after 3 days of therapy. Tympanocentesis will allow culture. **Co-amoxiclav** high dose reported successful for penicillin-resistant *S. pneumoniae* acute otitis media.
Chronic suppurative otitis media (CSOM)		
Aural toilet is an essential part of the treatment of CSOM in all patients. Surgery must be performed on all cases of CSOM with suppurative complications.		
Aerobic: *P. aeruginosa; E. coli; S. aureus; S. pyogenes; Proteus mirabilis; Klebsiella sp*. Anaerobic: *Bacteroides; Peptostreptococcus; Propionibacterium*	Daily ear cleansing and drying should be done. Give quinolone ear drops tid for 5 days.	
Acute mastoiditis		
Usually a complication of acute otitis media. Obtain cultures. Diagnosis is by CT or MRI scan. Look for complications, such as osteomyelitis, suppurative lateral sinus thrombophlebitis, purulent meningitis, or brain abscess.		

Etiology	Regimen	Comments
Consult an otorhinolaryngologist (ENT) for possible mastoidectomy.		
1st episode: *S. pneumoniae; S. pyogenes; S. aureus; H. influenzae; M. catarrhalis; P. aeruginosa* If secondary to otitis media: *S. aureus; P. aeruginosa; S. pneumoniae*	Pediatric: **Ceftriaxone** 100mg/kg/day IV div q12h ***PLUS*** **Oxacillin** 150-200mg/kg/day IV div q6h ***OR*** **Vancomycin** 45-60mg/kg/day div IV q6h Adult: **1st line:** Obtain cultures, then empiric therapy for the first episode: **Ceftriaxone** 2g IV daily ***OR*** **Levofloxacin** 750mg IV daily **2nd line:** Acute exacerbation of chronic otitis media If *Pseudomonas* and *Staphylococcus spp.* are suspected, surgical debridement of the auditory canal, then **Vancomycin** (dose to achieve serum trough levels of 15-20mcg/mL) ***PLUS*** **Piperacillin-tazobactam** 3.375g IV q6h If caused by a multidrug-resistant *Pseudomonas sp*: **Meropenem** 1g IV q8h should be given.	Antibiotic treatment as in acute otitis media if there is acute exacerbation. Systemic antibiotics should not be routinely given to patients with CSOM either alone or in combination with topical antimicrobials. Do not use neomycin drops if the tympanic membrane is ruptured.
Chronic or recurrent mastoiditis		
S. pneumoniae; S. pyogenes; S. aureus; H. influenzae; M. catarrhalis; P. aeruginosa; Fungi	Pediatric: **Piperacillin-tazobactam** 300mg/kg/day IV div q6h ***PLUS*** **Gentamicin** 7.5mg/kg/day IV div q8h **If intracranial extension is suspected:** **Cefepime**150mg/kg/day IV q8h Adult: Culture ear drainage. May need surgical debridement. Topical fluoroquinolone ear drops. Consult with ENT is recommended.	Surgical debridement, obtain cultures. Treatment in pediatric group depends on the patient's response.

Etiology	Regimen	Comments
Diphtheria in Developing Countries (Pediatrics) See recommendations for membranous pharyngitis due to diphtheria.		
Laryngitis		
Viral (90 %)	Antibiotics are not indicated in viral laryngitis.	

REFERENCES

Bartlett JG, ed. (2015) *Johns Hopkins ABX Guide*. Baltimore, MD: Johns Hopkins University Hospital.

Cherry JD, et al., eds. (2014). *Feigin and Cherry's Textbook of Pediatric Infectious Diseases*. 7th ed. Philadelphia, PA: Saunders.

Chow AW, BenningerMS, Brook I,Brozek JL,Goldstein EJ,Hicks LA, et al. (2012). Infectious Diseases Society of America. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clinical Infectious Disease*, 54: e72-e112.

Harris AM, Hicks LA, Qaseem A. (2016). Appropriate antibiotic use for acute respiratory tract infection in adults: advice for high-value care from the American College of Physicians and the Centers for Disease Control and Prevention. *Annals of Internal Medicine*, 164:425-34.

Kimberlin, DW et al., ed. (2015). *Red Book: Report of the Committee on Infectious Diseases*. 30th ed. Elk Grove Village, IL: American Academy of Pediatrics.

Kliegman RM, et al., eds. (2016) *Nelson Textbook of Pediatrics*. 20th ed. Philadelphia, PA: Elsevier.

Libman, H, Brockmeyer, DM, Gold, HS. (2017) Should We Prescribe Antibiotics to This Patient with Persistent Upper Respiratory Symptoms? Grand Rounds Discussion from Both Israel Deaconess Medical Center. *Annals of Internal Medicine*, 166, 201-208. doi:10.7326/M16-2766.

Macfadyen CA, Acuin JM, Gamble CL. (2006). Systemic antibiotics versus topical treatments for chronically discharging ears with underlying eardrum perforations. Cochrane Database of Systematic Review. Issue 1. Art. No.: CD005608. DOI: 10.1002/14651858. CD005608

Mandell LA, et al. (2015). Mandell, Douglas, and Bennett's Principles and Practice of Infectious Disease, 8th edition.

Philippine Society of Otolaryngology – Head and Neck Surgery. (2006). *Clinical Practice Guideline for Sinusitis*. Pasig City: Philippine Society of Otolaryngology – Head and Neck Surgery.

Research Institute for Tropical Medicine. *Antimicrobial Resistance Surveillance Program: 2015 Data Summary Report*. Retrieved from: http://arsp.com.ph/arsp-data-summary-report-2015/

Reveiz L, Cardona AF. (2013). Antibiotics for acute laryngitis in adults. *Cochrane Database of Systematic Review* (3):CD004783. doi: 10.1002/14651858.CD004783.pub4.

Rosenfeld RM et al. (2015). American Academy of Otolaryngology – Head and Neck Surgery. *Clinical Practice Guideline (Update): Adult Sinusitis. Head and Neck Surgery*.152 (2S): S1-S39.

Rosenfeld RM et al. (2016). Acute Sinusitis in Adults. The New England Journal of Medicine, 375:962-70. DOI: 10.1056/ NEJMcp1601749

The Sanford Guide to Antimicrobial Therapy 2015. Available at: http:// webedition.sanfordguide.com

LOWER RESPIRATORY TRACT INFECTIONS

Etiology	Regimen	Comments
Bronchiolitis / Wheezy Bronchitis (Expiratory Wheezing)		
Respiratory syncytial virus (RSV) is the most important etiology; rapid diagnosis uses antigen detection methods. In adults, RSV accounts for 10.6% of hospitalizations for pneumonia, 11.4% for chronic obstructive pulmonary disease, 7.2% for asthma and 5.4% for congestive heart failure in patients >65 years of age. RSV caused 11% of clinically important respiratory illnesses in military recruits. There is a need for surveillance for etiologies of bronchiolitis and bronchitis.		
RSV in 50%; Parainfluenza in 25%; Human metapneumovirus	Pediatric: **(<5 years old)** **Ribavirin** for severe disease (e.g., requiring mechanical ventilation). Administer at a concentration of 20mg/mL in sterile water by small particle aerosol generator (SPAG) 2 via continuous aerosol administration for over 18-20 hours daily for 3-5 days. Aerosolized **Ribavirin** is not available in the Philippines. *For infants hospitalized with RSV bronchiolitis:* Antibiotics not indicated unless there is evidence of secondary bacterial infection. The mainstay of therapy is supportive care, which includes hydration, measurement of oxygen saturation and use of supplemental oxygen if needed. Adult: Antibiotics are not indicated.	**Ribavirin** is not routinely recommended due to the high cost, toxicity, absence of controlled data. Aerosolized **Ribavirin** should only be administered with SPAG 2. **Palivizumab** is a humanized mouse monoclonal antibody for the prevention of bronchiolitis, reducing hospitalization rates by 39-82% among high risk infants (e.g., those with congenital heart disease, chronic lung disease, or preterm birth <32 weeks). It is given at a dose of 15mg/kg IM once every 30 days, for a maximum of 5 months.
Acute Bronchitis		
A throat swab polymerase chain reaction test may be done to diagnose *Mycoplasma* or *Chlamydophila* (formerly *Chlamydia*).		
<2 years: *Adenovirus* (most common)	Pediatric: **(<5 years)** Antibiotics are indicated only with associated sinusitis or heavy growth on throat culture for *S. pneumoniae*, Group A	Purulent sputum alone not an indication for antibiotic therapy. Expect cough to last for 2 weeks. If there is fever or rigors, get a chest X-

Etiology	Regimen	Comments
2-5 years: Respiratory syncytial virus; Parainfluenza 3 virus; Human metapneumovirus **Adolescents and adults:** Usually *M. pneumoniae* in 5%; *Chlamydophyla pneumoniae* in 5%	Streptococci, *H. influenzae*; or when there is no improvement in 1 week. Otherwise, treatment is symptomatic. Adult: Antibiotics are usually not indicated. Antitussive +/- inhaled bronchodilators.	ray. If *Mycoplasma* is documented, prefer **Doxycycline** over macrolides due to increasing macrolide resistance.
Pertussis (whooping cough) presents as 3 stages: 1) catarrhal (1-2 weeks); 2) paroxysmal coughing (2-4 weeks); and 3) convalescence (1-2 weeks). Diagnosis is made through polymerase chain reaction on nasopharyngeal secretions or increased pertussis-toxin antibody titres.		
Bordetella pertussis and occasionally, *B. parapertussis* Differential diagnoses include the following: 1. Asthma 2. Gastroesophageal reflux 3. Post-nasal drip 4. Mycoplasma infection 5. Chlamydophila infection	Pediatric: **<1 month up to 6 months: Azithromycin** 10mg/kg/day q24h for 5 days ***OR* Erythromycin** 40mg/kg/day in 4 div doses x 14 days **>6 months: Azithromycin** 10mg/kg/day PO on day 1 then 5mg/kg/day PO q24h x 4 days ***OR* Clarithromycin** 7.5mg/kg PO q12h x 7 days (Max: 1g/day) ***OR* Erythromycin estolate** 40mg/kg/day in 4 div doses ***OR* Erythromycin base** 40mg/kg/day div q6h x 7-14 days (Max: 1-2g/day) ***OR* Co-trimoxazole** 8/40mg/kg/day in 2 div doses x 14 days Adult: **Azithromycin** 500mg PO on day 1.25g q24h on days 2-5 ***OR* Erythromycin estolate** 500mg PO qid x14 days ***OR* Co-trimoxazole** 160/800mg PO bid x 14 days ***OR* Clarithromycin** 500mg PO bid x 7 days	Treatment may abort or eliminate pertussis in the catarrhal stage, but does not shorten the paroxysmal stage. Treatment is aimed at eradication of nasopharyngeal carriage. In the non-outbreak setting, the likelihood of pertussis is increased if post-tussive emesis or inspiratory whoop is present. Pertussis prophylaxis of household contacts (adults and children): **Azithromycin** 500mg PO x1 dose on day 1, then 250mg q24h on days 2-5 ***OR* Erythromycin** 500mg PO qid 14 days ***OR* Clarithromycin** 500mg PO bid x 7 days ***OR* Co-trimoxazole** 160/800mg PO bid x 14 days

Etiology	Regimen	Comments
Acute bacterial exacerbation of chronic bronchitis (ABECB), adult		
Almost always in smokers with chronic obstructive pulmonary disease. Tobacco use and air pollution contribute to ABECB. Severe ABECB is characterized by increased dyspnea, sputum viscosity/purulence and sputum volume. Management of severe ABECB includes: (1) consider a chest X-ray, especially if febrile and/or with low oxygen saturation; (2) inhaled anticholinergic bronchodilator; (3) oral corticosteroid; taper over 2 weeks; (4) tobacco cessation; and (5) non-invasive positive pressure ventilation		
Viruses in 20%-50%, *Chlamydophila pneumoniae* in 5%, *Mycoplasma pneumoniae* in <1% The role of *S. pneumoniae*, *H. influenzae*, and *Moraxella catarrhalis* is controversial	Mild Moderate infections: **Amoxicillin** 500mg tid ***OR*** **Doxycycline** 100mg PO bid ***OR*** **Cefuroxime** 500mg PO bid Severe infections: **Co-amoxiclav** 875/125mg bid ***OR*** **Azithromycin** 500mg q24h x 3 days ***OR*** **Clarithromycin** 500mg PO bid ***OR*** **Levofloxacin** 500mg PO q24h **Duration**: 5-10 days The GOLD COPD 2015 Update states: Antibiotics should be given to patients with exacerbations of COPD who: (1) have three cardinal symptoms (increase in dyspnea, sputum volume, and sputum purulence); (2) have two of the cardinal symptoms, if increased sputum purulence is one of the two symptoms; or (3) requires mechanical ventilation, invasive or non-invasive. IV antibiotics should only be used if the patient cannot tolerate oral antibiotics.	The role of antimicrobial therapy is debated even for severe diseases, but a recent study on over 80,000 patients shows value of antimicrobial therapy in patients hospitalized with severe disease.
Influenza		
Fever, cough, myalgia during influenza season. Complications include influenza pneumonia and secondary bacterial pneumonia due to community-acquired methicillin-resistant and susceptible *Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*. Prevention includes annual vaccination.		
Influenza a and b	Pediatric: **Oseltamivir** 2 weeks-11 months old: 3mg/kg bid x 5 days ≤15kg: 30mg bid x 5 days	Resistant to **Amantadine** and **rimantidine** (100%)

Etiology	Regimen	Comments
	>15kg to 23kg: 45mg bid x 5 days >23kg to 40kg: 60mg bid x 5 days >40kg: 75mg bid x 5 days	
	Adult: **Oseltamivir** 75mg PO bid x 5 days	
Acute bacterial exacerbation (bronchiectasis)		
May be caused by obstruction, decreased immunoglobulins, cystic fibrosis, dyskinetic cilia, tobacco, or prior severe or recurrent necrotizing bronchitis (e.g., pertussis). Pre-treatment screening includes baseline liver function tests, electrocardiogram, hearing test, and sputum culture to exclude mycobacterial disease.		
H. influenzae; P. aeruginosa; S. pneumoniae (rarely)	Adult: **Levofloxacin** 500mg PO q24h x 7-10 days Prevention of exacerbation: **Erythromycin** 500mg PO bid ***OR*** **Azithromycin** 250mg q24h x 1 year	Higher rates of macrolide resistance in oropharyngeal flora may potentially increase the risk of cardiovascular deaths from macrolide-induced QTc prolongation, liver toxicity, or hearing loss.
Allergic bronchopulmonary aspergillosis (clinical manifestation: wheezing, pulmonary infiltrates, bronchiectasis, and fibrosis). Airway colonization is associated with increase blood eosinophils, increase IgE levels and isolation of *Aspergillus spp*. or other dematiaceous species (*Alternaria*, *Cladosporium*, etc.)		
Aspergillosis; *Aspergillus fumigatus* (most common); *A. flavus* and others.	Treatment of allergic bronchopulmonary aspergillosis: **Itraconazole** 200mg PO bid x 16 weeks or longer. Acute asthma attacks associated with allergic bronchopulmonary aspergillosis is treated with corticosteroids.	**Itraconazole** decreases the number of exacerbations requiring corticosteroids with improved immunological markers, improved lung function and exercise tolerance.

Etiology	Regimen	Comments
Pneumonias and Infections of the Lung Parenchyma		
Community-Acquired Pneumonia (CAP) in Neonates		
Gram-negative bacilli, Group B Streptococci	**Ampicillin** 100-200mg/kg/day IV div q6h ***OR*** **Penicillin G** 100,000-250,000 U/kg/day IV div q4-6h infusion over 15-60 min For severe infections: 250,000-400,000 U/kg/day IV div q4-6h infusion over 15-60 min ***PLUS*** **Aminoglycoside Amikacin** 15mg/kg/day IV ***or*** **Gentamicin** 5mg/kg/day IV	**Immunize at 6 weeks of age:** • Pneumococcal Conjugate Vaccine given IM. Primary vaccination includes 3 doses every 4 weeks and a booster, 6 months after the 3rd dose. • Hib Conjugate Vaccine given IM. Primary vaccination includes 3 doses every 4 weeks and a booster dose at 12-15, with an interval of 6 months after the 3rd dose.
Community-Acquired Pneumonia (CAP) in Infants and Children up to 5 years		
S. pneumoniae in 30%-50%, *H. influenzae* type b in 10%-30%, *S. aureus*, *K. pneumoniae*, Non-typeable *H. influenzae*		
PCAP A/B (non-severe): No or mild dehydration; no malnutrition; no pallor; awake; no signs of respiratory failure; respiratory rate of ≥50-≥60/min (3-12months), ≥40-≤50/min (1-5years), ≥30-≤35/min (>5 years)	If with complete Hib vaccination: **Amoxicillin** 80-90mg/kg/day q12h PO x 5 days If with no Hib vaccination or incomplete or unknown vaccination history: **Co-amoxiclav** 80-90mg/kg PO div q12h (14:1 preparations) (amoxicillin component) For children >40 kg: **Co-amoxiclav** 500/125mg PO q8h (Max: 2g/day) ***OR*** **Cefuroxime** 20-30mg/kg/day PO div q12h If allergic to **Amoxicillin**, consider macrolide: **Azithromycin** 10mg/kg/day PO x 3 days or 10mg/kg/day PO on day 1 then	Equal efficacy between oral **Amoxicillin** and IV penicillin if feeding is tolerated. **PNF Preparations of HIGH DOSE Co-amoxiclav (ES 600) for BID dosing (14:1)** **Amoxicillin** 600mg /42.9mg/5mL in 5 mL

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td></td><td>5mg/kg/day PO on days 2-5 OR Clarithromycin 15mg/kg/day div PO q12h x 7 days
<u>If non-responsive to initial treatment (48-72h):</u>
• If started on Amoxicillin 80-90mg/kg/day, shift to Co-amoxiclav 90mg/kg/day div PO q12h (amoxicillin component).
• If started on Co-amoxiclav 80-90mg/kg/day, admit for IV antibiotics.
• May also consider adding an oral macrolide.
• Consider other diagnosis.</td><td rowspan="3">Switch from IV to oral form 2-3 days after initiation of treatment in patients who are:
1. Responding to initial treatment
2. Able to feed with, intact GI absorption
3. Free from pulmonary/ extrapulmonary complications

Although the total course of therapy is usually 7 to 10 days for uncomplicated pneumonia, longer courses of 2 to 3 weeks may be required for more severe disease (pleural empyema or pulmonary abscesses).</td></tr>
<tr><td>PCAP C (severe): Moderate dehydration; moderate malnutrition; with pallor; irritable (+ intercostal/ subcostal retractions, head bobbing, cyanosis); respiratory rate of >60-≤70/min (3-12 months), >50/min (1-5 years), >35/min (>5 years); NO grunting; NO apnea.</td><td><u>If with complete Hib vaccination:</u> Penicillin G 200,000 U/kg/day IV div q6h OR Ampicillin 200mg/kg/day IV div q6h

<u>If with no Hib vaccination or incomplete or unknown vaccination history:</u>
Ampicillin-sulbactam 100mg/kg/day IV div q6h OR Cefuroxime 100mg/kg/day IV div q8h OR Ceftriaxone 100mg/kg/day IV div q12h</td></tr>
<tr><td colspan="2">PCAP D (very severe): Severe dehydration; severe malnutrition; with pallor; lethargic/ stuporous/in coma (+ supraclavicular/ intercostal/ subcostal retractions, head bobbing, cyanosis, grunting, apnea; respiratory rate >70/min (3-12 months), >50/min (1-5 years), >35/min (>5 years).

Refer to Specialist and admit to critical care unit. Refer for antibiotic guidance.</td></tr>
<tr><td colspan="3">Children (>5 years) and adolescents: Clinical presentation may be indistinguishable from viral pneumonia. Complaints are related to slowly progressive systemic symptoms over 3 to 7 days, with malaise, pharyngitis, and headache, followed by cough that is irritative and nonproductive (lasting for 2-4 weeks). Physical examination may show rales, rhonchi, and wheezes in the context of a child who does not appear ill (“walking pneumonia”).</td></tr>
</table>

Etiology	Regimen	Comments
S. pneumoniae, M. pneumoniae, C. pneumoniae	**Erythromycin** 50mg/kg/day PO div q6-8h x 10-14 days ***OR*** **Clarithromycin** suspension 15mg/kg/day div q12h x 10 days ***OR*** **Azithromycin** 10mg/kg/day PO x 3 days or 10mg/kg/day PO on day 1 then 5mg/kg/day PO on days 2-5	Treatment choices when atypical pathogens are suspected.
Community-Acquired Pneumonia (CAP) in Adults		
Low-risk CAP: • Stable vital signs (RR <30/min, PR <125/min, SBP >90mmHg, DBP >60mmHg, Temp >36˚C or <40˚C) • No altered mental state of acute onset • No suspected aspiration • No or stable co-morbid conditions • Chest X ray: localized infiltrates; no evidence of pleural effusion For *S. pneumoniae* respiratory isolates tested (302), 11% were resistant to Penicillin using meningitis breakpoint and 0.7% (only 2 isolates) were reported as penicillin-resistant using non- meningitis breakpoints.		
Potential pathogens: *S. pneumoniae, H. influenzae, C. pneumoniae, M. catarrhalis* Enteric Gram-negative bacilli (among those with co- morbid illness)	Without co-morbid illness: **Amoxicillin** 1g PO tid ***OR*** **Azithromycin** 500mg PO daily ***OR*** **Clarithromycin** 500mg PO bid With stable co-morbid illness: **Co-amoxiclav** 1g PO bid ***OR*** **Cefuroxime axetil** 500mg PO bid +/- **Azithromycin** 500mg PO daily ***OR*** **Clarithromycin** 500mg PO bid **Duration:** For *S. pneumoniae*: 5-7 days or 3-5 days if using **Azithromycin**	**Fluoroquinolones** are potential second-line agents for the treatment of pulmonary tuberculosis, particularly for multi-drug resistant tuberculosis and not recommended as first line treatment option for low risk CAP. Sputum Gram stain and culture is not necessary.
Moderate-risk CAP: • Unstable Vital Signs: RR>30/min, PR >125/min, Temp <36˚C or >40˚C • Altered mental state of acute onset • Suspected aspiration • Chest X-ray: multilobar infiltrates; pleural effusion • Unstable/Decompensated comorbid condition: uncontrolled diabetes mellitus, active malignancies, neurologic disease in evolution, congestive heart failure class II-IV, unstable coronary artery disease, renal failure on dialysis, uncompensated COPD, decompensated liver disease.		

Etiology	Regimen	Comments
For those at risk of aspiration, infections with anaerobes should be considered. Choose antibiotics based on available micro- biological data, or use an oral agent from the same drug class. Blood culture, sputum Gram stain and culture are necessary.		
Potential Pathogens: *S. pneumoniae, H. influenzae, C. pneumoniae, M. pneumoniae, M. catarrhalis*, Enteric Gram (-) bacilli, *Legionella pneumophila*, Anaerobes (among those with risk of aspiration)	**Ampicillin-sulbactam** 1.5g IV q6h ***OR*** **Cefuroxime sodium** 1.5g IV q8h ***OR*** **Ceftriaxone** 2g IV q24h ***PLUS*** **Azithromycin** 500mg PO daily ***OR*** **Clarithromycin** 500mg PO bid ***OR*** **Levofloxacin** 750mg PO daily **Duration:** 7-10 days may be adequate (or 3-5 days for azalides). A longer duration of up to 28 days may be given for *S. aureus* or *P. aeruginosa* if with concomitant bacteremia	Due to increasing resistance of Gram-negative bacilli to **Fluoroquinolones**, monotherapy with **Fluoroquinolone** is not recommended. **Azithromycin** and **Fluoroquinolones** can cause prolongation of QT interval. Caution should be taken especially in elderly with cardiovascular diseases. Shift from IV to oral therapy once the patient is clinically improving.
High-risk CAP: Any of the clinical feature of Moderate-risk CAP plus any of the following: severe sepsis and septic shock or need for mechanical ventilation. **Risk factors for *P. aeruginosa* infections:** • History of chronic or prolonged (>7 days within the past month) use of broad-spectrum antibiotic therapy • Severe underlying bronchopulmonary disease • Malnutrition • Chronic use of steroids >15 mg/day for at least 2weeks		
Potential Pathogens: *S. pneumoniae, H. influenzae, C. pneumoniae, M. pneumoniae, M. catarrhalis;* Enteric Gram (-) bacilli*; L. pneumophila,* Anaerobes (among those with risk of aspiration), *S. aureus, P. aeruginosa*	No risk for *P. aeruginosa*: (**Ceftriaxone** 2g IV q24h ***OR*** **Ertapenem** 1g IV q24h) ***PLUS*** (**Azithromycin** 500mg IV daily ***OR*** **Levofloxacin** 750mg IV daily) Risk for *P. aeruginosa*: (**Piperacillin-tazobactam** 4.5g IV q6h **OR** **Cefepime** 2g IV q8-12h ***OR*** **Meropenem** 1g IV q8h) ***PLUS*** **Azithromycin** 500mg IV daily	Empiric therapy for MRSA among hospitalized patients with severe CAP is indicated in any of the following conditions: • requirement for intensive care unit • necrotizing or cavitary infiltrates • empyema.

Etiology	Regimen	Comments
	PLUS (**Gentamicin** 5-7mg/kg IV daily ***OR*** **Amikacin** 15mg/kg IV daily) ***OR*** (**Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Cefepime** 2g IV q8-12h ***OR*** **Meropenem** 1g IV q8h) ***PLUS*** (**Levofloxacin** 750mg IV daily ***OR*** **Ciprofloxacin** 400mg IV q8-12h) If MRSA pneumonia is suspected, ***ADD*** **Vancomycin** 25-30mg/kg loading dose then 15-20mg/kg IV q8-12h ***OR*** **Linezolid** 600mg IV q12h **Duration:** 7-10 days may be adequate. A longer duration of up to 28 days may be given for S. *aureus* or *P. aeruginosa* if with concomitant bacteremia.	Treatment should be modified according to culture/sensitivity results once available. Use of **Linezolid** or **Clindamycin** monotherapy for MRSA bacteremia, even if associated with a pulmonary source, is not recommended.
Empyema		
Acute Empyema		
S. aureus; S. pneumoniae; S. pyogenes; H. influenzae	Pediatric: **1st line:** **Clindamycin** 25-40mg/kg/day IV div q6-8h ***PLUS*** **Ceftriaxone** 50-100mg/kg/day IV q24h infusion over 10-30 min **2nd line:** (**Vancomycin** 40mg/kg/day IV div q6h ***PLUS*** **Ampicillin-sulbactam** 100 mg/kg/day IV div q6h) ***OR*** (**Vancomycin** 40mg/kg/day IV div q6h ***PLUS*** **Ceftriaxone** 50-100mg/kg/day IV q24h infusion over 10-30 min ***PLUS*** **Metronidazole** 30mg/kg/day IV div q6h) Adult: **1st line:** **Clindamycin** 600mg IV q8h ***PLUS*** **Ceftriaxone** 2g IV q24h	Treatment includes systemic antibiotic and drainage. Treatment should be guided by culture results.

Etiology	Regimen	Comments
	2nd line: (**Vancomycin** 15mg/kg IV q8-12h ***PLUS*** **Ampicillin-sulbactam** 1.5g IV q6h) ***OR*** (**Vancomycin** 15mg/kg IV q8-12h ***PLUS*** **Ceftriaxone** 2g IV q24h ***PLUS*** **Metronidazole** 500mg IV q6h) **Duration:** 2-4 weeks based on clinical response to drainage and antimicrobial therapy	
Chronic Empyema		
Mostly anaerobic organisms *Mycobacterium tuberculosis*	Refer to specialist.	Rule out the possibility of tuberculosis.
Lung Abscess		
S. aureus; S. pneumoniae; Anaerobes of the upper respiratory tract	Pediatric: **1st line:** **Clindamycin** 25-40mg/kg/day IV div q6-8h ***PLUS*** **Ceftriaxone** 50-100mg/kg/day IV q24h infusion over 10-30 min **2nd line:** **Vancomycin** 40mg/kg/day IV div q6h ***PLUS*** **Ceftriaxone** 50-100mg/kg/day IV q24h infusion over 10-30 min ***PLUS*** **Metronidazole** 30mg/kg/day IV div q6h Adult: (**Clindamycin** 600mg IV q8h ***OR*** **Ampicillin-sulbactam** 3g IV q6h) ***OR*** (**Ceftriaxone** 2g IV q24h ***PLUS*** **Metronidazole** 500mg IV q6h or 1g IV q12h) ***OR*** **Piperacillin-tazobactam** 4.5g IV q8h (for mixed infections with resistant Gram-negative aerobes) **Duration:** 4-6 weeks	Do surgical intervention if with failure to improve after 7 days of appropriate antibiotics.

Etiology	Regimen		Comments
Pneumonia, anaerobic or aspiration with or without lung abscess			
Anaerobes; Gram positive cocci; *Streptococcus milleri;* Gram-negative bacteria		Parenteral:	Oral:
	1st line:	**Clindamycin** 600mg IV q8h ***PLUS*** **Ceftriaxone** 2g IV q24h for suspected Gram-negative infection ***OR*** **Ampicillin-sulbactam** 3g IV q6h	**Clindamycin** 300-450mg PO tid ***OR*** **Co-amoxiclav** 1g PO bid
	2nd line:	**Piperacillin-tazobactam** 4.5g IV q8h ***OR*** **Ceftriaxone** 2g q24h IV ***PLUS*** **Metronidazole** 500mg IV q6h ***OR*** **Ertapenem** 1g IV q24h	**Co-amoxiclav** 1g PO bid
	Duration: Up to 3-4 weeks, depending on clinical response; longer (up to 2-3 months) for lung abscess.		
Pneumonia with concomitant/post-influenza			
Defined as patients with active influenza or with history of influenza within 2 weeks of development of CAP			
S. aureus; S. pneumoniae	Refer to recommendations for moderate or high-risk CAP in adults and ***ADD*** **Vancomycin** 15 mg/kg IV q8-12h ***OR*** **Linezolid** 600mg IV q12h		Use of **Linezolid** monotherapy for MRSA bacteremia, even if associated with a pulmonary source, is not recommended.

Etiology	Regimen	Comments
Hospital-acquired pneumonia (HAP) and Ventilator-associated pneumonia (VAP) in Children		
HAP in children is pneumonia (diagnosed by a combination of clinical, laboratory and imaging parameters) that occurs on or after the 3rd day of admission to an inpatient location. VAP in children is pneumonia where the patient is on mechanical ventilation for >2 calendar days on the date of event, with day of ventilator placement being day 1 and the ventilator was in place on the date of the event or the day before.		
S. aureus; S. pneumoniae	Refer to recommendations for moderate or high-risk CAP in adults and ***ADD*** **Vancomycin** 40-60mg/kg/day IV q6-8h for documented MRSA infections ***OR*** **Linezolid** 600mg IV q12h	
P. aeruginosa, A. baumanii, K. pneumoniae; Klebsiella spp., E. coli, Enterobacter spp.; Proteus spp.; Serratia marcesens	**Ceftazidime** 100-150mg/kg/day IV div q8h infused over 15-30 mins ***PLUS*** (**Amikacin** 15mg/kg IV ***OR*** **Gentamicin** 5mg/kg/day IV) If *S. aureus* is suspected, add **Vancomycin**.	Choice should be based on current antimicrobial susceptibility pattern in the institution. The recommendations for empiric therapy here are based on national antimicrobial resistance data.
Multi-drug resistant (MDR) pathogens Risk factors for infection with MDR pathogens are: • Antimicrobial therapy in the preceding 90 days • Current hospitalization of 5 days or more • High frequency of antibiotic resistance in the community or in the specific hospital unit • Presence of risk factors for HCAP: • Hospitalization for 2 days or more in the preceding 90 days		• Residence in a nursing home or extended care facility • Home infusion therapy (including antibiotics) • Chronic dialysis within 30 days • Home wound care • Family member with MDR pathogen • Immunosuppressive disease and/ or therapy
P. aeruginosa, K. pneumoniae (extended spectrum beta-lactamase and carbapenemase-producing	**Piperacillin-tazobactam** 300mg/kg/day div q6h ***OR*** **Meropenem** 300mg/kg/day div q6h (120mg/kg/day q8h if with meningitis) (Max: 2-	For infections with MDR Gram-negative bacilli that are highly resistant to several classes of

Etiology	Regimen	Comments
Klebsiella strains), *Acinetobacter spp., Stenotrophomonas maltophilia, Burkholderia cepacia*, Methicillin-resistant *S. aureus*	4g/day) ***OR*** **Cefepime** 100mg/kg/day q8h (150mg/kg/day q8h for *Pseudomonas*)	antimicrobial agents, referral to a specialist is warranted.
Viral and fungal pathogens in immunocompromised hosts (patients on chronic immunosuppressants, solid organ and bone marrow transplant recipients)		Refer to a specialist.
Hospital-acquired pneumonia (HAP) and Ventilator-associated pneumonia (VAP) in Adults		
Empiric Treatment for HAP HAP is defined as a pneumonia not incubating at the time of hospital admission and occurring 48 hours or more after admission and not associated with ventilation **Risk Factor for MDR HAP, MRSA, Pseudomonas in HAP**: Prior IV antibiotic use within 90 days		
Not at high risk of mortality and no factors increasing the likelihood of MRSA	**Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Cefepime** 2g IV q8h ***OR*** **Meropenem** 1g IV q8h	In patients with suspected VAP and HAP, include coverage for *S. aureus, P. aeruginosa*, and other Gram-negative bacilli in all empiric regimens). Do sputum GS/CS and blood culture to determine etiology of HAP. All hospitals should generate their own antibiogram and empiric treatment be guided
Not at high risk of mortality but with factors increasing the likelihood of MRSA	**Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Cefepime** 2g IV q8h ***OR*** **Meropenem** 1g IV q8h ***OR*** **Aztreonam** 2g IV q8h (if with beta-lactam allergy) ***PLUS*** **Vancomycin** loading dose of 25-30mg/kg then 15-20mg/kg IV q8-12h with goal to target trough level to 15-20mg/mL ***OR*** **Linezolid** 600mg IV q12h	

Etiology	Regimen	Comments
High risk of mortality and with risk factor for MDR High Risk for Mortality: Need for ventilatory support due to pneumonia; septic shock	**Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Cefepime** 2g IV q8h ***OR*** **Meropenem** 1g IV q8h ***OR*** **Aztreonam** (for penicillin allergy) 2g IV q8h ***PLUS*** **Levofloxacin** 750mg IV daily ***OR*** **Amikacin** 15-20mg/kg/day IV ***PLUS*** **Vancomycin** loading dose of 25-30mg/kg then 15-20mg/kg IV q8-12h with goal to target trough level to 15-20mg/mL ***OR*** **Linezolid** 600mg IV q12h **Duration:** 7 days but may be longer depending on clinical radiologic and laboratory improvement	by the local distribution of pathogens and their antimicrobial susceptibilities. Antibiotic therapy should be de-escalated or modified based on the culture and susceptibility results.
Empiric Treatment of VAP VAP is defined as pneumonia occurring >48 hours after endotracheal intubation and associated with mechanical ventilation **Risk Factors for MDR VAP:** Prior IV antibiotic use within 90 days, Septic shock at time of VAP, ARDS preceding VAP, Acute renal replacement therapy prior to VAP onset, At least 5 days hospitalization before VAP onset. High risk of pathogens in the ICU (25%).		
No risk factors for MDR VAP No structural lung disease	**Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Cefepime** 2g IV q8h ***OR*** **Meropenem** 1g IV q8h OR **Aztreonam** 2g IV q8h (if with allergy to beta-lactam)	If culture results show **Carbapenem** resistance or MDR where **Colistin** is to be used, referral to ID physician is required. Use procalcitonin levels and clinical criteria to guide discontinuation of therapy for both HAP and VAP. If hospital MRSA rate is unknown or is between 10-20%, add coverage for MRSA.
With risk factors for MRD VAP With structural lung disease	**Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Cefepime** 2g IV q8h ***OR*** **Meropenem** 1g IV q8h or **Aztreonam** 2g IV q8h (if with allergy to beta-lactam) ***PLUS*** **Levofloxacin** 750mg IV daily ***OR*** **Amikacin** 15-20mg/kg IV q24h ***PLUS*** **Vancomycin** loading dose of 25-30mg/kg then 15-20mg/kg IV q8-12h with goal to target trough level to 15-20mg/mL ***OR*** **Linezolid** 600mg IV q12h	

Etiology	Regimen	Comments
	Duration: 7 days but may be longer depending on clinical radiologic and laboratory improvement	
Pathogen-Specific Treatment for Adult and Pediatric Patients: Choice of antibiotic should be based on the results of culture and susceptibility testing		
Methicillin-resistant *S. aureus*	Pediatric: **Vancomycin** 40-60mg/kg/day div q6h with goal to target trough level to 15-20mg/mL ***OR*** **Linezolid** 30mg/kg/day IV/PO div q8h (up to 12 years) or 600mg IV/PO q12h (age >12 years) Adult: **Vancomycin** 15-20 mg/kg IV or **Linezolid** 600 mg IV/PO q12h	
P. aeruginosa	Pediatric: **1st line:** [**Ceftazidime**100-150mg/kg/day IV div q8h ***PLUS*** (**Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5-7mg/kg/day IV)] ***OR*** **Cefepime** 150mg/kg/day div q8h **2nd line:** **Piperacillin-tazobactam** 300mg/kg/day IV div q6h ***OR*** **Meropenem** 60mg/kg/day IV div q8h (120mg/kg/day if with meningitis) (Max: 2-4g/day) ***OR*** [**Ciprofloxacin** 20-30mg/kg/day IV div q12h (Max: 1.2g/day) ***PLUS*** (**Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5-7mg/kg/day IV)] Adult: **Piperacillin-tazobactam** 4.5g q6h by extended infusion ***OR*** **Ceftazidime** 2g IV q8h ***OR*** **Cefepime** 2g IV q8h ***OR*** **Meropenem** 1g IV q8h ***OR*** [(**Levofloxacin** 750mg IV ***OR*** **Ciprofloxacin** 400mg IV q8h) ***PLUS*** (**Amikacin** 15mg/kg/day IV ***OR***	Choice of antibiotic should be based on upon the results of susceptibility testing. Aminoglycoside monotherapy should be avoided. For patients with VAP/HAP due to *P. aeruginosa* not in septic shock or not at high risk for death and for whom the results of antibiotic susceptibility testing are known, monotherapy with a beta-lactam is preferred. For patients with HAP/VAP due to *P. aeruginosa* in septic shock or at high risk of death when results of antibiotic testing is available, use combination therapy using 2 antibiotics to which the isolate is susceptible. Use **Meropenem** only if organism is resistant to all other beta-lactams.

Etiology	Regimen	Comments
	Gentamicin 5-7mg/kg/day IV)] ***OR*** **Aztreonam** 2g IV q6h for beta-lactam allergy	
Acinetobacter species	Pediatric: **Meropenem** 60mg/kg/day IV div q8h ***PLUS*** (**Amikacin** 15mg/kg/day IV div q8h ***OR*** **Gentamicin** 5mg/kg/day IV) For **Carbapenem**-resistant strains: (**Ampicillin-sulbactam** 100-200mg/kg/day IV div q6h (ampicillin component) ***OR*** **Piperacillin-tazobactam** 300mg/kg/day IV div q6-8h) ***PLUS*** (**Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5-7mg/kg/day IV) For MDR Acinetobacter: Refer to Specialist Adult: Pan susceptible monotheraphy with **Meropenem** 2g q8h MDR strain sensitive only to **Colistin:** Combine **Colistin (colistimethate)** 9 MU initially to be followed 24 hours later by 4.5 MU q12h with **Meropenem** 1g IV q8h Pan resistant: **Meropenem** 2g IV q8h ***PLUS*** **Ampicillin-sulbactam** 3g IV q6h ***PLUS*** **Colistin**	In patients with HAP/VAP caused by *Acinetobacter* species that is sensitive only to polymyxins, use IV colistin plus **Meropenem**. Do not use adjunctive **Rifampicin** in patients caused by *Acinetobacter* species that is sensitive only to colistin. Do not use Tigecycline in patients with HAP/VAP due to *Acinetobacter* species. The combination of colistin and **Meropenem** is preferred than tigecycline. Refer to Specialist, if use of **Colistin** is indicated.
Klebsiella pneumoniae	Pediatric: **1st line:** **Meropenem** 60mg/kg/day IV div q8h ***OR*** **Imipenem** 60-100mg/kg/day IV div q6h	Consider patient specific factors such as allergies and comorbidities in choosing an

Etiology	Regimen	Comments
	2nd line: **Ciprofloxacin** 20-30mg/kg/day IV div q12h ***OR*** **Piperacillin-tazobactam** 300mg/kg/day IV div q8h Adult: **Ceftriaxone** 2g IV q24h ***OR*** **Levofloxacin** 750mg IV q24h ***OR*** **Piperacillin-tazobactam** 4.5g IV q8-6h Regimen for ESBL-producing organisms: **1st line:** **Ertapenem** 1g IV q24h **2nd line:** **Meropenem** 1g IV q8h	antibiotic. Consider prolonged infusion of **Carbapenem** particularly in septic patients.
Carbapenem-resistant *Klebsiella*	Refer to Specialist.	
Achromobacter	Pediatric: **1st line:** **Meropenem** 60mg/kg/day IV div q8h **2nd line:** **Co-trimoxazole** 8mg/kg/day PO div q6-12h (trimethoprim component) Adult: **1st line:** **Piperacillin-tazobactam** 4.5g IV q8-6h ***OR*** **Meropenem** 1g q8h IV **2nd line:** **Co-trimoxazole** 8-10mg/kg/day PO div q6-8h (trimethoprim component)	For **Meropenem**, if with meningitis, increase dose to 120mg/kg/day div q8h Some *Achromobacter* strains are susceptible to **Ceftazidime** and **Piperacillin-Tazobactam**
Burkholderia cepacia	Pediatric: **1st line:** **Meropenem** 60mg/kg/day IV div q8h ***PLUS*** (**Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5-7mg/kg/day IV)	

Etiology	Regimen	Comments
	2nd line: **Ceftazidime** 100-150mg/kg/day IV div q8h ***OR*** **Piperacillin-tazobactam** 300mg/kg/day IV div q6-8h ***OR*** **Ciprofloxacin** 20-30mg/kg/day IV div q12h ***OR*** **Co-trimoxazole** 8mg/kg/day PO div q12h ***PLUS*** **Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5-7mg/kg/day IV Adult: **1st line:** **Meropenem** 1g IV q8h ***OR*** **Ciprofloxacin** 400mg IV q12h **2nd line:** **Co-trimoxazole** 8-10mg/kg/day PO div q6-8h (trimethoprim component)	
Burkholderia pseudomallei	Pediatric: **1st line:** **Ceftazidime**150mg/kg/day IV div q8h ***OR*** **Meropenem** 60mg/kg/day div IV q8h x 7-14 days ***PLUS*** **Co-trimoxazole** 8mg/kg/day PO div q12h (trimethoprim component) x 12-24 weeks. Some eradication regimens use: **Co-amoxiclav** 90mg/kg/day PO div q8h (amoxicillin component) ***OR*** **Doxycycline** 4mg/kg/day div q12h ***PLUS*** **Co-trimoxazole** 8mg/kg/day PO div q12h (TMP component) x 12-24 weeks Adult: **1st line:** **Ceftazidime** 2g IV q6h x 10-14 days ***OR*** **Meropenem** 1g IV q8h x 10-14 days Followed by oral therapy: **Co-trimoxazole** 6-8mg/kg bid (trimethoprim component) ***PLUS*** **Folic acid** 5mg daily ***OR*** **Doxycycline** 100mg bid ***OR*** **Co-amoxiclav** 625mg PO tid (for pregnant or sulfa allergy)	

Etiology	Regimen	Comments
	Duration: 6 months for osteomyelitis and CNS infection, 3 months for other infections	
Escherichia coli	Pediatric: **1st line: Ceftriaxone** 100mg/kg/day IV div q12-24h ***PLUS*** **Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5mg/kg/day IV **2nd line: Meropenem** 60mg/kg/day IV div q8h ***PLUS*** **Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5mg/kg/day IV Adult: Pansensitive Strains: Choices include **Piperacillin-tazobactam, Cephalosporins**, **Fluoroquinolones** or **Aminoglycosides** ESBL strains: **Ertapenem** 1g IV q24h	
Enterobacter	Pediatric: **1st line: Cefepime**100-150mg/kg/day div q8-12h ***OR*** **Meropenem** 60mg/kg/day IV div q8h ***PLUS*** (**Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5-7mg/kg/day IV) **2nd line: Co-trimoxazole** 8mg/kg/day PO div q12h ***OR*** **Ciprofloxacin** 20-30mg/kg/day IV div q12h ***PLUS*** **Amikacin** 15mg/kg/day IV ***OR*** **Gentamicin** 5-7mg/kg/day IV Adult: **Piperacillin-tazobactam** 4.5g IV q6h ***OR*** **Cefepime** 2g IV q8h ***OR*** **Meropenem** 500mg-1g IV q8h	

REFERENCES

Antibiotic Guidelines 2015-2016. *Treatment Recommendations for Adult Inpatients*. Available at: http://www.hopkinsmedicine.org/amp/guidelines/antibiotic_guidelines.pdf

Cherry JD, et al., eds. (2014). *Feigin and Cherry's Textbook of Pediatric Infectious Diseases*. 7th ed. Philadelphia, PA: Saunders.

Kimberlin, DW et al., ed. (2015). *Red Book: Report of the Committee on Infectious Diseases*. 30th ed. Elk Grove Village, IL: American Academy of Pediatrics.

Kliegman RM, et al., eds. (2016) *Nelson Textbook of Pediatrics*. 20th ed. Philadelphia, PA: Elsevier.

Management of Adults with Hospital-acquired and Ventilator associated Pneumonia; 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society. CID 2016:63

Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases, 8th ed. 2015.

Mandell LA, et al. Clin Infect Dis. (2007) 44 (Supplement 2): S27-S72.

Philippine Academy of Pediatric Pulmonologists, Inc. *2012 PAPP Update in the Evaluation and Management of Pediatric Community- Acquired Pneumonia*. Quezon City: Philippine Academy of Pediatric Pulmonologists, Inc.

Research Institute for Tropical Medicine. *Antimicrobial Resistance Surveillance Program: 2015 Data Summary Report.* Retrieved from: http://arsp.com.ph/arsp-data-summary-report-2015/

The Sanford Guide to Antimicrobial Therapy 2016. 46th ed. Available at:http://webedition.sanfordguide.com/.

Task Force: Diagnosis, Empiric Management and Prevention of Community-Acquired Pneumonia in Immunocompetent Adults 2016 Update. Joint Statement of PSMID, PCCP, PAFP and PCR. Manila: Philippine Society of Microbiology and Infectious Diseases

SKIN AND SOFT TISSUE INFECTIONS - PEDIATRIC

<table>
<tr><th>Etiology</th><th colspan="3">Regimen</th><th>Comments</th></tr>
<tr><td colspan="5">Skin Infections</td></tr>
<tr><td colspan="5">Skin abscess, boils, furuncles</td></tr>
<tr><td colspan="5">Incision and drainage (I&D) is the mainstay of therapy. Needle aspiration is inadequate.
May treat patients with I&D only and in outpatient setting if there is no diabetes or immunosuppression, and boil or abscess is <5 cm in diameter. Oral therapy <i>PLUS</i> I&D may be effective in abscess >5 cm in diameter and in multiple abscesses.
Antibiotic therapy is recommended for abscesses with the following conditions: severe or extensive disease (e.g., involving multiple sites of infection) or rapid progression in presence of cellulitis; presence of systemic inflammatory response syndrome (SIRS), such as temperature >38°C or <36°C, tachypnea >24 breaths per minute, tachycardia >90 beats per minute, or white blood cell count >12,000 or <4000 cells/µL; associated comorbidities or immunosuppression; extremes of age abscess in areas difficult to drain (e.g., face, hand and genitalia), associated septic phlebitis; lack of response to I&D alone.</td></tr>
<tr><td rowspan="4">S. aureus: Methicillin sensitive (MSSA), Methicillin resistant (MRSA)
Community-associated MRSA is of increasing concern for effective management.</td><td colspan="3">1st line:
Oral: Cloxacillin 50-100mg/kg/day in 4 doses (Max: 2g/day)
OR Cephalexin
Mild to moderate infections: 25-50mg/kg/day in 3-4 doses
Severe infections: 75-100mg/kg/day in 3-4 doses (Max: 4g/day)
Parenteral: Duration: 5-10 days</td><td rowspan="4">If no response after 2-3 days with oral antibiotics, look for complications and consider: Incision and drainage: culture abscess and blood. Empiric antibiotic therapy using parenteral agents (in absence of specific culture and sensitivity data select an agent with activity against MRSA) follow up culture and sensitivity results. Systemic agents should be used in patients who are toxic, who have extensive disease, or who have associated cellulitis.
An antibiotic active against MRSA is recommended for any of the following:</td></tr>
<tr><td>Infections</td><td>Oxacillin</td><td>Cefazolin</td></tr>
<tr><td>Mild to moderate</td><td>100-150mg/kg/day IV/IM in 4 doses (Max: 4 g/day)</td><td>50mg/kg/day IV/IM in 3-4 doses (Max: 3g/day)</td></tr>
<tr><td>Severe</td><td>150-200mg/kg/day IV/IM in 4-6 doses (Max: 12 g/day)</td><td>100-150mg IV/IM in 3-4 doses (Max: 6g/day)</td></tr>
</table>

Etiology	Regimen	Comments
	2nd line: Duration: 7-10d Oral **Clindamycin** 30-40mg/kg/day PO in 3-4 doses (Max: 1.8g/day) ***OR*** **Co-trimoxazole** 8-12mg/kg/day in 2 doses (TMP component) (Max: 320mg/day) ***OR*** **Doxycycline** 2-4mg/kg/day in 1-2 doses (Max: 200mg/day) ***OR*** **Linezolid** *Mild to moderate infections:* <12 yrs.: 30mg/kg/day in 3 doses ≥12 yrs.: 1200mg/day in 2 doses *Severe infections:* Same (Max: 1.2g/day) Parenteral **Clindamycin** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***OR*** **Vancomycin** 40-60 mg/kg/day IV in 4 doses (Max: 4 g/day) ***OR*** **Linezolid** *Mild to moderate infections:* <12 yrs.: 30mg/kg/day in 3 doses ≥12 yrs.: 1200mg/day in 2 doses *Severe infections:* Same	• Patients with carbuncles or abscesses who have failed initial recommended antibiotic treatment against MSSA • Those with markedly impaired host defenses, or • Those with SIRS and hypotension **Doxycycline** is not recommended for age <8 yrs.; bacteriostatic; limited recent clinical experience.
Recurrent furunculosis		
Treat as for furuncles and boils		
S. aureus (MSSA and MRSA) infection presenting as recurrent furunculosis (abscesses, boils) in an otherwise healthy host.	For decolonization: If patient and physician wish to attempt decolonization. Patient should have no active skin infections and is otherwise a healthy host. Need to culture multiple sites, e.g., nose,	Some strains of MRSA, particularly the CA-MRSA, produce a toxin named Panton-Valentin leukocidin (PVL) and are associated with severe infections. PVL is a virulence factor of *S. aureus* which correlates with

Etiology	Regimen	Comments
	throat, and inguinal area skin. Nares-only culture missed 48% of colonized individuals. Avoid systemic antibiotics. **Mupirocin** ointment in anterior nares and under fingernails bid x 7 days ***PLUS*** **Chlorhexidine** 4% shower daily x 7 days One report indicates that bleach baths (tub of warm water with ¼ cup of 6% sodium hypochlorite (household bleach) for 15 minutes, is as effective as use of chlorhexidine shower body washes. Only a modest positive effect in a prospective, randomized single-blinded controlled trial. Intermittent bathing with **Chlorhexidine** 4% or dilute bleach baths/6% sodium hypochlorite (1/4 cup of bleach in a quarter-filled bathtub or 13 gallons water or 1 tsp bleach in 1 gallon of water) for 15 minutes 3x a week can be used to significantly reduce skin load of *S. aureus*.	chronic recurrent furunculosis. Topical decolonization is considered if patient has 2 or more episodes in 1 year or other household members develop infection. Systemic antibiotics is recommended for the treatment of active infection ONLY and is not routinely recommended for decolonization. Recommended intranasal preparation of mupirocin is not available locally. Some local experts use topical mupirocin for nasal decolonization.
Folliculitis		
S. aureus (most common) *P. aeruginosa* (from exposure to inadequately chlorinated swimming pools, whirlpools and hot tubs) *Aeromonashydrophila* (following water exposure)	Usually self-limiting; no therapy indicated. Hot packs for comfort. Incision and draining are the mainstay of therapy. **1st line:** Topical antibiotic therapy for mild cases of folliculitis. Could use **Mupirocin** ointment if staphylococcal etiology. Oral: **Cloxacillin** 50-100mg/kg/day in 4 doses (Max: 2g/day) ***OR*** **Cephalexin** 25-50mg/kg/day in 3-4 doses (mild to moderate infections) or 75-100mg/kg/day in 3-4 doses (Max: 4 g/day) (severe infections)	Folliculitis is infection of the hair follicle with purulent exudate in the epidermis. Hot tub folliculitis is almost always caused by *P. aeruginosa*, is usually self-limited and no treatment is indicated. Systemic therapy in cases of large and multiple lesions should be treated with

Etiology	Regimen	Comments
	Duration: 7-10 days	Penicillinase resistant antibiotics (**Cloxacillin** or **Cephalexin**).
Staphylococcal scalded skin syndrome		
Result of colonization of skin or mucosa by strain of *S. aureus* producing an exfoliative toxin. Pathogen may be MSSA or MRSA.	**1st line: Duration**: 7-10 days for MSSA Oral: **Cloxacillin** 50-100mg/kg/day in 4 doses (Max: 2g/day) Parenteral: **Oxacillin** 100-150mg/kg/day IM/IV in 4 doses (Max: 4g/day) for mild to moderate infections; 150-200mg/kg/day in 4-6 doses (Max: 12g/day) for severe ***OR*** **Cefazolin** 50mg/kg/day IM/IV in 3-4 doses (Max: 3g/day) for mild to moderate; 100-150 mg in 3-4 doses (Max: 6 g/day) for severe **2nd line:** if MRSA is suspected Oral: **Clindamycin** 30-40mg PO in 3-4 doses (Max: 1.8g/day) Parenteral: **Clindamycin** 25-40mg/kg/day in 3-4 doses (Max: 2.7g/day) ***OR*** **Vancomycin** 40-60mg/kg/day IV in 4 doses (Max: 4g/day)	
Impetigo and ecthyma		
Impetigo can be either bullous or nonbullous. Bullous impetigo is caused by strains of *S. aureus* that produce a toxin that cleaves the dermal-epidermal junction to form fragile, thin roofed vesicopustules. These lesions may rupture, creating crusted, erythematous erosions, often surrounded by a collar of the roof's remnants. Nonbullous impetigo can be caused by beta-hemolytic streptococci or *S. aureus*, or both in combination. Impetigo begins as erythematous papules that rapidly evolve into vesicles and pustules that rupture, with the dried discharge forming honey-colored crusts on an erythematous base.		

Etiology	Regimen	Comments
An antibiotic active against MRSA is recommended for patients who failed initial recommended antibiotic treatment against MSSA, has markedly impaired host defenses or has SIRS and hypotension. Ecthyma is a consequence of neglected impetigo, and *S. aureus* and/or streptococci may be the cause. Lesions begin as vesicles that rupture, resulting in circular, erythematous ulcers with adherent crusts, often with surrounding erythematous edema. *Streptococcus pyogenes* infection manifests as "honey crust" lesions or "punched out" ulcers (ecthyma). Unlike impetigo, ecthyma heals with scarring. Most frequently occurs in children in hot, humid environments. Gram stain and culture of the pus or exudates from skin lesions of impetigo and ecthyma are recommended to help identify whether *S. aureus* and/or a GABHS is the cause. Oral therapy for ecthyma and impetigo should be a 7-day regimen with an agent active against *S. aureus* unless cultures yield streptococci alone (when oral penicillin is the recommended agent).		
Streptococcus sp. Group A causes honey crust impetigo; Group B, C, G are less common	**Mupirocin** ointment 2% tid ***OR*** **Fusidic acid** 2% cream bid **Duration**: 7-12 days	Topicals can be used for patients with limited number of lesions and appropriate for those with mild, localized areas of impetigo, no more than 3 areas of impetigo or an area of infection <5 cm. Oral antibiotics are indicated for patients with more extensive areas of infection (those with multiple lesions) if infection is not resolving or is worsening, or those with systemic symptoms; and those with non-bullous impetigo in multiple family members, child care groups, or athletic teams.
Methicillin-susceptible *Staphylococcus aureus* bullous impetigo	**Cloxacillin** 50-100mg/k/day in 4 doses (Max: 12 g/day) ***OR*** **Cephalexin** 25-50 mg/kg/day in 3-4 doses for mild to moderate infections or 75-100mg/kg/day in 3-4 doses (Max: 4 g/day) for severe infections **Duration**: 7 days	
Suspected or confirmed methicillin-resistant *Staphylococcus aureus* bullous impetigo	**Clindamycin** 30-40mg/k/day in 3-4 doses (Max: 1.8 g/day) ***OR*** **Co-trimoxazole** 8-12mg/kg/day in 2 doses (TMP component) (Max: 320mg/day) ***OR*** **Doxycycline** 2-4mg/kg/day in 1-2 doses (Max: 200mg/day) **Duration**: 7 days	

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td colspan="3">Erysipelas</td></tr>
<tr><td>Streptococcus pyogenes (Groups A, B, C, G)</td><td>
1st line:
Oral: Penicillin except in patients with penicillin allergy
Parenteral:
Penicillin G OR Cefazolin
<table>
<tr><td>Mild to moderate</td><td>100,000-150,000 U/kg/day in 4 doses (Max: 8 MU/day)</td><td>25-50mg/kg/day in 3 doses (Max: 3g/day)</td></tr>
<tr><td>Severe</td><td>200,000-300,000 U/kg/day in 6 doses (Max: 24 MU/day)</td><td>100-150mg/kg/day in 3 doses (Max: 6 g/day)</td></tr>
</table>
If penicillin or cephalosporin allergic with severe infections:
Erythromycin 20mg/kg/day IV in 4 doses (Max: 4g/day) OR
Vancomycin 40-60mg/kg/day IV in 4 doses (Max: 4g/day)

Treat IV until afebrile; then may shift to oral agents as outpatient; oral agents are used also as out-patient therapy for less ill patients.

2nd line:

Oral: Penicillin VK 25-30mg/kg/day in 3-4 doses (Max: 2 g/day) OR
Amoxicillin 25-50mg/kg/day in 3 doses (Max: 1.5 g/day) OR
Cephalexin 25-50mg/kg/day in 3-4 doses for mild to moderate infections; 75-100mg/kg/day in 3-4 doses (max: 4 g/day) for severe infections
</td><td>
Erysipelas is an unusual type of streptococcal infection involving the skin and sometimes the adjacent mucous membranes. It is an elevated erythematous lesion, sometimes exhibiting blebs filled with yellowish fluid, which may crust over after rupture.

These infections cause rapidly spreading areas of erythema, swelling, tenderness, and warmth, sometimes accompanied by lymphangitis and inflammation of the regional lymph nodes.

The skin surface may resemble an orange peel (peau d'orange) due to superficial cutaneous edema surrounding hair follicles and causing skin dimpling because the follicles remain tethered to the underlying dermis.

Usually, can clinically distinguish between red indurated demarcated inflamed skin of erysipelas (S. pyogenes) from the abscess of S. aureus. Dual infection is rare.

Bedside ultrasound may be helpful in detection of deep S. aureus abscess(es). If in doubt, treat for both. Community-associated MRSA
</td></tr>
</table>

Etiology	Regimen	Comments
	If allergic to penicillin: **Azithromycin** (Children ≥6 months): 10 mg/kg PO on day 1 (Max: 500 mg/day) followed by 5mg/kg on days 2-5 daily (Max: 250 mg/day) ***OR*** **Clindamycin** 30-40 mg/kg/day PO in 3-4 doses (Max: 1.8 g/day) **Duration**: 7-10 days or until the patient is afebrile for 3-5 days; 5 days for **Azithromycin** For erysipelas involving the face: **1st line: Vancomycin** 40-60 mg/kg/day IV in 4 doses (Max: 4 g/day) **2nd line: Linezolid** (same for mild, moderate and severe) <12 yrs.: 30mg/kg/day in 3 doses ≥12 yrs.: 1200mg/day in 2 doses **Duration**: 7-10 days, longer if patient is bacteremic	can mimic erysipelas; look for loculated purulence. Mixed infection (Strep. And Staph.) is rare. If *S. aureus* is present, need incision and drainage. Sudden onset of rapidly spreading red edematous tender plaque-like skin on the face in an otherwise healthy host. *S. aureus* erysipelas of the face can mimic streptococcal erysipelas of an extremity. If erysipelas-like on the face, must treat as if MRSA is present.
Cellulitis (purulent)		
Most cases of cellulitis are attributed to *S. aureus*.	**1st line:** Empiric therapy to cover for *S. aureus* Oral: **Cloxacillin** 50-100 mg/kg/day PO in 4 doses (Max: 2 g/day) Parenteral: **Oxacillin** 100-150mg/kg/day IV/IM in 4 doses (Max: 4 g/day) for mild to moderate infections; 150-200mg/kg/day IV/IM in 4-6 doses (Max: 12 g/day) for severe ***OR*** **Cefazolin** 50mg/kg/day in 3 doses (Max: 3g/day) for mild to moderate; 100-150mg in 3 doses (Max: 6g/day) for severe	Cellulitis refers to infection involving the deeper dermis and subcutaneous fats. For purulent cellulitis, (e.g., cellulitis associated with purulent drainage or exudate in the absence of a drainable abscess), empiric therapy for *S. aureus* is recommended and empiric therapy for infection due to beta-hemolytic streptococci is likely unnecessary.

Etiology	Regimen	Comments
	Duration: 7-10 days is recommended but should be individualized based the patient's clinical response **2nd line**: For suspected/confirmed MRSA Oral: **Clindamycin** 30-40mg/kg/day in 3-4 doses (Max: 1.8g/day) ***OR*** **Co-trimoxazole** 8-12mg/kg/day in 2 doses (TMP component) (Max: 320mg/day) ***OR*** **Doxycycline** 2-4mg/kg/day in 1-2 doses (Max: 200mg/day) Parenteral: **Clindamycin** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***OR*** **Vancomycin** 40-60mg/kg/day IV in 4 doses (Max: 4g/day) ***OR*** **Linezolid** (same for mild, moderate and severe infections) <12 years**:** 30mg/kg/day in 3 doses ≥12 years and adults**:** 1200mg/day in 2 doses **Duration**: 7-10 days is recommended but should be individualized on the basis of the patient's clinical response	An antibiotic active against MRSA is recommended for the following: • Patients with carbuncles or abscesses who have failed initial recommended antibiotic treatment against MSSA • Those with markedly impaired host defenses • Those with SIRS and hypotension
Cellulitis (non-purulent)		
Usually caused by beta-hemolytic streptococci (e.g. Group A, B, C, G streptococci) and MSSA	**1st line**: Empiric therapy to cover both *Strep* and *Staph* Oral: **Cephalexin** 25-50mg/kg/day in 3-4 doses for mild to moderate infections; 75-100mg/kg/day in 3-4 doses (Max: 4g/day) for severe ***OR*** **Co-amoxiclav 7:1 formulation** [25-45mg/kg/day in 2 doses (amoxicillin component) (Max: 1.75 g/day)] or **4:1 formulation** [20-40 mg/kg/day PO in 3 doses (amoxicillin component) (Max: 1.5g)]	Non-purulent cellulitis is defined as cellulitis with intact skin and no evidence of purulent discharge. Empiric coverage for CAMRSA is recommended in patients who do not respond to beta-lactam therapy and may be considered in those with systemic toxicity.

Etiology	Regimen	Comments
	Parenteral: **Cefazolin** 50mg/kg/day in 3 doses (Max: 3g/day) for mild to moderate infections; 100-150mg in 3 doses (Max: 6g/day) for severe ***OR*** **Ampicillin-sulbactam** 100-200mg/kg/day in 4 doses (Max:4 g/day) for mild to moderate infections; 200mg/kg/day in 4 doses (ampicillin component) (Max:8 g/day) for severe **2nd line:** For suspected/confirmed MRSA Oral: **Clindamycin** 30-40mg/kg/day in 3-4 doses (Max: 1.8 g/day) ***OR*** [**Co-trimoxazole** 8-12 mg/kg/day in 2 doses (TMP component) (Max: 320mg/day) ***PLUS*** **Amoxicillin** 25-50 mg/kg/day in 3 doses (Max: 1.5 g/day)] ***OR*** **Doxycycline** 2-4 mg/kg/day in 1-2 doses (Max: 200 mg/day) ***PLUS*** **Amoxicillin** 25-50 mg/kg/day in 3 doses (Max: 1.5 g/day) Parenteral: **Clindamycin** 25-40 mg/kg/day IV in 3-4 doses (Max: 2.7 g/day) ***OR*** **Vancomycin** 40-60 mg/kg/day IV in 4 doses (Max: 4 g/day) ***OR*** **Linezolid** (same for mild, moderate to severe infections) <12 years**:** 30 mg/kg/day in 3 doses ≥12 years and adults**:** 1200 mg/day in 2 doses **Duration**: 7-10 days is recommended but should be individualized based on the patient's clinical response	An antibiotic active against MRSA is recommended for the following: • Patients who have failed initial recommended antibiotic treatment against MSSA • Those with markedly impaired host defenses • Those with SIRS and hypotension **Co-trimoxazole** and **Doxycycline** should not be used as a single agent in the initial treatment of cellulitis because their activity against beta-hemolytic streptococci is not well defined. If coverage for both beta-hemolytic streptococci and CA-MRSA is desired, may combine **Co-trimoxazole** or a **Tetracycline** with a beta-lactam (e.g., **Amoxicillin**).
Non-infected burns		
Wide spectrum of potential pathogens: e.g., Gram-positive	**1st line: Silver sulfadiazine** cream (mixture of silver nitrate and sodium sulfadiazine) Minor adverse effects: Sulfonamide allergy; Steven Johnson's Syndrome; some believe drug impairs re-epithelialization of the burn wound; silver is toxic to keratinocytes and fibroblasts. Transient leukopenia; probably due to margination of	

<table>
<tr><th>Etiology</th><th colspan="3">Regimen</th><th>Comments</th></tr>
<tr><td>cocci, Gram-negative bacilli, and fungi.</td><td colspan="3">WBCs in the wound rather than bone marrow suppression. Resolves spontaneously. Not facial burns for fear of eye irritation or injury.

2nd line: Topical antimicrobials

Stage I (epidermis) and II A and B wounds (partial thickness, superficial and deep): Silver nitrate 0.5% solution
Silver nitrate solution - Messy. Turns skin black. Activity vs Gram-negative bacteria less broad than silver sulfadiazine cream. Hyponatremia and hypochloremia can occur. Rarely, Methemoglobinemia can occurAnti-tetanus prophylaxis is indicated.</td><td></td></tr>
<tr><td colspan="5">Burns with secondary infections</td></tr>
<tr><td colspan="5">Gram-positive organisms prevail in the early postburn period: <i>Staph</i> (CONS and <i>S. aureus</i>), <i>Micrococcus</i>, <i>Strep</i>, <i>Pediococcus</i>, and <i>Enterococcus</i>. These then are replaced by fungi (Candida) and Gram-negative bacteria: <i>P. aeruginosa</i>, <i>E. coli</i>, <i>Enterobacter cloacae</i>, <i>Klebsiella pneumonia</i> and <i>Serratia marcescens</i>. <i>Acinetobacter</i> is also found more often in patients with more severe burns and comorbidities.

Gram-positive cocci, including <i>S. aureus</i> and MRSA were the most common causes of burn infections in patients with relatively small burns <30% of BSA. Gram-positive cocci and Gram-negative bacteria esp. <i>P. aeruginosa</i> were common causes in patients with extensive burns >30% of BSA. Other complications of concern in critically ill burn patient are <i>S. aureus</i> toxic shock syndrome (TSS), suppurative phlebitis, pneumonia.</td></tr>
<tr><td rowspan="3">S. pyogenes; Enterobacter sp.; S. aureus; S. epidermidis; E. faecalis; E. coli; P. aeruginosa; Fungi (rare) and Herpes virus (rare).</td><td>1st line:</td><td colspan="2">Oxacillin PLUS Ceftazidime</td><td rowspan="3">Ideal care is in dedicated burn unit.
An antibiotic active against MRSA is recommended for the following patients:
• Those who have failed initial recommended antibiotic treatment against MSSA</td></tr>
<tr><td>Mild to moderate</td><td>100-150mg/kg/day IV/IM in 4 doses (Max: 4g/day)</td><td>90-150mg IV/IM in 3 doses (Max: 3g/day)</td></tr>
<tr><td>Severe</td><td>150-200mg/kg/day IV/IM in 4-6 doses (Max: 12g/day)</td><td>200-300mg IV/IM in 3-4 doses (Max: 6g/day)</td></tr>
</table>

Etiology	Regimen	Comments
	2nd line: **Vancomycin** 40-60mg/kg/day IV in 4 doses (Max: 4g/day) ***PLUS*** [**Meropenem** 60-120mg/kg/day in 3 div doses (Max: 6g/day) ***OR*** **Cefepime** 100mg in 2 doses (Max: 4g/day) for mild to moderate infections, 100-150mg in 2-3 doses (Max: 6g/day) for severe]	• Those with markedly impaired host defenses • Those with SIRS and hypotension
Puncture wound		
S. aureus, Streptococcus sp., mixed flora	**1st line:** **Oxacillin** 100-150mg/kg/day IV/IM in 4 doses (Max: 4 g/day) for mild to moderate infections; 150-200mg/kg/day IV/IM in 4-6 doses (Max: 12 g/day) for severe **2nd line:** **Clindamycin** 25-40mg/kg/day in 3-4 doses (Max: 2.7g/day) ***PLUS*** **Amikacin** 15 -22.5mg/kg/day in 1-3 doses (Max: 1.5g/day) ***PLUS*** **Ceftazidime** 90-150mg IV/IM in 3 doses (Max: 3g/day) for mild to moderate infections; 200-300mg IV/IM in 3-4 doses (Max: 6 g/day) for severe ***OR*** **Piperacillin-tazobactam** for 240-300mg/kg/day in 3-4 doses (piperacillin component) (Max: 16g/day) for severe infections; 150-300mg/kg/day in 3-4 doses (piperacillin component) (Max: 16 g/day) for patients <6 months of age	Refer to WHO prevention and management of wound infection. Use **Clindamycin** instead of **Oxacillin** if anaerobes or MRSA are suspected. Any evidence of deep infection, especially if it persists or develops more than 72h after injury and particularly in children, is a strong indication for exploration and addition of an anti-pseudomonal agent. If *P. aeruginosa* infection is highly considered (e.g. wound is associated with nail through rubber-soled footwear), ***ADD*** **Amikacin** and **Ceftazidime** or **Piperacillin-tazobactam.**

Etiology	Regimen	Comments
Wound infection, post-trauma		
Polymicrobic (microbial flora dependent on nature of the trauma): *S. aureus* (MSSA, MRSA), *Streptococcus sp.* (aerobic and anaerobic), *Enterobacteriaceae*, *C. perfringens*, *C. tetani*, *Pseudomonas* sp. (water exposure), *Aeromonas*sp., *Acinetobacter* species	Uncomplicated, mild or moderate, afebrile patient **1st line:** **Cloxacillin** 50-100mg/kg/day in 4 doses (Max: 2g/day) ***OR*** **Cephalexin** 25-50mg/kg/day in 3-4 doses for mild to moderate infections; 75-100mg/kg/day in 3-4 doses (Max: 4 g/day) for severe infections **2nd line:** for suspected/confirmed MRSA **Doxycycline** 2-4mg/kg/day in 1-2 doses (Max: 200mg/day) ***OR*** **Linezolid** (same for mild, moderate to severe infections): **<12 yrs.:** 30mg/kg/day in 3 doses **≥12 yrs.:** 1200mg/day in 2 doses If Gram-negative bacilli is suspected: ***PLUS*** **Co-amoxiclav** **7:1 formulation:** 25-45mg/kg/day PO in 2 doses (amoxicillin component) (Max: 1.75g/day) ***OR*** **4:1 formulation:** 20-40mg/kg/day PO in 3 doses (amoxicillin component) (Max: 1.5g) for mild to moderate infections ***OR*** **Ciprofloxacin** 20-30mg/kg/day PO in 2 doses (Max: 1.5g/day) Complicated, severe, febrile patient **1st line:** Parenteral **Piperacillin-tazobactam** 240-300mg in 3 doses (piperacillin component) (Max: 16g/day) for severe infections	Debridement of wound may be indicated. Obtain culture and sensitivity, check Gram stain. Give Tetanus Prophylaxis and vaccine if indicated. An antibiotic active against MRSA is recommended for the following patients: • Those who have failed initial recommended antibiotic treatment against MSSA • Those with markedly impaired host defenses • Those with SIRS and hypotension If *S. aureus* are **Erythromycin**-resistant in vitro, may have inducible resistance to **Clindamycin**; make sure lab checks if using the latter. **Ciprofloxacin** has been used most extensively in children and adolescents and appears to be well tolerated, effective and does not appear to cause arthropathy.

Etiology	Regimen	Comments
	Patients <6months of age: 150-300mg/kg/day in 3-4 doses (piperacillin component) (Max: 16g/day) ***PLUS*** **Vancomycin** 40-60mg/kg/day IV in 4 div doses (Max: 4g/day) **2nd line:** Parenteral **Meropenem** 60-120mg/kg/day in 3 doses (Max: 6g/day) for severe infections ***PLUS*** **Vancomycin** 40-60mg/kg/day IV in 4 div doses (Max: 4g/day) ***OR*** **Linezolid** *Mild to moderate infections:* <12 yrs.: 30mg/kg/day IV in 3 doses ≥12 yrs. and adults: 1200mg/day IV in 2 doses *Severe infections:* same ***PLUS*** **Ciprofloxacin** 20-30mg/kg/day IV in 2 -3 doses (Max: 1.2g/day)	
Post-operative wound infection (non-GI tract, non-GU tract surgery)		
Skin flora, S. aureus, *Streptococcus* sp. (Group A, B, C, G)	Afebrile patients with mild to moderate infections without sepsis **1st line:** **Clindamycin** 30-40mg/kg/day in 3-4 doses (Max: 1.8g/day) ***OR*** **Co-trimoxazole** 8-12mg/kg/day in 2 doses (TMP component) (Max: 320mg/day) **2nd line:** **Linezolid** <12 yrs.: 30mg/kg/day in 3 doses ≥12 yrs.: 1200mg/day in 2 doses Febrile patients with severe infection and sepsis **1st line:** **Clindamycin** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day)	Surgical site infections require prompt and wide opening of the surgical incision. Antimicrobial therapy is recommended for deep incisional surgical site infections if systemic signs of sepsis are present, if source control is incomplete or in immunocompromised patients. In patients who have had clean operations, antimicrobial therapy should cover Gram-positive organisms.

Etiology	Regimen	Comments
	2nd line: Vancomycin 45-60mg/kg/day IV in 3-4 doses (Max: 4g/day) ***OR* Linezolid** *Mild to moderate infections:* <12 yrs.: 30 mg/kg/day IV in 3 doses or ≥12 yrs.: 1200 mg/day IV in 2 doses *Severe infections:* same ***PLUS*** **Ciprofloxacin** 20-30mg IV in 2-3 doses (Max: 1.2g/day) ***PLUS*** **Metronidazole** 30mg/kg/day in 3-4 doses (Max: 4 g/day)	An antibiotic active against MRSA is recommended for the following patients: • Those who have failed initial recommended antibiotic treatment against MSSA • Those with markedly impaired host defenses or • Those with SIRS and hypotension.
Post-operative wound infection (GI tract or GU tract surgery)		
Skin flora, GI and vaginal flora, *S. aureus* (MSSA, MRSA), Coliform species: e.g., *E. coli, Bacteroides* species: e.g., *B. fragilis*, Other anaerobic bacteria	Mild infections: **Co-amoxiclav** **7:1 formulation:** 25-45mg/kg/day PO in 2 doses (amoxicillin component) (Max: 1.75g/day) ***OR* 4:1 formulation:** 20-40mg/kg/day PO in 3 doses (amoxicillin component) (Max: 1.5g) If S. aureus (MRSA) is suspected ***PLUS*:** **1st line: Co-trimoxazole** 8-12mg/kg/day in 2 doses (TMP component) (Max: 320mg/day) **2nd line: Clindamycin** 30-40mg/kg/day in 3-4 doses (Max: 1.8g/day) Severe infections: **1st line: Piperacillin-tazobactam** IV 240-300mg/kg/day in 3 doses (piperacillin component) (Max:16 g/day) for adults; 150-300mg/kg/day in 3-4 doses (Max: 16g/day) for <6 months of age ***PLUS* Vancomycin** 40-60mg/kg/day IV in 3-4 doses (Max: 4g/day)	In patients who have had procedures on the GI or GU tract, antimicrobial therapy should cover both Gram-positive and Gram-negative organisms. If with skin incision, usually remove sutures to drain wound, obtain culture and sensitivity, and pack wound. An antibiotic active against MRSA is recommended for the following patients: • Those with carbuncles or abscesses who have failed initial antibiotic treatment; • Those with markedly impaired host; defenses; or • Those with SIRS and hypotension.

Etiology	Regimen	Comments
	OR [**Ceftriaxone** 100mg/kg/day IV in 1 or 2 doses (Max: 4g/day) ***OR*** **Cefotaxime** 100-200mg/kg/day IV in 3-4 doses (Max: 12g/day)] ***PLUS*** **Metronidazole** 30mg/kg/day IV in 3-4 doses (Max: 4g/day) ***PLUS*** **Vancomycin** 40-60mg/kg/day IV in 3-4 doses (Max: 4g/day) **2nd line: Vancomycin** 40-60mg/kg/day IV in 3-4 doses (Max: 4g/day) ***PLUS*** **Meropenem** 60-120mg/kg/day IV in 3 doses (Max: 6g/day) ***OR*** **Linezolid** IV <12 yrs.: 30mg/kg/day in 3 doses ≥12 yrs. and adults: 1200mg/day in 2 doses ***PLUS*** **Meropenem** 60-120mg/kg/day IV in 3 doses (Max: 6g/day)	
Wound infection, soil contaminated		
S. aureus, GABHS, Gram-negative enterics, *Enterobacter cancerogenus*, Anaerobes, Nocardia asteroids, *Nocardia otitidis-caviarum, M. fortuitum, M. abscessus, Actinomyces, Aspergillus, Enterococcus*	**1st line: Penicillin G** 100,000- 150,000U/kg/day in 4 doses (Max: 8MU/day) for mild to moderate infections; 200,000-300,000 U/kg/day in 6 doses (Max: 24MU/day) for severe ***PLUS*** **Amikacin** 15-22.5mg/kg IV/IM in 1-3 doses (Max: 1.5g/day) **2nd line: Clindamycin** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***PLUS*** **Amikacin** 15-22.5mg/kg IV/IM in 1-3 doses (Max: 1.5g/day)	
Cat, Dog and Mammal Bite		
Cat bite		
Pasteurella species, S. aureus, Bacteroides sp., Fusobacterium sp.,	Cleaning, irrigation and debridement are most important. **1st line:**	Preemptive early antimicrobial therapy for 3-5 days is recommended for patients who are

Etiology	Regimen	Comments
EF-4, *Capnocytophaga sp.,* Group A Strep 80% get infected, *P. multocida* infection develops within 24 h.	Oral: **Co-amoxiclav** (mild to moderate infections) **7:1 formulation:** 25-45mg/kg/day PO in 2 doses (amoxicillin component) (Max: 1.75g/day) ***OR* 4:1 formulation:** 20-40mg/kg/day PO in 3 doses (amoxicillin component) (Max: 1.5g) Parenteral: **Ampicillin-sulbactam** 100- 200mg/kg/day in 4 doses (Max: 4g/day) for mild to moderate infections; 200mg/kg/day in 4 doses (ampicillin component) (Max: 8g/day) for severe infections **2nd line: Clindamycin** 30-40 mg/kg/day PO in 3-4 doses (Max: 1.8g/day) or 25-40 mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***OR* Metronidazole** 30mg/kg/day in 3-4 doses (Max: 4g/day) ***PLUS* Cefuroxime axetil** 20-30mg/kg/day PO in 2 doses (Max: 1g/day) ***OR* Doxycycline** 2-4mg/kg/day PO/IV in 1-2 doses (Max: 200mg/day)	immunocompromised; are asplenic; have advanced liver disease; have preexisting or resultant edema of the affected area; have moderate to severe injuries, especially to the hand or face; or have injuries that may have penetrated the periosteum or joint capsule. Culture and treat empirically. Observe for osteomyelitis. *P. multocida*is resistant to **Dicloxacillin**, **Cephalexin** and **Clindamycin**. Many strains appear susceptible to **Azithromycin** but no clinical data. Consider rabies and tetanus post-exposure prophylaxis and vaccination.
Dog bite		
Pasteurella canis, Staphylococcus aureus, Bacteroides sp., Fusobacterium sp., EF-4, *Capnocytophaga sp.*	**1st line: Co-amoxiclav** (Mild to moderate infections) **7:1 formulation:** 25-45mg/kg/day PO in 2 doses (amoxicillin component) (Max: 1.75g/day) ***OR* 4:1 formulation:** 20-40mg/kg/day PO in 3 doses (amoxicillin component) (Max: 1.5g/day) **2nd line: Cloxacillin** 50-100mg/kg/day in 4 doses (Max: 2g/day) ***OR* Cefuroxime axetil** 20-30mg/kg/day PO in 2 doses (max 1g/day) *If allergic to Penicillin:* **Erythromycin** *Mild to moderate infections:* 50 mg/kg/day PO in 3-4 doses (Max: 2g/day)	Only 5% of dog bite wounds get infected. Treat only if the bite is severe or patient presents with co-morbidity (e.g., diabetes). For rabies post-exposure prophylaxis and vaccination, refer to DOH AO 2014-0012. (http://www.doh.gov.ph/sites/default/files/basic-page/ao2014-0012 pdf)

Etiology	Regimen	Comments
	Severe infections: 20mg/kg/day IV in 4 doses (Max: 4g/day) ***OR* Doxycycline** 2-4mg/kg/day in 1-2 doses (Max: 200mg/day)	
Human bite		
Viridans streptococcus (100%), *Staphylococcus epidermidis* (53%), *Corynebacterium* sp. (41%), *Staphylococcus* aureus (29%), *Eikenella* sp. (15%), *Bacteroides* sp. (82%), *Peptostreptococcus sp.* (26%)	**1st line:** Oral: **Co-amoxiclav** (Mild to moderate infections) **7:1 formulation:** 25-45mg/kg/d PO in 2 doses (amoxicillin component) (Max: 1.75g/day) ***OR* 4:1 formulation:** 20-40mg/kg/day PO in 3 doses (amoxicillin component) (Max: 1.5g) Parenteral: **Ampicillin-sulbactam** Mild to moderate infections: 100-200mg/kg/day in 4 doses (Max: 4g/day) Severe infections: 200mg/kg/day in 4 doses (ampicillin component) (Max: 8g/day) **Duration**: 5 days **2nd line: Piperacillin-tazobactam** IV 240-300mg/kg/day in 3 doses (piperacillin component) (Max:16 g/day) for adults; 150-300mg/kg/day in 3-4 doses (Max: 16g/day) for <6 months of age With allergy to penicillin: **Clindamycin** 30-40mg/kg/day PO in 3-4 doses (Max: 1.8g/day) **or** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***OR* Metronidazole** 30mg/kg/day in 3-4 doses (Max: 4g/day)	Cleaning, irrigation and debridement are most important. For clenched fist or hand injuries, X-rays should be obtained. For bites inflicted by hospitalized patients, consider aerobic Gram-negative bacilli. *Eikenella* sp.: Susceptible to **fluoroquinolones** and beta-lactam-beta lactamase inhibitor combinations, e.g., **Ampicillin-Sulbactam**. Resistant to **Clindamycin, Nafcillin/Oxacillin, Metronidazole, Cephalexin/ Cefazolin, Co-trimoxazole** and **Erythromycin**. Clenched fist (and other hand) bite wounds pose risk for deep infections (e.g., bone, joint, tendon sheath) and require careful evaluation. X-ray would evaluate for fracture or foreign body. Potential risk of transmitting blood-borne pathogens if injury contaminated with another's blood. Review tetanus immunization status. Preemptive early antimicrobial therapy for 3–5 days. For Infected bites, duration of therapy,

Etiology	Regimen	Comments
	***PLUS* Ciprofloxacin** 20-30mg/kg/day PO in 2 doses (Max: 1.5g/day) **or** 20-30mg/kg/day IV in 2-3 doses (Max: 1.2g/day)	when proper drainage has been established, is 10 days for cellulitis or localized abscess.
Rat bite		
Spirillum minus, Streptobacillus moniliformis	Prophylaxis **1st line: Amoxicillin** 25-50mg/kg/day in 3doses (Max: 1.5g/day) **2nd line: Doxycycline** 2-4mg/kg/day in 1-2 doses (Max: 200mg/day) **Duration**: 3 days Rat bite fever **1st line: Penicillin G** 100,000-150,000U/kg/day in 4 doses (Max: 8MU/day) for mild to moderate infections; 200,000-300,000U/kg/day in 6 doses (Max: 24MU/day) for severe infections ***OR* Doxycycline** 2-4mg/kg/day in 1-2 doses (Max: 200mg/day) **2nd line: Erythromycin** 50 mg/kg/day PO in 3-4 doses (Max: 2g/day) for mild to moderate infections; 20mg/kg/day IV in 4 doses (Max: 4g/day) for severe infections ***OR* Clindamycin** 30-40mg/kg/day PO in 3-4 doses (Max: 1.8g/day) **or** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) **Duration**: 10-14 days	Rabies post-exposure prophylaxis and vaccination is *not* indicated for rat bites.
Necrotizing fasciitis/gas gangrene		
S. aureus (CA-MRSA), Group A *streptococci*, *Clostridium* sp.: *C,*	**1st line: Vancomycin** 40-60mg/kg/day IV in 4 doses (Max: 4 g/day) ***PLUS* Piperacillin-tazobactam** 240-300mg/kg/day in 3-4 doses	Incise for exploration, drainage and debridement (include aerobic and anaerobic

Etiology	Regimen	Comments
perfringens (most common), *C. septicum, C. tertium*	(piperacillin component) (Max: 16g/day) for severe infections; 150-300 mg/kg/d in 3-4 doses (Max: 16g/day) for patients <6 months of age. **2nd line: Cefotaxime** 100-200mg/kg/day in 3-4 doses (Max: 12g/day) ***PLUS* Clindamycin** 30-40mg/kg/day PO in 3-4 doses (Max: 1.8g/day) **or** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) **Penicillin *PLUS* Clindamycin** is recommended for treatment of documented group A streptococcal necrotizing fasciitis and clostridial myonecrosis **Penicillin G** 100,000-150,000 U/kg/day in 4 doses (Max: 8MU/day) for mild to moderate infections; 200,000-300,000 U/kg/day in 6 doses (Max: 24MU/day) for severe infections ***PLUS* Clindamycin** 30-40 mg/kg/day PO in 3-4 doses (Max: 1.8g/day) **or** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) **Duration**: 10 days	cultures if available in your setting) and resect all nonviable tissue. Infection extends into the fascial plane between muscle and subcutaneous fat with resulting necrotizing fasciitis. Historically, *S. aureus* was not associated with necrotizing fasciitis, but CA-MRSA is now different and can cause the disease. Usually gas gangrene is preceded by a traumatic wound or surgery with contamination by Clostridial spores. Diagnosis is easily made by Gram stain of necrotic tissue. X-ray, CT scan may show gas in involved tissue. Hyperbaric oxygen (HBO) is not recommended.
Pyomyositis		
Magnetic resonance imaging (MRI) is the recommended imaging modality for establishing the diagnosis. Computed tomography (CT) scan and ultrasound studies are also useful. Appropriate cultures (blood and abscess) should be obtained.		
S. aureus, Streptococcus sp. (Group A and others), Gram-negative bacilli (rare), Anaerobic bacteria (rarely *Clostridium* species)	**1st line: Oxacillin** 100-150mg/kg/day IV/IM in 4 doses (Max: 4g/day) for mild to moderate infections; 150-200mg/kg/day IV/IM in 4-6 doses (Max: 12g/day) or 100-150mg/kg/day IV div q4-6h (Max: 12g/day) for severe	An antibiotic active against MRSA is recommended for the following patients: • Those who have failed initial recommended antibiotic treatment against MSSA;

Etiology	Regimen	Comments
	***OR* Cefazolin** 50mg/kg/day in 3 doses (Max: 3g/day) for mild to moderate infections; 100-150mg/kg/day in 3 doses (Max: 6g/day) for severe **2nd line: Clindamycin** 25-40mg/kg/day in 3-4 doses (Max: 2.7g/day) ***OR* Vancomycin** 40-60mg/kg/day IV in 4 doses (Max: 4g/day) Individual doses ≥1 g should be infused over 1.5-2 h **Duration**: 2-3 weeks	• Those with markedly impaired host defenses; • Those with SIRS and hypotension. An agent active against enteric Gram-negative bacilli should be added for infection in immunocompromised patients or following open trauma to the muscles (aminoglycosides).
Decubitus ulcer		
Streptococcus sp., *S. aureus*, Enterobacteriaceae, *P. aeruginosa*, Anaerobic streptococci, *B. fragilis*	**1st line: Silver sulfadiazine** 1% cream for superficial infection *Severe local infection:* **Piperacillin-tazobactam** 240-300mg/kg/day in 3-4 doses (piperacillin component) (Max: 16g/day). *For patients* ***<6 months of age:*** 150-300mg/kg/day in 3-4 doses (Max: 16g/day) **2nd line: Clindamycin** 25-40mg/kg/day IV in 3-4 doses (Max: 2.7g/day) ***PLUS* Ceftazidime** *Mild to moderate:* 90-150mg IV in 3 doses (Max: 3g/day) *Severe:* 200-300mg IV in 3 or 4 doses (Max: 6g/day) ***OR* Ciprofloxacin** 20-30mg/kg/day PO in 2 doses (Max: 1.5g/day) **or** 20-30mg/kg/day IV in 2-3 doses (Max: 1.2g/day)	Debride necrotic tissue and use moist wound dressing. Remove pressure if decubitus ulcer; elevate leg if venous stasis; evaluate for revascularization if there is arterial insufficiency. Do not use povidone iodine or chlorhexidine, both may damage granulation tissue and fibroblasts. Best method is surgically obtained deep tissue specimen for histology and culture. If osteomyelitis is suspected, also obtain bone biopsy. Needle aspiration from the ulcer margin is acceptable.
Cat scratch disease		
Bartonella henselae	**1st line:** Lymphadenitis in immunocompromised patient: **Azithromycin**	Self-limited regional lymphadenitis. Disease manifestations can include involvement of the

Etiology	Regimen	Comments
	Children ≥6 months: 10mg/kg PO on day 1 (Max: 500mg/d) followed by 5mg/kg/day on days 2-5 (Max: 250mg/day) ***OR*** **Rifampicin** 20mg/kg/day in 1-2 doses (Max: 600mg/day) ***OR*** **Co-trimoxazole** 8-12mg/kg/day in 2 doses (TMP component) (Max: 320mg/day) **Duration**: 7-10 days **2nd line:** Lymphadenitis in immunocompetent patient: No therapy, as the lymphadenitis spontaneously resolves.	central nervous system, eyes and viscera (liver, and spleen). The optimal duration of therapy is not known but may be several weeks for systemic disease. Complete resolution may take 2-6 months.
Tinea corporis, Tinea cruris (jock itch), Tinea pedis (athlete's foot)		
Trichophyton rubrum, T. mentagrophytes, Epidermophytonfloccosum	**1st line:** **Terbinafine** 1% cream for Tinea corporis, Tinea cruris, and interdigital Tinea pedis, apply bid x 1 week; for plantar Tinea pedis, apply bid x 2 weeks. **2nd line:** Topical: Imidazoles (**Clotrimazole**, **Ketoconazole**, etc.) apply bid x 2-4 weeks Systemic: **Terbinafine** <20 kg: 62.5mg/day | 20-40 kg: 125mg/day | >40 kg: 250mg/day **Fluconazole** 3-6mg/kg once a week x 2-4 weeks	Redder margins than centers create impression of a ring. Opposed to Tinea capitis, these infections can often be cured with topical therapy alone. Systemic therapy can be reserved for severe or refractory infection, recurrent infection, or in immunocompromised patients. Serious but rare cases of hepatic failure have been reported in patients receiving **Terbinafine** and should not be used in those with chronic or active liver disease.
Tinea versicolor (Pityriasis versicolor)		
Fine, scaly rash with patches of discolored skin with sharp borders commonly found on back, underarms, upper arms, chest, and neck. Skin may appear lighter than surrounding healthy skin; in African Americans, either hypo or hyper-pigmentation. Rule out erythrasma.		

Etiology	Regimen	Comments
Malassezia furfur	**1st line:** Limited disease: **Ketoconazole** 2% shampoo daily for 3 days; can use 2-3 times a week for maintenance/ prevention **Selenium sulfide** 2.5% shampoo, daily application while bathing for 1 to 2 weeks, can use 2-3 times a week for maintenance/prevention Extensive disease: **Fluconazole** 3-6mg/kg x 1 dose, repeat in 14 days **2nd line: Itraconazole** 5-10mg/kg/day PO in 2 doses x 7 days	Akapulco lotion (*Senna alata* extract): a meta-analysis (Tababa EJL, Genuino RF, and Salud-Gnilo CM, 2016 unpublished) showed that 50% Akapulco lotion was superior to placebo for tinea versicolor (mycologic cure and decrease in clinical activity). It appears to be as effective as 25% sodium thiosulfate and ketoconazole cream, but larger randomized trials with good follow-up rates are needed to confirm these findings.
Tinea capitis (ringwork)		
Trichophyton tonsurans, Microsporumcanis (North America; other species elsewhere)	**1st line: Terbinafine** for >2y; weight-based dosing <*20 kg:* 62.5mg PO in 1 dose x 2 weeks *20-40 kg:* 125mg PO in 1 dose x 2 weeks >*40 kg:* 250mg PO in 1 dose x 2 weeks **2nd line:** **Itraconazole** 5mg/kg/day x 4 weeks **Fluconazole** 6mg/kg/day PO every week x 8-12 weeks (Max: 150 mg PO every week for adults) **Griseofulvin** (microsize formulation) 10-20 mg/kg/day (child) until hair regrows.	Itchy, red, raised, scaly patches often sharply defined. Durations of therapy are for *T. tonsurans*; treat for approximately twice as long for *M. canis*. All agents have similar cure rates (60-100%) in clinical studies. Serious but rare cases of hepatic failure have been reported in patients receiving **Terbinafine** and should not be used in those with chronic or active liver disease.

Etiology	Regimen	Comments
Scabies		
• Mite infestation of the skin that causes intense itching that is worse at night. • Diagnosis is based on history and distribution of skin lesions. Sometimes, mites or eggs from scrapings of burrows are visible.		• Pruritus may persist for 2 weeks after mites are gone. • Antihistamines may help reduce itching. • Secondary streptococcal infections can occur.
Sarcoptesscabiei (mite)	**Permethrin** 5% cream: Apply to entire skin from chin down to and including toes and under fingernails and toenails. May require 30 g. Leave on 8-14 h. Repeat in 1-2 weeks. Safe for children age >2 months. Reapply to hands after handwashing. Treat close contacts. Wash and dry linens to prevent re-infection.	
Varicella-zoster virus infections		
Clinical syndromes: Chickenpox, Shingles (single dermatomal or multiple dermatomes), Disseminated VZV disease/organ involvement Prevention, post-exposure prophylaxis **Varicella-zoster immune globulin** (VZIG) (125 units/10 kg body weight IM up to a max of 625 units; minimum dose is 125 units) is recommended for post-exposure prophylaxis in susceptible persons at greater risk for complications (immunocompromised such as HIV, malignancies, pregnancy, and steroid therapy) as soon as possible after exposure (<96 hours). If VZIG is not available, IGIV can be used. Although licensed IGIV preparations contain anti-varicella antibodies, the titer of any specific lot of IGIV is uncertain because IGIV is not tested routinely for IGIV anti-varicella anti-bodies. The recommended IGIV dose for post-exposure prophylaxis to varicella is 400 mg/kg, administered once IV. If varicella develops, initiate treatment quickly (<24 hours of rash) with aciclovir. Some would treat presumptively with aciclovir in high-risk patients. Susceptible children should receive vaccination.		
Varicella-zoster virus	Immunocompetent host, chickenpox: Child ages 2-12y Mild to moderate disease: no treatment For patients at increased risk of moderate or severe varicella; chronic cutaneous or pulmonary diseases: **Aciclovir** 80mg/kg/day PO in 4	**Aciclovir** slowed development and reduced number of new lesions and reduced duration of disease in children. **Aciclovir** decreased duration of fever, time to healing, and symptoms.

Etiology	Regimen	Comments
	doses (Max: 3200mg/day) (start within 24h of rash) ***OR*** **Valaciclovir** 60mg/kg/day PO in 3 doses (Max: 1g/dose in 3 doses) **Duration**: 5 days	

REFERENCES

Baldwin G., Colbourne M. Puncture wounds. In Pediatrics in Review. 1999; 20 (1): 21-23.

Bravo, Gatchalian, Gonzales, Maramba-Lazarte, Ong-Lim, Pagcatipunan, delos Reyes. Handbook of Pediatric Infectious Disease an Easy Guide 5th ed.

Feigin R, Cherry J, et al. Textbook of Pediatric Infectious Diseases, 6th ed, 2009

Gilbert DN, Chambers HF, Eliopoulos GM, Saag MS, Black, Freedman DO, Pavia AT, Schwartz B. The Sanford Guide to Antimicrobial Therapy 2014, 44th edition.

Liu C, Bayer A, Cosgrove SE, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America for the Treatment of Methicillin- Resistant *Staphylococcus aureus* Infections in Adults and Children CID 2011: 52 (1 February)

MIMS Philippines 1/2016, 147th edition.

Pennycook A, Makover R, O'Donnell AM. Puncture wounds of the foot: can infective complications be avoided? J Royal Society Med 1994; 87:581-583.

Red Book 2015, 30th edition. Report of the Committee on Infectious Diseases. Am AcadPediatr2015;808-820.

Stevens DL, Bisno AL, Cambers HF, et al. Practice Guidelines for the diagnosis and management of skin and soft tissue infections: 2014 Update by Infectious Diseases Society of America, IDAS Practice Guidelines for SSTIs CID: 1-43.

Tababa EJL, Genuino RF, Salud-Gnilo. Senna alata (Akapulko) extract versus topical antifungals for treatment of superficial fungal skin infections: A systemic review and meta-analysis (Unpublished)

Topical antibiotics: very few indications for use: BPJ; Issue 64, p27.

Wolff, K., Goldsmith L., Katz, S., Gilchrest, B., Paller, A. and Lefell, D. (2008) Fitzpatrick's Dermatology in General Medicine. 7th Edition. USA: McGrawhill Hill.

Etiology	Regimen	Comments
Abscess		
Skin abscess, boils, furuncles		
These include purulent skin lesions, such as boils, furuncles, carbuncles and abscesses. Acute bacterial skin and skin structure infections (ABSSSI). Community-associated MRSA is of increasing concern in the management of skin and soft tissue infections (SSTI). See also *Recurrent Furunculosis* (decolonization)		
S. aureus; Methicillin-sensitive (MSSA); Methicillin-resistant (MRSA)	Incision and drainage (I&D) is the mainstay of therapy. **1st line:** Outpatient, no diabetes or immunosuppression, boil or smaller abscess (<2 cm in diameter): Incision and drainage only are usually effective. Hot packs are helpful. No need for antimicrobial therapy. Outpatient, larger (>2 cm in diameter within an area of erythema of ≥5 cm) or multiple abscesses, or systemic inflammatory response syndrome: Incision and drainage ***PLUS*** **Clindamycin** 300-450mg (higher dose in obese patient, BMI>40) PO tid x 5-10 days ***OR*** **Co-trimoxazole** 160/800mg (160/800mg 1 tab; 160/800mg 2 tabs in obese patient, BMI>40) PO bid x 5-10 days ***OR*** **Doxycycline** 100 mg PO q12h x 5-10 days (may also be effective for community-acquired MRSA infections)	Note: needle aspiration is inadequate. Avoid fluoroquinolones. For abscesses >2 cm in diameter, a large randomized controlled trial of I&D plus **Co-trimoxazole** vs I&D alone showed a higher rate of clinical cure among the former group (80.5% vs 73.6%, respectively). One double-strength (DS) tab of **Co-trimoxazole** bid as effective as two DS tabs bid. Lower dosage range of **Co-trimoxazole** (1 160/800mg instead of 2 160/800mg) and **Clindamycin** (150-300 mg instead of 450 mg) is found to be associated with treatment failure in obese patients (BMI >40). Another large double-blind randomized controlled trial was conducted for single

Etiology	Regimen	Comments
	If no response after 2-3 days, follow up exudate culture and sensitivity (C/S) results and shift to culture-guided antibiotic therapy, or if C/S results not yet available, shift to another first-line antibiotic. Inpatients: I&D: culture abscess and blood. Empiric therapy (in absence of specific culture and sensitivity data select an agent with activity against MRSA): **Clindamycin** 600mg IV q8h for patients without signs and symptoms of sepsis/ bacteremia ***OR*** **Vancomycin** 15mg/kg q12h (trough concentrations of 5-10 µg/mL are adequate for infections of moderate severity; for severe infections or if bacteremia is present, 15-20 mg/kg q8-12h targeting troughs of 15-20 µg/mL recommended). **2nd line:** For documented MSSA infection, a beta-lactam is the preferred agent: *Oral:* **Cloxacillin** 500mg PO qid ***OR*** **Cephalexin** 500mg PO tid-qid *Parenteral:* **Oxacillin** 1g IV q4h ***OR*** **Cefazolin** 1g IV q8h For MRSA infections: **Linezolid** 600 mg IV/PO q12h	abscesses ≤5 cm where **Clindamycin**, **Co-trimoxazole** or placebo was added to I&D. There was a higher rate of clinical cure in the two groups with antibiotics but the study did not break down treatment outcomes for those with abscesses ≤2 cm vs 2–5 cm, and prescribed antibiotics for 10 days regardless of abscess size. Use of antibiotics for a single abscess ≤2 cm should be weighed against the fairly high proportion of adverse events. For data on prevalence of MRSA in the Philippines and increasing resistance of MRSA to **Co-trimoxazole**, refer to the Antimicrobial Resistance Surveillance Program 2017 Report.
Furunculosis, recurrent		
Clinical setting for decolonization: does not apply to people who inject drugs (PWID) • If the patient and physician wish to attempt decolonization, the patient should have no active skin infections and is otherwise healthy. • Need to culture multiple sites, e.g., nose, throat, and inguinal area skin. Nares-only culture missed 48% of colonized individuals.		

Etiology	Regimen	Comments
S. aureus (MSSA and MRSA) presenting as recurrent furunculosis (abscesses, boils) in an otherwise healthy host.	Treat as for furuncles and boils. For decolonization: Avoid systemic antibiotics. **Mupirocin** ointment in anterior nares and under fingernails bid x 5-7 days ***PLUS*** **Chlorhexidine** 4% shower daily x 5-7 days.	There is no "gold standard" for decolonization. Optimal regimen and duration of treatment are uncertain. In a prospective randomized trial of combined topical and systemic therapy, at 3 months, cultures were negative for MRSA in 74% for treated vs. 32% of patients not treated.
Bites		
Cat bite		
80% of cat bites get infected. Culture and treat empirically. *Pasteurella multocida* infection develops within 24h. Observe for osteomyelitis.		
Pasteurella multocida; S. aureus	**1st line: Co-amoxiclav** 875/125mg PO bid or 500/125mg PO tid **2nd line: Cefuroxime axetil** 500mg PO q12h ***OR*** **Doxycycline** 100mg PO bid If culture is positive for only *P. multocida*, can switch to **Penicillin G** IV ***OR*** **Penicillin VK** PO.	*P. multocida* is resistant to **Dicloxacillin**, **Cephalexin** and **Clindamycin**. In vitro sensitivity to fluoroquinolones has been observed. Many strains appear susceptible to **Azithromycin** but no clinical data.
Dog bite		
Only 5% of dog bite wounds get infected. Treat only if the bite is severe or patient presents bad co-morbidity, e.g., diabetes.		
Pasteurella canis, S. aureus, Bacteroides sp., *Fusobacterium* sp., EF-4 *Capnocytophaga* sp.	**1st line: Co-amoxiclav** 875/125mg PO bid or 500/125 mg PO tid ***OR*** **Ampicillin-sulbactam** 3g IV q6h **2nd line: Clindamycin** 300mg PO qid	For rabies post-exposure prophylaxis and vaccination, refer to DOH AO 2014-0012 http://www.doh.gov.ph/sites/default/files/basic-page/ao2014-0012.pdf

Etiology	Regimen	Comments
Human bite		
Viridans streptococcus (100%); *S. epidermidis* (53%); *Corynebacterium sp.* (41%); *S. aureus* (29%); *Eikenella sp.* (15%); *Bacteroides sp.* (82%); *Peptostreptococcus sp.* (26%)	**1st line:** Early (wound not yet infected): **Co-amoxiclav** 875/125mg PO bid x 5 days Later (signs of infection, usually 3-24h): **Ampicillin-sulbactam** 1.5 to 3g IV q6h ***OR*** **Piperacillin-tazobactam** (4.5g q8h or 4-hr infusion of 3.375g q8h). For serious infections, until MRSA is excluded: ***ADD*** **Vancomycin** 1g IV q12h (or 1.5g q12h if wt. >100 kg) **2nd line:** A **Carbapenem** can be used in place of **Ampicillin-sulbactam**, **Cefoxitin**, ***OR*** **Piperacillin-tazobactam** if parenteral therapy is required. With allergy to penicillin: **Clindamycin** ***PLUS*** **Ciprofloxacin** ***OR*** **Levofloxacin**	Cleaning, irrigation and debridement are most important. For bites inflicted by hospitalized patients, consider aerobic Gram-negative bacilli. Review tetanus status. *Eikenella sp.* • Susceptible to: **Fluoroquinolones** and beta-lactam / beta-lactamase inhibitor combinations: e.g., **Ampicillin-sulbactam.** • Resistant to: **Clindamycin, Nafcillin/Oxacillin, Metronidazole, Cephalexin/Cefazolin, Co-trimoxazole** and **Erythromycin**. Clenched fist (and other hand) bite wounds pose risk for deep infections (e.g., bone, joint, tendon sheath) and require careful evaluation. X-ray would evaluate for fracture or foreign body. Potential risk of transmitting blood-borne pathogens if injury contaminated with another's blood.

Etiology	Regimen	Comments
Rat bite		
Spirillum minus (Asia); *Streptobacillus moniliformis* (USA)	**1st line:** Prophylaxis: **Co-amoxiclav** 875/125mg PO bid x 3 days Rat bite fever: **Penicillin G** 2MU IV q4h ***OR*** **Doxycycline** 100mg PO bid x 10-14 days **2nd line:** Prophylaxis: **Doxycycline** 100mg PO bid x 3 days Rat bite fever: **Erythromycin** 500mg PO qid ***OR*** **Clindamycin** 300mg PO qid x 10-14 days	Rabies post-exposure prophylaxis and vaccination are not routinely indicated for rat bites. Consider consultation with an expert for bites secondary to wild rodents.
Mastitis		
Postpartum Mastitis		
• Postpartum mastitis occurs in approximately 10% of nursing mothers. • Poor breastfeeding technique and incomplete emptying are contributing factors. • *S. aureus* is most common etiology but other pathogens are possible. If possible, obtain culture before starting empiric therapy	• May present with or without abscess. • Risk factors (same for MRSA and MSSA) include: mother employed outside the home, primiparity, advanced maternal age, breastfeeding difficulties	
S. aureus (MRSA or MSSA); *S. pyogenes* (Group A or B); *E. coli*;	**If MRSA is not present:**	**If MRSA is present/possible:**	If baby can latch on and the mother is comfortable, continue breastfeeding during the

Etiology	Regimen			Comments
Bacteroides species; *Corynebacterium* sp.; *Coagulase-negative staphylococci* (e.g., *S. lugdunensis*)	**Outpatient**	**Cloxacillin** 500mg PO qid ***OR*** **Cephalexin** 500mg PO qid	**Clindamycin** 300mg PO qid ***OR*** **Co-trimoxazole** 160/800mg 1-2 tabs PO bid	antibiotic therapy. Discontinue breastfeeding only if the breast is too painful for breastfeeding. On occasion, feeding can be temporarily interrupted, e.g., surgical I&D of an abscess. Breastfeeding should resume once pain is tolerable. Continued breastfeeding does not pose a risk to the infant; discuss with pediatrician age-specific risks to infant of drug exposure through breast milk.
	Inpatient	**Oxacillin** 2g IV q4h	**Vancomycin** 15-20mg/kg/day IV q8-12h	
Non-puerperal mastitis				
S. aureus; Bacteroides sp. (less often); *Peptostreptococcus*; Selected coagulase-negative *staphylococci*; *Corynebacterium sp.*-rare; can cause distinctive granulomatous inflammation.	**1st line:**	**If MRSA is not present:**	**If MRSA is present/possible:**	Consider inflammatory carcinoma in older women without clear abscess, especially if microcalcification, or a breast mass is detected radiographically. If not subareolar, probably *Staphylococcus*. Need pretreatment aerobic and anaerobic cultures. Drainage, either by ultrasound-guided needle aspiration or surgical, indicated for abscess.
	Outpatient	**Cloxacillin** 500 mg PO qid ***OR*** **Cephalexin** 500 mg PO qid	**Clindamycin** 300mg PO qid ***OR*** **Co-trimoxazole** 160/800 mg 1-2 tabs PO bid	
	Inpatient	**Oxacillin** 2g IV q4h	**Vancomycin** 1g IV q12h; 1.5g IV q12h if patient weight >100 kg	
	If subareolar & odoriferous, most likely anaerobes: ***ADD*** **Metronidazole** 500mg IV/PO tid **2nd line:** For granulomatous mastitis due to *Corynebacterium* sp: **Doxycycline** 100mg PO bid x 3-4 weeks			

Etiology	Regimen	Comments
Burns		
Infected burn wound, sepsis		
• An Infected burn wound is characterized by bacteria in the wound and wound eschar at high concentration (>105/g tissue). • Invasive infection is characterized by pathogens at a sufficient concentration, depth, and surface area to cause suppurative separation of eschar or graft loss, invasion of adjacent unburned tissue, or sepsis syndrome. • Treatment may require surgical debridement of infected necrotic tissue, application of skin grafts and/or skin substitutes, and /or topical medications. • Critically ill patients may have suspected burn wound sepsis. The ideal care is in a dedicated burn unit.		
S. pyogenes; Enterobacter sp.; S. aureus; S. epidermidis; E. faecalis; E. coli; P. aeruginosa; Fungi (rare) and Herpes virus (rare)	**1st line:** **Vancomycin** loading dose of 25-30mg/kg IV, then 15mg/kg IV q8-12h ***PLUS*** **Piperacillin-tazobactam** 4.5g IV q6h If *Candida* infection suspected: ***ADD*** **Fluconazole** 6mg/kg/day IV **2nd line:** **Meropenem** 1g IV q8h ***OR*** **Cefepime** 2g IV q8h ***PLUS*** **Vancomycin** loading dose of 25-30mg/kg IV, then 15mg/kg IV q8-12h If with IgE-mediated allergy to beta-lactams: **Aztreonam** 2g IV q6h If ESBL- or carbapenemase-producing multi-drug resistant Gram-negative bacillus: The only alternative is **Colistin** ***PLUS*** **Meropenem.**	Patients should undergo quantitative wound cultures, blood cultures, and then Empiric antimicrobial therapy while awaiting results. Other complications of concern in critically ill burn patients include *S. aureus* toxic shock syndrome (TSS), suppurative phlebitis, and pneumonia.

Etiology	Regimen	Comments
Cellulitis		
Diabetes mellitus and erysipelas		
Patients with diabetes mellitus peripheral neuropathy commonly suffer from inflammation of the skin and subcutaneous tissue. The patient may have contiguous skin ulceration and/or atherosclerotic peripheral vascular disease.		
Streptococcus sp. *(*Group A, B, C, G); *S. aureus; Enterobacteriaceae* Anaerobes (poor prognosis if present).	**1st line:** Early or mild infection: **Clindamycin** 300-450mg (higher dose in obese patient, BMI >40) PO tid x 5-10 days ***OR*** **Co-trimoxazole** 160/800 mg 1-2 tabs PO bid ***PLUS*** **Penicillin VK** 500mg PO qid ***OR*** **Cephalexin** 500mg PO qid **2nd line:** For hospitalized patient with severe disease, forced to use broad-spectrum therapy that targets both *S. aureus* and *Enterobacteriaceae*: **Piperacillin-tazobactam** 4.5g IV q8h ***PLUS*** **Vancomycin** 1g IV q12h ***OR*** **Linezolid** 600mg IV/PO bid. Can substitute **Piperacillin-tazobactam** with **Carbapenem**: **Ertapenem** 1g IV q24h ***OR*** **Meropenem** 1g IV q8h	Assess the adequacy of arterial blood supply. Surgical debridement for cultures may be required to determine or assess for contiguous osteomyelitis and the presence of necrotizing fasciitis. The likelihood of contiguous osteomyelitis is increased if one can probe to the bone. The likelihood of contiguous osteomyelitis is low if MRI is negative. Other alternatives to a **Carbapenem**: **Levofloxacin, Piperacillin-tazobactam.**
Acute bacterial skin and skin structure infections (ABSSSI)		
• This section focuses on the treatment of uncomplicated cellulitis, erysipelas in extremities and other ABSSSI in the non-diabetic patient. • This is characterized by an acute onset of rapidly spreading red edematous, tender plaque-like area of skin usually on the lower leg, often febrile. It may be associated with lymphangitis or lymphadenitis. • The portal of entry is frequently a fungal infection between the toes (Tinea pedis). • If the facial skin is involved, see *Facial Erysipelas.*		

Etiology	Regimen	Comments
• Erysipelas is characterized by red indurated demarcated inflamed skin (*S. pyogenes*), and is distinguishable from abscesses due to *S. aureus*. Dual infection is rare. Bedside ultrasound may be helpful in detecting deep *S. aureus* abscess. If in doubt, treat for both. Community-associated MRSA can mimic erysipelas; look for loculated purulence.		
S. pyogenes (Groups A, B, C, G); *S. aureus* (rare)	**1st line:** Inpatient parenteral therapy: **Penicillin G** 1-2MU IV q6h If history of penicillin skin rash and nothing to suggest IgE-mediated allergic reaction: **Cefazolin** 1g IV q8h OR **Ceftriaxone** 2g IV daily If history/evidence of past IgE-mediated allergic reaction (anaphylaxis), then may be forced to use: **Vancomycin** 15mg/kg IV q12h **2nd line: Linezolid** 600mg IV/PO bid. Give IV until afebrile. Stepdown to **Penicillin VK** 500mg PO qid ac and hs (outpatient) x 10 days of total therapy. Outpatient therapy for less-ill patients: **Penicillin VK** 500mg PO qid ***OR*** **Amoxicillin** 500mg PO q8h If history of Penicillin skin rash and nothing to suggest an IgE-mediated reaction (anaphylaxis, angio-neurotic edema): **Cephalexin** 500mg PO bid x 10 days If documented past history of IgE-medicated allergic reaction to beta-lactam antibiotics: **Azithromycin** 500mg PO x 1 dose then 250mg PO daily x 4 days ***OR*** **Linezolid** 600 mg PO bid x 10 days If clinically unclear whether infection is due to *S. pyogenes* or *S. aureus*, get cultures and start empiric therapy: **Amoxicillin** ***OR***	Treatment also includes leg elevation to reduce local edema. Mixed infection (Strep. and Staph.) is rare. If *S. aureus* is present, need incision and drainage. Usual duration of therapy is 7-10d. Some treat until the patient is afebrile for 3-5d. Treat *Tinea pedis* if present. Stasis dermatitis due to venous insufficiency can masquerade as bacterial cellulitis/erysipelas; condition is often bilateral, chronic and patient afebrile. Systemic antibiotics offer no additional benefit. Do not use a fluoroquinolone, **Co-trimoxazole** or a **Tetracycline** for reasons of resistance and/or clinical failures.

Etiology	Regimen	Comments
	Penicillin VK *OR* Cephalexin for *S. pyogenes* and **Clindamycin** for *S. aureus* (MRSA). *See comment re* **Co-trimoxazole**. For suspected *S. aureus* (fluctuance or positive Gram stain): MSSA (outpatient): **Cloxacillin** 500mg PO qid MSSA (inpatient): **Oxacillin** 2g IV q4h MRSA (outpatient): **Doxycycline** 100mg PO bid ***OR*** **Clindamycin** 300-450mg PO bid ***OR*** **Co-trimoxazole** 160/800mg 1tab PO bid MRSA (inpatient): **Vancomycin** 1g IV q12h	
Purulent cellulitis		
This is associated with purulent drainage or exudate, in the absence of a drainable abscess.		
S. aureus: predominantly MRSA; also MSSA Rare: beta-hemolytic *streptococci*	**1st line:** Non-severe: **Clindamycin** 300-450mg (higher dose in obese patient, BMI >40) PO tid x 5-10 days ***OR*** **Co-trimoxazole** 160/800mg (1 DS tab; 2 DS tabs in obese patient, BMI >40) PO bid x 5-10 days ***OR*** **Doxycycline** 100mg PO q12h x 5-10 days may also be effective for community acquired MRSA infections Inpatient: Empiric therapy (in absence of specific culture and sensitivity data, select an agent with activity against MRSA): **Clindamycin** 600mg IV q8h for patients without signs and symptoms of sepsis/bacteremia ***OR*** **Vancomycin** 15 mg/kg q12h (trough concentrations of 5-10 µg/mL are adequate for infections of moderate	Culture of blood, exudate, and/ or bullae is needed when there are signs of systemic toxicity, extensive skin involvement, or underlying co-morbidities. Empiric therapy for infection due to beta-hemolytic streptococci may not be necessary since MRSA is the dominant organism (59%). Others: MSSA (17%) and beta-hemolytic streptococci (2.6%). I&D with culture of the exudate and blood is beneficial.

Etiology	Regimen	Comments
	severity; for severe infections or if bacteremia is present, 15-20 mg/kg q8-12h) **2nd line:** **Linezolid** 600 mg PO q12h (MRSA) or 600mg IV q12h (severe) For documented MSSA infection, use a beta-lactam agent: *Oral:* **Cloxacillin** 500 mg PO qid ***OR*** **Cephalexin** 500 mg PO tid-qid *Parenteral:* **Oxacillin** 1g IV q4h ***OR*** **Cefazolin** 1g IV q8h	
Seawater, brackish water-associated, contaminated skin wounds		
Individuals at highest risk of life-threatening infection: cirrhosis due to alcohol or chronic viral hepatitis, alcoholism, hemochromatosis, diabetes mellitus, thalassemia major, chronic renal disease, and lymphoma. Roughly 75% of patients have bullous skin lesions.		
Vibrio vulnificus; Vibrio alginolyticus; Vibrio damsel	**1st line:** Severe infections/sepsis or those at risk for life-threatening infections: **Vancomycin** 15-20 mg/kg IV q 8-12h ***OR*** **Piperacillin-tazobactam** 4.5 g IV q8h **2nd line:** **Ciprofloxacin** 750mg PO bid or 400mg IV bid ***OR*** **Levofloxacin** 750mg IV/PO daily **Duration:** based on clinical response.	Due to the potential severity of disease, empiric therapy for wound and septic patients should include drugs active against *V. vulnificus* when risk factors are present (e.g. sepsis and septic shock in immunocompromised patients including hematological disease, malignancy, and liver disease.

Etiology	Regimen	Comments
Herpes Infection		
Herpes zoster, shingles		
• Effective treatment of shingles is most evident in patients >50y. • Must begin treatment within 3d of onset of rash. • Immunization results in 25-fold decrease in infection rate.		• There should be increasing recognition of increased risk of stroke in the 6 months after an episode of *H. zoster*. Oral antivirals during clinical infection may have a protective effect.
Herpes zoster virus (Varicella zoster virus)	**1st line:** Immunocompetent: **Aciclovir** 800mg PO 5x/d x 7-10d ***PLUS*** **Prednisone** in patients >50y to decrease discomfort during acute phase of infection. Does not decrease incidence of post-herpetic neuralgia. *Days 1-7:* 30mg PO bid; *D8-14:* 15mg PO bid; *D15-21:* 7.5mg PO bid Immunocompromised: *Not severe:* **Aciclovir** 800mg PO 5x/day x 7 days *Severe* (>1 dermatome, trigeminal nerve or disseminated): **Aciclovir** 10-12mg/kg IV (infusion over 1hr) q8h x 7-14 days **2nd line:** Immunocompetent: **Valaciclovir** 1g PO tid x 7 days Immunocompromised (not severe): **Valaciclovir** 1g PO tid x 7 days	**Valaciclovir** reduced post-herpetic neuralgia (PHN) more rapidly than **Aciclovir** in patients >50 y. Toxicity of both drugs are similar. **Prednisone** added to **Aciclovir** (in patients >50y) improved quality of life measurements. The role of antiviral drugs in the treatment of PHN is unproven. However, 8 out of 15 patients improved with **Aciclovir** 10 mg/kg IV q8h x 14d followed by oral **Valaciclovir** 1 g 3x/d for 1 month. Herpes zoster is a common manifestation of immune reconstitution following ART in HIV-infected children. Treatment must begin within 72 h. **Aciclovir**-resistant VZV occurs in HIV-positive patients previously treated with **Aciclovir**.
Diabetic Foot Infections (DFI)		

Etiology	Regimen	Comments
This manifests in diabetic patients with any foot wound with: signs of inflammation (redness, warmth, tenderness, swelling, or pain), purulent secretions, or additional secondary signs (e.g., non-purulent secretions, friable or discolored granulation tissue, undermining of wound edges, foul odor). The use of a validated classification system for DFI, e.g., IDSA classification, is recommended.		
Aerobic gram-positive cocci, including MRSA, are most common. Aerobic gram-negative bacilli and anaerobes are common secondary organisms.	**1st line:** *Mild to moderate DFI:* **Clindamycin** 300mg PO/IV qid ***OR*** **Cotrimoxazole** 160/800mg 1-2 tabs PO bid x 1-2 weeks *Severe DFI:* **Piperacillin-Tazobactam** 4.5g IV q6-8hr (for Gram-negative bacilli coverage, especially if *P. aeruginosa* is suspected) ***PLUS*** **Vancomycin** (for MRSA coverage) 15-20mg/kg IV q8-12h x 2-3 weeks **2nd line:** *Mild to moderate DFI:* **Levofloxacin** 750mg PO/IV daily *Severe DFI:* **Meropenem** 1g IV q8h ***PLUS*** **Vancomycin** 15-20mg/kg IV q8-12h x 2-3 weeks ***OR*** **Ceftazidime** 1-2g IV q8h (***OR*** **Cefepime**) ***PLUS*** **Metronidazole** 500mg IV q8h ***PLUS*** **Vancomycin** 15-20mg/kg IV q8-12h x 2-3 weeks **Duration:** may be as short as one week for osteomyelitis if all infected and necrotic bone and soft tissue are resected and there is clinical improvement. This may be extended for 4-6 weeks (or even longer) if there is residual infected bone following debridement of necrotic bone.	Management requires multi-specialty collaboration (for diabetes control, infectious diseases, debridement and other surgical interventions by orthopedic/vascular/general surgeons). Orthopedic consultation and management is needed when osteomyelitis is being considered. For moderate to severe infections, send specimens from deep tissue, obtained by biopsy or curettage after the wound has been cleansed and debrided. Avoid swab specimens. Plain x-ray of the affected foot and/or MRI may be necessary to determine the extent and depth of infection. Surgical debridement is usually necessary for moderate to severe DFI.

Etiology	Regimen	Comments
Varicella zoster virus		
Clinical syndromes include chickenpox, shingles (single dermatomal or multiple dermatomes) [see also *Herpes zoster (shingles)*] and disseminated VZV disease/organ involvement. Emerging data suggests VZV may cause vasculopathy of cerebral, temporal, and other arteries (suggested as possible cause of Giant Cell arteritis).		
Varicella-zoster virus (VZV)	**1st line:** Immunocompetent host, chickenpox: **Aciclovir** 800mg PO 5x/day x 5-7 days (start within 24h of rash) ***OR*** **Valaciclovir** 1g PO tid x 5 days Pregnancy (3rd trimester), pneumonia: **Aciclovir** 800mg PO 5x/day **or** 10 mg/kg IV q8h x 5 days Immunocompromised: **Aciclovir** 10-12mg/kg IV (infused over 1 hour) q8h x 7 days **2nd line:** **Valaciclovir** 1g PO tid x 5 days	Prevention, post-exposure prophylaxis: Refer to PSMID-PFV Adult Immunization Schedule 2015 available at http://www.philvaccine.org/vaccination-schedules/adult-immunization-schedule Varicella pneumonia is associated with a 41% mortality in pregnancy, but **Aciclovir** decreases incidence and severity of varicella pneumonia. If a varicella-susceptible mother is exposed and develops respiratory symptoms within 10d after exposure, start **Aciclovir**.
Necrotizing fasciitis		
Infection causing necrosis extending to fascial plane(s): usually involving an extremity, perianal area, genitals ("Fournier's gangrene"). Necrosis manifests by a decrease in pain and dusky, cyanotic skin, often with blood-filled bullae. Typically, gas is present in the involved tissue. May have associated toxic shock syndrome as defined by hypotension, nausea, vomiting, diarrhea, renal failure, respiratory failure, and maybe erythroderma.		
Mixed aerobic-anaerobic bacteria [Type I]: most common, fast moving; Group A Streptococcus (GAS, *S.*	**1st line:**	X-ray, CT scan or MRI may show gas in involved tissue. Urgent surgical debridement and antibiotics are the mainstay of therapy.

Etiology	Regimen	Comments
pyogenes) [Type II]—acute or subacute; *Clostridium perfringens*, MRSA, *Vibrio vulnificus*, *Klebsiella spp.*	If Type I necrotizing fasciitis is suspected: **Piperacillin-tazobactam** 4.5g IV q8h ***PLUS*** **Vancomycin** 15-20mg/kg IV q8-12h If Type II necrotizing fasciitis or clostridial necrotizing fasciitis is suspected: **Penicillin G** 4MU IV q4h ***PLUS*** **Clindamycin** 600-900mg IV q8h (to block toxin production) If MRSA is suspected: **Vancomycin** 15-20mg/kg q8-12h (target trough concentrations 15-20µg/mL) **2nd line:** For Type 1 necrotizing fasciitis: **Meropenem** 1g IV q8h ***PLUS*** **Vancomycin** 15-20mg/kg q8-12h (target trough concentrations 15-20µg/mL) **Penicillin** allergy manifested as skin rash only and unable to tolerate **Carbapenem**: **Cefepime** 1-2g q8-12h ***PLUS*** **Metronidazole** 500mg IV q6h ***PLUS*** **Vancomycin** If *S. aureus* suspected, **Penicillin** allergy manifested as anaphylaxis or angioneurotic edema: **Levofloxacin** 750mg IV daily ***OR*** **Ciprofloxacin** 400mg IV q12h ***PLUS*** **Metronidazole** 500mg IV q6h ***PLUS*** **Vancomycin** For streptococcal (Type II) necrotizing fasciitis, if with penicillin allergy: **Vancomycin** 1g IV q12h For clostridial necrotizing fasciitis: Susceptibility of *C. tertium* to **Penicillin** and **Metronidazole** is variable in published studies; resistance to **Clindamycin** and third-generation cephalosporins is	Early exploratory surgery is recommended to establish diagnosis (include aerobic and anaerobic cultures) and resect all non-viable tissue. IDSA Guidelines do *not* recommend hyperbaric oxygen. Type II necrotizing fasciitis: presents with and without TSS and/or rhabdomyolysis. Some lots of **intravenous immunoglobulin** (**IV IG**) have antibodies against streptococcal toxins. Use of **IV IG** is supported by a small controlled study and a retrospective review. More data is needed.

Etiology	Regimen	Comments
	common. **Vancomycin** and **Meropenem** expected to have activity in vitro. For necrotizing fasciitis caused by MRSA: **Linezolid** 600mg IV q12h.	
Wound Infection		
Post-operative wound infections		
Non-gastrointestinal tract and non-genitourinary tract surgery (e.g., "clean" surgery). Treatment regimen is determined by the severity of infection (may be mild in afebrile patients, or severe in febrile patients). Gastrointestinal tract (including oropharyngeal and esophageal) and non-genitourinary tract surgery (e.g., potential contamination by bowel or vaginal flora). The patient is febrile, with neutrophilia. If *S. aureus* is **Clindamycin**-sensitive but **Erythromycin**-resistant, watch out for inducible **Clindamycin** resistance. Based on a 2011 global survey of approximately 5,000 *S. aureus* isolates, 94% of MSSA were susceptible to **Tetracycline** and >98% were susceptible to **Minocycline**. For MRSA, approximately. 85% were susceptible to **Tetracycline**, and 88.3% (by Eucast breakpoint) or 97.2% (by CLSI breakpoint) were susceptible to **Minocycline**. In the Philippines, the rate of resistance of *S. aureus* to **Tetracycline** was 9.1 % in 2014 and 7.1 % in 2015.		
Non-gastrointestinal tract, non-genitourinary tract surgery: skin flora, *S. aureus,* Streptococcus sp. (Group A, B, C, G)	**1st line:** Mild infection (without sepsis; afebrile), if antimicrobial needed: **Clindamycin** 300-450mg PO tid ***OR*** **Co-trimoxazole** 160/800mg 1-2 tabs PO bid Severe infection (sepsis; febrile patient): **Vancomycin** 1g IV q12h (1.5g q12h if weight >100 kg) **2nd line:**	If the infection is on the skin incision, remove sutures to drain wound, obtain culture and sensitivity, and pack the wound. *See IDSA Guidelines for the assessment and management of infected surgical wounds.* In the absence of systemic response, wounds with <5 cm erythema and no induration or necrosis may

Etiology	Regimen	Comments
	Mild infection (without sepsis; afebrile patient): **Clindamycin** 300-450mg PO tid Severe infection (sepsis; febrile patient): **Linezolid** 600mg IV q12h ***PLUS*** **Ciprofloxacin** 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h ***PLUS*** **Metronidazole** 500mg IV q6h	be treated with opening and dressing changes only. Open and drain the wound if *S. aureus* suspected on GIT or GUT Surgery.
Gastrointestinal tract (GIT) or genitourinary tract (GUT) surgery: skin flora, gastrointestinal and vaginal flora, *S. aureus* (MSSA, MRSA), coliform species (e.g., *E. coli*), *Bacteroides* sp (e.g., *B. fragilis*), and other anaerobic bacteria	**1st line:** Mild infection: **Co-amoxiclav** 875/125mg PO bid or 500/125mg PO tid If *S. aureus* suspected: ***ADD*** **Clindamycin** 300-450mg PO ***OR*** **Co-trimoxazole** 160/800mg 1-2 tabs PO bid Severe infection: **Piperacillin-tazobactam** 4.5g IV q8h ***OR*** (Parenteral third-generation **Cephalosporin** ***PLUS*** **Metronidazole** 500mg IV q6h) ***OR*** (**Ertapenem** 1g IV q24h ***PLUS*** **Vancomycin** 1g IV q12h) **2nd line:** **Meropenem** 1g q8h ***PLUS*** **Vancomycin** 1g IV q12h	Can substitute **Linezolid** for **Vancomycin** in the primary regimen.
For suspected MSSA or MRSA postwound infection (Gram stain shows Gram positive cocci):	**1st line:** Oral: **Clindamycin** 300-450mg PO tid ***OR*** **Co-trimoxazole** 160/800mg 1-2 tabs PO bid IV: **Vancomycin** 1g IV q12h **2nd line:** Oral: **Minocycline** 100mg PO q12h ***OR*** **Doxycycline** 100mg PO bid ***OR*** **Linezolid** 600mg PO/IV q12h	

Etiology	Regimen	Comments
Infected wound, post-trauma		
Non-gastrointestinal tract and non-genitourinary tract surgery (e.g., "clean" surgery). Treatment regimen is determined by the severity of infection (may be mild in afebrile patients, or severe in febrile patients). Gastrointestinal tract (including oropharyngeal and esophageal) and non-genitourinary tract surgery (e.g., potential contamination by bowel or vaginal flora). The patient is febrile, with neutrophilia.		
Polymicrobic (Microbial flora dependent on nature of the trauma): *S. aureus* (MSSA, MRSA), *Streptococcus* sp. (aerobic and anaerobic), Enterobacteriaceae, *C. perfringens*, *C. tetani*, *Pseudomonas* sp. (water exposure), *Aeromonas* sp., *Acinetobacter* sp.; especially in soldiers infected in Afghanistan, Iraq	Uncomplicated, mild or moderate, afebrile patient: **1st line:** **Clindamycin** 300-450mg PO tid ***OR*** **Co-trimoxazole** 160/800mg 1-2 tabs PO bid **2nd line:** **Minocycline** 100mg PO bid ***OR*** **Linezolid** 600mg PO bid Complicated, severe, febrile patient: **1st line:** **Piperacillin-tazobactam** 4.5g q8h ***PLUS*** **Vancomycin** 1g IV q12h **2nd line:** **Meropenem** 1g IV q8h ***PLUS*** **Vancomycin** 1g IV q12h ***OR*** **Linezolid** 600mg IV/PO q12h ***PLUS*** **Ciprofloxacin** 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h	Regimen focuses on *S. aureus* or *Streptococcus* sp. If Gram-negative bacilli are suspected: add a Fluoroquinolone. Surgical debridement may be indicated. If *S. aureus* is **Erythromycin**-resistant in vitro, inducible resistance to **Clindamycin** is also possible. Ensure that the microbial laboratory checks this if **Clindamycin** is being considered.
Fungal Skin Infections		
Cutaneous candidiasis		
Candida albicans, Other Candida spp. Clinical settings: Common types of candida skin infections include:	**1st line:** Topical therapy for 3-5 days: **Clotrimazole** 1% cream; **Miconazole** 2% cream; **Ketoconazole** 2% cream applied bid	Maintain dry skin surface (e.g., for intertrigo, diaper dermatitis) and control hyperglycemia if present. Acute paronychia usually caused by

Etiology	Regimen	Comments
intertrigo, diaper dermatitis, erosion interdigitalis blastomycetica, perianal dermatitis, balanitis, and paronychia	**2nd line:** If topical treatment does not work: **Fluconazole** 100-200mg PO every week until normal nail anatomy restored *Alternatives:* **Itraconazole** 200mg PO bid x 1 week x 3 consecutive months ***OR*** **Terbinafine** 250 mg PO daily x 3 months	mixed bacterial infections and may require I&D if the abscess is present. Chronic paronychia may require referral to hand surgeon if medical treatment is ineffective.
Tinea corporis/cruris		
Check for history of: • Current and previous topical and/or systemic treatment • Occupational exposure (e.g., veterinarian, lab worker, farmer, pet shop workers) • Environmental exposure (e.g., gardening, pets), contact sports, locker rooms, gyms, affected family members)		
Certain spp. of dermatophytes of the following genera: *Epidermophyton, Microsporum and Trichophyton*	**1st line:** **Terbinafine** 1% cream bid x 3-4 weeks (recommended) ***OR*** **Ketoconazole** 2% cream daily or bid x 2-4 weeks ***OR*** **Clotrimazole** 1% cream, powder, solution bid x 2-4 weeks **2nd line:** Topical therapy ineffective or intolerant to topical medications, or with extensive and/or disabling, multifocal or inflammatory disease, deeper infection with hair follicle involvement: **Terbinafine** 250mg PO daily x 2-4 weeks ***OR*** **Itraconazole** 200mg PO daily x 2-4 weeks or 200mg bid x 7 days ***OR*** **Fluconazole** 50-100mg PO daily or 150mg once weekly x 2-3 weeks	Topical antifungals preferred for localized, uncomplicated noninflammatory lesions. Avoid tight-fitting clothes/underwear. If secondary bacterial infection is suspected, obtain bacterial cultures and start adequate antibiotic coverage. A meta-analysis showed that 50% **Akapulco** lotion was superior to placebo for *Tinea versicolor* (mycologic cure and decrease in clinical activity). It appears to be as effective as 25% **Sodium Thiosulfate** and **Ketoconazole** cream, but larger randomized trials with good follow-up rates are needed to confirm these findings.

Etiology	Regimen	Comments
Tinea pedis		
May manifest as: • Inter-digital, especially common in the 3rd and 4th web spaces • Moccasin-style: powdery plaques with mildly erythematous base on heels, soles, and lateral aspects of the feet • Vesicobullous: may have purulent exudate, usually on the instep		
Trichophyton rubrum, Trichophyton interdigitale, Trichophyton mentagrophytes. Rare: *Epidermophyton floccosum, Candida, Acremonium, Fusarium*	**1st line:** **Terbinafine** 1% cream daily x 2-4 weeks (recommended) ***OR*** **Ketoconazole** 2% cream bid x 3-6 weeks ***OR*** **Clotrimazole** 1% bid x 2-4 weeks **2nd line:** **Terbinafine** 250mg PO x 2 weeks ***OR*** **Fluconazole** 150mg PO weekly x 4 weeks	A randomized controlled trial showed faster response with topical **Terbinafine** compared to topical **Clotrimazole** after 1 week of treatment (84.6% vs 55.8%, respectively). Another RCT showed comparable efficacy between **Clotrimazole** 1% od and **Ketoconazole** 2% bid, applied for 28d. Tinea pedia can trigger an "id" reaction on the hands: multiple, very pruritic, minute deep-seated vesicles on the fingers and palms. May progress to a chronic phase resembling hand eczema. Topical or systemic corticosteroids: may be considered in cases of extensive or severe inflammatory tinea pedis. Topical or systemic antibiotics: may be needed in cases of secondary Gram-negative toe web infection.

REFERENCES

Bartlett JG, Editor in Chief. Johns Hopkins ABX Guide (@2000 – 2016).

Chambers HF, Eliopoulos GM, Gilbert DN, Saag MS (eds.). The Sanford Guide to Antimicrobial Therapy, 2016. Antimicrobial Therapy, Inc.

Daum RS, Miller LG, Immergluck L, et al. A placebo-controlled trial of antibiotics for smaller skin abscesses. New Engl J Med 2017; 376:2545-55.

Lipsky BA, Berendt AR, Comia PB, et al. 2012 Infectious Diseases Society of America Clinical Practice Guidelines for the Diagnosis and Treatment of Diabetic Foot Infections. Clin Inf Diseases 2012; 4:132-73.

Liu C, Bayer A, Cosgrove SE, et al. Clinical Practice Guidelines by the Infectious Diseases Society of America for the treatment of Methicillin resistant *Staphylococcus aureus* infections in adults and children. Clin Inf Diseases 2011; 52:1-38.

Research Institute for Tropical Medicine, Department of Health. Antimicrobial Resistance Surveillance Program. Manila: Department of Health; 2015.

Stevens DL, Bisno AL, Chambers HF, et al. Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America. Clin Inf Diseases 2014; 59: 147-59.

SURGICAL PROPHYLAXIS

General Comments
Adults: I. Surgical prophylaxis is recommended only when the potential benefits exceed the risks and the anticipated costs. For clean surgeries, no prophylaxis is recommended as a general rule. Exception: procedures where there are severe consequences of infection (e.g. prosthetic implants, cardiac procedures) II. The antibiotic chosen must cover the expected pathogens for the operative site and take into account local resistance patterns. III. Effective prophylaxis requires antimicrobial serum and tissue concentrations above the minimum inhibitory concentration (MIC) for the probable organisms associated with the specific procedure at the time of incision and throughout the duration of the procedure. A. Timing is crucial. Intravenous antimicrobial must be started within 60 minutes before surgical incision. **Exceptions**: **Vancomycin** and **Fluoroquinolones** require 1- to 2-hour infusion times; hence, dose is started 2 hours before surgical incision. Rapid infusion of **Vancomycin** may result in hypotension and other signs and symptoms of histamine release (red man syndrome). B. A single dose of antimicrobial with a long enough half-life to achieve activity throughout the operation is sufficient for prophylaxis under most circumstances. Post-procedure doses are generally not needed. C. For procedures lasting more than two half-lives of the prophylactic agent, or when there is excessive blood loss (>1,500 mL), intraoperative supplementary dose(s) may be required. Re-dosing interval is measured from time of the preoperative dose. IV. The use of **Vancomycin** is discouraged but may be justifiable in centers where rates of post-operative infection with methicillin-resistant *Staphylococcus* aureus (MRSA) are high, or in patients with known MRSA colonization or at high risk for this (e.g., hemodialysis patients). It is also an alternative when patients have a history of an immediate type of allergic reaction to beta-lactams (anaphylaxis, laryngeal edema, bronchospasm, hypotension, local swelling, urticaria or pruritic rash occurring immediately after a beta-lactam dose) or exfoliative dermatitis (e.g., Stevens-Johnson syndrome). A. Unlike beta-lactams, vancomycin has no activity against Gram-negative organisms. When Gram-negative bacteria are a concern (as shown by local surveillance data), adding a second agent with appropriate in vitro activity may be necessary. This can be done by adding cefazolin to vancomycin in the non-allergic patient. In patients intolerant of or allergic to beta-lactams, use vancomycin with another Gram-negative antibiotic (e.g., aminoglycoside, fluoroquinolone, or aztreonam).

V. For patients currently given therapeutic antibiotic(s) for infection remote to surgery site and when the antibiotic regimen is appropriate also for prophylaxis, a dose should be given within an hour prior to incision.

VI. The risks of pre-surgical prophylaxis include Clostridium difficile infection and allergic reactions. Improper antimicrobial prophylaxis leads to excessive surgical wound infection rate (up to 52% in most studies), prolonged hospital stay, increased morbidity and mortality, and increased health care cost.

Pediatrics:

I. The principles mirror those for antibiotic prophylaxis in adults. However, data in the pediatric population are limited and recommendations have largely been extrapolated from studies in adults.

II. Recommendations are generally the same as for adults except for dosing.

III. **Fluoroquinolones** should not be used because of the potential for toxicity.

Recommended Antibiotic Prophylaxis Regimen by Surgical Procedure

Procedure	Regimen	Comments
Cardiovascular Surgery		
• Reconstruction of abdominal aorta • Leg vascular procedures that involve a groin incision • Any vascular procedure with insertion of prosthesis/foreign body • Lower extremity amputation for ischemia • Cardiac surgery • Permanent pacemakers • Heart transplant • Implanted cardiac defibrillators	**Cefazolin** 2g x 1 dose for <120kg **or** 3g IV ≥120kg ***OR*** **Cefuroxime** 1.5g IV x 1 dose *If with allergy to beta-lactams:* **Vancomycin** **≤90kg**: 1g IV x 1 dose **>90kg:** 1.5g IV x 1 dose Consider **intranasal Mupirocin** on the evening before surgery, on the day of surgery, and bid for 5 days post-surgery in patients with positive nasal culture for *S.aureus*.	Single infusion just before surgery is as effective as multiple doses. Prophylaxis beyond 24 hours is not recommended. No prophylaxis is needed for cardiac catheterization, carotid and brachiocephalic procedures without insertion of prosthetic grafts, and intravascular central line insertion (tunneled/untunneled). For prosthetic heart valves, it is recommended to stop prophylaxis either after removal of the retrosternal drainage catheters or just give a 2nd dose after coming off bypass. **Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA.
Gastroduodenal/Biliary Surgery		
Gastroduodenal, includes percutaneous endoscopic gastrostomy (high risk only), pancreaticoduodenectomy (Whipple procedure)	**Cefazolin** 2g IV (3g if wt. ≥120kg) ***OR*** **Cefoxitin** 2g IV ***OR*** **Ceftriaxone** 2g IV x 1 dose	Gastroduodenal (PEG placement) high-risk conditions include: marked obesity, obstruction, decreased gastric acid or decreased motility, gastric bleeding, cancer. **Ceftriaxone** is recommended for centers where there is

Procedure	Regimen	Comments
		increasing resistance of Enterobacteriaceae to 1st and 2nd generation **Cephalosporins**. Avoid using **Ceftriaxone** in neonates.
Low risk, laparoscopic cholecystectomy	No prophylaxis	
Biliary, includes high risk laparoscopic cholecystectomy, open cholecystectomy	**Cefazolin** 2g IV (3g if wt. ≥120 kg) ***OR*** **Cefoxitin** 2g IV	Biliary high-risk factors include: age >70 years, diabetes, immunosuppression, acute cholecystitis, pregnancy, non-functioning gallbladder, obstructive jaundice or common duct stones, anticipated bile spillage or procedure duration >2 hours.
Endoscopic retrograde cholangiopancreatography	If without obstruction: No Prophylaxis If with obstruction: **Ciprofloxacin** 500-750mg PO **or** 400mg IV 2h prior to procedure ***OR*** **Piperacillin-tazobactam** 4.5g IV 1h prior to procedure	
Colorectal/intestinal surgery		
Colorectal surgery	(**Cefazolin** 2g IV [3g if wt.≥120kg] ***PLUS*** **Metronidazole** 0.5g IV) ***OR*** **Cefoxitin** 2g IV ***OR*** **Ceftriaxone** 2g IV ***PLUS*** **Metronidazole** 0.5 g IV) ***OR*** **Ampicillin-Sulbactam** 3g IV If with beta-lactam allergy: **Clindamycin** 900mg IV ***PLUS*** (**Gentamicin** 5mg/kg IV ***OR*** **Aztreonam** 2g IV ***OR*** **Ciprofloxacin** 400mg IV)	Prevention of surgical site infection includes a combination of mechanical bowel preparation, oral antibiotic and IV antibiotic. **Cefazolin** and **Metronidazole** can be given together in same IV bag. Repeat **Cefazolin** dose 4 hours after the initial pre-op dose.

Procedure	Regimen	Comments
	Oral (given x 3 doses over approximately 10h the afternoon and evening before the operation and after bowel preparation): **Neomycin** 1g ***PLUS*** **Erythromycin** base 1g PO	On the pre-operative day: 1. Do bowel preparation using 4L polyethylene glycol electrolyte solution PO over 2 hours. 2. Clear liquid diet only. 3. NPO after midnight.
Small bowel surgery without obstruction	**Cefazolin** 2g IV (3 g if wt.≥120 kg)	
Small bowel surgery with obstruction	As for colorectal parenteral regimen	
Appendectomy for uncomplicated appendicitis	**Cefoxitin** 2g IV ***OR*** **Cefazolin** 2g IV (3g if wt.≥120 kg) ***PLUS*** **Metronidazole** 0.5g IV	
Head and Neck Surgery		
The efficacy of prophylaxis is best established for head and neck cancer surgery. Wound infection rates can still be high though even with prophylaxis.	(**Cefazolin** 2g IV x 1 dose ***PLUS*** **Metronidazole** 0.5 g IV) ***OR*** (**Clindamycin** 600-900mg IV x 1 dose **±** **Gentamicin** 5mg/kg IV x 1 dose)	Clean, uncontaminated head and neck surgery, such as thyroidectomy, does not require prophylaxis except when there is placement of prosthetic material. Prophylaxis is not indicated for tonsillectomy and functional endoscopic sinus procedures.

Procedure	Regimen	Comments
Neurosurgical Procedures		
Clean, non-implant; e.g. elective craniotomy	**Cefazolin** 2g IV (3 g if wt.≥ 120kg) Alternative: **Vancomycin** ≤ 90 kg: 1g IV; >90 kg: 1.5g IV ***OR*** **Clindamycin** 900mg IV daily	**Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA.
Clean, contaminated (cross sinuses, or naso/oropharynx)	**Clindamycin** 900mg IV x 1 dose ***OR*** **Ampicillin-sulbactam** 3g IV ***OR*** **Cefuroxime** 1.5g IV ***PLUS*** **Metronidazole** 0.5g IV	
CSF shunt surgery, intrathecal pumps	**Cefazolin** 1-2g IV daily Alternative: **Vancomycin** ≤90 kg: 1g IV; >90 kg: 1.5g IV ***OR*** **Clindamycin** 900mg IV daily	**Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA.
Obstetric/Gynecologic Surgery		
Vaginal or abdominal hysterectomy	**Cefazolin** 2g IV ***OR*** **Cefoxitin** 2g IV ***OR*** **Ampicillin-sulbactam** 3g IV Alternative: **Clindamycin** 900mg IV ***PLUS*** **Gentamicin** 5mg/kg IV x 1 dose	
Caesarean section for premature rupture of membranes or active labor	**Cefazolin** 2g IV Alternative: **Clindamycin** 900mg IV ***PLUS*** **Gentamicin** 5mg/kg IV x 1 dose	Administer before skin incision.
Episiotomy for vaginal birth	Antibiotic prophylaxis is NOT recommended for uncomplicated vaginal birth with or without an episiotomy.	

Procedure	Regimen	Comments
Ophthalmic Surgery		
	Topical **Neomycin-Polymyxin B–Gramicidin** ***OR*** **Fluoroquinolone** given as 1 drop every 5-15 mins x 5 doses within the hour before start of procedure. Optional at the end of procedure: **Cefazolin** 100mg by subconjunctival injection ***OR*** **Cefazolin** 1-2.5mg intracameral ***OR*** **Cefuroxime** 1mg intracameral	Most available data involve cataract procedures.
Orthopedic Surgery		
Total joint replacement (TJR), spinal procedures, hip fracture repair, implantation of internal fixation devices (screws, nails, plates, wires)	**Cefazolin** 2g IV pre-op Alternative: **Vancomycin** ≤90 kg: 1g IV; >90 kg: 1.5g IV ***OR*** **Clindamycin** 900mg IV Consider intranasal **Mupirocin** if colonized with *S. aureus*.	Stop prophylaxis within 24h of surgery. For TJR (other than hip), finish the initial antibiotic infusion before the tourniquet is inflated. Antibiotic-impregnated bone cement in addition to intravenous antibiotic is commonly practiced for joint replacements. **Vancomycin** may be preferred in hospitals with increased frequency of MRSA, in high-risk patients, and those colonized with MRSA.
Clean operations of hands, feet and arthroscopy without implantation of foreign materials	Prophylaxis not indicated.	

Procedure	Regimen	Comments
Thoracic Surgery		
Noncardiac procedures, including lobectomy, pneumonectomy, lung resection, and thoracotomy Video-assisted thoracoscopic surgery	**Cefazolin** 2g IV x 1 dose ***OR*** **Ampicillin-sulbactam** 3g IV x 1 dose ***OR*** **Clindamycin** 900mg IV x 1 dose	
Urologic Surgery/ Procedure		
Cystoscopy	Prophylaxis is generally not necessary if urine is sterile. May give a **Fluoroquinolone** or **Co-trimoxazole** for those with potentially adverse host factors (e.g., advanced age, immunocompromised state, anatomic abnormalities, etc.)	Modify antimicrobial to target urinary pathogens based on local resistance patterns. Increasing **Co-trimoxazole** and/or **Fluoroquinolone** resistance among enteric Gram-negative bacteria has been a concern. Treat patients with UTI based on urine c/s prior to procedure.
Cystoscopy with manipulation	**Ciprofloxacin** 500mg PO ***OR*** **Levofloxacin** 500mg PO	Procedures include ureteroscopy, biopsy, fulguration, TURP, etc. Treat UTI with targeted therapy before procedure if possible.
Transrectal prostate biopsy	**Ciprofloxacin** 500mg PO 12h prior to biopsy and repeated 12h after 1st dose	Screening stool culture pre-procedure for colonization with **Fluoroquinolone**-resistant organisms is increasingly used to guide the choice of prophylaxis, which should ideally be

Procedure	Regimen	Comments
		based on susceptibility of prevailing organisms.
Others		
Breast surgery, herniorrhaphy	**Cefazolin** 1-2g IV x 1 dose ***OR*** **Ampicillin-sulbactam** 3g IV x 1 dose ***OR*** **Clindamycin** 900mg IV x 1 dose	

Recommended Doses for Pediatric Patients (beyond the Newborn Period) and Redosing Intervals for Commonly Used Antimicrobials for Surgical Prophylaxis			
Antibiotic	**Dose for Pediatrics**	**Half-Life in Adults with Normal Renal Function (hours)***	**Redosing Interval (From Initiation of Preoperative Dose) (hours) ******
Ampicillin-Sulbactam	50mg/kg (ampicillin component)	0.8-1.3	2
Ampicillin	50mg/kg	1-1.9	2
Aztreonam	30mg/kg	1.3-2.4	4
Cefazolin	30mg/kg	1.2-2.2	4
Cefuroxime	50mg/kg	1-2	4
Cefoxitin	40mg/kg	0.7-1.1	2
Ceftriaxone	50-75mg/kg	5.4-10.9	NA
Ciprofloxacin	10mg/kg	3-7	NA
Clindamycin	10mg/kg	2-4	6
Fluconazole	6mg/kg	30	NA
Gentamicin***	2.5mg/kg based on dosing weight	2-3	NA
Metronidazole	15mg/kg	6-8	NA
Piperacillin-tazobactam (piperacillin component)	Infants 2-9 mos: 80mg/kg Children >9 mos and <40kg:	0.7-1.2	2

	100mg/kg		
Vancomycin	15mg/kg	4-8	NA
Oral Antibiotics for Colorectal Surgery in Conjunction with Mechanical Bowel Preparation			
Erythromycin base	20mg/kg	0.8-3	NA
Metronidazole	15mg/kg	6-10	NA
Neomycin	15mg/kg	2-3	NA

* The maximum pediatric dose should not exceed the usual adult dose. Pediatric patients weighing more than 40 kg should receive weight-based doses unless the dose or daily dose exceeds the recommended adult dose.

** For antimicrobials with a short half-life (e.g., **Cefazolin** or **Cefoxitin**) used for long procedures, redosing during surgery is recommended at an interval of approximately two times the half-life of the agent in patients with normal renal function. Recommended redosing intervals marked as "not applicable" (N/A) are based on typical case length; for unusually long procedures, redosing may be needed.

*** In general, **Gentamicin** for surgical antibiotic prophylaxis should be limited to a single dose given preoperatively. Dosing is based on the patient's actual body weight. If actual body weight is more than 20% above ideal body weight (IBW), the dosing weight (DW) can be determined as follows: DW = IBW + 0.4 (actual wt. – IBW)

REFERENCES

Anderson DJ, et al. Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery. Infect Control Hospital Epidemiol 2014; 35(6): 605-627.

Antibiotic Guidelines 2015-2016. Treatment Recommendations for Adult Inpatients. Available at: http://www.hopkinsmedicine.org/amp/guidelines/antibiotic_guidelines.pdf

Bratzler DW, et al. Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery. Am J Health Syst Pharm 70:195, 2013.

Berrios-Torres SI, Umscheid CA, Bratzler DW, et al; Healthcare Infection Control Practices Advisory Committee. Centers for Disease Control and Prevention guideline for the prevention of surgical site infection, 2017. JAMA Surg. Published online May 3, 2017. doi:10.1001/jamasurg.2017.0904.

Gilbert DN, Chambers HF, Eliopoulis GM, Saag MS, Pavia AT, Black DB, Freedman DO, Kim K, Schwartz BS editors. Sanford Guide to Antimicrobial Therapy 2016.

Katzung BG, Masters SB, Trever AJ editors. Basic and Clinical Pharmacology, 13th edition Mc Graw Hill 2015:883

Research Institute for Tropical Medicine. Antimicrobial Resistance Surveillance Program 2015 Annual Report

Scottish Intercollegiate Guidelines Network (SIGN). Antibiotic prophylaxis in surgery. Edinburgh: SIGN; 2008.

Wolf JS Jr1, et al. Best practice policy statement on urologic surgery antimicrobial prophylaxis. J Urol. 2008 Apr;179(4):1379-90.

World Health Organization 2016 Global Guidelines on the Prevention of Surgical Site Infections. Available at: www.who.int/gpsc/ssi-prevention-guidelines/en/. Accessed 14 November 2016.

WHO recommendations for prevention and treatment of maternal peripartum infections. Geneva: World Health Organization; 2015

URINARY TRACT INFECTIONS

Etiology	Regimen				Comments
Urinary Tract Infection in Children					
In children, Urinary Tract Infection (UTI) is defined by the presence of a single pathogen in urine culture accompanied by clinical findings in the history, physical examination, and diagnostic evaluation. The following recommended antimicrobial treatments for selected pathogen-specific conditions are based on evidence of clinical efficacy, cost-effectiveness and local patterns of drug resistance reported for the past two years. Once the sensitivity pattern of a specific pathogen has been obtained from the urine culture requested, antibiotic therapy may be adjusted accordingly.					
Acute Uncomplicated UTI					
Acute pyelonephritis: condition that indicates renal parenchymal involvement where infants and children may present with fever with any or all of the following symptoms: abdominal, back, or flank pain; malaise; nausea; vomiting; and, occasionally, diarrhea. Infants and children who have bacteriuria and fever ≥38°C OR those presenting with fever <38°C with loin pain/tenderness and bacteriuria should be worked up for acute pyelonephritis. Acute cystitis: condition that indicates urinary bladder involvement where infants and children may present with any or all of the following symptoms of dysuria, urgency, frequency, suprapubic pain, incontinence, and malodorous urine. Patients usually have no systemic signs or symptoms.					
E. coli, Klebsiella, Enterobacter, Enterococcus, Group B *Streptococcus*	**<2 mos old: Cefotaxime *PLUS***	*Age*	*Weight*	*Dose*	If there are signs of sepsis, treat as neonatal sepsis. Adjust therapy based on culture. Early onset is usually due to maternal transmission. Use **Ceftriaxone** if **Cefotaxime** is not available and the neonate is not jaundiced.
		<7d		50mg/kg/dose q12h	
		>7d	<1200g	50mg/kg/dose q12h	
		>7d	>1200g	50mg/kg/dose 8h	
		>4 weeks		100-200 mg/kg/day q6h	
	Amikacin	*Age*	*Weight*	*Daily dose*	
		0-4 weeks	<1200g	7.5mg/kg q24h	
		≤7d	1200-2000g	7.5mg/kg q24h	
		≤7d	>2000g	7.5-10mg/kg q24h	

Etiology	Regimen				Comments
		>7d	1200-2000g	7.5mg/kg q24h	
	Duration: 10-14 days				
E. coli, Klebsiella, Enterobacter, Citrobacter	Oral: **>2 months to 18 years: Co-amoxiclav**: <*40 kg:* 20-40mg/kg/day div q8h (amoxicillin component) or 25-45mg/kg/day div q12h using the 20mg/5mL or 400mg/5mL >*40 kg:* 500-875mg q8h (Max: 2g/day) ***OR* Cefuroxime** >3mos - 12years: 20-30 mg/kg/day PO div q12h **Adolescent: Cefuroxime** 250-500mg PO q12h ***OR* Nitrofurantoin** (only for cystitis) 5-7mg/kg/day div q6h (Max: 400 mg/day) Parenteral: **Ampicillin-sulbactam** 100-200mg/kg/day div q6h (ampicillin component) IM or IV infusion over 10-15 mins ***OR* Cefuroxime** 75-150mg/kg/day div q8h (Max dose: 6 g/day). For those >40 kg, use adult dose. **Duration** (IV/PO): 7-14 days Clinical response is expected in 24-48 hours. Antibiotic coverage should be re-assessed if still unwell in 24-48h.				Oral therapy is equally effective to IV therapy. IV therapy is preferred for seriously ill children and for those who cannot take oral therapy. Early antibiotic therapy is necessary to prevent renal damage. Switch to oral therapy once the patient has been afebrile for 24h and able to take oral medications. Obtain renal ultrasound within 6 weeks for 1st UTI in children <6 months old ultrasound and if abnormal, refer to a pediatric nephrologist for further work-up. **Cephalosporins** are not useful if *Enterococcus* is suspected. **Nitrofurantoin** should NOT be used for pyelonephritis and renal sepsis due to poor serum concentrations. According to a Cochrane review on antibiotics for lower urinary tract infection in children (August 2012), "there are insufficient data to answer the question on which type of antibiotic and which duration is most effective to treat symptomatic lower UTI. This review found that

<table>
<tr><th>Etiology</th><th colspan="4">Regimen</th><th>Comments</th></tr>
<tr><td></td><td colspan="4"></td><td>10-day antibiotic treatment is more likely to eliminate bacteria from the urine than single-dose treatments.”</td></tr>
<tr><td colspan="6">UTI, recurrent catheter-related or with co-morbids</td></tr>
<tr><td colspan="6">These patients require a referral to a pediatric infectious disease specialist, a pediatric nephrologist and a pediatric urologist.</td></tr>
<tr><td rowspan="11">Enterobacteriaceae, P. aeruginosa, Enterococcus</td><td rowspan="4">Ceftriaxone
PLUS</td><td>Age</td><td>Weight</td><td>Daily dose</td><td rowspan="11">Use Cefotaxime instead of Ceftriaxone in jaundiced patients. If Pseudomonas is suspected, use Ceftazidime instead of Cefotaxime. Adjust antibiotics depending on the results of the culture. Cephalosporins are not active against Enterococcus.</td></tr>
<tr><td><7d</td><td></td><td>50mg/kg/day q24h</td></tr>
<tr><td>>7d</td><td><2000g</td><td>50mg/kg/day q24h</td></tr>
<tr><td>>7d</td><td>>2000g</td><td>50-75mg/kg/day q24h</td></tr>
<tr><td colspan="3">Infants & children: 50-100 mg/kg/dose q24h</td></tr>
<tr><td rowspan="6">AND/OR
Amikacin</td><td>Age</td><td>Weight</td><td>Daily dose</td></tr>
<tr><td>0-4 weeks</td><td><1200g</td><td>7.5mg/kg/day q24h</td></tr>
<tr><td>≤7d</td><td>1200 - 2000g</td><td>7.5mg/kg/day q24h</td></tr>
<tr><td>≤7d</td><td>>2000g</td><td>7.5-10mg/kg/day q24h</td></tr>
<tr><td>>7d</td><td>1200 - 2000g</td><td>7.5mg/kg/day q24h</td></tr>
<tr><td>>7d</td><td>>2000g</td><td>10 mg/kg/day q24h</td></tr>
<tr><td colspan="3">Infants & children: 15-22.5mg/kg/day or q8h (Max: 24 g/day)</td></tr>
<tr><td colspan="4">Duration: 7-14 days depending on response.</td></tr>
</table>

Etiology	Regimen	Comments
Perinephric abscess		
Enterobacteriaceae, S. aureus	**Oxacillin** 100-200mg/kg/day div q6h ***PLUS*** **Amikacin** 15-22.5mg/kg/day or div q8h (Max: 24 g/day)	Use **Vancomycin** if MRSA is suspected. Refer to specialist for drainage.
Hospital-acquired UTI		
	Ceftazidime 100-150mg/kg/day IV q8h (Max: 6 g/day) ***OR*** **Amikacin** 15mg/kg IV q24h (Max: 24g/day)	Choice should be based on current antimicrobial susceptibility pattern in the institution.
Prophylaxis for Recurrent UTI		
	Nitrofurantoin 1-2mg/kg/day PO in 1-2 div doses (Max: 100 mg/day)	Refer to an infectious disease specialist or nephrologist
Urinary Tract Infection in Adults		
Uncomplicated UTI		
Acute uncomplicated cystitis (AUC): Acute dysuria, frequency, urgency in a non-pregnant, otherwise healthy premenopausal female		
E. coli (75-90%), *S. saprophyticus* (5-15%)	**1st line: Nitrofurantoin** macrocrystals 100mg qid x 5 days ***OR*** **Fosfomycin** 3g x 1 dose sachet in 3-4 oz (or 90-120ml) water [*Note:* **Nitrofurantoin** monohydrate/ macrocrystals (100mg bid) is not locally available.] **2nd line: Cefuroxime** 250mg bid x 7 days ***OR*** **Cefixime** 200mg bid x 7 days ***OR*** **Co-amoxiclav** 625mg bid x 7 days	Empiric treatment is the most cost-effective approach; urinalysis and urine culture not pre-requisites. **Amoxicillin/ampicillin** and **Co-trimoxazole** are not recommended for empiric treatment given the high prevalence of resistance to these agents. **Fluoroquinolones** are considered as reserved drugs because of propensity for collateral damage (e.g., selection for drug-

Etiology	Regimen	Comments
		resistant bacteria); but are efficacious in 3-day regimens. The treatment is the same for otherwise healthy elderly women with AUC.
Acute uncomplicated pyelonephritis: Fever, flank pain, costovertebral angle tenderness, nausea/vomiting, with or without signs or symptoms of cystitis in an otherwise healthy premenopausal female		
As for AUC, *E. coli* is predominant, as well as other *Enterobacteriaceae*	**1st line:** Oral: **Ciprofloxacin** 500mg bid x 7-10 days ***OR*** **Levofloxacin** 750mg daily x 5 days Parenteral: **Ceftriaxone** 1-2g q24h ***OR*** **Ciprofloxacin** 400mg q12h ***OR*** **Levofloxacin** 250-750mg q24h ***OR*** **Amikacin** 15mg/kg q24h ***OR*** **Gentamicin** 3-5mg/kg q24h +/- **Ampicillin** **2nd line:** Oral: **Cefuroxime** 500 mg bid x 14 days ***OR*** **Cefixime** 400 mg daily x 14 days ***OR*** **Co-amoxiclav** 625 mg tid x 14 days (when GS shows Gram+ cocci) Parenteral: **Ampicillin-sulbactam** 1.5g q6h (when GS shows gram-positive cocci) *Reserved for multidrug-resistant organisms:* **Ertapenem** 1g q24h (if ESBL rate >10%) **Piperacillin-tazobactam** 2.25-4.5g q6-8h Switch to oral regimen once afebrile for 24-48 hr. and able to take oral medicines. Tailor antibiotic regimen once culture result available.	Urine analysis, Gram stain, culture and susceptibility tests should be done. Blood cultures are not routinely done unless septic. Consider giving initial IV/IM dose of antibiotic followed by oral regimen in patients not requiring hospitalization. Indications for hospitalization/parenteral regimen: 1. signs of sepsis 2. inability to take oral medications/hydration 3. concern re compliance 4. presence of possible complicating conditions Routine urologic evaluation and imaging not recommended unless still febrile after 72 hr. If clinically responding to treatment, post-treatment urine culture is not recommended.

<table>
<tr><th>Etiology</th><th>Regimen</th><th>Comments</th></tr>
<tr><td colspan="3">Asymptomatic bacteriuria (ASB)</td></tr>
<tr><td colspan="3">Presence of bacteria in the urine without signs and symptoms of UTI.

<u>Diagnosis:</u>
• In women: 2 consecutive voided urine specimens with the same organism in quantitative counts ≥100,000 cfu/mL
• In men: single, clean-catch voided urine with one bacterial species in a quantitative count ≥100,000 cfu/mL
• In both men and women: a single catheterized urine specimen with one bacterial species in a quantitative count ≥100 cfu/mL; pyuria, odor and color of urine not relevant to decision to treat.</td></tr>
<tr><td>Similar to acute uncomplicated cystitis</td><td>No screening and treatment recommended <u>except</u> in:
• pregnant women
• persons undergoing invasive genitourinary tract procedures (likely to cause mucosal bleeding)

DO NOT TREAT ASB in:
• healthy adults
• non-pregnant women
• patients with diabetes mellitus
• elderly patients
• persons with spinal cord injury
• persons with indwelling urinary catheter
• persons with HIV
• persons with urologic abnormalities</td><td>Antibiotics do not decrease asymptomatic bacteriuria or prevent subsequent development of UTI. The optimal screening test is a urine culture. If urine culture not possible, significant pyuria (>10 wbc/hpf) or a positive Gram stain of unspun urine (>2 microorganisms/oif) in two consecutive midstream urine samples may be used to screen for ASB. When indicated, treatment should be culture-guided. A 7-day regimen is recommended.</td></tr>
<tr><td colspan="3">Recurrent UTI in Women</td></tr>
<tr><td colspan="3">≥3 episodes of acute uncomplicated cystitis documented by urine culture in 1 year or ≥ 2 episodes in a 6-month period</td></tr>
<tr><td>Similar to cystitis</td><td>Treat as acute episode for uncomplicated UTI.</td><td>Radiologic or imaging studies not routinely indicated. Screen for urologic abnormalities in:</td></tr>
</table>

Etiology	Regimen	Comments
	Prophylaxis: **Co-trimoxazole** 40/200mg ***OR*** **Nitrofurantoin** 50-100 mg at bedtime for 6-12 mos (continuous prophylaxis) ***OR*** **Co-trimoxazole** 40-80/200-400mg ***OR*** **Nitrofurantoin** 50-100 mg x 1 dose (post-coital) ***OR*** **Co-trimoxazole** 320/1600mg x 1 dose at symptom onset Others: Lactobacilli is not recommended. Cranberry juice and products can be used. For post-menopausal women, intra-vaginal estriol nightly x 2 weeks then twice-weekly for at least 8 months.	• No response to treatment • Gross hematuria/persistent microscopic hematuria • Obstructive symptoms • History of acute pyelonephritis • History of or symptoms suggestive of urolithiasis • History of childhood UTI • Elevated serum creatinine • Infection with urea-splitting bacteria (*Proteus*, *Morganella*, *Providencia*)
UTI in Pregnancy		
Acute Uncomplicated Cystitis in Pregnancy		
E. coli (70%), Other Enterobacteriaceae, Group B *Streptococcus*	Start empiric antibiotic immediately, but pre-treatment urine must be submitted for culture and susceptibility; adjust treatment accordingly. Document clearance of bacteriuria with a repeat urine culture 1-2 weeks post-treatment.	
	Cefalexin 500mg qid x 7 days **Cefuroxime** 500mg bid x 7 days **Cefixime** 200mg bid x 7 days **Nitrofurantoin** macrocrystals 100mg qid x 7 days **Fosfomycin** 3g single-dose sachet **Co-amoxiclav** 625mg bid x 7 days	Use **Nitrofurantoin** from the 2nd trimester to 32 weeks only, if possible, because of potential for birth defects and hemolytic anemia. Avoid **Co-trimoxazole** especially during the first and third trimesters because of risk of teratogenicity and kernicterus. Avoid **Co-amoxiclav** in those at risk of pre-term labor because of potential for neonatal necrotizing

Etiology	Regimen	Comments
		enterocolitis. **Fluoroquinolones** are contraindicated.
Acute Pyelonephritis in Pregnancy		
Similar to acute cystitis in pregnancy	Parenteral: **1st line: Ceftriaxone** 1-2g q24h ***OR*** **Ceftazidime** 2g q8h **2nd line: Ampicillin-Sulbactam** 1.5g q6h (when GS shows gram-positive cocci) Oral: **Cefalexin** 500mg to complete 14 days ***OR*** **Cefuroxime** 500mg bid to complete 14 days ***OR*** **Cefixime** 200mg bid to complete 14 days ***OR*** **Co-amoxiclav** 625mg bid to complete 14 days **Duration:** 14 days	Urinalysis, Gram stain and culture/susceptibility tests should be done. Blood cultures are not routinely done unless septic. Ultrasound of KUB reserved for failure to respond to treatment. Indications for admission: pre-term labor and other indications as listed above for acute uncomplicated pyelonephritis. Switch to oral regimen when afebrile x 48 hrs. and based on culture/susceptibility result. Test of cure with a urine culture post-treatment is essential. Follow up with monthly urine culture until delivery.
Asymptomatic Bacteriuria (ASB) in Pregnancy		
Similar to acute cystitis in pregnancy	Treat ASB to reduce the risks of symptomatic UTI and low birth weight neonates and preterm infants. Choice of regimen is based on culture/susceptibility test result.	Note caveats for use of **Nitrofurantoin** and **Co-amoxiclav**. Screen all pregnant women for ASB once between the 9th and 17th week, preferably

Etiology	Regimen	Comments
	Cefalexin 500mg qid x 7 days ***OR*** **Cefuroxime** 500mg bid x 7 days ***OR*** **Nitrofurantoin** macrocrystals 100mg qid x 7 days ***OR*** **Fosfomycin** 3g single-dose sachet ***OR*** **Co-amoxiclav** 625mg bid x 7 days	during the 16th week. The standard urine culture/susceptibility is the test of choice. Urinalysis is inadequate for ASB screening. Do follow-up urine culture 1-week post-treatment and monitor every trimester until delivery.
Complicated UTI		
Significant bacteriuria plus clinical symptoms occurring in the setting of functional or anatomic abnormalities of the urinary tract; presence of an underlying disease that interferes with host defense mechanisms; or any condition that increases the risk of persistent infection and/or treatment failure. Cut-off for significant bacteriuria in cUTI is 100,000 cfu/mL; may be lower in certain clinical situations, such as in catheterized patients.		
More varied and may include drug – resistant organisms (e.g., ESBL-producing *E. coli*), *P. aeruginosa* and enterococci	Oral: **Ciprofloxacin** 500-750mg bid ***OR*** **Levofloxacin** 500-750mg daily ***OR*** **Co-amoxiclav** 625mg tid **or** 1g bid Parenteral: **Amikacin** 15mg/kg q24h ***OR*** **Gentamicin** 3-5mg/kg q24h ***OR*** **Piperacillin-tazobactam** 2.25-4.5g q6-8h ***OR*** **Ertapenem** 1g q24h ***OR*** **Meropenem** 1g q8h **Duration**: 7-14 days Start with parenteral broad-spectrum antibiotic for severely ill patients, and then switch to an oral regimen/ deescalate when there is clinical improvement.	Always obtain urine for Gram stain, culture and susceptibility prior to start of treatment, and adjust regimen as needed based on culture result. Ancillary diagnostic tests such as imaging of the urinary tract (CT or ultrasound) are often warranted. Repeat urine culture 1-2 weeks post-treatment. Referral to a specialist often warranted.

Etiology	Regimen	Comments
Catheter-Associated UTI (CAUTI)		
More varied and may include drug – resistant organisms (e.g., ESBL-producing *E. coli*), *P. aeruginosa* and enterococci	**Amikacin** 15mg/kg IV q24h ***OR*** **Ertapenem** 1g IV q24h ***OR*** **Meropenem** 1g IV q8h ***OR*** **Cefepime** 1-2g IV q8-12h ***OR*** **Ceftazidime** 1-2g IV q8h ***OR*** **Piperacillin-tazobactam** 4.g IV q8h For susceptible enterococcal infection: **Ampicillin** 1-2g IV q6h For mild infections with no previous 3rd gen. **Cephalosporin** or **Fluoroquinolone** use: **Levofloxacin** 750mg IV/PO q24h **Duration:** 7 days w/ prompt resolution of signs and symptoms; 10-14 days of antibiotic treatment for patients with delayed response	Pyuria, odorous or cloudy urine alone is not an indication for initiating antibiotics. Whenever possible, **remove indwelling catheter**; if still needed, replace with a new catheter and obtain urine for Gram stain and culture/ susceptibility test prior to initiating treatment. **DO NOT obtain urine for culture if asymptomatic.** Choice of empiric antibiotics is institution-specific depending on the local susceptibility patterns and severity of illness.
Candiduria		
Asymptomatic Candiduria		
Candida sp. in urine almost always represents colonization; more often in the elderly, female, diabetic, w/ indwelling urinary device, w/ prior surgical procedure, and taking antibiotics; colony count and presence of pyuria not helpful in differentiating colonization from infection.		
	No treatment indicated Exceptions: When undergoing urologic procedure, treat with oral **Fluconazole** 400mg (6 mg/kg) pre-and post-procedure. Treat also those at risk for dissemination (e.g., neutropenic patients).	Elimination of risk factors (ex. indwelling urinary catheter) usually adequate to clear candiduria.
Symptomatic Cystitis		
Most common etiologic agent: *C. albicans*	**Fluconazole** 200-400mg PO daily x 2 weeks	Do ultrasound or CT of kidneys if candiduria persists in immunocompromised patients.

Etiology	Regimen	Comments
	For fluconazole-resistant Candida (*C. krusei* or *glabrata*): **AmB deoxycholate** 0.3-0.6mg/kg/day x 1-7 days	
Pyelonephritis		
Most common etiologic agent: *C. albicans*	**Fluconazole** 200 mg PO daily x 2 wks. For fluconazole-resistant *Candida* (*C. krusei* or *C. glabrata*): **AmB deoxycholate** 0.3-0.6 mg/kg/day x 1-7 days	Consider surgical intervention to relieve obstruction if any (e.g., fungus ball). If disseminated disease suspected, treat as if bloodstream infection is present.
Bacterial Prostatitis		
Most cases of bacterial prostatitis are preceded by a urinary tract infection. Risk factors: urinary tract instrumentation, urethral stricture, or urethritis (usually due to sexually transmitted pathogens)		
Acute Bacterial Prostatitis (ABP) without risk of STD		
Enterobacteriaceae, enterococci, P. aeruginosa	**1st line: Ciprofloxacin** 500mg PO or 400mg IV bid ***OR* Levofloxacin** 500-750mg IV/PO daily If enterococcus is suspected/documented: **Ampicillin** 1-2g IV q4h; **Vancomycin** 15mg/kg IV q12h (if ampicillin resistant) **2nd line: Co-trimoxazole** 160/800mg bid ***OR* Piperacillin-tazobactam** 4.5g IV q6-8h **Duration:** 2 weeks; extend to 4 weeks if patient still symptomatic.	Do CBC, blood cultures, urinalysis and urine culture. **Caveat:** *E. coli* resistance to **Co-trimoxazole** is high so **Co-trimoxazole** cannot be 1st line empiric treatment despite its high prostatic concentration.

Etiology	Regimen	Comments
ABP with risk of STD		
N. gonorrhoeae and *C. trachomatis*	**Ceftriaxone** 250mg IM x 1 dose ***PLUS*** **Doxycycline** 100mg bid ***OR*** **Azithromycin** 500 mg PO daily **Duration:** 2 weeks	**Fluoroquinolones** not recommended for gonococcal infection.
ABP with risk of Antibiotic-Resistant Pathogens		
Fluoroquinolone-resistant *Enterobacteriaceae* and *Pseudomonas*, ESBL or AmpC beta lactamase-producing *Enterobacteriaceae*	**1st line: Ertapenem** 1g IV daily ***OR*** **Meropenem** 1g IV q8h (for *Pseudomonas*) **2nd line: Cefepime** 2g IV q12h	Consider a 4-week regimen.
Complicated ABP (e.g., bacteremia or suspected prostatic abscess)		
Enterobacteriaceae, enterococci, P. aeruginosa	**1st line: Ciprofloxacin** 400mg IV q12h ***OR*** **Levofloxacin** 750mg IV q24h **2nd line: Ceftriaxone** 1-2g IV q24h ***PLUS*** **Levofloxacin** 750mg IV q24h ***OR*** **Ertapenem** 1g IV q24h ***OR*** **Piperacillin-tazobactam** 4.5g IV q8h **Duration:** 4 weeks	Obtain blood cultures. Consider genitourinary imaging. Drain abscess. Switch to oral regimen once bacteremia has cleared and abscess is drained.
Chronic Bacterial Prostatitis (CBP)		
Prolonged urogenital symptoms (i.e., >3 months) Hallmark: relapsing UTI		

Etiology	Regimen	Comments
Enterobacteriaceae, enterococci, *P. aeruginosa*	**1st line: Ciprofloxacin** 400mg IV q12h ***OR* Levofloxacin** 750 mg IV q24h **2nd line: Co-trimoxazole** 160/800mg bid **Duration**: 4-6 weeks	If refractory, options are: • treat intermittently for symptomatic episodes; • suppressive treatment; or • prostatectomy if all other options have failed.

REFERENCES

Antimicrobial Resistance Surveillance Laboratory, Department of Health. Antimicrobial Resistance Surveillance Program 2015 Annual Report, Manila, Philippines 2016. Accessed at http://arsp.com.ph/wp-content/uploads/2016/06/2015-ARSP-annual-report-summary_1.pdf on September 7, 2016

Bay AG, Anacleto F. Clinical and Laboratory Profile of Urinary Tract Infection Among Children at The Outpatient Clinic of A Tertiary Hospital. PIDSP Journal 2010;11(1):10-16.

Bravo LC, Gatchalian SR, Gonzales ML, Maramba-Lazarte CC, Ong-Lim AT, Pagcatipunan MR, delos Reyes CA. Hand book of Pediatric Infectious Diseases 2012, 5th edition. Manila: Section of Infectious and Tropical Diseases; 2012.

Gilbert DN, Chambers HF, Eliopoulis GM, Saag MS, Pavia AT, Black DB, Freedman DO, Kim K, Schwartz BS editors. Sanford Guide to Antimicrobial Therapy 2016. VA: Antimicrobial Therapy, Inc.; 2016.

Gupta K, Hooton TM, Naber KG, et al. International clinical practice guidelines for the treatment of acute uncomplicated cystitis and pyelonephritis in women: a 2010 update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. Clin Infect Dis 2011; 52: e103 -e120.

Hooton TM, Bradley SF, Cardenas DD, et al. Diagnosis, Prevention, and Treatment of Catheter-Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America. Clin Infect Dis 2010;50 (5): 625-663

Hsueh P, Hoban D, Carmeli Y, et al. Consensus review of the epidemiology and appropriate antimicrobial therapy of complicated urinary tract infections in Asia-Pacific region. Journal of Infection (2011) 63, 114 -123

Lipsky BA, Byren I, Hoey CT. Treatment of Bacterial Prostatitis. Clin Infect Dis 2010; 50:1641.

Maramba-Lazarte CC, Bunyi MAC, Gallardo EE, Lim JG, Lobo JJ, Aguilar CY. Etiology of neonatal sepsis in five urban hospitals in the Philippines. PIDSP J 2011; 12(2): 75-85.

National Institute for Health and Care Excellence. Urinary Tract infection in Children: Diagnosis, Treatment and Long-term Management. NICE guideline 54 accessed on 7/13/15 at nice.org.uk/cg54

NICE Clinical Guidelines 54, Urinary Tract Infection in Children: Diagnosis, Treatment and Long-Term Management, 2007. Available at: http://guidance.nice.org.uk/cg54. Accessed on July 13, 2015.

Philippine Clinical Practice Guidelines on the Diagnosis and Management of Urinary Tract Infections in Adults 2013 Update. Quezon City: Philippine Society of Microbiology and Infectious Diseases; 2013.

Research Institute for Tropical Medicine. Antimicrobial Resistance Surveillance Program 2014 Annual Report. Muntinlupa: Research Institute for Tropical Medicine; 2015.

Roberts KB. Revised AAP Guideline on UTI in Febrile Infants and Young Children. Am Family Phys 2012;86(10):940-946.

Shaikh N, Hoberman. Urinary tract infections in infants older than one month and young children: acute management, imaging and prognosis. UpToDate last updated August 25, 2016

FILARIASIS (SELECTIVE TREATMENT)

For patients (+) for microfilariae in nocturnal blood examination (NBE) or Immunochromatographic test (ICT)

Etiology	Regimen	Comments
Roundworms of the Filarioidea type. Lymphatic filariasis is caused by the worms *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*. These worms occupy the lymphatic system, including the lymph nodes; in chronic cases, these worms lead to the syndrome of elephantiasis.	**Mass Drug Administration for individuals 2 years old and above living in all established endemic areas** **Diethycarbamazine Citrate (DEC)** 6mg/kg body with **Albendazole** 400 mg tablet as single dose given once annually for at least 5 years **Selective Treatment for patients positive for microfilariae in nocturnal blood examination or rapid diagnostic test, is a 12-day treatment:** **On Day 1: DEC** 6mg/kg div in 3 doses (after meals) ***PLUS*** **Albendazole** 400mg **On Day 2 to Day 12: DEC** 6mg/kg div in 3 doses Tablets should be given within 2 hours after a meal. **DEC** is free and only available at DOH Central office and government health facilities in endemic areas.	Precautions: • Treatment of pregnant women should be deferred until after delivery. • Treatment is contraindicated in individuals with severe cardiac and kidney diseases. • Individual with asthma, seizure disorders or severe malnutrition should be treated with caution. Do not initiate treatment when patient has asthma attack. Treat asthma first before taking antifilarial drugs. • If patient is <2 years old, refer to specialist. Adverse Reactions • ***Localized****:* Pain, inflammation, and tenderness of nodules, adenitis, lymphangitis due to death of adult filarial worms. Usually begins 2-4 days after the first dose of **DEC**. • ***Systemic****:* Fever, headache, malaise, myalgia and hematuria occur due to death of microfilariae. Usually begin from few to 48 hours after taking **DEC** and are usually self-limited.

For more information regarding the mass drug administration of the program of the DOH, please refer to the website, www.doh.gov.ph.

REFERENCE: Department of Health. Guidelines for the Implementation of the National Filariasis Elimination Program, 2009. Manila: National Filariasis Elimination Program National Center for Disease Prevention and Control; 2009.

LEPROSY

<table>
<tr><th>Etiology</th><th colspan="4">Regimen</th><th>Comments</th></tr>
<tr><td rowspan="8">A chronic disease caused by Mycobacterium leprae that affects the skin, peripheral nerves, upper respiratory tract mucosa and eyes, is curable by multidrug therapy (MDT). When untreated it can cause permanent and progressive damage to the affected organs.</td><td colspan="2"></td><td>Monthly: Day 1</td><td>Daily: Days 2-28</td><td rowspan="8">When it has been determined that a leprosy patient needs MDT, take the following steps:
Step 1: Determine the type of MDT required: paucibacillary (PB) or multibacillary (MB).
Step 2: Determine the required dose level: adult or pediatric.
Step 3: Before the start of treatment, provide the patient, the family members or other treatment partner with orientation counseling:
• Regular treatment is necessary e.g., Leprosy is a curable infection. Take medication regularly and have monthly checkups.
• Leprosy possibly can have complication that will need other treatments.
• The health center or clinic is always ready to see them if they have any problems.
Step 4: Give the first dose of treatment and explain how to take treatment at home. Treatment rapidly kills the leprosy bacilli and renders the patient non-infectious.</td></tr>
<tr><td>Pedia</td><td><10</td><td>Rifampicin 10mg/kg BW
Clofazimine 6 mg/kg BW</td><td>Clofazimine 1mg/kg BW
Dapsone 2mg/kg BW</td></tr>
<tr><td>MB Pedia</td><td>10-14</td><td>Rifampicin 450 mg
Clofazimine 150 mg
Dapsone 50 mg</td><td>Clofazimine 50 mg every other day
Dapsone 50 mg</td></tr>
<tr><td>MB Adult</td><td>≥15</td><td>Rifampicin 600 mg
Clofazimine 300 mg
Dapsone 100 mg</td><td>Clofazimine 50 mg
Dapsone 100 mg</td></tr>
<tr><td colspan="2"></td><td colspan="2">Duration: 12 blister packs to be taken monthly within a maximum period of 18 months. Lapses in taking MDT should be <3 months.</td></tr>
<tr><td>PB Pedia</td><td>10-14</td><td>Rifampicin 450 mg
Dapsone 50 mg</td><td>Dapsone 50 mg</td></tr>
<tr><td>PB Adult</td><td>≥15</td><td>Rifampicin 450 mg
Dapsone 50 mg</td><td>Dapsone 50 mg</td></tr>
<tr><td colspan="2"></td><td colspan="2">Duration: 6 blister packs to be taken monthly within a maximum period of 9 months. Lapses in taking MDT should be <1 month.</td></tr>
<tr><td colspan="5">A patient with a high baseline average bacillary index (BI of +4 to +6) may need more than 12 months of treatment. A poor response to treatment is defined as a less than +1 reduction in average BI after 12 months of MBMDT. This decision may only be taken by specialists at referral units. Lepra reactions may occur before, during, and after</td></tr>
</table>

Etiology	Regimen	Comments
	treatment. These complications should be detected and treated early. The treatment of leprosy should still be continued during lepra reactions.	

REFERENCES

Department of Health. National Leprosy Control Programme Manual of Procedures, 2016. Manila: Department of Health; 2016.

World Health Organization. Global Leprosy Strategy 2016–2020: Accelerating towards a leprosy-free world. Operational Manual. Geneva: World Health Organization; 2016.

MALARIA

The objectives of antimalarial treatment are to prevent severe malaria and, for patients residing in endemic areas, to interrupt transmission via anopheline vectors, among others. The National Malaria Program aims to eliminate the disease by 2030; thus, compliance to guidelines and treatment with highly effective drugs are critical. Response to malaria treatment must be monitored with daily blood film microscopy until the end of administration of the first line drugs, then weekly until the 28th day after the start of treatment. The second line drug is administered when asexual forms of the parasite are detected in blood films during this specified period. Recurrence of asexual parasitemia with the first line drugs must also be immediately reported to the Department of Health.

Etiology	Regimen	Comments
Uncomplicated *Plasmodium falciparum* or *P. malariae*		
Plasmodium falciparum or *P. malariae*	**Pediatric:** <6 mos: **Quinine** 10mg salt/kg q8h X 7 days ***PLUS*** **Clindamycin** 10mg/kg bid x 7 days 6-11 months: **Artemether–lumefantrine (AL)** (20mg/120mg) combination **(Coartem)** On day 1, 1 tab followed by 1 tab after 8h; then 1 tab bid for days 2-3 **Children and Adult:** **1st line:** **AL** 20mg/120mg PO div in 6 doses in 56 hours – give dose 1 and dose 2 q8h then dose 2 and dose 3 until dose 6 q12h. ***PLUS*** **Primaquine** (15 mg/tab) 0.25mg base/kg on dose 1 *For adults >60 kg*: 3 tabs **2nd line:** Pediatric: **Quinine sulfate** 10mg salt/kg q8h x 7 days ***PLUS*** **Clindamycin** 10mg/kg bid x 7 days	Advise patients to take **AL** with milk or fat-containing food (*gata* or coconut milk, *buko* or *suman sa latik*, and cookies), particularly on the second and third days of treatment. Considering that **Lumefantrine** is highly lipophilic, its absorption is enhanced by co-administration of fat. Low blood levels with resultant treatment failure could potentially result from inadequate fat intake. Repeat administration of the first dosage in the event of vomiting within one hour of administration. Do not give **AL** to infants less than 6 months or less than 5 kg. Do not give **Primaquine** to infants below 1 year old. Obtain past medical and family histories of G6PD deficiency before

Etiology	Regimen	Comments
	Adult: **Quinine sulfate** 10mg salt/kg q8h x 7 days ***PLUS*** **Clindamycin** 10mg/kg bid x 7 days ***OR*** **Tetracycline** 250mg qid x 7 days ***OR*** **Doxycycline** 3mg/kg/day x 7 days ***PLUS*** **Primaquine** (15mg/tab) 0.25mg-base/kg on dose 1 (pediatric and adult). *For adults >60kg:* 3 tabs	administration of **Primaquine**. The normal G6P level for adults is 5.5 to 20.5 units/gram of hemoglobin. If the G6PD status cannot be documented when required withhold **Primaquine** administration. Do not give **Primaquine** to patients with G6PD deficiency. See **Doxycycline** precaution below. Closely monitor infants for side effects such as methemoglobinemia, hemolytic anemia, hemoglobinuria in G6PD deficiency neutropenia, and renal dysfunction.
Severe *Plasmodium falciparum or P. malariae*		
Plasmodium falciparum or *P. malariae*	**1st line:** Pediatric: For children <20 kg: 3mg/kg per dose IV or IM **Artesunate (AS)** powder dissolved in 5% **NaHCO3**. Diluted in 5mL D5W IV drip or IM (anterior thigh; WHO 2015) Adult: **AS** IV or IM 2.4mg/kg/dose. Give 3 IV/IM doses q12h. Shift to oral **AL** once patient can tolerate oral medicines ***AND*** **Primaquine** (15 mg/tab) 0.25 mg-base/kg on dose 1 if patient can tolerate oral medicines (pediatric and adult). For adults >60 kg: 3 tabs **2nd line:** Parenteral **Quinine Dihydrochloride** Infusion	Concomitant management of complications of severe *P. falciparum* malaria should be done, e.g., hyperpyrexia, convulsions, hypoglycemia, severe anemia, pulmonary edema and respiratory failure, acute renal failure, bleeding. **AS** suppository is strictly used as a pre-referral drug when travel time from the initial diagnosing facility lasts longer than 1 hour to the next referral point. The use of **AS** suppository is limited to 12 years of age or younger. If referral is impossible, continue the

Etiology	Regimen	Comments
	Pediatric: **≤7 years:** 10 mg salt/kg in IV drip for 4h as loading dose, then 10mg salt/kg IV drip q12h as maintenance dose **8-16 years:** 15mg salt/kg IV drip for 4h in 10mL/kg D5W or 0.9 **NaCl** (infusion rate must not exceed 5mg/kg/h) as loading dose, then 10mg salt/kg IV drip for 4h q8h as maintenance dose ***PLUS*** **Clindamycin** 10mg/kg bid x 7 days Adult: 20mg salt/kg in 500 mL D5W or 0.9 NaCl for 4h IV drip (total dose not to exceed 2,000 mg), then 10mg salt/ kg in 0.9NaCl or D5W IV drip for 4h q8h as maintenance dose. Shift to oral **AL** once patient can tolerate ***PLUS*** **Clindamycin** 10 mg/kg bid x 7 days ***OR*** **Tetracycline** 3mg/kg/day x 7 days ***OR*** **Doxycycline** 250 mg qid x 7 days **2nd line:** for pre-referral to hospital **AS** suppository (pediatric) 10mg/kg	application of **AS** using one to two thirds of the initial dose as maintenance dose until the patient can tolerate oral medication at which point, treatment with **AL** and **Primaquine** according to schedule for uncomplicated *P. falciparum* in adults. **Precautions when using Doxycycline:** • Avoid during pregnancy unless benefit outweighs risks; consider alternatives. • Skin, nail, eye, tooth or gum discoloration may occur. • Diarrhea may occur. • It may reduce the efficacy of oral contraceptive pills. Consider other contraceptive options. • May cause photosensitivity. Avoid sun exposure. • May cause increased intracranial pressure. Watch out for headache, blurred vision, or changes in vision. May cause autoimmune reactions. Watch out for fever, rash, joint pain, or tiredness.
Congenital and Neonatal *Plasmodium falciparum* or *P. malariae*		
Plasmodium falciparum or *P. malariae*	**Chloroquine** 10mg/kg on days 1-2, and 5 mg/kg on day 3	

Etiology	Regimen	Comments
Uncomplicated *Plasmodium vivax or P. ovale*		
	1st line: Pediatric and Adult: **Chloroquine** 10mg/kg on days 1-2, then 5mg/kg on day 3 ***PLUS*** **Primaquine** 0.25mg base/kg/day x 1 dose for 1-14 days **2nd line:** Pediatric: **AL** 20mg/120mg div in 6 doses in 56 hours – give dose 1 and dose 2 q8h then dose 2 and dose 3 until dose 6 q12h ***PLUS*** **Primaquine** tablet 0.25mg-base/kg starting on day 1 Adult: **AL** (20mg/120mg) combination on day 1, 4 tabs followed by 4 tabs after 8h, then 4 tabs bid for days 2-3 ***PLUS*** **Primaquine** tablet 0.25mg-base/kg on days 1-14 For patients with G6PD-deficiency: those with mild deficiency may receive a dose of 0.75 mg/kg once a week for 8 weeks.	**Primaquine** should be taken with meals (causes abdominal discomfort taken on an empty stomach). Do not give **Primaquine** to patients with G6PD-deficiency. If the patient has a history of recent travel to Africa or Papua New Guinea, the patient is started on **AL** 20-120mg because of the documented resistance of chloroquine resistance in these areas. If the patient is a locally-transmitted or indigenous case, the patient is given **Chloroquine** (see regimen for dosage). If the patient has a history of previous *vivax* infection within 30 months of the current consultation and there is no history of *vivax* or *ovale* transmission in the area where he/she resides OR if there is no history of any recent travels to any other areas currently with *vivax* or *ovale* transmission, then v*ivax* relapse may be entertained. There is currently no laboratory procedure available locally which could diagnose relapse except if phenotyping of the

Etiology	Regimen	Comments
		vivax species is done. These patients are also started on **AL** 20-120mg. **Primaquine** is given at 0.25mg/kgBW to start on d1-14 unless contra-indication exists (children below 12 mos, pregnant or lactating women where the G6PD status of the nursing infant is unknown).
Relapse *Plasmodium vivax or P. ovale*		
Chloroquine- and **Primaquine**-tolerant *vivax* is known to exist in nearby countries particularly in East Timor, Indonesia, Papua New Guinea, Myanmar and Thailand. If recurrence of parasitemia is within 28 days after the start of **Chloroquine**, the patient is treated with **Artemether–Lumefantrine**. Relapse must be distinguished from recrudescence. Relapse is associated with *P. vivax* or *P. ovale* and refers to infections resulting from activation of hypnozoites. Its occurrence within 28 days of an initial infection/diagnosis is unlikely. Recrudescence refers to persistence or re-appearance of parasitemia in a patient within 28 days of the initial diagnosis it is an indication of treatment failure. It is counted as the same case.		
Relapse refers to recurrence of parasitemia due to hypnozoites of *P. vivax* with laboratory confirmation.	**Chloroquine** 10mg/kg BW for days 1-2, and 5 mg/kg BW on day 3 ***OR*** **AL** for 3 days (see regimen for uncomplicated *vivax* malaria) ***PLUS*** **Primaquine** 0.75mg/kg/day on days 1-14 (Max: 30–45 mg/d) (do not give if patient is G6PD deficient) For previously treated with Chloroquine based on previous treatment records: give **AL** 20-120mg oral in 6 doses within 3 days then give 0.25mg **Primaquine** to start on day 1.	For Falciparum recrudescence (persistence of asexual malaria parasites following treatment) following investigation into alleged cause of treatment failure, patient is admitted and treated as a severe malaria case with IV **AS**.

Etiology	Regimen	Comments
Severe *Plasmodium vivax or P. ovale*		
Plasmodium vivax or P. ovale	Pediatric: **1st line:** For children <20kg – 3mg/kg BW per dose IV or IM **AS** powder dissolved in **5% NaHCO3**. Diluted in 5ml D5W IV drip or IM (anterior thigh; WHO 2015) **2nd line:** Parenteral **Quinine dihydrochloride** Infusion <*7y:* 10mg salt/kg in IV drip for 4h as loading dose, then 10mg salt/kg IV drip q12h as maintenance dose *8y-16y:* 15mg salt/kg IV drip for 4h in 10mL/kg D5W or 0.9 NaCl (Max infusion rate: 5mg/kg/hour) as loading dose, then 10mg salt/kg IV drip for 4h q8h as maintenance dose. ***PLUS* Clindamycin** 10mg/kg bid x 7 days Adult: **Artesunate** IV or IM 2.4 mg/kg/dose. Give for at least 24 hours. Shift to oral **Artemether-Lumefantrine** once patient can tolerate oral medicines, to complete three days of treatment *If patient can tolerate oral medications, shift to:* Pediatric: **Artemether–Lumefantrine** 20mg/120mg div 6 doses in 56 hours – give dose 1 and dose 2 q8h then dose 2 and dose 3 until dose 6 q12h Adult: **Artemether–Lumefantrine** 20 mg/120 mg combination on day 1, 4 tabs followed by 4 tabs after 8h, then 4 tabs bid for days 2 and 3 ***PLUS* Primaquine** tablet 0.25 mg-base/kg starting on day 1	Management is similar to that of severe *falciparum* malaria.

Etiology	Regimen	Comments
Plasmodium knowlesi		
Plasmodium knowlesi	Pediatric: **Artemether–Lumefantrine** 20mg/120mg div 6 doses in 56 hours – give dose 1 and dose 2 q8h then dose 2 and dose 3 until dose 6 q12h Adult: **Artemether–Lumefantrine** 20 mg/120 mg combination on day 1, 4 tabs and 4 tabs after 8h, then 4 tabs bid for days 2 and 3	Definite diagnosis for *P. knowlesi* is by PCR. By microscopy, it is usually mistaken for *P. malariae* or even *P. vivax*; and infrequently, *P. falciparum*.
Mixed Infections		
Plasmodium falciparum and *P. vivax* with/ without *P. malariae*	Pediatric: **Artemether–Lumefantrine** ***PLUS*** **Primaquine** tablet 0.25 mg-base/kg starting on days 1-14 Adult: **Artemether–Lumefantrine** (20mg/120mg) combination on day 1, 4 tabs followed by 4 tabs after 8h, then 4 tabs bid for days 2-3 ***PLUS*** **Primaquine** tablet 0.25mg-base/kg starting on days 1-14	
Plasmodium vivax and *P. malariae*	Pediatric and Adult: **Chloroquine** tablet 10 mg/kg on days 1-2, then 5 mg/kg on day 3 ***PLUS*** **Primaquine** 0.25 mg base/kg/day for days 1-14	
Pregnant and Lactating Women		
Uncomplicated *Plasmodium Falciparum*		
Plasmodium Falciparum	Pregnant: *On the first trimester of pregnancy:* **Quinine sulphate** 10mg/kg q8h x 7 days ***PLUS*** **Clindamycin** 10mg/kg bid x 7 days	Withhold **Primaquine** during the entire period of pregnancy.

Etiology	Regimen	Comments
	On the second to the third trimester: **Artemether–Lumefantrine** 20mg/120mg may be given div in 6 doses in 56 hours – give dose 1 and dose 2 q8h then dose 2 and dose 3 until dose 6 q12h Lactating: ***ADD*** **Primaquine** 0.25mg/kg, single dose on day 1 to the above regimen	Give **Primaquine** 2 weeks after delivery until G6PD status is ascertained. **Chloroquine**, **Quinine** and **Primaquine** are secreted in the breast milk in amounts that are not harmful to the infant and in insufficient amounts to provide protection against malaria.
Severe *Plasmodium Falciparum*		
	Pregnant: **Quinine Dihydrochloride** 20mg/kg infused over 4h (in 500 mL 5% dextrose water or 0.9% saline) as loading dose and 10mg/kg q8h infused over 2-4 hours as maintenance dose. If patient can already tolerate oral meds, shift to oral **Quinine Sulphate** (10mg/kg q8h) to complete 7 days at the same dose ***PLUS*** **Clindamycin** 10mg/kg IV bid; shift to oral **Clindamycin** as soon as patient tolerates it at the same dose to complete 7 days. Lactating: ***ADD*** **Primaquine** 0.25mg/kg, single dose after 7 days of **Clindamycin**, to the above regimen.	If **Quinine** Plus is not available, give **AL** only if the patient is on the 2nd and 3rd trimester according to the guidelines for uncomplicated *P. falciparum.* While **AL** is contraindicated during the first trimester, give it as the last resort for pregnant women during the 1st trimester with patient's informed consent when **Quinine** is not available. Withhold **Primaquine** during the entire period of pregnancy but give it 2 weeks after delivery in single dose at 0.75mg/kg.

Etiology	Regimen	Comments
Acute *Plasmodium vivax*		
	Pregnant: **Chloroquine** tab 10mg/kg on days 1-2, and 0.5 mg/kg on day 3 Lactating: ***ADD*** **Primaquine** 0.25mg/kg, single dose on day 1 to the above regimen.	Withhold **Primaquine** during the entire period of pregnancy but give it 2 weeks after delivery at 0.25 mg/kg/day for 14 days. For breastfeeding women, give **Primaquine** only if their infant is confirmed to be non-G6PD-deficient. For a list of newborn screening coordinators, refer to the DOH website http://www.doh.gov.ph/newbornscreening
Relapse *Plasmodium vivax*		
	Pregnant: **Chloroquine** 150mg base/tab 2 tabs per week for 8 weeks Lactating: ***ADD*** **Primaquine** 0.25mg/kg body weight per day (mmax:30-45 mg/ day) beginning days 1-14 to the above regimen	Withhold **Primaquine** during the entire period of pregnancy but give it 2 weeks after delivery at 0.5-0.75 mg/kg/ day (maximum of 30-45 mg/d) for 14 days.
Plasmodium ovale		
Plasmodium ovale	Pregnant: **Chloroquine** tab 10mg/kg on days 1-2, and 0.5 mg/kg on d3 Lactating: ***ADD*** **Primaquine** 0.25mg/kg/day beginning day 1 to 14 to the above regimen.	Withhold **Primaquine** during the entire period of pregnancy but give it 2 weeks after delivery at 0.5 mg/kg/day for 14 days.

Etiology	Regimen	Comments
Plasmodium malariae		
Plasmodium malariae	Pregnant: **Chloroquine** tab 10mg/kg on days 1-2, and 5 mg/kg on day 3 Lactating: **Chloroquine** tab 10mg/kg on days 1-2, and 0.75 mg/kg on day 3 ***PLUS*** **Primaquine** 0.25mg/kg X 1 dose on day 1 to the above regimen	Withhold **Primaquine** during the entire period of pregnancy but give it 2 weeks after delivery in a single dose of 0.75 mg/kg.
Mixed Infections		
	Pregnant: **Quinine Sulphate** 10mg/kg q8h x 7 days ***PLUS*** **Clindamycin** 10mg/kg bid x 7 days Lactating: ***ADD*** **Primaquine** 0.25mg/kg, x 1 dose on day 1 to the above regimen If **Quinine** + **Clindamycin** is not available, and if the patient is on the second or third trimester: **AL** (20mg/120mg) combination <35 kg: 3 tabs on day 1 and 8 h after, 3 tabs bid on days 2-3 > 35 kg: 4 tabs on day 1 and 8 h after, 4 tabs bid on days 2-3 ***PLUS*** **Primaquine** Pregnant: withhold until delivery Post-partum/lactating women: 0.25 mg/kg/day on days 1-14	

Etiology	Regimen	Comments
Chemoprophylaxis		
DOH is advisory on the matter and not prescriptive. Patients are given the entire spectrum of preventive measures they may undertyake including chemoprophylaxis. The patient is further assisted by assessing the relative risk of disease acquisition given the (a) reasons for travel, (b) relative length of stay in the endemic area.		

REFERENCES

Department of Health. (2014). National Malaria Control Program: Manual of Operations, 5th edition.

World Health Organization. (2015). *Guidelines for the Treatment of Malaria*, 3rd edition. Geneva: WHO.

DOH PUBLIC HEALTH PROGRAMS: SCHISTOSOMIASIS

SCHISTOSOMIASIS [Selective Treatment (Passive or Active Surveillance)]

Supported by a positive result on kato katz for *Schistosoma japonicum* ova by stool exam and or rectal imprint

Etiology	Regimen	Comments
Schistomes, the most common in the Philippines being *S. japonicum.*	**Praziquantel** 40 mg/kg/day div in 2-3 doses x 1 day Dose is increased to 60 mg/kg in neuroschistosomiasis. **Praziquantel** is free and only available at the DOH Central office and government health facilities in endemic areas.	This regimen may also be given for hepato-intestinal schistosomiasis and pulmonary schistosomiasis. **Praziquantel** should be given on a full stomach. Follow up treatment of confirmed cases 1 month later because **Praziquantel** does not kill developing worms. Observe patients for 1 to 3 hours for possible adverse reactions, such as headache, dizziness, abdominal discomfort, and less commonly, nausea, vomiting, diarrhea, fever and urticaria. Instruct them afterwards to watch out for these reactions for 24 hours. Supportive treatment may be given to relieve adverse reactions as appropriate. Indications of hospital referral: • Presence of complications, such as periportal fibrosis, splenomegaly with hypersplenism, development of portosystemic collateral blood vessels, cor pulmonale, or glomerulonephritis • CNS schistosomiasis (patients with seizures, focal neurologic deficit, or signs of increased intracranial pressure or diffuse encephalitis). For more information regarding the mass drug administration of the program of the DOH, please refer to the website, www.doh.gov.ph.

REFERENCE: Department of Health. Clinical Practice Guidelines for the Diagnosis, Treatment and Prevention of *Schistosoma japonicum* Infections in the Philippines: 2013 Update.

SEXUALLY TRANSMITTED INFECTIONS

Etiology	Regimen	Comments
Pelvic Infections		
Pelvic Inflammatory Disease (PID) comprises a spectrum of inflammatory disorders of the upper female genital tract, including any combination of endometritis, salpingitis, tubo-ovarian abscess, and pelvic peritonitis. Presumptive treatment should be initiated in sexually active young women and other women at risk for STIs if: • with pelvic or lower abdominal pain • no cause for the illness other than PID can be identified • one or more of the following minimum clinical criteria are present on pelvic exam: cervical motion tenderness, uterine tenderness or adnexal tenderness Screen for trichomoniasis, bacterial vaginosis, and syphilis.		
N. gonorrhoeae; C. trachomatis; Bacteroides*;* Enterobacteriaceae*; G. vaginalis; H. influenzae;* Enteric Gram-negative rods; *S. agalactiae;* Cytomegalovirus (CMV); *M. hominis; U. urealyticum; M. genitalium*	Parenteral: if with uncertain diagnosis, presence of tubo-ovarian abscess, pregnancy, HIV infection, fever >38.5˚C, nausea and vomiting precluding use of oral medications, lack of improvement after 48h of oral antibiotic **1st line: Cefoxitin** 2g IV q6h ***PLUS*** **Doxycycline** 100mg PO q12h x 14 days ***OR*** **Clindamycin** 900mg IV q8h ***PLUS*** **Gentamicin** 2mg/kg IV/IM loading dose, followed by 1.5mg/kg q8h maintenance dose. Single daily dosing (3–5mg/kg) can be used. ***THEN*** **Doxycycline** 100mg PO q12h x 14 days **2nd line: Ampicillin-sulbactam** 3g IV q6h ***PLUS*** **Doxycycline** 100mg PO q12h x 14 days Outpatient: IM/PO **Ceftriaxone** 250mg IM/IV x 1 dose	For inpatient regimens, continue treatment until satisfactory response for at least 24h before switching to outpatient regimen. Women who do not respond to IM/oral therapy within 72h should be re-evaluated to confirm the diagnosis and should be given intravenous therapy. The recommended 3rd generation **Cephalosporins** are limited in their coverage of anaerobes. **Metronidazole** should be considered with third-generation cephalosporins.

Etiology	Regimen	Comments
	OR (**Cefotaxime** 0.5-1.0g IM x 1 dose ***PLUS*** **Doxycycline** 100mg PO bid x 14 days) ***WITH or WITHOUT*** **Metronidazole** 500mg PO bid x 14 days	
Tubo-ovarian Abscess		
Late manifestation of PID; Useful clinical features that suggest the presence of a pelvic abscess are pain, persistent fever, adnexal tenderness (for >7 days) and an erythrocyte sedimentation rate greater than 30 mm/hr. Ultrasonography of the pelvis is valuable in confirming the presence of an abscess. An abscess larger than 10 cm has a 60% chance, a 7- to 9-cm abscess has a 35% chance, and a 4- to 6-cm abscess has a 20% chance of requiring surgical intervention.		
Sexually active: *E. coli; Bacteroides fragilis*; Other Bacteroides spp.; Peptostreptococcus; Peptococcus; aerobic streptococci **Non-sexually active:** *E. coli*, α-hemolytic streptococci; anaerobes	Parenteral: **Cefoxitin** 2g IV q6h ***PLUS*** **Doxycycline** 100mg PO q12h x 14 days ***OR*** **Clindamycin** 900mg IV q8h ***PLUS*** **Gentamicin** 2mg/kg IV/IM loading dose, followed by 1.5 mg/kg q8h maintenance dose. Single daily dosing (3–5 mg/kg) can be substituted ***PLUS*** **Doxycycline** 100mg PO bid x 14 days Outpatient: Continuing oral therapy of **Doxycycline** 100mg PO bid ***OR*** **Clindamycin** 450mg PO qid x 14 days **Duration (IV/PO):** at least 21 days	Patient with tubo-ovarian abscess should have at least 24 hours of inpatient treatment that includes anaerobic coverage. Clinical response should be noted in 72 hours and pelvic ultrasound should be repeated to note any further increase in the size of the abscess.
Perihepatitis or Fitz-Hugh-Curtis syndrome		
Classic manifestation is severe right upper quadrant abdominal pain (lasts about 48 h) that often radiates to the shoulder.		

Etiology	Regimen	Comments
N. gonorrhoeae, C. trachomatis	Treatment similar as with PID. Parenteral: **1st line:** **Cefoxitin** 2g IV q6h ***PLUS*** **Doxycycline** 100mg PO q12h x 14 days ***WITH or WITHOUT*** **Metronidazole** 500mg PO bid x 14 days ***OR*** **Clindamycin** 900mg IV q8h ***PLUS*** **Gentamicin** 2mg/kg IV/IM loading dose, followed by 1.5 mg/kg q8h maintenance dose. Single daily dosing (3–5 mg/kg) can be used. Oral: **1st line:** **Doxycycline** 100mg PO bid x 14 days ***OR*** **Clindamycin** 450mg PO qid x 14 days **2nd line:** **Ampicillin-sulbactam** 3g IV q6h ***PLUS*** **Doxycycline** 100mg PO q12h x 14 days Outpatient: IM/PO **Ceftriaxone** 250mg IM daily ***OR*** **Cefotaxime** ***PLUS*** **Doxycycline** 100mg PO bid x 14 days ***WITH or WITHOUT*** **Metronidazole** 500mg PO bid x 14 days	The diagnosis is made by having a high index of suspicion. Perihepatitis frequently mimics cholelithiasis, hepatitis, pleuritis, subphrenic abscess, perforated peptic ulcer, nephrolithiasis, appendicitis, ectopic pregnancy, abdominal trauma, and pancreatitis.
Oophoritis		
Inflammation of the ovaries, the oocytes in particular		
Mumps virus, Cytomegalovirus	Treatment is palliative. **Paracetamol** 10-15 mg/kg PO q4-6h (Pediatric); 500 mg PO q4h (Adult)	The presence of an enlarged, tender, boggy, smooth, mobile ovary in a child with mumps or one of the exanthems suggests oophoritis.

Etiology	Regimen	Comments
	Ibuprofen 5-10mg/kg PO q6-8h (Pediatric); 400-800mg PO q6-q8h (Adult)	
Epididymitis		
Clinical syndrome consisting of pain, swelling, and inflammation of the epididymis that lasts <6 weeks. Evaluate all suspected cases of acute epididymitis for objective evidence of inflammation by one of the following point-of-care tests: • Gram or methylene blue or gentian violet (MB/GV) stain of urethral secretions demonstrating ≥2 WBC/oif; • Positive leukocyte esterase test on first-void urine; or • ≥10 WBC/hpf on a spun first void urine.		
Age ≤35 years: *N. gonorrhoeae*, *C. trachomatis*, Enterobacteriaceae (occasional) **Age >35 years:** Enterobacteriaceae	**1st line:** *All:* Bed rest, scrotal elevation, and analgesics. ≤*35 years:* **Ceftriaxone** 250mg IM x 1 dose ***PLUS*** **Doxycycline** 100mg PO bid x 10 days (for cases likely caused by chlamydia and gonorrhea) ***ADD*** **Levofloxacin** 500mg PO daily ***OR*** **Ofloxacin** 300mg PO bid x 10 days if patient is a man who practices insertive anal sex since he will also be at risk for enteric organisms, ***OR*** give as single agent if no risk for chlamydia and gonorrhea >*35 years:* **Levofloxacin** 750mg/day IV/PO x 10-14 days **2nd line:** ≤*35 years:* **Levofloxacin** 500mg/day PO x 10 days >*35 years:* **Ampicillin-Sulbactam** 3g IV q6h ***OR*** **Ceftriaxone** 2g IV q24h ***OR*** **Piperacillin-tazobactam** 4.5g IV q6h or 4h infusion of 2.25g q8h	Men who have acute epididymitis confirmed or suspected to be caused by *N. gonorrhoeae* or *C. trachomatis* should be advised to abstain from sexual intercourse until they and their partners have been adequately treated and symptoms have resolved. All men with acute epididymitis should be tested for other STIs, including HIV. Tests should be done for *C. trachomatis* and for *N. gonorrhoeae* by NAAT. Urine is the preferred specimen for NAAT testing in men.

Etiology	Regimen	Comments
Pelvic Vein Suppurative (Septic) Thrombophlebitis		
Infection of ovarian or deep pelvic veins; usually postpartum (either vaginal or C-section delivery); can complicate postpartum endometritis or pelvic inflammatory disease. Diagnosis: CT scan or MRI.		
Bacteroides sp., *Prevotella bivia*, other anaerobes, Streptococcus sp. (Group A, B), Enterobacteriaceae	If low prevalence of MDR GNB: **Piperacillin-tazobactam** 2.25g IV q6h or 4.5 gm IV q8h ***OR*** **Ceftriaxone** 2g IV daily ***PLUS*** **Metronidazole** 500mg IV q8h If high prevalence (≥ 20%) of MDR GNB: **Meropenem** 1g IV q8h	Treatment is a combination of effective antibiotics and anticoagulation (**Coumadin** x 6 weeks). No clear role for surgery on infected veins. Discontinue antibiotic(s) when WBC and differentials are normal and patient is afebrile for 48 hrs. **Carbapenem** ensures adequate therapy versus ESBL producing aerobic GNB.
Septic Abortion		
Bacteroides sp., especially Prevotella bivia; Streptococcus sp. (Groups A, B); Enterobacteriaceae; Chlamydia trachomatis; Ureaplasma urealyticum (less common); C. perfringens;	**1st line:** **Cefoxitin** 2g IV q6–8h ***OR*** **Ampicillin-Sulbactam** 3g IV q6h ***OR*** **High Dose Penicillin** 5 MU IV q6h ***PLUS*** **Doxycycline** 100mg PO q12h x 7 days **2nd line:** **Meropenem** 1g IV q8h ***OR*** **Ertapenem** 1g IV q24h ***OR*** **Piperacillin-tazobactam** 4.5g IV q6h (**or** 4-hr infusion of 2.25g q8h) ***PLUS*** **Doxycycline** 100mg PO q12h x 7 days ***OR***	Curettage, supportive therapy, and intensive cardiovascular monitoring. If there is deterioration or no response, consider hysterectomy and laparotomy is indicated. **Clindamycin** + **Ceftriaxone** is preferred to ensure activity versus Group B Strep (one-third of isolates are **Clindamycin** resistant).

Etiology	Regimen	Comments
	Clindamycin 450–900mg IV q8h ***PLUS*** (**Ceftriaxone** 2g IV q24h or **Gentamicin** 5mg/kg/day)	
Amnionitis/ chorioamnionitis		
Group B Streptococci; *Escherichia coli*; Mycoplasma; Pathogenic anaerobes (e.g., *Prevotella bivia*).	**1st line: Cefoxitin** 2g IV q6–8h ***OR*** **Ampicillin-Sulbactam** 3g IV q6h ***OR*** **Clindamycin** 450–900mg IV q8h ***PLUS*** **Ceftriaxone** 2g IV q24h ***OR*** **Gentamicin** 5mg/kg/day **2nd line: Meropenem** 1g IV q8h ***OR*** **Ertapenem** 1g IV q24h ***OR*** [**Piperacillin-tazobactam** 4.5g IV q6h (**or** 4-hr infusion of 2.25g q8h) ***PLUS*** **Doxycycline** 100mg PO q12h] For vaginal delivery: **Ampicillin** ***PLUS*** **Gentamicin**.	For Cesarean section: should include anaerobic coverage such as **Clindamycin** or **Metronidazole** to decrease the risk of post-partum endometritis. **Clindamycin** + **Ceftriaxone** is preferred to ensure activity versus Group B Strep (one-third of isolates are **Clindamycin** resistant).
Balanitis		
Candida sp. (40%)	Mild cases: Topical azoles such as **Clotrimazole** ***OR*** **Miconazole** 3-7 days Unresponsive and more severe cases: **Fluconazole** 150mg PO x 1 dose ***OR*** **Itraconazole** 200mg PO bid x 1 dose	
Gardnerella sp., other bacteria (e.g., anaerobes)	**Metronidazole** 2g x 1 dose	

Etiology	Regimen	Comments
Streptococcus sp. (GBS)		Group A streptococcal balanitis has been reported after oral sex.
Bartholinitis and Bartholin abscess		
N. gonorrhoeae, *C. trachomatis*, anaerobes and facultative organisms	Incise and drain. Do not aspirate because it is likely to cause recurrences. Recurrent infection: marsupialization or fistulization. Antibiotic coverage for *N. gonorrhoeae*, *C. trachomatis* and anaerobes for at least 2 weeks.	See recommendations for *N. gonorrhoeae*, *C. trachomatis*. Risk factors similar to other sexually transmitted infections.
Urethritis and Cervicitis		
Urethritis is characterized by urethral inflammation which may be due to infectious or non-infectious causes. Symptoms, when present, may include dysuria, urethral pruritus, mucoid, mucopurulent or purulent discharge.		
N. gonorrhoeae; C. trachomatis; M. genitalium; T. vaginalis; Ureaplasma	Pediatric: *<45kgs and <8yrs old:* **Ceftriaxone** 125mg IM x 1 dose ***PLUS*** (**Erythromycin Base *OR* Ethylsuccinate**) 50mg/kg/day PO in 4 div doses (Max: 2g/day) x 14 days *>45kgs and <8yrs old:* **Ceftriaxone** 250mg IM x 1 dose ***PLUS*** **Azithromycin** 1g PO x 1 dose *>45kgs and >8years old:* **Ceftriaxone** 250mg IM x 1 dose ***PLUS EITHER*** **Azithromycin** 1g PO x 1 dose ***OR*** **Doxycycline** 100mg PO bid x 7 days Adult:	When diagnostic work-up has not yet been done and cause is not known, if symptoms are present and no evidence of urethral inflammation, NAAT testing for Chlamydia and gonorrhea might identify the infection. Use combination therapy even if NAAT is negative for Chlamydia.

Etiology	Regimen	Comments
	1st line: **Ceftriaxone** 250mg IM x 1 dose ***PLUS*** (**Azithromycin** 1g PO x 1 dose ***OR*** **Doxycycline** 100mg PO q12h x 7 days) **2nd line:** If **Ceftriaxone** is not available, **Cefixime** 400mg PO x 1 dose ***PLUS*** **Azithromycin** 1g PO x 1 dose ***OR*** **Cefotaxime** 500mg IM Alternatives to **Azithromycin** or **Doxycycline**: **Erythromycin** base 500mg PO qid x 7 days ***OR*** **Erythromycin Ethylsuccinate** PO 800mg qid x 7 days ***OR*** **Levofloxacin** 500mg/day PO x 7 days ***OR*** **Ofloxacin** 400mg PO bid x 7 days	
Nongonococcal Urethritis		
Confirmed in symptomatic men when staining of urethral secretions without Gram-negative diplococci		
C. trachomatis; M. genitalium; T. vaginalis; Ureaplasma;	**1st line:** **Azithromycin** 1g PO x 1 dose ***OR*** **Doxycycline** 100mg PO bid x 7 days **2nd line** **Erythromycin base** 500mg PO qid x 7 days ***OR*** **Erythromycin Ethylsuccinate** 800mg PO qid x 7 days ***OR*** **Levofloxacin** 500mg/day PO x 7 days ***OR*** **Ofloxacin** 300mg PO bid x 7 days	**Azithromycin** should be administered to men initially treated with **Doxycycline**. To minimize transmission and reinfection, men treated for NGU should be instructed to abstain from sexual intercourse until they and their partner(s) have been adequately treated (e.g., for 7 days after single-dose therapy or until completion of a 7-day regimen and symptoms resolved). Men who receive a diagnosis of NGU should be tested for HIV and syphilis.
Persistent and recurrent NGU	If initially treated with **Doxycycline**: **Azithromycin** 1g PO x 1 dose Treat for *T. vaginalis* with **Metronidazole** 2g PO x 1 dose. (Alternative Regimen: **Metronidazole** 500mg PO bid x 7 days)	

Etiology	Regimen	Comments
Cervicitis		
Diagnostic signs: 1) a purulent or mucopurulent endocervical exudate visible in the endocervical canal or on an endocervical swab specimen, and 2) sustained endocervical bleeding easily induced by gentle passage of a cotton swab through the cervical os. Women with a new episode of cervicitis should be assessed for signs of PID and should be tested for *C. trachomatis* and *N. gonorrhoeae*.		
C. trachomatis; N. gonorrhoeae; M. genitalium	**Azithromycin** 1g PO x 1 dose ***OR*** **Doxycycline** 100mg PO bid x 7 days Consider concurrent treatment for gonococcal infection if patient is at risk for gonorrhea or lives in a community where the prevalence of gonorrhea is high.	Treatment of cervicitis in pregnant women does not differ from those who are not pregnant women. Women treated for cervicitis should be instructed to abstain from sexual intercourse until they and their partner(s) have been adequately treated.
Chlamydial Infections		
C. trachomatis	**1st line:** Pediatric *<45 kg:* **Erythromycin** 50mg/kg/day q6h x 14 days *≥45 kg and <8 yrs old:* **Azithromycin** 1g PO x 1 dose *≥8 yrs old:* **Azithromycin** 1g PO x 1 dose ***OR*** **Doxycycline** 100mg PO bid x 7 days Adult: **Azithromycin** 1g PO x 1 dose ***OR*** **Doxycycline** 100mg PO bid x 7 days *Pregnant Women:* **Azithromycin** 1g PO x 1 dose	Diagnostic test (not routinely recommended): NAAT, Tissue culture, and Direct Fluorescent Antibody Test. **Specimen:** *Women:* first-catch urine or swab specimens from the endocervix or vagina *Men:* first-catch urine or urethral swab *Infants and Children:* nasopharyngeal swab (if pneumonia); swabs from inner eyelid (if conjunctivitis)

Etiology	Regimen	Comments
	2nd line: Pediatric: *<45 kg:* **Azithromycin** 20mg/kg/day PO x 3 days Adult: **Erythromycin Base** 500mg PO qid x 7 days ***OR*** **Erythromycin Ethylsuccinate** 800mg PO qid x 7 days ***OR*** **Levofloxacin** 500mg/day PO x 7 days ***OR*** **Ofloxacin** 300mg PO bid x 7 days *Pregnant Women:* **Amoxicillin** 500mg PO tid x 7 days ***OR*** **Erythromycin Base** 500mg PO qid x 7 days ***OR*** **Erythromycin base** 250mg PO qid x 14 days ***OR*** **Erythromycin Ethylsuccinate** 800mg PO qid x 7d ***OR*** 400mg PO qid x 14 days	Do not give **Doxycycline** and **quinolones** to pregnant women. Data is limited on the effectiveness and optimal dose of **Azithromycin** for the treatment of chlamydial infection in infants and children who weigh <45 kg. Onsite, directly observed single dose therapy with **Azithromycin** should be available for persons whose adherence is a concern.
Gonococcal Infections		
Caused by *N. gonorrhoeae* Gram's stain and Culture – endocervical (women) or urethral (men) swab specimens NAAT - endocervical swabs, vaginal swabs, urethral swabs (men), and urine (from both men and women). Due to emerging resistance data for gonococcal infections and reduced effectiveness of some medicines, good practice dictates that the choice of treatment depends on reliable local data on antimicrobial susceptibility. DGI might present as sepsis, arthritis, or meningitis and is a rare complication of neonatal gonococcal infection. Positive Gram-stained smears of exudate, CSF, or joint aspirate provide a presumptive basis for initiating treatment for *N. gonorrhoeae*. Complete immunization for hepatitis B and HPV.		

Etiology	Regimen	Comments
Uncomplicated infections of the cervix, urethra, and rectum; uncomplicated infections of the pharynx (more difficult to eradicate than urogenital or anorectal sites)	**1st line** Pediatric: **Ceftriaxone** 25–50 mg/kg IV/IM x 1 dose (Max: 125mg IM) Adult: **Ceftriaxone** 250mg IM x 1 dose ***PLUS*** **Azithromycin** 1g PO x 1 dose **2nd line** Pediatric: **Cefixime** 8 mg/kg/day ***PLUS*** **Azithromycin** 10-12mg/kg/day Adult: **Cefixime** 400mg PO x 1 dose ***PLUS*** **Azithromycin** 1g PO x 1 dose	Oral **Cephalosporins** are no longer recommended except if **Ceftriaxone** is not available; then consider **Cefixime** but with test of cure one week later. Medication for gonococcal infection should be provided on site and directly observed. No data exists regarding the use of dual therapy for treating children with gonococcal infection. Persons treated for gonorrhea should be instructed to abstain from sexual activity for 7 days after treatment and until all sex partners are adequately treated. All persons who receive a diagnosis of gonorrhoea should be tested for other STIs, including chlamydia, syphilis, and HIV. **Fluoroquinolones** are not recommended for gonococcal urethritis. For Gonococcal meningitis and endocarditis, increase **Ceftriaxone** to 1–2 g IV every 12–24 hours. Gonococcal ophthalmia is strongly suspected when intracellular Gram-negative diplococci are identified on Gram stain of conjunctival exudate.
Gonococcal Conjunctivitis	Pediatric: **Cefixime** 8 mg/kg/day ***PLUS*** **Azithromycin** 10-12mg/kg/day Adult: **Ceftriaxone** 1g IM x 1 dose ***PLUS*** **Azithromycin** 1g PO x 1 dose	
Disseminated Infection	Pediatric: **Ceftriaxone** 50 mg/kg/day IV/IM x 7 days (Max: 1g) Adult: **1st line:** **Ceftriaxone** 1g IV/IM q24h ***PLUS*** **Azithromycin** 1g PO x 1 dose **2nd line:** **Cefotaxime** 1g IV q8h ***PLUS*** **Azithromycin** 1g PO x 1 dose	
Ophthalmia Neonatorum	**Ceftriaxone** 25-50mg/kg IV/IM x 1 dose (Max: 125mg) ***OR*** **Spectinomycin** 25mg/kg IM x 1 dose (Max: 75 mg)	
Disseminated Gonococcal Infection (DGI) and Gonococcal Scalp Abscesses in Neonates	**Ceftriaxone** 25–50mg/kg/day IV/IM x 1 dose x 7 days ***OR*** **Cefotaxime** 25mg/kg IV/IM q12h x 7 days **Duration:** if meningitis is documented, 10-14 days	

Etiology	Regimen	Comments
Vaginal Discharge		
Bacterial Vaginosis		
A polymicrobial clinical syndrome resulting from replacement of the normal hydrogen peroxide producing *Lactobacillus sp.* in the vagina with high concentrations of anaerobic bacteria. Gram stain is used to determine the relative concentration of lactobacilli (e.g., long Gram-positive rods), Gram-negative and Gram-variable rods and cocci (e.g., *G. vaginalis*, *Prevotella*, *Porphyromonas*, and peptostreptococci), and curved Gram-negative rods (e.g., *Mobiluncus*) characteristic of BV. Amsel's Diagnostic criteria: at least 3 of the following symptoms or signs must be present: • homogeneous, thin, white discharge that smoothly coats the vaginal walls; • clue cells on microscopic examination • pH of vaginal fluid >4.5 • a fishy odor of vaginal discharge before or after addition of 10% KOH (Whiff test)		
Prevotella sp.; *Porphyromonas;* Peptostreptococci; *Mobiluncus* sp.; *G. vaginalis;* Ureaplasm; Mycoplasma; Fastidious anaerobes	Pediatric: <45 kg: **Metronidazole** 15mg/kg/day PO div q12h x 7 days Adult: **1st line: Metronidazole** 500mg PO bid x 7 days **2nd line: Clindamycin** 300mg PO bid x 7 days ***OR*** **Metronidazole** 2g PO single dose	
Vaginitis, Prepubertal		
Group A Streptococci; E. coli; Herpes simplex virus; *N. gonorrhoeae; C. trachomatis; T. vaginalis;* Enteric bacteria including Shigella species	*<45kgs and <8yrs old:* **Ceftriaxone** 125mg IM x 1 dose ***PLUS*** **Erythromycin** 50mg/kg/day div q6h x 14 days *>45kgs and <8yrs old:* **Ceftriaxone** 250mg IM x 1 dose ***PLUS*** **Azithromycin** 1g PO x 1 dose	

Etiology	Regimen	Comments
	>45kgs and >8yrs old: **Ceftriaxone** 250mg IM x 1 dose ***PLUS EITHER*** **Azithromycin** 1g PO x 1 dose ***OR*** **Doxycycline** 100mg PO bid x 7 days	
Trichomoniasis		
Most infected persons have minimal or no symptoms. Some infected men have symptoms of urethritis, epididymitis, or prostatitis, and some infected women have vaginal discharge that might be diffuse, malodorous, or yellow-green with or without vulvar irritation. Diagnostic Tests: Wet-mount microscopy NAAT, Trichomonas Rapid Test (dipstick).		
T. vaginalis	**1st line: Metronidazole** 500mg PO bid x 7 days **2nd line: Metronidazole** 2g PO x 1 dose *Pregnant women:* **Metronidazole** 2g PO x 1 dose *Women with HIV Infection:* **Metronidazole** 500mg PO bid x 7 days	Treatment of partner is recommended. If single dose metronidazole regimen fails, give 2g orally for 5 days.
Candidiasis		
Typical symptoms include pruritus, vaginal soreness, dyspareunia, external dysuria, and abnormal (thick, curdy) vaginal discharge. Diagnostic tests: Wet preparation (saline, 10% KOH) or Gram stain of vaginal discharge which demonstrates budding yeasts, hyphae, or pseudohyphae. Culture. A diagnosis of Candida vaginitis is suggested clinically by the presence of external dysuria and vulvar pruritus, pain, swelling, and redness.		
Candida spp.	**1st line: Fluconazole** 150mg PO x 1 dose **2nd line: Clotrimazole** 1% cream 5g intravaginally daily x 7–14 days ***OR*** **Miconazole** 1,200mg vaginal suppository, 1 supp x 1 day	

Etiology	Regimen	Comments
Genital, Anal, or Perianal Ulcers		
Chancroid		
Painful genital ulcer plus tender suppurative inguinal lymphadenopathy suggests the diagnosis of chancroid. **Criteria for probable diagnosis:** • one or more painful genital ulcers • regional lymphadenopathy • negative HSV PCR test or HSV culture performed on the ulcer exudate • no evidence of *T. pallidum* infection by darkfield examination of ulcer exudate or by a serologic test for syphilis performed at least 7 days after onset of ulcers		
H. ducreyi	**Azithromycin** 1g PO x 1 dose ***OR*** **Ceftriaxone** 250mg IM x 1 dose ***OR*** **Ciprofloxacin** 500mg PO bid x 3 days ***OR*** **Erythromycin Base** 500mg PO tid x 7 days	Sex partners of patients who have chancroid should be examined and treated if they had sexual contact with the patient within 10 days prior to patient's onset of symptoms.
Genital HSV Infections		
HSV1 and *HSV2*	**First clinical episode:** **Aciclovir** 400mg PO bid x 7-10 days **or** 200mg PO 5x/day x 7-10 days ***OR*** **Valaciclovir** 1g PO bid x 7-10 days ***OR*** **Famciclovir** 250mg PO tid x 7-10 days *Children <45 kg:* **Aciclovir** 80mg/kg/day PO div q6-8h (Max: 1.2g/day) x 7-10 days ***OR*** **Valaciclovir** 40mg/kg/day div q12h x 7-10 days **Recurrent Genital Herpes** Suppressive Therapy (Adult): **Aciclovir** 400mg PO bid ***OR*** **Valaciclovir** 500mg PO daily ***OR*** **Valaciclovir** 1g PO daily ***OR*** **Famciclovir** 250mg PO bid	Diagnostic tests: Viral culture, PCR, HSV serology. Extend treatment if healing is incomplete after 10 days. Suppressive therapy reduces: 1. frequency of recurrences by 70%–80% 2. risk of disease transmission.

Etiology	Regimen	Comments
	Pregnant Women: **Aciclovir** 400mg PO tid ***OR*** **Valaciclovir** 500mg PO bid *HIV-infected Adults:* **Aciclovir** 400–800mg PO bid- tid ***OR*** **Valaciclovir** 500mg PO bid ***OR*** **Famciclovir** 500mg PO bid Episodic Therapy (Adult): **Aciclovir** 400mg PO tid x 5 days **or** 800mg PO bid x 5 days **or** 800mg PO tid x 2 days ***OR*** **Valaciclovir** 500mg PO bid x 3 days ***or*** 1g PO daily x 5 days ***OR*** **Famciclovir** 125 mg PO bid x 5 days ***or*** 1g PO bid daily ***or*** 500mg daily, then 250mg bid x 2 days *HIV-infected Adults:* **Aciclovir** 400mg PO tid x 5-10 days ***OR*** **Valaciclovir** 1g PO bid x 5-10 days ***OR*** **Famciclovir** 500mg PO bid x 5-10 days	Safety and efficacy have been documented among patients receiving daily therapy with **Aciclovir** for as long as 6 years and with **Valaciclovir** or **Famciclovir** for 1 year. **Valaciclovir** 500mg daily is less effective than other regimen in those with ≥10 recurrences per year. Treatment is recommended starting at 36 weeks of gestation. Effective episodic treatment of recurrent herpes requires initiation of therapy within 1 day of lesion onset or during the prodrome.
	Severe Disease: **Aciclovir** 5–10mg/kg IV q8h x 2-7 days or until clinical improvement is observed, followed by oral antiviral therapy to complete at least 10 days. *Neonatal:* **Aciclovir** 20mg/kg IV q8h x 14 days if disease is limited to the skin and mucous membranes, or for 21 days for disseminated disease and involving the central nervous system.	HSV encephalitis requires 21 days of intravenous therapy. Impaired renal function warrants dose adjustment.
Granuloma Inguinale (Donovanosis)		
Characterized by painless, slowly progressive ulcerative lesions on the genitals or perineum without regional lymphadenopathy		
Klebsiella granulomatis (formerly known as *Calymmatobacterium granulomatis*)	**1st line:** **Azithromycin** 1g PO weekly ***OR*** 500 mg daily	**Gentamicin** 1 mg/kg IV q8h can be added if improvement is not evident within the first few days of therapy.

Etiology	Regimen	Comments
	2nd line: Doxycycline 100mg PO bid ***OR* Ciprofloxacin** 750mg PO bid ***OR* Erythromycin** base 500mg PO qid ***OR* Co-trimoxazole** 160/800mg) PO bid **Duration:** for at least 3 weeks and until all lesions have completely healed.	
Lymphogranuloma Venereum		
Special diagnostic tests: culture, immunofluorescent test, NAAT (if available)		
C. trachomatis serovars L1, L2, L3	**1st line**: **Doxycycline** 100mg PO bid x 21 days **2nd line**: **Erythromycin** Base 500mg PO qid x 21 days	Persons with a clinical syndrome consistent with LGV, including proctocolitis or genital ulcer disease with lymphadenopathy, should be presumptively treated for LGV.
Syphilis		
Caused by *Treponema pallidum* Diagnostic tests: Definitive diagnosis: Darkfield examinations Presumptive diagnosis: Nontreponemal tests (VDRL or RPR) Treponemal tests (FTA-ABS or TPHA, EIAs, immunoblots). Test all patients with syphilis for HIV.		
Primary Syphilis Clinical Presentation: presence of chance	Pediatric: **Benzathine Penicillin G** 50,000 U/kg IM (Max: 2.4 MU x 1 dose) Adult: **1st line: Benzathine Penicillin G** 2.4MU IM x 1 dose	For primary and secondary syphilis, clinical and serologic evaluation should be performed at 6 and 12 months after treatment. Failure of nontreponemal test titers to decline fourfold within 6–12 months after therapy for primary or

Etiology	Regimen	Comments
	2nd line: Doxycycline 100mg PO bid x 14 days ***OR* Tetracycline** 500mg qid x 14 days ***OR* Ceftriaxone** 1g IV/IM q24h x 10-14 days ***OR* Azithromycin** 2g PO x 1 dose	secondary syphilis might be indicative of treatment failure. Infants and children aged ≥1 month with primary and secondary syphilis should be evaluated for sexual abuse. **Doxycycline** and **Tetracycline** cannot be given to pregnant women.
Secondary Syphilis Clinical Presentation: Fever, puplosquamous rash often involving palms of hands and soles of feet	Pediatric: **Benzathine Penicillin G** 50,000 U/kg IM (Max: 2.4 MU x 1 dose) Adult: **1st line: Benzathine Penicillin G** 2.4MU IM x 1 dose **2nd line: Doxycycline** 100mg PO bid x 14 days ***OR* Tetracycline** 500mg qid x 14 days ***OR* Ceftriaxone** 1g IV/IM q24h x 10-14 days ***OR* Azithromycin** 2g PO x 1 dose	
Early Latent Syphilis Latent syphilis of less than one-year duration Characterized by serore activity without other evidence of primary, secondary, or tertiary disease.	Pediatric: **Benzathine penicillin G** 50,000 U/kg IM (Max: 2.4 MU x 1 dose) Adult: **1st line: Benzathine penicillin G** 2.4MU IM x 1 dose **2nd line: Doxycycline** 100mg PO bid x 14 days ***OR* Tetracycline** 500mg qid x 14 days ***OR* Ceftriaxone** 1g IV/IM q24h x 10-14 days ***OR* Azithromycin** 2g PO x 1 dose	Quantitative nontreponemal serologic tests should be repeated at 6, 12, and 24 months. A CSF examination should be performed if 1. a sustained (>2 weeks) fourfold increase or greater in titer is observed, 2. an initially high titer (≥1:32) fails to decline at least fourfold within 12–24 months of therapy 3. signs or symptoms attributable to syphilis develop
Late Latent Syphilis Latent syphilis of less than unknown duration	Pediatric: **Benzathine Penicillin G** 50,000 U/kg IM, up to the adult dose of 2.4 MU, administered as 3 doses at 1-week intervals (total 150,000 units/kg up to the adult total dose of 7.2 MU) Adult:	

Etiology	Regimen	Comments
	1st line: Benzathine Penicillin G 7.2 MU total, administered as 3 doses of 2.4 MU IM each buttock at 1-week intervals **2nd line**: **Doxycycline** 100mg PO bid x 30 days ***OR*** **Tetracycline** 500mg PO qid x 30 days	
Tertiary Syphilis Refers to gummas and cardiovascular syphilis but not to neurosyphilis.	Adult: **Benzathine Penicillin G** 7.2 MU total, administered as 3 doses of 2.4 MU IM each at 1-week interval	Pregnant women and those who are allergic to penicillin should be desensitized and treated with penicillin.
Neurosyphilis	Adult: Aqueous Crystalline **Penicillin G** 18–24 MU/day, administered as 3–4 MU IV q4h or continuous infusion x 10-14 days	Diagnosis of neurosyphilis depends on a combination of CSF cell count or protein and a reactive CSF-VDRL in the presence of reactive serologic test results and neurologic signs and symptoms. In a person with neurologic signs or symptoms, a reactive CSF-VDRL is considered diagnostic of neurosyphilis.
Congenital Syphilis		
Proven or Highly Probable Congenital Syphilis	Aqueous Crystalline **Penicillin G** 100,000–150,000 U/kg/day, administered as 50,000 U/kg/dose IV q12h during the first 7 days of life and q8h thereafter for a total of 10 – 15 days ***OR*** **Procaine Penicillin G** 50,000 U/kg/dose IM x 1 dose for 10-15 days	Any neonate with: 1. PE consistent with congenital syphilis; OR 2. nontreponemal serologic titer fourfold higher than the mother's titer; OR

Etiology	Regimen	Comments
		3. positive darkfield test or PCR of lesions or body fluid(s).
Possible Congenital Syphilis	Aqueous Crystalline **Penicillin G** 100,000–150,000 U/kg/day, administered as 50,000 U/kg/dose IV q12h during the first 7 days of life and q8h thereafter for a total of 10 days ***OR*** **Procaine Penicillin G** 50,000 U/ kg/dose IM x 1 dose for 10 days ***OR*** **Benzathine Penicillin G** 50,000 U/kg IM x 1 dose	Any neonate who has a normal physical examination and a serum quantitative nontreponemal serologic titer equal to or less than fourfold the maternal titer and one of the following: 1. mother was not treated, inadequately treated, or has no documentation of having received treatment; 2. mother was treated with **Erythromycin** or an inappropriate regimen (e.g. nonpenicillin G) 3. mother received recommended treatment <4 weeks before delivery.
Congenital Syphilis less likely	**Benzathine penicillin G** 50,000 units/kg IM x 1 dose **OR** Do not treat but do close serologic follow-up every 2–3 months for 6 months for infants whose mother's nontreponemal titers decreased at least fourfold after appropriate therapy for early syphilis or remained stable for low-titer, latent syphilis (e.g., VDRL <1:2; RPR <1:4).	Any neonate who has a normal physical examination and a serum quantitative nontreponemal serologic titer equal to or less than fourfold the maternal titer and both of the following are true: 1. mother was treated during pregnancy, treatment was appropriate for the stage of infection, and treatment was administered >4 weeks before delivery, and 2. mother has no evidence of reinfection or relapse

Etiology	Regimen	Comments
Congenital Syphilis unlikely	No treatment is required, but infants with reactive nontreponemal tests should be followed serologically to ensure the nontreponemal test returns to negative. **Benzathine penicillin G** 50,000 U/kg as a single IM injection might be considered, particularly if follow-up is uncertain and the neonate has a reactive nontreponemal test.	Any neonate who has a normal physical examination and a nontreponemal serologic titer equal to or less than fourfold the maternal titer and both of the following are true: 1. mother's treatment was adequate before pregnancy and 2. mother's nontreponemal serologic titer remained low and stable before and during pregnancy and at delivery (VDRL <1:2; RPR <1:4).
Syphylis in Pregnancy	**Penicillin** is the only drug recommended for treatment of pregnant women with syphilis. Give the same dose as in non-pregnant women appropriate for the stage of syphilis.	All pregnant women should be screened for syphilis early in pregnancy. Pregnant women allergic to penicillin should be desensitized and treated with penicillin.
Anogenital Warts		
HPV and genital warts		
Human papillomavirus	Patient-Applied: **Imiquimod** 5% (or 3.75%) cream Provider–Administered: Cryotherapy with liquid nitrogen or cryoprobe ***OR*** Surgical removal either by tangential scissor excision, tangential shave excision, curettage, laser, or electrosurgery (electrocautery or electrocoagulation) ***OR*** **Trichloroacetic acid (TCA)**	The aim of treatment is removal of the wart and amelioration of symptoms. Treatment of anogenital warts should be guided by wart size, number, and anatomic site; patient preference; cost of treatment; convenience; adverse effects; and provider experience. Therapeutic methods are effective in 22 to

Etiology	Regimen	Comments
		94% in clearing exophytic genital warts, however recurrence rate is high, at least 25% within 3 months.
Molluscum contagiosum	Curettage ***OR*** Cryotherapy with liquid nitrogen ***OR*** Electrodessication ***OR*** Chemical agents (podophyllin, tretinoin, cantharidin, 25% to 50% trichloroacetic acid, silver nitrate, tincture of iodine or potassium hydroxide) **OR Imiquimod**	Physical destruction is the most effective and rapid means of curing *molluscum contagiosum*. Treat genital lesions to prevent spread to sexual contacts. Lesions in healthy individuals are self-limited and may not necessitate treatment. Genital lesions have a potential carcinogenicity, neutropenia and potential permanent as well as nephrotoxicity.
Ectoparasitic Infections		
Pediculosis Pubis		
Persons with pubic lice usually seek medical attention because of pruritus or because of lice or nits on pubic hair.		
Pubic Lice	**Permethrin 1% cream** rinse applied to affected areas and washed off after 10 minutes	
Scabies		
Sarcoptes scabiei	**Permethrin 5% cream** applied to all areas of the body from the neck down and washed off after 8–14h ***OR*** **Ivermectin** 200ug/kg PO, repeated in 2 weeks	Infants and young children should be treated with **Permethrin**. Infants and young children aged <10 years should not be treated with lindane. Bedding and clothing should be decontaminated (e.g., either machine-washed, machine-dried using the hot cycle, or dry

Etiology	Regimen	Comments
		cleaned) or removed from body contact for at least 72hours. Persons with scabies should be advised to keep fingernails closely trimmed to reduce injury from excessive scratching.

REFERENCES

Antibiotic Guidelines 2013-2014. Treatment Recommendations for Adult Inpatients. John Hopkins Medicine.

Carlos C. Antimicrobial Resistance Surveillance Program 2014 Report.

CDC Sexually Transmitted Diseases Treatment Guidelines, 2015. MMWR Recomm Rep June 5, 2015: Vol. 64. No. 3.

CDC. Sexually transmitted diseases treatment guidelines. MMWR Recomm Rep 2010;59(No. RR-12).

Feigin RD, et.al, Textbook of Pediatric Infectious Diseases. 7th edition, Philadelphia: Saunders Elsevier; 2014.

Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases: 2-Volume Set, 8th Edition.

Red Book, 30th Edition. 2015 Report on the Committee of Infectious Diseases.

The Sanford Guide to Antimicrobial Therapy 2014, 44th Edition Sanford Guide 2015. Web Edition. (http://webedition.sanfordguide.com)

WHO guidelines for the treatment of *Treponema pallidum* (syphilis) 29 August 2016.

WHO guidelines for the treatment of *Chlamydia trachomatis* 29 August 2016.

WHO guidelines for the treatment of *Neisseria gonorrhoeae* 28 August 2016.

TUBERCULOSIS (TB)

The available anti-TB drugs are:

- First Line anti-TB drugs: Rifampicin (R), Isoniazid (H), Ethambutol (E), Pyrazinamide (Z)
- Second line anti-TB drugs: Streptomycin (S), Levofloxacin (Lfx), Moxifloxacin (Mfx), Amikacin (Akx)Prothionamide (Pto), Cycloserine (Cs), Linezolid (Lzd), Clofazimine (Cfz), Bedaquiline (Bdq), Para-aminosalicylic Acid (PAS) and Imipenem (Imp). These drugs will only be used in certified PMDT centers.

Anti-TB drugs in fixed-dose combination (FDC) preparation.

- Adult FDC tablet: Contains isoniazid 75 mg and rifampicin 150mg, +/- pyrazinamide 400 mg, +/-ethambutol 275 mg per tablet.
- Pediatric FDC dispersible scored tablet: Contains isoniazid 50 mg and rifampicin 75 mg, +/- pyrazinamide 150 mg per tablet. Give the entire daily dose once a day.

Single-drug formulations (SDF) are still recommended for the following situations: adverse reactions or at risk for adverse reactions; co-morbid conditions requiring dose adjustments (especially liver, kidney diseases); or expected to have significant drug interactions. However, local availability of SDFs is poor.

Drug-susceptible TB

Pulmonary TB (no treatment or had undergone previous treatment for less than a month; whether bacteriologically confirmed or clinically diagnosed)
Miliary TB or with dissemination not involving meningitis, bones, joints

Pediatrics (<15Y):

BODY WEIGHT (kg)	Intensive phase (2 mos. HRZE) (No. of tablets)		Continuation phase (4 mos. HR)
	HRZ	E (100 mg)	HR
4-7	1	1	1
8–11	2	2	2
12–15	3	3	3
16-24	4	4	4

ALL children being treated for TB should be weighed at least once every month to allow for adjustment of dosage(s). All patients should be weighed monthly for possible dose adjustments.

Anti-TB treatment shall be done through a patient-centered, Directly-

<table>
<tr><td rowspan="15">Extrapulmonary TB (EPTB) (whether bacteriologically confirmed or clinically diagnosed) EXCEPT CNS, bones, joints</td><td>>25</td><td colspan="4">Adult dose and preparations</td><td rowspan="15">Observed Treatment (DOT) to foster adherence. Anti-TB treatment regimen shall be based on anatomical site and bacteriologic status including drug resistance and history of prior treatment, as well as the presence of co-morbid conditions.

A patient's anti-TB regimen shall be comprised of at least four (4) first-line drugs. Fixed dose combination (FDC) should be used even for children. Single drug formulation should be used for specific subsets of patients such as those with hypersensitivity reactions to rifampicin and other anti-TB drugs: drug reactions; hepatic or renal impairment.

Refer to Table below on Summary of treatment regimens for EPTB.</td></tr>
<tr><td colspan="5">Adults:</td></tr>
<tr><td>BODY WEIGHT (kg)</td><td colspan="2">Intensive phase (2 mos. HRZE) (No. of tablets)</td><td colspan="2">Continuation phase (4 mos. HR)</td></tr>
<tr><td></td><td colspan="2">HRZE</td><td colspan="2">HR</td></tr>
<tr><td>30-37</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>38–54</td><td colspan="2">3</td><td colspan="2">3</td></tr>
<tr><td>55–70</td><td colspan="2">4</td><td colspan="2">4</td></tr>
<tr><td>>70</td><td colspan="2">5</td><td colspan="2">5</td></tr>
<tr><td colspan="5">Drug Dosage per kg body weight (if using single-drug formulations):</td></tr>
<tr><td></td><td colspan="2"><u>Pediatrics</u></td><td colspan="2"><u>Adults</u></td></tr>
<tr><td>ANTI-TB Drug</td><td>Dose (mg/kg BW)</td><td>Max dose/d (mg)</td><td>Dose (mg/kg BW)</td><td>Max dose/d (mg)</td></tr>
<tr><td>Isoniazid</td><td>10 (10 – 15)</td><td>300</td><td>5 (4 – 6)</td><td>400</td></tr>
<tr><td>Rifampicin</td><td>15 (10 – 20)</td><td>600</td><td>10 (8 – 12)</td><td>600</td></tr>
<tr><td>Pyrazinamide</td><td>30 (20 – 40)</td><td>2,000</td><td>25 (20 – 30)</td><td>2,000</td></tr>
<tr><td>Ethambutol</td><td>20 (15 – 25)</td><td>1,200</td><td>15 (15 – 20)</td><td>1,200</td></tr>
<tr><td colspan="6">Drug-susceptible TB</td></tr>
<tr><td rowspan="2">Extra-pulmonary TB (EPTB): CNS, bones or joints</td><td colspan="4">Pediatrics (<15Y):</td><td rowspan="2"></td></tr>
<tr><td>BODY WEIGHT</td><td colspan="2">Intensive phase (2 mos. HRZE)</td><td>Continuation phase</td></tr>
</table>

<table>
<tr><td></td><td>(kg)</td><td colspan="2">(No. of tablets)</td><td>(10 mos. HR)</td><td rowspan="11">Referral to relevant specialties is recommended for EPTB. Use of corticosteroids as adjunctive therapy is recommended ONLY for patients with TB meningitis and/or TB pericarditis.
• TB meningitis: Dexamethasone 0.4mg/kg/24h with a reducing course over 6-8 weeks
• TB pericarditis: Prednisolone 60 mg for the first 4 weeks, 30 mg for weeks 5-8, 15 mg for weeks 9-10 and 5 mg for week 11.
Refer to Table below on Summary of treatment regimens for EPTB.</td></tr>
<tr><td></td><td></td><td>HRZ</td><td>E (100 mg)</td><td>HR</td></tr>
<tr><td></td><td>4–7</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td></td><td>8–11</td><td>2</td><td>2</td><td>2</td></tr>
<tr><td></td><td>12–15</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td></td><td>16–24</td><td>4</td><td>4</td><td>4</td></tr>
<tr><td></td><td>>25</td><td colspan="3">Adult dose and preparations</td></tr>
<tr><td></td><td colspan="4">Adults:</td></tr>
<tr><td></td><td rowspan="2">BODY WEIGHT (kg)</td><td colspan="2">Intensive phase (2 mos. HRZE) (No. of tablets)</td><td>Continuation phase (10 mos. HR)</td></tr>
<tr><td></td><td colspan="2">HRZE</td><td>HR</td></tr>
<tr><td></td><td>30 – 37</td><td colspan="2">2</td><td>2</td></tr>
<tr><td></td><td>38 – 54</td><td colspan="2">3</td><td>3</td></tr>
<tr><td></td><td>55 – 70</td><td colspan="2">4</td><td>4</td></tr>
<tr><td></td><td>> 70 kg</td><td colspan="2">5</td><td>5</td></tr>
<tr><td colspan="6">Multidrug- or Rifampin-resistant TB (MDR/RR-TB)</td></tr>
<tr><td colspan="6">Persons whose treatment have been interrupted, failed or have recurrence of disease are at risk of drug-resistant TB. The standard of care is performance of Xpert MTB/RIF, mycobacterial culture and susceptibility testing of sputum specimens and then treatment based on the drug-resistance profile. Empirical treatment is NOT recommended. Such patients must be referred to treatment centers for drug-resistant TB.</td></tr>
<tr><td colspan="6">INDIVIDUAL CONDITIONS/SPECIAL SITUATIONS</td></tr>
<tr><td>PEOPLE LIVING WITH HUMAN IMMUNODEFICIENCY VIRUS (HIV)</td><td colspan="4">In HIV-related TB, the priority is to treat TB. Standard TB regimen for HIV-associated TB is the same as the general population.</td><td>All newly diagnosed PLHIV should be screened for active TB. All PLHIV with cough of any duration,</td></tr>
</table>

	ARV should be initiated after the 2nd week of TB treatment. For patients with TB meningitis, **ARV** should be given after the Intensive Phase of TB treatment.	fever, night sweats, or loss of weight shall undergo sputum collection for Xpert testing. PLHIV without these symptoms should undergo chest x-ray or clinical assessment to rule out EPTB. Should there be cutaneous reactions observed in HIV-infected individuals, it is important to note that RIF should be reintroduced last. **Efavirenz** is the preferred NNRTI for PLHIV on TB treatment. Avoid the use of **nevirapine** because of drug-drug interactions. **Pyridoxine** (Vitamin B6) at 10-25 mg/d.
DIABETES MELLITUS	Same as general population	Glucose control should be optimal, referral to specialist is recommended for difficult to control diabetes
PREGNANCY	Standard TB regimen for pregnant is the same as the general population. Pregnant patients taking Isoniazid should be given Pyridoxine (Vitamin B6) at 10-25mg/day.	Always ascertain whether or not a woman is pregnant before she starts TB treatment. First line anti-TB drugs are safe for pregnant

		women, EXCEPT streptomycin (an ABSOLUTE contraindication).
BREASTFEEDING/LACTATING WOMEN	Standard TB regimen for breastfeeding/Lactating women is the same as the general population. Breastfeeding/Lactating women should be given **Pyridoxine (Vitamin B6)** at 10-25mg/day. Supplemental **Pyridoxine** should be given at 5-10 mg/day to the infant who is taking **isoniazid** or whose breastfeeding mother is taking **isoniazid**.	Breastfeeding woman afflicted with TB should receive a full course of TB treatment. In lactating mothers on TB treatment, most anti-TB drugs will be found in breast milk in concentrations equal to only a small fraction of the therapeutic dose in infants.
ORAL CONTRACEPTIVES	Rifampicin interacts with oral contraceptive (OC) medications with a risk of decreased protective efficacy against pregnancy. Advise a woman receiving OC while on Rif treatment that she has the following options: 1. Take an OC pill containing a higher dose of estrogen (50 u) following consultation with a clinician 2. Use another form of contraception	
LIVER DISEASE / HISTORY OF LIVER DISEASE	Treatment should be interrupted and generally modified or alternative regimen used for those with alanine aminotransferase (ALT) elevation >3x the upper limit of normal (ULN) in the presence of hepatitis symptoms/or jaundice. If ALT is elevated 5x the ULN, treatment should be interrupted even in the absence of symptoms. **Refer to the appropriate specialist.**	
CHRONIC LIVER DISEASE	(For compensated liver cirrhosis): 2HRSE/6HR or 2HSE/10HE or 9HRE	

	Patients undergoing prolonged ethambutol treatment should undergo regular ophthalmologic screening (visual acuity and red/green color discrimination). For decompensated liver cirrhosis: Refer to a specialist because use of possible SLDs is warranted. The more advanced the liver disease, the fewer number of hepatotoxic drugs should be used.	
ACUTE VIRAL HEPATITIS	It is possible to defer TB treatment until acute hepatitis has been resolved. When it is necessary to treat TB during acute hepatitis, the safest option is the combination of streptomycin and ethambutol for 3 months. Once the hepatitis has resolved, a Continuation Phase of 6 months HR is given (3SE/6HR). If the hepatitis has not been resolved, SE should be continued for a total of 12 months (12SE). Refer all patients to a specialist.	
KNOWN CHRONIC KIDNEY DISEASE	2HRZE/4HR modified in dosage and frequency based on creatinine clearance. Thrice weekly instead of daily **pyrazinamide** and **ethambutol** is recommended. Please refer to the Table below on ***Dose Adjustments for Patients with Kidney Disease***. Anti-TB medications should be administered immediately AFTER hemodialysis or ANYTIME during peritoneal dialysis. SDFs are preferred over FDCs to facilitate proper dose adjustments. Same adjustments are made for those receiving second line drugs.	
RENAL FAILURE (with reduced renal function or receiving hemodialysis)	H: 300 mg od; or 900 mg 3x per week R: 600 mg od; or 600 mg 3x per week Z: 25-35 mg/kg/dose 3x per week (NOT daily) E: 15-25 mg/kg/dose 3x per week (NOT daily) S: 12-15 mg/kg/dose 2 or 3x per week	Noting the recommendations cited, it is possible to give a 4-drug FDC (HRZE) 3x per week and then give a 2-drug FDC (HR) for the rest of the week during the Intensive Phase. Continuation Phase may proceed with 4HR. Otherwise, another safe option is 2HRZ/4HR. It is recommended that anti-TB medications be taken after hemodialysis.

Summary of treatment regimens for Extra-pulmonary TB

Site	Regimen	Recommendation/ Level of Evidence
Central Nervous System	2 HRZE / 10 HR	STRONG recommendation, High quality evidence
Bone and Joints	2 HRZE / 10 HR	STRONG recommendation, Moderate quality evidence
Lymph node	2 HRZE / 4 HR	STRONG recommendation, Moderate quality evidence
Pericardium	2 HRZE / 4 HR	STRONG recommendation, Low quality evidence
Pleura	2 HRZE / 4 HR	STRONG recommendation, Moderate quality evidence
Liver	2 HRZE / 4 HR	STRONG recommendation, Moderate quality evidence
Gastrointestinal, Peritoneum	2 HRZE / 4 HR	STRONG recommendation, Moderate quality evidence
Kidney and Genitourinary tract	2 HRZE / 4 HR	STRONG recommendation, Low quality evidence

Dose Adjustments for Patients with Kidney Disease

Anti TB Drug	Reference dose (normal renal function)	Dose Adjustment			
		GFR ≥ 30 ml/min	GFR ≤ 30 ml/min	Hemodialysis	Peritoneal Dialysis
Isoniazid	5 (4-6) mg/kg/d (max 300 mg/d)	None		After dialysis	None

Rifampicin	10 (8-12) mg/kg/d (max 600 mg/d)	None		After dialysis	None
Pyrazinamide	25 (20-30) mg/ kg/d (max 2 g/d)	None	25-35 mg/kg, 3x/week	25-35 mg/kg, 3x/week, after dialysis	25-35 mg/kg, 3x/week
Ethambutol	15 (15-20) mg/ kg/d (max 1.2 g/d)	GFR > 70 ml/min: None GFR < 70 ml/min:15-25 mg/kg, 3x/week	15-25 mg/kg, 3x/week	15-25 mg/kg, 3x/week, after dialysis	15-25 mg/kg, 3x/week

REFERENCES:

WHO Treatment of Tuberculosis Guidelines, 4th edition. Geneva, Switzerland: WHO, 2010.

National Tuberculosis Control Program Manual of Procedures, 5th edition. Sta. Cruz, Manila: DOH, 2014.

CPG for the Diagnosis, Treatment, Prevention and Control of Tuberculosis in Adult Filipinos – 2016 Update. Manila: Philippine Coalition Against Tuberculosis (PhilCAT); 2016


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