

The Pharmacist's Guide to Antimicrobial Therapy and Stewardship

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Dedication

This guide is dedicated to our students and residents who continue to inspire us to be better preceptors and clinicians for our patients.

~SW and CS

For my late Dad, who continuously instructed, modeled, coached, and facilitated the value of hard work. He was the ultimate preceptor.

~SW

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Preface

In the ever-changing practice of medicine, there is an abundance of gray area and very little in terms of black and white decision-making, especially within the specialty of infectious diseases (ID). As preceptors and practicing clinicians, we have seen many providers struggle with the gray area of ID management. The primary purpose of this point-of-care guide is to provide a simplified, comprehensive, and quick reference on the most commonly encountered ID states and anti-infectives to assist with how to evaluate and manage patients with suspected or confirmed infection. This text begins with the basics of how to assess these patients and progresses to the more challenging recommendations for antimicrobial therapy with subsequent antimicrobial stewardship-related interventions. This reference is specifically designed for the non-ID specialist pharmacists, pharmacy residents, and student pharmacists, although it contains information that would be helpful to all healthcare personnel providing direct patient care in various settings (i.e., acute care, long-term care, ambulatory care). Content may be reviewed generally to gather information on overall key concepts or for specific disease state or drug-specific information.

Organization and Content

The content is separated into five parts describing a general approach for ID patient assessment, treatment, monitoring, and antimicrobial stewardship:

Part I: How to Evaluate a Potentially Infected Patient

This section provides a step-wise approach for the evaluation of a patient with a suspected or confirmed infection and lays the foundation for the remainder of the reference. It contains a flow chart illustrating the steps to take throughout the patient evaluation process. In the first step, clinicians determine whether a confirmed infection is present or absent based on specific subjective and objective data. Also included is how to differentiate between colonization, contamination, and infection based on symptomatology and the variety of culture data available for the patient. Information on the development and interpretation of an antibiogram as well as details about the most clinically significant microorganisms is included. The next sub-section covers healthcare-associated risk factors that predispose patients for infection or colonization with multidrug-resistant infections.

Part II: What Is the Suspected Source of Infection and What Organisms Are Typically Associated with Infection at this Site?

This section includes information about the most commonly encountered ID listed in tabular format that include the following: definition (e.g., diagnostic criteria, clinical presentation, symptoms), most common offending pathogens, treatment and monitoring recommendations (i.e., empiric and definitive with comments on de-escalation when applicable), and duration of therapy. Clinical pearls and comments may also be found throughout this section.

Part III: What Anti-Infectives Provide Adequate Coverage for the Suspected Infection?

This section includes information about antifungals, antimicrobials, and antivirals by drug class in tabular format so as to provide the reader with the quick ability to compare within the class. Drug information includes generic names, mechanism of action, spectrum of activity (including general comparisons), FDA- and non-FDA-approved indications, pharmacodynamics, pharmacokinetics, distribution, the most pertinent adverse effects and drug interactions, common doses, monitoring requirements, resistance mechanisms, and specific comments about each agent.

Part IV: What Patient- or Disease State-Specific Factors Affect Your Decision for Therapy?

This section focuses on information regarding antimicrobial allergies and ways to approach patients, a renal dose adjustment chart, antimicrobial pharmacodynamics definitions and key concepts, and antimicrobial pharmacokinetics with dosing and monitoring recommendations for vancomycin and aminoglycosides.

Part V: What Antimicrobial Stewardship Interventions Can Be Made on Re-Assessment and What Needs to Be Monitored?

The last section focuses on the basics of antimicrobial stewardship (AMS), including where to start with the development of an AMS team and how to maintain the program. It begins with the rationale for AMS and describes content on the following: unintended consequences of antimicrobial misuse or overuse, purpose and goals of AMS, key AMS stakeholders and their role in AMS initiatives, description of specific AMS interventions, information on how to monitor and report AMS data, a general approach to the delivery of educational efforts, and key references to utilize.

Origins of Our Book

The idea for this point-of-care guide originated from self-developed drug tables and general ID information created as a reference to utilize throughout my ID fellowship training that was inspired by Carrie's lectures in pharmacy school. This information was a quick reference to utilize while on rounds. Subsequently, when asked to deliver a "Bugs and Drug" overview to fourth-year pharmacy students prior to the start of rotations, these tables served as the framework for the lecture. Since this time, it is noted that worn out copies of these tables continue to circulate. As a result, the idea for sharing this information as a guide was conceived.

We hope this reference will serve as a concise, step-by-step reference to enhance students', residents', and pharmacists' knowledge and application of ID to positively impact the patients for whom they provide care, and to become an increasing part of their anti-infective decision-making.

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Abbreviations

aBW	adjusted body weight
AECB	acute exacerbations of chronic bronchitis
AF	atrial fibrillation
AG	aminoglycoside
ALT	antibiotic lock therapy
ALT	alanine aminotransferase
AMS	antimicrobial stewardship
ANC	absolute neutrophil count
AST	aspartate aminotransferase
AUC	area under the curve
AUC/MIC	area under the concentration time curve to minimum inhibitory concentration ratio
BID	twice a day
BP	blood pressure
BSI	bloodstream infections
CA-MRSA	community-acquired methicillin-resistant <i>Staphylococcus aureus</i>
CAP	community-acquired pneumonia
CAPD	continuous ambulatory peritoneal dialysis
CAVH	continuous arteriovenous hemofiltration
CBC	complete blood count
CF	cystic fibrosis
CFU	colony forming unit
CLSI	Clinical Laboratory Standards Institute
C_{\max}/MIC	maximum drug concentration to minimum inhibitory concentration ratio
CMV	cytomegalovirus
CNS	central nervous system
COPD	chronic obstructive pulmonary disease
CrCl	creatinine clearance
CRE	carbapenem-resistant Enterobacteriaceae
CSF	cerebrospinal fluid
CT	computed tomography scan
CV	cardiovascular
CVP	central venous pressure
CVVH	continuous veno-venous hemofiltration
DS	double strength
DW	dosing weight
ECHO	echocardiogram (an ultrasound evaluation of the heart)
ED	emergency department

EPS	extrapyramidal symptoms
erm	erythromycin ribosome methylation
ESBL	extended spectrum β lactamase
ET	endotracheal
EtOH	ethanol
FQ	fluoroquinolone
GI	gastrointestinal
GU	genitourinary
HA	headache
HAP	hospital-acquired pneumonia
HCAP	healthcare-associated pneumonia
HD	hemodialysis
Heme	hematology
HGB/HCT	hemoglobin/hematocrit
HSV	herpes simplex virus
Hx	history
IBW	ideal body weight
ICU	intensive care unit
IgE	immunoglobulin E
IgG	immunoglobulin G
IHD	intermittent hemodialysis
IM	intramuscular
IV	intravenous
IVC	inferior vena cava
IVIG	intravenous immunoglobulin
K	potassium
KPC	<i>Klebsiella pneumoniae</i> carbapenemase
LFT	liver function test
LRTI	lower respiratory tract infections
MAO	monoamine oxidase
MAP	mean arterial pressure
MBC	minimum bactericidal concentration
MDR	multidrug-resistant
MDRO	multidrug-resistant organism
Mg	magnesium
MIC	minimum inhibitory concentration
MRI	magnetic resonance imaging
MRSA	methicillin-resistant <i>Staphylococcus aureus</i>
MRSE	methicillin-resistant <i>Staphylococcus epidermidis</i>
MSSA	methicillin-susceptible <i>Staphylococcus aureus</i>
MSSE	methicillin-susceptible <i>Staphylococcus epidermidis</i>

Na	sodium
NDA	new drug application
NRTIs	nucleoside reverse transcriptase inhibitors
P	desired peak
PAE	post-antibiotic effect
PCN	penicillin
PD	pharmacodynamics
PEG	percutaneous endoscopic gastrostomy
PID	pelvic inflammatory disease
PO	oral
PO ₄	phosphorus
PPE	personal protective equipment
PRBC	packed red blood cells
Q	every
Qnr	quinolone-resistant
QOD	every other day
RBCs	red blood cells
RVR	rapid ventricular response
Rxn	reaction
SBP	systolic blood pressure
SCr	serum creatinine
Scvo ₂	central venous oxygen saturation
SSTI	skin and soft tissue infection
T > MIC	time above minimum inhibitory concentration
TEE	transesophageal echocardiogram
TEN	toxic epidermal necrolysis
TIW	three times per week
TMP/SMX	trimethoprim/sulfamethoxazole
TPN	total parenteral nutrition
TSH	thyroid stimulating hormone
TTE	transthoracic echocardiogram
URTI	upper respiratory tract infection
UTI	urinary tract infection
VAP	ventilator-associated pneumonia
Vd	population volume of distribution estimate
VISA	vancomycin-intermediate <i>Staphylococcus aureus</i>
VRE	vancomycin-resistant <i>Enterococcus</i>
VRSA	vancomycin-resistant <i>Staphylococcus aureus</i>
VZV	varicella zoster virus
WBCs	white blood cells

