

Sixth Edition

Basic Skills in

INTERPRETING LABORATORY DATA

MARY LEE

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publications

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Basic Skills in

**INTERPRETING
LABORATORY DATA**

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DEDICATION

This book is dedicated to all of the chapter authors and reviewers, whose commitment to the education of future health professional students is evident in all that they do.

Mary Lee

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Mary Lee

PREFACE

The last four editions of *Basic Skills in Interpreting Laboratory Data* have been made possible by the dedicated chapter authors, reviewers, and the publishing staff at the American Society of Health-System Pharmacists. It has been my honor to serve as the editor and to work with this team.

For this sixth edition, approximately 90% of the lead authors have served in this capacity for the earlier editions with some exceptions. Paul O. Gubbins, PharmD, and Heather Lyons-Burney, PharmD, joined as the lead authors of a new chapter on Point-of-Care Testing, and Nicholas M. Moore, MS, MLS (ASCP), updated the chapter on Introduction to Common Laboratory Assays and Technology. All of the lead authors are established clinicians and/or experienced faculty at colleges of pharmacy or medicine, which enhance the quality of the chapter content.

A whole new group of reviewers has joined this project, and many reviewers are board-certified or established experts. Their specialty knowledge and scrutiny of the chapter content have helped to ensure that each chapter is up-to-date and content is relevant to clinical practice. As you use this book, you will find that the sixth edition includes updated chapter content with references, and almost all of the chapters have at least one new Minicase and Learning Point. In addition, the Abbreviations in the front of the book and the Glossary in the back have been expanded for reader convenience.

Significant and notable new chapter content:

1. Hematology: Blood Coagulation Tests includes expanded sections on laboratory tests to monitor direct thrombin inhibitors, direct oral anticoagulants, and low molecular weight heparin.
2. Hematology: Red and White Blood Cell Tests includes a discussion of cell types, associated cluster of differentiation epitopes or targets, and FDA-approved targeted therapies.
3. Infectious Diseases includes an expanded section on molecular diagnosis of specific viral nucleic acids and 1,3- β -glucan detection of fungi.
4. Liver and Gastroenterology Tests includes a new section on laboratory tests to diagnose and monitor hemochromatosis.
5. Interpretation of Serum Drug Concentrations includes information on new medications that have become commercially available since the last edition.
6. Men's Health includes an expanded section on PSA testing for screening, staging, and monitoring treatment of prostate cancer.

Suggestions for using this book efficiently:

- For a general overview of the laboratory tests for various organ systems or types of diseases, use the table of contents to identify the most appropriate section or chapter(s). The chapters are grouped into three major sections: Basic Concepts and Test Interpretations, System Disorders and Diagnostic Tests, and Tests for Special Populations. By reading the section or a chapter from start to finish, you get a detailed summary of the laboratory tests used to evaluate that organ system or disease, why the test is used, what a normal value range is for the test, and how to interpret an abnormal laboratory test result. Minicases guide the reader through common clinical scenarios about ordering appropriate laboratory tests, interpreting results, managing patients, and addressing spurious laboratory tests. Learning points conclude each chapter and highlight key concepts about the laboratory tests. Using the book in this way will be helpful, especially when used as a companion to a disease state management course, a pharmacotherapeutics course, or a course that prepares students for full-time clinical rotations.
- For information on a specific laboratory test, use the alphabetical index to locate the test, and then go to the page(s) to access the following information: the purpose of the test; how the test result relates to the pathophysiology of a disease or the physiologic function of a cell or organ;

the normal range for the test; causes for an abnormal test result; and causes of false-positive or false-negative results. This approach will be most useful in the clinical management of a patient.

- Quickview charts are provided for some of the most common laboratory tests. These charts are standardized template presentations of information that allow readers to quickly learn about a specific laboratory test (e.g., what the test is used for, what a normal result is, and causes of an abnormal result). This approach also will be most useful in the clinical management of a patient, but the Quickview content should be supplemented with the in-depth information in the chapters about a particular laboratory test. Although this book does not provide Quickview charts for all of the laboratory tests discussed, readers can refer to other clinical laboratory test handbooks, such as ASHP's *Interpreting Laboratory Data: A Point-of-Care Guide*.

The authors, reviewers, and I hope that *Basic Skills in Interpreting Laboratory Data* is useful to your practice.

Mary Lee
May 2017

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ABBREVIATIONS

μm	micrometer	ALL	acute lymphoblastic leukemia
1,25-DHCC	1,25-dihydroxycholecalciferol	ALP	alkaline phosphatase
17-OHP	17α-hydroxyprogesterone	ALT	alanine aminotransferase
²⁰¹ Tl	thallium-201	AMA	antimitochondrial antibody
2,3 DPG	2,3-diphosphoglycerate	AMI	acute myocardial infarction
25-HCC	25-hydroxycholecalciferol	AML	acute myelogenous leukemia
3SR	self-sustained sequence replication	ANA	antinuclear antibody
5HT	serotonin	ANCA	antineutrophil cytoplasmic antibody
6-AM	6-acetylmorphine	ANF	atrial natriuretic factor
6MWT	6-minute walk test	ANP	atrial natriuretic peptide
^{99m} Tc	technetium-99m	anti-HAV IgG	IgG antibody against hepatitis A virus
²⁰¹ Tl	thallium-201 (radio isotope)	anti-HAV IgM	IgM antibody against hepatitis A virus
α ₁ AC	α ₁ -antichymotrypsin	anti-HBc	antibody to hepatitis B core antigen
A-G6PD	glucose-6 phosphate dehydrogenase variant	anti-HbeAg	antibody to hepatitis B extracellular antigen
A1c	glycosylated hemoglobin	anti-HBs	antibody to hepatitis B surface antigen
A2M, α ₂ M	α ₂ -macroglobulin	anti-HCV	antibody against HCV antigen
AACE	American Association of Clinical Endocrinologists	anti-HD	antibody against hepatitis D
AAG	α ₁ -acid glycoprotein	APC	activated protein C
ABG	arterial blood gas	APC	antigen-presenting cell
ACA	anticentromere antibody	apoB	apolipoprotein B
ACC	American College of Cardiology	APS	antiphospholipid antibody syndrome
ACCF	American College of Cardiology Foundation	aPTT	activated partial thromboplastin time
ACCP	American College of Clinical Pharmacy	ARB	angiotensin receptor blocker
ACCP	anticyclic citrullinated peptide	ASA	aspirin
ACE	angiotensin-converting enzyme	ASCO	American Society of Clinical Oncology
ACE-I	angiotensin-converting enzyme inhibitor	ASCVD	atherosclerotic cardiovascular disease
ACPA	anticitrullinated protein antibody	AST	aspartate aminotransferase
ACR	albumin-to-creatinine ratio; American College of Rheumatology	AT	antithrombin
ACS	acute coronary syndrome	ATP	adenosine triphosphate
ACT	activated clotting time; α ₁ -coded testing	ATP-K	adenosine triphosphate potassium
ACTH	adrenocorticotrophic hormone (corticotropin)	ATP	Adult Treatment Panel
ADA	American Diabetes Association	ATP III	Adult Treatment Panel III
ADAM	androgen deficiency in aging males	ATS	American Thoracic Society
ADCC	antibody-dependent cellular cytotoxicity	AUA	American Urological Association
ADH	antidiuretic hormone	AUA-SI	American Urological Association Symptom Index
ADME	absorption, distribution, metabolism, excretion	AUC	area under the (serum concentration time) curve
ADP	adenosine diphosphate	AV	atrioventricular
AFB	acid-fast bacilli	AVP	arginine vasopressin
AFP	α-fetoprotein	B&B	Brown and Brenn
AG	anion gap	B2M	β ₂ -microglobulin
AGPA	allergic granulomatosis with polyangiitis	BAL	bronchial alveolar lavage; bronchoalveolar lavage
AHA	American Heart Association	BAMT	blood assay for <i>Mycobacterium tuberculosis</i>
AIDS	acquired immunodeficiency syndrome	BBT	basal body temperature
ALK	anaplastic lymphoma kinase	BCG	Bacillus Calmette-Guérin
		bdNA	branched-chain DNA

BGMK-hDAF	buffalo green monkey kidney cell line decay accelerating factor	CGE	capillary gel electrophoresis
BHI	brain heart infusion	CH ₅₀	complement hemolytic 50%
BHR	bronchial hyper-responsiveness	CHD	coronary heart disease
BID	twice daily	CHF	congestive heart failure
BMI	body mass index	CI	chemical ionization
BMP	basic metabolic panel	CIS	combined intracavernous injection and stimulation
BNP	brain natriuretic peptide	CK	creatine kinase
BP	blood pressure	CK-BB	creatine kinase isoenzyme BB
BPH	benign prostatic hyperplasia	CK-MB	creatine kinase isoenzyme MB
BPSA	benign form of prostate-specific antigen	CK-MM	creatine kinase isoenzyme MM
BPT	bronchial provocation testing	CK1	creatine kinase isoenzyme 1
BRAF	v-Raf murine sarcoma viral oncogene homolog B1	CK2	creatine kinase isoenzyme 2
BSA	body surface area	CK3	creatine kinase isoenzyme 3
BSL	biosafety level	CKD	chronic kidney disease
BT	bleeding time	CKD-EPI	Chronic Kidney Disease Epidemiology Collaboration
BUN	blood urea nitrogen	CLIA-88	Clinical Laboratory Improvement Amendments of 1988
<i>C. difficile</i>	<i>Clostridium difficile</i>	CLIA	Clinical Laboratory Improvement Amendments
C3	complement protein 3	CLL	chronic lymphocytic leukemia
C4	complement protein 4	CLSI	Clinical and Laboratory Standards Institute
CA	cancer antigen	cm	centimeter
CA	carbonic anhydrase	CMA	cornmeal agar
CABG	coronary artery bypass graft	C _{min}	minimum concentration (of a drug)
CA _{corr}	corrected serum calcium level	CML	chronic myelogenous leukemia
CAD	coronary artery disease	CMP	comprehensive metabolic panel
CAH	congenital adrenal hyperplasia	CMR	cardiac magnetic resonance
CAN2	chromID Candida agar	CMV	cytomegalovirus
cANCA	cytoplasmic antineutrophil cytoplasmic antibody	CNA	colistin-nalidixic acid
CAP	College of Pathologists	C _{normalized}	normalized total concentration
CAP	community-acquired pneumonia	CNP	c-type natriuretic peptide
CAT	computerized axial tomography	CNS	central nervous system
CA _{uncorr}	uncorrected serum calcium level (or actual measured total serum calcium)	CO	carbon monoxide; cardiac output;
CBC	complete blood count		cyclooxygenase
CCFA	cycloserine cefoxitin fructose agar	CO ₂	carbon dioxide
CCNA	cell cytotoxicity neutralization assay	CO-Hgb	carboxyhemoglobin
CCP	cyclic citrullinated peptide	COP	colloid osmotic pressure
CCR5	chemokine coreceptor 5	COPD	chronic obstructive pulmonary disease
cCRP	cardiac C-reactive protein	CPE	cytopathic effect
CCT	cardiac computed tomography	CPK	creatine phosphokinase
cd	candela	CPPD	calcium pyrophosphate dihydrate
CD	clusters of differentiation	cPSA	complexed PSA
CDC	Centers for Disease Control and Prevention	CrCl	creatinine clearance
CDR	complementarity-determining regions	CREST	syndrome characterized by calcinosis, Raynaud disease, esophageal motility disorder, sclerodactyly, and telangiectasias
CE	capillary electrophoresis	CRH	corticotrophin-releasing hormone
CEA	carcinoembryonic antigen	CRP	C-reactive protein
CEDIA	cloned enzyme donor immunoassay	CSF	cerebrospinal fluid
CETP	cholesteryl ester transfer protein	C _{ss, avg}	average steady-state concentration (of a drug)
CF	complement fixation	CT	computed tomography
CFTR	cystic fibrosis transmembrane conductance regulator	cTnC	cardiac-specific troponin C
CFU, cfu	colony-forming units	cTnI	cardiac-specific troponin I
CFW	calcofluor white		

cTnT	cardiac-specific troponin T	EGFR	epidermal growth factor receptor
CVD	cardiovascular disease	eGFR	estimated glomerular filtration rate
CX	circumflex	EF	ejection fraction
CXCR4	CXC chemokine coreceptor	EI	electron ionization
CYP	cytochrome P450 drug metabolizing enzymes	EIA	enzyme immunoassay
CYP2C19	cytochrome P450 2C19 enzyme	EIB	exercise- or exertion-induced bronchospasm
CYP2D6	cytochrome P450 2D6 enzyme	EKG	electrocardiogram
CYP3A4	cytochrome P450 3A4 enzyme	ELISA	enzyme-linked immunosorbent assay
CYP450	cytochrome P450 enzyme	ELVIS	enzyme-linked virus-inducible system
CYP4F2	cytochrome P450 4F2 enzyme	EM	electron microscopy
CZE	capillary zone electrophoresis	EMB	eosin methylene blue
D&C	dilation and curettage	EMIT	enzyme-multiplied immunoassay technique
D5W	5% dextrose in water	EOF	electroosmotic force
DASH	<u>d</u> ietary <u>a</u> pproaches to <u>s</u> top <u>h</u> ypertension	EPA	eicosapentaenoic acid
DAT	direct agglutination test	EPS	expressed prostatic secretions
DAT	direct antibody test	ER	estrogen receptor
DCCT	Diabetes Control and Complications Trial	ERS	European Respiratory Society
DCP	des-gamma-carboxyprothrombin	ERV	expiratory reserve volume
DDAVP	desmopressin	ESA	erythrocyte-stimulating agent
dTT	dilute thrombin time	ESBL	extended-spectrum β -lactamase
DDT	dichlorodiphenyltrichloroethane	ESC	European Society of Cardiology
DFA	direct fluorescent antibody	ESI	electrospray ionization
DHA	docosahexaenoic acid	ESR	erythrocyte sedimentation rate
DHEA	dehydroepiandrosterone or dehydroepiandrosterone	ESRD	end-stage renal disease
DHEAS	dehydroepiandrosterone sulfate	Etest	epsilometer test
DI	diabetes insipidus	ETIB	enzyme-linked immunoelectrotransfer blot
DIC	disseminated intravascular coagulation	EU	ELISA units
DIM	dermatophyte identification medium	EUCAST	European Committee on Antimicrobial Susceptibility Testing
DKA	diabetic ketoacidosis	EULAR	European League Against Rheumatism
dL	deciliter	FA	fluorescent antibody
DLCO	diffusing capacity of the lung for carbon monoxide	Fab	fraction antigen-binding
DM	diabetes mellitus	FAB	fast atom bombardment
DNA	deoxyribonucleic acid	FAB	French-American-British
DNP	dendroaspis natriuretic peptide	FACS	fluorescence-activated cell sorting
DO ₂	oxygen delivery	FALS	forward-angle light scattering
DOAC	direct oral anticoagulant	FANA	fluorescent antinuclear antibody
DPD	dihydropyrimidine dehydrogenase	FDA	Food and Drug Administration
DPP-4	dipeptidyl peptidase-4	FDP	fibrin degradation product
dsDNA	double-stranded DNA	FEF ₂₅₋₇₅	forced expiratory flow at 25% to 75% of vital capacity
DST	dexamethasone suppression test	FEF	forced expiratory flow
DTI	direct thrombin inhibitor	FE _{Na}	fractional excretion of sodium
DTM	dermatophyte test medium	FENO	fractional exhaled nitric oxide
E2	estradiol	FEV ₁	forced expiratory volume in 1 second
EBM	esculin base medium	FiO ₂	fraction of inspired oxygen
EBV	Epstein-Barr virus	FISH	fluorescence in situ hybridization
ECD	energy coupled dye	FITC	fluorescein isothiocyanate
ECG	electrocardiogram	fL	femtoliter
ECMO	extracorporeal membrane oxygenation	FM	Fontana-Masson
ECT	ecarin clotting time	FN	false negative
ECW	extracellular water	FP	false positive
ED	emergency department	FPG	fasting plasma glucose
EDTA	ethylenediaminetetraacetic acid	FPIA	fluorescence polarization immunoassay

fPSA	free prostate specific antigen	HER-2	human epidermal growth factor receptor 2
FRC	functional residual capacity	HEV	hepatitis E virus
FSH	follicle-stimulating hormone	HFpEF	heart failure with preserved ejection fraction
FTA-ABS	fluorescent treponemal antibody absorption		
FVC	forced vital capacity	HFrEF	heart failure with reduced ejection fraction
FWR	framework regions	HGA	human granulocytic anaplasmosis
g	gram	Hgb	hemoglobin
G-CSF	granulocyte colony-stimulating factor	HHS	hyperosmolar hyperglycemic state
G6PD	glucose-6 phosphate dehydrogenase	HIPA	heparin-induced platelet activation
GA	gestational age	HIT	heparin-induced thrombocytopenia
GADA	glutamic acid decarboxylase autoantibodies	HIV	human immunodeficiency virus
GAP	group A streptococcus	HIV-1	human immunodeficiency virus type 1
GAS	group A streptococci	HLA	human leukocyte antigen
GC	gas chromatography	HLA-B27	human leukocyte antigen B27
GC-MS	gas chromatography and mass spectrometry	HLA-DQ	human leukocyte antigen coded DQ genes
GERD	gastroesophageal reflux disease	HLAR	high-level aminoglycoside resistance
GF	Gridley fungus	HME	human monocytic ehrlichiosis
GFR	glomerular filtration rate	HMG-CoA	3-hydroxy-3-methyl-glutaryl-coenzyme A
GGT, GGTP	gamma-glutamyl transferase; gamma-glutamyl transpeptidase	HMWK	high-molecular weight kininogen
GHB	gamma-hydroxybutyrate	HPA	hypothalamic pituitary axis
GI	gastrointestinal	HPF	high-power field
GIP	glucose-dependent insulinotropic peptide	HPLC	high-performance (or pressure) liquid chromatography
GLC	gas liquid chromatography	HPV	human papillomavirus
GLP-1	incretin hormones glucagon-like peptide-1	HR	heart rate
GLUT	glucose transporter	hr	hour
GM-CSF	granulocyte/macrophage colony-stimulating factor	hs-CRP	high-sensitivity C-reactive protein
GMS	Gomori methenamine silver	HSG	hysterosalpingogram, hysterosalpingography
GnRH	gonadotropin-releasing hormone	hsTnI	high-sensitivity troponin I
GOLD	Global Initiative for Chronic Obstructive Lung Disease	hsTnT	high-sensitivity troponin T
gp	glycoprotein	HSV	herpes simplex virus
GPA	granulomatosis with polyangiitis	Ht	height
GTF	glucose tolerance factor	HTN	hypertension
H&E	hematoxylin and eosin	I	intermediate
<i>H. Pylori</i>	<i>Helicobacter pylori</i>	IA	immunoassay
HAAg	hepatitis A antigen	IA-2A	insulinoma-associated-2 autoantibodies
HAP	hospital-acquired pneumonia	IAA	insulin autoantibodies
HAV	hepatitis A virus	IAT	indirect antibody test
Hb; hgb	hemoglobin	IBW	ideal body weight
HbA1c	glycated hemoglobin	IC	inspiratory capacity
HBcAg	hepatitis B core antigen	IC ₅₀	inhibitory concentration 50%
HBeAg	hepatitis B extracellular antigen	IC ₉₀	inhibitory concentration 90%
HBsAg	hepatitis B surface antigen	ICA	immunochromatographic assay
HBV	hepatitis B virus	ICA	islet cell cytoplasmic autoantibodies
hCG	human chorionic gonadotropin	ICTV	International Committee on Taxonomy of Viruses
HCO ₃ ⁻	bicarbonate	ICU	intensive care unit
HCT, Hct	hematocrit	ICW	intracellular water
HCV	hepatitis C virus	ID	immunodiffusion
HDAG	hepatitis D antigen	IDC	International Diabetes Center
HDL	high-density lipoprotein	IDL	intermediate-density lipoproteins
HDL-C	high-density lipoprotein cholesterol	IDMS	isotope dilution mass spectrometry
HDV	hepatitis D virus	IFA	immunofluorescence assay; indirect fluorescent antibody
HER-1	human epidermal growth factor receptor 1		

IFN- γ	interferon gamma	LDL-C	low-density lipoprotein cholesterol
IgA	immunoglobulin A	LE	lupus erythematosus
IgD	immunoglobulin D	LFT	liver function test
IgE	immunoglobulin E	LH	luteinizing hormone
IgG	immunoglobulin G	LHRH	luteinizing hormone-releasing hormone
IgM	immunoglobulin M	LIS	laboratory information system
IHC	immunohistochemistry	LMP	last menstrual period
IHD	ischemic heart disease	LMWH	low molecular weight heparin
IIEF	International Index of Erectile Function	Lp(a)	lipoprotein(a)
IIM	idiopathic inflammatory myopathy	Lp-PLA ₂	lipoprotein-associated phospholipase A ₂
IMA	inhibitory mold agar	LPL	lipoprotein lipase
INR	international normalized ratio	LSD	lysergic acid diethylamide
IP	interphalangeal	LTA	light transmittance aggregometry
iPSA	inactive PSA	LUTS	lower urinary tract symptoms
IPSS	International Prostate Symptom Score	LVEF	left ventricular ejection fraction
IQ	inhibitory quotient	m	meter
IRMA	immunoradiometric assay	m ²	meters squared
IRV	inspiratory reserve volume	MAbs	monoclonal antibodies
ISE	ion-selective electrode	Mac	MacConkey
ISI	International Sensitivity Index	MAC	membrane attack complex
ITP	idiopathic thrombocytopenic purpura	MAC	<i>Mycobacterium avium</i> complex
IV	intravenous	MALDI	matrix-assisted laser desorption/ionization
J	joule	MALDI-TOF	matrix-assisted laser desorption ionization time-of-flight
JIA	juvenile idiopathic arthritis	MAP	mitogen-activated protein
JRA	juvenile rheumatoid arthritis	MAT	microagglutination test
JVP	jugular venous pressure	MBC	minimum bactericidal concentration
k	constant of proportionality	MBP	mannose-binding protein
K	kelvin	mcg	microgram
K _{corr}	corrected serum potassium level	MCH	mean corpuscular hemoglobin
KDIGO	Kidney Disease Improving Global Outcomes	MCHC	mean corpuscular hemoglobin concentration
kg	kilogram	MCP	metacarpophalangeal
KIMS	kinetic interaction of microparticles in solution	MCT	medium chain triglycerides
Km	Michaelis constant	MCTD	mixed connective tissue disease
KOH	potassium hydroxide	MCV	mean corpuscular volume
KRas	V-Ki-ras2 Kirsten rat sarcoma viral oncogene homolog	MDMA	3,4-methylenedioxy-N-methamphetamine (Ecstasy)
K _{uncorr}	uncorrected serum potassium level (or actual measured serum potassium)	MDR	multidrug resistant
L	liter	MDRD	Modification of Diet in Renal Disease
LA	latex agglutination	MDx	molecular diagnostics
La/SSB	La/Sjögren syndrome B	mEq	milliequivalent
LAD	left anterior descending	mg	milligram
LBBB	left bundle branch block	MHA	Mueller-Hinton agar
LC	liquid chromatography	MHA-TP	microhemagglutination <i>Treponema pallidum</i>
LCAT	lecithin cholesterol acyltransferase	MHC	major histocompatibility complex
LCR	ligase chain reaction	MI	myocardial infarction
LDH	lactate dehydrogenase	MIC	minimum inhibitory concentration
LDH1	lactate dehydrogenase isoenzyme 1	MIC ₅₀	MIC value representing 50% of a bacterial population
LDH2	lactate dehydrogenase isoenzyme 2	MIC ₉₀	MIC value representing 90% of a bacterial population
LDH3	lactate dehydrogenase isoenzyme 3	MIF	microimmunofluorescence
LDH4	lactate dehydrogenase isoenzyme 4	min	minute
LDH5	lactate dehydrogenase isoenzyme 5		
LDL	low-density lipoprotein		

mL	milliliter	NYHA	New York Heart Association
mm	millimeter	OA	osteoarthritis
mm ³	cubic millimeter	OAT	organic anion transport
mmol	millimole	OATP1	organic anion-transporting polypeptide 1
mTOR	mammalian target of rapamycin	OATP2	organic anion-transporting polypeptide 2
moAb	monoclonal antibody	OCT	organic cation transport
mol	mole	OGTT	oral glucose tolerance test
MOTT	mycobacteria other than tuberculosis	OSHA	Occupational Safety and Health Administration
MPO	myeloperoxidase		
MPV	mean platelet volume	P ₁ G ₁ O ₁	one live birth, one pregnancy, no spontaneous or elective abortions
MRI	magnetic resonance imaging	P-gp	P-glycoprotein
mRNA	messenger ribonucleic acid	Pa	Pascal
MRO	medical review officer	pAB	polyclonal antibody
MRP1	multidrug resistant protein 1	PaCO ₂	partial pressure of carbon dioxide, arterial
MRP2	multidrug resistant protein 2	PAD	peripheral arterial disease
MRP3	multidrug resistant protein 3	PAE	postantibiotic effect
MRSA	methicillin-resistant <i>Staphylococcus aureus</i>	PAI1	plasminogen activator inhibitor 1
MS	mass spectrometry	pANCA	perinuclear antineutrophil cytoplasmic antibody
MSSA	methicillin-susceptible <i>Staphylococcus aureus</i>		
mTOR	mammalian (or mechanistic) target of rapamycin	PaO ₂	partial pressure of oxygen, arterial
MTP	metatarsophalangeal	PAS	periodic acid-Schiff
N	newton	PBC	primary biliary cirrhosis
NA	nucleic acid	PBMC	peripheral blood mononuclear cell
NAAT	nucleic acid amplification test	PBP	penicillin-binding protein
NACB	National Academy of Clinical Biochemistry	PC ₂₀ FEV ₁	provocation concentration of the bronchoconstrictor agent that produces a 20% reduction in FEV ₁
NAEP	National Asthma Education Prevention Program	PCA	postconceptional age
NASBA	nucleic acid sequence-based amplification	PCI	percutaneous coronary intervention
NASH	nonalcoholic steatohepatitis	pCO ₂	partial pressure of carbon dioxide
NCCB	nondihydropyridine calcium channel blocker	PCOS	polycystic ovary syndrome
NCEP	National Cholesterol Education Program	PCP	phencyclidine
ng	nanogram	PCR	polymerase chain reaction
NHL	Non-Hodgkin lymphoma	PCSK9	proprotein convertase subtilisin/kexin type 9
NK cells	natural killer (T) lymphocytes	PD	pharmacodynamic
NKDEP	National Kidney Disease Education Program	PDA	potato dextrose agar
NKF KDOQI	National Kidney Foundation Kidney Disease Outcomes Quality Initiative	PE	phycoerythrin
NLA	National Lipid Association	Peak _{steady state}	Peak concentration of a drug in serum or plasma
nm	nanometer	PEA	phenylethyl alcohol
NNRTI	non-nucleoside reverse transcriptase inhibitor	PEFR	peak expiratory flow rate
NNS	number needed to screen	PET	positron emission tomography
NQO1	NADPH quinone dehydrogenase 1	PF3	platelet factor 3
NQMI	non Q-wave myocardial infarction	PF4	platelet factor 4
NRTI	nucleoside reverse transcriptase inhibitor	PFA	potato flake agar
NSAID	nonsteroidal anti-inflammatory drug	PFGE	pulsed-field gel electrophoresis
NSCLC	non-small-cell lung cancer	PFT	pulmonary function test
NSTEMI	non-ST-segment elevation myocardial infarction	pg	picogram
NT-proBNP	N-terminal-proBNP	PG	prostaglandin
NTM	nontuberculous mycobacteria	PG2	prostacyclin
		pH	power of hydrogen or hydrogen ion concentration
		PHY	phenytoin

Ph	Philadelphia	RI	reticulocyte index
PICU	pediatric intensive care unit	RIA	radioimmunoassay
PID	pelvic inflammatory disease	RIBA	recombinant immunoblot assay
PIP	proximal interphalangeal	RIDTs	rapid influenza diagnostic tests
PK	pharmacokinetic	RNA	ribonucleic acid
PKU	phenylketonuria	RNP	ribonucleoprotein
PL	phospholipid	Ro/SSA	Ro/Sjögren syndrome A antibody
PMA	postmenstrual age	RPF	renal plasma flow
PMN	polymorphonuclear leukocyte	RPR	rapid plasma reagin
PNA	postnatal age	RR	respiratory rate
PNA-FISH	peptide nucleic acid fluorescent in situ hybridization	RSA	rapid sporulation agar
PO	per os (by mouth)	RSAT	rapid streptococcal antigen test
pO ₂	partial pressure of oxygen	RSV	respiratory syncytial virus
POC	point-of-care	RT	reverse transcriptase; reverse transcription
POCT	point-of-care testing	RT-PCR	reverse-transcriptase polymerase chain reaction
PPAR	peroxisome proliferator-activated receptor	RV	residual volume
PPD	purified protein derivative	S	susceptible
PPG	postprandial glucose	S Cys C	serum cystatin C
PPI	proton pump inhibitor	S:P ratio	saliva:plasma concentration ratio
PR	progesterone receptor	SA	sinoatrial
PR3	proteinase 3	SaO ₂	arterial oxygen saturation
PRN	as needed	SAMHSA	Substance Abuse and Mental Health Services Administration
PRU	P2Y12 reaction units	SAT	serum agglutination test
PSA	prostate specific antigen	SBA	sheep blood agar
PSAD	prostate specific antigen density	SBT	serum bactericidal test
PSB	protected specimen brush	Scl ₇₀	scleroderma-70 or DNA topoisomerase I antibody
PSM	patient self-management	SCr	serum creatinine
PST	patient self-testing	ScvO ₂	central venous oxygen saturation
PT	prothrombin time	SD	standard deviation
PTCA	percutaneous transluminal coronary angioplasty	SDA	Sabouraud dextrose agar
PTH	parathyroid hormone	SDA	strand displacement amplification
q	every	sec	second
Q	perfusion	SEGA	subependymal giant cell astrocytoma
QC	quality control	SGE	spiral gradient endpoint
QID	four times daily	SGLT	sodium glucose cotransporters
qPCR	real-time polymerase chain reaction	SHBG	sex hormone-binding globulin
QRS	electrocardiograph wave; represents ventricular depolarization	SI	International System of Units
QwMI	Q-wave myocardial infarction	SIADH	syndrome of inappropriate antidiuretic hormone
R	resistant	SID	strong iron difference
R-CVA	right cerebral vascular accident	SIG	strong ion gap
RA	rheumatoid arthritis	SLE	systemic lupus erythematosus
RAAS	renin-angiotensin-aldosterone system	Sm	Smith antibody
RADT	rapid antigen detection test	SMBG	self-monitoring blood glucose
RAEB	refractory anemia with excess blasts	SNP	single nucleotide polymorphism
RAIU	radioactive iodine uptake test	SNRI	serotonin-norepinephrine reuptake inhibitor
RALS	right-angle light scattering	SnRNP	small nuclear ribonucleoprotein particle
RBC	red blood cell	SPECT	single-photon emission computed tomography
RBF	renal blood flow	SPEP	serum protein electrophoresis
RCA	right coronary artery	SRA	C-serotonin release assay
RDW	red cell distribution width		
RF	rheumatoid factor		
RhMK	rhesus monkey kidney		

ssDNA	single-stranded DNA	TT	thrombin time
SSRI	selective serotonin reuptake inhibitor	TTE	transthoracic echocardiography
STD	sexually transmitted disease	TTP	thrombotic thrombocytopenic purpura;
STEMI	ST segment elevation myocardial infarction		total testing process
SV	stroke volume	TTR	time in therapeutic range
SVC	slow vital capacity	TV	tidal volume
SvO ₂	venous oxygen saturation	T _x A ₂	thromboxane A ₂
T ₃	triiodothyronine	type 1 DM	type 1 diabetes mellitus
T ₃ RU	triiodothyronine resin uptake	type 2 DM	type 2 diabetes mellitus
T ₄	thyroxine	U	urinary creatinine concentration
TAT	turnaround time	U ₁ RNP	uridine-rich ribonuclear protein
TB	tuberculosis	UA	unstable angina
TBG	thyroxine-binding globulin	UCr	urine creatinine
TBI	total body irradiation	UFC	urine-free cortisol
TBPA	thyroid-binding prealbumin	UFH	unfractionated heparin
TBW	total body water	UGT1A1	uridine diphosphate glucuronyl transferase
TBW	total body weight		
TC	total cholesterol	UKPDS	United Kingdom Prospective Diabetes Study
TCA	tricyclic antidepressant		
TDM	therapeutic drug monitoring	ULN	upper limit of normal
TEE	transesophageal echocardiography	uNGAL	urine neutrophil gelatinase associated lipocalcin
TF	tissue factor		
TFPI	tissue factor pathway inhibitor	uPA	urokinase plasminogen activator
TG	triglyceride	UTI	urinary tract infection
THC	total hemolytic complement	UV	ultraviolet
TIA	transient ischemic attack	V	total urine volume collected; ventilation; volt
TIBC	total iron-binding capacity		
TID	three times daily	VAP	ventilator-associated pneumonia
TJC	The Joint Commission	VC	vital capacity
TK	tyrosine kinase	Vd	volume of distribution
TKI	tyrosine kinase inhibitor	VDRL	Venereal Disease Research Laboratory
TLA	total laboratory automation	VISA	vancomycin-intermediate <i>Staphylococcus aureus</i>
TLC	therapeutic lifestyle changes		
TLC	thin layer chromatography	VKORC1	vitamin K epoxide reductase complex subunit 1
TLC	total lung capacity		
TMA	transcription mediated amplification	VLDL	very low-density lipoprotein
TN	true negative	V _{max}	maximum rate of metabolism
TnC	troponin C	VPA	valproic acid
TNF	tumor necrosis factor	VO ₂	oxygen consumption
TnI	troponin I	VRE	vancomycin-resistant enterococci
TnT	troponin T	VTE	venous thromboembolism
TP	true positive; tube precipitin	vWF	von Willebrand factor
tPA	tissue plasminogen activator	VZV	varicella zoster virus
TPMT	thiopurine methyltransferase	W	watt
TPN	total parenteral nutrition	WB	western blot
TR	therapeutic range	WBC	white blood cell
TRH	thyrotropin-releasing hormone	WHO	World Health Organization
TRUS	transrectal ultrasound of the prostate	WNL	within normal limits
TSB	trypticase soy broth	Wt	weight
TSH	thyroid-stimulating hormone	WT	wild type
TST	tuberculin skin test	yr	year

PART I

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