

101 TOPICS FOR CLINICAL MICROBIOLOGY LABORATORY LEADERS

ACCREDITATION, VERIFICATION, QUALITY SYSTEMS, AND MORE



REBEKAH M. MARTIN

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ACCREDITATION, VERIFICATION, QUALITY SYSTEMS, AND MORE

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Washington, DC

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For Ben
Life with you is my favorite adventure
xxx

Excellence, then, is not an act but a habit.
—Will Durant (1926) *The Story of Philosophy: The Lives and Opinions of the World's Greatest Philosophers* (often misattributed to Aristotle)

Contents

Foreword	<i>xv</i>
Preface	<i>xvii</i>
Acknowledgments	<i>xix</i>
About the Author	<i>xxi</i>
List of Abbreviations	<i>xxiii</i>

Part I Getting Started: Regulatory Oversight and Laboratory Accreditation 1

1 Clinical Laboratory Improvement Amendments (CLIA) and Regulatory Oversight	3
How is “clinical laboratory” defined?	3
What is CLIA?	4
What is the Code of Federal Regulations (CFR)?	5
What roles do the Centers for Medicare and Medicaid Services (CMS), the Centers for Disease Control and Prevention (CDC), and the U.S. Food and Drug Administration (FDA) play in regulating clinical laboratories?	5
What is an FDA-cleared or FDA-approved test?	6
What is a laboratory developed test (LDT)?	7
What does the FDA final rule mean for my laboratory?	8
What is Emergency Use Authorization (EUA)?	14
What is test complexity?	15
Is there a list of tests categorized by complexity?	17
References	17
2 Clinical Laboratory Improvement Amendments (CLIA) Certificates	21
Which laboratories need a CLIA certificate?	21
Which laboratories are NOT required to obtain a CLIA certificate?	21
What are the types of CLIA certificates?	21
What procedures are categorized as provider-performed microscopy (PPM) procedures?	22
How does a laboratory obtain a CLIA certificate?	23
How many laboratories can be on one CLIA certificate?	24
Can one location have multiple CLIA certificates?	24
How many CLIA certificates can one laboratory director have?	25
How long is a CLIA certificate effective, and how does a laboratory renew a CLIA certificate?	25

What are the laboratory specialties and subspecialties?	25
Which states have CLIA-exempt laboratory programs?	26
When can a laboratory begin testing?	26
Who should be notified if there are changes in the laboratory, and when?	26
What happens if a laboratory is out of compliance with CLIA requirements?	27
References	28

3 Waived Testing 29

What are waived tests?	29
Is there a list of tests that are waived?	30
Is my laboratory subject to inspection if we perform waived testing?	30
What are the personnel qualifications for performing waived testing in clinical laboratories?	30
Are there compliance exemptions for laboratories performing waived testing?	30
References	31

4 Laboratory Accreditation 33

What is laboratory accreditation?	33
What are the current CMS-approved accrediting agencies?	33
How can my laboratory become accredited?	34
How does my laboratory maintain accreditation?	35
What happens during a laboratory inspection?	35
How does a laboratory respond when cited for deficiencies?	36
How is laboratory noncompliance addressed by CMS?	36
Can I become a laboratory inspector?	36
What is “ISO certification/accreditation” and does my laboratory need it?	37
I need some help with terms!	38
References	39

Part II Going Live: Verification and Validation of Test Systems 41

5 Verification and Validation 43

What are verification and validation?	43
When should a laboratory perform a verification or validation study?	43
If our laboratory complies with the FDA final rule for LDTs, do we still need to perform a validation study for our LDTs?	44
What is a test system?	45
What counts as a modification to a test system?	45
Who is responsible for designing and implementing a verification or validation study?	46
Can the company who made the instrument perform the verification study?	46
What performance characteristics should be assessed for a verification study?	46
What performance characteristics should be assessed for a validation study?	47
Is verification/validation necessary for point of care and other CLIA-waived assays?	47
My laboratory is moving an instrument. Is a verification/validation necessary?	47
My laboratory has five of the same instruments running the same assay. Do we have to run a verification/validation on each instrument?	48

My laboratory has multiple high-complexity laboratories across the health system that run the same assays on the same platform. Does a verification/validation need to be performed at each location? 48

My laboratory stopped running a particular assay. Is verification/validation necessary to resume testing with this assay? 48

My laboratory is running a test under Emergency Use Authorization (EUA). Is verification/validation required? 49

Which laboratory personnel are involved in a verification/validation study? 49

References 49

6 Performance Characteristic: Precision 51

What is precision? 51

How many and what types of samples should be used to assess precision? 52

How does a laboratory assess precision for qualitative assays? 52

How does a laboratory assess precision for quantitative assays? 53

What calculations should be used for precision? 54

How can precision be assessed for matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) identification systems? 55

How can precision be assessed for antimicrobial susceptibility test (AST) systems? 57

How can precision be assessed for multiplex molecular systems? 57

References 62

7 Performance Characteristic: Accuracy/Agreement 65

What is accuracy? 65

How many and what types of samples should be used to assess accuracy? 66

What calculations should be used for accuracy? 67

What calculations should be used for agreement? 68

How does disease prevalence affect test performance? 69

How can accuracy be assessed for matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) identification systems? 69

How can accuracy be assessed for antimicrobial susceptibility test (AST) systems? 70

How can accuracy be assessed for multiplex molecular systems? 73

References 77

8 Performance Characteristic: Reportable Range 79

What is reportable range? 79

How many and what types of samples should be used to assess reportable range? 80

How does a laboratory assess reportable range for quantitative assays? 81

How does a laboratory assess reportable range for qualitative assays? 81

How can reportable range be assessed for matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) identification systems? 84

How can reportable range be assessed for antimicrobial susceptibility test (AST) systems? 84

How can reportable range be assessed for multiplex molecular systems? 84

References 85

9 Performance Characteristic: Reference Interval 87

What is a reference interval? 87

How many and what types of samples should be used to assess the reference interval? 87

How does a laboratory assess the reference interval? 88
 What calculations should be used for reference interval? 88
 How can the reference interval be assessed for matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) identification systems? 89
 How can the reference interval be assessed for antimicrobial susceptibility test (AST) systems? 89
 How can the reference interval be assessed for multiplex molecular systems? 89
 References 89

10 Performance Characteristic: Analytical Sensitivity 91

What is analytical sensitivity? 91
 How many and what types of samples should be used to assess analytical sensitivity? 92
 How does a laboratory assess analytical sensitivity? 92
 What calculations should be used for analytical sensitivity? 93
 How can analytical sensitivity be assessed for matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) identification systems? 93
 How can analytical sensitivity be assessed for antimicrobial susceptibility test (AST) systems? 93
 How can analytical sensitivity be assessed for multiplex molecular systems? 94
 References 94

11 Performance Characteristic: Analytical Specificity 95

What is analytical specificity? 95
 How many and what types of samples should be used to assess analytical specificity? 95
 How does a laboratory assess analytical specificity? 96
 What should we do if cross-reactivity or interfering substances are identified? 97
 How can analytical specificity be assessed for matrix-assisted laser desorption ionization–time of flight (MALDI-TOF) identification systems? 97
 How can analytical specificity be assessed for antimicrobial susceptibility test (AST) systems? 98
 How can analytical specificity be assessed for multiplex molecular systems? 98
 References 98

12 Additional Performance Characteristics 99

What additional performance characteristics could be considered, and how are they assessed? 99
 References 100

13 Unacceptable Results and Resolution 101

What should we do if there are significant discrepancies between our new assay and the comparator assay? (Accuracy) 101
 We are using a less sensitive method as our comparator method, and our new test is showing poor agreement and increased “false positives.” What should we do? (Accuracy) 101
 Our assay shows significant cross-reactivity with a particular organism. What should we do? (Analytical specificity) 102
 References 103

14 Documentation for Verification and Validation Studies 105

What documentation is necessary for a verification or validation study? 105

What should be included in a verification/validation plan? 105

What should be included in a verification/validation summary? 106

How long is the laboratory required to keep verification/validation documentation? 106

What do I do if my laboratory's legacy assays do not have verification/validation documentation? 106

References 107

Part III Staying Live: Quality Management Systems 109**15 Quality Management Systems 111**

What is a quality management system, and why is it essential for clinical microbiology laboratories? 111

What are the essentials of a quality management system? 111

What are some additional resources to help with developing a quality management system? 112

References 113

16 Essential: Organization 115

What is "organization" in a quality management system? 115

What are some key organization components to consider for a clinical microbiology laboratory? 115

What is a quality manual and how do I write one? 119

References 120

17 Essential: Laboratory Personnel 121

Who are the key clinical microbiology laboratory personnel? 121

What are the qualifications for laboratory personnel by test complexity? 123

Do testing personnel need to be licensed and/or certified? 129

How is personnel competency assessed? 130

What personnel records should be maintained, where, and for how long? 131

References 132

18 Essential: Customer Service 133

Who are the clinical microbiology laboratory's customers? 133

How is customer satisfaction monitored? 134

How is customer dissatisfaction managed? 135

References 136

19 Essential: Facilities and Safety 137

How does the laboratory maintain safety? 137

How does the laboratory maintain security? 138

How does a laboratory perform a risk assessment? 139

What role does facilities design play in safety? 141

What is emergency/disaster preparedness and how can this be implemented in the laboratory? 142
References 144

20 Essential: Purchasing and Inventory 147

What is the purchasing and inventory quality essential? 147
What are key considerations for purchasing materials and services? 147
How is inventory managed? 149
What happens when there is a lack of inventory? 151
What are examples of external services that need to be tracked and managed? 152
What documents and records should be retained for purchasing and inventory? 152
References 152

21 Essential: Equipment 155

What is the equipment quality essential? 155
What are examples of equipment in the clinical microbiology laboratory? 160
If we use multiple instruments to perform the same test, do test results need to be compared? 161
What documents and records should be maintained for equipment? 161
How is return on investment calculated? 162
References 163

22 Essential: Process Control 165

What is process control? 165
How can the laboratory implement process control? 165
What is quality control (QC)? 168
What is an individualized quality control plan (IQCP)? 169
What is a Levey-Jennings control chart? 171
What are calibration and calibration verification? 172
What documents and records should be retained as part of process control? 173
References 174

23 Essential: Document and Records Management 175

What are documents and records? 175
What is document and records management? 176
What are controlled and uncontrolled documents? 177
What is a policy versus a procedure? 178
What should be included in an analytical testing standard operating procedure (SOP)? 178
How does the laboratory store documents and records? 180
How long does the clinical microbiology laboratory need to retain documents and records? 181
References 183

24 Essential: Information Management 185

What is information management? 185
What are some key considerations for information management? 185
What is the LIS? 187
References 188

25	Essential: Occurrence Management	189
	What is occurrence management?	189
	What are some common laboratory errors?	189
	How should the laboratory respond when a nonconforming event (NCE) occurs?	190
	When and how does the laboratory perform a root cause analysis (RCA)?	193
	What are corrective and preventive actions (CAPAs)?	197
	References	199
26	Essential: Assessment	201
	What is assessment?	201
	How does the laboratory monitor quality processes?	201
	What are inspections, surveys, or audits?	203
	What indicators should the laboratory use to monitor and assess quality?	204
	How does the laboratory implement proficiency testing (PT)?	205
	References	209
27	Essential: Process Improvement	211
	What is process improvement?	211
	What should be included in a process improvement plan?	213
	What does it mean for a process to be efficient and effective?	214
	What are some common improvement models and tools?	214
	What is a process map?	216
	References	218
	Index	219

Foreword

As I settle into the later phase of my career in diagnostic and medical microbiology, I occasionally reflect on my activities, which I hope have had a special impact on or significance to the field. Two notable examples that stand out are mentoring the next generation of laboratory medicine leaders and serving as a subject matter expert on the topic of verification and validation of laboratory tests. (I fondly remember being referred to by colleagues as the “V and V guy.”) In these areas, I have had the pleasure of collaborating with Rebekah Martin, coauthoring manuscripts on the verification and validation of laboratory tests. Martin has demonstrated a deep knowledge and understanding of this complex subject, for which written regulations are relatively sparse. This often leaves details open to interpretation and forces laboratorians to consult supplemental materials authored by subject matter experts.

In this book, Martin provides a concise overview and practical guidance for several topics that are important responsibilities of laboratory leaders. These topics include laboratory accreditation, verification and validation of laboratory tests (of course), and essential elements of a laboratory quality management system—such as personnel qualifications, competency assessments, equipment maintenance, information management, document control, process control (including individualized quality control programs), nonconforming event investigation, and process improvement. These are challenging topics, because (as previously mentioned) the laboratory regulations often lack granularity. Much is left to the discretion and expertise

of the laboratory director, whether designing a test verification study, developing a competency assessment program, investigating nonconforming events, or establishing an external quality assessment program for nonregulated analytes. While there are resources available for these topics, Martin has skillfully tied it all together in one practical, insightful, and informative guide. Concise and addressing the key points, this book serves as a pocket guide that I’m confident laboratory leaders will frequently consult. Keep it in a handy location—a hard copy will likely be well worn.

Several chapters deserve special mention. The book appropriately begins with a comprehensive description of the Clinical Laboratory Improvement Amendments (CLIA), which includes a nice description of emergency use authorization (EUA) and the important distinction between an EUA and a declared public health emergency. Martin does a great job of defining test complexity designations, and her chapter on waived testing is particularly timely given the recent explosion in point-of-care testing for infectious diseases, driven largely by COVID-19, as well as sexually transmitted infections, hepatitis C virus, and others. Most point-of-care testing in the United States is performed with CLIA-waived tests, and this chapter addresses some key considerations such as personnel qualifications and training requirements.

A chapter near and dear to my heart is the one on verification and validation, which provides important definitions for ambiguous concepts such as a test system and what

represents a test modification. Martin also helps to sort out an ongoing source of confusion: when is it necessary to perform a verification or validation study? The chapter on quality management systems (QMS) discusses each of the essential elements of a QMS and describes important resources such as the Clinical and Laboratory Standards Institute (CLSI). The chapter on personnel clearly lays out the CLIA definitions of laboratory personnel, distinguishing, for examples, between individuals who might be titled “laboratory director” by their institution but are actually usually either a technical or general supervisors under CLIA’s definitions—an important distinction.

Finally, the chapter on occurrence (or error, or nonconforming event) management is essential reading. Some of these laboratory errors can lead to adverse events and patient harm and Martin does a superb job explaining the process for managing errors, including

monitoring, investigating, determining root cause, and implementing corrective and preventive actions. I especially note the inclusion of a risk matrix table in this chapter that highlights the probability and risk of patient harm.

Martin’s book will be extremely valuable not only for laboratory leaders—medical and technical directors, managers, supervisors—but also for trainees in laboratory medicine fellowship programs, for whom board examinations are right around the corner. As a current representative of the diagnostic device industry, I also strongly believe this book will be a great resource for my industry colleagues, helping them better understand the laboratory customer environment and the regulatory guard rails in which they operate.

Michael Loeffelholz
Vice President, Scientific Affairs
Cepheid
Sunnyvale, CA

Preface

The purpose of this book is to act as a guide for navigating some of the complexities of clinical microbiology laboratory administration. As we all know, maintaining compliance in the clinical laboratory can be challenging. Not only are regulations and requirements numerous, but they can sometimes be confusing or vague—and on occasion there may be updates or events that introduce new requirements and unfamiliar processes. Additionally, terms like “CLIA,” and activities such as “verification” and “document control” are often casually referred to, but are also often unaccompanied by definitions, context, or an explanation of how to fulfill related requirements. It is therefore unsurprising that it may be daunting to develop—or even to work within—a laboratory management and administrative system when there are gaps in practical knowledge.

When I began working on this project, I wanted to create something that would help fill these gaps for laboratory administrators and employees, but that would also be something I would have actually used in the clinical laboratory. I also wanted to consolidate information into a single, digestible resource. My goal was therefore to develop an easy-to-use, accessible reference that could provide readers across experience levels with context for various requirements as well as some specific suggestions for best practices. The product of

these contemplations is what you now hold in your hands.

While the focus of this text is on activities for the clinical microbiology laboratory in particular, a great deal of what is included will be applicable to or adaptable for other specialties in the clinical laboratory. It should be noted that the requirements and suggestions included throughout the book are intended for clinical laboratories based in the United States that must comply with U.S. federal and/or state requirements¹.

As a final note, this book is meant to be an aid for YOU. Whether you are a new (or seasoned!) laboratory director, a microbiology fellow or pathology resident, a laboratory manager, a medical laboratory scientist, a student, or you just happen to be interested in these topics, my hope is that you find this text useful (and perhaps even a little bit engaging) and that you come away with more knowledge than when you started.

Rebekah M. Martin
October 2024

¹ This book is comprehensive but not exhaustive. Laboratory personnel both within and outside of the United States are responsible for identifying and complying with all applicable regulations and requirements.

Acknowledgments

It is perhaps cliché—but nonetheless true—to say that this book would never have happened without the support of a whole host of people. I’ve been incredibly lucky to have a fantastic group of colleagues, friends, and family who have assisted in getting me to this point. I wish to extend particular thanks to those listed here.

Michael J. Loeffelholz, for recommending me to write this book. When you passed the torch of expertise, I never dreamed it would lead to this!

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All the Beautiful Micro Mamas: Mel, Paige, Jocelyn, Lauren, Thess, Phyu, and Dona! For

sharing wisdom, experience, frustration, and laughter. You women inspire me.

Lola, my cat, for providing all the snuggles during writing sessions.

Elisa, my sibling, for being a source of delight, encouragement, and support; both in writing and in life.

Bob and Kathy, my parents, for being interested in and proud of everything I’ve accomplished. And of course, thank you for regularly asking about how “the book” is going. Good news mom and dad...it’s finally finished!!

Ben, my husband. As an historian and archivist, you probably care very little about the regulations governing clinical micro labs. But you care about me, and you know that I care about this. Thank you for reading every single chapter and providing feedback prior to submission, and for putting up with me while I fretted about deadlines and brooded over specific wording. You are always the first to tell me “You can do it”. You encourage me to reach for my dreams—whether those dreams involve writing a book, moving across the ocean, or taking time to do absolutely nothing—and I would not have made it as far as I have without your partnership and support.

And finally, thanks to you, the reader, for taking the time to engage with this book.

About the Author



Rebekah (Bekah) M. Martin, PhD, D(ABMM), MLS(ASCP)^{CM} has enjoyed working in or adjacent to the clinical microbiology laboratory throughout a career that spans the health care, academic, and industry sectors. After graduating with a clinical laboratory science degree from Michigan State University (Go Green!), she worked as a medical laboratory scientist in the microbiology division at Henry Ford Hospital in Detroit. She then went on to receive her PhD in molecular and cellular pathology from the University of Michigan

where her dissertation focused on identifying bacterial and host risk factors for clinical infection with *Klebsiella pneumoniae*. She has completed a medical microbiology fellowship at the University of Utah School of Medicine and ARUP Laboratories, worked as an associate technical director of microbiology at Labcorp, taught as an assistant professor both in the Clinical and Diagnostic Sciences department at Oakland University and in the Biomedical Laboratory Diagnostics program at Michigan State University, and is currently the regional medical affairs subject matter expert for molecular solutions at Becton, Dickinson, and Company (BD) in the Europe, Middle East, and Africa region. Bekah is certified as a Diplomate of the American Board of Medical Microbiology, and also maintains certification as a Medical Laboratory Scientist through the American Society for Clinical Pathology Board of Certification. She is passionate about good food and wine. She also enjoys traveling, spending time outdoors hiking and kayaking, and spending time indoors reading. Bekah currently lives in the East Riding of Yorkshire in the United Kingdom with her husband Ben and their cat Lola.

List of Abbreviations

Unless otherwise stated, all government regulations and bodies refer to those in the United States.

A2LA	American Association for Laboratory Accreditation
AABB	Association for the Advancement of Blood & Biotherapies (formerly the American Association of Blood Banks)
ABB	American Board of Bioanalysis
ABCC	American Board of Clinical Chemistry
ABFT	American Board of Forensic Toxicology
ABMGG	American Board of Medical Genetics and Genomics
ABMLI	American Board of Medical Laboratory Immunology
ABMM	American Board of Medical Microbiology
ACHC	Accreditation Commission for Health Care
ACHI	American College of Histocompatibility and Immunogenetics (formerly American Board of Histocompatibility and Immunogenetics [ABHI])
ACLA	American Clinical Laboratory Association
AMP	Association for Molecular Pathology
AMR	Analytical measurement range
ANAB	ANSI National Accreditation Board
ANSI	American National Standards Institute
APHL	Association of Public Health Laboratories
ASCP BOC	American Society for Clinical Pathology Board of Certification
ASHI	American Society for Histocompatibility & Immunogenetics
ASM	American Society for Microbiology
ASR	Analyte specific reagents
AST	Antimicrobial susceptibility test
BSL	Biosafety level
BLA	Biologics License Application
BV	Bacterial vaginosis
CA	Categorical agreement
CAP	College of American Pathologists
CAPA	Correction and preventive action
CDC	Centers for Disease Control and Prevention
CE	Continuing education
CFR	Code of Federal Regulations
CFU	Colony forming units