NEJM Knowledge+ | AACC Learning Lab

FOR LABORATORY MEDICINE

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NEJM GROUP

A DIVISION OF THE MASSACHUSETTS MEDICAL SOCIETY,
PUBLISHER OF *THE NEW ENGLAND JOURNAL OF MEDICINE*

AACC

THE LEADING AUTHORITY IN
LABORATORY MEDICINE

area9

GLOBAL PARTNER IN EDUCATION TECHNOLOGY

NEJM Knowledge+ | AACC Learning Lab

AACC Learning Lab for Laboratory Medicine on NEJM Knowledge+ is an adaptive e-learning product for preparation for certification, competency assessment, and continuing medical education. The program is sectioned into the following major pillars in Laboratory Medicine*.

1 GENERAL LABORATORY MEDICINE

Covers principles in laboratory medicine, such as safety, management, leadership, and statistics.

2 CLINICAL CHEMISTRY

Covers analytical techniques and instrumentation, pathophysiology of various organ systems and the corresponding analytes.

3 TRANSFUSION MEDICINE

Covers testing in the blood bank, transfusion service techniques, indications for transfusion, blood products and modifications, adverse events associated with transfusion of blood products, and transfusion reactions.

4 CLINICAL MICROBIOLOGY

Covers microbes (bacteriology, mycobacteriology, virology, mycology, parasitology, prions) and associated infectious diseases, antiinfectives, infection control, and diagnostics as well as infection control and disease surveillance.

5 LABORATORY GENOMICS

Covers principles of molecular biology, nucleic acid techniques and applications, pharmacogenetics, forensic testing, molecular tumor markers, monogenic and polygenic basis for common and rare diseases.

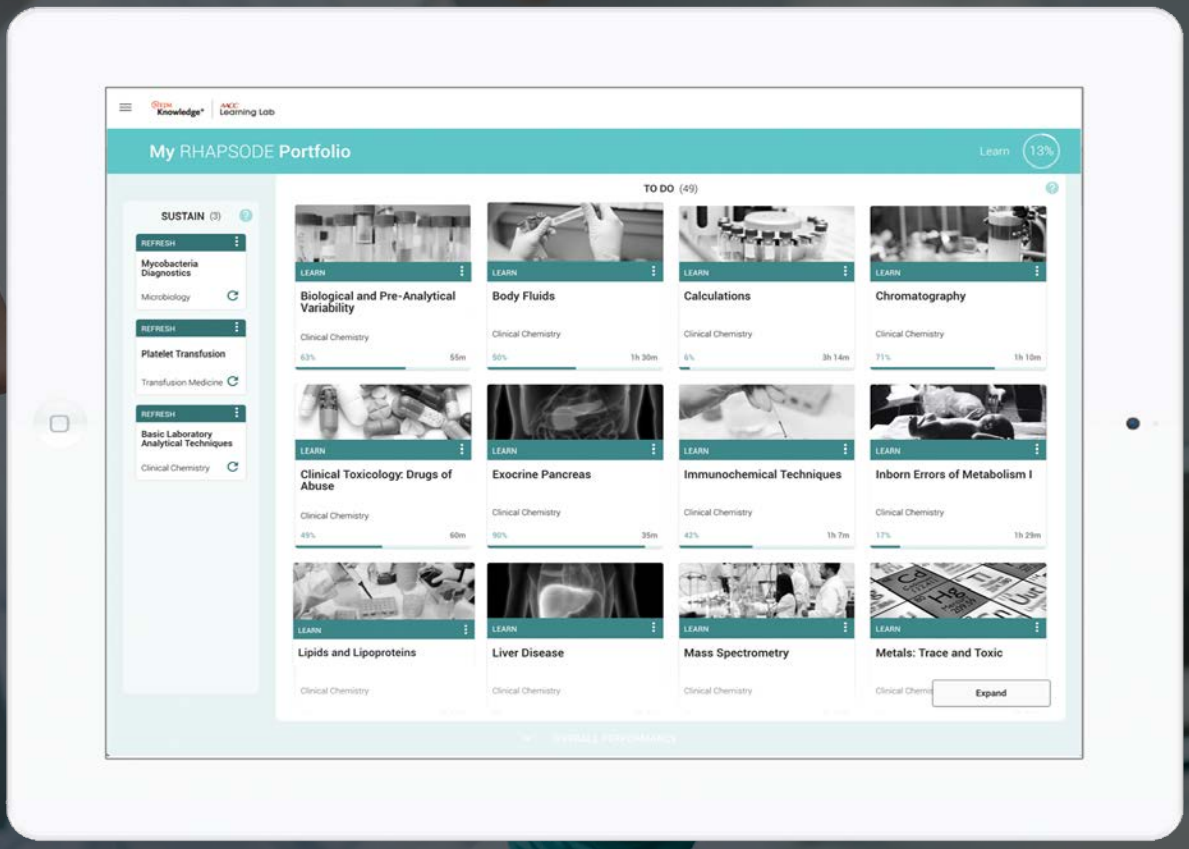
6 HEMATOLOGY AND COAGULATION

Covers analytical techniques and instrumentation, hematopoiesis, iron metabolism (including hemoglobin, iron, bilirubin, anemia), red and white blood cell disorders, platelet disorders, porphyrins and porphyrias, hematologic neoplastic disorders, hemostasis and coagulation.

7 CLINICAL IMMUNOLOGY

Covers primary immunodeficiencies, allergic diseases, organ-specific and systemic autoimmune diseases, and monoclonal gammopathies.

*A listing of the curricula of the seven sections is included in the Appendix.



WHEN COMPLETED, THIS PROGRAM WILL CONSIST OF APPROXIMATELY 120 COURSES SPANNING ACROSS ALL DISCIPLINES OF LABORATORY MEDICINE THUS BECOMING THE *DE FACTO* BACKBONE OF ALL TRAINING PROGRAMS AND THE MAIN SOURCE FOR PROVIDING CONTINUING EDUCATION CREDITS IN THE FIELD.

UNIQUENESS OF AACC LEARNING LAB

COLLABORATIVE EFFORT

AACC Learning Lab is a collaborative effort between NEJM Group, the most trusted and respected name in medical science, AACC, a recognized leader in laboratory medicine, and Area9, a global leader in education technology.

ADAPTIVE LEARNING

AACC Learning Lab utilizes adaptive learning. Through a series of questions while timing the learner and asking about the level of confidence in the answer, sophisticated algorithms identify the areas in which the learner is not proficient and provides targeted learning materials.

MICRO LEARNING

AACC Learning Lab enables learning in small blocks of time since most professionals are not always able to find the time needed to read long review articles.

MOBILE

AACC Learning Lab enables learning wherever you are as the program can be accessed on mobile devices.

PEER COMPARISON

AACC Learning Lab allows the learners to monitor their progress and provides comparison to peer groups.

LIFE-LONG LEARNING

AACC Learning Lab is a life-long learning companion.

WHAT IS A COURSE?

Courses for all sections are based on curricula that are used by experienced and board-certified professionals from the various disciplines in laboratory medicine and approved by the NEJM Knowledge+ team. Each course consists of three separate components: learning objectives, probes, and learning resources.

LEARNING OBJECTIVES

Learning objectives are granular and utilize Bloom's taxonomy. They range in complexity from *describe* or *define* to *deduce* and *analyze.* Each course contains 100-150 learning objectives to cover the topic of interest.

PROBES

There are nine different types of questions to choose from including multiple choice, fill in the blank, matching, and a clinical case. Morphologies, chromatograms, tables, electrophoretic patterns and other images can be used in these questions. There are at least two questions for each learning objective. Based on continuous analyses of how learners are responding, more depth will be developed.

LEARNING RESOURCES

Learning resources provide explanation for the answer in the form of a video, image, pathway, text (possibly read by a professional reader) and they also include a reference to support the explanation. There is at least one learning resource for each learning objective. Based on continuous analyses of how learners are responding, more depth will be developed where appropriate.

TARGET AUDIENCE

PRIMARY AUDIENCE

LABORATORY MEDICINE PROFESSIONALS

Laboratory medicine professionals at all levels (MD, PhD, and MT). Approximately 20% of the materials in each course is basic, 60% intermediate, and 20% advanced.

SECONDARY AUDIENCE

CLINICIANS

Because of the granular nature of each course and the richness of available materials, specific courses targeting clinicians of certain specialties or general practitioners can be constructed from existing courses. For example, NEJM Knowledge+ Internal Medicine Board Review contains one course in endocrinology and another in infectious disease. AACC Learning Lab contains 6 courses in endocrinology and 21 courses in microbiology.

TARGET AUDIENCE

TERTIARY AUDIENCE

STUDENTS IN ALL HEALTH CARE PROFESSIONS

Students in all health care professions, including nursing, medical and lab technicians, can benefit from targeted courses specific to their area of study adjusted by our team of authors and learning engineers. For example, students focusing on clinical microbiology can get a tailored program to their needs to support their learning.

NADER RIFAI, PHD

EDITOR-IN-CHIEF, *CLINICAL CHEMISTRY*
CO-EDITOR, AACC LEARNING LAB

CHRISTINA ELLERVIK, MD, PHD

CO-EDITOR, AACC LEARNING LAB

FACULTY

THE PROGRAM IS CREATED UNDER THE EDITORSHIP
OF NADER RIFAI AND CHRISTINA ELLERVIK

Each section has one or two editors. Currently, over 100 practicing professionals, primarily from academia, from the US, UK, Canada, Iceland, Denmark, Norway, Australia, Croatia, Italy, South Africa, Singapore and Turkey are participating in this project.

CREATION OF A COURSE

After the identification of an author by one of the editors and a 45 minute phone call with Nader Rifai to explain the program and the vision, the following steps take place:

1 OUTLINE

Author develops a detailed outline of the course for review by editors.

2 TRAINING

Author is trained on the platform and the writing style.

3 MONITORING

Author's progress is monitored by the Area9 editorial specialist and editors. Approximately 15 one-hour conferences usually take place during the development of a course.

4 REVIEW

When the course is completed, it is reviewed by the Area9 editorial specialist, the editors involved, and an expert reviewer.

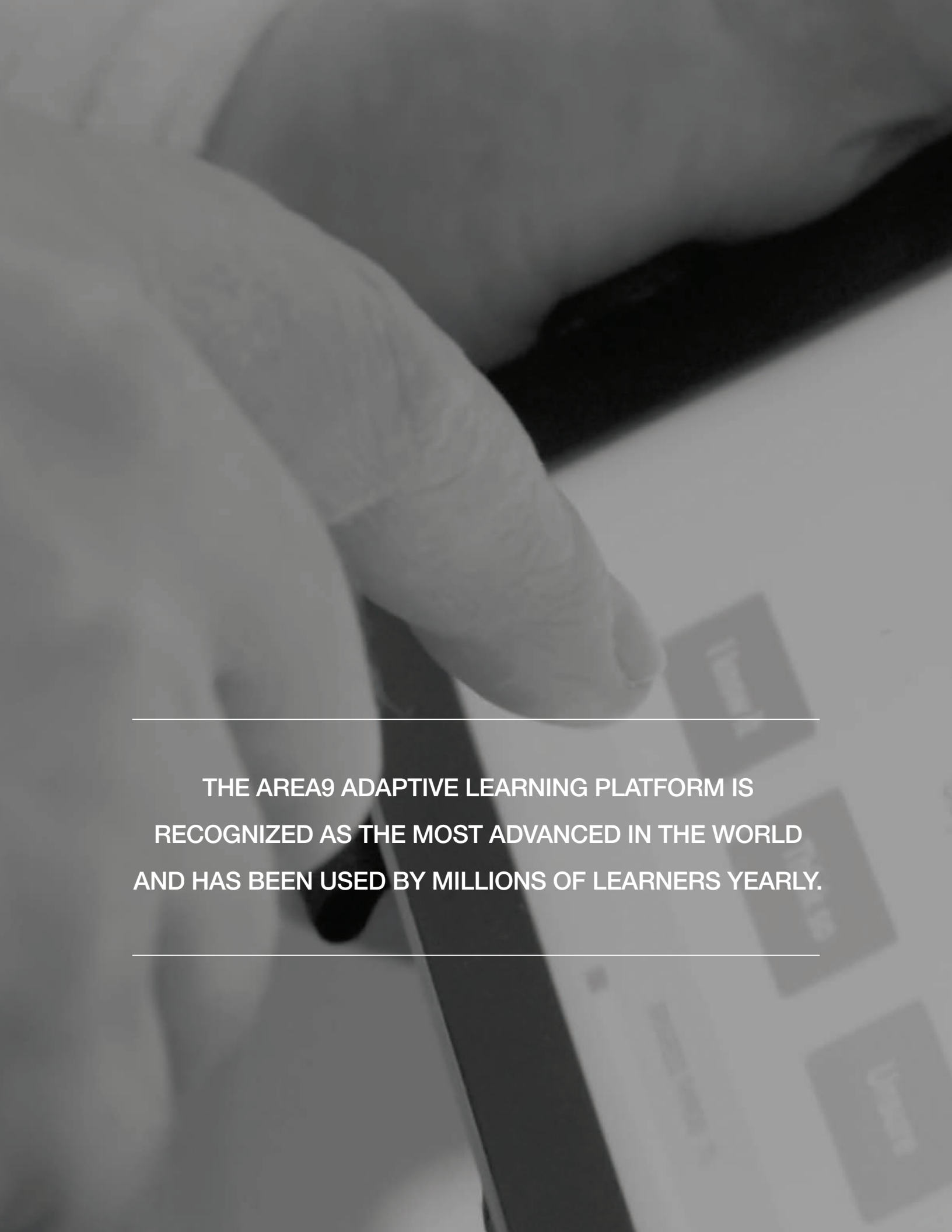
5 BETA TESTING

After the author responds to the reviewers' comments, the course undergoes beta testing by 3-5 individuals.

6 SUBMISSION

Finally, the course is submitted to NEJM Knowledge+ for review.

It takes about 300 hours to complete a course (4-6 months) by an author. The review process takes approximately 2 months. This program follows the same review process developed for other NEJM Knowledge+ programs.



THE AREA9 ADAPTIVE LEARNING PLATFORM IS RECOGNIZED AS THE MOST ADVANCED IN THE WORLD AND HAS BEEN USED BY MILLIONS OF LEARNERS YEARLY.

UTILITY OF AACC LEARNING LAB

THE AACC LEARNING LAB WAS BUILT WITH TWO MAJOR GOALS:

- **To be used by all laboratory medicine professionals**

- **To be used by laboratory medicine professionals in the three entities:**
  - Hospital labs
  - Commercial labs
  - IVD industry

THIS PROGRAM IS USEFUL IN:

- **Preparing for certification exams**

- **Assessing competency on a personal and institutional level**
  Employers will find the program not only useful in teaching their employees various aspects of laboratory medicine, but also in providing them with an assessment of their employees' knowledge level and competency.

- **Maintaining certification by obtaining the required CE and CME credits**
  Employers may find this program as the most cost effective means for their employees to obtain the desired credits since they will be able to use the program when workload is low or on their own time.

- **Staying current in an ever expanding and fast moving field**

- **Providing a life-long learning companion**

GENERAL LABORATORY MEDICINE COURSES	
Management	Laboratory Leadership
	Laboratory Management
	Laboratory Safety
Variability Assessment and Core Topics	Biochemical Calculations
	Biological and Preanalytical Variability
	Machine Learning
	Quality Control of the Examination Process
	Statistical Methodologies in Laboratory Medicine

CLINICAL CHEMISTRY COURSES	
Analytical Principles	Basic Laboratory Analytical Techniques
	Chromatography
	Immunochemical Techniques
	Mass Spectrometry
	Point of Care Testing
	Proteomics
Body Fluids	Body Fluids
Endocrinology	Bone and Mineral Metabolism
	Catecholamines and Serotonin
	Pituitary Function and Pathophysiology
	Pregnancy and its Disorders
	Reproductive Endocinology
	Tests for Diagnosis and Management of Diabetes
	The Adrenal Cortex
	Thyroid
Nutrition	Metals: Trace and Toxic
	Nutrition
	Vitamin D
	Vitamins
Proteins	Amino Acids, Peptides, and Proteins
	Protein Electrophoresis
	Serum Enzymes
	Tumor Markers
Therapeutic Drugs Management and Toxicoloy	Clinical Toxicology: Alcohols, Analgesics, and Anti-Depressants
	Clinical Toxicology: Drugs of Abuse
	Therapeutic Drugs and Their Management I
	Therapeutic Drugs and Their Management II

CLINICAL CHEMISTRY COURSES CONTINUED	
Cardiovascular	Cardiac Biomarkers
	Lipids and Lipoproteins
Kidney	Disorders of Water, Electrolytes and Acid-Base Metabolism
	Kidney Disease
Newborn Screening	Inborn Errors of Metabolism I
	Inborn Errors of Metabolism II
	Inborn Errors of Metabolism III

HEMATOLOGY AND COAGULATION COURSES	
Ancillary Diagnostic Techniques	Cytogenetics and Molecular Genetics of Hematolymphoid Disorders, Both Benign and Malignant
	Flow Cytometry Immunophenotyping Principles and Clinical Applications
General	Automated Hematology
	Lymph Node Pathology: Normal, Reactive, Malignant and Metastatic
	Normal and Abnormal Peripheral Blood and Bone Marrow Morphology
	Overview of Hematopathology
	Porphyrias
	Spleen and Thymus: Neglected Organs in Hematopathology
Hemostasis/Coagulation/Platelets	Hemostasis
	Thrombosis
Neoplastic	Acute Myeloid Leukemia
	Histiocytic and Dendritic Cell Disorders (not just Neoplasms)
	Hodgkin Lymphoma
	Lymphoproliferative Disorders Associated with Primary and Iatrogenic Immune Deficiency
	Mature B-Cell Neoplasms
	Mature T-Cell and NK-Cell Neoplasms
	Myelodysplastic Syndromes, Myeloproliferative Neoplasms, and Hybrid Disorders
	Precursor Lymphoid Neoplasms (B and T Lymphoblastic Leukemia/Lymphoma)
Red Cells	Anemia (Microcytic/Normocytic/Macrocytic and Hemolytic/Hypoproliferative)
	Hemoglobin Electrophoresis/HPLC
	Hemoglobinopathies, Thalassemias, and RBC Cytoskeletal and Enzyme Defects
White Cells	White Blood cell Abnormalities (Quantitative and Qualitative)

LABORATORY GENOMICS COURSES	
Foundational Genomics	Genomes and Variants
	Principles of Molecular Biology
Genomics	Concepts in Mendelian Genetics
	Mitochondrial Genetics
	Non-Mendelian Disorders
	Pharmacogenetics
Hereditary Disorders	Congenital Hearing Loss
	Hereditary Arrhythmias
	Hereditary Cardiomyopathies
	Hereditary Hematologic Disorders
	Hereditary Neurologic Disorders
	Hereditary Neuromuscular Disorders
	Hereditary Renal Disorders
	Inherited Cancer Sydromes I: Mechanisms and Genetic Instability Syndromes
	Inherited Cancer Sydromes II: Dominant Inheritance Models of Cancer Syndromes
	Molecular Immunology
Human Identification	Molecular Determination of Identity
Molecular Diagnostics Techniques	Cytogenomics
	Nucleic acid Isolation
	Nucleic Acid Techniques
	Sequencing-Based Techniques
Molecular Oncology	Liquid Biopsy
	Lymphoid and Histiocytic Genetics
	Myeloid Genetics
	Solid Tumor Genomics
Prenatal Screening	Circulating Fetal Nucleic Acids

TRANSFUSION MEDICINE COURSES
Acute Transfusion Reactions
Blood Donation
Blood Groups and Pre-Transfusion Compatibility Testing
Delayed Transfusion Reactions
Hemolytic Disease of the Fetus and the Newborn
Plasma Components and Derivatives
Platelet Transfusion
Red Blood Cell Transfusion
Therapeutic Apheresis

CLINICAL MICROBIOLOGY COURSES	
Biosafety and Infection Surveillance	Biosafety
	Infection Surveillance
Infectious Diseases and Preanalytical Considerations	Infectious Syndromes
	Microbiology Specimens
Laboratory Management	Management of the Clinical Microbiology Laboratory
Microbiology and Antimicrobials	Antibacterials
	Antifungals
	Antimicrobial Susceptibility
	Bacteria
	Bacterial Diagnostics
	Bacterial Infections
	Coronavirus Disease (COVID 19)
	Fungal Diagnostics I
	Fungal Diagnostics II
	Fungal Infections
	Mycobacteria & Diagnostics
	Mycobacterial Infections & Antimycobacterials
	Parasites
	Parasitic Diagnostics
	Parasitic Infections and Antiparasitics
	Viral Diagnostics
	Viral Infections & Antivirals
	Viruses

CLINICAL IMMUNOLOGY COURSES
Allergic Disease
Coronavirus Cytokine Storm
Monoclonal Gammopathies
Organ-Specific Autoimmune Diseases
Primary Immunodeficiencies
Systemic Autoimmune Diseases

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