

DOCTOR OF MEDICINE (MD)

Programs Leading to MD

Today, applicants can choose from three programs to obtain a medical degree at Case Western Reserve University: the University Program, the College Program (Cleveland Clinic Lerner College of Medicine of Case Western Reserve University), and the Medical Scientist Training Program (<https://case.edu/medicine/admissions-programs/md-phd-program>). Students in all three programs:

- are introduced to clinical work and patients almost as soon as they arrive on campus.
- learn medicine using an integrated, systems-based approach.
- are treated as junior colleagues by faculty members.
- are taught the science of medicine infused with the skills of communication and compassion.
- learn how to learn- a skill they will call on throughout their careers in the quickly changing field of medicine.

Educational Authority

Governance of the educational programs leading to the medical degree resides in the Faculty of Medicine. Each class of students selects representatives who become voting members of the Faculty of Medicine. The faculty of the School of Medicine is responsible for the content, implementation, and evaluation of the curriculum. The Dean of the School of Medicine serves as its chief academic officer, with overall responsibility to the university for the entire academic program. The Vice Dean for Medical Education carries the Dean's academic and administrative authority and has direct supervisory responsibility for the units that lead and support the curriculum.

The faculty's Committee on Medical Education (CME) evaluates, reviews and makes recommendations concerning overall goals and policies of the School's medical education program, which includes the University and College programs. Acting for the faculty, the Committee on Medical Education is responsible for: 1) the formal approval and adoption of the School's educational program objectives and ongoing monitoring to ensure that the objectives serve as guides for establishing curriculum and provide the basis for evaluating program effectiveness, 2) the review of performance in each program's competencies, and 3) the evaluation of the overall content and appropriateness of the educational programs and curricula leading to the MD degree. The faculty elects the majority of the members of the Committee on Medical Education. Student representatives also serve on this committee and its curriculum councils.

The operational responsibility for the medical curriculum is invested in curriculum committees that report to the Committee on Medical Education. There are four curriculum committees: (a) the WR2 Curriculum Committee (University Program), (b) the Program Evaluation and Assessment Committee (University Program), (c) the Curriculum Steering Council (College Program), and (d) the Joint Clinical Oversight Group. These committees are responsible for the strategic planning, content, design, selection of teaching leadership, oversight of the curriculum, student assessment, and program evaluation.

Expectations for Personal and Professional Characteristics

Students are evaluated on knowledge base, clinical skills, and professional behavior and attitudes. The following characteristics are

evaluated throughout the medical curriculum, and students are expected to adhere to these standards in both their academic and personal pursuits:

Interpersonal relationships: Provide supportive, educational and empathetic interactions with patients and families, and is able to interact effectively with "difficult" patients. Demonstrates respect for and complements roles of other professionals, and is cooperative, easy to work with, commanding respect of the health care team.

Initiative: Independently identify tasks to be performed and makes sure that tasks are completed. Performs duties promptly and efficiently, and is willing to spend additional time, assume new responsibilities, and able to recognize the need for help and ask for guidance when appropriate.

Dependability: Complete tasks promptly and well. Present on time and actively participates in clinical and didactic activities. Always follows through and is exceptionally reliable.

Attitude: Are actively concerned for others. Maintain a positive outlook toward assigned tasks. Recognizes and admits mistakes. Seeks and accepts criticism, using it to improve performance.

Integrity and honesty: Demonstrate integrity. Is honest in professional encounters. Adheres to professional ethical standards.

Tolerance: Demonstrate exceptional ability to accept people and situations. Acknowledges her or his biases and does not allow them to affect patient care.

Function under stress: Consistently maintain professional composure and exhibits good clinical judgment in stressful situations.

Appearance: Always display an appropriate professional appearance.

Graduation Requirement

To graduate from CWRU School of Medicine with the MD degree (or the MD degree with Special Qualifications in Biomedical Research for students in the Cleveland Clinic Lerner College of Medicine program), students must:

1. Satisfactorily complete all Program Specific Requirements and Educational Program Objectives of the School of Medicine
2. Pass the USMLE Step 1 and USMLE Step 2 CK and CS
3. Pass or remediate the School of Medicine's Clinical Skills Exam
4. Satisfactorily complete the MD Thesis
5. Meet financial obligations to the University
6. Be approved to graduate by the Committee on Students

Licensure

Licensure to practice medicine in the United States and its territories is a privilege granted by the individual licensing boards of the states and territories. Each licensing board of the individual jurisdictions establishes its policies, eligibility, and requirements for the practice of medicine within its boundaries pursuant to statutory and regulatory provisions. The degree of doctor of medicine awarded by Case Western Reserve University is an academic degree and does not provide a legal basis for the practice of medicine.

Learning Management System

The School of Medicine uses an integrated Learning Management System for all years of the medical education program that conveniently

organizes courses, associated learning expectations and resources to support learning in the curriculum. The learning resources include references to traditional textbooks and journal articles, as well as PowerPoint presentations, illustrations, animations, videos, audio files, and links to internet-based learning tools.

University Program students have access to the internet and their curricular material via gigabit ethernet connections to the CWRU network and via an extensive campus-wide wireless access as well as access from any other internet connection. Cleveland Clinic Lerner College of Medicine students have access to the internet and the College Program curriculum via wireless access at the Cleveland Clinic or anywhere else they have an internet connection.

Medical Student Organizations

The list of organizations and activities available to medical students continually evolves to reflect the interests of current students. Visit here for the most up-to-date list of student organizations (<http://www.casemed.org/student-groups1.html>). (<http://casemed.case.edu/admissions/studentlife/organizations.cfm>)

Admission

There are three paths to a medical degree at Case Western Reserve University School of Medicine: the University Program (4 yr. MD), the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (College Program - 5 yr. MD), and the Medical Scientist Training Program (MSTP). Inquiries about admission and application should be addressed to the appropriate office:

Office of Admissions-University Program

School of Medicine, T-308
10900 Euclid Avenue
Cleveland, Ohio 44106-4920
Phone: 216.368.3450 or casemed-admissions@case.edu

Office for Admissions and Student Affairs-College Program

Cleveland Clinic Lerner College of Medicine of Case Western Reserve University
9500 Euclid Avenue NA21
Cleveland, Ohio 44195
Phone: 216.445.7170 or 866.735.1912 or cclcm@ccf.org ([//cclcm@ccf.org](http://cclcm@ccf.org))

Medical Scientist Training Program

School of Medicine
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-4936
Phone: 216.368.3404 or mstp@case.edu

Getting Started

Students wishing to apply to any MD program at the School of Medicine must initiate this electronic process through the American Medical Colleges Application Service (AMCAS). Visit AMCAS (<https://www.aamc.org/students/applying/amcas>) to learn more about the medical school application process.

Admissions Process

After the American Medical College Application Service (<https://students-residents.aamc.org/applying-medical-school/applying-medical-school-process/applying-medical-school-amcas>) (AMCAS) is completed the applicant receives an e-mail directing him or her to the CWRU School of Medicine online secondary (final) application where the applicant can designate to which MD program(s) they wish to apply. Applicants can apply to both MD programs and/or the MSTP. It is possible for an applicant to be interviewed by and receive an admission offer from all three programs.

Applicants should complete this secondary application as instructed. After the applicant has submitted the secondary application and all supporting materials, the appropriate admissions subcommittee will review the information and decide whether to invite the applicant for an interview. After the interview, the Admissions Committee of the CWRU SOM will discuss each applicant and decide whether to extend an offer of admission.

Admissions Criteria

Although academic credentials are important in the admissions process, high grades and a high score on the MCAT are not the only criteria for admission. Just as important are interpersonal skills, exposures to medicine, well-roundedness and qualities such as professionalism, empathy, and leadership ability. The School of Medicine includes a widely diverse student body.

Academic Requirements

Given the variability in the way undergraduate institutions structure various courses, there is some flexibility with some of our prerequisite courses. Please closely review the prerequisite charts (<http://case.edu/medicine/admissions/application-process/requirements>) for each program.

If these prerequisites were not fulfilled at an accredited, four-year, degree-granting American or Canadian college or university, the applicant should be prepared to take at least 1 year of challenging, upper-level sciences at one of these institutions prior to application.

If all science prerequisites were taken at a **community college**, the committee strongly recommends that the applicant take at least one year of upper-level sciences from an accredited four-year degree granting university within the United States or Canada. If a few science prerequisite courses were taken at a community college, the committee will evaluate them on a case-by-case basis.

Undergraduate students should pursue a major in a subject of their own choosing; they should not structure their undergraduate experiences in an attempt to sway the medical school admissions committee but instead, base it on their own personal interests and goals.

Financial Aid

About 70 percent of the University Program's medical students receive some financial aid based strictly on financial need. It's impossible to provide precise figures for financial aid before each specific situation is completely analyzed, but here is a description of the general aspects of the process:

The School of Medicine adheres to the unit loan concept used by most private medical schools. Under this concept, if a student qualifies for financial aid, he or she is expected to obtain a specific portion of his or

her support from outside sources such as a Federal Direct Loan, savings, and family. Once the student obtains this amount, the remaining aid would be provided through the School of Medicine resources, up to the amount determined to be his or her reasonable need. The school's contribution would be a combination of loan and scholarship, with the exact ratio determined by the student's particular circumstances.

All students within the College Program receive a full scholarship covering tuition and fees. Additionally, the Medical Scientist Training Program offers financial support for participants. For more information, see other entries in this publication and contact the specific program.

The University Program each year offers a number of merit scholarships to each class through its Dean's Scholars program. These scholarships, which vary in annual amounts, are awarded for up to four years for selected students. Application for the scholarships is by invitation of the Admissions Committee. Recipients are students with records of exceptional academic and personal achievement.

Overview of the University Program

The School of Medicine curriculum always has reflected the most current educational principles, practices, and knowledge. In the 1950s the School of Medicine was the first to introduce the organ systems approach to teaching the basic sciences. In July 2006, the University Program launched the Western Reserve2 Curriculum (WR2) to develop a learner-centered and self-directed curriculum framework and implement dynamic small group learning teams. Students learn in an environment that fosters scientific inquiry and excitement.

The University Program in Detail

The WR2 Curriculum has high expectations for self-directed learning, and seeks to train physician scholars who are prepared to treat disease, promote health and examine the social and behavioral context of illness. It interweaves four themes - 1) research and scholarship, 2) clinical mastery, 3) teamwork and leadership, and 4) civic professionalism and health advocacy to prepare students for the ongoing practice of evidence-based medicine in the rapidly changing healthcare environment of the 21st century.

Scholarship and clinical relevance are the benchmarks for learning, and clinical experiences and biomedical and population sciences education are integrated across the four years of the curriculum. The WR2 Curriculum also creates an independent, educational environment where learning is self-directed and where student education primarily occurs through:

1. facilitated, small-group student-centered discussions
2. large group interactive sessions such as Team-Based Learning or didactic sessions that offer a framework or synthesis
3. interactive anatomy sessions
4. clinical skills training
5. patient-based activities

Clinical experiences begin in the first week of the University Program when students participate in community-based health care field experiences. In January of the first year, the Community Patient Care Preceptorship (CPCP) rotations begin. Each student works with a community physician one afternoon a week for 3 months.

Research and Scholarship begin early in the curriculum with special sessions led by faculty engaged in cutting-edge research. In the summer following year one, the majority of students engage in summer

research opportunities. All students participate in a mentored 16-week experience in research and scholarship and complete an MD thesis prior to graduation.

Electronic resources make the most of classroom time while improving opportunities for self-directed learning and capitalizing on the innovative technology available at Case Western Reserve University.

A key component of the University Program is the unscheduled time on most Thursday mornings and some weekday afternoons. Students use this time for self-directed learning as well as to pursue a joint degree, take electives, participate in interest groups, shadow a practicing physician, or become active in student organizations.

Each student in the University Program is a member of one of the following advising societies: Blackwell-McKinley Society, Robbins Society, Satcher Society, Geiger Society, or Wearn Society. Each society is headed by an advising dean, who helps the students navigate the curriculum, advises them on residency and career planning, and writes their dean's letters. The society deans hold regularly scheduled small group and individual meetings with the students. The society deans are all members of the faculty of the School of Medicine and participate actively in the educational programs of the school. Some aspects of the curriculum are coordinated through the societies.

Education throughout the Four Years is Centered on:

1. Fostering experiential and interactive learning in a clinical context;
2. Stimulating educational spiraling by revisiting concepts in progressively more meaningful depth and increasingly sophisticated contexts;
3. Promoting integration of the biomedical and population sciences with clinical experience;
4. Transferring concepts and principles learned in one context to other contexts;
5. Enhancing learning through deliberate practice, or providing learners with direct observation, feedback, and the opportunity to practice in both the clinical environment and in the Case Western Reserve University (CWRU) School of Medicine's Mt. Sinai Skills and Simulation Center.

The Western Reserve2 Curriculum has 10 Guiding Principles:

1. The core concepts of health and disease prevention are fully integrated into the curriculum.
2. Medical education is experiential and emphasizes the skills for scholarship, critical thinking, and lifelong learning.
3. Educational methods stimulate an active interchange of ideas among students and faculty.
4. Students and faculty are mutually respectful partners in learning.
5. Students are immersed in a graduate school educational environment characterized by flexibility and high expectations for independent study and self-directed learning.
6. Learning is fostered by weaving the scientific foundations of medicine and health with clinical experiences throughout the curriculum. These scientific foundations include basic science, clinical science, population-based science, and social and behavioral sciences.
7. Every student has an in-depth mentored experience in research and scholarship.
8. Recognizing the obligations of physicians to society, the central themes of public health, civic professionalism and teamwork & leadership are woven through the curriculum.

9. The systems issues of patient safety, quality medical care, and health care delivery are emphasized and integrated throughout the curriculum.
10. Students acquire a core set of competencies in the knowledge, mastery of clinical skills and attitudes that are pre-requisite to graduate medical education. These competencies are defined, learned and assessed and serve as a mechanism of assessment of the school's success.

Curricular Composition

The four years of the WR2 Curriculum are divided into four major components, each of which focuses on health as well as disease.

Foundations of Medicine and Health

This component is made up of six curricular blocks.

The first block, **Becoming a Doctor**, is five weeks in duration and gives students an understanding of population health and the doctor's role in society. Typically students begin their medical education by studying basic science at the molecular level and are often not fully aware of the relevance that this knowledge has in their future education as physicians or how it relates to the actual practice of medicine. This curricular block focuses on how physicians can act as advocates for their patients in the health care system; how social and environmental factors impact health; and the importance of population health. Medical students participate in an Extensive Care Unit, an experiential, longitudinal, service learning project intended to introduce them to key population health concepts including epidemiology, biostatistics, community assessment, health risk behavior, and social-environmental determinants of health.

The next five blocks in the Foundations of Medicine and Health are comprised of basic science education complemented by early contact with patients in clinical preceptorships and simulated clinical experiences. Subject matter is integrated across entire biological systems, which permits faculty in the different disciplines to leverage teaching time to convey content and concepts common to their disciplines. Content is divided into the following blocks:

- **The Human Blueprint:** Comprised of endocrine, reproductive development, genetics, molecular biology, and cancer biology.
- **Food to Fuel:** Encompasses gastro-intestinal system, nutrition, energy, metabolism, and biochemistry.
- **Homeostasis:** Includes cardiovascular system, pulmonary system, renal system, cell regulation, and pharmacology.
- **Host Defense and Host Response:** Focuses on host defense, microbiology, blood, skin, and the auto-immune system.
- **Cognition, Sensation and Movement:** Comprised of neurosciences, mind, and the musculoskeletal system.

Several concepts and themes stretch longitudinally across these blocks, including **Structure** (anatomy, histopathology, and radiology) and clinical mastery. Teamwork, interprofessional collaboration, and bioethics are likewise incorporated longitudinally.

During Block 4's Clinical Immersion Week, students leave the classroom and enter the clinical setting to see the relevance of the basic science they have been studying as the concepts are used in the setting of patient care.

The Reflection and Integration week is the final week of blocks 2-6. During this week, no new material is introduced. Learning activities are planned to help students spiral back to concepts introduced earlier in the block by presenting these concepts again, sometimes in new contexts,

and now integrated with other concepts previously learned. End of block assessment takes place during the reflection and integration week.

Research and Scholarship

The WR2 Curriculum is in concert with CWRU's emphasis on research and scholarship to encourage student career development in the areas of clinical investigation and population research. The practice of medicine is becoming increasingly evidence and science-based, and research teaches students a way of framing questions and developing an approach to answering them. The focus on research and scholarship provides medical students with opportunities to pursue individualized areas of interest in great depth. Through this 16-week, mentored experience in research and scholarship (which can be taken at any point from March of the second year onward), students acquire the intellectual tools needed to formulate research questions, critically assess scientific literature and continue the life-long pursuit of learning that is a critical aspect in the careers of all physicians and physician/scientists. The research project culminates in a thesis, which is written in the format of a manuscript of the leading journal in the particular area of interest.

Clinical Experiences

The clinical curriculum cuts across all four years of the medical school curriculum, and can be divided into three areas of involvement:

1. Foundations of Clinical Medicine

This segment of the clinical curriculum runs longitudinally through the Foundations of Medicine and Health and seeks to develop a broad range of clinical and professional capabilities. FCM develops the necessary skill sets through 4 separate, but integrated programs:

- **Tuesday Seminars:** Course continues the theme of "doctoring" begun in Block 1 through the Year 1 and Year 2 curriculum. Topics examined include the relationship between the physician and the patient, the family and the community; professionalism; healthcare disparities; cultural competence, quality improvement; law and medicine; medical error/patient safety, development of mindful practitioners and end of life issues.
- **Communications in Medicine:** Course is comprised of seven workshops running through Year 1 and Year 2 that focus on the range of skills needed for effectively talking with patients including the basic medical interview, educating patients about a disease, counseling patients for health behavior change, and presenting difficult news and diagnosis.
- **Physical Diagnosis:** Course runs throughout Year 1 and Year 2 and includes: Physical Diagnosis 1 introducing the basic adult exam to Year 1 students for one session per week for eight weeks, Physical Diagnosis 2 in-depth regional exams in various formats during Year 1 and Year 2, and Physical Diagnosis 3 in Year 2 where students spend five sessions doing complete histories, physicals and write-ups on patients they see in an in-patient setting.
- **Patient-based Programs:** Community Patient Care Preceptorship (CPCP) during either Year 1 or Year 2 students spend 10 afternoons in a community physician's office developing and reinforcing medical interviewing, physical exam and presentation skills (written and oral) with ongoing mentorship from a preceptor.
- **Interprofessional Education (IPE):** IPE provides students from the health professions (Medical, Dental, Nursing, Social Work, Public Health, Nutrition and Physician Assistants) the opportunity to engage in a dynamic and interactive team learning environment to better

understand the goals, purpose, and benefits of inter-professional collaboration.

2. Core Clinical Rotations:

The Core Clinical Rotations are designed to provide students from both the University and College programs of the Medical School with both breadth and depth in clinical care. Experiences are developmental, with opportunities to reinforce, build upon, and transfer knowledge and skills from all parts of the curriculum. Clinical learning is integrated across disciplines whenever possible through a unique block structure, and important themes related to scholarship, humanism, and science are supported through specially designed weekly small group programs. A unified approach to addressing and assessing a core clinical curriculum is utilized at all teaching sites with the flexibility to take advantage of the unique strengths of each clinical setting.

Core Rotations: Beginning in March of their second year, students have the opportunity to begin their core clinical rotations. These rotations are organized in blocks that integrate core specialties in at one site for 8 or 12 weeks. Core 1 combines Internal Medicine, Family Medicine, and Geriatrics for 12 weeks, Core II combines Pediatrics and OB/Gyn for 12 weeks, Core 3 combines Neuroscience and Psychiatry for 8 weeks, and Core 4 combines Surgery and Emergent Care for 8 weeks. Each of these clinical rotations is offered at all of the School of Medicine's hospital affiliates including University Hospitals of Cleveland, MetroHealth Medical Center and the Louis Stokes VA Medical Center.

Longitudinal Clerkship: Students will have the option of completing their core clinical rotations as part of a 12-month longitudinal clerkship experience at the Cleveland Clinic. The educational learning objectives remain the same for all Case Western Reserve University students on their core rotations, however, the structure of this experience will offer some unique features aimed at increased learning, longitudinal experiences with faculty and creation of a learning community. Students will complete all 40 weeks of their core rotations within the Cleveland Clinic Health System and have 8 weeks of electives that can be taken at other core hospitals in Cleveland or as a visiting student at another institution. The structure of the core rotations will differ from other sites in order to integrate a longitudinal ambulatory block. The rotation structure will be as follows:

Longitudinal Ambulatory Block (LAB) – 12 weeks

Team-Based Care 1 – Inpatient Internal Medicine/Surgery – 12 weeks

Team-Based Care 2 – OB, Inpatient Gynecology, Inpatient Pediatrics – 8 weeks

Team-Based Care 3 – Neurology/Psychiatry – 8 weeks

Electives (any site) – 8 weeks

Vacation – 4 weeks

The LAB will include outpatient components of Family Medicine, Internal Medicine, Ob/Gyn, Pediatrics, Emergency Medicine, Palliative Medicine, and Geriatrics. LAB will also provide exciting opportunities for students to explore disciplines and possible areas of career interest and establish longitudinal experiences by working a half-day a week with the same preceptor over 12 weeks. The longitudinal clerkship will also allow students to create a community of learning by participating in Longitudinal Learning Groups over the year. Topics such as quality/

safety, high-value care, and palliative medicine will be covered as part of a year-long curriculum.

3. Advanced Clinical and Scientific Studies

Advanced clinical and scientific studies provide students with flexible learning opportunities that support ongoing professional development and residency preparation and planning:

- Two Acting Internships are required: one in Internal Medicine, Surgery, Pediatrics, or Inpatient Family Medicine, and one in an area of student choice.
- One Acting Internship and all electives can potentially be done outside of the CWRU system.
- Students are encouraged to augment their interest in scholarship through rotations and activities that focus on sciences basic to medicine as well as clinical rotations.

Pathways

In addition to our innovative curriculum, students in the University Program have the option of specializing in several longitudinal pathways:

Urban Health Pathway:

The Urban Health Pathway is designed to provide selected students with the opportunity to expand their knowledge and skills in caring for patients in an urban setting, and to foster a better understanding of medicine and health in urban communities by aligning students' engagement, clinical and research goals with the community's health care needs.

The Jack, Joseph, and Morton Mandel Wellness and Preventative Care Pathway:

The mission of this pathway is to provide participants with insight and skills in wellness and health promotion as it relates to the domain of the mind, body, and spirit, social interactions, and the community. The vision is to incorporate and advance the promotion of health and wellness at the individual, family, institutional, professional and community levels.

Humanities Pathway:

The vision of the Humanities Pathway is to use arts and humanities-based courses and experiences to promote the development of health care professionals who will explore the fundamental questions of what it is to be human and to be a healthcare professional. Students will think critically about the complex interplay among patients, health care professionals, and culture. They will develop innovative and informed approaches to health, well-being, and quality of life for the patients and communities they serve while developing resilience and passion to improve the culture of medicine.

Health Innovation and Entrepreneurship Pathway

In today's world, innovation and aligned entrepreneurial activities are increasingly focused upon as required value-drivers in patient care, healthcare economics, and regional economic development. The goal of the Health Innovation and Entrepreneurship Pathway is to address issues relating to the commercialization of medical-related inventions by exposing students to the challenges and opportunities encountered when attempting to develop innovative concepts from the point of early discovery to the market. The students will gain insight into what constitutes innovation, the skills necessary to become successful entrepreneurs, and future approaches on how to manage their clinical practice.

Evaluation and Assessment

Student assessment in the WR2 Curriculum is designed to accomplish three goals:

1. drive the types of conceptual learning and scientific inquiry that are goals for the WR2 Curriculum
2. assess whether students have attained the level of mastery set for each phase of the curriculum
3. prepare students for medical licensure

These three goals are accomplished through multiple assessment methods.

Independent study and inquiry are hallmarks of WR2 through assessment strategies that are formative, focus on the synthesis of concepts, and promote student responsibility for the mastery of skills and material. The following assessments are used in Foundations of Medicine and Health:

1. Assessment of students' participation in weekly Case Inquiry (IQ) groups by faculty facilitators, utilizing observable behavior anchors and focusing on contributions to team process and content, critical appraisal skills, and professional behaviors.
2. Synthesis Essay Questions (SEQs). Weekly, formative, open book concept reasoning exercises in which students are given a brief written clinical scenario and asked to explain a clinical phenomenon and its basic science underpinnings. Throughout a teaching block, students complete SEQs at the end of each week. They compare their own answers to an 'ideal' answer and receive feedback from their IQ group facilitator.
3. Summative Synthesis Essay Questions (SSEQs), or exercises that measure what students know at specific points in their education, are closed book exercises with approximately 5 clinical vignettes that take an estimated 3-4 hours to complete. These SSEQs are based on the synthesis essays students have been assigned throughout the block. In the final week of the block SSEQs present concepts from previous exercises in new contexts and require concept integration. These summative exercises are scheduled at the end of each large teaching module (every 3-4 months) and are graded by faculty.
4. Structure Practical Exercises. These assessments occur in the final week of blocks 2-6 and assess anatomy, histo-pathology and radiology through clinical scenarios and questions that require anatomic localization and histo-pathologic identification.
5. Self-Assessment Multiple Choice Questions (MCQs). Throughout the block, students are required to complete MCQs. These are drawn from the School of Medicine's extensive bank of questions which are mapped to learning objectives for the block. Students use these MCQs throughout the block as a study aid and method of self-assessment.
6. Cumulative Achievement Tests (CAT). At the end of each block, students complete a secure formative MCQ achievement test, based on content covered in the current teaching block as well as on content from each previous block. These exams are designed utilizing test question resources available through the National Board of Medical Examiners (NBME). Tests will become progressively longer throughout the Foundations of Medicine and Health. The final CAT reflects material across all curriculum blocks. These formative tests enable students to gain perspectives on their overall progress and preparedness for the USMLE Step 1.
7. Student progress in Foundations of Clinical Medicine is measured by small group facilitator assessment in the Seminars of Clinical

Practice, direct observation of skills, preceptor evaluation of patient-based activities, and OSCE examinations.

8. Professional Learning Plan. During the Block, students review learning objectives and reflect on their learning, identifying their strengths and areas for further study. A reflective essay is completed that links to pieces of evidence, accumulated throughout the block, to support areas of strength and areas for further growth that have been identified. Students, working with their Society Deans develop a plan for further learning.

The WR2 Curriculum provides students with a focused education that that is faculty-directed and student-centered. Classroom hours are limited. The content of WR2, organized across biological systems, provides students with an integrated view of medicine and health and an understanding of how the basic sciences and clinical practice relate to one another. The flexibility of WR2 permits students to explore in depth an area of interest to them alongside a mentor. The curriculum places great emphasis on the social and behavioral context of health and disease as well as on population medicine which will prepare students to face the emerging challenges of today's health care system.

Assessment for Promotion and Graduation

The faculty of the School of Medicine is charged with assessing student performance, including knowledge, skills and personal characteristics that are important qualities of a responsible, competent and humane physician. This responsibility is delegated by the faculty to the Committee on Students, a standing committee of the faculty of medicine, with a majority of its members faculty-elected.

The Committee on Students reviews the performance of every medical student in the University Program during each of the four years, determines each student's continuing status as a student in the school, and recommends candidates for graduation. The committee reviews a medical student's total performance, which includes the usual indices such as formal grades and assessments, as well as the professional attitudes and behavior manifested by the student. Medical education entails the mastery of didactic, theoretical, and technical matters as well as the demonstration of appropriate professional and interpersonal behavior, sensitivity, sense of responsibility and ethics, and the ability to comport oneself suitably with patients, colleagues and co-workers. To be eligible for promotion and graduation, students must complete the requirements and perform satisfactorily in all components of the curriculum. Medical students in the University Program are graded "meets expectations" or "does not meet expectations" in the first two years and as "honors," "commendable," "satisfactory," "unsatisfactory," or "achieves or exceeds expectations" in the clerkships of the third and fourth years. There is no class ranking.

Graduation Requirements

To graduate from CWRU School of Medicine with the MD degree (or the MD degree with Special Qualifications in Biomedical Research for students in the Cleveland Clinic Lerner College of Medicine program), students must:

1. Satisfactorily complete all Program Specific Requirements and Educational Program Objectives of the School of Medicine
2. Pass the USMLE Step 1 and USMLE Step 2 CK and CS
3. Pass or remediate the School of Medicine's Clinical Skills Exam
4. Satisfactorily complete the MD Thesis

5. Meet financial obligations to the University
6. Be approved to graduate by the Committee on Students

Overview of the College Program

The Cleveland Clinic Lerner College of Medicine (CCLCM or College Program) is a distinct 5-year program within the School of Medicine. In 2002, Cleveland Clinic and CWRU formed a historic partnership to collaborate in education and research through creation of the CCLCM. As stated in the affiliation agreement between the two institutions, “the principal purpose and educational mission of the College shall be to attract and educate, in specially designed programs, a limited number of highly qualified persons who seek to become physician investigators and scientists who will advance biomedical research and practice.” To achieve this mission, the CCLCM selects students with a desire to pursue careers as physicians *and* researchers, educates them to be excellent doctors, nurtures their curiosity about science and medicine, provides them with substantive research experience and core research skills, and offers financial support to ensure that excess debt does not preclude their ability to follow careers in research and medicine.

The College Program in Detail

Training the Physician Investigators of Tomorrow: A Synopsis of the Program

Recognizing the critical shortage of physicians engaged in research, the College Program offers an educational program that provides medical students with the necessary skills and knowledge to enter academic residencies and pursue successful careers as basic, translational or clinical investigators and expert doctors – without requiring them to complete an advanced degree in addition to the MD. Graduates are expected to be scientifically inquisitive, to be life-long learners, to be independent thinkers with excellent teamwork skills, to have broad-based research knowledge as well as strong clinical acumen, and to be reflective practitioners of medicine and science who take a critical approach to self-assessment and self-improvement. All three components of the curriculum – **basic science**, **clinical** and **research** – in addition to the **advising** and **assessment** processes have been created to support the development of these attributes in our medical students.

The **basic science curriculum** applies adult learning principles, building on problem-based learning (PBL) to create an early link between clinical problems and basic science learning and to help students develop their skills in hypothesis generation, critical thinking, self-identification of learning objectives, oral presentation, and teamwork. Almost all faculty-student contact time involves some form of active learning – graduate school-style seminars and problem sets rather than lectures, case-based anatomy sessions using prosections and cross-sectional images rather than full cadaver dissections, interactive lab sessions rather than demonstrations, and journal clubs. To support this educational model, curriculum schedules provide extensive time for independent study. The basic science curriculum is organ-system based, with the disciplines of anatomy/embryology, biostatistics/epidemiology, cell biology, histology, imaging, immunology, pathology, pharmacology, physiology, infectious disease, oncology, genetics, evidence-based medicine, bioinformatics and ethics designated as curricular threads woven through every organ-based basic science course and extending into the year 3-5 clinical curriculum. Learning objectives for the thread disciplines are used to determine the organ system curriculum structure in the first two years, with the goal of providing a logical, coherent two-year curriculum in each of these topics basic to medicine. Courses in Year 1 focus on normal human structure and function; in Year 2, courses focus on pathophysiology of disease.

Later, in Years 3 through 5, students revisit advanced basic science concepts in their core clinical rotations, clinical electives, and College Program specific pullout sessions.

The **clinical curriculum** begins in the fall of the first year contiguous with the first basic science course in Year 1. At its foundation is a continuity teaching and learning experience with a primary care preceptor and his/her patients throughout the first two years. Students spend one half-day every other week in Year 1 and one half-day every week in Year 2 with the same preceptor. During Year 1, students learn core clinical skills in doctor-patient communications and physical diagnosis in sessions linked whenever possible to the basic science courses (e.g., learning the cardiac and lung exams during the Cardiovascular and Respiratory Sciences course and the basic neurological exam during the Neurological and Behavioral Sciences course) and then practice those skills with real patients in their preceptors’ offices on alternate weeks. Once they have mastered the basics of the history and physical, they begin to apply their skills to more complete evaluations of ambulatory patients with direct observation and feedback from their preceptors. By the end of Year 2, students are capable of performing a complete history and physical and confidently evaluating adults with common outpatient problems.

In Year 2, students spend a second half-day each week in sessions focused on building advanced clinical skills or clinical activities designed to complement concomitant basic science systems topics (e.g., a session in the Diabetes Clinic during the week devoted to learning about diabetes). The other key component of the clinical curriculum in Years 1 and 2 is the weekly Art and Practice of Medicine Seminar series. This course focuses on principles of leadership and their application to medical practice, professionalism and ethics, health care systems, population medicine, and provides a setting for students to reflect on their experiences and observations of the health care system. In Years 3 through 5, students in CCLCM participate in the same core clinical experiences as students in CWRU’s University Program. Friday afternoon sessions in Years 3-5 bring CCLCM students together regardless of clinical location and focus on program-specific topics in research and human values.

During all five years, there are close **mentoring** and **advising** relationships between students and faculty. To ensure this happens, at the beginning of medical school each student is assigned a physician advisor who serves as the student’s partner and guide in navigating and mastering the curriculum throughout all five years. In addition, during the first summer, each student is assigned to an experienced basic or translational research preceptor who integrates the student into all activities in his/her lab and provides guidance and feedback to the student in such areas as working effectively with the lab team, research design, data analysis, and oral and written presentations of research. During the second summer, each student develops a similar relationship with an experienced clinical researcher who includes the student as an active participant in one or more ongoing research projects. Students are exposed to a broad range of basic, translational and clinical researchers during the first two years – during the summer research blocks, during weekly research seminars (Advanced Research in Medicine series), and in class during basic science and clinical courses. Students then select a research advisor for the master’s level research project on which they will spend 12 to 15 months during the last three years of medical school.

The College uses a unique approach to student assessment designed to enhance student learning and to promote self-directed learning. There are no grades for any course or rotation and no class ranking. Instead, each student is expected to attain a defined level of achievement in each of the 9 CWRU School of Medicine competencies. Seven of these

defined competencies encompass the 6 core competencies defined for all U.S. graduate medical education programs accredited by the ACGME (Accreditation Council for Graduate Medical Education) as well as research and personal development. Starting on the first day of medical school, students begin collecting evidence from faculty and peers of their progress in achieving the standards in each of the 9 competencies and reflecting on how the evidence demonstrates their development as doctors and researchers – the two interrelated professional roles for which they are preparing.

One of the principles of the College is that assessment drives learning – that a curriculum designed to foster self-directed learning and achievement of competencies is ineffective if assessment focuses on what the “teacher” said in class and factual recall. Therefore, the College uses a student-centered, student-driven approach to assessment with strong support from the physician advisors who know the students well and guide them as they develop skills and self-confidence as self-directed learners.

Students gather a broad range of types of evidence over their five years of study and work as partners with their physician advisors to review the evidence and their reflections, to create individual learning plans to address areas of relative weakness and to tailor the curriculum to build on their areas of particular strength. Evidence of achievement and reflections on progress in their professional development are collected in electronic Student Portfolios and used to document readiness for promotion and graduation from the program. By training students in accurate self-assessment and developing their reflective ability, we intend to send them out of medical school already skilled in the kind of independent, self-directed learning habits that will be required of them as residents and throughout the rest of their professional lives.

CCLCM’s Foundation: A Comprehensive Research Curriculum

The **research curriculum** begins on the first day of medical school with the basic and translational research block and is integrated throughout all five years of the College Program. Every student participates actively in a “bench” project in the first summer, prepares an oral presentation describing the project in the format used at most scientific meetings, and develops a mock research proposal that extends the summer research project to the next research question. In addition, students learn the basic principles of research design and data analysis, ethics of the use of animals in research, and critical appraisal and interpretation of the basic science research literature in a journal club. At the end of the summer, students formally present their research project and findings to students and preceptors. Linked with the summer research curriculum is a core curriculum in basic biochemistry, cell biology, molecular biology, genetics, and bioinformatics.

The second summer is devoted to clinical research. Coursework focuses on applied medical biostatistics, clinical epidemiology, including appropriate design and analysis of various kinds of clinical research protocols, and ethical issues such as human subjects protection. Each student participates actively in an ongoing clinical research project and writes an original clinical research protocol to extend the summer research project to the next research question, prepares an oral presentation describing the proposed research protocol, and formally presents this proposal at the end of the summer.

During the remainder of Years 1 and 2, students participate in Advanced Research in Medicine (ARM), a weekly series of highly interactive research seminars linked to the content of the basic molecular science courses. In Year 1, ARM is designed to provide students opportunities for

interaction with a wide range of successful investigators to help them understand the sequence of problem identification, exploring prior work in the area, hypothesis development, experimentation, successes and failures that lead to new research findings. ARM 1 also helps students appreciate the interaction between basic and clinical research – how basic science discoveries translate into changes in the clinical care of patients and how clinical observations or research findings result in new directions in basic science research. In ARM 2, the presentations are linked to the basic clinical science content each week but are more focused on current research projects and development of well-constructed research questions and reinforcement of epidemiology and biostatistics principles learned in the Year 2 summer. The sessions take on the format of a formal research presentation at a scientific meeting.

Deans’ chats are held 4-6 times a year separately for all CCLCM students that provides a forum for students to meet and interact with Cleveland Clinic health care leaders and learn the complexity of managing health care and health care systems through the eyes of senior leaders.

By the end of Year 2, each student has experienced basic and clinical research first-hand, has met a large number of investigators with different research interests, has developed essential research skills, and is ready to choose an advisor to supervise and support his/her research project. Students must submit a research proposal with the thesis advisor and thesis committee members listed at least 6 months prior to the start date of the research. A Thesis Committee made up of the research advisor and two or more additional faculty supervise and approve the student’s research proposal, progress, and final master’s level thesis that must be completed by February 15 of Year 5.

The last three years of the curriculum are specifically designed to provide flexibility to students in scheduling their research and clinical rotations. Working together, the student, research advisor, and physician advisor tailor the curriculum to the student. Students complete their research projects in one 12- to 15-month block of time, usually during the fourth year. Every student regardless of the overall schedule will continue to engage in clinical experiences at least one half-day per week during blocks devoted primarily to research – to ensure that students maintain clinical skills and contact with patients, develop a deeper appreciation of the connection between advances in biomedical research and patient care, and have the opportunity to reflect on their ongoing development as *both* physicians and researchers.

Curriculum Timeline: Years 1 and 2

Students begin Year 1 with a one week-long Orientation in which they are formally welcomed to the profession of medicine by the Deans and their physician advisors. The week includes individual meetings with the student’s summer research preceptor and physician advisor, an introduction to the unique assessment system and the Student Portfolio, and an introduction to the summer curriculum and its expectations. A White Coat Ceremony that commemorates the entry of all students in both the College and University programs into the CWRU School of Medicine highlights the week.

The **Basic and Translational Research Block** occupies the first 10 weeks of Year 1 and includes a course reviewing core concepts in cell biology, molecular biology and biochemistry. Scheduled classes and meetings occur 5 days a week for 2 hours, with the remainder of each day devoted to independent study and hands-on experience in the lab of the student’s summer research preceptor. This block sets the stage for active learning in the rest of the curriculum. Throughout the core basic science course and all the basic science courses, each week has a conceptual “theme”

within which more detailed learning objectives fall. All assignments and scheduled activities are designed to help students master the core concepts for the week. Mastery is defined as being able to explain the concepts and to apply them to new or different problems or situations, rather than simply “listing” all the factual details. Sessions for the core basic science course are held on Monday, Wednesday and Friday mornings and students are expected to study background material before class and self-assess their understanding of the readings. They then work together in class to solve complex problems related to what they have studied. Tuesday mornings are devoted to focused discussions and presentations related to the science topics discussed that week or introduce students to key concepts in areas such as genetics, oncology, and bioinformatics.

Students meet each Friday for a Journal Club aimed at enhancing skills in critically assessing the basic science research literature. Each week, two students present an article; the other students are expected to read the articles carefully and come prepared with questions. Each presenter works with a faculty facilitator to review the paper and presentation before Journal Club. Using feedback from faculty and other students on their presentations and on the questions they ask of others, students begin to hone their communication skills and develop confidence participating as speakers in this setting.

The primary focus of the Year 1 Basic and Translational Research Block is the summer research project. Students are assigned to a summer research preceptor with attention to individual preferences for specific research areas. They are expected to engage fully in all activities in the preceptor’s research group, such as special lab meetings or journal clubs, in addition to working on their defined project. At the end of week 2, they submit a draft plan for their summer research project and review it with their preceptor to set the expectations for the summer. During the summer, students also develop a brief research proposal that extends their research project. At the end of week 5, they submit a draft outline of their brief research proposal. The final document is due in week 9. During week 10, students present their projects orally in the format used at many scientific meetings – a 10-minute presentation with audiovisuals followed by 5 minutes for questions. Thus, in addition to actually working on a bench project, students are guided by their preceptors in developing a number of other key skills. Students receive feedback from their preceptors, other members of the lab team, and peers on their contributions in the lab and their written and oral presentations.

During the summer, students schedule their first formal meeting with their physician advisors to review the evidence in their Student Portfolios, to discuss their reflections on their development in their new professional roles, and to review their learning plans to address any specific weaknesses or gaps they have identified. They review feedback on their activities in small group and journal club, lab work, mock grant proposal, oral presentations and scientific writing. This evidence is provided by their summer preceptors, peers, and self-assessments of their mastery of the core basic science concepts. Just as the interactive learning in class sets the stage for research and the rest of the curriculum, the first summer sets the stage for student success in the unique assessment process used in College Program.

Each week of the Year 1 and 2 basic science courses is organized around a theme that provides a focus of learning for the students and an opportunity to integrate when possible the basic science, clinical, and research curriculum components. For example, the theme of one of the weeks of the Gastrointestinal System 1 course is “Liver, Gallbladder and Pancreas.” The Problem-Based Learning (PBL) case focuses on a patient who takes an overdose of acetaminophen and alcohol and subsequently

develops liver failure. Students learn normal liver function as they explore this case. (All PBL cases used in the curriculum are based on real cases at the Cleveland Clinic.) The case provides the framework for the anatomy and other seminar sessions that focus on liver, gallbladder and pancreas anatomy, histology, drug elimination, and genetics. Friday Advanced Research in Medicine session is a meeting of the Liver Transplant Selection Committee attended by all the students where research, bioethics, and clinical care are integrated in the discussion of liver transplant candidates. During Years 1 and 2, the topics of the 2 Deans’ Dinners for each class are also coordinated with the basic science course and weekly theme.

The first basic science course in Year 1, **Cardiovascular and Respiratory Sciences 1 (CRS1)**, is a 7-week course in which students learn basic concepts of the normal structure and function of these systems. There are 14 hours of scheduled curricular time each week in the basic science courses, including 6 hours devoted to PBL cases and 8 hours devoted to other activities such as labs, seminars, and problem sets.

Throughout Year 1, anatomy, imaging and embryology are integrated into the basic science courses with information presented in two ways – self-directed learning modules that cover basic anatomical information (and are available online), and Case Directed Anatomy Sessions on Monday mornings for which students study clinical cases designed to introduce anatomical concepts and facts before coming to the lab. In the lab, students rotate among a number of stations using cadaver dissections to demonstrate anatomy relevant to the cases and radiological images such as 3-dimensional CT scans. For example, a case of a patient who has suffered a penetrating injury to the chest may be used to focus students on the anatomical structures that might be injured and their relationship to one another.

Histology is also integrated into the basic science courses, with students using a computer-based virtual microscopy system rather than a mechanical microscope to look at slides. This allows students not only to scan slides but also to see slide annotations and related gross and radiographic images. Specific learning objectives for histology are included in PBL cases in addition to seminars devoted to histology. The goal is for students to understand the gross and histological structures of each organ system in relation to its function, rather than as isolated anatomical facts. For example, during the week in CRS1 devoted to the theme of how the heart functions as a pump, students learn the structure and anatomical relationships of the four chambers of the heart and heart valves and the histological appearance of myocardial cells while they are studying the physiological concepts of preload, afterload, and contractility.

In addition to anatomy/embryology, imaging, and histology, the other “threads” in Year 1 include cell biology, pharmacology, physiology, bioinformatics, evidence-based medicine, genetics, nutrition, health care systems, ethics and humanities, building on the core concepts from the summer in specific relation to each organ system. In CRS1, students learn not only the molecular structures and functions of α - and β -receptors but also the pharmacology of endogenous and exogenous agonists and antagonists of these receptors as they study myocardial contractility and physiological regulation of blood pressure. They learn the biochemical pathways involved in aerobic and anaerobic production of ATP as they study determinants of oxygen delivery to myocardial cells, concepts they will revisit and build upon during subsequent courses when they study skeletal muscle metabolism during exercise and the role of the liver in maintenance of normal blood glucose levels. They study physiology of the heart, lungs, red blood cells and plasma as an integrated system providing oxygen and removing

carbon dioxide, supporting metabolic needs of the entire body. During each course, students return to the core concepts they mastered in previous courses, using those concepts as a framework for building their understanding of the human organism as a whole. The basic science curriculum continues with **Gastrointestinal System** (4.5 weeks), **Endocrinology and Reproductive Biology** (4 weeks), **Renal Biology** (3 weeks), **Musculoskeletal Sciences** (3 weeks), **Neurosciences** (5 weeks), and **Hematology, Immunology and Microbiology** (7 weeks). Each basic science course focuses on normal structure and function, relating back to previous courses and preparing students for concepts in future courses.

Starting in the fall of Year 1, the Basic and Translational Research Summer Block's Friday journal clubs are replaced by Advanced Research in Medicine 1, a weekly series of research seminars in which students are exposed to a wide range of basic and clinical research topics in interactive discussions with accomplished investigators. Presentations are linked closely with the basic science curriculum in order to reinforce core basic science concepts, help students feel confident in questioning the investigators based on what they are learning at the time, and illustrate the process whereby new biomedical discoveries change clinical practice.

Foundations of Clinical Medicine begins at the same time as the first basic science course and continues throughout Years 1 and 2. The guiding principle is that early exposure to patients, with direct observation and feedback by experienced faculty physicians, is optimal for real-time assessment and feedback of student clinical skills. Foundations of Clinical Medicine has 3 interrelated components – clinical skills training, patient care experiences, and Art and Practice of Medicine seminar series. The Art and Practice of Medicine seminar series is a two-year continuum addressing professionalism, ethics, leadership and its application to the care of patients and the practice of medicine, evidence-based medicine, health care systems and patient safety introduced to students primarily through the humanities.

Core clinical skills training occurs every other week from September through May and is coordinated with the organ systems under study. On alternate weeks, students practice the basic skills they just learned with standardized patients in the classroom by conducting histories and physical exams with real patients and writing chart notes on the previous week under the supervision of their longitudinal preceptors. Starting in February, students are exposed to special aspects of the history and physical for geriatric and pediatric patients, while continuing to work on basic skills every other week with their preceptors. They also begin to take on more patient care responsibility in preparation for their weekly clinics with the same preceptor in Year 2. An Objective Structured Clinical Examination (OSCE) with feedback from preceptors is used to help students chart their progress in mastering core skills.

Year 2 begins with the 9-week **Clinical Research Block**. Students work with a preceptor in an active clinical research environment on an ongoing project, continuing to develop their skills in building relationships with members of a research team. They also write a mock clinical research proposal that extends the research question on which the student is working during the summer. Scheduled coursework occupies 2 hours each weekday and includes a rigorous immersion in biostatistics with students using statistical software to analyze real data sets and a clinical epidemiology course focusing on formulation of scientific questions, study design, clinical trials, and legal and ethical issues in research including human subjects' protection. The coursework requires significant class preparation for students, thus students must balance their time and effort between the classwork and research project in the Year 2 summer. Journal Club sessions on Fridays focus on articles from

the clinical research literature, with students using knowledge gained from biostatistics and epidemiology to help them analyze the papers. Feedback from peers and faculty facilitators help students enhance their presentation skills and ability to critically read and present scientific papers. Students complete the second summer with a comprehensive range of clinical research skills and knowledge, complementing their basic research experience in the first summer and preparing them to engage in basic, translational or clinically oriented research for their thesis.

For the remainder of Year 2, students return to the same organ-system based basic science curriculum they studied in Year 1, this time focusing on learning the pathophysiology of common diseases. Immunology, Pathology, Oncology, Infectious Disease/Microbiology, and Biostatistics/Epidemiology are now integrated as threads throughout the Year 2 basic science curriculum. The first basic science course is **Musculoskeletal Sciences** (2 weeks), followed by **Neurosciences** (3 weeks) and **Behavioral Sciences** (3 weeks), **Endocrinology and Reproductive Biology** (4.5 weeks), **Cardiovascular and Respiratory Sciences** (7 weeks), **Hematology** (4 weeks), **Gastrointestinal System** (4 weeks), and **Renal Biology** (4 weeks). Anatomy and embryology seminars are conducted less often during Year 2, usually 1-3 sessions per course. The clinical curriculum continues to be closely linked to the basic science courses. Students spend one half-day every week in their primary care longitudinal preceptor's office. An additional clinical half-day is added and students see patients who demonstrate the pathophysiology being studied that week. Some of the additional half-days are devoted to learning advanced clinical skills (the gynecologic and urologic exams, evaluation of geriatric and pediatric patients with common problems) and an exposure near the end of Year 2 to the acute care setting helps to prepare students for Year 3. The Art and Practice of Medicine seminar series begin in September of Year 1 and ends in April of Year 2. Students also participate in two OSCEs, one at the beginning of Year 2 to help students identify skills to address over the year and the second at the end of Year 2 to help students document their skills for their portfolio. After classes end in mid-May, students have 6 weeks available to study for and take the USMLE Step 1 Examination.

By the end of Year 2, students have engaged actively in both basic and clinical research, learned and practiced a wide range of research skills. They have extensive experience in self-directed learning both independently and in teams and have mastered core basic science concepts related to human health and disease. They are comfortable "doctoring" adult outpatients and competent in the complete history, physical examination, oral and written presentations, and basic clinical skills such as reading EKGs. Perhaps most important, they have learned to accurately assess their own strengths and weaknesses and create learning plans for themselves – preparing them to succeed in the next three years of the curriculum and a lifetime of professional practice.

Curriculum Timeline: Years 3 through 5

After Year 2, the clinical curriculum for the College Program is the same as the University Program. In all Core Clinical Rotations, students experience both breadth and depth in clinical care, and clinical experiences are developmental, with opportunities to reinforce, build upon, and transfer knowledge and skills. Clinical learning is also integrated across disciplines whenever possible, and the roles of basic science, civic professionalism, scholarship, and population health in clinical care are evident throughout the clinical curriculum. Students likewise have patient care responsibilities that are progressive in sophistication and increasing in amount as their level of clinical skill and knowledge increases, and all core clinical competencies are addressed

and assessed using common methods applied at the clinical sites at which rotations occur.

Core Rotations: Beginning in July of their third year, students have the opportunity to begin their core clinical rotations. These rotations are organized in blocks that integrate core specialties at one site for 8 or 12 weeks. Core 1 combines Family Medicine, Internal Medicine, and Geriatrics for 12 weeks, Core 2 combines Pediatrics and OB/Gyn for 12 weeks, Core 3 combines Neurology and Psychiatry for 8 weeks, and Core 4 combines Surgery and Undifferentiated Care for 8 weeks. Each of these clinical rotations is offered at all of the School of Medicine's hospital affiliates (including University Hospitals of Cleveland, the Cleveland Clinic, MetroHealth Medical Center and the Louis Stokes VA Medical Center).

These Core Clinical Rotations, launched in July 2006 and modified in 2009 and 2012, represent an integrated approach to clinical education that is shared by students from both the University and College programs of the School of Medicine. Students engage in clinical learning with basic science correlation through patient-based experiences that are developmental and provide opportunities to acquire, reinforce, build upon, and transfer knowledge and skills.

Advanced Clinical and Scientific Studies

Advanced clinical and scientific studies provide students with flexible learning opportunities that support ongoing professional development and residency preparation and planning:

- Two Acting Internships are required: one in Internal Medicine, Surgery, Pediatrics, or Inpatient Family Medicine, and one in an area of student choice.
- One Acting Internship and all electives can potentially be done outside of the CWRU system.
- Students are encouraged to augment their interest in scholarship through rotations and activities that focus on sciences basic to medicine as well as clinical rotations.

The last three years are purposely designed as a flexible continuum of core clinical rotations, clinical and other electives, and research – to allow each student to individualize the curriculum to address his/her own career goals, learning needs and research interests. Each student plans the last three years with the advice of his/her physician and research advisors.

Every CWRU student must pass the CWRU Clinical Skills Examination and USMLE Step 2 CK (Clinical Knowledge) and CS (Clinical Skills) Examinations to graduate from the CWRU School of Medicine. Students take OSCEs similar in format and content to the USMLE Step 2 CS Examination as part of routine assessments of their clinical skills beginning in Year 1 and are well prepared for the CWRU Clinical Skills Examination and USMLE Step 2 CS Examination by the time they have completed the required clinical rotations. Students must take the USMLE Step 2 CK and CS Examinations by October 31 of their 5th year.

Students spend 12 to 15 months during the last three years on their mentored research project, including preparation and defense of a masters' level thesis. Students are expected to complete their research in one block of time. During time devoted primarily to research, students spend one half-day each week in related clinical activities. Students must complete all required thesis research rotations by December 31 of Year 5 and defend the Research Thesis within 3 months of research completion, but no later than February 15 of Year 5. Within these guidelines, students and their advisors are encouraged to be as creative as possible in designing the final 3-year continuum. Research may be conducted with

faculty research advisors at any CWRU campus, or in some instances, with advisors at a limited number of other institutions (e.g., the NIH), with advanced approval from the Research Education Committee. Student research may focus on clinical, translational or basic research. Some students may wish to engage in health services research, research in biomedical ethics, or other areas relevant to the advancement of biomedical science and the care of patients in addition to the more "traditional" research areas.

The Student Portfolio: Competency-Based Assessment and Reflective Practice

The College's approach to student assessment is based on two key educational concepts – "competency-based assessment" and "reflective practice." Competency-based assessment emphasizes the need for every student to achieve the broad range of required learning outcomes by providing an appropriate curriculum, learning resources, and regular formative assessments. No grades are assigned in the College Program during the 5-year program; when a student achieves the standards for all competencies, they are assigned a "Achieves Expectations" ("AE") for each course on their transcript. Assessment of student performance is criterion-referenced, not norm-referenced; students are not compared to one another but to faculty-defined standards of achievement. A full range of assessment methods are used to profile learning outcomes. Reflective practice emphasizes that learning is dependent upon the integration of reflection and experience. Professionals learn by reflecting on their experiences both during the experiences ("reflection-in-action") and after the experiences ("reflection-on-action") and by using these reflections to develop new knowledge and skills. The assessment process helps our students develop their reflective practice skills – the ability to accurately describe, analyze and evaluate their performance and to identify and follow through on effective learning plans. We are committed to helping every student achieve our competency standards and develop reflective practice skills through frequent formative assessments and close advising.

Evidence of achievement for each of the Case Western Reserve University School of Medicine's Program's 9 competencies is collected and managed in an electronic portfolio. Students and their advisors share access to the e-Portfolio database of evidence and thus can track and document student progress in meeting our nine competencies. A broad range of types of evidence is collected from the learning experiences in the research, basic science, and clinical curriculum.

During research blocks, research preceptors, journal club facilitators, problem-solving session facilitators, and student peers provide written assessments of both individual work and teamwork in the lab, written and oral presentations, and critical thinking and reasoning skills. Written research proposals and reports and the final thesis are also included in the e-Portfolio.

During the basic science courses, students complete weekly online quizzes called **Self-Assessment Questions (SAQs)** that cover the breadth of knowledge for each week's theme at the level of factual recall and simple application of the facts. Faculty design the SAQs so that students who are actively participating and studying should expect to know at least 80% of the answers; the individual results of the SAQs are available only to the students, but students are encouraged to contact the course director for help with any difficulties they are having. Students have continued access to the SAQs to assess their retention of this basic science knowledge. At the end of each week, students complete 1-2 open book **Concept Appraisals (CAPPs)** designed to determine if they have mastered the concepts for that week well enough to apply them to

new or different problems or situations in brief, well-organized, clearly written essay(s). CAPPs are designed to assess depth of knowledge in key concept areas. Other evidence is provided by PBL facilitators and peers who provide assessments of performance in PBL sessions.

Assessments in the clinical curriculum include written feedback on performance from longitudinal preceptors and other faculty physicians and residents, results of OSCEs, patient logs documenting breadth of clinical exposure, patient journals in which students record their reflections on specific patients and their problems, self-assessments of videotaped interviews with patients (both standardized and real), and feedback from patients and other health care providers.

Students are expected to meet regularly with their physician advisor to discuss their progress. Several times each year, they are required to review their assessment evidence in relation to expected levels of achievement in the 9 competencies and write Formative Portfolios composed of structured reflective essays on how the evidence demonstrates their development as doctors and researchers. Based on this analysis, they develop learning plans to address areas needing improvement. The essays also include judgments on whether previously established learning goals have been achieved and reflections on the process of achieving these goals. Students discuss these materials with their physician advisors during Formative Assessment meetings. During the last three years, students submit learning plans on a bi-annual basis and meet with their physician advisor to review their progress. Students are expected to assume more and more responsibility and independence in accurate self-assessment, in developing learning plans and following through on addressing their own learning needs, and in recognizing and building on their own strengths.

At the end of Years 1, 2 and 4, students assemble a Summative Portfolio for review by the Medical Student Promotions and Review Committee that determines if the evidence presented by the student indicates a level of achievement sufficient for promotion to the next year of the program (or graduation). Students are expected to choose not only their best examples of their work, but more importantly evidence demonstrating their growth across the year in specific competencies. We want to graduate students who recognize areas needing improvement, identify an approach to addressing them, and can show that they have now achieved that skill as well as those students who excel in specific areas throughout the year. Graduates of CCLCM will have not only achieved a defined level of achievement of each of the 9 competencies, they will also have developed their reflective ability to accurately assess their own strengths and areas needing improvement. The assessment process is designed to enhance student learning and the student portfolio enables students to document their progress in the achievement of defined competencies.

Graduation Requirements

To graduate from CWRU School of Medicine with the MD degree (or the MD degree with Special Qualifications in Biomedical Research for students in the Cleveland Clinic Lerner College of Medicine program), students must:

1. Satisfactorily complete all Program Specific Requirements and Educational Program Objectives of the School of Medicine
2. Pass the USMLE Step 1 and USMLE Step 2 CK and CS
3. Pass or remediate the School of Medicine's Clinical Skills Exam
4. Satisfactorily complete the MD Thesis
5. Meet financial obligations to the University
6. Be approved to graduate by the Committee on Students