



SOM 13-15

School of Medicine Curriculum

In 2010, the School of Medicine launched its new **Learner-centered Integrated Curriculum (LInC)**, based on new vision and principles to guide the training of 21st-century physicians. Designed with input from more than 400 faculty and students, LInC incorporates innovations in teaching and learning as well as new national standards for medical education. The medical education program is designed to develop six foundational competencies required of all physicians: professional, scientist, communicator, clinical problem solver, patient and community advocate and person. Grounded in these required core competencies, the School of Medicine educational program prepares students for their future medical careers regardless of specialty choice, while maintaining our founding commitment to prepare students for training in the primary care disciplines. Our philosophy values partnership between students and faculty in teaching and learning; respect and dignity in the physician-patient and student-learner relationship; and an educational milieu of collegiality, collaboration and diversity.

Learner-centered Integrated Curriculum Innovations

- Integrated Basic Sciences
- Early Clinical Electives
- Formal Transitional Studies Curricula
- Foundational Studies Curriculum
- Core Clinical Experiences
- Advanced Studies Curriculum
- Longitudinal Themes
- Learning Communities
- Capstone Scholarship and Discovering Course

Competency Standards

- Physician as Professional
- Physician as Scientist
- Physician as Communicator
- Physician as Clinical Problem Solver
- Physician as Patient and Community Advocate
- Physician as Person

Overview: Learner-Centered Integrated Curriculum (LInC)

In partnership with our diverse faculty, students, alumni and educational leaders, the Medical School completed a comprehensive four-year curriculum redesign, with the new Foundations of Medicine 1 (FOM1) curriculum launching with the entering class of 2010, and subsequent years being implemented annually, culminating in the new Advanced Studies (AS) year launching in May 2012. Guided by the school's competency-based framework established in 2003, our LInC redesign process translated the six foundational competencies into an innovative, state-of-the-art educational program. Additional LInC innovations include the following:

- Enhancement of engaged learning through limitation of scheduled curriculum hours and expansion of independent study, varied teaching methods and development of online student preparatory exercises. The goal is to better utilize student-faculty

interaction time and to promote self-directed and lifelong learning through increased student responsibility for active learning.

- Diversity of teaching methods, including interactive large and small group settings, online exercises, podcasts, video archives of lectures, simulation, standardized patients, peer-to-peer teaching and direct patient encounters.
- Utilization of state-of-the-art technology to appropriately support student learning with digital and electronic systems—in both large and small group settings—through a technology-enhanced anatomy laboratory facility, an integrated Teaching and Learning Center (iTLC), and the interprofessional Center for Experiential Learning and Simulation (iCELS).
- Broadening of student assessment methods, including formative assessment (which provides feedback to students without contributing to grades) balanced with summative assessment (which contributes to student grades), as well as electronic USMLE-type exams;

short answer questions; simulation and standardized patient tests; graded exercises; and participation in small-group sessions.

- Scheduled time for students to participate in pathway programs, community-based activities, interest groups, optional enrichment offerings and research activities, including clinical/translational research pathway, master's in clinical science investigation and MD/PhD programs in biomedical and clinical/population health sciences.

As an integral aspect of the LinC redesign effort, the School of Medicine began a four-year initiative to dramatically enhance the training of medical students, residents and practicing physicians in geriatrics. Funded through a grant award from the Donald W. Reynolds Foundation, this initiative provides extensive resources to support the implementation of a comprehensive geriatrics curriculum as a longitudinal theme across all four years of the school's educational program.

To provide a state-of-the-art learning environment to support the curriculum redesign, UMMS has undergone a major transformation of its educational facilities and resources, including the new, state-of-the-art anatomy laboratory facility; creation of an integrated Teaching and Learning Center (iTLC), featuring interactive, technology-based and multimedia capabilities for small group and conference-style teaching and learning (dry lab); provision of cutting-edge technology in teaching laboratories and lecture halls; expanded and enhanced facilities for experiential learning and simulation to support hands-on clinical training utilizing simulation technology and standardized patients; expanded on-site computer access for students and wireless connectivity throughout the campus; and enhanced student life facilities.

In addition, the opening of the Albert Sherman Center in 2013 provided five dedicated learning communities houses for our School of Medicine students. Each house contains three small group teaching rooms, space for meeting with faculty mentors, and informal gathering space for students. The houses are linked on

two floors of the ASC and provide direct access to dedicated kitchen space. They are adjacent to the Graduate School of Nursing learning community and the new 24,000-square-foot interprofessional Center for Experiential Learning and Simulation (iCELS), which supports opportunities for students to participate in formal and informal interprofessional experiences. The iCELS houses our expanded standardized patient program and increases our simulation capacity with more high fidelity manikins, task-trainers, surgical simulators and screen-based "virtual" simulation resources.

Our faculty and technology experts have partnered to create a robust array of educational resources, including an online curriculum with video and pod capture of course lectures; the web-based curriculum calendar, providing students and faculty with universal, up-to-date access to course schedules and educational events; technology-based classroom sessions that integrate online, interactive teaching into large group lectures; and computer-based independent learning modules that include high resolution image databases, interactive learning exercises, web-based clinical simulations and computer-based testing.

Our curriculum emphasizes early patient care exposure from the first weeks of medical school; strong clinical skills development in communications, clinical problem solving and professionalism; student activism in community service and advocacy; diverse opportunities for research and promotion of lifelong learning skills. Learning Communities, which bring together small groups of students and faculty across class years for formal and informal teaching and mentoring, are an integral component of our comprehensive curriculum redesign. Educational methods promote active scholarship and engaged, interactive learning, with hands-on practice under the close observation of faculty.

As a supplement to students' learning in the clinical setting, our nationally recognized Standardized Patient Program, and other simulation resources housed in iCELS, provide opportunities for ongoing practice, improvement and mastery of essential clinical skills. Our courses and clerkships are

continuously enhanced and renewed to keep pace with the rapidly changing science of medicine, evolving standards of professional medical practice and state-of-the-art educational methods and technologies.

Foundations of Medicine FOM1 (Year 1) and FOM2 (Year 2)

The first two years of the educational program provide the essential foundations of the medical sciences, clinical skills and professional values to serve students' lifelong learning needs and career paths as physicians. The curriculum emphasizes current advances in the life sciences; applications and clinical correlations to patient care; integration of content across years and courses; opportunities for self-directed, independent study; teaching and learning in teams; and cross-disciplinary teaching models that engage clinicians, basic scientists and the broad spectrum of health professions trainees in nursing, the social sciences, public health and the allied health professions. Grading for both FOM1 and FOM2 is pass-fail.

Students begin FOM1 with a **Transition to Medical School** curriculum, which acclimates entering students to the medical school structure by attending to their intellectual, social and emotional needs in preparation for the academic rigor of medical education. Topics include an orientation to Worcester and to the Medical School's student support resources, introductions to learning communities, professionalism, and strategies for learning and test-taking. This transitional curriculum culminates in basic life support certification, preparing students to act as first responders.

The **Doctoring and Clinical Skills (DCS)** course, which runs throughout both FOM1 and FOM2, utilizes learning communities as the primary mechanism for supporting student engagement in personal and professional development and lifelong learning through a skill-based curriculum with faculty mentors who foster long-term relationships with students throughout their medical school experience. Primary content offered in Doctoring and Clinical

Skills during FOM 1 includes the medical interview, communication in medicine, physical examination, clinical reasoning, professionalism and medical ethics. More specific applications include reinforcement of basic science content from the clinical perspective, oral presentations, working in teams, physician (and student) as teacher, application of appropriate evidence-based medicine, cultural diversity in patient care, determinants of health, health care systems and balancing personal and professional life. This longitudinal, multi-component course comprises more than 300 hours of required curriculum time across FOM1 and FOM2 and draws upon approximately 300 faculty.

The course has three main components: Doctoring and Clinical Skills small groups, in which students meet regularly with two faculty facilitators to acquire skills in course competencies, and two practice laboratory components—the Longitudinal Preceptorship Program (LPP) and the Physical Diagnosis course (PD). LPP places students in the clinical setting beginning in the first weeks of medical school, providing the opportunity to interact with patients under the supervision of an assigned faculty physician preceptor. Diverse preceptorship sites are available, including urban, rural and underserved settings, located in various clinical sites throughout Worcester county and neighboring towns, within a one-hour commuting distance of the Medical School. Students attend LPP sessions an average of every other week during the first two years, first shadowing their assigned preceptor, and then actively practicing clinical skills introduced in Doctoring and Clinical Skills small groups. In PD, the principles of the normal and abnormal physical examination are taught and practiced, providing opportunities for early hands-on practice of physical exam skills with standardized patients (SPs) in our new iCELS and, subsequently, with patients at various clinical sites. As with the preceptorship program, these sites are located across Worcester County and the Central Massachusetts region, generally within a one-hour commuting distance from the campus. Students are responsible for providing their own transportation for these educational experiences. For practicing

and developing clinical skills on campus, students and faculty benefit from our fully equipped iCELS with 20 rooms dedicated to teaching and learning physical diagnosis and exam techniques. In addition to this physical diagnosis component and the longitudinal ambulatory care experience, DCS also provides students with an inpatient “Clinical Immersion,” in which they observe and reflect on the structure and practice of inpatient medicine in the first months of their education by shadowing a clinical physician team and nurse and working more closely with a hospitalized patient.

UMMS **Learning Communities** are composed of “houses” into which students are randomly assigned upon enrollment, with 20 Learning Community mentors dedicated to student teaching who are selected for their exceptional educational skills and clinical experience as well as personal and professional characteristics. Learning Communities are designed to enhance the quality of student-teacher and student-student relationships by developing longitudinal interactions between students, faculty and peers from other classes throughout the four-year educational program. This model improves continuity of teaching doctoring and clinical

Academic Year — Important Highlights for Academic Year 2013-2014

May

- Transition to Core Clinical Experiences (CCE) for clinical students
- Interstitial Curriculum begins for CCE students (sessions span the year)

August

- Start of Fall Semester for FOM1 and FOM2 students
- Transition to Medical School curriculum for FOM1 students

September

- Convocation for all medical students
- White Coat Ceremony for FOM1 students

October

- Population Health Clerkship
- Interprofessional Immersion Experience for FOM 2 students

November

- Career Day—Part 1 for Core Clinical Experiences students

December

- End of Fall Semester for FOM1 and FOM2 students

January

- Start of Spring Semester for FOM1 and FOM2 students
- Career Day—Part 2 for Core Clinical Experiences students

March

- Match Day for Advanced Studies students
- Introduction to Core Clinical Experiences for FOM2 students
- Formative Foundational Assessment for FOM2 students

April

- Oath Ceremony for FOM2 students
- Preparation for USMLE Step 1 for FOM2 students
- Comprehensive Core Clinical Assessment for CCE students
- Career Day—Part 3 for Core Clinical Experiences students

May

- End of Spring Semester FOM1 and FOM2 students
- Certification for graduation for Advanced Studies students
- Transition to internship for Advanced Studies students

June

- Commencement for Advanced Studies students



skills, supports interactive and small group teaching, fosters students' self-directed learning and develops students' skills in formal and informal peer teaching and mentoring. Each Learning Community has its own assigned house in the Learning Communities suites housed in the Sherman Center, where students from each house can convene and interact as needed.

The first biomedical science course, **Building Working Cells and Tissues**, introduces and applies key principles of biochemistry, histology, physiology, carbohydrate metabolism and cellular genetics to an understanding of how cells and tissues are built and how they work. The course is structured to initiate clinical thinking processes, promoting the application of scientific knowledge to solving medical problems, including an early introduction to mechanisms of disease, which provides the framework for expansion in subsequent courses. **Building Working Cells and Tissues** makes extensive use of cases to illustrate clinical aspects of basic scientific concepts and features collaborations between basic scientists and clinician faculty to illustrate these topics.

In addition, LInC expands the popular **Integrated Case Exercises** program to a longitudinal two-year experience, drawing content from all FOM1 and FOM2 courses. **Integrated Case Exercises** provide structured opportunities for students to apply their foundational knowledge to guided clinical problem-solving. The program engages basic scientists and clinicians to teach together

interactively, emphasizing the relevance and application of basic sciences to clinical care and integrating content from anatomical, physiological, biochemical, genetic, epidemiological and human (patient/family) perspectives. Other longitudinal content areas include nutrition, pharmacology, aging and evidence-based medicine.

Our **Principles of Human Genetics** course recognizes the critical role of genetics in current and future medical research and practice; it runs concurrently with and complementary to **Building Working Cells and Tissues**. The **Principles of Human Genetics** course focuses on essential genetics principles that provide a foundation for further learning in other FOM courses as well as in the **Core Clinical Experiences**. Specific content includes basic cellular and molecular genetics and clinical application in areas such as chromosomal abnormalities, genetic diseases, the human genome project, reproductive genetics, cancer genetics, genetics of aging, gene therapy, stem cells and cloning. The course highlights contemporary ethical, legal and social issues of genetic privacy, the genetic non-discrimination act and emerging topics, such as epigenetics and personalized medicine based on genetic variants.

These courses build the foundation for **Development, Structure and Function**, a course that examines how the human body develops and how it works by presenting an integrated view of anatomy, histology, physiology, embryology and growth. This course emphasizes both the regional and

systemic approaches to human biology and medicine and applies patient cases and clinical imaging in an integrated learning experience that models the clinical-reasoning of real medical practice. This course is integrated so that dissection, physiologic function and imaging occur in closely related sections that reinforce each other. Related microanatomy/histology, embryology and case presentations support students' continued integration, understanding and building of knowledge.

The **Development, Structure and Function** course offers exceptional learning experiences including cadaver dissection in small groups in our state-of-the-art anatomy labs with pull-down, cadaver-side computers and online interactive dissectors for each table; an anatomy resource center; an introduction to surgery; multiple prosections and clinical procedural demonstrations. Supplemental activities draw on the medical humanities, including presentations on the history of human anatomy, discussions of death and dissection and an annual student-led memorial service honoring donors to the UMMS Anatomical Gift Program.

In addition to **Principles of Human Genetics**, two other courses—**Principles of Pharmacology** and **Cancer Concepts**—present a similar model of learning that teaches essential principles that are subsequently applied in other courses in all four years of the curriculum. The **Principles of Pharmacology** course occurs in fall of FOM1 and introduces basic pharmacology principles and concepts, such as drug development and regulation, pharmacodynamics, pharmacokinetics, drug metabolism and neuroeffector systems. The course emphasizes how basic pharmacology principles impact treatment decisions, using clinical vignettes and case studies co-taught by clinicians and basic scientists, who together integrate basic principles into applied patient care. **Cancer Concepts** occurs in FOM2 and is a case-based course that features a combination of lectures and small group sessions covering the basic pathophysiology of malignancy. Each "cancer concept" is introduced or related back to one or more specific clinical cases. Students discuss assigned readings and participate in virtual laboratories, offering high-resolution

digitized pathology “slides” and three-dimensional anatomic displays of various malignancies to understand cancer at the cellular, tissue, organ and organism levels. Introductions are provided to the three clinical disciplines of oncology (radiation oncology, surgical oncology and medical oncology) as well as the epidemiology and societal implications of cancer.

FOM1 ends with two seamlessly integrated courses: **Host Defense and Blood and Infections**. Host Defense and Blood provides an integrated overview of bone marrow, peripheral blood and inflammation and the major pathologic disorders in hematology and immunology, including autoimmune diseases and hematologic malignancies. Teaching includes online learning modules, virtual microscopy exercises, and student-led clinical case discussions and problem-solving sessions. The specific focus is on building students’ basic science knowledge of the interactions between the blood and immune systems and applying relevant principles to clinical data and problem solving in hematologic and immune disorders. The **Infections** course includes the host response to and its defense mechanisms against infections, facilitating a close integration with the Host Defense and Blood course. Infections is taught from the global perspective of the infectious agents and diseases affecting our world and its inhabitants across all living organisms (from human to animal to microbe), diverse human populations and disparate environments. This course deals with the laboratory aspects, structure and pathogenic mechanisms of infectious agents that cause disease across populations and the developmental continuum from conception through childhood and the aging adult. Infectious agents are presented in the context of epidemiologic (population health) factors, including the psychological and social implications of various infections and the need for cultural competence in providers. The principles of the Infections course are linked to specific content in FOM2 organ-based blocks, correlating infectious disease pathology with microbial properties, presenting signs and symptoms, and differential diagnosis and treatment.

To help students synthesize the FOM1 content, our FOM2 **Organ System Diseases** course is introduced through its first critical organ block (cardiovascular), prior to the summer break and students’ pursuit of summer activities. The entire OSD curriculum, which resumes after the summer break, covers a total of seven major organ systems (cardiovascular, renal, respiratory, gastrointestinal, reproductive, endocrine, musculoskeletal). Each OSD block follows similar structural and teaching principles and, for each organ system, covers the advanced physiology and pathophysiology as well as relevant pharmacology, infections, cancers, doctoring skills and clinical cases. Our new integrated Teaching and Learning Center (iTLC) provides a state-of-the-art technology-infused classroom designed to support interactive teaching and learning for the OSD and other FOM courses. With more than 4,000 square feet of educational space, the iTLC includes 14 plasma screens; six projectors; hard wire and wireless access to the Internet, our library and our online curriculum, which houses extensive image databases, including an “electronic slide box” of pathology slides as well as anatomic and histologic specimens. The iTLC environment supports interactive small group learning and independent, self-paced study as well as computer-based testing and remote teleconferencing. In the OSD course, the iTLC’s educational technologies support the seamless integration of relevant basic science with clinical content relating to human disease, clinical cases and patient care, taught by faculty from multiple departments collaborating in lectures, case presentations and discussions. Students develop an in-depth understanding of disease by correlating underlying molecular and physiologic mechanisms with structural, functional and clinical manifestations, as well as learning initial approaches to diagnosis and management. Multi-system course components bridge individual organ blocks through interactive problem-solving sessions based on clinical cases. These sessions allow students to interact directly with faculty to solve clinical problems while integrating curriculum content across organ systems.

LInC includes a course focusing on the **Determinants of Health**, which focuses on community and population health, addressing the impact of community, culture and medical care systems on health, and the quantitative health sciences, including epidemiology and biostatistics. There is an emphasis on applying Determinants of Health principles to clinical care, screening, diagnosis and treatment of disease, and the role of physicians as advocates for individuals and populations within a multidisciplinary healthcare team. The course engages students in two substantial interprofessional activities. The first occurs in FOM1 and involves the teaching of epidemiology and biostatistics to small groups of medical and graduate nursing students. The second is a Population Health Clerkship experience, in which SOM students are placed with colleagues from the Graduate School of Nursing in diverse sites across the commonwealth to enhance their understanding of the importance of the community context in health and health care. These immersion experiences focus on underserved populations and the application of curricular principles to real-life community settings. Students focus on the problems and services among diverse racial, ethnic and cultural groups; gay, lesbian, bisexual and transgender patients; poor families; patients with HIV/AIDS; persons dealing with substance abuse; older adults; the homeless; people with developmental disabilities; abused children and incarcerated patients.

The Brain: Nervous System and Behavior is another major FOM2 course that runs concurrently with Organ Blocks. The course presents disorders of the nervous system and behavior as disorders of the “whole person” and takes into account genes, neurological substrate, behavior, environment and impact on the person and society. Structured as three concurrent tracks (psychiatry and behavioral science, neuroanatomy and neurophysiology, neuropathology and neurology), the course anchors teaching in clinical disorders and syndromes, including stroke, traumatic neurologic injury, depression, pain and memory loss. While integrating relevant pharmacology, infectious diseases and malignancies, the course

emphasizes clinical problem solving and content relevant to general medical practice.

FOM2 culminates in a course titled **Patients**, which links self-assessment and formative assessment to selected multisystem problems and common and urgent clinical presentations in order to help students synthesize the learning in FOM1 and FOM2 as well as help students identify areas for specific focus in clinical learning. In addition a Formative Foundational Assessment (FFA) provides all students with the opportunity to encounter dynamic simulation cases in teams, practice focused history and physical exam skills with standardized patients, and apply knowledge from their foundational years to clinical practice. LInC allows ample time for preparation and completion of **Step I of the U.S. Medical Licensing Exam** (USMLE), which is required for licensure and for graduation from UMMS. The FOM 2 curriculum offers interested students the opportunity to participate in a comprehensive board review course for USMLE Step 1, and the school also provides individualized test preparation support to all students through free access to the Comprehensive Basic Science Exam (CBSE) and a voucher for one Comprehensive Basic Science Skills Assessment (both are NBME sponsored practice tests). The professional services and the resources of the Center for Academic Achievement are also fully integrated into the USMLE Step 1 prep program. Multiple self-assessment opportunities and simulated USMLE experiences are available through the use of boards-type questions, NBME customized exams for course-related student assessment and online USMLE-designed course-related tests. Our Center for Academic Achievement also provides specialized USMLE prep programs as well as individualized test prep support.

Core Clinical Experiences

Students enter their Core Clinical Experiences (CCE) by mid-May of the second year of medical school, allowing an earlier start to the clinical clerkships and enhanced flexibility and individualized exploration of clinical disciplines. In this model, students have the opportunity to craft a self-directed learning experience that links four discrete one-week periods of time, called Flexible Clinical Experiences, to meet their individualized needs over the span of the CCE year. In addition they may choose elective experiences as early as spring of their third year of medical school, promoting more choice in the third year clerkship experiences and earlier electives for career exploration.

Advancement from FOM2 to Core Clinical Experiences represents a critical transition in the educational program as students enter the hospital wards, ambulatory clinics and physician offices and serve as participating members of health care teams providing direct care to patients and their families. Under faculty guidance and supervision, core clinical students actively apply the principles of clinical medicine to patient care, acquire essential technical skills and further develop personal and professional values to enable them to serve as caring, competent and compassionate physicians. The Core Clinical Experiences begins with the **Transition to the Core Clinical Experiences**, a curriculum designed to provide hands-on training and exposure to essential information and introductory skills to promote students' successful transition to their clinical rotations. This curriculum features small group sessions to review core clinical skills such as X-ray and EKG interpretation; heart, neurologic and musculoskeletal exam skills; basic life-support recertification and procedures such as blood drawing and simulation exercises in our iCELS. Also featured are presentations on important health care systems topics, such as utilizing electronic medical records, infection control, quality improvement and patient privacy.

Students begin their third year core clinical rotations, which feature experiences in seven required disciplines: internal medicine, surgery, family medicine,

neurology, obstetrics & gynecology, pediatrics and psychiatry. These Core Clinical Experiences are organized into coordinated thematic sections that allow for discipline-specific experiences as well as supporting interdisciplinary teaching, learning and assessment. Clinical rotations focus on hands-on mentored, experiential learning and are structured to include basic science content, a cross-disciplinary longitudinal curriculum (Interstitial Curriculum), and interdisciplinary and interprofessional experiences. The resources of the UMMS standardized patient program and simulation center provide state-of-the-art educational technologies to support ongoing clinical skills training, practice and mastery throughout the clinical years.

The **Internal Medicine** experience includes significant opportunities to work and learn in the acute care, inpatient setting with students rotating at UMass Memorial Medical Center, our clinical partner, and at one of our community-based educational affiliates, as well as immersion in the ambulatory care setting in a community physician's office. In addition to the general wards, students self-select experiences with any of the medical subspecialties to broaden knowledge of diseases cared for by these specialists and characteristics of the profession. Students learn to diagnose and manage the major illnesses of adults of all ages as well as the principles and practice of health promotion and disease prevention. Essential skills in history-taking, clinical problem solving and physical examination are developed through hands-on practice and direct observation and feedback from faculty and standardized patients. The Internal Medicine clinical curriculum emphasizes an appreciation of the impact of illness on the patient, physician and society; the importance of professionalism and professional development; rapid and effective access to information; ways to assure patient safety; and the use of evidence-driven approaches to the diagnosis, management and prevention of disease. Students explore ethical dilemmas and issues surrounding the end of life and examine transfers of care between hospital and community settings. The core clinical experience utilizes the school's online

classroom system and a nationally developed case-based online curriculum to present course content at times convenient to students, allowing them fewer interruptions with their patients. In addition, each student is paired with a Longitudinal Preceptor for Medicine who meets with a small group of students weekly to review clinical cases, skills and personal and professional issues.

During **Neurology**, students gain a solid foundation in the neurological exam, the interpretation and significance of exam findings and the major neurological disorders and syndromes. Educational experiences include inpatient as well as outpatient rotations and a core curriculum to supplement clinical experiences. Students gain exposure to neurologic procedures such as the lumbar puncture through hands-on training in our simulation center. Educational experiences are supplemented through case-based sessions with expert clinicians and nationally developed curricular resources. The Internal Medicine and Neurology experiences are closely related to take advantage of overlapping patient care experiences, knowledge and skills required for the care of adults.

Pediatrics allows students to participate in the care of infants, children and adolescents in the ambulatory, inpatient and nursery settings. Students become familiar with primary care and subspecialty pediatrics and the important role of the pediatrician in children's physical and emotional development. They acquire basic knowledge of normal growth and development as well as common pediatric acute and chronic illnesses. In the ambulatory component of the curriculum, students are members of a health care team in a community-based office, supplemented with experiences in the pediatric emergency department, newborn nursery and patient home visits. During the inpatient component, students rotate in an acute care hospital, caring for hospitalized children. Students develop competency in the physical examination of infants, children and adolescents; acquire an understanding of the influence of family, community and society on a child's health; and develop strategies for health promotion. Throughout the Pediatrics clinical curriculum,

students actively participate in the health care of pediatric patients and their families, developing and refining their communication and interviewing skills and clinical problem-solving skills. All conferences are in a Case Method Teaching format, facilitating student-preceptor discussion, critical thinking and development of problem-solving skills. The experience is supplemented by a computer-based learning program that allows students to participate in the care of interactive virtual patient cases designed to cover areas of the core curriculum.

Clinical experiences with faculty from the Department of Family Medicine & Community Health give students broad exposure to the principles and practice of **Family Medicine**. Students work one-on-one with an assigned community-based faculty preceptor, seeing and following patients in the office setting. This format provides students with a continuity-of-care experience, in which the health care needs of patients and their families are managed over time. An innovative curriculum based on the virtual "McQ" family is conducted at the Medical School, where students work in small groups to manage the health care needs of this simulated three-generation family. Core curricular objectives include prenatal care management; common childhood illness; adolescent issues; health maintenance and disease prevention across diverse age groups; and evidence-driven management of common diseases encountered in the ambulatory setting. Additionally, students participate in online curriculum programs as well as hands-on curriculum in evidence-based medicine.

Students undertaking their **Psychiatry** clinical experience develop the interviewing, reasoning and communications skills fundamental to psychiatric diagnosis and intervention. An integrative model emphasizes the biologic, psychodynamic, social and behavioral aspects of treatment. Students learn about diagnosis and treatment of common psychiatric disorders and develop an appreciation for the unique factors that influence presentation, treatment response and prognosis. Students also learn about the role of the psychiatrist and other mental health disciplines in the care of

persons with mental illness, how to work as part of a health care team and when and how to refer patients for mental health services. All students are given opportunities to see patients in hospital-based and ambulatory settings. UMass Memorial has a state-of-the-art emergency mental health facility, where students can observe evaluations of adults and children in crisis. The Psychiatry core curriculum includes case-based teaching sessions, videotapes, role play with standardized patients and new audience response technology. All students are given the opportunity to observe electroconvulsive therapy. A one-week enrichment elective is available where students can rotate on a unique psychiatric inpatient service for developmentally disabled adults.

Pediatrics, Family Medicine and Psychiatry clinical experiences are closely coordinated to help present the overlapping competencies required for the care of families.

Obstetrics & Gynecology provides students with clinical experiences in women's health care in inpatient and ambulatory settings, located at large tertiary referral centers and smaller community hospitals. Formal didactic and clinical sessions are interwoven to help students develop interviewing, physical examination and diagnostic and management planning skills. The OB/GYN clinical curriculum focuses on a variety of areas related to women's health across the life cycle, including family planning; prenatal care; normal and abnormal labor management; gynecologic surgery; cancer screening and treatment; menopausal issues; and assessment and management of pain, infection and bleeding. Additional content includes explorations of legal and ethical issues related to women's health care; topics in lesbian, bisexual and transgender health; and a basic science-clinical correlation in reproductive endocrinology.

During their **Surgery** training, students learn a broad base of fundamental skills and clinical knowledge pertaining to general surgery and the surgical specialties. The Surgery experience includes a variety of venues, with rotations in the traditional surgical disciplines as well as the subspecialties. Clinical experiences are enriched by a core curriculum that includes

lectures with case discussions, standardized patient cases and practice in basic surgical techniques. In addition to seeing patients in the hospital, emergency rooms and clinics, students attend conferences and participate in small group discussions utilizing the case study method of teaching. In the UMMS Simulation Center, special sessions are offered on fundamental technical skills such as intravenous access, management of the patient with small bowel obstruction and relevant human factors issues (including surgical decision making, communicating empathy and caring, oral presentations and time management). All students participate in the Trauma Evaluation and Management Program sponsored by the American College of Surgeons as well as a day-long session dedicated to surgical imaging. A website provides links to multiple resources, including interactive case-based exercises that enhance student learning.

Obstetrics & Gynecology and Surgery clerkships work together to emphasize key operative competencies and diagnostic and clinical skills in perioperative and maternal care.

As described above, one-week Flexible Clinical Experiences (FCE) are offered to CCE students in order to provide opportunities for individual exploration for students in a variety of clinical and translational fields early in a student's career. The program allows for self-directed learning by providing a diverse offering of pre-designed experiences and allowing students to propose one of their own creation. Students complete four weeks of FCE during their core clinical year. This early selective experience fosters mentoring, nurtures and develops early interest in clinical specialties not included in traditional clerkship training and allows students to forge their own pathway.

A longitudinal curriculum, called the **Interstitial Curriculum** supplements the learning in these core disciplines and addresses topics that cross over care throughout the Core Clinical Experiences. The innovative Interstitial Curriculum addresses important contemporary issues and areas of need in our curriculum as identified by faculty and curriculum committees. The diverse Interstitial Curriculum comprehensively

addresses medical and societal dimensions of health care in a wide range of topics, including domestic violence, geriatrics, disabilities, end-of-life care, multiculturalism, medical error/patient safety, oral health, pain management, and health care policy and the practice of medicine. The program is led by a pair of faculty that includes a basic scientist and an educator, who are aided by a team of faculty and multidisciplinary professionals to address educational objectives from basic and clinical sciences as well as psychosocial, legal, ethical and societal perspectives. A broad range of educational formats is used to promote active learning and interdisciplinary teaching. A typical Interstitial Curriculum day is taught by as many as 40 medical school and community faculty and includes plenary sessions, classroom teaching, small group workshops, expert panels, films and interactions with standardized and real patients. Some incorporate interprofessional learning with colleagues from the Graduate School of Nursing. Each Interstitial Curriculum session emphasizes specific advocacy issues and highlights local and national resources to enhance students' abilities to advocate for their patients and communities. These days also serve as the major curricular component of the Doctoring and Clinical Skills course and Learning Communities during the Core Clinical Experiences, and integrate a variety of journal club experiences as well as a specific small-group interprofessional curriculum co-taught with faculty from nursing, pharmacology, medicine and behavioral sciences and with students from multiple professional training programs aimed at communication skills and teamwork. Students are required to attend all scheduled Interstitial Curriculum sessions and receive a credit grade for each one on their transcripts.

Each element of the Core Clinical Experiences integrates appropriate basic molecular, genetic and biomedical sciences. This model takes advantage of rich resources in cutting-edge biomedical research at UMMS, links to students' foundational studies experiences, promotes critical thinking and maintains scientific inquiry as an important element of clinical medical education and practice.

Upon completion of the Core Clinical Experiences, all students must pass the Comprehensive Core Clinical Assessment, which evaluates student performance in the essential clinical skills and competency areas covered in the core disciplines. This is a comprehensive performance-based assessment consisting of multiple clinical cases using standardized patients as well as other methods, such as computer-based and mannequin-based case simulations, X-ray interpretation and physical exam models.

Advanced Studies

Advanced Studies begin in the spring of the third academic year, following completion of the Core Clinical Experiences. This curriculum balances required and elective time to support students' personal and professional development. The required elements currently include the Subinternship, an Advanced Biomedical and Translational Sciences elective, an Emergency Clinical Problem Solver course and the Capstone Scholarship and Discovery course. The remainder of curriculum time is allocated to at least 20 weeks of electives.

The required **Subinternship** is designed to allow students the experience of managing patient care on an acute care hospital service under direct supervision of residents and attending physicians or hospitalists. These required rotations are offered in approved specialties that currently include Internal Medicine, Family Medicine, Acute Care Surgery and Pediatrics. Rotations have been standardized to ensure comparable experiences with different patient populations. The roles and responsibilities of subinterns mirror that of interns as closely as possible. Duties include patient admission; initial evaluation and subsequent coordination of care; daily ward rounds and discharge planning; communication with primary care providers, consultants, patients and family members; necessary procedures and coordination of discharge. Subinterns attend team and resident educational meetings and participate in a case-based curriculum that focuses on higher level practice-based skills. Some of these rotations

include membership on a team with residents and interns, while others pair students directly with hospitalist faculty.

New required curricular elements during Advanced Studies include Advanced Biomedical and Translational Sciences, Capstone Scholarship & Discovery and Emergency Clinical Problem Solver experiences. The goal of the **Advanced Biomedical and Translational Sciences** experiences is to allow students to select from a number of courses that emphasize frontiers in biomedical sciences in a field of interest relevant to students' interest, preferences and career path. The **Capstone Scholarship and Discovery** course is designed to train students as future physicians, in the principles of scholarship, research methods and scientific inquiry, so that all students will have an opportunity for a mentored scholarly project on a topic of choice and under the guidance of a faculty member. The program asks students to identify their chosen topic from a broad range of options, including basic, clinical or behavioral sciences, and apply principles of research and scholarship to examine, collect and analyze information and develop

a formal presentation worthy of peer-review. Students are mentored through this work, which builds on the four-year curriculum. The **Emergency Clinical Problem Solver** course is a combination of simulation, problem solving and clinical experiences in emergency and urgent care settings. This course serves as a culmination of clinical experiences, reinforcing students' problem-solving skills and confidence in key clinical scenarios as they prepare for the next phase of their training in internship.

For the remainder of the Advanced Studies year, students undertake a planned program of study consisting of 20 weeks of elective experiences. With the guidance of Learning Community mentors and specialty advisors, students develop an individualized and balanced elective schedule that includes rotations appropriate to their field of interest, work in both basic science and clinical medicine and experiences in preparation for internship. Fourth-year elective opportunities are available in diverse areas of interest, such as the medical and surgical subspecialties, community-based experiences at public health agencies and community health centers, rotations sponsored by other U.S.

medical schools, experiences abroad through our International Medical Education Program and research in the clinical or basic sciences. As many as 30 percent of fourth-year students elect to participate in the Senior Scholars Program, which offers up to three months of supervised research experience under the sponsorship of a research faculty mentor. Students who participate in the Senior Scholars Program do not need to complete an additional capstone project.

The Advanced Studies year culminates in a **Transition to Internship** that offers students a choice of targeted curricula in areas relevant to their chosen field, including practicing relevant procedures in the interprofessional Center for Experiential Learning and Simulation, response to on-call urgencies and emergencies, laboratory medicine reviews, transitions of care and sign-out, and advanced cardiac/trauma/pediatric life support.

A passing score on USMLE Step 2 Clinical Skills (CS) and Clinical Knowledge (CK) exams will be required for graduation from the School of Medicine. Students are advised to complete both USMLE Step 2 exams before December of their final year.



Final phase of new curriculum approved

A milestone was quietly reached in February 2012 when the Educational Policy Committee unanimously approved the final phase of the new School of Medicine curriculum, symbolizing the culmination of years of careful work by more than 500 members of the UMass Medical School community.

When the process of redesigning the curriculum began in 2004, the goal was beyond ambitious: to completely re-imagine medical education from top to bottom with involvement from as many stakeholders as possible, from first-year students to senior staff.

The resulting Learner-centered Integrated Curriculum, or LInC, incorporates innovations in teaching and learning as well as the latest national standards for medical education, and is designed to address the six competencies required of all School of Medicine graduates: physician as professional, scientist, communicator, clinical problem solver, patient and community advocate, and person.

The newly approved fourth-year curriculum, called Advanced Studies, begins in May 2014. In addition to the 20 elective weeks, Sub-Internship and the Transition to Internship program requirements in the fourth year, three new courses have been created: Emergency Clinical Problem Solver, Advanced Biomedical and Translational Sciences and the Capstone course.