



UNIVERSITY *of* CALIFORNIA, SAN DIEGO

SCHOOL OF MEDICINE

Proposed Curriculum Revision:
The Integrated Scientific Curriculum

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Mission Statements

University of California Mission Statement

“The distinctive mission of the University is to serve society as a center of higher learning, providing long-term societal benefits through transmitting advanced knowledge, discovering new knowledge, and functioning as an active working repository of organized knowledge. That obligation, more specifically, includes undergraduate education, graduate and professional education, research, and other kinds of public service, which are shaped and bounded by the central pervasive mission of discovering and advancing knowledge.”

—University of California Academic Plan, 1974-1978

University of California, San Diego School of Medicine Mission Statement

“The mission of UCSD School of Medicine is to provide skilled, compassionate physicians well-trained to practice medicine who are sensitive to the needs of the special populations of our region and the nation.

In addition, we strive to build on our exceptional biomedical, behavioral and health services research strengths to extend the boundaries of the art and science of medicine through continued research and the preparation of future academicians. In these ways, we also strive to improve the overall health of the population.”

From the Dedication Ceremony of the University of California, San Diego School of Medicine’s First Building, 1968

“In medicine, science and human concern can never be put asunder.”

Curricular Objectives

The overall objective of the medical school curriculum at the University of California, San Diego is to instill graduates with the knowledge, skills, behaviors, and attitudes that will lead to their becoming capable, compassionate physicians, and potentially leaders in academic medicine.

Specific objectives:

Knowledge domains

To provide an understanding of:

- Principles related to discovery.
- Normal anatomy, histology, physiology, development and aging as integrated disciplines that provide a basis for understanding disease.
- The biological mechanisms governing homeostasis.
- Mechanisms of drug action, pharmacokinetics, pharmacodynamics and therapeutics.
- The genetic, biochemical, physiologic, environmental and pathologic mechanisms underlying disease states and their treatment.
- The clinical, laboratory, radiologic and pathologic manifestations of diseases.
- The manifestations and consequences of illness at various stages of life.
- Health maintenance, disease prevention, and the principles of public health as they relate to the practice of medicine.
- The structure and function of the health care system and how it affects the delivery of care.
- The basic epidemiologic methods and statistical principles that underlie evidence-based medicine.
- The ethical principles of the medical profession.
- The psychological aspects of illness.
- The influence of geographic ancestry and culture on the perception of illness and its treatment.
- Health disparities

Skills

To be able to:

- Identify, access, interpret and apply scientific literature and implement new discoveries.
- Obtain both a comprehensive and directed medical history and perform a careful, accurate, complete and directed physical examination.

- Competently perform common technical procedures (see 3rd year competencies).
- Reason deductively to solve clinical problems, including those in which information is incomplete or ambiguous.
- Communicate effectively with patients, families, colleagues and other health care professionals.
- Correctly diagnose common physical and mental disorders based upon historical, physical examination and laboratory data.
- Recognize and incorporate into clinical decision making the important psychosocial determinants contributing to poor health and health disparities.
- Construct and execute a patient-centered therapeutic plan.
- Recognize and respond appropriately to medical situations that are immediately life threatening.
- Work effectively with the other members of the health care team.
- Relate in an effective manner to patients of different ages, gender and backgrounds.
- Aid colleagues in adhering to standards of the profession.
- Operate with self-awareness and mindfulness

Behaviors

To demonstrate:

- Compassion and sensitivity in the care of patients and respect for their privacy and dignity.
- Respect for patient autonomy.
- The ability to build therapeutic relationships with patients.
- Honesty and integrity in all interactions.
- Responsibility and trustworthiness in the execution of all duties.
- The ability to accept criticism and to understand the limitations of one's own knowledge and skills.
- Adherence to all of the principles of UCSD's Professionalism Code.
- A commitment to excellence and ongoing professional development.

In addition, graduates of the UCSD School of Medicine should possess the following:

- Dedication to the well-being and needs of patients.
- Dedication to lifelong learning and an appreciation for the role of science in medical advances.
- Dedication to continual enhancement of clinical skills.
- An understanding of the threats posed by conflicts of interest in the practice of medicine and the performance of research.
- A commitment to promote the health and well-being of the communities they serve.
- The willingness to lead when leadership is required.

UCSD Core Curriculum (Current)

	Summer	Fall		Winter	Spring
Year 1	Optional prematriculation course	Cell Biology and Biochemistry* SBS: Dr/Pt Relationship	CBB* POP*	Principles of Pharmacology* Organ Physiology* Introduction to Clinical Medicine Basic Cardiac Life Support	Principles of Pharmacology* Basic Neurology Endocrine, Reproduction, and Metabolism* Introduction to Clinical Medicine SBS: Human Growth and Development
2	Unscheduled	Hematology	Introduction to Clinical Medicine SBS: Intro Health Syst Anatomy Histology Epi/biostats	Human Disease (micro component taken with SSPPS*) SBS: Psychopathology Introduction to Clinical Medicine	Human Disease Introduction to Clinical Medicine Lab Medicine
3	Core Clinical Clerkships: Medicine (12 weeks); Surgery (12 weeks), Pediatrics (8 weeks); Reproductive Medicine (6 weeks); Psychiatry (6 weeks); Neurology (4 weeks); Primary Care (1 afternoon/wk throughout year)				
4	Requirements of 4th year: 9 months of enrollment; 12 weeks of direct patient care clerkships (4 each of inpatient, outpatient, and primary care); at least 12 weeks of other clinical electives; completion of Independent Study Project.			Principles to Practice	

* Denotes courses taken with students from the UCSD Skaggs School of Pharmacy and Pharmaceutical Sciences

UCSD Core Curriculum (Proposed)

	Summer	Fall	Winter	Spring
Y e a r 1	Optional prematriculation course	<u>Foundations of Human Health and Disease</u> Foundations of Human Biology* Organs 1 (anat/histol/physiol*/pharm*/CMM*)	Organs 1(anat/histol/physiol*/pharm*/CMM*)	Responses to injury* (infection/immunology; genetics/ oncology) Neuro/psych 1
		<u>Clinical Foundations</u> (Including clinical skills and professional development curriculum, longitudinal ambulatory externship, case-based learning modules)		
2	Optional exploratory pursuits (e.g., research, clinical outreach)	Organs 2 (pathology/pathophysiology/diagnostics/therapeutics) Neuro/psych 2	Organs 2 (pathology/pathophysiology/diagnostics/therapeutics)	<u>Clinical Transitions</u> (1 week)
		<u>Clinical Foundations</u> (Including clinical skills and professional development curriculum, longitudinal ambulatory externship, case-based learning modules)		
3	<u>Core Clinical Clerkships</u> (continued) Medicine (12 weeks); Surgery (8 weeks), Pediatrics (8 weeks); Reproductive Medicine (6 weeks); Psychiatry (6 weeks); Neurology (4 weeks); Primary Care (1 afternoon/wk throughout year); Clinical Elective (4 weeks)			<u>Advanced Basic Science</u> (6 weeks)
	<u>Requirements of 4th year:</u> 9 months of enrollment; 12 weeks of direct patient care clerkships (1 each of inpatient and outpatient) at least 12 weeks of other clinical electives; 4 weeks of clinical “selectives”; completion of Independent Study Project.			<u>Principles to Practice</u>

* Denotes courses taken with students from the UCSD Skaggs School of Pharmacy and Pharmaceutical Sciences

Introduction

By any standard, the UCSD School of Medicine has been remarkably successful at fulfilling its missions of research, clinical service and education since graduating its first class in 1973. By many objective measures and rankings, the school continues to excel: as examples, the school is at or near the top of medical schools in terms of grant funding per faculty member, and *U.S. News and World Report* positioned the UCSD School of Medicine 5th in the nation among public medical schools and 14th among all U.S. medical schools in its 2009 rankings.

Outcomes data regarding the success of the educational mission are scarcer than those regarding research and clinical benchmarks. Informal feedback from residency program directors is very positive about the performance of our graduates, and many of our graduates obtain positions in highly competitive training programs each year. Performance on standardized NBME Step I and Step II examinations, both in terms of mean scores and pass rates, exceeds the national means, although our precise national rankings in this regard cannot be obtained, and the gap between the UCSD and national means on Step I has narrowed in recent years.

Some data regarding the performance of the undergraduate medical educational curriculum are less positive. Review of AAMC Graduate Questionnaire data from 2004-2007 shows that while nearly all core clerkship evaluations meet or exceed national means, and aspects such as research experience, financial aid services, and education about ethical and end of life issues were perceived as strengths, a number of areas rated surprisingly low. These included:

- Overall quality of medical education
- Content integration, coordination, and organization in the basic sciences
- Clinical relevance of basic science instruction
- Degree of attending supervision on clerkships
- Perception of the accessibility, awareness of student issues, and responsiveness of administration and faculty
- Faculty mentoring, with the exception of the ISP project

Likewise, the UCSD Annual Student Survey also has been mixed in its review of the UCSD educational enterprise. The Office of Educational Support Services, the Free Clinic, and many aspects of individual courses were cited as strengths, but the majority of students regard the preclinical curriculum as insufficiently integrated or clinically focused; they reported that student morale is low and students feel isolated from faculty members and administration, including in terms of working with faculty and administration to improve the quality of the curriculum.

Reviewing survey data from applicants accepted to UCSD but who chose to go elsewhere, student satisfaction (or the perceived lack of it at UCSD) was rated as the most important reason for matriculating elsewhere. An outdated, traditional preclinical curriculum compared to our peer institutions was perceived by the nonmatriculants as the major reason for poor student satisfaction.

In 2006, the AAMC released data on the percentage of graduates from the 1991-2000 classes who became medical school faculty members. UCSD ranked 41st among medical schools, with 13% of graduates in medical school faculty positions.

In short, UCSD continues to graduate physicians who score well on standardized tests and appear highly rated by training program directors, yet there appear to be significant areas of the curriculum and the student learning environment that require close scrutiny and innovation. Indeed, if we are to compete effectively with our peer institutions in recruiting outstanding students, it is imperative that our deficiencies be addressed.

The proposal for a revised curriculum, termed the Integrated Scientific Curriculum, represents the distillation of the efforts offered by scores of faculty members and students over the past 22 months in a number of venues: two educational retreats, a number of curriculum working groups, and in the course of multiple committee and departmental meetings. Throughout these activities, a number of themes of the Integrated Scientific Curriculum have become clear. These include:

1) The curriculum should build upon UCSD's assets in basic and translational science.

One of UCSD's most important distinguishing characteristics is the institution's accomplishments in research. The Integrated Scientific Curriculum seeks to attract and successfully educate a diverse group of learners with diverse career goals who will have in common an appreciation of the importance of the sciences and fundamental research for the advancement and optimal practice of medicine. Put another way, all of UCSD's graduates need to either perform science or be informed by science in an ongoing fashion throughout their careers, whether their primary focus is clinical or investigatory.

2) The curriculum should be better integrated and improve the connections between foundational and clinical components.

One of the most frequent suggestions by faculty and students alike has been the need to better organize and integrate the curriculum so that material is presented across disciplines in a manner that emphasizes the links between best science and best practice, and which crosses traditional discipline boundaries in order to do so. There is a strong desire to reduce fragmentation, and introduce the connections between clinical experiences and basic principles starting early in the curriculum and continuing throughout all four years of medical school. As a means of doing so, substantive clinical experiences should begin at the start of the curriculum and interface with scientific components.

3) Explicit design of the learning environment. There has been wide agreement that steps should be taken to redesign the learning environment to better facilitate active learning, improve intellectual engagement among students and faculty, and augment mentoring relationships in order to better stimulate and support learners. The learning environment needs to encourage the development of skills for lifelong learning and collaborative approaches to education, patient care and investigation, and not have an undue focus on “cramming and purging” behavior around individual tests.

It is envisioned that the institution of the Integrated Scientific Curriculum, including the development of Academic Communities situated in the new Medical Education Building, will address many of the challenges of the current curriculum and learning environment. It is anticipated that these changes will improve the quality of medical education at UCSD and improve our competitiveness for students versus our peer institutions in California and elsewhere.

Evaluation of the effectiveness of these changes will be coordinated by the Office of Educational Development and Evaluation. Data to be collected and analyzed in this effort will include NBME scores, AAMC and UCSD student survey data, faculty survey data, matriculation rates, and possibly an updated version of the National Survey of Student Engagement that is being developed for medical students.

Academic Communities

A robust literature supports the belief that curricular optimization and improvement of the learning environment are synergistic in producing improved academic outcomes in a variety of scholastic environments. This may be particularly true in medical school, where the amount of material to be mastered is enormous, and where success in the profession is highly dependent upon successful professional collaboration with peers, patients, and other health care professionals. In addition, the “hidden curriculum,” defined by Kenneth Ludmerer as “the implicit messages continually conveyed, the education that occurs by example rather than word, and the imprinting of attitudes and values,” is highly dependent upon the quality and culture of the overall learning environment.

One of the cornerstones of The Integrated Scientific Curriculum (ISC) is the creation of six Academic Communities (ACs) at UCSD. Each incoming student will be assigned to one of the ACs and maintain this affiliation over their entire medical school career. As such, each AC would contain approximately 24 medical students from each class and a total of approximately 100 medical students.

The ACs are being implemented to address a number of needs:

- Perception of impersonality of the school - The AC provides a ‘home base’ to each student where they know and are known by a subgroup of their class. Such connections are increasingly important in view of class size increases.
- Limited interaction between students of different academic years - The structure of the AC fosters improved student-student interaction and mentoring, both within the ~24 students of the same class, and also vertically between students of different classes who are within the same AC. This permits important guidance by more advanced students around developmental and practical issues of medical school, e.g. study strategies, professionalism, elective selection, and residency applications.
- Limited interactions between students and faculty - Faculty-student interactions will be more frequent via assignment of a faculty AC Director and several core teaching faculty members to each AC. The Director will be primarily responsible for student advising and mentoring issues, while the core faculty will have responsibility for teaching in the Clinical Foundations course during the first five quarters. Physical space for ACs in the new education building is designed to facilitate frequent scheduled and spontaneous meetings between students and core AC faculty members.

- Limited longitudinal continuity of education – Currently, small group learning experiences are relatively infrequent and small groups are formed, dissolved, and reformed in a near random fashion that limits the development of productive group dynamics. In the Integrated Scientific Curriculum, small groups are drawn from within each AC and the longitudinal continuity of core faculty is emphasized, permitting more mature group dynamics to develop and for evaluation and formative feedback to be more precise.
- Limited opportunities for student leadership and development - Each AC will provide important opportunities for student leadership development, as the AC has a shared governance model between elected student leadership and the Faculty Director.
- Limited contact between UCSD SOM and the community at large - Each AC will develop community health outreach and other service learning activities, and will form telemedicine partnerships with remote clinical sites in underserved communities.

Assignment of Students to Academic Communities

Newly entering students (including SSPPS students) will be assigned to one of 6 ACs prior to orientation week. The assignments will be random. Early assignment to an AC will help to foster affiliation and facilitate new students meeting peers and faculty in a timely way. Similar to AC structure at other universities, all AC events other than sessions related to self-governance (e.g., social, educational, career development opportunities) will be open to the entire UCSD community. Student affiliation with a single AC is maintained until graduation. The rationale of consistent membership in the AC is that it provides a basis for coherent mentoring of students by faculty and other students, and provides a primary base for students across the 4 years of medical school.

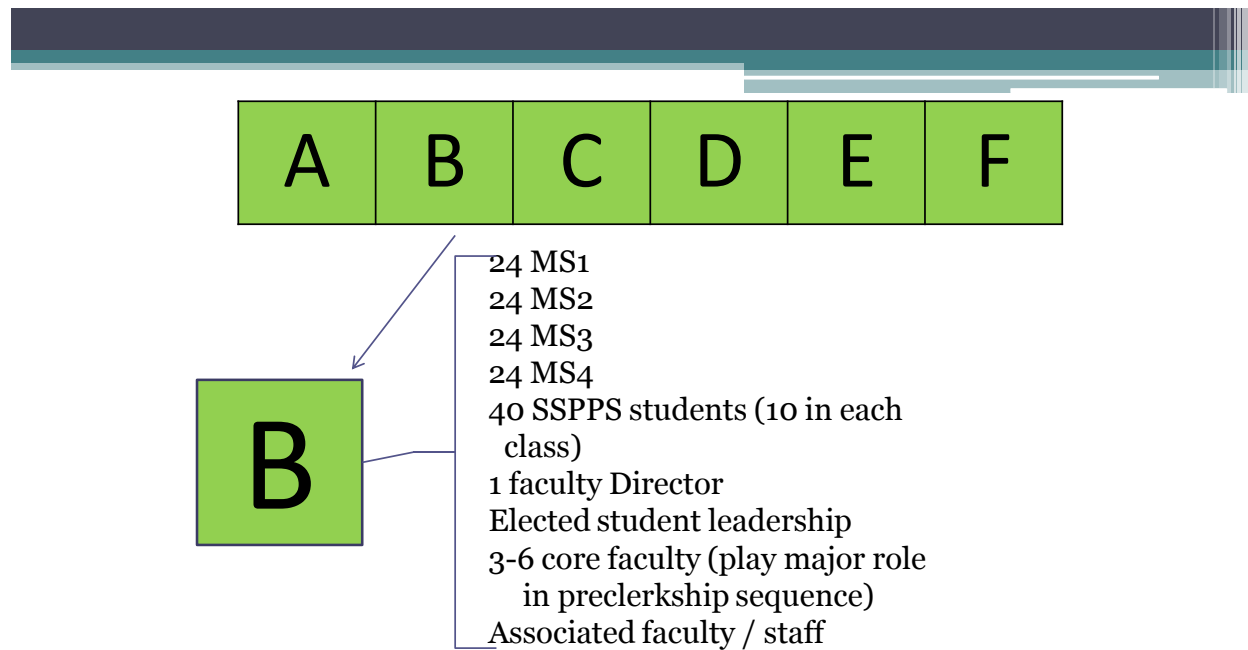
Of note, the Core Curriculum Committee was sympathetic to the possibility that segregating all of the MSTP students in a single AC might be useful to promoting increased peer interactions within this group. However the committee believed that there is a potential negative impact on the overall community of the school that outweighs this if nonrandom assignment of students is pursued, and believes that improved cohesiveness of the MSTP cohort can be obtained by means other than AC assignment. This issue was discussed further at CEP and CEP voted that the issue of assignment of MSTP students to the ACs should undergo additional consideration with the goal of arriving at a solution that meets the needs of both the MST Program and the needs of the overall UCSD community.

Pharmacy students will have full affiliation and voting rights in their AC, although their curriculum does not require enrollment in the Clinical Foundations course that is closely aligned with the AC. In order for the ACs to successfully mentor and advise pharmacy students, SSPPS will need to contribute faculty and other resources to the ACs, as SOM faculty are not equipped

for this task. Without such resources, the utility of the ACs to SSPPS is less clear, as they would serve only social and community health outreach functions.

Similar to procedures at other medical schools, students will play a central role in the governance of the ACs. Robust student leadership increases student affiliation and identification with the ACs while developing additional opportunities for faculty and students to collaborate closely. In addition, student governance contributes to the development of leadership skills among the students. Possible elected student roles in the AC governance include President, Treasurer, and Academic, Social, or Service Coordinator. As these are initiated, changes in the overall structure of student government will be required.

In the initial implementation of the ACs, students in years, 2, 3, and 4 also will be assigned to an AC. Although students in years 2 through 4 will have previously been paired in Big Sib/Little Sib relationships, it is anticipated that this peer mentoring can and will be maintained as students also create new, supportive and mentoring relationships within their assigned AC. As the ACs develop, prospective Big Sib/Little Sib assignments will be made within each AC.



- Designated space in new building
- Superstructure for improved advising/mentoring
- More intense longitudinal contact with core faculty and students in community
- Bridges curricular and learning environment issues
- Opportunities for community health outreach, student leadership, enrichment and wellness activities

Assignment of Faculty and Staff to Academic Communities

All faculty will be assigned to an AC, in a manner that ensures students in each community access to advising and mentorship within the full range of medical specialties. In consultation with graduate medical education leadership, consideration will be given to assigning housestaff and fellows to AC's as well. While it is understood that not all faculty and fellows will take an equally active role in mentoring and teaching medical students, the assignment of all faculty members to the ACs ensures that even those without specific responsibilities will still have opportunities and access to social, mentoring, and educational activities within the ACs. It is anticipated that having a broad range of faculty affiliated with each AC will facilitate improved opportunities for professional development and career and research exploration for each student. In addition, key non-faculty staff from the UCSD may also be assigned to academic communities, such as individuals from the Biomedical Library and the Offices of Student Affairs and Undergraduate Medical Education.

Role of Academic Communities in the School of Medicine

The ACs are considered a vital component of curriculum change at UCSD. In almost all medical schools in which they have been introduced, they are perceived as highly valuable in promoting connectedness and intellectual engagement among students and faculty, and in helping to develop a more consistent and positive student culture. Because the ACs vertically integrate students from different graduation classes, each entering student cohort steps into a structure in which there is explicit continuity of shared values, and where the student is an important stakeholder in actualizing the governance, projects, and professional values of the community. This is of key importance in fostering the professional development of students who come to UCSD SOM largely as recent graduates of large undergraduate institutions, and who must transition quickly over four years to leave as full members of the medical profession.

The ACs serve a number of distinct developmental needs during the student's tenure at the SOM. They will be oriented to specifically assist first-year students with issues of transitioning to medical school, help second-year students deal with issues of burnout and fatigue, serve as a structure to help third-year students reflect and process issues encountered on the core clerkships, and shepherd fourth-year students through the residency application process.

The ACs will play a vital role in organizing the outreach activities of the School of Medicine. Each AC will form a partnership with a remote underserved site that the AC will assist through telemedicine and a number of other community health initiatives. The student telemedicine experiences, both at UCSD and at the remote site, will facilitate student learning of the principles and best practices of telemedicine.

The impact of the ACs structure is magnified by the design of the Medical Education Building, upon which construction is slated to begin in November, 2008. The building houses the gathering space of each AC, each of which is grouped with associated small group rooms, telemedicine rooms, study and social areas, and office space to support the AC's activities.

Naming of the Academic Communities

One of the first tasks of the AC's leadership is to name each community. The faculty/student working group on Learning Communities has recommended they be named either for prestigious physicians with a connection to UCSD, for geographic and/or natural features in the San Diego area, or for fauna and flora found in San Diego County.

Preclerkship Core Curriculum

Since its founding, the preclerkship curriculum at the UCSD School of Medicine has been marked by its innovativeness, its interdisciplinary nature, and its scientific rigor. The transition to a new Integrated Scientific Curriculum builds on these themes, and focuses on the importance of combining robust scientific foundations and a humanistic, biopsychosocial approach to the practice of medicine to develop outstanding physicians and physician-scientists. The new preclerkship curriculum occurs over five quarters of instruction, spans the spectrum of health and disease, and is primarily organ focused in its orientation, although material on molecular, cellular, whole organism, and population orientations are also involved. Students develop expertise in both the scientific principles of medicine and its optimal clinical practice in tandem, and do so in an environment that more closely simulates the broad integrative intellectual environment of medicine. In addition to the traditional disciplines of medicine, the curriculum will also impart key principles of newer fields, such as molecular and cell biology, structural biology, genetics and genomics, molecular pathology, molecular pharmacology, molecular physiology, bioengineering and tissue engineering, and computational biology.

The preclerkship encompasses two broad areas of organization: *Human Health and Disease*, which provides the bulk of the basic knowledge that is critical to develop the best practice of medicine, and *Clinical Foundations*, in which that knowledge is applied to increasingly complex clinical problems, and in which the competencies of medical interviewing, physical examination, clinical reasoning, and medical professionalism are developed. Material in both of these sequences is coordinated so that key concepts are learned, applied, practiced, and clinically integrated in an ongoing fashion starting from the first day of medical school.

Of note, the curriculum will adhere to the current SOM academic schedule as much as possible. However, if pedagogical considerations suggest that students would be better served by deviating somewhat from that schedule, the possibility of doing so will be thoroughly investigated and considered within the context of external constraints such as tuition, financial aid, and registration requirements.

There will be further exploration of creating an alternative curricular track during the preclerkship curriculum that is geared to students with a strong, well-articulated motivation toward a physician-scientist biomedical research career and who have had strong scientific preparation prior to matriculation. It is expected that the track would be taken by the MSTP students, as well as other students with an established or acquired interest in research. Similar to the Harvard-MIT Health Sciences and Technology M.D. Program, this alternative track would be designed to be flexible, allowing students to either obtain the MD degree in four years, or to add an additional year or two for structured research training. The track would consist of additional

modules in the elective curriculum that would be taken in conjunction with the core curriculum, and/or alternative core curricular activities at various points during medical school.

This alternative track will serve several functions. It will provide students with a means to pursue basic science principles in even greater depth than the rigorous *Human Health and Disease* course and offer a bridge to the cutting edge research activities currently underway at UCSD. In addition, it is expected that this curricular track would improve the cohesiveness of the MSTP cohort without some of the possible pitfalls of assigning all of the MSTP students to a single academic community.

Foundations of Human Health and Disease

This course is designed to enable learning of key biomedical concepts and paradigms that form the foundation of clinical practice and/or a primarily investigative medical career.

Year 1, Fall and Winter Quarters The Fall quarter begins with an approximately four week Foundations block that focuses on human evolutionary biology, and the essentials of biochemistry, metabolism, and cell biology. It is recommended that biochemistry be added as an SOM prerequisite if this will permit this portion of the curriculum to be conveyed at a more integrated and applied level and/or with greater efficiency.

Immediately following this portion, the remainder of the Fall and Winter Quarters takes a structure and function perspective that is organ system focused. Each of the organ systems is covered with an emphasis on the normal human, and with particular emphasis on the traditional disciplines of anatomy, histology, physiology and pharmacology as well as cellular and molecular biologic aspects of each specific organ. The Fall quarter focuses on the cardiovascular and respiratory systems, while the Winter quarter focuses on the gastrointestinal, renal, musculoskeletal, hematologic and endocrine systems. A mock-up of how a renal block in this sequence could look is attached in the Appendix, although the final content of each ISC component will be determined by the course leadership.

Year 1, Spring Quarter The Spring quarter begins with the final “system” of the brain and behavior. In an approximately four week block, the central and peripheral nervous system is reviewed with an emphasis on normal structure and functional relationships as was developed for the other organ systems. In addition, the fundamentals of human behavior and the biopsychosocial model of health and disease are covered in depth, with particular focus on normal human growth and development.

The final eight weeks of the Spring quarter serve as a transition from consideration of the individual in health to biomedical and psychosocial models of disease. Particular emphasis is given to the body’s repertoire of responses to injury, with particular consideration of infection,

inflammation, and principles of oncogenesis. The bulk of preclerkship teaching in genetics, microbiology, and immunology takes place in this section.

Of note, the first year of the *Foundations of Human Health and Disease* course will be organized to permit students from SSPPS to cover the key curricular elements that they currently receive within a single year in the Cell Biology and Biochemistry, Organ Physiology, Endocrine, Reproduction, and Metabolism, and Principles of Pharmacology, and Microbiology courses. The educational activities that are appropriate for both medical and pharmacy students will be preferentially scheduled at specific times of the week so as to interdigitate with other SSPPS requirements.

Year 2, Fall and Winter Quarter During these two quarters, the organ systems are reexamined from the perspective of the pathology and pathophysiology of disease, as well as clinical diagnosis and therapeutics. Similar to the first year, units are organized around organ systems, starting with the neurologic system and psychopathology, and proceeding to the cardiovascular, respiratory, gastrointestinal, renal, musculoskeletal, hematologic and endocrine systems.

Clinical Foundations

The *Clinical Foundations* course runs contemporaneous with the *Foundations of Human Health and Disease* during the five quarters of preclerkship instruction and is closely coordinated with it. *Clinical Foundations* has four major components:

Patient assessment – This component teaches the fundamentals of data gathering and communication in the physician-patient encounter, including the development of medical interviewing and physical examination techniques. It is organized so that it is temporally coordinated with the organ systems under study in the *Foundations of Human Health and Disease* course, and thus helps bridge between basic concepts and clinical assessment skills. In addition, communication skills are developed that are essential for developing care partnerships with patients and serving in educational roles for patients, families, and communities.

Ambulatory externship – Beginning the first quarter of medical school, each student will be paired with an area physician, and will spend one afternoon every other week working with him or her seeing patients in an ambulatory setting. Learning objectives for these sessions are designed to focus on areas under study during that time in *Foundations of Human Health and Disease* and in the other components of *Clinical Foundations*. In addition, this portion of the course seeks to introduce students at an early point in their education to the ambulatory care setting, in which the majority of healthcare in the United States is delivered.

Case-based learning – A key component of the *Clinical Foundations* course is the construction of a robust portfolio of case-based learning materials. This portion of the curriculum serves a number of purposes, including:

- Providing a forum for mastery and employment of basic biomedical knowledge in a context similar to that in which it will ultimately be used
- The incorporation of learning objectives related to important “orphan topics,” such as cultural competency, healthcare disparities, ethics, law, geriatrics, health economics, global health, and medical professionalism.
- Teaches key skills of searching and interpreting the biomedical literature, and employing evidence-based decision making. Core skills in epidemiology and biostatistics will be developed in a longitudinal fashion by a focus on study design and interpretation, and it is also anticipated that biomedical librarians will assist in this portion of instruction.
- Begins to train students how to best make decisions in the face of uncertainty and incomplete evidence
- Promotes student initiative, curiosity, and engagement, as well as critical thinking and greater retention due to non-passive role
- Trains students to communicate and function effectively in team settings

Professional development – This portion of the course involves didactic sessions (panels, seminars, lectures) that relate to the student’s development as a physician. These include specific issues related to medical professionalism (e.g., the nature of a physician’s commitment to professional competence, honesty, patient confidentiality, appropriate boundaries, just distribution of finite resources, and management of conflicts of interest), as well as additional content related to error prevention, provision of culturally sensitive and appropriate care, self-assessment and reflection, health care systems and organization, and some of the orphan topics listed previously.

Pedagogy and Evaluation of Students

All the existing hours of the current curriculum will not map directly onto the template for Integrated Scientific Curriculum, nor should they. As an example, the basic science curriculum working group recommended a 50 percent reduction in lecture hours when the new curriculum is adopted. Given that curricular time will always be a scarce resource, it is recommended that course directors first and foremost emphasize the acquisition of enduring skills (e.g., self-directed learning, clinical reasoning, communication and collaboration with patients and colleagues) and critical concepts (e.g., population health and disease prevention, regulation of biologic systems, interactions between genetics and the environment). Imparting the complete corpus of specific medical knowledge in all areas is not a realistic or achievable goal during the four years of medical school, and the emphasis on specific knowledge components must be

appropriate to the stage of the learner's medical training and the competing needs for teaching enduring skills and core concepts.

Based on strong input from course directors, grading in the preclerkship curriculum will be pass/fail only. This will facilitate:

- More rational application of faculty time to assist truly marginal students, rather than those on the margins of “pass” and “honors” in the current system
- Greater emphasis on learning the material for its own sake, with a decreased perception of competition among students
- Decreased incentives for students to demand “teaching for the test,” and to disproportionately focus on one subject with an upcoming exam to the exclusion of other subjects (the so-called “binge and purge cycle” between courses)

Evaluation and Oversight of the Preclerkship Curriculum

Construction and ongoing improvement of the preclerkship portion of the Integrated Scientific Curriculum requires the participation and close collaboration of a number of faculty members. Further discussion will be necessary to fully clarify the optimal structure, but at present it is envisioned that each of the five preclerkship quarters the *Foundations of Human Health and Disease* will have a director who will have overall responsibility for the material covered in that quarter. In addition, “thread directors” for anatomy, histology, pharmacology, physiology, pathology, pathophysiology, microbiology/immunology, genetics, neurology, biochemistry and cell biology will be identified and assist the director of each quarter in preparing content in their area, both throughout the preclinical curriculum and extending into the clinical clerkships.

The *Clinical Foundations* course will likely have a director for the patient assessment, ambulatory externship, professional development, and case-based learning components, each of which will likely require a committee of faculty members to develop and execute.

It is expected that the leadership of the *Foundations of Human Health and Disease* and *Clinical Foundations* will meet on a regular ongoing basis to continuously monitor, adjust, and improve the curriculum.

Core and Advanced Clinical Clerkships

CURRENT CLINICAL CURRICULUM

Currently students are required to take 48 weeks of clinical core clerkships during the **third year** as follows:

Medicine 401	12 weeks
Surgery 401	12 weeks
Pediatrics 401	8 weeks
Ob/Gyn 401	6 weeks
Psychiatry 401	6 weeks
Neurology 401	4 weeks
Primary Care 401	1 afternoon per week for the entire year

During the **Fourth year**, students are allowed to choose their fourth year schedule, but they must fulfill the following requirements:

- Direct Patient Care (DPC) Clerkship - A minimum of three months of the fourth-year curriculum shall be devoted to DPC Clerkships at UCSD or a UCSD affiliated hospital. Direct Patient Care status is defined and approved by the Core Curriculum Committee. The fourth-year Direct Patient Care Clerkships must be taken at UCSD. All non-UCSD rotations require approval by the director of the corresponding UCSD clerkship.

Ambulatory Care Clerkship – A minimum of one month of ambulatory care.

Inpatient Care Clerkship – A minimum of one month of inpatient care (including intensive care units)

Primary Care Clerkship – A minimum of one month of primary care. Most sub-specialty consultative rotations do not satisfy this requirement.

- Elective Clerkships – a minimum of three months of elective clerkships
- SOM 410 - All fourth year students are required to take the course, “From Principles to Practice” (SOM 410). This course is scheduled during the Winter quarter.
- CPX - Students are required to take and pass the Clinical Practice Examination (CPX) which is administered at the end of the third year.
- Students need to be enrolled full-time for seven out of the eight quarters in years III and IV.

PROPOSED CHANGES

*The **Third** year will consist of the following rotations:*

<i>Clinical Transitions</i>	<i>1 week</i>
Medicine 401	12 weeks
Surgery 401	<i>8 weeks</i>
Pediatrics 401	8 weeks
Ob/Gyn 401	6 weeks
Psychiatry 401	6 weeks
Neurology 401	4 weeks
Primary Care 401	1 afternoon per week for the year <i>except while on Surgery 401</i>
<i>Clinical Electives</i>	<i>4 weeks</i>
<i>Scientific Basis of Medicine</i>	<i>5 weeks</i>

During the **Fourth year**, students are allowed to choose their fourth year schedule, but they must fulfill the following requirements:

- Direct Patient Care (DPC) Clerkship - A minimum of two months of the fourth-year curriculum shall be devoted to DPC Clerkships at UCSD or a UCSD affiliated hospital. Direct Patient Care status is defined and approved by the Core Curriculum Committee. The fourth-year Direct Patient Care Clerkships must be taken at UCSD. All non-UCSD rotations require approval by the director of the corresponding UCSD clerkship.

Ambulatory Care Clerkship – A minimum of one month of ambulatory care.

Inpatient Care Clerkship – A minimum of one month of inpatient care (including intensive care units)

- “Selective” Clerkships- Two 2-week selectives must be chosen and completed during either the third or fourth years. These can be chosen from 2 week “selective clerkships” that are anticipated to be offered in such disciplines as radiology, ophthalmology, emergency medicine, dermatology, surgical/clinical pathology, anesthesiology, and certain surgical subspecialties.
- Elective Clerkships – *a minimum of 6 months of elective clerkships must be taken during the third and fourth years. The two months of required DPC experiences are included in this number. The remaining four required months can be either DPC or non-DPC electives.*
- Family Medicine Requirement – 4 weeks (satisfied if PCC401 experience was in Family Medicine, otherwise requires additional Family Medicine experience)
- SOM 410 - All fourth year students are required to take the course, “From Principles to Practice” (SOM 410). This course is scheduled during the Winter quarter.

Other requirements –

- CPX - Students are required to take and pass the Clinical Practice Examination (CPX) which is administered at the summer quarter of the fourth year.

- USMLE – If the USMLE Step 1 and Step 2 exams are consolidated, students will be required to take the USMLE step 1-2 exam before the beginning of Summer Quarter of their MS4 year. The USMLE Clinical Skills exam must be taken before the beginning of Winter Quarter of the MS4 year. Both components must be passed prior to graduation
- Students need to be enrolled full-time for seven out of the eight quarters in years III and IV.

1) **Changes in the duration of the Surgery Clerkship to 8 weeks**

The proposed changes in the duration of the Surgery clerkship stem from the belief that student learning needs in these areas are met by an 8 week core clerkship experience, and indeed the educational experience can be more focused upon general surgical experiences and didactics with the 8 week duration. Of note, less than 20 percent of medical schools offer a 12 week core clerkship in surgery. Students are strongly encouraged to enroll in at least one surgical subspecialty experience as part of their clinical elective experiences.

During the core surgery clerkship, students will not attend their regular PCC 401 ambulatory experiences, but will attend required PCC401 didactic experiences.

2) **Creation of 4 weeks of clinical elective time during the MS3 year**

Creation of elective time during the MS3 year is important for all students, particularly for those who wish to explore their interest and obtain letters of recommendation in specialties outside of the core clerkships (e.g. radiology, urology, physical medicine and rehabilitation.) The creation of elective time during the core clerkship year will require reexamining the elective curriculum to determine rational prerequisites for each, rather than the current blanket prohibition against clinical electives before the entire core curriculum has been completed.

3) **Creation of a Clinical Transitions course prior to the core clerkships**

There is widespread support for a one to two week Clinical Transitions course to be added to help students consolidate their knowledge and review practical skills that are essential to optimal performance in the clinical clerkships, including clinical reasoning, basic medical procedures, practice-based learning, appropriate use of diagnostic tests and procedures, communication, evidence-based medicine, and other aspects of professionalism.

4) **Improved integration of basic and clinical sciences throughout the third and fourth years**

Each clerkship should take steps to improve the integration of basic science concepts and learning objectives into its curriculum in order to further the goals of basic/clinical

science integration. Clerkships have wide latitude in the mechanisms employed to achieve this, and these may include appropriate modifications to the syllabus, reading materials, didactic sessions, and bedside rounds with both a master clinician and a basic or translational scientist. These efforts will likely require formal faculty development, which will be facilitated centrally.

In addition, a new 5 week didactic course called “The Scientific Basis of Medicine” will be developed and taught at the end of the MS3 year. This will provide an in depth review and exploration of basic scientific principles within the clinical context and experience that students have developmentally achieved at the end of their first year of clinical rotations.

5) **Improved curricular coordination across clerkships**

In order to improve coordination among core clerkships, a Core Clerkship Subcommittee should be created as a formal subcommittee of the Core Clinical Curriculum Committee. Membership would consist of the course chairs of the Third Year clerkships listed above (including Clinical Transitions and Scientific Basis of Medicine) as well as the course chair of Principles to Practice, one other faculty member of the CCC who is not a core clinical course director, and one student CCC member. This group will meet at least quarterly and report to the full CCC at least quarterly. The charge of this subcommittee should include:

- Ensuring appropriate integration and comprehensiveness of the core clinical curriculum, and incorporation of “orphan topic” learning objectives, such as systems based practice, end of life care, substance abuse, geriatrics, within specific clerkships.
- Reviewing outcomes data and plans for change in each clerkship on an annual basis.
- Ensuring standardization of practices, where feasible, around issues of orientation, special accommodations, syllabi, midclerkship feedback, evaluation, absences, and remediation.
- Assisting each clerkship to transition learning objectives to a format consistent with ACGME competencies: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice.

6) Improved longitudinal continuity between teachers and learners

Each department should construct its clinical teaching schedule to foster maximal longitudinal student exposure to teachers. Transitions of supervising faculty every 1-2 weeks should be avoided as possible, and the number of housestaff and faculty transitions during a specific student rotation should be minimized.

7) Creation of a requirement to complete two 2-week “selectives.”

There is widespread interest in creating this requirement in lieu of the requirement for a primary care DPC, which predated the development of the current PCC401 clerkship that yields a robust primary care experience for all students. The purpose of 2-week “selectives” is twofold: to develop opportunities for students to test their potential interest in a variety of specialties that are not well covered in the current core clinical curriculum and to also to gain exposure to the content of specialties that will be complementary to their future area of specialization. As examples, exposure to dermatology may be particularly useful to those planning careers in primary care, while exposure to anesthesia may be helpful for those starting a surgical residency imminently.

The Core Curriculum Committee will establish guidelines for these courses, which will be different in structure than current core or elective courses. In consultation with SOM department heads, the CCC will facilitate the development of at least six such selectives.

Elective Curriculum

PRECLINICAL ELECTIVE COURSE REQUIREMENTS

Because total core contact hours will be reduced to some extent during the preclerkship portion of the Integrated Scientific Curriculum, there needs to be a concomitant reduction in required elective hours in order to preserve the balance between core and elective commitments. Toward that end, the requirement for preclinical elective hours will be reduced from 21 weekly units of elective work during the preclerkship portion of medical school to 15 weekly units.

The elective hour requirement may be satisfied through participation in preclinical elective courses, directed readings, preceptorships, and laboratory experiences. Students may enroll in courses offered on the undergraduate campus, through Extension, or in other schools at UCSD on a limited basis. Medical students are advised that the general campus academic calendar differs from the SOM calendar. If a scheduling conflict arises, students may make arrangements with the general campus instructor to complete coursework (at the instructor's discretion).

Responsibility for assuring compliance with the elective requirement rests with the Registrar in the Admissions and Student Affairs Office, who will report this information to the Associate Dean for Undergraduate Medical Education. Elective participation by each student during Year I will be reviewed during the summer between Year I and Year II. Students who have not completed 8 weekly hours or approximately 80 total elective hours during the first year will be notified by the Registrar. Students will have the opportunity to complete their elective participation during the second year of medical school.

Students who fail to complete the elective requirements of the preclerkship period will not be allowed to proceed to the clinical curriculum and will be reviewed by the Standings and Promotions Committee.

Although the opportunities for elective study should allow all students to complete requirements, the SOM recognizes that in extenuating circumstances a waiver of the elective requirement may be appropriate. Students may thus petition for waiver of part or all of the requirement. This petition should be submitted, following discussion between the student and his/her OSA or faculty advisor, to the Associate Dean for Undergraduate Medical Education. The advisor may include his/her comments on the petition of waiver.

CLINICAL ELECTIVES

As noted in the preceding section on core and advanced clinical clerkships, the major changes in the elective curriculum during the clinical phase of the curriculum are:

- Creation of 4 weeks of clinical elective time during the core clinical clerkship year (which approximates the third year of medical school)
- A consequent increase in total required elective clerkships during the third and four years from 24 weeks to 28 weeks

In consultation with appropriate Course Directors, the Office of Undergraduate Medical Education will undertake a review of the clinical elective curriculum, and identify potentially appropriate elective clerkships that can be taken prior to completion of all core clinical requirements. Identified courses will be forwarded to the Electives Committee for review and certification as Clinical Entry Electives that do not require prerequisites for third-year students.

The student's fourth-year curriculum should be discussed with and approved by his/her Senior Advisor. The responsibility for verifying that each student's clinical program meets the requirements of the School of Medicine resides with the Registrar and staff in the UGME Office who must certify the student's record to the Standing and Promotions Committee (SPC). Students are required to be enrolled full-time for at least seven of the eight quarters in Years III and IV and must complete a minimum of 9 months of work in Year IV of which a minimum of 6 must be clinical, and 3 of these must have Direct Patient Care certification.

INDEPENDENT STUDY PROJECT

UCSD remains among the minority of North American medical schools that requires a scholarly project for graduation. This opportunity for in-depth, creative, scholarly work is highly regarded by most faculty and students. The goals of the independent study project are to engender:

- Independent creativity
- Self-directed learning habits
- Use of rational and scholarly methods
- The ability to perform in-depth study
- A close relationship with a faculty member

Future directions in the curriculum are likely to include the development of areas of concentration (see below), and such changes are likely to impact the ISP. For now, however, the requirements of the ISP are largely unchanged in the Integrated Scientific Curriculum.

All students must submit an ISP proposal to the Electives Committee for approval prior to beginning work on the project. Work done prior to matriculation in UCSD SOM is admissible as a starting point only for the ISP. A student may apply for an ISP waiver if they are receiving an advanced degree during medical school (e.g., Ph.D. or M.P.H.), or if they pursue an approved, full-time, rigorous, year-long research experience.

AREAS OF CONCENTRATION

Because of organizational and resource constraints, medical student Areas of Concentration are not included in the current proposal. However, the issue of Areas of Concentration should be reviewed and revisited within three years of adoption of the Integrated Scientific Curriculum.

The Electives Curriculum Working Group recommended the following topics as areas of concentration:

- 1) Healthcare Equity
- 2) Leadership in Healthcare
- 3) International Health/Disaster Preparedness
- 4) Science in Medicine
- 5) Art of Medicine
- 6) Technological Advances in Medicine

Further consideration should be given to adopting elective but rigorous Areas of Concentration curricula that may permit students to gain meaningful additional expertise and credentials in a focused area of interest. In such a schema, the ISP could serve as an integral part of this experience.

Principles of Evaluation

EVALUATION OF STUDENTS

Students are expected to participate fully in all aspects of the curriculum. Lack of attendance may be a professionalism issue, particularly when attendance is required to maximize the learning of others (e.g., in small group experiences) or involves scheduled patients or standardized patients.

The evaluation of students should include objective, outcomes based-assessments where possible. Final evaluations should be submitted to the Dean's Office within six weeks of course completion.

During clinical clerkships, evaluations should include both formative and summative feedback and be provided by faculty who are most familiar with the performance of the student. Evaluation of students must include direct monitoring by faculty of patient care skills, including history taking, physical examination and procedural skills as appropriate to the clerkship. Formal midclerkship feedback must be provided to the student.

EVALUATION OF COURSES

The faculty, acting through appropriate faculty committees, is ultimately responsible for defining the specific content of each course and clerkship. All faculty members are expected to participate in the educational programs involving medical and/or graduate students, and/or resident physicians.

The Office of Educational Development and Evaluation will work with course and clerkship directors to collect evaluation data. This data should be shared annually with all members of the course committee, including student members. The Core Curriculum Committee will review and credential core courses and course leadership on an every three year basis. More frequent discussions of course performance and possible improvements are expected to occur in other venues.

EVALUATION OF FACULTY

The Office of Educational Development and Evaluation will work with course and clerkship directors to collect evaluation data for individual faculty members as appropriate. This evaluation is intended to provide formative feedback to faculty members, to assist course and clerkship directors in optimizing their offerings, and to aid individual faculty members in assembling documentation to characterize their teaching contributions when being considered for academic advancement.

Based on preliminary discussions between the Core Curriculum Committee and campus CAP, it is appropriate to appoint a task force to ensure that the metrics for educational contributions that will factor into academic advancement decisions appropriately reflect the variety of teaching roles within the Integrated Scientific Curriculum.

EVALUATION OF CURRICULUM

Evaluation of the effectiveness of the curriculum will be coordinated by the Office of Educational Development and Evaluation and presented annually to course directors, department chairs, and appropriate faculty committees such as the Committee on Educational Policy, the Core Curriculum Committee, and Health Sciences Faculty Council. Data to be collected in this effort will include NBME scores, AAMC and UCSD student survey data, matriculation rates, and other data deemed appropriate.

APPENDIX: Mock up a potential configuration for the Renal Unit of Organs I

Monday	Tuesday	Wednesday	Thursday	Friday
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8-9	Developmental biology of kidney and urinary tract	Body fluid compartments	Cell biology of the glomerular filter: endothelium, basement membrane, podocytes	Problem sets: Calculation of clinically quantifiable kidney functions	Molecular medicine: Mutations in epithelial cell transporters and clinical phenotype
9-10	Kidney anatomy and histology	Kidney functions: Filtration, Transport, water handling, Clearance/GFR	Cell biology of epithelial cells of the renal tubule	Problem sets: Calculation of clinically quantifiable kidney functions	Diuretics and antidiuretics: Mechanism of action, Clinical use
10-11	Anatomy lab	Renal blood flow and glomerular filtration	Case 1: Minimal change disease in an 8 y.o. child (parental right to refuse treatment, culturally competent interviewing)	Proximal tubule Loop of Henle Distal tubule, collecting duct	Case 2: CRF in a hypertensive, diabetic man (Symptoms and ddx of CRF, mechanisms of renal injury, history and exam in renal disease, nutritional history)
11-12	Anatomy lab	Histology lab		Urinary concentration and dilution	
12-1	LUNCH	LUNCH	LUNCH / ACADEMIC COMMUNITY PROGRAMMING	LUNCH	LUNCH
1-2			Minimal change disease (patient/family interview).		
2-3			Adverse Childhood Experiences		
3-4			Physical exam: BP measurement in routine and special situations, end organ effects of hypertension		
4-5					

8 – 9	Diuretics and antidiuretics: Mechanism of action, Clinical use	Calcium and phosphorus handling by kidney	Kidney and acid-base balance	Problem sets in acid-base balance	Antihypertensive therapies
9 – 10	Internal, external potassium balance	Kidney and acid-base balance	Problem sets in acid-base balance	ECV regulation: Renal nerves, Renin-angiotensin system, Natriuretic peptides	Molecular medicine: Story of recombinant erythropoietin and its impact on human disease
10-11	Case 2: Non-RRT treatments of CRF, principles/mechanics/complications of RRT, impact of Chronic disease on psycho-Social functioning	Anatomy lab	Case 2: Health policy/ethical issues of RRT	ECV regulation: Prostaglandins, Nitric oxide G-T balance	Epidemiology: Type II Diabetes, Hypertension, End stage renal disease, confounding and effect
11-12		Anatomy lab	Interview of dialysis patient, introduction of RRT apparatus and options	ACE inhibitors, ARBs: BP control, Effects on the kidney	Health care disparities: Epidemiology of ESRD and access to treatment modalities as a model system
12-1	LUNCH	LUNCH	LUNCH / ACADEMIC COMMUNITY PROGRAMMING	LUNCH	LUNCH
1-2			Ambulatory Externship		
2-3					
3-4					
4-5					

8 – 9	Scientific methodology: polycystic kidney disease and pregnancy-induced hypertension	Case studies in hypertension control	EXAM		
9 – 10	Imaging of urinary system	Case studies in hypertension control	EXAM		
10-11	Case 3: Nephrolithiasis, renal handling of calcium, Phos, oxalate, patient confidentiality	Case 3: Complications/treatment of nephrolithiasis, boundary issues with patients			
11-12		REVIEW			
12-1	LUNCH	LUNCH	LUNCH / ACADEMIC COMMUNITY PROGRAMMING		
1-2					
2-3					
3-4					
4-5					