

## SOUNDING BOARD

## MEDICAL EDUCATION

Malcolm Cox, M.D., and David M. Irby, Ph.D., Editors

**“Continuity” as an Organizing Principle  
for Clinical Education Reform**

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If the ultimate purpose of medical education — to meet the health needs of society — is to be achieved, the primary goal of undergraduate medical education should be to produce students who are broadly skilled in the core competencies that transcend all disciplines of medicine.<sup>1,2</sup> The challenge is how to accomplish this goal in a clinical learning environment fragmented by increasing specialization and demands for clinical productivity and constrained by a prevailing culture in which education must compete with research and clinical practice for medical school resources.<sup>3</sup>

As compared with the dramatic changes that have occurred in biomedical science and the practice of medicine, the fundamental model of clinical education in American medical schools has changed little since the time of Sir William Osler, a century ago. Students are still assigned to specialty-specific teams of interns, residents, and supervising faculty physicians for relatively brief, randomly sequenced rotations in acute care hospitals.<sup>4,5</sup> And the core clinical credentialing experience continues to be this same series of rotations, primarily in the third year of the traditional four-year undergraduate curriculum, just as it was in Osler’s day.

Although there is no doubt that the hospital environment remains rich in learning opportunities for medical students and that students need to learn the skills necessary to succeed in an environment in which most of them will spend 3 to 8 years of postgraduate training, there is a growing sense nationally that the current model is poorly aligned with society’s present and future health care needs.<sup>6,7</sup> This realization has led many observers to call for a new model of clinical

education, one that would incorporate the strengths of the present acute care educational model but eliminate the model’s major weakness — a lack of connection or continuity among different learning experiences.<sup>8,9</sup>

## EDUCATIONAL CONTINUITY

Rooted in the principles of modern learning theory,<sup>10,11</sup> the notion of educational continuity reflects the progressive professional and personal development required of physicians in training.<sup>12</sup> A spirit of “ownership” of the entire curriculum, rather than one discipline-specific portion of the curriculum, is a prerequisite for educational continuity.<sup>13</sup> As applied to the core clerkship year, educational continuity subsumes two interrelated integrating forces: horizontal integration (enhancing the development of general competency by linking learning experiences between and across clinical specialties) and vertical integration (enhancing evidence-based practice by linking advances in the biomedical and clinical sciences to clinical problem solving).

Continuity of the learning environment fosters both patient-centeredness and learner-centeredness by establishing more opportunities for connections with patients (“continuity of care”); by integrating important educational themes across clinical specialties, focusing on the developmentally appropriate attainment and assessment of core clinical competencies, and promoting the connection between science and clinical medicine (“continuity of curriculum”); and by enhancing supervision, role modeling, and mentoring (“continuity of supervision”) (Table 1).

**CONTINUITY OF CARE**

Throughout the history of the profession, the most powerful motivator for learning has been the sense of deep commitment to patients. Connecting the student's desire to serve with his or her desire to learn has strong support in learning theory and has been used effectively for many years in a wide variety of service learning programs in health-related disciplines. However, only rarely has service learning been part of the core clerkship experience itself.<sup>14</sup>

In order to anchor clinical learning in caregiving, students must have relevant involvement with patients at the site and time of initial medical decision making, ideally before the diagnosis is made, and be able to follow patients for the duration of an illness episode (and beyond), ideally across care venues. The critical thinking involved in making a diagnosis compels students to value history taking, physical examination, rational diagnostic testing, and differential diagnostic reasoning. By the same token, students should follow patients long enough to observe the course of the illness and the patient's experience of the illness, and they should witness the effects of their management decisions. Continuity of care also provides opportunities for teachers to custom-design patient enrollment to meet overarching educational goals and fine-tune cohorts of patients as the learning experience unfolds over time.

**CONTINUITY OF CURRICULUM**

To support the progression of a learner's values, attitudes, knowledge, and skills, each component of a curriculum should have a rational, considered relationship with all others. A developmentally progressive curriculum has three major aspects. First, there is a rational sequential order that facilitates learning, with certain types of knowledge and skills serving as the foundation for subsequent learning. Skills that are notably different, but equally complex, may still be most appropriately taught in a particular order. For example, knowledge of anatomy and pathophysiology facilitates the taking of a medical history. Second, more complex tasks should follow some degree of achievement in the performance of more simple but related tasks. Thus, one learns to construct a simple problem list before learning to develop a complicated differential diagnosis. Similarly, grappling with complex therapeutic decisions makes

**Table 1. Goals and Expected Outcomes of Educational Continuity.**

Continuity	Goals	Specific Objectives	Operational Requirements	Expected Outcomes
Care	Learning through patient connection, caring, and advocacy	Involvement with patients at the site and time of initial medical decision making and during the full course of illness Custom-designed patient enrollment	Longitudinal patient care experiences Collaborative, interdisciplinary delivery of care Ability to identify, track, and follow patients across care venues	Promotion of a full range of clinical skills, including chronic-disease management Enhanced professionalism Patient-centered health care
Curriculum	Learning in an integrated fashion to promote foundational knowledge and clinical skills	Acquisition of relevant competencies in a structured, developmental fashion Application of biomedical science to clinical problem solving Developmentally appropriate, competency-based assessment	Interdisciplinary curriculum design and management "Horizontal" and "vertical" curriculum integration Continuous formative assessment Interdisciplinary summative assessment and grading	Promotion of core doctoring skills, including communication and clinical reasoning Enhanced evidence-based practice and lifelong learning Learner-centered education and assessment
Supervision	Learning from close and serial connection with the most able educators	Community of learners, educators, and caregivers engaged in a transparent dialogue about patient care and medical science Faculty coaching, role modeling, and mentorship	Longitudinal student oversight and assessment Protected time for teaching and faculty development	Promotion of medical collegiality and interdisciplinary values Interprofessional understanding and collaboration Enhanced pedagogy and learning

little sense for a student who has yet to master rudimentary diagnostic decision making. Third, the curriculum should be implemented in a learner-centered manner, such that a given student's learning is tailored to his or her particular evolving (i.e., developmentally appropriate) needs.

Optimally, the core clinical clerkship curriculum should be designed to emphasize themes central to doctoring (professionalism, communication, and teamwork) and continuing scientific literacy (evidence-based decision making). It should ensure the exposure of students to a pre-defined set of clinical syndromes and diseases, thereby promoting both context-specific clinical reasoning and the acquisition of cross-disciplinary competencies. It should consolidate and expand fundamental insights into the mechanisms of disease in individual patients and populations. And it should assess particular knowledge, skills, and attitudes at times most suited to ascertain competence and ensure developmental progression. Diverse and repeated formative assessments of student performance are also important. Especially when embedded in integrated educational programs, multimethod assessment enhances both the evaluation process itself and the students' learning trajectory.<sup>15</sup>

All these requirements are greatly facilitated by collaborative, interdisciplinary ownership of the clinical curriculum. Collaboration across clinical departments ensures a horizontally integrated curriculum, with an emphasis on core competency development. Likewise, collaboration between clinical and basic science departments (vertical integration) ensures that the core clinical clerkship experience is built on and deliberately connected to the basic biomedical and epidemiologic sciences, thereby promoting continuing scientific literacy. In sum, interdisciplinary governance provides a platform for promoting general competencies; exploring the pertinence of basic, translational, and clinical science to medical practice; and incorporating all manner of biomedical scientists into the clinical learning environment itself.

#### CONTINUITY OF SUPERVISION

Establishing connections between faculty, other caregivers, and students and among faculty across disciplines is critical to forming a productive learning community.<sup>16</sup> Students and longitudinal preceptors share the professional intimacy of dual responsibility for patient care. Such relationships,

in which faculty members have personal responsibility for overseeing their own students, provide students with the emotional comfort to take intellectual risks in their learning. At the same time, trusting relationships and shared goals foster coaching, promote effective feedback, and enhance clinical performance.

At a minimum, clerkship directors and clinical teachers should collaborate across disciplines to design, implement, and oversee the entire clerkship year and should have joint responsibility with inpatient attending physicians and continuity preceptors for student supervision, mentoring, and assessment. Because of their particular effectiveness in teaching the fundamentals of clinical reasoning and the psychosocial aspects of care, experienced clinician-educators ("master clinicians") rather than inexperienced faculty or residents should have the most prominent educational and supervisory roles.<sup>17,18</sup>

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#### BARRIERS TO EDUCATIONAL CONTINUITY

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Although the concept of educational continuity provides a powerful organizing principle for clinical education reform, the barriers to changing the manner in which the traditional core clinical clerkship experience is organized should not be underestimated (Table 2). Promoting innovation on the basis of either educational theory or nascent outcomes data alone will require visionary leadership, innovative resource management, and careful attention to learning, cultural, and regulatory issues.

Relatively few academic medical centers can easily deliver meaningful experiences in continuity of care. In most such centers, investment in ambulatory care facilities is insufficient to match the care needs of patients, let alone support learning. And although investments in information technology are increasing, with few exceptions, patient information systems and mechanisms to identify, track, and follow patients across sites of care remain rudimentary. For the most part, care is delivered in a discipline-specific fashion, and although all academic medical centers aspire to be truly patient-centric organizations, few of them actually meet this goal.

Achieving the full potential of integration will not be easy. Departmental boundaries are notoriously difficult to breach, and coordinating teach-

ing time across clerkships and between basic science and clinical departments will be challenging. Reaching agreement on learning objectives, curriculum content and delivery methods, and common assessment and grading systems will be possible only with clearly delineated objectives and willingness to compromise. At first sight, planning, start-up, and ongoing administrative costs — including student and faculty scheduling across departments and departmental teaching effort and funds-flow analyses — may appear to be prohibitive, especially in the absence of mission-based budgeting. New curricular models must take into account already established local, state, and national standards, and regulatory relief will have to be obtained from the appropriate accrediting and licensing bodies.

The barriers to effective supervision and mentoring are diverse. In the absence of mission-based budgeting, the cost of incremental faculty teaching and supervision — including both new responsibilities and some of those currently assumed by residents — may appear to be prohibitive. Teaching time and faculty availability are limited by demands for increased clinical and research productivity. Regardless of cost and availability, freeing faculty for more extensive educational responsibilities will be difficult as long as educational effort and excellence continue to be undervalued in academic advancement. Perhaps most important, not all clinicians have the requisite background or skills to incorporate innovations in basic science or evidence-based practice into their teaching, and not all basic scientists are comfortable with participatory teaching in a clinical environment. Finally, the relative lack of well-validated interdisciplinary teaching models and competency-based evaluation instruments may have a negative effect on teaching and assessment.

#### NEW MODELS OF CLINICAL CLERKSHIPS

Promoting educational continuity is complicated by the traditional division of the core clinical clerkship experience into a disconnected series of independently governed, discipline-specific, randomly ordered, sequential blocks (Fig. 1A), each characterized by largely ad hoc patient assignments and poorly coordinated learning objectives. To provide opportunities for a more collective ap-

**Table 2. Potential Barriers to Educational Continuity.**

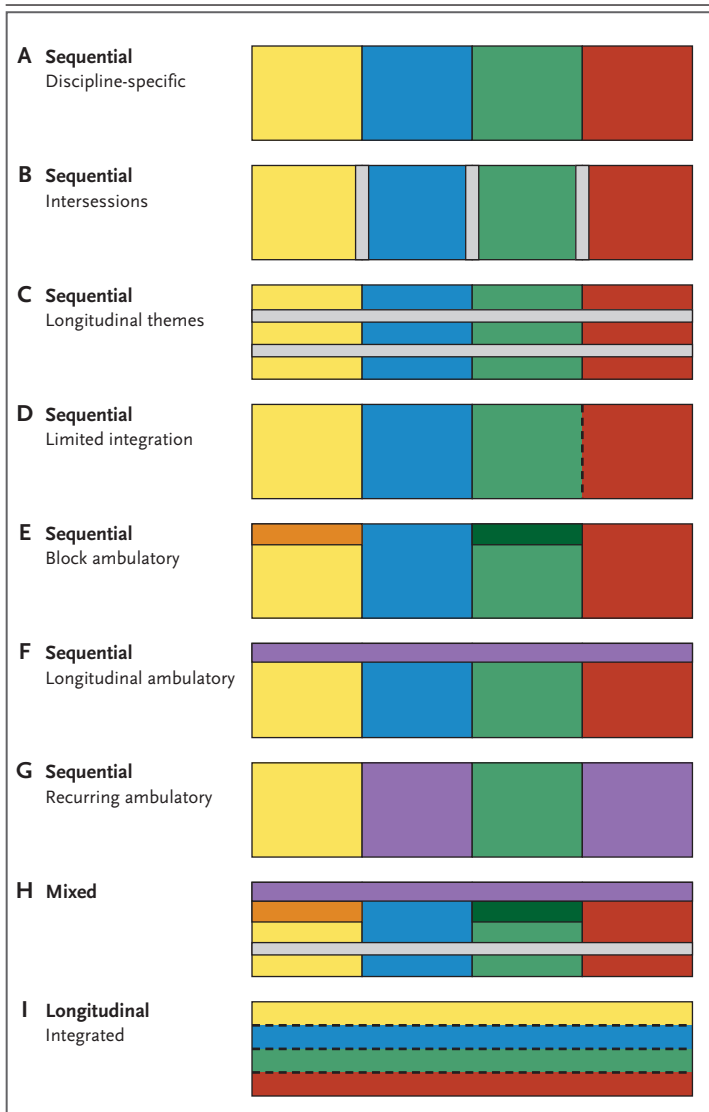
Continuity	Barriers
Care	Underinvestment in ambulatory care infrastructure Underinvestment in information technology infrastructure Traditional academic medical center organization and culture
Curriculum	Departmental boundaries and culture Lack of agreement on educational and assessment strategies Administrative costs Inflexible accreditation and other regulatory standards
Supervision	Incremental faculty teaching effort Lack of recognition and academic advancement Narrowness of faculty expertise Lack of interdisciplinary teaching models Insufficient competency-based evaluation instruments

proach to curriculum design and management and to better deal with so-called orphan topics, medical schools have begun to assume more centralized control of the clerkship year. Over the past decade, this shift in governance has allowed for the development of a variety of new models of clinical clerkships, many of which have incorporated elements of educational continuity into the overall learning experience.

Some schools have developed interdisciplinary “intersessions” or “interclerkships” (courses, generally of about a week’s duration, interposed between sequential clerkships) (Fig. 1B)<sup>19</sup> and longitudinal “themes” or “threads” (courses that link similar content between clerkships) (Fig. 1C).<sup>20</sup> Both models provide opportunities for interdisciplinary curriculum design and management. However, short of major curricular revisions (such as consolidating core clerkship objectives or extending the duration of the overall experience), time limitations curtail the ability of either approach to reach its full potential.

Many of these new clerkship experiences have used small-group, problem-based learning, which although a natural locus for interdisciplinary teaching,<sup>21</sup> had not previously been used in the clinical curriculum as commonly as in the pre-clinical curriculum.<sup>22</sup> In England, at the University of Manchester, modules of thematically organized, problem-based material are now being taught alongside traditional discipline-specific “attachments” (clerkships).<sup>23</sup> Semistructured interviews of Manchester graduates have indicated significant gains in dealing with clinical uncertainty, knowing their personal limits, and asking for help when these limits are exceeded.<sup>24</sup>

A variant of problem-based learning has been



**Figure 1. Clerkship Organization.**

Each panel illustrates a different organizational model, with specialties represented by different colors. For simplicity, only four of the six traditional core clerkship specialties (internal medicine, obstetrics and gynecology, neurology, pediatrics, psychiatry, and surgery) are shown. Surgery generally includes formal exposure to anesthesiology. Many schools now include family and community medicine in the core clerkship experience as well; a smaller number also include emergency medicine and radiology. The models are named for their dominant organizational characteristic (sequential, longitudinal, or mixed). Interdisciplinary curricular governance and longitudinal care experiences greatly enhance educational continuity. Panel A represents the traditional clerkship year, a randomly sequenced series of discipline-specific, inpatient block rotations. This organization is not conducive to continuity of care or supervision and allows for only limited curricular continuity. “Intersession” courses (gray bars) between two or more discipline-specific blocks provide the opportunity for interdisciplinary teaching of selected core competencies or other material (Panel B). Core material can also be presented as longitudinal “themes” or “threads” bridging two or more discipline-specific clerkships (Panel C). The sequential model in Panel D, in which two related discipline-specific blocks are combined, offers opportunities for interdisciplinary patient care experiences in the particular disciplines involved. Panels E and F represent relatively common variants of the traditional clerkship model: the addition of an ambulatory care experience to the still dominant sequential, inpatient model. Ambulatory care experiences can be structured as discrete blocks (Panel E, darker shades in the first and third blocks) or in a longitudinal fashion (Panel F, purple block) and may be organized by one or more disciplines. Panel G illustrates an as-yet-untried model for retaining discipline-specific immersion experiences and continuity by alternating inpatient experiences with recurring outpatient rotations (purple block); this may be a way of introducing experiences in continuity of care without resorting to a strictly longitudinal curriculum structure. Panel H is one of many potential mixed models in which discipline-specific sequential clerkships are retained (with their time allotment reduced), and educational continuity is provided by longitudinal ambulatory care experiences, longitudinal mentoring and assessment, and a longitudinal interdisciplinary curriculum. In Panel I, the clerkships are organized in a parallel rather than sequential fashion. For example, each week of the clerkship year might contain experiences in all (or most) of the traditional disciplines. In this model, students follow patients longitudinally across some or all care venues (including across disciplines), and the members of the faculty assume collective ownership of the entire clerkship experience.

used at the University of Dundee in Scotland to integrate content across the entire curriculum.<sup>25</sup> Task-based learning uses the clinical experience itself, rather than “paper” cases, to generate examples of a series of predetermined tasks, with the students themselves responsible for finding opportunities to explore these tasks as they move through a discipline-specific, sequential curriculum. Task-based learning is credited with enhancing the transfer of basic science knowledge to the clinical years as well as providing an opportunity for integration of core content across clinical disciplines without the need to create interdisciplinary teaching teams.<sup>26</sup>

Where curricular content sufficiently overlaps disciplines (neurology and psychiatry or obstetrics and neonatology, for example), the opportunity exists to integrate clerkships more fully across disciplinary lines (Fig. 1D). However, although there are examples of integration in which related clerkships have been grouped together for administrative or scheduling purposes, multidisciplinary governance and joint teaching have been attempted only infrequently and have proved difficult to sustain in a subspecialty-dominant practice environment.<sup>27-29</sup>

Ambulatory care clerkships are another potential locus for interdisciplinary design and management. In recent years, block or longitudinal ambulatory care clerkships (Fig. 1E and 1F, respectively) — individually or collectively organized by departments of family medicine, general internal medicine, and general pediatrics — have become relatively common components of the core clerkship year.<sup>30-34</sup> Although single or isolated block experiences are an appropriate forum for the follow-up of time-limited disorders, they provide little opportunity for exposure to chronic disease management, a major required competency in the modern practice environment.

Students appear to benefit from longitudinal ambulatory care experiences by developing more effective relationships with patients, gaining insight into the psychosocial aspects of care, and understanding the longitudinal management of chronic illness.<sup>35</sup> However, this potential is often degraded by competing inpatient responsibilities and patient-scheduling problems. Recurring ambulatory-block rotations devoted exclusively to generalist community practice, alternating with discipline-specific inpatient blocks (Fig. 1G), might provide an effective solution. Combining both departmentally based and interdisciplinary governance models, this intriguing approach — recently suggested to promote continuity in internal medicine residency education<sup>36</sup> — has yet to be tested. Applied to undergraduate education, however, it would probably require substantial lengthening of the traditional clerkship year.

Many permutations of these basic models are possible. Any substantial combination of sequential and longitudinal experiences — so-called mixed models — would allow for some degree of both discipline-specific immersion and educational continuity (Fig. 1H). In a pilot program at Case Western Reserve University in Cleveland, for ex-

ample, time was equally divided between traditional, discipline-specific inpatient rotations and ambulatory settings, with ambulatory training being provided in specialty clinics and a year-long continuity experience in one of the generalist disciplines.<sup>37</sup> Weekly tutorials and seminars, organized as longitudinal themes and provided by a constant group of faculty mentors, served to bridge individual specialty-specific experiences. Grade distributions in core clerkships were similar, except in psychiatry, in which students in the integrated track achieved significantly higher scores than did students in the traditional curriculum. They also performed better on a generalist Objective Structured Clinical Examination but had a lower mean score on the National Board of Medical Examiners' internal-medicine "shelf" exam. A majority of students reported that they would choose the integrated third year again and would recommend it to others. Similar approaches are being tested at several teaching hospitals associated with Harvard Medical School and the University of California, San Francisco, as part of school-wide efforts on medical education reform.

Longitudinal organization of most or all specialties that are commonly represented in the core clerkships (Fig. 1I) is an emerging but still uncommon model. Motivated by the need for graduates who are interested in practicing in medically underserved areas, some schools have created clerkships that place students in longitudinal ambulatory care experiences — including primary care and multidisciplinary group practices — for a significant portion of their clinical training. When measured against regional workforce goals, these programs have been judged to be quite successful.<sup>38-43</sup> Students in these variously integrated longitudinal clerkships have performed as well as their more traditionally trained counterparts on local and national examinations of clinical competence.<sup>44-46</sup>

Other schools are testing the feasibility of multidisciplinary, cross-site longitudinal integration without emphasizing primary care or attempting to steer students toward the generalist disciplines. In a pilot project at Harvard Medical School and the Cambridge Health Alliance in Cambridge, Massachusetts, students spend the entire third year learning from serial contact with a carefully selected cohort of patients recruited from their preceptors' practices in internal medicine, pediatrics, psychiatry, neurology, and ob-

stetrics and gynecology.<sup>47</sup> Each patient is followed across all venues of care, including outpatient specialty and subspecialty clinics, the inpatient setting, and rehabilitative, nursing home, and home care. Special arrangements facilitate exposure to patients in the emergency department and a full spectrum of general surgical care. Weekly case-based tutorials on fundamental topics that seek to integrate basic and clinical science, simulation exercises, electronic records, and mentored educational portfolios further emphasize the interdisciplinary and personalized nature of the curriculum.<sup>48,49</sup>

Outcomes data have been encouraging, although the population of participating students is as yet small.<sup>50</sup> Students see patients far more frequently before a diagnosis is made and after discharge from the hospital and are supervised by experienced faculty, rather than residents, to a much greater extent. In tests of knowledge and clinical skills, these students perform as well as or better than their more traditionally trained counterparts. At the same time, clinical preceptors and tutorial facilitators are enthusiastic about teaching, some for the first time after many years of frustration.

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#### CONCLUSIONS

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Only time will tell whether any of these new clerkship models will have enduring value or whether yet others will need to emerge. Whatever the model, the clinical environment must be made more receptive to professional development, and learning must be embedded in caring for patients. Just as patient-centeredness and improvements in health care quality are becoming the overarching metrics of the health care delivery system, so too should learner-centeredness and improvements in educational quality become the proximate metrics of the medical education system.

The concept of educational continuity — driven by collaborative, interdisciplinary governance — provides a sufficiently broad framework to accommodate the development and evaluation of a wide variety of new models of clinical education. Any model of clinical education that emphasizes the complex cross-disciplinary skills of doctoring rather than preparing students solely for discipline-specific inpatient practice will present substantial financial, organizational, and cultural difficulties,<sup>51,52</sup> but the American public deserves

a health care system second to none.<sup>53</sup> Medical education reform is one important means to this end.

Although considerable heterogeneity of clinical education is ultimately likely, and even desirable, the essential features of a new paradigm for the 21st century must include a substantive rethinking of the relationships among patients, students, and teachers and most especially the environment in which this relationship either prospers or falters. An emphasis on continuity of care, curriculum, and supervision provides a solid foundation for maintaining and enhancing an even more fundamental continuity: the continuity of idealism. Students enter medical school highly idealistic, with core values of altruism, empathy, humanism, and service. However, despite being cornerstones of professionalism, values such as excellence in communication, cultural competence, and attention to social justice, actually erode during training.<sup>54,55</sup>

Attention to educational continuity has the potential to forestall such erosion. Continuity of care provides students with relevant, extended, and serial contact with patients, physician preceptors, and other health care professionals. The goals of students and patients are aligned, and students become natural advocates for their patients' interests and needs. Continuity of curriculum creates space for self-reflective practice, conceptual integration, and critical thinking, without which learning becomes task-based and heuristic. As students wrestle with complex professional issues, a cohesive curriculum provides both a conceptual framework and a practical forum for explicit learning and development. Meaningful clinical experiences and continuity of supervision support students' ability to know all they can about their patients and their conditions, from the basic science underlying the pathophysiology to the family and community in which the patient lives. Continuity of supervision also provides the luxury of intergenerational, iterative dialogue grounded in practice about values, professionalism, and lifelong learning. In this way, the entire learning community nurtures and maintains a spirit of idealism — idealism that will surely be translated into enhanced learning, greater patient satisfaction, and more efficient and effective medical care.

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