

# **Indiana University School of Medicine 2001-2002 Curricular Assessment Report**

## **Background**

In 1992, IUSM initiated a process of curriculum review, faculty development, and curriculum planning. The first two phases of the review, the study phase and the design phase, represent a significant commitment of time, effort, and creativity on the part of faculty, staff, students, and administrators at IUSM. The process was characterized by strong faculty ownership and based on a strong faith in the quality of our undergraduate medical program and our students.

The process culminated in both a shared vision of the skills of the successful graduate and a plan for achieving that vision. The design teams produced a comprehensive set of recommendations that addressed five facets of the curriculum: (1) a core knowledge base; (2) the adoption of a competency-enhanced curriculum; (3) recommendations for the improvement of integration between the basic and clinical sciences; (4) an institutional framework and plan for evaluation and assessment; and (5) a faculty governance structure that ensures integration of the knowledge base and competencies, and facilitates ongoing improvement of the curriculum. This document focuses on the progress made towards achieving the faculty recommendations for curricular improvement. The following is a summary of the recommendations for curricular improvement at IUSM.

## **Recommendations for Curricular Improvement**

1. The basic science disciplines will be responsible for teaching and learning objectives that provide our medical students with a core of information that establishes the scientific basis of medicine and prepares students to integrate continuing advances in medical sciences into their information core.
2. The basic science core content will be presented in a logical sequence that promotes and maximizes integration and coordination among basic and clinical science disciplines.
3. The basic science curriculum will be organized in a manner that features and maximizes active learning opportunities.
4. The basic science curriculum will prepare students for lifelong learning.
5. Clinical science will be incorporated into the early years of medical school and basic science teaching will continue through the later years of medical school.

6. Faculty development and protected time for teaching will be essential for integrating basic and clinical teaching and for the facilitation of more active learning environments.
7. The school will adopt a competency-enhanced curriculum.
8. The school will need to develop an administrative structure that insures competencies are integrated into the curriculum throughout the medical school.
9. Mechanisms to evaluate and assess our students' accomplishment of the competencies will be developed and used.
10. Departments, which rely on residents to provide significant portions of students' medical education, should provide those residents with training to enhance their skills as educators.
11. Resources required for the implementation, evaluation, and assessment of the new curriculum will be identified and dedicated early in the implementation process.
12. Academic units with responsibility for student instruction will be charged to use at least one evaluation instrument common to all instructional sites. Performance on common evaluation instruments will be monitored, cross-sectionally and longitudinally, as one aspect of program evaluation.
13. A centralized, multidisciplinary program will be developed to assist the teaching and assessment of clinical skills, attitudes, and knowledge that builds upon experiences obtained from departmental assessment programs.
14. The school will develop a centralized mechanism for identifying and providing learner remediation needs.
15. The school will continue to provide students with the opportunity to evaluate courses, clerkships, electives, and instructors.
16. The school will develop a school-wide coordinated policy for managing data as an institutional resource.
17. The Curriculum Council will be created.
18. An Evaluation and Assessment Committee for curriculum will be created.
19. Component Committees for the basic and clinical sciences will be created.
20. A Competency Committee will be created.

21. An Office of Medical Education and Curricular Affairs (MECA) and as well as an Office for Medical Student Affairs (MSA) will be created.

Four of the recommendations that resulted from our intensive curriculum review focused on modifying the governance structure of the educational program. The Education and Curriculum Committee (ECC) was replaced with the Curriculum Council (CC) in 1996. The Curriculum Council is much larger than the ECC and thus allows more faculty, students, and administrators the opportunity to participate in the governance structure. The members of the CC are clustered in five small working groups:

1. The Steering Committee gives direction to the Council and has curricular approval authority,
2. Component I has statewide oversight responsibility for the first year curriculum,
3. Component II has statewide oversight responsibility for the second year curriculum,
4. The Clinical Component has oversight responsibility for the third and fourth years of the curriculum,
5. The Competency Directors are charged with statewide oversight responsibility of their respective competencies and are responsible for the implementation of the competency-enhanced curriculum across the nine IUSM campuses.

The Academic Standards Committee (ASC) is charged with evaluating the educational program; analyzing USMLE, statewide exam, and Objective Structured Clinical Examination (OSCE) results; monitoring educational equivalence across the 9 IUSM campuses; reviewing students' evaluations of courses and instructors; and recommending grading distribution policies. With the implementation of the competency-enhanced curriculum in 1999, ASC also participates in the evaluation of the competencies at all instructional sites. Faculty, students, and administrators serve on ASC.

The competency-enhanced curriculum was implemented for all first year students in the 1999-2000 academic year, for second year students in the 2000-2001 academic year, for third year students in the 2001-2002 academic year, and will reach full implementation for all IUSM students in the 2002-2003 academic year. The development of a competency-enhanced curriculum addresses items 7 through 9 listed on the summary of recommendations. Implementation of the other recommendations is as follows:

- Item numbers 1 through 4 and number 12 are being addressed by Component I and the Basic Science Council (Basic Science Department Chairs). All state-wide basic science course directors are required to present an 80% core of material, are being asked to provide learning objectives as part of their syllabi, and are required to give common statewide examinations. Basic science course directors have been working together with Components I and II to integrate material in the first two years and to present it in an organized manner, which maximizes active learning opportunities. The fourth recommendation focuses on the

lifelong learning competency. Students' lifelong learning skills are assessed in a few basic science courses and faculty are actively seeking opportunities to incorporate these skills in other courses.

- Items 5 and 6 focus on the integration of basic and clinical sciences. In addition to the existing Introduction to Clinical Medicine course, other courses such as Neuroscience and Clinical Neurology, Evidence-Based Medicine, and Concepts of Health and Disease are being team taught by basic scientists and clinicians. The Curriculum Council has also recommended that all students be required to take the Scientific Basis of Clinical Therapeutics course during their fourth year. The course focuses on using basic science principles during the clinical years and is co-directed by a clinician and a basic scientist. We are working to identify other potential areas for the integration of basic and clinical sciences. Item number 6 addresses the specific issue of protected time and remains a challenge. As a school we are considering adopting mission-based accountability principles that would allow us to track the amount of faculty time dedicated to education.
- Item 10 focuses on enhancing the training skills of residents and is being addressed by the Clinical Component with the implementation of the competencies in the clinical years.
- Item 11 addresses the need for resources. The Dean has allocated funds for faculty development, education grants, a comprehensive computer information system, educational facilities, and additional personnel to support the new curriculum. During the pilot phase, two full-time professional positions in the Dean's Office for Medical Education and Curricular Affairs were created to assist with the implementation of the competency-enhanced curriculum. One of the new positions is a Basic Science Curriculum Coordinator and the other is a Clinical Science Curriculum Coordinator. During the 2000-2001 academic year, two Curriculum Specialist positions were created. The first Curriculum Specialist began in August 2000 and has worked with faculty to develop IUSM's centralized curriculum management system, A New Global Environment for Learning (ANGEL). The ANGEL program will be offered to all courses, students, faculty, and residency programs at IUSM. We are currently recruiting for the second curriculum specialist. During the spring of 1999, \$50,000 was earmarked for Educational Research and Development grants; \$50,000 was awarded in spring 2000 and another \$50,000 was awarded in spring 2001. During the summer of 1999, we held the first IUSM faculty development symposium on competency-enhanced education. In addition to specific competency information, faculty in small groups used role-play exercises to practice giving meaningful feedback to students. Approximately 50 educational leaders attended and strongly encouraged the Curriculum Council to continue offering workshops of this nature. During Spring 2000, a half-day faculty development and planning symposium was held to discuss competency implementation plans for the 2000-2001 academic year. A dinner

meeting/planning symposium was held in April 2001 to discuss competency implementation plans for the 2001-2002 academic year. Over 80 educational leaders attended the spring 2000 workshop. An Innovations in Medical Education faculty development symposium was held in fall 2000. During Spring 2001, MSAA offered a faculty development symposium focused on active learning and in August of 2001, IUSM hosted an Educational Retreat for curricular leaders and faculty. The Dean recently allocated funds to create the Clinical Skills Education Center, a 4500 sq ft. facility that is dedicated to teaching and assessing competencies and clinical performance using standardized patients. The facility was operational in Fall 2000. Additional monies were allocated to fund the salaries of the standardized patient trainer, the standardized patients, and a facility manager. The function of this facility is outlined in recommendation number 13. In an effort to facilitate the use of various pedagogical methods, IUSM renovated the student center that houses several small group conference rooms and is equipped with a facility for distance education.

- Item number 14 focuses on remediation. The topic has been discussed by the Curriculum Council and the Academic Standards Committee, and we are in the process of developing plans for remediation.
- Giving students the opportunity to evaluate courses and instructors (item number 15) was part of the traditional curriculum. We will continue to strive to improve the student evaluation process with the implementation of the competency-enhanced curriculum.
- Item number 16 will be subsumed as part of the school's effort to develop a comprehensive informational structure that will link several existing databases. The first phase of implementation included an evaluation module offered through the ANGEL program and in August 2001. The pilot was successful and full implementation of the online evaluation system for the first and second year courses and instructors will begin in Fall 2002. Online evaluations for clinical courses and instructors will be piloted in Fall 2002. During the development of this comprehensive program, policies will need to be made regarding the management of data as an institutional resource.
- Items 17 through 20 were recommendations to revise the governance structure and were implemented in 1996. The only exception is we retained the Academics Standards Committee rather than creating an Evaluation and Assessment Committee (item 18).
- In an effort to move towards implementation of item 21, the Dean's Office for Student and Curricular Affairs assumed additional curricular administrative responsibilities and was renamed the Dean's Office for Medical Student Academic Affairs in 1999. In July 2001, that office was divided into two separate offices: Office for Medical Education and Curricular Affairs (MECA) and the Office of Medical Student Affairs. MECA has approximately 20 staff members including an Associate Dean, an Assistant Dean, faculty, professional staff, and clerical staff. MECA

has been charged by the Dean to create a relative value unit system for IUSM.

The 1997-1998 and 1998-1999 academic years were used to pilot curricular change and continue with the development of implementation plans.

As a supplement to Curriculum Council and subcommittee meetings, we began holding annual planning meetings and faculty development activities in which all interested faculty, students, and administrators were invited to hear and comment on the implementation plans and gain skills in competency assessment. A series of four dinner meetings was held in spring 1998 and another series of three dinner meetings was held in spring 1999. The dinner meetings offered an opportunity for all interested parties to hear and comment on the fall 1999 implementation plans. Competency planning and implementation meetings were also held in spring 2000 and spring 2001.

During the pilot phase, a group of 22 IUSM educational leaders visited Brown University to learn about the strengths and weaknesses of their competency-enhanced curriculum. The meeting proved to be beneficial to both groups. We have since joined an informal consortium of schools interested in sharing information about competency-enhanced curricula in medical schools. The consortium sponsored a working luncheon meeting during the 1999 AAMC annual meeting in Washington, DC.

Before instituting the competency-enhanced curriculum for first year students during the 1999-2000 academic year, we invited the LCME to visit and give us feedback on our implementation plans. Drs. Harry Jonas and Barbara Barzansky visited the IUSM on August 24, 1999. Drs. Jonas and Barzansky met with curriculum leaders, course directors, department chairs, competency directors, students, and the Dean during their visit.

The goal of the Curriculum Council is that full implementation of all four years of the competency-enhanced curriculum will be fully realized during the 2002-2003 academic year.

### **Process used to identify and rectify problems in the curriculum**

Problems with course execution are identified and addressed by the ASC. This committee analyzes student performance on the NBME/USMLE examinations and monitors grade distributions, grade policies, and student evaluations concerning various courses. The Dean's Office routinely collects course and/or instructor evaluations from students at all instructional sites. Student satisfaction is another important way of identifying curricular problems, and results of those evaluations are made available to the course directors, department chairs, center directors, and the Dean, thus allowing correction of problems. The ASC monitors these reports and formally reviews them annually. A pattern of negative comments prompts a discussion of the evaluations with

the course director, and if the problem remains uncorrected, a more thorough study by the ASC may occur. Interviews with the course director may be scheduled and are aimed at assessing the cause of the negative reviews and developing strategies to alleviate the problem. In the rare case when these interventions fail, the Chair of ASC will report problems to the administration and Curriculum Council for appropriate formal action.

The Biostatistics course offered at the Indianapolis campus is an example of this process. In response to negative student evaluations, the ASC had discussions with the course director and made a recommendation to the Curriculum Council to investigate the central problems plaguing the course. The Biostatistics Taskforce was formed and developed a plan for restructuring the course and integrating evidence-based medicine curriculum across all four years. As a result the current Evidence-Based Medicine course was formed and as judged by student evaluations has been a successful.

Finally, the AAMC Graduation Questionnaire is used to identify opportunities for improvement in the curriculum and serves as a guide for curricular change as described by students. The results of the data are distributed to all department chairs, center directors, the Curriculum Council, the ASC, and the Dean and concerns are addressed via the mechanisms described above. The importance the IUSM places on the AAMC Graduation Questionnaire is demonstrated by the fact that its completion is a graduation requirement.

### **Feasibility of educational change and curricular innovation and the correction of identified problems**

Change has, does and will continue to occur at IUSM. The seminal document: “The Primary Care Initiative-Physicians for the 21<sup>st</sup> Century has been the driving force behind a major transformation that has been occurring over the past four years. This document realizes that a new type of medical school will be required to educate a student in the new millennium.

Two major structural alterations have occurred to enhance the School’s ability to accomplish this curricular transformation in a coherent fashion. The first has been adoption of a Strategic Goals proposal by the new Dean of the School of Medicine, with the establishment of an Executive Associate Dean for Educational Affairs. The charge of this position is to oversee and coordinate educational processes at the IUSM. Secondly, the work from the Primary Care Initiative established the Curriculum Council and its various subcommittees. While even incremental revisions are difficult at an institution the size and complexity of the IUSM, the identification of an appropriate mechanism to propel change increases the feasibility of successful transition. The Curriculum Council serves this function at the IUSM, and will continue to guide IU’s evolution, as it becomes a medical school of the 21<sup>st</sup> century. The Curriculum Council oversees the implementation of new curricular policies, including the mechanisms to more effectively accomplish this, such as the official Course Change Policy approved in 2000. It has also overseen curricular progress statewide in both the pre-clinical and clinical years. Change is not only feasible at IUSM but has been accomplished due to the work of this body.

The revolutionary curricular reform that the Council has overseen has been the establishment of the competency-enhanced curriculum, beginning formally in 1999/2000. This reform has required innovation and cooperation on an unprecedented scale, and has progressed quite well to this point. The emphasis on outcome inherent in this system has produced changes from the sweeping renovation in curricular structure and content at the Lafayette campus, to refined innovations in the specific, such as a unique computer-based Likert scale assessment methodology developed by the Bloomington Center. Exercises such as personality inventory (Myers Briggs Type or others) have been adopted across all campuses as specific curricular exercises in the competency system.

Additionally, statewide changes in assessment have occurred for students on all campuses. A statewide triple jump exam was instituted in 2000 for first year students. For all second and third year students, an Objective Structured Clinical Examination (OSCE) has been constructed through progressively more ambitious pilot projects and will be given for the first time as a high-stakes exam in 2002. Both of these projects focus on assessing achievement of the competencies.

Several modifications have occurred at the course level as a result of a perceived opportunity for improvement. An Introduction to Clinical Medicine course has been implemented statewide in the first year, and a more advanced version is taught in the second year. Active learning opportunities have been created to encourage the synthesis of basic science material, and to allow for small-group problem-based learning experiences. The Otolaryngology clerkship has been integrated into the third year and a Medical Informatics clerkship and a Current Issues in Medicine experience have been added. Other modifications include the split of Immunology and Microbiology into separate courses on several campuses, and the rearrangement of the course sequence and initiation of block exams on the Indianapolis campus.

Changes may arise not only from perceived opportunities for development, but from identified problems as well. The Academic Standards Committee closely monitors the quality of the IUSM offerings, and when the need becomes apparent, works through the Curriculum Council to effect the required actions. Examples include the replacement of the Biostatistics course with a newly created Evidence Based Medicine course in Indianapolis, streamlining the Clinical Therapeutics elective, elimination of the required research course (X802), and ongoing quality upgrades in several clerkships and statewide courses in response to the AAMC Graduation Questionnaire and IUSM internal evaluations.

During the 2001-2002 academic year, plans for restructuring the third and fourth years into a more integrated and cohesive experience were created. The plans will be fully implemented during the 2002-2003 academic year. Additionally, we are continuing to improve the competency-enhanced curriculum throughout the third and fourth years of the curriculum, and are planning the construction of a state of the art OSCE facility.

### **Extent of integration of basic science and clinical education in the curriculum**

One of the stated aims of the Primary Care Initiative is greater integration of the basic sciences and clinical education, and there are several examples of this throughout the IUSM curriculum.

Perhaps the best example of integration in the basic science years at the IUSM is the fact that all campuses teach an Introduction to Clinical Medicine (ICM) course in each of the first two years, during which students are exposed to clinical topics. The IUSM's commitment to this concept is illustrated by the Curriculum Council's recommendation that approximately thirty percent of the credit hours during those years be devoted to ICM I and ICM II. Another course devoted to integration is the Concepts of Health and Disease course at some of the centers in which students are instructed using a clinically oriented problem based learning (PBL) method. This approach is also used at the Northwest center, where the entire first two years are completely integrated and employ the PBL format. Several courses in the first two years utilize clinical correlations during course presentations. These include: Anatomy, Biochemistry, Microbiology, Physiology, Medical Genetics, Neurology/Neuroscience, Pathology, and others. A final method of integration is the synchronization of topic presentation between courses. Examples of this are the Genetics, ICM II, and Pathology courses in Indianapolis, the Histology, Physiology and Biochemistry courses in Bloomington, the previously mentioned Northwest campus curriculum, and others.

Basic science concepts are incorporated in all required courses in the clinical years. One example, is that repeated references to anatomical, histological, pharmacological and pathological concepts are made in the Radiology clerkship. Additionally, the Curriculum Council recommended that the Scientific Basis of Clinical Therapeutics course, which is devoted strictly to integrating basic and clinical science be required of all students. The course directors are presently investigating the feasibility of this recommendation. The Clinical Component has reorganized the third and fourth years into a structure that allows horizontal integration of related disciplines and to participate in three 16-week curricular blocks of interdisciplinary clinical experience and permits fourth year students more time to focus on electives. The restructured curriculum is expected to ensure that the students' clinical exposure will be one that is organized and sequential, with a strong presence of basic sciences, many different types of integrated teaching and opportunities for patient care highlighting a multidisciplinary approach.

Another example of the importance IUSM places on integration of the basic and clinical sciences is evident in the governance structure of the school. The chief curricular governing body, the Curriculum Council, is designed to be chaired by a clinician and co-chaired by a basic scientist.

IUSM believes that we can produce better physicians by combining the basic science and clinical portions of medical education into a more cohesive whole. Thus we are actively pursuing opportunities for further integration in the curriculum, and will continue to do so.

The Curriculum Council (CC) and the Academic Standards Committee (ASC) oversee curricular content and assessment through actions of the component committees, competency directors, and the Statewide Assessment Sub-Committee. These committees monitor several facets of the curriculum to ensure agreement between assessment and stated instructional objectives. The Basic Science Council (made up of all basic science department chairs), the Clinical Chairs, and the Center Directors also monitor curricular content and evaluation across disciplines. Department chairs and course directors are responsible for statewide curricular monitoring within disciplines.

The CC and ASC require uniform assessment tools and examinations for required courses and clerkships, and common statewide evaluations of competency achievement. As part of the competency-enhanced curriculum, the CC ensures competency performance of students by requiring that they fulfill three levels of proficiency as outlined in The Indiana Initiative: Physicians for the 21<sup>st</sup> Century. In this document there is a list of specific knowledge, skills and behaviors required of students. This list serves as an effective guide for structuring the curriculum. Statewide assessments associated with the competency-enhanced curriculum include the Triple Jump and the Objective Structured Clinical Examination (OSCE).

A triple-jump exam is a case study based series of questioning and answers occurring in three phases over at least two days. The exam is designed such that students are required to document their thought processes while solving a problem. In the course of solving the problem, they employ various research instruments and are required to communicate their answers to the different sections of the exam in both hand-written and typed formats. The triple-jump exam may be adapted to assess other competencies as well.

As part of the Competency enhanced curriculum, IUSM requires that all students take OSCEs before beginning the third year, and again before beginning the fourth year of medical school. The IUSM has administered OSCEs to all rising third and fourth year students since 1998. From 1998 to 2000 these examinations were given in the outpatient surgery area of University Hospital, but beginning in 2001, all third and fourth year OSCEs have been administered in the Indiana University School of Medicine Clinical Skills Education Center on the Methodist campus. An OSCE is an exam in which a student's interaction with a trained actor, or "standardized patient" (SP) in a mock clinical setting is observed and scored. The SP has a list of behaviors that the IUSM faculty feel the student should exhibit in the encounter, and scores the student on their presence or absence. These behaviors are related to the nine competencies, and the SP will present with a condition requiring the student to demonstrate them. After the encounter the student will be required to answer short written questions and then receive verbal feedback from the SP. The encounters are video taped and students are asked to review the tape with their faculty advisor.

Statewide discipline meetings are held to discuss the relationship between statewide course content and objectives and evaluation methods. The statewide discipline meetings also provide a forum to discuss results of statewide discipline examinations, triple jump performance, OSCE scores, and USMLE discipline data.

The IUSM has an interest and commitment to scholarship, self-study, and life-long learning as evidenced by our adoption of the competency-enhanced curriculum. Two of the Competencies in our curriculum are Life-long Learning and Problem-solving, both of which emphasize the acquisition of the skills necessary to continuously acquire knowledge and apply it in the most efficient manner throughout a career. Specific examples of this commitment include Problem Based Learning (PBL) components in the curriculum at several IUSM centers for medical education. Courses such as Concepts of Health and Disease, Microbiology, Biochemistry, Evidence-Based Medicine, and Medical Informatics incorporate PBL concepts into traditional instructional methodologies. Assessment tools such as the TJ and OSCE that further emphasize the importance we place on these qualities and abilities.

Students also have pre-matriculation and other opportunities for scholarship and research in the Master of Science in Medical Science program, the pre-matriculation program, summer research opportunities for students, and combined degree programs. We feel that in order to adequately prepare our students for the changes and demands they will face during a career in medicine, they must be able to continue to learn, and we have thus emphasized the acquisition of the skills that will enable them to do so.

The recommendations in the document “The Indiana Initiative: Physicians for the 21<sup>st</sup> Century” were accepted by the IUSM faculty in 1996, and have had a profound effect on student evaluation. The document suggests the implementation of a Competency-enhanced curriculum, describes a method of curricular review and oversight, and lists several classical as well as innovative methods for evaluation. All of these impact student assessment in the basic and clinical years, and across disciplines and centers.

During the preclinical years, students are evaluated using a variety of assessment techniques including multiple-choice examinations, true/false, short-answer, essay, and oral examination, and performance on examinations with standardized patients. In addition, students’ performance in competencies is routinely assessed with triple-jump exams and/or objectively structured clinical examinations (OSCEs). Other assessment methodologies are incorporated into the curricula and recorded on Likert scales developed in accordance with the criteria for assessment as published in “The Indiana Initiative: Physicians for the 21<sup>st</sup> Century”. The Likert scales can be accessed from resources section of the Curriculum Councils’ website located at <http://meded.iusm.iu.edu/>.

The Curriculum Council and Academic Standards Committee require that all disciplines administer a uniform statewide assessment or develop a plan to do so by August 2001. Implementation of the statewide assessment tools in all disciplines should be complete by August 2002. Competencies are assessed globally by the administration of common instruments as well. These include a triple-jump exam during the first year, a self-awareness inventory such as the Myers-Briggs-Type-Indicator (MBTI), and a statewide OSCE during the beginning of the third year.

The Curriculum Council and Academic Standards Committee also monitor student assessment in the clinical years. During the third and fourth year required clerkships, this most often consists of a National Board of Medical Examiners (NBME) shelf examinations, multiple preceptor evaluations of clinical skills, task-logs, computer-assisted-instruction with evaluation components, research projects, conferences/case-presentations, and OSCEs. A final global assessment encompassing the entire IUSM experience, is the school's requirement that students pass USMLE Step I before beginning third year coursework and pass USMLE Step 2 to be eligible for graduation.

The IUSM faculty have agreed to a "core curriculum" for the Basic Sciences, with the recommendation that the entire core curriculum be taught but that the core would comprise only 80 % of the individual course content. The additional 20% of the material may be given by individual instructors to enhance the curriculum. Given that evaluation examines mastery of course subject matter, evaluations in the preclinical years are thus assured of a high degree of consistency across sites relative to content. In addition, the CC and ASC require that all disciplines administer a statewide exam, thus increasing this consistency. The IUSM addresses consistency of evaluation in the clinical years by providing formal didactic instruction in all clerkships, then assessing student achievement with NBME exams and OSCEs.

Formative evaluation is provided in the Basic Science courses in multiple ways including, on-line exercises, practice examinations, peer review, and faculty observation and feedback. Students receive an interim report of the faculty evaluation of their status in the competencies at the end of the first year. This formative feedback provides students with at least one academic year to improve in any weak areas before they are summatively evaluated at the end of year two. In the clinical years students' performance is observed on a continual basis, thus providing numerous opportunities for formative evaluation. Comments on the AAMC Graduation Questionnaire indicate that students are not satisfied with the amount of formative feedback they receive from our faculty, thus IUSM is making concentrated efforts to improve in this area. A faculty development symposium focused on improving feedback skills was held in Fall 1999 and a portion of the 2001 Summer Educational Retreat sponsored by Dr. Stephen Leapman, Executive Associate Dean for Educational Affairs, was dedicated to this topic.

Summative evaluation is given through examination scores, final grades, competency evaluation reports, and a summary of each student's performance on their third and fourth year OSCEs.

Students usually receive feedback in the preclinical years on traditional exams within one week (usually sooner). Non-traditional exams such as triple jumps and OSCEs require more time to grade, but are generally completed within a few weeks. For the two years in which the competency-enhanced curriculum has been in effect, feedback was distributed within a single month for most centers, and within two months in Indianapolis (the largest center). Feedback in the clinical years in the form of a final grade is an area where

an opportunity for improvement has been identified. In an effort to address students' concerns about the timeliness of feedback, ASC established a policy requiring all clinical rotations to submit grades no later than 30 days after the conclusion of the clerkship.

## **Outcomes Assessment**

### ***Basic Science Objectives across Sites***

Since we have a statewide system (9 campuses) for the first two years, basic science disciplines have agreed to present a core of information to all students representing 80% of the curriculum with the remaining 20% of the course reserved for enhancements based upon the strengths of individual faculty. The department chair is responsible for monitoring the academic content of the courses throughout the state. All disciplines have been required by the Dean, the Curriculum Council, and the Academic Standards Committee to adopt a statewide discipline examination. Some disciplines base their statewide discipline examination on the core material, while other disciplines use an external examination such as a National Board of Medical Examiners (NBME) subject exam.

### ***Competency-enhanced Curriculum***

In addition to the core material in each discipline, the school adopted a competency-enhanced curricular layer that requires all students to achieve level 1 (beginning) and 2 (intermediate) mastery in the following competencies:

1. Effective Communication
2. Basic Clinical Skills
3. Using Science to Guide Diagnosis, Management, Therapeutics, and Prevention
4. Lifelong Learning
5. Self-Awareness, Self-Care, and Personal Growth
6. The Social and Community Contexts of Health Care
7. Moral and Ethical Judgment
8. Problem Solving
9. Professionalism and Role Recognition.

Students are also required to demonstrate mastery of three of the competencies listed above at the advanced (or third) achievement level to be eligible for graduation. To assist faculty with evaluating students' performances in competency areas, a standardized competency assessment form and an electronic competency tracking system were developed.

### ***Teaching and Learning Methodologies***

There has been an increase in small group learning experiences, problem-based learning, computer-enhanced instruction, self-directed learning, and the use of standardized patients for assessment. No school-wide objectively structured clinical examination (OSCEs) stations were performed in the 1997-1998 academic year,

approximately 2,240 OSCE stations were conducted in 1998-1999, approximately 3,360 OSCE stations were administered during the 1999-2000 academic year, and roughly 6,720 statewide stations were administered during the 2001-2002 academic year.

### ***Assurance of Comparable Quality of Education Across the State-wide Campuses***

In addition to the adoption of statewide discipline examinations, we have begun to use standardized patients, on-line testing, faculty observation, OSCEs, and triple jump examinations to assess our students' competence. At the end of the first year, students from all centers take a statewide triple jump examination to assess their communication, problem-solving, and lifelong learning skills. All 280 students in each class are required to take a multi-station OSCE at the end of second year and the end of third year. Each student's performance is scored, videotaped, and reviewed by a faculty member with the student. As we continue to develop the OSCE program, students will be encouraged to compile competency and clinical performance assessment portfolios.

For program evaluation purposes, we have developed regression equations used to predict students' performance on a variety of measures (USMLE, statewide exams, basic science GPA, clinical GPA, and performance during the first year of residency). Results of the regression analyses indicate there are few differences in the performance of students from the nine campuses on the performance measures mentioned above. As we continue developing and utilizing OSCEs, triple jump examinations, and other common instruments, we will include those variables in the regression analyses.

We also review the AAMC Graduation Questionnaire results and conduct a content analysis on the open-ended comments, review student evaluations of courses and instructors, examine discipline performance of our medical education centers on Steps 1 and 2 as well as the statewide exams, and survey residency directors about graduates' performance. We will continue to collect these data and compare the performance of our students before and after the adoption of the competency-enhanced curriculum. In addition, a portion of the AAMC Graduation Questionnaire will be administered to second year students in an attempt to define clinical versus pre-clinical issues.

### **Base-line Data for the Competency-enhanced Curriculum**

To assess the impact the competency-enhanced curriculum has on the performance of our graduates, we have begun collecting base-line competency data. Results of the OSCE given to 1999 fourth year students who had not participated in the competency-enhanced curriculum will be compared to the performance of fourth year students in the year 2003 who have completed the competency-enhanced curriculum.

In addition to base-line OSCE data, we have begun to collect base-line data on the performance of our students in the nine competency areas at the end of their first year of residency. We intend to compare the performance of graduates who did not

experience the competency-enhanced curriculum to the performance of those students who did. This comparison will be made in an effort to measure the effect the new curriculum has had on students' performance in residency.

## **Regression Analyses**

### ***Methodology***

Data for 1,520 students from the IUSM (IUSM) who sat for the United States Medical Licensing Examination (USMLE) Step 1 for the first time in 1992 through 1999 were included in this study. Five analyses were designed to predict the following: (a) performance on the Introduction to Clinical Medicine (ICM) state-wide discipline final examinations, (b) performance on the Pathology state-wide discipline final examination, (c) USMLE Step 1 scores, (d) USMLE Step 2 scores, and (e) grade point averages (GPA) on third year clerkships. To predict performance, each analysis examined a core of independent variables including: age; gender; educational site assignment (nine unique sites); MCAT score; GPA in biology, chemistry, physics and mathematics undergraduate courses; and GPA in all other undergraduate courses. In addition to the core, other specific independent variables were included in some analyses.

The first two analyses were designed to predict students' performance on two statewide discipline final examinations using the core independent variables and GPA for the first year of medical school as predictors. The third analysis was designed to predict board performance on USMLE Step 1, using the core independent variables and GPA for the first two years of medical school. The fourth analysis was designed to predict board performance on USMLE Step 2 using the core independent variables, GPA for the first three years of medical school, and USMLE Step 1 score. The fifth analysis was designed to predict GPA on third year clerkships using the core independent variables, GPA for the first two years of medical school, and performance on Step 1.

### ***Results***

Significant ( $p < 0.05$ ) positive predictors of performance on the ICM statewide exam were: Age; Assignment to five educational sites; MCAT score; GPA in undergraduate courses other than biology, chemistry, physics and mathematics; and GPA for the first year of medical school. Significant ( $p < 0.05$ ) positive predictors of performance on the Pathology statewide exam were: Gender; assignment to one educational site; MCAT score; GPA in undergraduate courses other than biology, chemistry, physics and mathematics; and GPA for the first year of medical school. Significant ( $p < 0.05$ ) positive predictors of USMLE Step 1 were: assignment to two specific educational sites MCAT score; GPA in undergraduate biology, chemistry, physics and mathematics courses; and GPA for the first two years of medical school. Gender was a significant ( $p < 0.05$ ) negative predictor of USMLE Step 1, meaning when all other variables were controlled female students scored 3.86 points lower on Step 1 than male students. Significant ( $p < 0.05$ ) positive predictors of USMLE Step 2 were: Gender; assignment to 2 specific educational sites; MCAT, GPA in undergraduate courses other than biology, chemistry, physics and mathematics; GPA for the first three years of medical school, and

score on Step 1. GPA in undergraduate biology, chemistry, physics and mathematics courses was a significant ( $p < 0.05$ ) negative predictor of USMLE Step 2 score. Significant ( $p < 0.05$ ) positive predictors of GPA on third year clerkships were: Gender; assignment to one educational site; GPA in undergraduate courses other than biology, chemistry, physics, and mathematics; GPA for the first and second years of medical school; and score on Step 1. Significant ( $p < 0.05$ ) negative predictors of GPA on third year clerkships were: assignment to 3 educational sites; and GPA in undergraduate biology, chemistry, physics and mathematics courses.

### ***Conclusions and Future Directions***

Significant predictors of the academic performance of students from the IUSM were identified. The regression equations developed in this study will be improved as additional data are collected and new independent variables are identified.

The impact of educational site assignment on academic performance can be objectively measured and used as one component of program evaluation. Results such as these are regularly shared with faculty who are encouraged to implement changes aimed at improving program quality and ensuring equivalent educational experiences across campuses.

The results of these analyses will serve as base-line data for measurement of the impact of the competency-enhanced curriculum recently adopted by IUSM.

Educational equivalence among educational sites is attained when all site assignment boxes are white, meaning the independent variable of educational site is not a significant predictor of performance on the dependent variable.

Results of the statewide discipline examinations and the regression analyses are shared with the Dean, the Executive Associate Dean for Medical Education, the Assistant Deans and Center Directors, the Department Chairs, the Curriculum Council, and the Academic Standards Committee. Due to the widespread sharing of these data, peer pressure is a tremendous motivator for those sites who do not perform as well as others. The system works relatively well and encourages healthy competition among our faculty to continuously improve.

### **Internal Evaluation Measures**

The educational program is assessed primarily in three ways: periodic assessment and review of curricular content, evaluation of student performance on course and discipline-based and statewide examinations, and course evaluations submitted by students. In 1996, IUSM published the strategic education plan, "The Indiana Initiative: Physicians for the 21<sup>st</sup> Century", which contains an outline of core educational objectives for the undergraduate educational program. In addition to an extensive listing of topic areas for clinical and basic medical science disciplines, this plan outlines the inclusion of skills and attitudes that reflect the nine core competencies of the curriculum. Curricular content,

evaluation and oversight involves many different facets at the departmental, regional center, discipline, and school-wide levels.

Internal evaluation of the effectiveness of the educational program involves both course-specific and program-wide assessments of student performance, not only on standard objective examinations of basic and clinical knowledge, but also on assessments of the skills and attitudes outlined in the competencies. With nine different regional campuses offering courses during the first two years of the curriculum, an important component of student performance is statewide examinations. All disciplines have been charged to administer common statewide assessments by August 2002. Results from the examinations are used by the individual disciplines in different ways, but serve as a measure of the adequacy of the educational programs for that discipline. The statewide examinations have been instrumental in helping individual disciplines develop core curricula and exchange curricular materials between different regional centers. In addition to comparing performance of the students at the different regional sites, the exams measure the performance of individual students against a statewide standard. Performance data for students on statewide discipline examinations are used by individual center and course directors to evaluate the effectiveness of their the educational program.

In addition to developing discipline-specific statewide examinations, the Curriculum Council has moved forward to develop statewide measures of the skills, knowledge base, and attitudes outlined by the different core competencies. In particular, the school has instituted two statewide OSCEs that are offered to all students in the system. The first examination comes after completion of the second year. Students must also complete a second series of OSCEs following completion of the third year. Both OSCEs focus on assessment of the competencies. At the end of the first year of the curriculum, all students must complete a statewide Triple Jump Examination that focuses on components of the competencies. This two-day written examination assesses the student's ability to interpret sequential presentation of information associated with a clinical case. The emphasis is on problem-solving skills rather than basic science knowledge. The use of this exam offers a common standard by which all students are assessed in demonstrating their mastery of the associated competencies.

While student evaluations of courses may not directly evaluate student performance, they continue to play an important role in evaluating the effectiveness of the educational program from the students' perspective. Students are strongly encouraged to return completed course and instructor evaluations for all of their courses and instructors. The compiled evaluation data are reviewed by individual faculty, course directors, department chairs, the Curriculum Council, the Academic Standards Committee, the Dean's Office for Medical Student Academic Affairs and the Dean. The Academic Standards Committee has a formal method of recognizing courses and instructors with letters of commendation or concern. These evaluations play a key role in identifying student concerns about the IUSM educational program. In addition to standard course evaluations, the office of Curricular Evaluation and Assessment distributes a survey at the end of the second year to all students. The survey asks students to comment on the overall educational program and basic science curricula at the different regional centers. This survey is structured similarly to the AAMC Graduation Questionnaire. We utilize

the information from student evaluations and other communications of student concerns (such as exchanges on student liaison committees, communications with the Dean Office, etc.) to identify problem areas that may not appear as the result of standard performance evaluations. Any issues of concern that are identified are communicated to the appropriate faculty committees.

In light of the strong reception of the dinner meetings and the faculty development symposium, the Dean dedicated funds to support additional faculty development exercises during the 2000-2001 academic year. We will continue to collect satisfaction data from faculty regarding the curriculum and development experiences.

Informal feedback from students is solicited during class meetings and small group luncheon meetings. These events are sponsored by the Dean's Office for Medical Student Academic Affairs. Component II of the Curriculum Council has also developed a Liaison Committee, which has equal representation from second year students, faculty, and administration. This group is responsible for bringing curricular (and other) issues to the group for input and resolution.

### **External Evaluation Measures**

External measures of the effectiveness of our educational program include: 1) performance of our students on USMLE exams such as Steps 1 and 2, as well as discipline-based shelf exams, 2) participation of our faculty in discipline-based professional organizations that assist faculty in curriculum development and teaching resources, 3) placement of students in the residency match, and 4) exit surveys administered by the AAMC.

All students must pass USMLE ME Step 1 before beginning third year course work. Students must also pass Step 2 in order to be eligible for graduation. Many courses and clerkships use NBME shelf exams as the final examination for their discipline. Other disciplines use IUSM faculty-generated examinations instead of USMLE shelf exams. Required clinical clerkships that use USMLE shelf exams as their final examinations include Family Medicine, Medicine, Pediatrics, Psychiatry, and Surgery.

Many faculty participate in discipline-based national organizations that identify key curricular content for medical students and assist in the development of teaching resources and skills. These efforts are an attempt to continually improve our educational program. Some disciplines, such as Pathology (Group for Research in Pathology Education), offer large, national banks of examination questions and teaching slides that are widely used in the statewide system.

As previously discussed, placing students in the residency match is another general measure of the effectiveness of our educational program. We utilize a survey to collect data from Residency Directors on the performance of our graduates after their first year of residency. In addition, we ask all incoming first year students to sign a waiver to allow us to collect the results of their Step 3 examinations, which may be used as a final measure of success.

IUSM has noted a discrepancy between external measures of performance, such as higher than average USMLE scores, and lower student satisfaction ratings as gauged by responses on the AAMC Graduation Questionnaire. This survey is important in evaluating various aspects of our educational program that may not be specifically assessed on performance-based exams including learning environment, appropriateness of the curriculum, and integration of basic medical sciences and clinical applications. The Academic Standards Committee and the Curriculum Council review this information annually, and use it as a basis for adjustments to course offerings. Further evaluation is planned through the office of our newly appointed Executive Associate Dean for Educational Affairs.