Educating the Pediatrician of the 21st Century: Defining and Implementing a Competency-Based System

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ABSTRACT. *Purpose.* **The final product of the Accreditation Council for Graduate Medical Education (ACGME) Outcomes Project is to improve health care through ensuring the competence of physicians during their training and beyond. Its success depends on a paradigm shift to a competency-based model of medical education. This article presents an overview of the model and describes the first stages of this multistep transition in a university setting. Our hope is to raise awareness of the impact on the pediatric community at large and provide a foundation on which other educators can continue to build.**

Methods. **The ACGME established 6 domains of competence as the first step in the paradigm shift. To begin work on the second step of establishing benchmarks for evaluation of competence and thresholds at which they should be achieved, the educational leadership from the primary care departments formed a work group with the support of a Health Resources and Services Administration grant.**

Results. **Review of the literature led us to embark on a stepwise process for initiating a competency-based system of medical education. We established the benchmarks by a process of individual effort followed by group consensus. These benchmarks, in the aggregate, permit an evaluator to determine whether a given competency has been achieved. The next phases of step 2 required setting thresholds for the demonstration of competence and finally establishing consensus regarding the threshold for competence at each level of training for each specific benchmark. To accomplish the latter, we surveyed the program directors of the 202 accredited pediatric training programs that are members of the Association of Pediatric Program Directors. Eighty-one members (40%) completed our survey. Although some controversy existed for thresholds during the postgraduate-year-1 level, majority consensus was reached for nearly all benchmarks at the upper levels of training. Impact of the shift to competencies for medical students and practicing physicians is also reviewed.**

Conclusion. **Having defined the benchmarks and thresholds for the 6 ACGME domains of competence, we are well positioned to move to step 3: developing the necessary tools to evaluate competence. The move to competency-based education impacts the entire pediatric community. Lessons learned from our experience may be generalized and thus be of value to the community at large.** *Pediatrics* **2004;113:252–258;** ***competency-based education, medical education, residency training, maintenance of certification.***

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ABBREVIATIONS. ACGME, Accreditation Council for Graduate Medical Education; ABMS, American Board of Medical Specialties; APPD, Association of Pediatric Program Directors; ABP, American Board of Pediatrics; PGY, postgraduate year.

The Accreditation Council for Graduate Medical Education (ACGME) has partnered with the American Board of Medical Specialties (ABMS) in responding to public concerns regarding accountability in health care and medical education through the "Outcomes Project."[1] As a result, all graduate-level training programs have been mandated to change the infrastructure of the training process to one that is competency based. Although the changes in graduate medical education have received the most focused attention, generalization to undergraduate education of medical students and to the certification process of practicing physicians is also underway. The purpose of this article is twofold: 1) to update pediatricians about competency-based education and its impact on the pediatric community at large and 2) to describe the first stages of the multistep process to implement a competency-based system of education in a university setting.

DEFINITIONS

In an attempt to define a competency-based system of education, one must first come to grips with a definition of "competency." Review of the literature shows a number of definitions that, when synthesized and simplified, describe "competency" as a complex set of behaviors built on the components of knowledge, skills, and attitudes.[2–9] In contrast "competence" refers to one's ability to perform a task. The focus on competencies differs significantly from our current structure/process system of education, in which the focus of training is on knowledge acquisition and the process is teacher centered. In a competency-based system, the focus is on outcome, which is the application of the knowledge, and the process is learner centered with input from a mentor.

The ACGME named the following 6 competencies that all graduate-level trainees must attain by the completion of formal training: patient care, medical knowledge, interpersonal and communication skills, professionalism, practice-based learning and im-

provement, and systems-based practice. The former 4 competencies are traditionally areas of focus within graduate medical education with the emphasis on professionalism being more recent. The latter 2 domains of competence are less familiar but critically important as one reflects on the environment in which medical care is practiced in the 21st century. The essence of practice-based learning and improvement is the commitment to practice improvement by 1) designing and evaluating interventions to address identified problems, 2) the use of technology in the acquisition and application of "best evidence," and 3) the commitment to life-long learning. Competence in systems-based practice requires us to demonstrate an "awareness of and responsiveness to the larger context and system of health care and to effectively call on system resources to provide care that is of optimal value."[1] It includes one's ability to partner with other professionals to navigate and advocate for patients within the context of the health care delivery system. The practitioner is challenged to balance cost with quality. Also included is a focus on system errors and one's ability to improve the system by impacting these errors.

The sequel to identifying the broad competencies was to define the elements that comprise them. The ACGME and ABMS laid the groundwork for this step but garnered the help of 24 teams, 1 for each of the 24 ABMS specialties. Each team was comprised of a representative from the specialty board, program directors association, residency review committee, and a resident, hence earning the name "specialty quad." Thus the initial draft of competencies was refined and specialty specific language and elements were incorporated (see Table 1).[10] At this juncture, the education community was challenged to continue the effort initiated by the ACGME by developing best-practice models to bring the Outcomes Project to fruition.

LAYING THE GROUNDWORK FOR CHANGE

Accepting this challenge, the program directors from the departments of pediatrics, internal medicine, and family medicine applied for and received an academic administrative unit grant from the Health Resources and Services Administration to develop a collaborative educational initiative that would move us in the direction of a competency-based system of education. The program directors, clerkship directors, and ambulatory clinic directors, as well as a medical educator, became members of the work group that brought this initiative to fruition.

In an effort to understand the logistics and process for implementation of a competency-based system of education, we performed a literature search on competency-based education dating back to the beginning of both the ERIC and MEDLINE systems.[2] Review of the literature on the development of competency-based curricula and evaluation outlines a 4-step process. The 4 steps include 1) competency identification, 2) determination of competency components and performance levels, 3) evaluation of competence, and 4) an overall assessment of the process itself. The ACGME took the first step with the initiation of the Outcomes Project in 1999 by defining the 6 competencies.[1] The remainder of this article describes how we accomplished step 2, determination of competency components and performance levels.

As we began this undertaking, the working group met to develop the framework for this project. Our first major task was to mesh discipline-specific curricula, the traditional goals and objectives, with the 6 competencies. Consensus was that we develop benchmarks for the 5 competencies that crossed disciplinary lines as well as the 2 components of the medical-knowledge competency that dealt with knowledge acquisition and application. For the third component of the medical-knowledge competency, dealing with specialty-specific content in the form of goals and objectives, faculty within each specialty developed their own curriculum. Our framework then embodies the traditional curriculum as 1 component of the medical-knowledge competency.

STEP 2: DETERMINATION OF COMPETENCY COMPONENTS AND PERFORMANCE LEVELS

Phase 1: Defining Benchmarks

Step 2 in the process of shifting to a competency-based system is to further define the elements of the competencies by determining the measurable behavioral objectives that comprise the elements of the competency. These behavioral objectives are referred to as benchmarks or performance indicators. For example, the patient care competency includes a number of elements that were defined by the ACGME in conjunction with the specialty quad. One of these elements is "gather essential and accurate information about the patient." Each element of the competencies was assigned to a program director or associate program director with the charge to develop a draft of measurable benchmarks or performance indicators for that element. (See the Appendix for an excerpt. The full grid can be found on the Association of Pediatric Program Directors [APPD] web site at www.appd.org under resources for competency evaluation, evaluation portfolio). The working group reviewed the drafts in an effort to minimize errors of omission or commission and to ensure that benchmarks were assigned to the most appropriate competency, especially in areas of overlap. Attention also was focused on the specific use of behavioral verbs to define the benchmarks as measurable tasks. This process was reiterated until there was consensus from the group. The entire first phase of the project took several months to complete. Subsequently, the clerkship directors developed a parallel document to address the same domains of competence for undergraduate trainees. The literature describing a similar process for preventive medicine was particularly helpful in guiding us through this exercise.[11–14]

Phase 2: Defining the Thresholds

The second phase of step 2 involved setting thresholds that demonstrate competence. We started by defining the types of thresholds to be used in deter-

TABLE 1. Pediatrics General Competencies and Synopsis of Competency Elements

Competencies	Elements of Competency:
Patient care Residents must be able to provide family-centered patient care that is developmentally and age appropriate, compassionate, and effective for the treatment of health problems and the promotion of health	• Gather essential and accurate information • Make informed diagnostic and therapeutic decisions • Carry out patient-management plans • Prescribe and perform competently all medical procedures • Counsel patients and families • Provide effective health maintenance and anticipatory guidance • Use information technology to optimize patient care
Medical knowledge Residents must demonstrate knowledge about established and evolving biomedical, clinical, and cognate (eg, epidemiological and social-behavioral) sciences and the application of this knowledge to patient care and the education of others	• Demonstrate an investigatory and analytic approach to clinical problem solving and knowledge acquisition • Know, apply, and teach the basic and clinically supportive sciences
Practice-based learning and improvement Residents must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices	• Analyze practice experience and perform practice-based improvement activities • Locate, appraise, and assimilate evidence from scientific studies related to one's patients' health problems • Obtain and use information about one's own population of patients and the larger population from which the patients are drawn • Apply knowledge of study designs and statistical methods to the appraisal of clinical studies • Use information technology, peer review, and self-assessment to promote life-long learning • Facilitate the learning of students and other health care professionals
Professionalism Residents must be able to demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients, their patient's families, and professional associates	• Communicate effectively to create and sustain a therapeutic relationship with patients and families • Work effectively with others as a member or leader of a health care team or other professional group
Systems-based practice Residents must demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population	• Demonstrate respect, compassion, and integrity; a responsiveness to the needs of patients and society that supercedes self-interest; accountability to patients, society, and the profession; and a commitment to excellence and on-going professional development • Demonstrate a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, informed consent, and business practices • Demonstrate sensitivity and responsiveness to a diverse patient population
Systems-based practice Residents must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value	• Know how types of medical practice and delivery systems differ from one another • Practice cost-effective health care and resource allocation that do not compromise quality of care • Advocate for quality patient care and assist patients in dealing with system complexities • Partner with health care managers and health care providers to assess, coordinate, and improve health care • Understand the reciprocal impact of personal professional practice, health care teams, and the health care organization on the community/society

mining whether competence for a given benchmark was achieved. In a focus-group session of the Program Director's Committee of the American Board of Pediatrics (ABP), 3 types of thresholds were suggested. The first involved the percentage of time that a learner accomplished a task. An example of a benchmark that would fit with this type of threshold is "interviews patients with an appreciation of their developmental level and/or age," where one may expect a competent junior resident to perform this task 25% to 50% of the time while expecting a competent senior resident to demonstrate this skill >75% of the time. The second type is based on one's ability to complete the task based on acuity/complexity of patient problems, with more junior learners demonstrating competence in a skill with routine patients

but more-senior learners needing to demonstrate competence in the skill regardless of patient acuity or complexity. An example of such a benchmark would be "performs a detailed and accurate physical examination." The third type of threshold involved dichotomous categories of behavior (eg, does or does not demonstrate a behavior). This would be the most-frequent type of threshold for the professionalism competency. Two of the authors (C.C. and R.E.) applied 1 of the 3 specific types of thresholds to each benchmark listed under each of the 6 domains of competence. These designations were brought back to the multidisciplinary group for approval. This preliminary work was presented to the Residency Review Committee for Pediatrics in October 2001 and modified further based on input from committee members.

Phase 3: Setting Thresholds for Competence

The third phase of step 2 required the establishment of consensus regarding the threshold for competence at each level of training for each specific benchmark. To accomplish this task, the document was sent to the membership of the APPD along with a cover letter explaining the content and process of the draft. Each program director was asked to assign the most-appropriate threshold for each level of training for each benchmark at the end of that postgraduate year (PGY). Responses were sought for residents at the following PGYs of training: PGY-0.5 (half-way through year 1), PGY-1, PGY-2, and PGY-3 (the end of years 1, 2, and 3, respectively). Follow-up to the initial mailing was done through several e-mail communications. All surveys were anonymous.

Survey results were analyzed by using the Statistical Package for the Social Sciences. Frequencies of responses were determined for each benchmark at each of the specified levels of training. A consensus response was considered one in which >50% of program directors agreed on the threshold for the level of training for the specific benchmark. In cases for which there was not a clear-cut consensus, the minimum threshold was chosen. For example, if 45% of program directors felt that a PGY-1 should be able to perform a task for routine patients to have achieved competence for that benchmark and 40% felt that a PGY-1 should be able to perform a task on most patients, the minimum threshold (ie, demonstrating the task for routine patients) was considered to be the consensus for that benchmark at the PGY-1 level of training.

Of the 208 programs in categorical pediatrics accredited by the ACGME, 202 are members of the APPD. Of these 202 programs, 81 completed the survey, for a response rate of 40%. Although some controversy existed for thresholds at the PGY-0.5 and PGY-1 levels, 95% and 100% agreement were reached for the PGY-2 and PGY-3 levels, respectively. Although the 40% response rate is a limitation of these data, the fact that clear consensus was achieved for 95% of benchmarks at the PGY-2 level and 100% of benchmarks at the PGY-3 level adds to the face validity of the threshold. Additionally, for all benchmarks the consensus threshold increased as level of experience of the trainee increased, thus lending discriminant validity to the instrument. Examples of the consensus thresholds for each benchmark at each level of training are shown in the Appendix.

STEP 3: EVALUATING COMPETENCE

Steps 1 and 2 of the shift to competency-based education are challenging but pale in comparison to step 3, which requires the evaluation of competence. The process for evaluating competence differs from the typical approach to evaluation that has been used in the current medical education system. Most programs use global evaluations that are generic in nature, with a single evaluation form serving as the assessment tool for a number of different clinical experiences and settings. The components of the evaluation are often a proxy for the task being evaluated. The evaluator's response is typically based on general interactions with the learner over a prescribed period of time. The evaluator may never have observed the learner performing a given task directly but rather extrapolated an assessment based on discussions with the learner regarding patient care activities. In addition, in the current system, learners are compared with each other, a process known as norm-referenced assessment. In contrast, competence is evaluated by using criterion-referenced assessment; that is, the learner must meet a predefined threshold to be considered competent.[15] Thus, if one is to evaluate competence in patient care, one must observe directly the benchmarks that comprise ability in patient care. A directly observed history and physical or an interview with a standardized patient provide 2 potential ways of assessing competence in patient care. The individual's performance of a history and physical is not measured by comparison to the other members of the team. Rather, each resident must simply meet the predefined standard for performing the history and physical examination. Implicit in judging a learner's ability to meet thresholds is the teacher's ongoing feedback to the learner as part of the educational process to guide the learner in meeting standards that have been set. A competency-based system of education emphasizes formative or ongoing feedback rather than summative feedback given at the end of the clinical experience or rotation.

The diversity of the domains of competence that have been defined by the ACGME makes the evaluation process a particular challenge. To meet this challenge, we must identify and develop a variety of tools to assess competence, the tools designed to measure competence in systems-based practice being quite different from those needed to evaluate professionalism. In fact, the relative newness of the concepts of competency in systems-based practice and practice-based learning and improvement underscore the need for the medical education community to develop new assessment tools. In addition, we are challenged to begin to study the reliability and validity of any new assessment measures. In response to this challenge we are in the process of developing a web-based evaluation portfolio to assess the di-

verse range of competencies required of graduate medical trainees.

STEP 4: EVALUATING THE OUTCOME

Step 4 of the process is the evaluation of the outcome of the shift to a competency-based system. This step requires us to determine whether the implementation of a competency-based system of education results in "better" physicians and, ultimately, improved patient outcomes. Only through improved patient outcomes can we establish the ultimate effectiveness of the ACGME Outcomes Project. This step will require the input and collaboration of national organizations such as the ACGME, ABMS, and the National Initiative for Children's Healthcare Quality, as well as others.

GENERALIZING THE COMPETENCIES TO MEDICAL STUDENTS AND PRACTITIONERS

Although the changes that are occurring in graduate education have received the greatest press, similar changes are occurring in both medical school and continuing medical education. The Association of American Medical Colleges supports a shift to competency-based education for medical students. Aligning student and resident competencies allows us to begin to address education along the continuum. The key here is pairing leadership in undergraduate and graduate education to ensure that outcome competencies from medical school match expected incoming competencies for residency training.

The practicing physician is now being called on to demonstrate competence through continuous professional development as a requirement for maintaining certification. At the level of board certification, the member boards of ABMS, of which the ABP is one, are shifting away from "recertification" for practicing physicians to "maintenance of certification." The essence of this shift parallels what is happening at the undergraduate and graduate levels of education. The practicing physician will need to demonstrate not only current knowledge but also evidence of professional standing, a commitment to life-long learning and satisfactory performance in practice. For pediatricians, there will be 4 steps to maintaining one's general pediatric certification.[16] Step 1 requires pediatricians to maintain valid medical licenses in all states in which they hold a license. Step 2 is demonstrating a commitment to life-long learning through the Knowledge Self-Assessment and Decision Skills Self-Assessment. The Knowledge Self-Assessment is an on-line activity that the ABP will make available on its web site (www.abp.org) in late 2004. This requirement also can be accomplished by completing the PREP Self-Assessment offered by the American Academy of Pediatrics. The Decision Skills Self-Assessment is offered only by the ABP and will require attaining a passing score. Step 3 will involve successfully completing a secure examination at local testing centers. Step 4 will involve 2 practice improvement activities: 1) peer/patient surveys and 2) a performance in practice activity. The peer/patient process is still in the developmental stages and will not be required for several years. Completing an ABP-approved program for quality improvement can fulfill the performance in practice activity. The American Academy of Pediatrics has designed an on-line program called eQIPP (Education in Quality Improvement for Pediatric Practice) that meets the ABP's standards for a performance in practice activity. The phase-in of the new maintenance of certification process will be complete by 2010. Diplomates with certificates that expire before 2010 will need to complete the first (medical license) and third (examination) steps of the process; diplomates with certificates issued from 2010 onward will need to complete all 4 components successfully.

LESSONS LEARNED

There were several lessons learned from the process of developing these benchmarks and thresholds. The first lesson involved the identification of key faculty for the working group. The establishment of a multidisciplinary group of faculty involving individual stakeholders in the medical education process, from undergraduate through graduate training, enriches the process, garners buy-in, and improves the outcome by virtue of the collaborative process. In particular, the input of the group as a whole significantly decreases the number of errors of omission that each faculty member commits on his/her own. The input of a medical educator is also extremely helpful, particularly in providing an understanding of the lexicon of competency-based education. The process requires a champion who is passionate about the project. This individual will be pivotal in motivating the group, particularly at the inevitable times of inertia.

The second lesson learned was that establishing the framework for relating goals and objectives to competencies is a major hurdle. Reaching this milestone allowed us to develop the infrastructure for the educational program. The 6 competencies became the foundation, and the elements of the competencies were defined further by benchmarks. The medical-knowledge competency embraces acquisition and application of knowledge as well as discipline-specific content in the form of a curriculum. The latter is framed in traditional goals and objectives. Each department would write its specific curricula, but the rewards of this collaborative effort inspired us to continue work group efforts on curricula that crossed disciplinary lines such as substance abuse, nutrition, and complementary medicine, to name a few.

The third lesson learned was the difficulty in getting responses by survey mailings. We established thresholds for the benchmarks based on only a moderate survey response from the APPD membership. The response rate likely was affected by the length of the survey and potential lack of understanding regarding how consensus on these benchmarks and thresholds would help the pediatric community take the next step in the process. Despite the moderate response rate, clear consensus on thresholds for PGY-2s and PGY-3s was encouraging. Moving forward we will need to test the hypothesis that the

expected resident performance as reported in this survey is consistent with the actual performance of our residents.

IMPACT ON THE PEDIATRIC COMMUNITY

The magnitude of these changes in education has broad implications for the pediatric community. All pediatricians who hold a time-limited certificate from the ABP will need to "maintain certification." In addition, practicing physicians and academic faculty who contribute to the education of medical students and residents will need to provide more direct observation of the learner performing authentic tasks, along with formative feedback to the learner about performance. Finally, those pediatricians who have assumed roles in educational leadership will have the added responsibility of 1) developing curricula to address the required competencies and 2) creating assessment tools to demonstrate to accrediting agencies and the general public that our graduates have met performance standards for the 6 ACGME competencies. Our hope in initiating the second step in this process was to provide the pediatric community with a foundation on which to build an evaluation system that one can use to assess competence. The major challenges in the third step will be 1) creating tools that measure competence of the trainee in performing the tasks of the practicing physician that are both cost-effective and practical and 2) testing the reliability and validity of any of the new development-assessment tools. We are currently in the process of creating a web-based evaluation portfolio that will address the benchmarks for the 6 ACGME competencies. Only when we have addressed the third step can we systematically study the pivotal question of whether this shift to a competency-based system of education makes a "difference." This final step will require a national effort combined with a national consensus on defining "difference." We speculate that various organizations and interest groups will define "difference" based on the issues critical to the organization itself. Thus, measurable differences in job satisfaction, cost of care, etc may result. We may say that we have trained "better" physicians based on higher board scores or decrease in the number of medical errors; however, the "real difference" can be measured only in the quality of care delivered to our patients.

APPENDIX: EXCERPT OF BENCHMARKS AND THRESHOLDS FOR COMPETENCE IN PATIENT CARE

Residents must be able to provide family-centered patient care that is developmentally and age appropriate, compassionate, and effective for the treatment of health problems and the promotion of health.

Element of Competency: Gather Essential and Accurate Information About the Patient

Knowledge/Skills/Attitudes Benchmarks	Rarely Demonstrates (<25% of the Time)	Sometimes Demonstrates (25–50% of the Time)	Demonstrates in Most Cases (50–75% of the Time)	Demonstrates in Majority of Cases (>75% of Time)
Demonstrates knowledge of how to access adjunctive sources of information to the history obtained from the family (eg, chart)		PGY-0.5	PGY-1	PGY-2, PGY-3
Interviews patients with an appreciation for their developmental level and/or age		PGY-0.5	PGY-1	PGY-2, PGY-3
Describes age-specific concerns in the approach to the physical examination		PGY-0.5	PGY-1	PGY-2, PGY-3
Conveys an appreciation for the value of the caretaker's observations and judgments regarding the patient's health and illness		PGY-0.5	PGY-1	PGY-2, PGY-3
Conveys an appreciation for the opportunity to be involved in the care of the patient			PGY-0.5	PGY-1, PGY-2, PGY-3

Knowledge/Skills/Attitudes Benchmarks	Unable to Demonstrate Even With Routine Patients	Demonstrates for Routine Patients	Demonstrates for Most Patients	Demonstrates for Almost Any Patient Despite Acuity or Complexity
Performs a complete history including a chief complaint, history of the present illness, past history, family history/ social history, and review of systems		PGY-0.5	PGY-1	PGY-2, PGY-3
Performs a detailed and accurate physical examination		PGY-0.5	PGY-1	PGY-2, PGY-3

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VIDEO IMMERSION IN INFANCY

"In the last five years, there has been an explosion in electronic media for infants and toddlers: 'Teletubbies,' the first television show for preverbal children; computer 'lapware' for infants to play with while sitting in a parent's lap; and hundreds of videotapes and DVDs for even the tiniest infants. . . . Many infants are now immersed in electronic media for hours every day. In fact, more than a quarter of children under 2 have a television in their room, according to a large study of young children's media habits that was issued yesterday by the Henry J. Kaiser Family Foundation."

Lewin T. A growing number of video viewers watch from crib. *New York Times*. October 29, 2003

Submitted by Student