

DOCUMENT RESUME

ED- 155 067

SE 024 389

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 TITLE Defining a Universe of Expected Competencies: A Methodological Example for Internal Medicine.
 PUB DATE Mar 78
 NOTE 16p.; Paper presented at the annual meeting of the American Educational Research Association (Toronto, Canada, March 27-31, 1978)

EDRS PRICE MF-\$0.83 HC-\$1.67 Plus Postage.
 DESCRIPTORS *Course Content; *Curriculum Development; Graduate Medical Education; Health Occupations Education; Higher Education; *Medical Education; *Medicine; *Performance Based Education; Science Education

ABSTRACT

This paper describes a method for defining the universe of competencies expected of a general internist. This was accomplished by defining the nature of the medical practice, describing the internal medicine content in terms of subspecialty divisions and general areas of competence, and defining a format for describing competencies. The format for describing competencies used involved defining six categories of knowledge, skills, and attitudes: (1) knowledge, (2) skills (technical and psychosocial), (3) synthesis, (4) management, (5) research, and (6) education. Included are a number of suggested procedures and examples highlighting how procedures can be incorporated into other curricular efforts. (BB)

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ED155067

Defining a Universe of Expected Competencies:
A Methodological Example for Internal Medicine

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AERA SESSION 19.22
MARCH 29, 1978

4:05 - 6:05 p.m.

An essential assumption in most criterion-referenced methodology discussions is that there exists a defined universe of expected competencies or objectives to which the test results can be generalized. In curriculum development the issue is expressed in terms of a written description of the program objectives. Few disciplines have these. This paper describes an effort, following the traditional instructional systems approach, to develop a curriculum document for an internal medicine residency. Included are a number of suggested procedures and examples highlighting how the procedures can be incorporated into other curricular efforts.

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Competencies: A Methodological
Example for Internal Medicine

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Much has been said of late about criterion referenced testing. (1) An essential assumption in most of these test methodology discussions is that there exists a defined universe of expected competencies or objectives to which the test results can be generalized. In the health professions there are only a few fields in which curricula are sufficiently defined to meet the testing assumption (e.g., 2,3). The assumption is even more tenuous when techniques other than cognitive tests are incorporated into the assessment brew. In assessing the clinical competence of a physician, for example, simulated patient encounters, observations of performance, reports from peers and patients, and audits of patient records as well as traditional cognitive tests, all require a defined universe to which sampled performance is to be referred.

Viewed from the perspective of curriculum development, the expected competencies of a health professional are implied by the content of the selected textbooks and journal articles, the scheduling of preceptorships and student involvement in clinical training experiences. However, curricular documents incorporating a written description of expected competencies are extremely rare. These documents would be the same ones needed for the testing assumption.

With the increased emphasis on educational accountability, particularly in the health professions, many programs are undertaking curriculum revisions which incorporate defining expected competencies. The most difficult task in these efforts is delineating the limits of the field. A typical approach involves classifying content and performance into behavioral objectives for knowledge, skills, and attitudes consistent with the Taxonomies of Educational Objectives. (4,5,6) Common textbooks in the health professions, particularly medicine, contain thousands of pages crammed with content. Picture writing at least 50 behavioral objectives in the Magarian style for each page. (7) Having completed such a task it is unlikely the objectives would be more enlightening than reading the textbook, to say nothing of the psychic energy consumed in the process.

In most health disciplines, the range of content and skills makes such a classification nearly insurmountable. After many furtive attempts beginning with the taxonomic classifications, we devised a methodology for defining the universe of competencies expected of a general internist. This paper describes that method as part of a general curriculum development approach, and provides some recommendations for its use in other disciplines.

METHODS

Setting

The Department of Medicine at Michael Reese Hospital and Medical Center and the Educational Development Unit of the School of Health Sciences formed a 6-member ad hoc committee composed of general internists, sub-specialists in various fields of Internal Medicine, and educators to review the existing curriculum of the general Internal Medicine residency. The residency has been in existence for over 50 years and involves three years of required and elective rotations in the major medical subspecialties and health care delivery areas (e.g., hospital, ambulatory care, emergency room). Approximately 30 residents are admitted each year. Traditional residency training methods are used: there are patient care rotations in each of the medical subspecialties; there are case conferences, grand rounds, chart rounds, and other formal conferences for learning patient care principles and medical content; and attending staff and fellows teach all residents, with senior residents responsible for guiding their junior counterparts. The program has a reasonably good reputation in the community of internists, having over 400 applicants for the 30 first-year spaces. However, as with all long standing residency programs, written curriculum descriptions are cursory at best and do not contain clear definitions of expected competencies for the residency.

Procedures

The committee began in February 1976 meeting weekly. Since the initial meetings the working mode has evolved into three formats.

Format a. Competencies defined as specific to medical subspecialties (i.e., hematology, cardiology, etc.) are initially defined by the respective subspecialty division staff with help from the chief medical resident and an educator. Their efforts are reviewed and modified by the committee with continuous input from subspecialists and general internists. The resulting documents are reviewed by a group of residents representative of each residency year and a group of internists in general practice. Finally, the documents are forwarded to the department for review, approval and adoption.

Format b. In the general content and performance areas (i.e., those clinical competencies that cross over specialty lines, or are non-clinical) the committee generates descriptions of competence either by drawing upon the expertise in the committee or by obtaining consultation from experts in the specific area (i.e., legal, psychiatry). The review and approval process follows the same steps as in Format a.

Format c. Much of the initial discussion concerned defining how to proceed with the overall task. Usually the committee chairman, an educator, would suggest a format or strategy for the task or encourage others to propose ideas. Inevitably, there were frustrating dead end discussions; but, as the group developed, the committee has asked the chairman to serve as recorder, returning to subsequent meetings with a draft of what has been discussed for further debate. The results of these efforts were not reviewed by others in the manner of formats a and b; but they provided the subspecialty experts and reviewers a framework for their activities. Of course, the use of the materials and definitions served as an informal review process.

The three formats have been intertwined over the year with format c emphasized during the first six to nine months and formats a and b predominant at other times. A typical meeting begins by reviewing the prior session and reporting on progress in working with the subspecialties. Along with group maintenance activities this takes about five minutes. The remainder of the meeting usually is devoted to discussing competencies in one subspecialty or one general area. It requires between four and five sessions to review, revise, and agree upon competencies for a subspecialty and between three and six sessions for the general areas.

At the outset the committee was well aware that departmental acceptance of their work depends upon educating and persuading the staff about their activities and the potential benefits. Also, the committee appreciated the sensitive nature of their efforts. They realized that asking the medical staff to participate in defining the residency objectives could be interpreted as challenging the quality of the program and specifically the teaching competence of the staff. Keeping these concerns in mind the committee has been very careful to maintain a low profile and let results persuade the staff.

RESULTS

The committee agreed upon a five-phase approach to its task, pretty much following traditional instructional systems methodology (8):

1. Describe the expected competencies of the general internist completing the Michael Reese Residency.
2. Develop and implement an evaluation methodology to assess the program and whether residents at the end of the program achieve Number 1.
3. Review the existing residency program by assessing its potential to help residents achieve Number 1.
4. Recommend and implement changes in the existing residency program.
5. Revise expected competencies, evaluation methodology, and the residency program to incorporate new approaches, concepts or contingencies in the training of general internists.

As of this writing, the committee has focused almost exclusively upon Phase 1, describing the expected competencies. However, before discussing the methodology devised for Phase 1 a brief explanation of the thinking for the other phases may be helpful.

Phase 2 - Evaluation Methodology. The Committee has accepted the concept that evaluation of the residency should focus primarily on two areas: the program impact upon resident's performance, and the quality of the teaching/learning activities. The present evaluation plan builds upon a conceptualization for assessing clinical competence reported previously. (9) The concept assumes that interactions with patients are the critical incidents to be measured in assessing the residents' performance. An evaluation design has not been selected for program evaluation. We anticipate adopting one of the popular curriculum evaluation approaches with appropriate adjustments to our needs.

Phase 3 - Review Existing Residency Programs

Department staff and chiefs of subspecialty divisions have been involved in defining expected competencies. The plan is to return sequentially to each subspecialty division with the agreed upon competencies and help the division staff review the present rotations. We anticipate most will rise to the occasion while a few will use this opportunity to expand territory or resources or add this experience to their fodder in fighting against educational change.

Phase 4 - Recommend and Implement Changes.

Consistent with the committee's philosophy of a low profile, recommendations will be forwarded to departmental committees and staff for approval before implementation. Whenever possible

pilot testing will precede some of the approval process to provide practical results for staff discussion. Implementing changes will follow the same cooperative efforts described for Phase 3.

Phase 5 - Revisions

Incorporating revisions in an established program depends on the nature of the program governance and the revisions. Clearly, we are assuming that efforts to have the department take ownership of the curriculum plan should facilitate future program revisions.

Describe Expected Competencies - Phase 1

The committee has struggled with three issues in defining expected competencies: (1) What is the nature of the medical practice anticipated of graduates? (2) How to describe the content expected to be mastered in the residency? (3) How to define and format the knowledge, skills, and attitudes expected of internists?

1. Nature of the Medical Practice

The simplest definition of the expected practice conditions of our graduates is to say "he/she will practice medicine just like the medical staff at Michael Reese." Beginning with careful introspection and critical analysis of stereotypic colleagues we concluded that the "good" general internist trained in the Michael Reese Residency would have the following practice conditions: an urban private or joint practice with a hospital-based focus, primarily employing tertiary care facilities and relying upon house staff for day-to-day inpatient care, developing a network of subspecialty consultants with which the general internist easily communicates and when used for patient referral the internist retains responsibility for coordinating the patient's care, and having the capability of managing most patient problems including many of the uncommon diseases with minimal consultation from subspecialists. The committee deliberated about the availability of specialized laboratory facilities and the internist's ability to perform some of the less common procedures. They concluded that each practice setting will place special demands on the internist's talents and to define practice emphasis more rigidly would not be helpful. Instead, the committee decided that the internists should have learned in the residency how to acquire the additional talents through continuing education.

2. Description of Internal Medicine Content

The committee explored alternative descriptions of the whole field of Internal Medicine. Of particular interest were the approaches taken by Hiss and Vaneslow (10) and the American Board of Pediatrics (11). During the committee's work, the American Board of Internal Medicine published guidelines for residency programs. (12) The committee realized that their initial instincts about the importance of subspecialty divisions also applied to describing the internists' competencies. In

addition to describing competencies in all subspecialties, we identified a number of general areas which internists must master that are not part of any subspecialty. The precise level of mastery was defined for each:

General Areas of Competence

1. Medico-legal concepts and procedures
2. Medical records and documentation
3. Governmental and public policies
4. Medical consultation
5. Health care delivery modalities and concepts
6. Office practice management
7. Preventive and community medicine
8. Public Health concepts

Rather than replicate the content from textbooks, the committee concluded that describing the depth and scope of knowledge or performance in an area could be accomplished by indicating a reference (i.e., book, monograph, pamphlet, or journal article) which typifies the expected functioning of a general internist. The reference need not cover the whole field or be the traditional reference for the subject; but it must convey the sense of the subject at the level expected for the general internist. For example, the Red Cell Manual was recommended for hematology because it addresses the topics at the appropriate level; however, the pamphlet does not describe everything expected of internists. The additional knowledge and abilities are described by objectives listed under the specialty.

3. Definitions and Format for Describing Competencies

A major obstacle to curriculum development can be constructing a format to display the curriculum that is simple to use and does not distort the philosophical foundations of a discipline. Beginning with the classical divisions of knowledge, skills, and attitudes, we evolved six categories for this curricular display:

1. Knowledge
2. Skills
 - a. Technical skills
 - b. Psychosocial skills
3. Synthesis
4. Management
5. Research
6. Education

Definitions for each are contained in Figure 1.

A second major obstacle can be stating curricular objectives in a manner which communicates the content while not burdening the authors or readers with long boring lists. The committee decided to use behavior objectives following Gron-

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lund's format. A general objective is followed by a series of specific objectives that refine the general objective or serve as examples of expected performance required to demonstrate mastery of the general objective. (13) For example, internists should be able to:

Evaluate the quality of research studies

- a. Critique the studies' statistical validity at the level of basic statistical procedures (e.g., χ^2 , t, ANOVA).
- b. Analyze the appropriateness of experimental designs including use of control groups, sampling procedures, and prospective or retrospective data collection.
- c. Deduce assumptions, either implied by the research methods or in the study conclusions.
- d. Criticize potential implications of findings and conclusions in relationship to accepted medical practice.

The third obstacle, possibly unique to disciplines with a heavy emphasis on problem solving tasks, is differentiating between activities expected to be performed under the guidance of experts or with access to reference materials and activities which should be performed without help. In medicine these limits are fuzzy, particularly between general medicine and the sub-specialty areas.

The committee decided upon two means of clarifying the limits of expertise. For management of disease, diagnosing patient problems and general patient care, the competencies are separated into three categories: (1) performed totally by an internist; (2) performed by the internist but utilizing consultative support; and (3) performed by a consultant with an internist coordinating overall patient care. For example, in Pulmonary Medicine, the general internist (not subspecialist) should be able to diagnose infectious pneumonias caused by pneumococcus, staphylococcus, common gram negative bacteria, anaerobic bacteria and viruses but are not expected to obtain a diagnosis for infectious pneumonias when it requires a specialized procedure such as bronchoscopy. Or, pulmonary infections should be routinely managed by general internists except if they occur in immunosuppressed patients or are complicated by respiratory failure. For these, the internist can rely on the initial and subsequent support of a consultant.

For medical knowledge the committee defined four categories of understanding: (1) aware that the entity exists and is associated with a particular disease condition; (2) able to define the natural history of the disease or conditions, initial treatment requirements, clinical manifestations, important lab-

oratory findings, and associated clinical condition; (3) able to describe the currently accepted pathophysiological mechanisms; and (4) able to recognize the histopathology of the disease or condition. For example, for some rheumatological diseases like Lofgren's syndrome, Whipples Disease, hemochromatosis and nodular synovitis, the internist should be aware of their existence and associated conditions. On the other hand, an internist should be able to describe the pathophysiology of gout, rheumatoid arthritis, neuropathic arthropathy, among other conditions.

DISCUSSION

As the complexities of our society increase, there is a tendency to centralize decision-making about education and health care. Witness the increased federal influence upon what was locally determined medical school admissions policies, curriculum requirements and graduation conditions. Or, watch the maneuvering for control of the Health Systems Agencies intended to coordinate the federal infusion of money and ideas into local health care establishments. The educational research community has followed the same pattern with near total dependence on federal funding of projects having the requisite attached strings and encumbrances. The curricular development effort described here markedly departs from this trend. The focus is: one hospital's residency program; the personnel are the existing hospital staff; and the cost is their time and energy plus minimal secretarial support. Outside funds and influence have been nearly non-existent. Except to comply with accrediting requirements, the methodology was initiated to meet practical needs of the institution. How can this experience contribute to other curricular efforts?

The answer lies with two activities: curricular development procedures which foster portraying as accurately as feasible the content to be mastered in the residency; and strategies implemented to help the department take ownership of the curriculum development process and its products.

Following Schwab's conception of The Practical (14), with Westbury's modifications (15), the committee was careful to make sure that the descriptions of competencies reflected "the pattern, order, method, structure" of Internal Medicine and become what Westbury calls the "syntax-in-use" of Internal Medicine. Searching for the demarcation boundaries within the field of medicine was an important curriculum development procedure we performed in this program. By applying the "syntax-in-use" of our situation, a subspecialty emphasis and references to define content limits, we also enhanced the growth of departmental ownership. For example, the department staff routinely function in a subspecialty frame-of-reference and have had little difficulty incorporating the results into their thinking. In fact, one division chief has already used the defined competencies of his discipline as the minimum acceptable entry level in screening prospective fellows.

Another contribution of this curricular effort which should have general application is the classification of categories required to define expected competencies. The terms, knowledge, skills, synthesis, management, education and research have become convenient handles for organizing our thinking about curricula generally, and particularly for residency programs. In our efforts at describing a general surgery residency, for example, we have used the categories without modification.

Finally, the difficulties in designating limits to expertise were addressed and resolved by expecting different levels of understanding or use of consultants. These levels worked well for all subspecialty areas and also the general topics.

The committee format and calling in of experts for testimony about their field is not new. One of the earliest comprehensive curriculum projects in medicine at the Abraham Lincoln School of Medicine, University of Illinois (2) used this approach. However, the efforts reported here differ in that the experts are intimately involved in the first stage of generating the content without having to submerge their parochial interests. They freely express their biases in representing their subspecialty and do not feel they serve as a representative in creating a joint multidisciplinary package. Their advice stands accepted in their discipline and only is challenged when the expected competencies may not be appropriate for a general internist's practice of medicine. We have purposely avoided discussing how the subspecialist should teach the needed abilities, in order to circumvent disagreements on the number of weeks or months of rotation required in each subspecialty. Hopefully, that issue will be discussed in Phase 3.

In thinking back on this curriculum development effort, two feelings stand out. The amount of time, psychic energy, and dedication required to reach this goal may explain why few have attempted it. And, all those who encouraged its effort or acted as nay-sayers while sitting on the sidelines, may be an important stimulus for perseverance. The second dominant feeling is frustration. Each search of the curriculum development literature for guidance found few guideposts. In the few instances where constructive ideas were apparent, the resources in manpower and money anticipated for the tasks negated our considering their adoption. Hopefully, this paper can encourage others to report their curricular struggles and contribute to defining a coherent direction in curriculum development for the health care professions.

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INTERNAL MEDICINE RESIDENCY PROGRAM

Figure 1: Definition of Concepts

The resident completing the program in Internal Medicine should be able to demonstrate: competence in the clinical evaluation and management of patients, an understanding and ability to perform research, and an interest and preparation for continued learning. Specific definitions for these attributes are defined under the headings: knowledge, skills, synthesis, management, research, and education.

I. Knowledge

Knowledge is defined as the ability to recall information and comprehend important concepts. Medical knowledge as used here refers to understanding physical and psychosocial systems and diseases. For each system, knowledge of the basic or common diseases which occur is essential. This includes an understanding of the general diagnostic approaches, the pathophysiology, the natural history of the disease and effects of intervention, and the treatment options. Knowledge in the psychosocial domain includes familiarity with basic theories of personality (normal and abnormal), social economic factors affecting human behavior, and behavioral characteristics of patients and families.

II. Skills

Skills are defined as the observable performance of acquired behavior. Medical skills have three characteristics: reliability, efficiency (in terms of both speed and appropriateness), and completeness of performance.

Two types of skills are apparent when considering medical performance: technical skills requiring physical actions and verbal interaction with the patient; and psychosocial skills, requiring verbal and non-verbal interaction.

A. Technical Skills

Technical skills are demonstrated in data acquisition and in careful application of treatments designed to affect desired outcomes for the patient. In data acquisition, the physician performs procedures traditionally classified as history taking, physical examination, and laboratory procedures. Obtaining relevant history is dependent on skill in selecting and posing questions. The reliability of the data is, in turn, affected by: how the patient presents information

available from prior or collateral sources, and, most importantly, the rapport established between patient and physician. All of these factors must be considered when measuring the physician's reliability, efficiency, and completeness in history taking. Measuring performance in physical examination and laboratory procedures is affected by similar considerations. Technical skills applied in treating patients are primarily demonstrated in the proper preparation and use of equipment and procedures involving physical contact with the patient.

B. Psychosocial Skills

Psychosocial skills include understanding the individual patient's behavior, establishing rapport and communication with patients. Effective understanding of patient behavior is demonstrated when a resident can accurately describe the patient's behavior and explain obvious underlying causes. When rapport is established with a patient, there should be a feeling of trust, openness, and comfort in the relationship, and the patient should be able to express his or her feelings easily. The critical communication skills, in addition to the technical skills involving verbal acquisition of data, are an ability to recognize non-verbal cues and maintain rapport during interactions with the patient.

III. Synthesis

Synthesis is defined as the process of combining facts (data) to form a complete and coherent understanding of what is known.

Medical synthesis is the process of collating data into a list of problems each at the highest level of refinement consistent with available knowledge. The most refined statement of a problem is a diagnosis.

Three elements are key in this process; recognition of datum or collected data which constitute diagnostic clues; juxtaposition of these diagnostic clues with known disease characteristics to identify differential diagnoses; and systemic collection of additional data to reach a definitive diagnosis.

IV. Management

Medical management is the coordination and direction of the patient's health care. Its focus is upon effectively combining knowledge, diagnostic and therapeutic techniques, medications, and health care resources to attain an optimal health state for the patient. There are six elements involved in management: 1) knowledge of the patient's physical, psychological, and environmental situation; 2) knowledge of health and pathologic states and disease entities; 3) knowledge of therapeutic techniques, including effective use of patient education to aid the patient in understanding his disease, the effects of therapy, and his role in the management process; 4) synthesizing appropriate elements of patient data into diagnoses; 5) applying and modifying therapeutic regimens to maximize the effects of therapy, and 6) appropriate use of consultants and various health care resources; (a. knowing who, when, and how to obtain consultation, b. knowing how to evaluate and use consultative recommendations).

V. Research

Research is defined as critical investigation or experimentation aimed at the discovery of knowledge, validation or revision of previous knowledge and theories, establishing the validity of previous findings, or the practical application of knowledge. Experience in this area would provide a foundation for: 1) assessing the quality of research findings, 2) appreciating the need to continually incorporate new findings into the practice of medicine, 3) appreciating the importance of participating in research, and 4) appreciating the need for ongoing research to expand medical knowledge.

VI. Education

Continuing education is the process of continued learning for acquisition and development of skills and knowledge. Continuing education helps improve and refine present skills and knowledge (technical, psychosocial and management, etc.). Continuing education also includes involvement within the teaching/learning process as an instructor. In this capacity the resident would be expected to be able to perform all of the following: didactic teaching, clinical teaching, and teaching as a therapeutic tool in treating patients (patient education).