Evaluation of Clinical Skills in Pharmaceutical Education: Past, Present and Future

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The purpose of this paper was to review past and present methods employed for the evaluation of clinical skills demonstrated on clerkships. The ideal method would: (i) assess the knowledge base from all areas of clerkship activities, (ii) assess problem-solving skills, (iii) assess communication skills, (iv) serve as a diagnostic tool for identifying deficiencies, (v) be conducted in a clinical environment, and (vi) be objective. Historically, various methodologies were utilized and these are reviewed. Currently, the principal process used for evaluation includes rating scales. These are usually combined with written and/or verbal examinations, or simulated experiences for selected course objectives. Both in the past and now, a variety of evaluation methods have been used, but none thoroughly assess cognitive learning, mastery of essential practice skills, nor measure the ability to use patient data in realistic problem-solving. A potential future method which would meet these goals is discussed.

INTRODUCTION

Colleges of pharmacy are encouraged to implement curricular changes based on the concept and philosophy of pharmaceutical care(1,2). Pharmaceutical care involves the use of a treatment plan for the purpose of achieving patient-specific outcomes that will positively affect the quality of life(3). To effect pharmaceutical care, the pharmacist must obtain crucial patient-specific information, integrate this information with pre-existing pharmacotherapy knowledge, and reach a decision on the most appropriate course of action. The experiential component of a curriculum allows students to synthesize didactic information within the realm of pharmacy practice, providing the necessary preparation for the execution of pharmaceutical care.

Because more emphasis is being placed on experiential programs, more emphasis must be placed on evaluation of student performance in practice settings. Appropriate evaluation of student performance demonstrates that necessary practice competencies are realized. It also serves as a continuous quality control measure between clinical clerkships, ensuring that each site teaches necessary student skills for performance of practice competencies. An evaluation method which can achieve both goals must be an objective, standardized and consistent approach that is also valid and reliable(4). The prototype evaluation method would:

1. assess the student’s knowledge base in all areas of activities experienced during the clerkship;
2. assess the student’s problem-solving skills under actual clinical conditions;
3. assess communication skills;
4. serve as a diagnostic tool for identifying both students’ and clerkship sites’ deficiencies;
5. be conducted in an actual clinical environment; and
6. be objective and minimize errors of assessor judgement(4).

The American Council on Pharmaceutical Education (ACPE) further recognizes that clinical evaluation should measure cognitive learning, mastery of essential practice skills, and the ability to use data in realistic problem-solving(5). Unfortunately, few existing methods provide this range of application. The purpose of this review was to examine evaluation methods of the past and present, as well as to propose a method for the future.

PAST

A thorough review of past methods employed in the evaluation of experiential education exists(6). This paper will review only those attempts to assess clinical skills. One of the first advanced efforts at evaluating clinical skills was published by Warner in 1970(7). This approach combined behavioral objectives, defined skills to be demonstrated, and utilized six instruments for evaluation. These instruments for evaluation were a test of applied drug knowledge, analysis of student written assignments, a log of student activity, direct observation, evaluation of services performed by students, and a questionnaire for self-evaluation completed by clerkship students. The purpose of the project was more to develop a clinical clerkship than to evaluate clinical skills of students. However, the study showed that students exhibited significant gains in their ability to apply pharmaceutical knowledge. Specific reliability and validity measurements were not performed.

Elenbaas and Jacoby developed a behavioral rating scale for the evaluation of pharmacy residents in the clinical setting(8). Advantages of this behaviorally based evaluation over traditional, nonbehavioral methods included increased objectivity through the limiting of evaluator bias,
Smith proposed that drug information is the foundation of clinical pharmacy and that effective communication is essential(9). She felt that integration and problem-solving were the most important skills necessary for students to develop in order to become effective communicators in a clinical environment. Therefore, a clinical clerkship was developed to instruct students to apply theoretical knowledge to practical professional problems. Students were evaluated based on their clerkship performance and case presentations, both written and oral. Clerkship performance was divided into seven categories, written presentation into four, and verbal presentation into seven. Evaluation was accomplished using a five-point rating scale (superior, above average, average or satisfactory, below average, unsatisfactory) applied to each category in the three areas: clerkship, written presentations, and verbal presentations. Again, no data on reliability or validity of the instrument were discussed.

In 1976, Elenbaas described methods used to evaluate clinical skills of pharmacy students (10). The first step to student evaluation was to develop documents defining desired competencies of graduates. Then, these competencies were used to generate specific facts, skills and concepts required by graduating students. All educational outcome statements were written in behavioral terms so as to be observable and measurable(10). Four evaluation methods were employed: two multiple-choice exams and two mechanisms used to simulate a clinical environment.

The multiple-choice exams were used to identify students possessing educational deficiencies requiring remediation. The two methods used to simulate the clinical environment were a behaviorally-based evaluation in a clinical case conference format, and a verbal examination. The behaviorally-based evaluation used cases where the student must identify the problem, design a drug regimen, delineate monitoring parameters, and express this information verbally to another, in this way simulating the true clinical arena. Because this was a behaviorally-based evaluation, criteria defining unacceptable performance were used. The verbal exam was considered the best simulator of the clinical setting and therefore was the major instrument used to assess student progress.(10) All clinical faculty orally “challenged” each student in this exam. The basis of the exam was a complex case based on an actual patient where the student must utilize multiple sources of information, integrate them, and formulate therapeutic responses. The student’s answers were compared to a key composed of weighted answers. Clinical faculty graded each student’s performance, the high and low scores were dropped, and the remainder scores were averaged to determine the final grade on the exam. Data regarding the reliability and validity of the evaluation instruments were not discussed.

Tobias, Speedie and Kerr(11) identified that observation was the primary means of evaluating the fundamental skills in problem solving, while realizing that observation may be predisposed to error because it is a subjective measurement with observer bias. A better method would closely approximate clinical practice and yet test all components of the problem-solving process. One such method tested by them was written simulations. They cited previous studies which demonstrated that written simulations were reasonably reliable and valid(12,13). The advantage of written simulations was that it allowed the student to work through a realistic yet ambiguous problem, collate information, and decide on the most appropriate solution. The disadvantages included the amount of time spent in developing the cases and the cost associated with preparation and administration(11). Scoring of the cases involved comparing the student’s choices to the optimal choices, those defined by an expert panel.

Tobias, Michocki and Edmondson(14) developed a competency-based undergraduate clinical clerkship using an evaluation instrument that incorporated task analyses for three levels of competency, i.e., essential, intermediate, maximal. Adequate student performance was assessed by the instructor for each defined task using the developed task-analysis criteria(14). The essential level of competency must be achieved by all students to pass the clerkship. The intermediate level was composed of tasks involving in-depth patient monitoring. In order to complete the tasks, the student had to monitor drug therapy for therapeutic/toxic effects using gathered subjective and objective data. The maximal level of competence incorporated tasks related to conferences, drug information, therapeutic planning, and comprehensive patient education. In general, maximal tasks could increase a student’s grade if superior performance was demonstrated. Though grading was discussed, no data regarding inter-rater reliability or content validity were discussed.

Smith and Kifer(6) took a holistic approach to evaluating student performance in a clinically-oriented externship. They developed a model to analyze course material, student activities, four learning domains (cognitive, analysis and application skills, attitude, and integration), and the integration of these four domains. The authors state that this was a model for evaluation of experiential skills, and that all instruments for measurement, especially one to measure the ability to integrate knowledge and skills necessary to perform in a real environment, must be validated. Therefore, reliability and validity data were lacking from this descriptive report.

A group from Minnesota(4) expanded on the concepts for clinical skills evaluation presented by Elenbaas(10) and developed a procedure that: (i) defined rotation competencies for PharmD students; (ii) evaluated students’ competencies; and (iii) assessed the validity and reliability of this process(4). The required competencies were given to students at the beginning of the rotation and were discussed every two weeks until the end of the rotation (eight weeks). At the end of the rotation, students were given an oral
Table I. Past methods used to evaluate clinical skills

<table>
<thead>
<tr>
<th>Authors</th>
<th>Evaluation approach</th>
<th>Evaluation instruments</th>
<th>Reliability and validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warner(7)</td>
<td>Competency-based battery</td>
<td>Used a drug application test, written assignments, activity log, self-evaluation questionnaire, evaluation of clinical services, and direct observation.</td>
<td>Not performed</td>
</tr>
<tr>
<td>Elenbaas, et al. (8)</td>
<td>Behavioral rating scale</td>
<td>Used critical characteristics defining clinical pharmacy services. Each was behaviorally described in gradations from excellent to unsatisfactory.</td>
<td>Not performed</td>
</tr>
<tr>
<td>Smith (9)</td>
<td>Assessment of problem-solving skills</td>
<td>Used clerkship performance (7 categories), written integration and presentation skills (4 categories), and verbal presentation skills (7 categories). Each category was graded using a 5-point rating scale.</td>
<td>Not performed</td>
</tr>
<tr>
<td>Elenbaas (10)</td>
<td>Competency-based battery</td>
<td>Used two multiple-choice exams and two mechanisms used to simulate the clinical environment. Each method consisted of educational outcomes defined in behavioral terms.</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Tobias, et al. (11)</td>
<td>Written simulations</td>
<td>Compared the student choices to those of an expert panel.</td>
<td>Cited previous studies for data</td>
</tr>
<tr>
<td>Tobias, et al. (14)</td>
<td>Task analysis</td>
<td>Assessed performance for each defined task using task-analysis criteria. Three levels of competency were defined: essential, intermediate and maximal.</td>
<td>Not discussed</td>
</tr>
<tr>
<td>Smith, et al. (6)</td>
<td>Integration model</td>
<td>Analyzed course material, student activities and learning domains (cognitive, application skills, attitude and integration). Stressed integration assessment.</td>
<td>Not performed</td>
</tr>
<tr>
<td>Pancorbo, et al. (4)</td>
<td>Behavioral rating scale</td>
<td>Used an oral exam. Questions, using a point value system, determined students’ drug data base, problem-solving skills and communication skills.</td>
<td>Reliability coefficient of 0.485</td>
</tr>
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</table>

*Reference citation.

examination, this examination being the basis for evaluation. The oral examination was chosen to simulate the pressures of a real clinical environment. During the oral examination, the student was given two clinical cases based on real clinical situations with questions designed to determine if the student attained the desired competencies. A point value system was used for each question, and three faculty graded the examination simultaneously. The authors felt this process provided an objective measurement of the student’s drug data base, problem-solving skills, and communication skills.

Reliability of the evaluative process was measured using the Kuder and Richardson method and further by calculating a coefficient of agreement using Ebel’s table(4). The calculated reliability coefficient was 0.485. The validity of the examination process was assessed using a questionnaire offered to students at the end of the examination. The majority of students felt that the process appropriately tested problem-solving and communication skills, but that it failed to ideally simulate a clinical situation. Table I summarizes the past methods used to evaluate clinical skills.

PRESENT

A national survey was conducted by the Professional Experience Program Special Interest Group (PEP SIG) of the American Association of Colleges of Pharmacy (AACP)(15). The purpose of this survey was to identify evaluation systems currently in place and to provide background information that may be used in the development of a system for evaluation of experiential programs at all colleges of pharmacy. Data surveyed included to what extent professional practice competencies were used as course objectives and what evaluation methods were used to assess student performance.

Fifty-four of the 74 (73 percent) schools of pharmacy participated in the survey. Approximately 68 percent of the schools used to some extent nationally recognized pharmacy practice competency statements for their experiential programs. The source of the competency statements varied, especially between schools offering different degrees, i.e., BS versus PharmD or both.

The principal process used for final evaluation of student performance by most schools included rating scales, either behaviorally-anchored or Likert-type. These were completed by the preceptor and usually combined with written and/or verbal examinations, or simulated experiences for selected course objectives. Other schools used check-off lists or narrative feedback by the preceptor. Various evaluation methods are currently used, but none thoroughly assesses cognitive learning, mastery of essential practice skills, nor the ability to use patient data in realistic problem-solving. Also, these methods may not be fully objective and may not minimize errors of assessor judgement, nor can all present methods be used as diagnostic tools.
to identify deficiencies in clerkship sites. New models of performance evaluation must be explored if these deficiencies are to be ameliorated.

FUTURE

Academic medicine has determined that competence cannot be validly assessed exclusively through the use of written examinations such as multiple-choice tests(16). Assessing physician skills is most accurately measured when set in a clinical environment similar to medical practice. That is, where the student encounters a series of patients, each presenting a unique problem that must be assessed, evaluated, and resolved(17). Performance examinations such as this allow for direct observation and assessment of the student’s ability to perform clinical skills and to communicate with or to educate patients. This can be accomplished through the use of standardized patients.

A standardized patient is an actor or real patient trained to present an illness in a standardized, undeviating manner(18). With accurate and precise training, it is not possible to differentiate a standardized patient from an actual patient(19). Because the presentation does not vary from student to student, direct comparisons between student performance can be made. Therefore, standardized patients can be used for evaluating clinical skills that cannot be validly assessed through written examinations, including communication interactions(20). Standardized patients have been employed in academic medicine for approximately 30 years(18). Fifteen years of research involving the assessment of clinical skills led to a recent recommendation by a consensus panel that standardized patient examinations be used to assess clinical skills of training physicians(20). Currently, standardized patients are used to teach or evaluate clinical skills in 70 percent of U.S. medical schools(21). When used to assess clinical skills, most schools use the “objective structured clinical examination” (OSCE) approach(18).

During an OSCE, a student rotates around a circuit of stations, where each station requires the student to perform clinical tasks, such as taking a medical history, performing a physical examination, educating a patient, etc.(22). The time per station can vary, but usually station lengths are four to 30 minutes. Also, the number of stations in an examination can vary, but studies indicate that 10 to 40 patient-management problems are necessary to acquire satisfactory inter-station reliability(23). Encounters are developed from real life experiences, similar to case studies or simulations, but have the added benefit of human interaction within a short time frame.

The use of standardized patients can impact the profession of pharmacy, particularly now in light of the national agenda to implement change in pharmaceutical education. This curricular reform ties closely to the AACP’s Center for the Advancement of Pharmaceutical Education (CAPE) which will focus primarily on assessment and competency building(24). Potential applications in pharmaceutical education for this type of assessment include evaluating clinical skills in traditional students, nontraditional students, and current practitioners wishing to assess their level of practice skills, i.e., credit for life experiences.

Advantages of the standardized patient approach to assessing clinical skills in pharmaceutical education over traditional evaluation methods are numerous. These advantages include assessing skills other than memorization; allowing students to generate original responses rather than selecting responses from a given list; permitting the student to make harmless mistakes prior to an actual patient encounter; improving interpersonal skills necessary for pharmacists who interact with patients and other healthcare professionals; and most important, allowing the student to integrate pharmacotherapeutic knowledge, problem-solving skills, and communication skills into each exercise. With this kind of examination, faculty have control over the content of an examination, and hence, can ensure that a student sees the desired range of clinical challenges.

The standardized patient in pharmaceutical education is more of a standardized participant, because he or she can be a physician, nurse, patient, or other healthcare worker with whom pharmacists interact. The standardized participant would be trained to present a station involving a clinical or professional practice competency in a reproducible way. In this way, the pharmacy student is asked to perform a clinical task involving the standardized participant, i.e., providing drug information to a nurse, optimizing pharmacotherapy through physician interaction, counseling a patient on the appropriate use of metered dose inhalers, interviewing a patient for an accurate drug history, etc.

To our knowledge, no college of pharmacy employs a comprehensive, patient-oriented evaluation process that assesses cognitive learning, mastery of essential practice skills, and the ability to use data in realistic problem-solving cases on clerkships. Through the support of a Grants Award for Pharmacy Schools (GAPS), we are attempting to develop and validate an assessment instrument, using standardized participants, which will consistently assess comprehensive student performance on clinical clerkships. Similar to an OSCE, this Pharmaceutical Care Encounters Program, or PCEP, will be designed to:

1. assess the student’s knowledge base on all areas of activities experienced during the clerkship;
2. assess the student’s problem-solving skills under actual clinical conditions;
3. assess communication skills;
4. serve as a diagnostic tool for identifying both students’ and clerkship sites’ deficiencies;
5. be conducted in an actual clinical environment; and
6. be objective and minimize errors of assessor judgement.

Our intent is to combine this program with existing methods of experiential evaluation to define “fully students” clinical skills during the experiential portion of the curriculum. Additionally, we are evaluating the capacity of this program to assess prior learning, which we see as a first step toward awarding credit for life experiences. This program may serve to evaluate better the clinical skills necessary in order for future pharmacists to realize the goals of pharmaceutical care.

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References

(2) PEW Health Professions Commission Report; May 1993, pp. 95-96.


