INSTRUCTIONAL DESIGN AND ASSESSMENT

Development of an Internet-based Management Tool for Advanced Practice Experience Distance Education Students

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Objectives. To design and develop a robust, Internet-based tool to assist in the management of distance-based advanced pharmacy practice experiences (APPE). It is intended to allow faculty members to monitor student progress and evaluate their attainment of educational outcomes such as taking effective medication histories, assessing physical and chemical status, and developing prospective pharmacotherapeutic plans.

Design. The database management tool was constructed using a Web-enabled version of *FileMaker Pro*.

Assessment. Students and faculty members conducted early assessments of the tool and affected numerous changes.

Conclusion. The *Clinical Portfolio* is a powerful tool that has allowed faculty members to successfully administer and precept clinical APPEs while remaining geographically distant from the student and the APPE site. Additional assessment is planned to formally compare the distance-based APPE with in-residence APPE experiences.

Keywords: Distance education, clerkship, rotation, portfolio, Internet, advanced pharmacy practice experience

INTRODUCTION

In 1998 the Kansas University School of Pharmacy admitted its first class of students to the distance-based Non-Traditional PharmD (NTPD) program. Shortly after the program was approved by the school, the NTPD Curriculum and Academic Affairs committee, with the support of the involved faculty members, elected to offer courses using distance education technology. The program was designed so that all communication, course activities, and examinations would be managed without necessitating student's travel to campus. This decision was made coincident with the commitment to maintain comparable academic rigor to the traditional, in-residence PharmD program. This program philosophy is consistent with guideline 12.4 (and others) of *Accreditation Standards and Guidelines for the Professional Program in Pharmacy Leading to the Doctor of Pharmacy Degree*, adopted by the Accreditation Council for Pharmacy Education (ACPE) on June 14, 1997.[1] This accreditation guideline identifies the need for nontraditional and traditional programs to have equivalent outcomes but be accessible to working pharmacists.

At the time the first NTPD class was admitted, details defining the APPE courses had not been complet-

ed. The first logical step in designing the APPE was to identify goals, objectives, and core outcomes to be used to gauge progress and student success in each clerkship. In an attempt to define an exclusively distance-based APPE program to compliment the online format of the didactic courses and achieve the desired outcomes, multiple-focus groups were held with faculty members, students, and employers. While the concept of exclusive distance-based APPEs proved to be exciting and well received, the innovative ideology made implementing them a much more daunting challenge. The natural tendency during this process was to create a blended, hybrid distance/traditional APPE model and avoid stepping too far out of our "pedagogical comfort zone."

In order to honor our original commitment and develop an exclusively distance-based APPE model, it was necessary to identify a method of effectively and efficiently monitoring students who were geographically separated from the University setting. Much energy during the design and development process was dedicated to identifying guidelines for the distance APPEs that would produce academic outcomes consistent with the standards of the school and ACPE. First, the issue of student contact time or patient quantity per distance APPE was addressed. The faculty members determined that completion of an APPE would be tied to interacting with and developing detailed prospective pharmacotherapeutic plans for a fixed number of patients. It was determined

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that students must interact with and assemble a clinical profile for an average of 16 patients per APPE (5 total APPEs) to complete the experiential portion of the Kansas program. This number could vary if another school of pharmacy elected to use this method to manage distance APPEs. The complexity with which different schools may choose to have students develop each profile could increase or decrease the number required. Some patient portfolios may require 1 patient visit with subsequent data evaluation and entry, while others may require repeated visits. In the Kansas program, students are required to complete 1 linear care advanced practice experience, in which each patient is evaluated a minimum of 3 times. Other APPEs do not specify a minimum or maximum number of interactions, but they must contain the same thorough patient histories, physical, laboratory, and other diagnostic assessments, and detailed pharmacotherapeutic care plans. Next, the issue of time to completion for each APPE was considered. A maximum, as well as a minimum, time for completion of each APPE was determined to aid in keeping students on track for degree attainment. The timeline selected for the Kansas program, which again could vary depending on the specific pharmacy school, was a range of 4 weeks to 4 months. The distance-friendly aspect of the program, allowing the APPEs to be completed without having to withdraw from the work force, continued to force the innovative aspect of the APPE design. Since appointing adjunct faculty members across the nation and around the world to precept APPE students and maintain the consistency and quality that is critical to pharmacy education was not feasible, an alternate method had to be implemented to facilitate this.

A resolution that addressed concerns of consistency and quality, while maintaining our academic standards, was to co-precept the APPEs with 2 medical professionals. The co-preceptor design included a student-proposed, University-approved onsite preceptor to work in collaboration with a University-based clinical faculty member. The onsite preceptor would shepherd the student's clinical interactions in a focused, patient-centered fashion. The University-based preceptor would provide consistency and ensure the academic rigor of each APPE, regardless of the site, and insure that students gained an appreciation of the pharmacotherapeutic content of each experience. In addition, the University-based preceptor would maintain and manipulate the organizational paperwork of each APPE to allow the onsite preceptor to maximize his or her efforts in providing clinical expertise. This co-preceptor arrangement took on more importance as the concept developed. It facilitated

a more diverse onsite preceptor group, including physicians, nurses, and other skilled clinicians who may not have experience precepting professional pharmacy students without compromising the expected outcomes of the experience. Not only did this preceptor arrangement increase the pool of potential preceptors, it was also important in the design of the monitoring tool itself, as it would be necessary to provide the architecture for student/preceptor interactions from multiple preceptors, all in an asynchronous, distance fashion.

The success of traditional style APPEs has long been recognized as an integral component of the educational process for pharmacy students.[2] It was important that this "Gold Standard" in healthcare student training not be limited to the traditional setting, and that the same type of quality patient interaction be experienced by distance-based students if comparable outcomes were to be expected. To assure this quality experience in our co-preceptor model, developing a robust tool for documenting clinical interactions and live patient encounters in a way that they could be reviewed and critiqued from many miles away was necessary. Documentation of patient interactions and the learning process that occurs would be central in monitoring student progress and achievement and would require a simple, intuitive, and reliable mechanism. The original tool developed for this purpose, the paper-based Clinical Portfolio System (CPS), has been used by many students in documenting and following patient cases.

DESIGN

Once the concept of an exclusively Internet-based clerkship, monitored by a CPS, had been realized it became apparent that, if designed correctly, the CPS could be used to monitor student activity and progress in essentially any patient care arena in the world. This would include monitoring within different healthcare specialties and settings by students and preceptors in/from a variety of disciplines. NTPD students signed confidentiality agreements and completed any HIPPA training required by each specific site to foster professional conduct. In addition, the system (paper or online) allowed each student access to only the portfolios he or she prepared. The CPS was originally based on the concept of a patient-specific pocket card used by many clinicians for monitoring patients in the APPE portion of their own education. The original clinical portfolio system (paper version) was a detailed version of this form and facilitated a thorough evaluation of the whole patient. It also allowed faculty members to measure student progress in terms of appropriate pharmacotherapy

review, assessing the need for interventions, use of medical evidence to support pharmacotherapy choices, and the number and quality of patient interactions.

It became apparent early in the APPE phase that a mechanism for effectively managing a massive amount of student-generated patient data would be necessary. Facsimile or paper mail exchanges of portfolios and faculty member comments were not an acceptable method of facilitating timely student-preceptor interactions (with multiple preceptors) and encouraging the student to excel on every patient encounter in every clerkship. A Web-based tool to streamline and speed the documentation of clinical activities, student progress, and patient outcomes while facilitating faculty-student communication was needed to replace the paper-oriented method. This more robust method would also be necessary to simultaneously manage the data entered by hundreds of APPE students, while maintaining the flexible distance-based principles on which the program was formed. At the time this manuscript was prepared, the faculty members charged with developing this method were not aware of any existing system that could efficiently enable this. Literature and Web searches did not identify methods or tools in use at other schools of pharmacy that allowed students to build detailed patient portfolios online and provided a mechanism for faculty members to interact with students from many miles away. This need led to the development of the tool now in use by the Kansas Non-Traditional PharmD program.

The Online Clinical Portfolio System (OCPS) was created to meet the need for a secure, Internet-based, distance-friendly method of monitoring APPEs and matured into a tool that presents an opportunity for a student to comprehensively evaluate the whole patient. All patient data in the OCPS is protected by a student-specific password and patient identity is protected from compromise by de-identification. Alone, the OCPS serves as a powerful clinical documentation and self-directed learning tool. One of the most critical aspects of this tool that exponentially increases the clinical learning and utility of the document is the preceptor feedback design. There are 3 opportunities for the onsite and/or University-based preceptor to evaluate student assessment of the patient and provide a focused teaching opportunity to direct student learning. When students have completed a patient portfolio, discussed it with their onsite preceptor, and are ready for faculty review, they print a signature form. The form must be signed by both the student and onsite preceptor and sent to their University-based preceptor via fax. The student then sends an e-mail indicating that the portfolio is complete and ready for review. The signature form serves

as documentation and confirmation from the onsite preceptor that the student did indeed interact with the patient described and that they have discussed the case together. The University-based faculty member typically responds within 48 weekday hours of being notified by the student. Subsequent interactions regarding the portfolio also typically occur within 48 hours of student resubmission. This method of notification necessitates that faculty members remain vigilant in monitoring e-mail communication but eliminates the confusion of monitoring multiple sites. It also places the burden of notification on the student.

The OCPS tool was constructed using a Web-enabled *FileMaker Pro* database management system and deployed on a Dell PowerEdge 2500 Web server running *IIS V*. This combination of software and hardware are entry-level tools and comparable combinations are likely available at most ACPE-accredited pharmacy schools.

The OCPS contains 4 main sections, each designed to stimulate student learning in a different area. The first section of the OCPS is the Initial Visit Interview. This section contains the basic initial information about the patient including the patient history and physical examination. The student obtains the medical history through direct patient interview and the physical examination information through direct observation or chart review. At the end of this section is the first Preceptor Comments box. The preceptor comments related to this section generally focus on the student's ability to obtain and understand the information necessary to critically evaluate the patient case. The next section allows input of most of the objective data for the patient case. This includes laboratory data, vital signs, diagnostic tests, current drug therapy, therapy previously used, and any herbal medications taken. Next, the student is asked to identify and construct a clinical problem list for the patient. The problem list is expanded into a detailed pharmacotherapy problem development section where the student identifies and lists the medications used to treat each problem, then assesses that therapy including its appropriateness, goals, supportive medical evidence, recommendations, monitoring, and necessary interventions. At the end of the patient case section is the second Preceptor Comments box. Preceptor comments in this section frequently involve assessment of the developed pharmacotherapy problem list and proper student assessment of current therapy. The final section involves the preparation of Progress Notes to document subsequent student visits with the patient. Each visit with the patient is documented with the date of the visit and a SOAP (Subjective, Objective, Assessment, Plan) note encompassing each of the problems from the developed problem list. Following this is the third and final Preceptor Comments box.

Preceptor comments in this section typically involve questions specific to each SOAP note detailing patient visit information and follow-up. Students may overlook certain subjective or objective data pertinent to the case and will be prompted for those details. Additionally, the development of the SOAP note itself is often a point of discussion. The 3 preceptor comments boxes help to foster an open dialogue between the student and the preceptors. The comments made are positive and constructive and often evolve into tangential discussion of other similar case experiences, of the preceptor or student, and/or questions or comments regarding pharmacotherapy and current clinical practice. Both the onsite and University-based preceptors have access to the portfolio comment boxes and each is encouraged to comment. The majority of written comments typically are provided by the University-based faculty members, since the onsite preceptor has already verbally discussed each patient with the students.

During the modification and refinement of the OCPS it became clear that if this was to be a universal tool, students had to be able to incrementally advance at different rates. Students and preceptor(s) needed repeated and efficient access to the portfolio document to modify, update, add, or remove information. For this to be feasible, the tool was designed to allow students to make changes to their original document in real time. In this manner, the Internet-based portfolio system has become a unique APPE documentation and monitoring tool that meets the needs of students, preceptors, and faculty members in many different practice settings.

The OCPS, while a valuable tool in monitoring student progress through APPE experiences, is not a replacement for faculty member input. Faculty resources are still required to manage the student's APPE experience in general and each individual portfolio. The University-based faculty time commitment per portfolio varies depending on the quality of a student's work. Time invested ranged from 15 minutes to 2 hours. The estimated average is 20 to 25 minutes per portfolio. Each new University-based preceptor is introduced to the portfolio system via parallel evaluation with the APPE coordinator to assure consistency among different faculty members. Students complete an asynchronous 20-minute online orientation prior to beginning their first APPE.

The clinical faculty members in the School of Pharmacy have reviewed well over 2500 completed portfolios. The majority of these reviews have been conducted by 3 faculty members heavily engaged in the distance-education program. Approximately 240 onsite preceptors from a variety of disciplines (PharmD, 36%; BS Pharm, 29%; MD, 21%; DO, 5%; RN, 4%; and ARNP, PA, ND, PhD, DVM, RD, comprising less than 4%) have participated in the program and students from across the nation (26 states) and around the world (6 countries) have developed clinical portfolios. One of the advantages of managing APPEs in this manner is that all students receive the same high-quality input from faculty members regardless of their distance from the University. Many small changes have been made to improve the tool and ease the burden of documenting pharmaceutical care activities and evaluating student progress. Most of these changes resulted from student requests and comments. This input was received both in follow-up evaluations and forums, as well as by individual contacts, often initiated by the students.

ASSESSMENT

Evaluation of the OCPS, and of student outcomes in distance APPEs in which the tool was used, was conducted on various tiers. At The University of Kansas, the evaluation of traditional APPEs historically has been somewhat subjective and is comparative between current and recent students. This makes direct comparison of distance APPEs and traditional APPEs a more difficult task. This type of comparison is confounded even more when one considers evaluating 2 populations with vastly different experience bases. The distance-based students in the Kansas program are all licensed pharmacists with clinical experience, and the traditional students are generally first-professional degree pharmacy students with limited pharmacy practice experience. This makes the comparison of performance outcomes difficult. While difficult, it is nonetheless important to implement processes for collecting data to help understand the quality and impact of the tool in the educational process.

The first tier of evaluation was a post-design, pre-implementation assessment of the CPS. It was done by a small group of alumni practitioners at clinical practice sites in the state of Kansas. Without receiving any orientation to the tool, the practitioners used the portfolios to document their pharmaceutical care on patients in their practices. This beta test identified areas that would benefit from clarification.

Students in the program completed the next tier of evaluation. This evaluation information was collected from free-text comment boxes included on the preceptor assessment form. Student comments addressing the CPS are generally very positive. This ongoing evaluation, on occasion, results in suggestions or requests that lead to minor modifications of the CPS.

The final tier of evaluation was provided by University-based faculty members who routinely used

the CPS to monitor students. This small group of faculty members rated the system highly and unanimously felt that it helped them manage student progress through individual APPEs. Thus, assessment included 3 different groups: practitioners, students, and faculty members. All of these groups helped shape the tool that is used today.

Another evaluation issue was how the assessment process compared in distance vs. traditional APPEs. Assessment of achievement of educational outcomes in the experiential phase of the program at Kansas is much more an indication of surpassing a threshold of competency instead of a measurement of degrees of expertise. For this reason we assign a passing grade to those students who are able to adequately collect patient histories, conduct or interpret physical examinations, assess the results of laboratory and other diagnostic evaluations, and develop advanced pharmacotherapeutic treatment plans. Students who do not reach this threshold are assigned failing grades. Realistically a comparison of this type provides limited documentation on the usefulness of the tool itself in the process. Differences detected may be the result of differences in the student populations in each group. When we examined student evaluations of both the APPE site and preceptors for information about the OCPS, the results were extremely positive. These evaluations were textual in nature, and not collected on a Likert scale, so statistical analysis of evaluations were not possible. While a numeric value for comparison was not sought in the evaluations, students and faculty member comments were generally complimentary and negative comments about the OCPS were rare. While we can only draw a cursory level of confidence from these types of evaluations, distance-education students as a group have been uninhibited about expressing their opinions throughout the entire program and there is no reason to believe that their comments on APPE evaluations would be any less candid.

Enhancements to the current system that have been considered include migration to an even more robust database, with a more efficient, sectional-style organization. An updated form may include tabs to different sections of the tool to eliminate the need for scrolling through the entire Web page. In addition graphical output is desirable, especially in the laboratory assessment area.

One of the most informative and instructive ways to evaluate the potential usefulness of the tool may be to have other educators view it as it is currently used. (Readers who would like to view the OCPS are invited to either review a completed sample document available on the school website at http://ntpd.pharm.ku.edu/nontrad/rotations/sampleport.htm, or contact the office of the Non-

Traditional PharmD program to have temporary access to the operational database established. This will allow individuals interested in the concept of distance APPEs to determine whether they feel it would be of use in managing students and providing the architecture to help achieve educational outcomes.)

SUMMARY

There are numerous advantages of developing distance-based APPEs. These advantages include the development of a robust tool for administering APPEs in a diverse environment, the opportunity for students to propose and submit for approval by the University office, APPE sites in many different settings and environments, and the opportunity for students to learn from different types of clinicians. Distance-based APPEs centered on the OCPS allow students to probe and expand their professional interests by exploring different aspects and settings of pharmacy. It opens up many specialty areas that would be inaccessible if students were limited to APPE sites that were already included in the cadre of traditional APPE sites.

Specifically, the Internet-based portfolio system requires students to address all pharmacotherapy and disease state aspects of an individual patient's care while encouraging the use of medical evidence to guide therapy decisions. In addition, it allows students to complete APPE activities anytime, day or night, 7 days a week, at their own pace. Many of the advantages of the OCPS that students appreciate, faculty members also enjoy, such as the asynchronous "24-7" style. This feature allows faculty members to provide instruction to students on a part-time basis from any location with a high-speed Internet connection.

The distance-based APPE tool has in many regards exceeded our initial expectations. It has provided an excellent method for insuring that students document the knowledge and experience necessary for providing advanced patient care, and it does so without geographic limitations. As a benefit, it has prompted examination of the APPEs that traditional students complete and the exploration of ways to better meet the needs of all students and the profession.

REFERENCES

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