

Pharmacy Students' Attitudes Toward Therapeutics and Clinical Pharmacokinetics Lectures via Interactive Videoconferencing

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ABSTRACT. The purpose of this manuscript is to: (1) compare students' attitudes toward interactive videoconferencing in two courses (therapeutics and clinical pharmacokinetics) and (2) determine whether duration of time or the type of course significantly affected students' attitudes toward interactive videoconferencing lectures. In fall 1995, a 6-item pretested survey was administered to 40 (100% of the class) third-year professional Pharm.D. students in the Advanced Therapeutics course and the Clinical Pharmacokinetics course at the University of Georgia College of Pharmacy. The survey was given to the students two weeks after each course began (one-fifth of the way through the

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course) and six weeks later to reassess students' attitudes toward interactive videoconferencing lectures in these two courses. The students were asked to respond to each of the six items by using a five-point Likert response scale. Descriptive analysis for items on the survey was performed. Two-way analysis of variance using the general linear model procedure was used to determine whether the course type, duration of time, or interaction term of the two factors (course and time) significantly affected students' attitudes toward interactive videoconferencing lectures. Results indicated that: (1) duration of time (six weeks) between the first and second survey administration had a significant effect on students' attitudes toward the quality of the audio system and students' preference for "live" lectures rather than interactive videoconferencing lectures ($p < 0.01$) and (2) the course (favoring therapeutics) was a significant factor in regard to students' attitudes toward enjoying lectures via interactive videoconferencing, students wanting to have more lectures via interactive videoconferencing, students preferring "live" lectures rather than interactive videoconferencing lectures, and the students' perception of the effectiveness of the interactive videoconferencing lectures ($p < 0.01$). Useful "teaching pearls" for pharmacy educators using interactive videoconferencing are discussed. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: <getinfo@haworthpressinc.com> Website: <<http://www.haworthpressinc.com>>]

KEYWORDS. Videoconferencing, distance learning, interactive learning

INTRODUCTION

To get the most experienced and knowledgeable instructors to teach pharmacy students didactic clinical topics, schools of pharmacy often rely on off-campus instructors. Traditional approaches to off-campus faculty lecturing to on-campus students have involved the lecturer traveling to the students. Depending upon the travel distance, the number of lectures, and the other responsibilities of the instructor (e.g., clinical and administrative duties at the practice site), this method has often lead to inconvenience, enormous cost and time for travel (e.g., transportation, room and board), and a reduction of time allowed for the lecturer's other activities. To bridge the gap between instructor and students, to reduce travel, and to continue to provide the most qualified instructors to students, many pharmacy schools are using alternative methods of instructional delivery (1).

Distance learning is defined as learning that takes place when teacher and students are separated by distance. Distance learning commonly involves an electronic medium as the method of communication, such as computer technology, videotapes, and teleconferencing (2-3). One common distance learning method used in pharmacy education today is interactive videoconferencing (1, 3-5). Interactive videoconferencing, unlike televised presentations, permits students and instructors to see, hear, and discuss material that is currently being presented.

At the University of Georgia College of Pharmacy, the Clinical Pharmacokinetics course and the Advanced Therapeutics course are taught in the third professional year of the curriculum and are capstone courses (6). The Clinical Pharmacokinetics course uses mathematical equations and patient-specific data to estimate the proper amount of medication to give a particular patient to achieve desired clinical outcomes and prevent toxicity, and the Advanced Therapeutics course involves teaching students about disease states and how to medically manage these disease states. Due to the fundamental differences in the two courses (one relying heavily on the use of mathematical equations and the other relying heavily on teaching principles of disease state management without using mathematical computations) and the fact that many instructors involved in the teaching of these two courses are off-campus at the Medical College of Georgia, it was important to the College of Pharmacy to assess students' attitudes toward interactive videoconferencing in these two courses.

Approximately 50% of the instructors for both courses are off-campus, located 100 miles away from the College of Pharmacy at the Medical College of Georgia (distant site). The other 50% of the instructors for the courses are located at the College of Pharmacy (local site). Both sites have technical support personnel to operate the videoconferencing system, thus operating the interactive videoconferencing equipment is not the responsibility of the instructor. The interactive videoconferencing equipment used by the University of Georgia College of Pharmacy (local site) and the Medical College of Georgia (distant site) is the CLI Radiance System Model and consists of four 37-inch viewing monitors in each classroom (one classroom was used at each site).

A literature search was conducted to investigate students' perception of lectures taught via interactive videoconferencing in the delivery of lectures related to didactic pharmacy courses or postgraduate

pharmacy continuing education. The review yielded few reports describing the value of distance learning in pharmacy education (1, 3-5). The search revealed that pharmacists taking postgraduate pharmacy continuing education programs were pleased with their education via distance learning, whereas pharmacy students were not (1, 4). Whiteman et al. found that pharmacists ($n = 436$) responded favorably to distance learning as a method of delivering continuing education and described convenience and cost minimization as reasons contributing to the success of distance learning (4). No studies were found describing clinical pharmacokinetics lectures via interactive videoconferencing, and only one study was found concerning therapeutics lectures via interactive videoconferencing. This study was conducted by Talbert and colleagues and describes the effects of "live" lecture versus interactive televised presentations on pharmacy students' achievement as measured by written examination in a therapeutics course (1). Results of the study indicated that although students' ($n = 49$) examination performance was not adversely affected by this method of instruction, they preferred "live" lectures to interactive televised lectures. With exposure to interactive videoconferencing lectures, students may become more accepting of this method of instructional delivery.

To allow pharmacy instructors to improve their teaching via interactive videoconferencing, it is imperative to assess pharmacy students' attitudes toward lectures delivered by this method. Therefore, the purpose of this study was to evaluate pharmacy students' attitudes toward interactive videoconferencing in two courses taught at the University of Georgia College of Pharmacy (Advanced Therapeutics and Clinical Pharmacokinetics). Specific objectives of the study included: (1) determining whether the duration of the time of lectures delivered via this method significantly affected students' attitudes toward lectures by interactive videoconferencing and (2) determining whether the type of course (Advanced Therapeutics or Clinical Pharmacokinetics) significantly affected students' attitudes toward lectures by interactive videoconferencing.

METHODS

The literature review yielded no survey instruments measuring pharmacy students' attitudes toward interactive videoconferencing. Therefore, survey items from a study that measured pharmacists' atti-

tudes concerning interactive videoconferencing were modified and used to assess pharmacy students' attitudes in this study (4). All six items were pretested on 20 pharmacy students to assess item clarity. Based on students' suggestions, two modifications were made: (1) the five-point Likert scale (1 = "strongly disagree," 2 = "disagree," 3 = "neutral," 4 = "agree," 5 = "strongly agree") was enlarged from a 10-point font size to a 14-point font size to increase scale visibility and (2) each item on the survey was numbered. The survey items assessed students' attitudes toward the quality of the interactive videoconferencing audio system, whether the method of instructional delivery (interactive videoconferencing) was enjoyable, whether interactive videoconferencing lectures were effective, and whether students would like to have more lectures using this method of instructional delivery. Two survey items compared live lectures to lectures via interactive videoconferencing (Table 1, Items 4 and 5).

In fall 1995, the survey was administered to 40 (100% of the class) Pharm.D. students (third professional year) who were enrolled in the Advanced Therapeutics course and the Clinical Pharmacokinetics course at the University of Georgia College of Pharmacy. Advanced Therapeutics and Clinical Pharmacokinetics were the only courses taught to this group of students using interactive videoconferencing, and approximately 50% of the Advanced Therapeutics Course and the Clinical Pharmacokinetics Course was taught via this method. The other 50% of the courses was taught via "live" lecture, where the instructor is physically in the same classroom as the students. The survey was given to the Pharm.D. students ($n = 40$) two weeks after each course began (one-fifth of the way through the course) and two weeks prior to the end of each course. Student participation in the study was voluntary, and the investigators were blinded as to the identity of the survey respondents.

Data obtained from the surveys were entered in Excel[®] and later downloaded to SAS[®] for statistical analysis. Descriptive statistics for each item on the survey were calculated. Two-way analysis of variance was used to determine whether the course (Advanced Therapeutics or Clinical Pharmacokinetics) or duration of time over a six-week time period affected students' attitudes toward interactive videoconferencing lectures. An alpha level of 0.05 was selected for the analysis.

RESULTS

A total of 39 Pharm.D. students (97.5% response rate) completed and returned the first administration of the survey in the Advanced Therapeutics and the Clinical Pharmacokinetics courses. For the second administration, 38 Pharm.D. students (95% response rate) returned the Advanced Therapeutics survey and 39 Pharm.D. students (97.5% response rate) returned the Clinical Pharmacokinetics survey. The means and standard deviations for the six items are listed in Table 1. Students had more positive attitudes toward interactive videoconferencing lectures on the second administration of the survey than the first administration of the survey for survey items that assessed students' attitudes toward the quality of the audio system and whether they preferred "live" lectures rather than interactive videoconferencing lectures ($p < 0.01$). The course (favoring Advanced Therapeutics) was a significant factor in students' attitudes toward enjoying lecture via interactive videoconferencing, students wanting to have more lectures via interactive videoconferencing, students preferring "live"

TABLE 1. Item, Item Means, and Standard Deviations for Administrations 1 and 2 of the Advanced Therapeutics Course and the Clinical Pharmacokinetics Course.

	Advanced Therapeutics		Clinical Pharmacokinetics	
	Administration 1	Administration 2	Administration 1	Administration 2
1. The quality of the audio system via distance learning (interactive videoconferencing) was good.	3.28 □ 0.79	3.66 □ 0.63	3.18 □ 1.00	3.56 □ 0.75
2. This method of instructional delivery (interactive videoconferencing) was enjoyable.	2.67 □ 1.13	2.87 □ 0.88	2.23 □ 0.74	2.51 □ 0.64
3. I would like to have more lectures using this method of instructional delivery (interactive videoconferencing).	1.92 □ 0.96	1.84 □ 0.72	1.44 □ 0.56	1.67 □ 0.62
4. I would rather receive my lectures "live" rather than by interactive videoconferencing.	4.23 □ 0.78	3.45 □ 0.83	4.64 □ 0.78	4.14 □ 0.75
5. In my opinion, lectures via interactive videoconferencing are just as good as "live" lectures.	1.77 □ 0.84	1.65 □ 0.60	1.74 □ 0.79	1.79 □ 0.59
6. Overall, the interactive videoconferencing lectures were effective.	3.28 □ 0.72	3.32 □ 0.57	2.62 □ 0.96	2.64 □ 0.63

Scale: 1 = "strongly disagree"; 2 = "disagree"; 3 = "neutral"; 4 = "agree"; 5 = "strongly agree"

lectures rather than interactive videoconferencing lectures, and students' perception of the effectiveness of the interactive videoconferencing lectures ($p < 0.01$) (Table 2).

DISCUSSION

With the large number of off-campus experiential training sites, it is becoming increasingly challenging to provide quality education to students who are geographically separated from their instructors (1). The use of distance learning techniques in teaching has become a necessity in pharmacy education. From the results obtained in this study (Table 1), it can be reasoned that pharmacy students are more accustomed to the traditional lecture format and may be opposed to alternative methods of instructional delivery such as interactive videoconferencing.

To determine the effect of time (or what transpired during the time period) on students' attitudes concerning interactive videoconferencing, students in both courses were surveyed twice. By the first survey administration, students had received approximately 6 hours of lecture by interactive videoconferencing in each course, and by the second administration of the survey, students had received 12 additional hours in each of the 2 courses. Each instructor taught in the course for less than two weeks at a time and only one of the instructors who taught in the first two weeks of one of the courses taught in the last two weeks

TABLE 2. *P*-Values from the Analysis of Variance.

	Course	Time	Course	Time
1. The quality of the audio system via distance learning (interactive videoconferencing) was good.	0.7347	0.0021	0.7347	
2. This method of instructional delivery (interactive videoconferencing) was enjoyable.	0.0051	0.0847	0.7737	
3. I would like to have more lectures using this method of instructional delivery (interactive videoconferencing).	0.0053	0.5230	0.1848	
4. I would rather receive my lectures "live" rather than by interactive videoconferencing.	0.0001	0.0001	0.0001	
5. In my opinion, lectures via interactive videoconferencing are just as good as "live" lectures.	0.2695	0.1894	0.1894	
6. Overall, the interactive videoconferencing lectures were effective.	0.0001	0.8027	0.9728	

of the course. This situation suggests that it was the effects of time that influenced students' responses on the survey and not that students had become more familiar with or accustomed to individual course instructors (Table 2).

Generally speaking, the course (favoring Advanced Therapeutics) was a significant factor in students' responses to many survey items (Table 2). Based on information gained from conversations with individual students, the investigators speculate that students felt more comfortable with interactive videoconferencing lectures in the Advanced Therapeutics course than in the Clinical Pharmacokinetics course because they could logically follow the lecture better. Difficulty such as not being able to see the entire equation on the screen at one time often occurred in the Clinical Pharmacokinetics lectures when students and instructors had to solve problems using equations over the "television." From the direct information gathered by the survey items and the indirect information obtained from conversations with approximately 30 of the students after the study, lectures in the Advanced Therapeutics course appear to be more suitable for interactive videoconferencing than lectures in the Clinical Pharmacokinetics course.

During our experience with interactive videoconferencing, we collected many "teaching pearls" for teaching via this method. For example, since many students are camera shy, instructors may want to encourage students to ask questions during lecture by stopping every 15 minutes and asking for questions instead of putting the responsibility of getting the instructor's attention on the students. Stopping to ask questions approximately every 15 minutes, as opposed to asking questions every 5, 10, or 20 minutes, was determined by the instructors to be adequate because it generally allowed the instructor enough time to explain a concept and then answer questions at a natural breaking point soon after the concept was explained. The few instructors who asked questions every 10 minutes eventually changed to asking questions approximately every 15 minutes because they found it difficult to complete the lecture material as planned. Similarly, the few instructors who asked questions every 20 or 30 minutes eventually started asking questions every 15 minutes because students complained about not having the opportunity to ask questions about a concept before the instructor started lecturing on another concept. By trial and error, instructors determined that stopping to ask questions approximately

every 15 minutes appeared to work best (see Appendix for additional “teaching pearls”).

Another “teaching pearl” had to do with reducing the feedback noise during interactive videoconferencing lectures. It was determined that the feedback noise experienced during lectures was a direct result of noises made by the students (e.g., students talking to other students while the instructor was talking, students passing papers). To reduce feedback noise from the system and to enhance individuals’ ability to hear during interactive videoconferencing lectures, a plan to reduce the noise was implemented. The plan consisted of putting the distant site on mute when they were not interacting or talking with the instructor. We also found that the best way to interact between the distance and local sites was for the students to raise their hands to get the attention of the instructor and the technical personnel, and then after the instructor indicated to the student that it was time for him or her to speak, the technical personnel turned the mute off and the student then begin to speak. When the student was finished speaking, the technical personnel turned the mute back on. This technique eliminated greater than 90% of the feedback noise experienced.

It is a natural occurrence and an expected occurrence for people to become more efficient in performing a task, given time. Instructors in the two courses learned many “teaching pearls” during the six weeks between the first and the second administration of the survey that may have helped them to become more efficient with their distance learning teaching techniques and thereby helping to influence more positive student attitudes toward interactive videoconferencing lectures. Although the investigators of the study believed that it would have been difficult to measure the separate influences of instructors adapting to teaching via interactive videoconferencing from students adapting to receiving their lectures via this method, the investigators felt that the time factor should reflect everything that transpired during the six-week period, including instructors becoming more effective using interactive videoconferencing and students adjusting to this mode of instructional delivery. Therefore, when analyzing the results, be aware that the time factor represents more than one single event that occurred over the six-week time period.

Since the study had to be built around the courses, there was not much flexibility in the study design in terms of changing instructors and the time that the instructors taught in the courses. Because of this,

the investigators of the study found themselves performing two important post-hoc analyses to address study limitations. For example, after administering both surveys, the investigators realized that the various lecture topics taught in the courses may represent different levels of difficulty in the time between the administration of the two surveys. Therefore, to explore the influence of the difficulty of the lecture material on the results of the survey, students were asked to indicate whether they thought that the most difficult material was taught in the beginning of the course or at the end of the course or that the difficulty of the lectures was consistent throughout the course. Approximately 98% of the class responded ($n = 39$), and more than 80% of the students perceived that the difficulty of the lecture material was consistent throughout the two courses, suggesting the limited effects of varying difficulty of the lectures on the students' responses to the surveys. A second limitation to the study design was that there was no consideration of instructor variability on the survey. Although instructor variability was not a major consideration in the study design a priori because the investigators could not change the instructors in the course or the order in which they taught, students were asked on a voluntary basis to complete a teaching evaluation for each of the instructors in the courses (teaching evaluation used was the standardized form to evaluate teaching at the College of Pharmacy). We examined all instructors' teaching evaluations in the therapeutics and pharmacokinetics courses to detect differences. This post-hoc analysis revealed that students had positive attitudes concerning all the instructors' teaching abilities and no differences were found between students' evaluations of the instructors, suggesting that students' assessments of the instructors' teaching performances were similar (Table 3).

CONCLUSION

Although the results of this study are limited to the study population and institution, based on the data obtained, students preferred a teacher who is physically located in the same classroom. Despite this finding, the use of interactive videoconferencing is expected to increase due to increasing demands on resources and the need to use the most qualified lecturers, regardless of geographic location. The concept of the lecturer always being in the same classroom as the students is a barrier that needs to be overcome. Improving interactive videoconferencing

TABLE 3. Mean Scores and Standard Deviations on Each Instructor's Teaching Evaluations in the Clinical Pharmacokinetics Course and the Advanced Therapeutics Course.

Instructors	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Course	N
Instructor 1	4.42□ 0.49	4.22□ 0.63	4.48□ 0.66	4.20□ 0.68	4.73□ 0.54	4.35□ 0.96	CP	27
Instructor 2	4.40□ 0.38	4.30□ 0.55	4.46□ 0.71	4.22□ 0.78	4.72□ 0.42	4.30□ 1.02	CP	27
Instructor 3	4.47□ 0.61	4.33□ 0.68	4.51□ 0.53	4.18□ 0.41	4.78□ 0.63	4.25□ 0.90	CP	27
Instructor 4	4.41□ 0.62	4.20□ 0.81	4.44□ 0.61	4.08□ 0.39	4.62□ 0.52	4.32□ 0.81	AT	32
Instructor 5	4.51□ 0.44	4.35□ 0.77	4.54□ 0.81	4.25□ 0.50	4.33□ 0.44	4.55□ 0.67	AT	32
Instructor 6	4.37□ 0.73	4.22□ 0.81	4.35□ 0.68	4.25□ 0.61	4.68□ 0.49	4.58□ 0.55	AT	32
Instructor 7	4.55□ 0.66	4.42□ 0.91	4.55□ 0.71	4.33□ 0.62	4.51□ 0.92	4.28□ 0.38	AT	29
Instructor 8	4.48□ 0.44	4.32□ 0.55	4.44□ 0.63	4.21□ 0.59	4.52□ 0.55	4.36□ 0.89	AT	29
Instructor 9	4.55□ 0.52	4.41□ 0.66	4.52□ 0.72	4.18□ 0.66	4.66□ 0.63	4.39□ 0.69	AT	29

Item 1. The instructor was well organized and prepared for class.

Item 2. The instructor presented course material in an understandable manner.

Item 3. I learned a lot from this class.

Item 4. The instructor motivated me to do my best.

Item 5. The instructor treated students with respect.

Item 6. Grades were assigned fairly and impartially.

Scoring for items: 1 = "almost never"; 2 = "seldom"; 3 = "sometimes"; 4 = "often"; 5 = "almost always"

Course: CP = Clinical Pharmacokinetics; AT = Advanced Therapeutics

N = number of students who completed the teaching evaluation

teaching techniques should help both the instructor and the student to overcome this barrier.

Results of this study suggest that certain courses, such as Advanced Therapeutics, may be more suitable for using interactive videoconferencing as a mode of instructional delivery than courses such as Clinical Pharmacokinetics. The study indicates that within the six-week time period pharmacy students can develop a more favorable attitude toward this mode of instructional delivery.

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APPENDIX

Interactive Videoconferencing "Teaching Pearls"

- Stop the presentation approximately every 15 minutes to ask the students if they have questions.
- Improved readability of the presenter's visuals can be accomplished by:
 - Use of sans serif font (e.g., Universal or Arial) and avoidance of a font such as Times Roman
 - Use of a font size of at least 25 points.

10 points

15 points

20 points

25 points

- Use a mixture of instructional methods, e.g., combine writing on the overhead with pages from graphical software (e.g., Freelance[®] or Power Point[®]) or word processing software (e.g., Word Perfect[®] or Word[®]) during a presentation. This technique is believed to maintain students' interest in the presentation.
 - If available, use technical support personnel; this greatly reduces the technical burden on the instructor.
 - Always provide the distant class with a hard copy of the material covered during the session (e.g., handouts) so they can refer to your material during and after the lecture.
 - Assign a student representative at the distant site to provide feedback to the instructor concerning the lecture.
 - When writing on an overhead, use a wide tip felt marker to improve visibility.
-