The purpose of this study was to determine the effect of tele-video conferencing (TVC) on the academic performance of graduate students in anesthesiology nursing. The study compared local-site students who viewed lectures in person to their distant-site counterparts who viewed lectures via TVC. There were no statistically significant differences in the admission qualifications data between the groups of students studied.

The results of the Self-Evaluation Examination (SEE), administered by the Council on Certification of Nurse Anesthetists, were compared at the completion of the first year of the curriculum. No statistically significant differences were found between groups in the mean SEE scores of the students. These findings support the contention that instruction through TVC can be as effective as lectures conducted using the “in person” format.

Key words: Distance learning, real-time televideo conferencing, technology in education, 2-way video conferencing.

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Televideo conferencing: Is it as effective as “in person” lectures for nurse anesthesia education?

Introduction
The anesthesia community is currently being faced with an increasing number of patients presenting to the operating suites. More surgeries yield the need for additional providers. According to the Council on Accreditation of Nurse Anesthesiology Educational Programs (COA), as of December 2004, there were 94 recognized nurse anesthesia programs in the United States.1 With the increasing number of recognized programs and increasing numbers of practitioners needed, the number of nurse anesthesia students will likely follow. Anecdotally, a greater number of students, along with the changing guidelines for specialty cases required for graduation, have programs searching for multiple clinical sites. In the past, programs would be limited to their local areas in the search for appropriate clinical sites; however, with the current advancements in technology, this is no longer the case. Didactic learning can be projected across states or even continents with the tools currently available to educators.2 The new technologies in education range from online asynchronous self-learning classes to real-time televideo conferencing (TVC) that produces live 2-way communication between the local and distant sites.

The medical community is not the only participant in this trend of technological education. Mesa Community College (Mesa, Ariz) produced a study of its online Introductory Biology course, stating the number of students enrolled in its distance education courses quadrupled in only 2 years, growing from 424 to 1,745.3 Distance education models also are being used in such fields as accounting, master of business administration, and construction throughout the world's schools.3-6 As with any changes in educational modality, these technological advances must be studied to demonstrate their validity. Multiple studies have appeared in the literature debating the statistical significance of differences in local vs off-site students in the use of distance technology.

Yet there are few studies on the comparison of students using televideo conferencing as the mode of education. Most comparisons are of online web-based courses or non-2-way communication and many include qualitative data. Schulman and Sims,7 at Nova Southeastern University, Fort Lauderdale, Fla, evaluated 49 undergraduate students in online classes and 59 students in the traditional setting via pretesting and posttesting in various courses. They found that there were no significant differences in the
posttest scores for the online and in-class students. Efendioglu and Murray used a Tutored Video Instruction (TVI) model in their study. In this model the live lectures are videotaped and sent to a remote location where students watch them. Afterward a tutor, who gives feedback to the instructor at the home site, meditates a discussion session. This study yielded that TVI students received slightly lower grades and failed to perform as well as the on-campus student. The results of these studies are as varied as their educational methodologies.

The study reported here was conducted at a university-based nurse anesthesia program that employed the use of real-time TVC in its didactic learning. The TVC unit consists of cameras, projected video, and microphones throughout the classroom that are able to pick up conversation in the class, as well as microphones at the podium for the speaker. Transmission was conducted over the Internet, thus eliminating the need for long distance telephone connections. The same equipment was in the classroom at a distant clinical site 350 miles away. The 2 sites are able to visualize and communicate with each other in real time with this equipment. A presentation can be made by either group with the use of visuals aids, such as PowerPoint presentations or videotape. Also, a third connection could be used from time to time to allow students on other specialty rotations or guest lecturers to participate. This form of communication and lecturing has allowed this nurse anesthesia program to grow from an initial 15 students in the inaugural class to more than 100 students since the program's conception. These students have been assigned to more than 7 clinical sites. Though the increase in the number of students is noteworthy, it does not, by itself, signify the success of TVC in the delivery of education.

It is vitally important that methodologies of teaching produce not only the number of providers needed but also the quality of professionals expected. The purpose of this study was to quantitatively compare distant-site vs onsite students to determine any statistical differences in their academic achievements when using real-time TVC to deliver didactic requirements.

**Methods**

A group of 36 nurse anesthesia students were selected as a convenience sample of students from the same class. Of this sample, 26 students received all their didactic instruction “in person” and 10 received 2 of their 3 completed semesters of didactic instruction via TVC. It was determined that the Self-Evaluation Examination (SEE) would be used as a tool to evaluate academic achievement. The SEE is an examination, constructed by the Council on Certification of Nurse Anesthetists, that nurse anesthesia students across the nation may take in their first and/or second year of study. This test was chosen because it has a demonstrated validity and its content is based on COA curriculum standards, thereby minimizing the potential confounding variable of differing clinical experiences between sites. One group was comprised of 26 local site students that attended classes on the university campus. The 10-student distant-site group attended classes via TVC at their clinical site 350 miles away from the campus. In both groups there were a total of 10 males and 26 females. Multiple cultural backgrounds also were represented. The students in both groups were evaluated for statistical differences in program admission qualifications by considering 3 variables.

A t test was used to compare these values to determine the presence or absence of differences. The variables studied were undergraduate grade point average (GPA), the combined verbal and quantitative scores on the Graduate Record Examination (GRE), and each student’s years of nursing experience prior to admission. These 3 variables are in common used to determine entrance qualifications by nurse anesthesia programs. None of the students in the year group chosen were excluded. All students attended all anesthesia classes together either at the local or distant site. They received instruction from the same professors, completed the same requirements for each of the classes, and were evaluated with the same professor-prepared course examinations and assignments. At the completion of their first 12 months in the program, each student completed the SEE. The value used to compare the SEE results was the total examination score. The total score is a mathematically scaled score that represents the student’s performance across all content areas of the examination. The data were evaluated to determine if there was any statistical difference between groups regarding the total scores on the SEE.

**Results**

The previously enumerated variables were examined for a total of 36 nurse anesthesia students. Comparisons were made between the local and distant groups. The t test demonstrated that there was no statistically significant difference between the 2 groups related to GPA, GRE, or years of nursing experience. The absence of difference is demonstrated by the $P$ values produced by analysis of the following variables: GPA, $P = 0.44$; GRE, $P = 0.54$; and years of nursing experience, $P = 0.78$. The SEE scores of these student groups were compared using the t test. The local-site students scored between 308 and
Table. Data comparison by group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Local group (mean)</th>
<th>Distant group (mean)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA</td>
<td>3.58</td>
<td>3.66</td>
<td>P = 0.44</td>
</tr>
<tr>
<td>GRE</td>
<td>1,042</td>
<td>1,067</td>
<td>P = 0.54</td>
</tr>
<tr>
<td>Experience (y)</td>
<td>5.27</td>
<td>5.0</td>
<td>P = 0.78</td>
</tr>
<tr>
<td>SEE scores</td>
<td>392</td>
<td>401</td>
<td>P = 0.52</td>
</tr>
</tbody>
</table>

GPA indicates grade point average; GRE, graduate record examination; SEE, Self-Evaluation Examination.

456 out of a possible 600 with a group mean of 392 on the SEE. The distant-site students scored between 365 and 443 out of a possible 600 with a group mean of 401 on the examination. Although the range of score distribution was smaller in the distant-site group, the t-test showed no statistical difference between groups (Table). As stated, the local group mean was 392, while the distant group mean was 401, yielding a P = 0.52. It should be noted that the mean score for both the local and distant groups exceeded the national reported mean for first-year students. Having documented that both groups entered the program with comparable entry level qualifications, with the only difference in treatment of the respective groups being the mode of transmission of didactic material, the contention that TVC is a viable method of delivering didactic materials to students is supported.

Discussion

With the increasing numbers of surgical cases and an increasing need for providers in anesthesia, it is obvious that the demand for training sites also will increase. Also, current providers may well require new and unique ways to obtain the continuing education requirements for licensure while minimally reducing time spent in the clinical arena. These demands on the education system will require changes to the traditional “in person” method of teaching. The limitations of the traditional classroom approach to instruction are not only a concern in nurse anesthesia education but also throughout all forms of education. Umble et al. noted the first broadcast used in their study to distribute continuing education on vaccine-preventable diseases reached 10,640 persons, which equaled more than that of the 10 years of previous classroom courses combined. Although 1 study is certainly not conclusive, it is apparent that the use of TVC may be a reasonable alternative to the traditional classroom teaching model.

The use of TVC could create almost an unlimited range of possibilities in the search of valuable clinical experiences for nurse anesthesia students. The specialty cases, required for graduation, may be more easily obtained in the future by diversifying clinical facilities away from the local geographical region in which the nurse anesthesia educational program is located. Additional studies in the future may be aimed at determining if multiple sites cause any added difficulties for students. Cost and design evaluations, similar to previous studies of other technologies, may establish price-to-value comparisons in the future. The continued success of program studied, as well as other programs that use this new form of technology, will continue to demonstrate that students in distant learning sites can be as successful as their local counterparts in all academic endeavors.

REFERENCES


AUTHORS

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