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INSTRUCTIONAL DESIGN AND ASSESSMENT

The Training of a Telepharmacist: Addressing the Needs of Rural West Texas

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Objective. To implement a teaching model of telepharmacy with a practice component for fourth-year doctor of pharmacy students.
Design. A televideo-based system of remote dispensing that complies with Texas pharmacy law was established with the Turkey Medical Clinic in Turkey, Tex, and the Texas Tech Pharmaceutical Care and Infusion Center in Lubbock, Tex. A 6-hour didactic session with "hands on" experience was provided for the third-year doctor of pharmacy students on the Lubbock campus in June of 2002 prior to starting full-time fourth-year clerkships. During their fourth-year required rural clerkship the students on the Lubbock campus spent 1 week each with the pharmacy and rural health clinic providing telepharmacy services.
Results. As of May 2003, 14 students had spent time with telepharmacy as part of their required rural clerkship. Student evaluations of the didactic course were excellent (2.82/3.0) and clerkship evaluations were fair to good (2.64–3.62/5.0), with 75% recommending the site to future students.
Conclusions. The program illustrates that telepharmacy in concert with telemedicine in remote areas can function as a practical clerkship training site for pharmacy students.
Keywords: telepharmacy, telemedicine, teleconferencing, rural health

INTRODUCTION

A recent report from the Argus Commission of the American Association of Colleges of Pharmacy states, "pharmaceutical education is responsible for supplying pharmacists for the workforce."[1] To many students and educators, initially what comes to mind is preparation for practice in a community or hospital pharmacy environment, incorporating principles of pharmaceutical care. Texas Tech University Health Sciences Center School of Pharmacy has incorporated a special program into the curriculum that adds a dimension to pharmacy students' educational experiences, helping them prepare for a unique practice environment. As part of a rural clerkship rotation, students receive didactic coursework on telecommunications delivery and get hands on experience using telepharmacy.

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Texas has become one of the most urbanized states in the nation, with more than four fifths of its residents living in urban areas.[2] The Texas Panhandle region is a predominantly rural area located in the northwestern part of the state (Figure 1). By the end of the century, the region accounted for less than 4% of the state's population.[3]

According to the National Center for Health Statistics, the rural population in general reports poorer health than the urban population, with the supply of health care personnel representing one of the greatest contrasts between rural and urban areas in the United States.[4] In the immediate Texas Tech University Health Sciences Center service area, 27 counties have one or no physician, no nurse, and no physician assistant. In addition, 37 of these counties have no hospital, 19 have no pharmacist, 54 are designated as primary care shortage areas, and 80 are classified as medically underserved. Access to healthcare for an ever-increasing elderly population in rural, isolated communities is of particular concern.[5] Residents of smaller rural communities generally have to either travel long distances

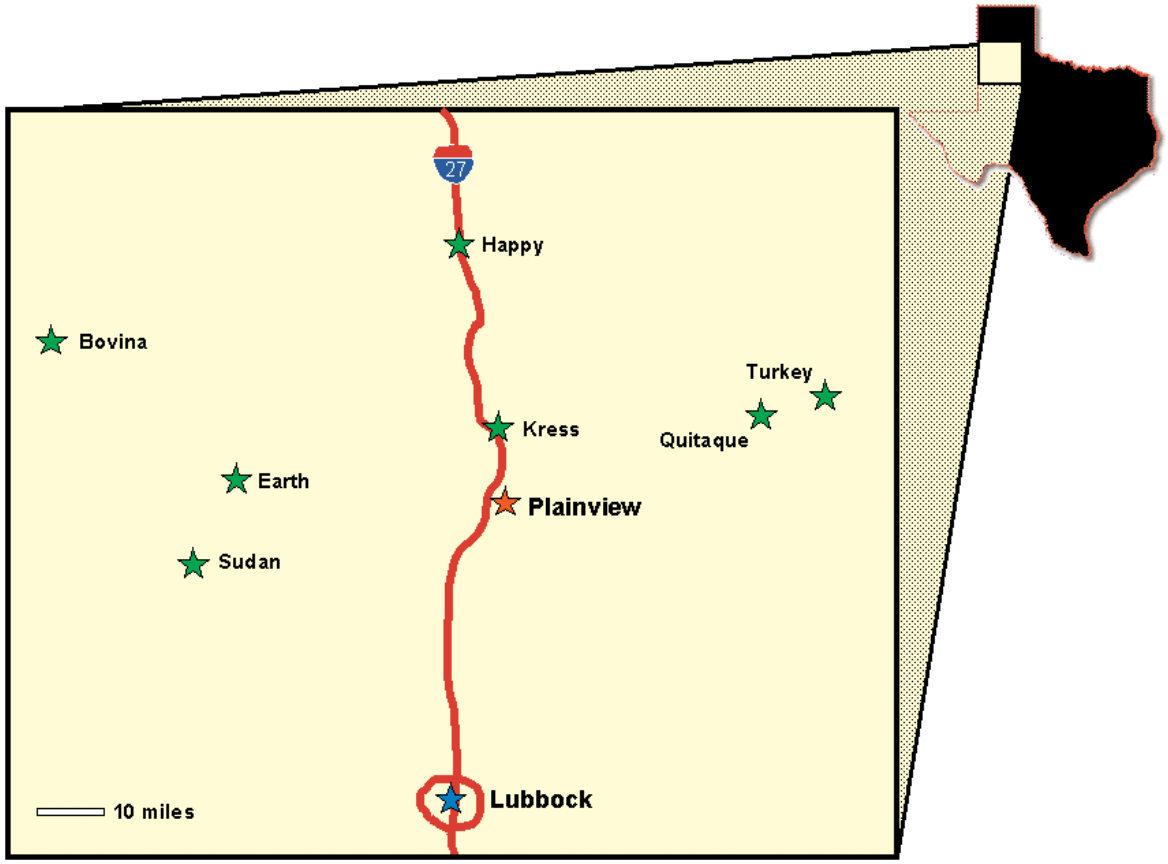

Figure 1. The Texas Panhandle with rural communities served by the proposed Texas Tech University Health Sciences Center Telepharmacy Project. (Illustration courtesy of Charles Seifert, PharmD)

to obtain prescription medications or use a mail-order pharmacy. With mail-order delivery, there may be no drug utilization review, and counseling may be available only over the phone and only at the patient's request.[6] Clearly, the health status of residents in rural communities would benefit from the delivery of pharmaceutical care by a community pharmacist. Telepharmacy can be a viable means to remedy these healthcare concerns.[7]

In existence since the 1960s, telemedicine is defined as "the use of electronic information and communication technologies to provide and support health care when distance separates the participants."[8] Several rural health care projects using telemedicine have been implemented in Texas.[9] However, the use of telecommunications technology in the provision of pharmacy services is a fairly recent phenomenon.[8,10]

PROJECT DESCRIPTION

The Texas Tech University Health Sciences Center School of Pharmacy is the only school of pharmacy in the State of Texas that requires a rural clerkship in its doctor of pharmacy program, and 1 of only 2 in the United States.[11] As part of the rural clerkship, Texas Tech has developed a telepharmacy teaching and service model that serves as a training tool for pharmacy students and as a mechanism for the delivery of pharmaceutical care in the rural community.

Dr. Sidney Ontai is a family practitioner who practices in Plainview, Tex, a community of approximately 20,000 people in the heart of the Texas Panhandle region. Funds from a United States Department of Agriculture (USDA) Rural Utilities grant were used to configure an existing medical clinic located in the small rural community of Turkey, Tex, for telemedicine operations. The success of the project led to further funding (from USDA) for implementation of 6 additional telemedicine clinic sites in the small rural communities of Earth, Bovina, Sudan, Happy, Kress, and Quitaque, also located in the Texas Panhandle (Figure 1).

The model for the telemedicine project is designed around a "hub and spoke" configuration. From the "hub" location in Plainview, Dr. Ontai serves as the primary clinical consultant. The remote "spoke" telemedicine clinic sites extend approximately 35 to 85 miles from the central location. This network system possesses high quality audio and video capabilities, using commercially available laptop and desktop personal computers and

Figure 2. Dr. Charles Seifert in Lubbock, Tex, engaged in a televideo conference with personnel 120 miles away at the TTUHSC Drug Information Center in Amarillo, Tex.

videoconferencing cameras with DSL (Digital Subscriber Line) connectivity. The system supports real-time and asynchronous video and audio clinical sessions between the physician and remote rural patients. The computer system interfaces with instruments such as stethoscopes, pulse oximetry devices, otoscopes, thermometers, and electrocardiography devices to enable assessment of patients at a distance.

Telepharmacy System

A telepharmacy system has been implemented at the Turkey Medical Clinic, with further plans to integrate similar models into future clinic sites. Analogous to the telemedicine system, the telepharmacy model is designed to deliver pharmaceutical care similar to what a community pharmacy would deliver if located within the area. Since the point of care exists in a remote clinic site, communication between a central and remote pharmacy site requires secure telecommunications utilizing DSL. The model consists of a pharmacy computer system, 2-way video and audio transmission capabilities (Figure 2) between central and remote sites, prescription label generation, and remote dispensing capabilities that comply with Texas pharmacy law. The Texas Tech Pharmaceutical Care and Infusion Center in Lubbock, Tex, is the "central" pharmacy and maintains patient records and a drug inventory, and arranges product delivery for the remote sites.

As allowed by law, the remote site is staffed with an emergency medical technician (EMT) or other health care professional such as a certified pharmacy technician. Healthcare personnel can access and dispense doses of common medications from a secured storage container at the remote telemedicine clinic site. A committee comprised of the physician, health care personnel serving the area, and the pharmacist in charge at the central pharmacy determine the medications available for dispensing at the remote telemedicine clinic site (remote formulary).

System Flow

Prescription processing and delivery follow a process of communication between the central pharmacy and remote site clinic (Figure 3). A computer at the remote site clinic is networked to the central pharmacy's computer system.

Prescription order communication. To initiate the process, the prescription order may be brought to the remote site clinic and then faxed to the central pharmacy. Alternatively, the prescriber may transmit a new prescription order directly to the central pharmacy by telephone, fax, or electronic prescribing technology. For prescription refills, the original prescription number is com-

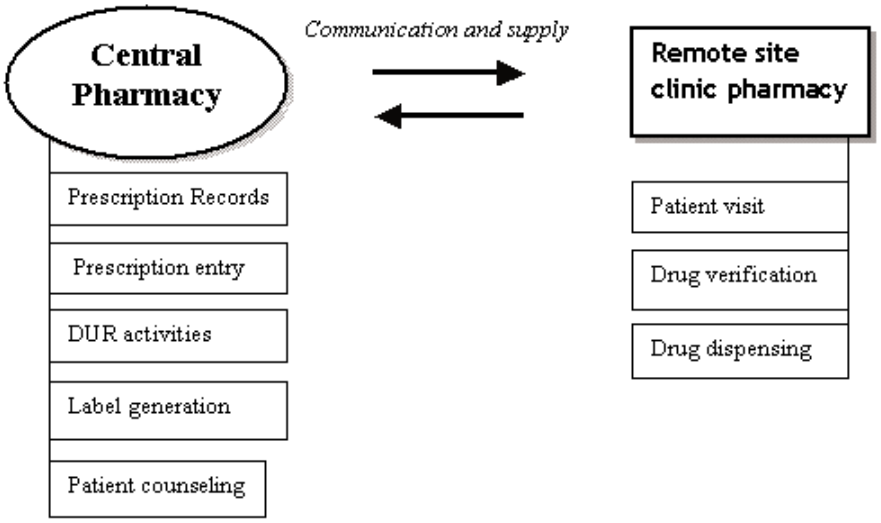

Figure 3. Prescription processing and delivery in the TTUHSC telepharmacy model.

municated to the central pharmacist in a similar manner.

Documentation. For new clinic patients at the remote site, standard health information such as patient allergies and current medications is entered by personnel into the computer system. The new prescription or refill order is reviewed by the central pharmacist who performs all drug utilization review activities. The prescription order is then entered into the central pharmacy's computer system.

Label generation. After prescription entry, the central pharmacist authorizes printing of a label and patient information materials at the remote site clinic. A hard copy of the prescription order is attached to the prescription request and stored at the central pharmacy. As identified on the label, the technician retrieves the prepackaged medication from an on-site storage container, then visually inspects the item to ensure that the correct medication, dosage, and quantity have been selected.

Label verification. Using "still image capture" the technician may be able to create an image of both the label generated at the central pharmacy and the label of the prepackaged medication that was retrieved from the storage container for inspection by the central pharmacist. By means of "store-and-forward" technology, both images can be transmitted along the network and maintained in the central pharmacy's database. Bar code identification capabilities exist for both the medication package and prescription label. After the technician has appropriately labeled the medication package, the bar codes on the label and package are scanned to verify an exact NDC (national drug code) match.

Medication verification. If an exact bar code match is made, a verification message, which displays both on the technician's computer screen and on that of the central pharmacist, allows the prescription order to proceed. The technician at the remote site collects the labeled medication and printed patient education information and directs the patient to the counseling and checkout area. Meanwhile, the central pharmacist visually inspects previously transmitted images of the prescription order as a means of additional verification.

Remote video counseling. For all new prescriptions, counseling takes place via a video-conferencing session between the patient at the remote site and the central pharmacist. In addition, for all prescription refills, the technician at the remote site offers to schedule counseling with the pharmacist, as well as at any time upon the patient's request. While teleconferencing, the patient and pharmacist use headphones to ensure the privacy of the counseling session.

Additional safety verification. When counseling is complete, the technician at the remote site again scans the labeling on the medication package and the prescription label as a final means of verification. The technician then delivers the prescription to the patient and the transaction is complete at the point of care.

THE TEACHING MODEL

Dr. Charles Seifert developed the concept for the telepharmacy teaching model through discussions with representatives from the Office of Rural and Community Health and the Texas Tech University Health Sciences Center Telemedicine program, and Dr. Sidney Ontai. Reasons for implementing the model included the following: (1) to establish a pharmacy model utilizing technology in rural areas that would demonstrate that distance need not impair the pharmacist's ability to deliver pharmaceutical care and products; such a model that demonstrates implementing pharmaceutical care in rural areas through telecommunications technology would be appealing to a pharmacy student as a clerkship training site; (2) to prepare pharmacy students for expanded roles in community pharmacy practice implementing concepts of remote dispensing; (3) to highlight business aspects of a functioning telepharmacy system between an independent pharmacy and a rural health clinic; and (4) to clarify the acceptability of remote faculty supervision to accrediting bodies and regulatory compliance agencies.

Educational Experience

The program begins with a 6-hour didactic session for the third-year doctor of pharmacy students on the Lubbock campus during the spring semester prior to starting full-time fourth-year clerkships. Faculty from the Center for Telemedicine conduct the session in a classroom environment with presentations and written handouts on telecommunications and conclude with a "hands on" experience using telepharmacy equipment. Initially, students receive an overview of telemedicine, with history, general description, and description of the Texas Tech University Health Sciences Center program. Next, students review various operating models that use telemedicine technology, such as primary to specialty care, low-level and mid-level provider to primary and specialty care provider, correctional institutions, and nursing home and geriatric care facilities. A technology section reviews equipment, connectivity, remote dispensing, digitizing information, and technology requirements such as bandwidth. Next, practical issues are covered, including accessibility, quality of transmission, ability to make a diagnosis, outcomes, and patient satisfaction. Finally, legal issues, funding for projects, general telemedicine resources, and setting up a telemedicine project are reviewed.

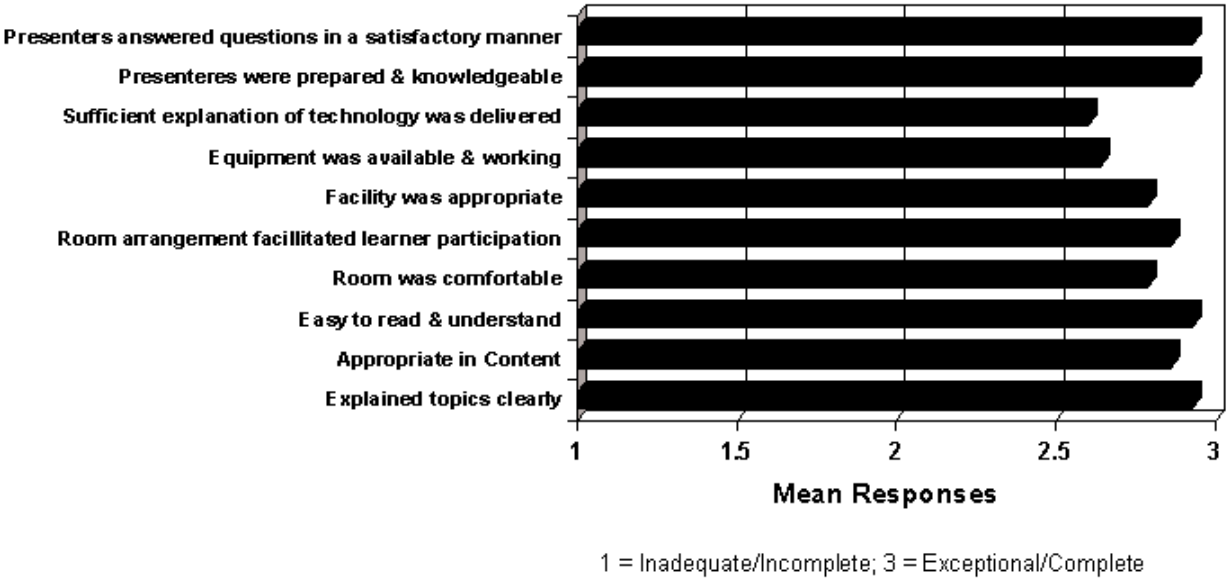

Figure 4. Student evaluations of a telepharmacy didactic course (n = 14).

When students reach their fourth year, they are required to complete a 6-week rural clerkship, of which 1 week is devoted to the telepharmacy program. A typical weekly schedule involves time spent in the various locations that make up the telepharmacy network. Monday is spent observing the physician operating the telemedicine equipment at the physician's office in Plainview, Tex. Tuesdays, Wednesdays, and Fridays are spent at the remote sites in Turkey, Tex, and Quitaque, Tex, observing the emergency medical technician who is delivering health care services under the direction of the physician at the central location in Plainview. Thursdays are spent working with the pharmacist in the central pharmacy in Lubbock who receives prescription orders, performs drug utilization review (DUR) activities, approves label generation at the remote site, and counsels patients in videoconferencing sessions. Students are required to document all of their activities on a daily log sheet. In addition, telecommunication stations are located in Lubbock at the School of Pharmacy offices and in Amarillo in the Drug Information and Health Policy Center at the School of Pharmacy. This allows for live evaluations of student performance by the faculty mentor in Lubbock and comprehensive drug information access to the Center in Amarillo.

RESULTS

Since the program's inception in June 2002, a total of 14 students from the Lubbock campus have completed both the didactic and clerkship training experience through May 16, 2003. Mean student evaluation scores for the didactic component are included in Figure 4. The evaluations of the didactic component were outstanding. An assessment of the quality of documentation on student log sheets is in Figure 5. Student documentation was assessed as follows:

1. Excellent: The student completely documented all of their activities with telepharmacy including individual patient's major disease states, complete medication histories, prescriptions filled through telepharmacy, patients counseled through telepharmacy, and any recommendations.
2. Good: The student documented patient's major disease states; however, had incomplete medication histories, prescriptions filled through telepharmacy, patients counseled through telepharmacy, or recommendations.
3. Fair: The student documented activities involved in filling prescriptions, however, failed to include much information on individual patients or recommendations.
4. Poor: The student documented activities such as mileage or location and that they saw patients; however, no information was included on patients, prescriptions filled, or recommendations.

As can be seen from Figure 5, the students' documentation varied considerably and most of their activities were poorly documented, especially early in the implementation of the experience.

Mean student evaluation scores for the clerkship experience are included in Figure 6. The clerkship evaluation forms were the standard evaluation forms used for all clerkships at Texas Tech. The evaluations are divided between preceptor, site, and course, and use a 1–5 Likert

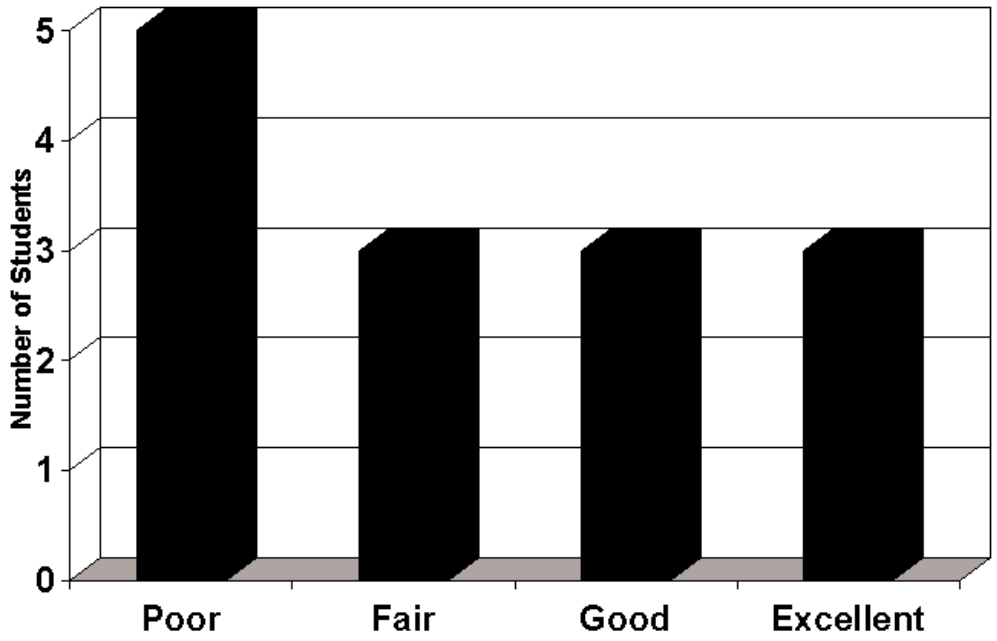

Figure 5. Student documentation on log sheets for a telepharmacy course. Excellent = diseases and meds documented with recommendations; good = disease states documented with very little about medications; fair = other activities documented but very little about patients; poor = documented location and mileage but not much else..

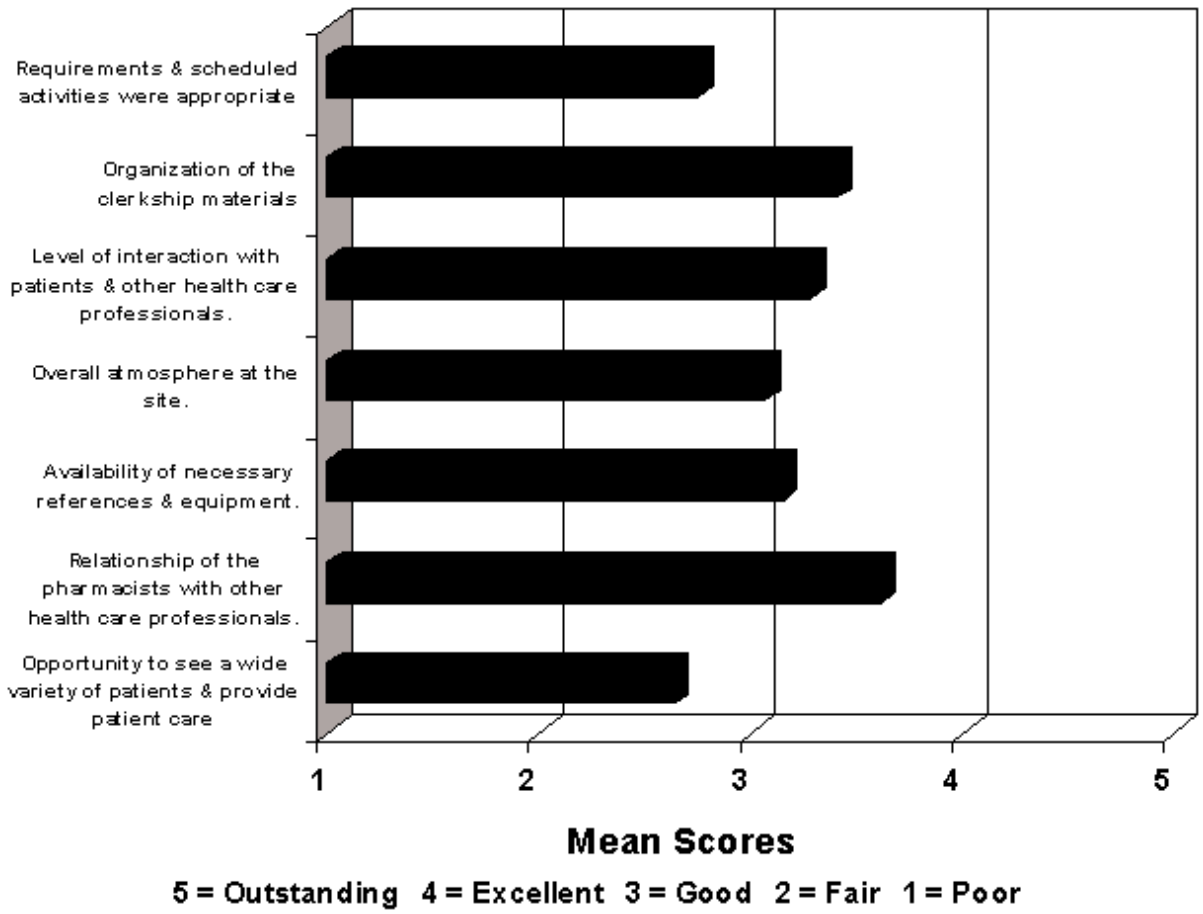

Figure 6. Telepharmacy clerkship student site evaluations (n = 14)

scale corresponding to the groupings in Figure 6. There is also a "not applicable" (N/A) response on the evaluation form. These N/A responses were not included in the evaluation. Each section also had a comments section. The preceptor ratings were not included in this evaluation because several different preceptors participated in the experience. Typical student comments on the clerkship evaluations were as follows:

1. Very interesting to see how telecommunications are utilized to improve patient care in underserved rural areas.
2. Very beneficial for patient care.
3. Change days of the week so the central pharmacy experience occurs before the remote clinic experience.
4. One week was too long to spend evaluating telepharmacy.
5. Activities needed more structure.
6. Small numbers of patients in remote areas caused large amounts of dead time.

Seventy-five percent of students who completed the rotation recommended it to future students and indicated that the service benefits rural patients.

DISCUSSION

The didactic component was well received by the students even though it was held on a Saturday. Most of the students had to get off from work to attend. Those not in attendance were required to view the videotapes prior to their clerkship experience. As can be seen in Figure 5, most of the students poorly documented their activities, especially early in the implementation of the clerkship experience. The students were given a blank log sheet and asked to document all of their experiences. These instructions were quite vague, and as a result, we received vague documentation from the students. The log sheet from one of the students (identifiers removed) who had excellent documentation is now used as an example log sheet for students during their clerkship experience. There were multiple comments that the activities needed more structure. The expected activities were not clearly communicated to the students and preceptors. An activity checklist was developed (Appendix 1) for each site and implemented with the 2003–2004 clerkship experience. Some students wanted to experience the central pharmacy operation prior to going out to the remote location. This would have allowed the student to evaluate what was on the remote formulary, understand how a prescription was processed at the central pharmacy, and learn how the video counseling equipment worked prior to being deployed to the remote location. Some of the students also felt that 5 full days evaluating telepharmacy was too long. Due to the small volume of patients in remote areas like Turkey, certain days of the week were busier than others, with Friday being the slowest day. On Fridays, the students had to travel approximately 180 to 200 miles round trip from Lubbock to Turkey just to sit in a slow clinic. As a result, the program was decreased from 5 to 4 days.

With input from students and colleagues, several changes previously discussed were made for the 2003–2004 clerkship year, including: (1) giving an example log sheet to students to improve documentation, (2) developing set activities at each site (clerkship activity checklist for 2003–2004 is depicted in Appendix 1), (3) decreasing the experience from 5 days to 4 days, and (4) moving the central pharmacy experience to Tuesdays, so that it took place before students went to the remote site. As a result of the changes, the weekly schedule for 2003–2004 was Monday: physician's office; Tuesday: central pharmacy; and Wednesday and Thursday: remote location. For 2003–2004, 17 students on the Lubbock campus scheduled the course. Future plans are to include students from the Amarillo and Dallas/Fort Worth campuses in the program. There are also plans to include a telepharmacy module in the required second-year pharmaceutical care laboratory.

CONCLUSIONS

The telepharmacy model enables an off-site pharmacist to "telecommute" to the point of care to provide pharmacy services in real time. By linking multiple dispensing sites to a single pharmacy, a "hub and spoke" network can be created to further maximize use of pharmacist resources. Telepharmacy in concert with telemedicine in remote areas can function as a practical clerkship training site for pharmacy students.

ACKNOWLEDGEMENTS

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Appendix 1. Telepharmacy Clerkship Daily Activities Checklist for 2003-2004

Mondays

Clerkship Site	**Activity**	**Preceptor's Initials**
Dr. Ontai's Office	1. Review the electronic medical record. 2. Review the telemedicine equipment. 3. Medication Histories on all patients including prescription drugs, OTC drugs, and herbal medications. 4. In-depth drug information question (completed by the end of the experience). 5. See patients with Dr. Ontai (at least 1 telemedicine patient). 6. COMPLETE LOG SHEET AS INSTRUCTED!	

Tuesdays

Clerkship Site	**Activity**	**Preceptor's Initials**
TTMC Southwest Pharmaceutical Care & Infusion Center	1. Review the telepharmacy law. 2. Review the telepharmacy system. 3. Review how a prescription is entered into the system. 4. Review how drugs are pre-packed. 5. Review what's included on the formulary and how the formulary has changed from the beginning. 6. Enter a prescription on the telepharmacy system. 7. Counsel a patient over the telepharmacy system. 8. Pre-pack drugs for the telepharmacy operation. 9. COMPLETE LOG SHEET AS INSTRUCTED!	

Wednesdays & Thursdays

Clerkship Site	**Activity**	**Preceptor's Initials**
Turkey/Quitaque Medical Clinics	1. See patients with mid-level practitioner or Dr. Ontai. 2. Medication Histories on all patients including prescription drugs, OTC drugs, and herbal medications. 3. Dispense at least one prescription at the remote site. 4. Counsel at least one patient at the remote site with observation from the central pharmacist. 5. Perform at least one house call. 6. Perform at least one nursing home visit. 7. Complete drug information question. 8. COMPLETE LOG SHEET AS INSTRUCTED!	

Anytime

Activity	**Preceptor's Initials**
1. CONTACT DIPC THROUGH TECHNOLOGY	