
Shriners Hospitals for Children, Honolulu's Experience with Telemedicine: Program Implementation, Maintenance, Growth, and Lessons Learned

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Abstract

Shriners Hospitals for Children, Honolulu Telemedicine Program conducts real-time video consultations with remote sites in Hawaii, Guam, Saipan, American Samoa, the Federated States of Micronesia, and the Republic of the Marshall Islands. The program began in 1999 and has provided over 240 consultations. This report is a summary of the Shriners Hospitals experience and lessons learned regarding program implementation and maintenance.

Introduction

Shriners Hospitals for Children - Honolulu is one of 22 hospitals within the Shriners Hospital system. The hospital provides free care to children with primarily pediatric orthopaedic conditions. The hospital's mission also includes evaluation and treatment of chronic burn scar conditions and other conditions requiring plastic surgery. Since its establishment in 1923, the Honolulu hospital has treated over 22,000 children. The majority of the children are from Hawaii, but the hospital also draws patients from the Commonwealth of the Northern Marianas (Islands), The Federated States of Micronesia, Guam, American Samoa, Samoa, Fiji, the Republic of the Marshall Islands, and the Republic of Palau. Outreach trips for outpatient clinic evaluations are scheduled on a regular basis to each of these areas. All patients requiring operative procedures or further evaluation are seen at the Honolulu hospital.

Since the large geographic area of responsibility poses significant time and distance barriers, establishment of an effective telemedicine program became a priority beginning in 1998. A generous grant from the Harry and Jeanette Weinberg Foundation provided the initial funds needed for equipment purchase. The stated goals of the program included: increasing pediatric orthopaedic surgery care access at geographically remote sites; decreasing the need for travel with its associated costs for patients and providers; providing education in the area of pediatric orthopaedic surgery for these remote and medically underserved areas; improving the coordination of care

between the hospital and remote site care providers; providing further distance education opportunities for the staff of the Honolulu hospital; and gaining access to other telemedicine sites on the mainland United States such as the Shriners Hospital in Sacramento. This article reviews our experience and outlines how our telemedicine service functions along with lessons learned from implementation and maintenance of our program.

Program Implementation and Development

The telemedicine program began in 1998 with a grant from the Harry and Jeanette Weinberg foundation providing funds to purchase a video-teleconferencing system. This system complemented the State of Hawaii's initiative to develop a comprehensive statewide telemedicine network through the Hawaii Health Systems Corporation (HHSC).^{1,2} Once funding was obtained, a full-time temporary telemedicine coordinator was appointed, and a medical director for the telemedicine program was appointed.

The first demonstration of the program occurred in September of 1999 when one patient was seen at Kohala Hospital on the island of Hawaii. Because the patient and family were unable to travel, the telemedicine coordinator traveled to the remote site, using the equipment at the HHSC facility and televising to the physician at the Shriners Hospital site. The videoconference successfully demonstrated ability to evaluate and manage a patient through this communication format.

During our initial start-up period, a variety of information technology programs were being developed around the Pacific to include the State of Hawaii Telehealth Access Network (STAN) and distance education initiatives such as the Pacific Resources in Education and Learning (PREL). The Harry and Jeanette Weinberg Foundation funded videoconferencing equipment for 30 key healthcare organizations in the State of Hawaii. Various granting agencies such as the National Telecommunications Information

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Agency (NTIA) and the Rural Utilities Services (RUS) assisted with the purchasing of videoconferencing equipment for areas such as Guam, Saipan, American Samoa. The PREL Star program helped the Federated States of Micronesia, the Republic of Palau, and the Republic of the Marshall Islands. Healthcare providers at remote sites found that they were able to connect up with Shriners Hospital for consultations, and providers at Shriners Hospital found they could successfully connect with remote sites for new patient evaluations and follow-ups. Subsequent telemedicine visits were then arranged on an as-needed basis with these remote sites.

The telemedicine coordinator was a vital key in developing effective relationships with remote sites, providers and funding resources. These relationships were fundamental to setting the stage and gaining access to necessary networks. The coordinator had to understand the technical capabilities and roles of all the participants in the process, how to troubleshoot problems and obstacles that arose, understand and comply with ever changing regulations governing the industry, and play promoter/marketer for an innovative service.

Shriners Hospitals for Children - Honolulu, showed its continued commitment to the program by making the telemedicine coordinator position a permanent one and continuing to support a medical director. The central headquarters for Shriners Hospitals for Children demonstrated support and responsibility by developing and advancing telemedicine throughout the Shriners Hospitals system. As a result, more than 15 of the 22 Shriners Hospitals have telemedicine capabilities.

Program Growth and Maintenance

The Shriners Hospitals Telemedicine program has had its share of growing pains. Initial equipment purchase in 1998 included the PictureTel Concord 4500 ZX video teleconferencing system with two monitors for remote and local viewing. Three Integrated Service Digital Network (ISDN) lines were installed. Additional peripheral devices purchased included a document camera, a general handheld camera, an electronic otoscope, an electronic ophthalmoscope, an electronic stethoscope, a digital camera/camcorder, and a video recorder.

Since our initial efforts, we have installed a direct T1 line to the State of Hawaii Telehealth Access Network located at the University of Hawaii. The STAN bridge has the ability to connect Shriners Hospital to the Federated States of Micronesia and American Samoa without per minute usage charges. The STAN bridge is the only conduit to these remote areas.

The PictureTel equipment failed in 2002 and was replaced by the Tandberg 2500 system. This system has the capability to do encryption, dual video, and can connect through Integrated Service Digital Network (ISDN), Asynchronous Transfer Mode (ATM), or Internet Protocol (IP). We continue to use the document camera, general handheld camera, and the digital camcorder, but have found little use for the otoscope, ophthalmoscope and stethoscope in our orthopaedic practice.

Telemedicine consultations have been successful with Guam, Saipan, the Federated States of Micronesia, the Republic of the Marshall Islands, and American Samoa. (Table 1). Efforts to serve Guam have been slowed by legal and financial issues. Consultations with Saipan have been influenced by the departure of key Saipan personnel who were responsible for scheduling and coordinating the clinic at their remote sites. Access to Shriners Hospital pediatric orthopaedic care did not significantly drop, as we continued to conduct outreach clinics at those locations twice a year.

Telemedicine consultations with American Samoa and the Marshall Islands benefited by American Samoa's direct T1 line to Hawaii with a high quality transmission connection of 384kbps, and only a one-hour time difference between the two centers. There is also a dedicated off-island referral liaison that is active in coordinating and scheduling American Samoa patients. Most importantly, there is an orthopaedic surgeon in American Samoa who found value in the process and developed a physician-to-physician relationship with providers in Honolulu.

Telemedicine consultations with the Republic of the Marshall Islands have increased because of similar factors. The Majuro Hospital has assigned a dedicated liaison to coordinate the clinics. The physician in Majuro is active in the referral and telemedicine process. Since Shriners Hospital staff travel to the Republic of the Marshall Islands and American Samoa only once a year, telemedicine at these two locations has improved access to specialized pediatric orthopaedic care throughout the year.

Telemedicine referrals have not been as successful on the neighboring islands of Hawaii because of multiple factors. Most children have insurance that pays for travel to Honolulu. Shriners Clinics are held on the neighbor islands every 4 to 6 months. General orthopaedic surgeons perform the initial evaluation on most of these children and refer directly to Shriners Hospital if there is an acute problem requiring immediate referral. In those situations, the child is brought to Honolulu for evaluation.

Table 1.— Shriners Hospitals for Children, Honolulu's Telemedicine Consults 1998–2004

Remote Site	Number of Consults
State of Hawaii	18
Guam	51
Federated States of Micronesia	5
American Samoa	123
Common Northern Mariana Islands	32
Republic of the Marshall Islands	11

Discussion: Lessons Learned

Over the course of the past 7 years we have learned some valuable lessons. Shriners Hospital for Children - Honolulu has relied on the telemedicine program to improve access to pediatric orthopaedic care for children in the areas we serve, and it is committed to further development and expansion of the program, despite the challenges encountered at every turn.

Seeing a child through the telemedicine format is not straightforward. Videoconferencing format for a medical encounter seeks to replicate what happens in the health care provider's office. This process includes: gathering the medical history; conducting the physical examination; developing a diagnostic and therapeutic plan; counseling the patient and/or family as to the treatment plan; arranging follow-up. Challenges and barriers to accomplishing each and every one of these tasks through the videoconferencing format abound.

Since the videoconferencing format is a different encounter for both care providers, a written consent from the patient and/or family is necessary. The encounter does not occur in the usual, relative privacy of a clinic examination room. There are concerns regarding the extent of privacy when the patient visit includes a video signal moving from a remote site, through several networks and bridges to another site that typically has technical personnel and clinic coordinators present. Concerns regarding the efficacy of the encounter and whether or not adequate clinical information can be formulated by this venue are considered. If the encounter is unsatisfactory, then arrangements are made for the child to be seen in person.

Patient history is obtained by interview with the remote site provider as facilitator. Barriers to an effective interview include language, cultural mores, age, level of comfort or discomfort talking to a television screen, seeing oneself projected on a television screen, lag time and technical glitches. As an interviewer, one needs to be attuned to body language in order to gain an understanding of whether or not the medical history interview is effective.

A good orthopaedic physical exam is a definite challenge as it is part observational and part hands-on. The observational part of the examination includes assessment of active range of motion, gait, posture, and, signs of inflammation such as swelling and redness. The hands-on examination assesses areas of local tenderness, quality of any swollen or indurated areas, passive range of motion, joint crepitus, stiffness, muscle tone and provocative examinations for joint stability. The quality of the hands-on part of the examination is directly dependent on the skill of the examiner at the remote site. (Figure 1).

A videoconference camera focused on a standard x-ray view box is usually used to transmit radiographs. Radiographic and transmission quality varies. The radiographs are usually relayed well enough using this technique to see gross anatomic changes such as displaced fractures. But subtle bone dysplasias, early infections, and permeative bone lesions cannot be easily identified using this modality. When this occurs, alternate means of transmitting data is required -- such as digitization of the image and e-mail transmission or mailing the radiograph to the facility.

At the conclusion of the teleconference, a diagnostic or therapeutic plan is formulated and communicated to the provider, patient and family at the remote site. Language and cultural barriers are critical



Figure 1.— Physician in American Samoa assisting with a telemedicine consult for the Shriners orthopaedic surgeon in Honolulu.

at this juncture. Follow-up is then arranged around the availability of the providers at both the local and remote sites.

Using dedicated providers at the local and remote sites has helped lower some of these barriers. The providers have to be familiar and comfortable with the process. During outreach trips to these remote areas, we meet with the local providers in order to provide education and to review the orthopaedic physical examinations. Follow-up and assistance in management of our shared patients is provided. The success of the system relies on having qualified, dedicated, consistent personnel on both ends of the connection.

Regularly scheduled clinics, regardless of the number of patients to be seen, allows providers to exercise the videoconference equipment and hook-ups. Technical personnel gain experience and follow-up appointments can be more routinely scheduled for healthcare providers and patients alike.

The organization needs to support the telemedicine effort. Telemedicine clinic volume accounts for just over 1% of the total outpatient volume of Shriners Hospital - Honolulu. Despite the small percentage, the hospital continues to support a full time coordinator plus a clinician who commits 1 day-a-week to the program -- actively seeing patients via the telemedicine venue. The program budget continues to be supported by Shriners Hospitals for Children.

Finally, telemedicine has not replaced our need to travel to remote areas and conduct outreach clinics. However the quality of our clinic visits to these remote areas has improved. It is extremely beneficial to see and discuss a new child with the provider at the remote site before we see the child in person. As a result, treatment and diagnostic plans can be instituted earlier. Occasionally parents just need to be counseled and reassured. This can easily be done through the videoconferencing format. Patients with acute issues that require immediate referral and travel to Honolulu can be identified earlier and their care can be expedited. While telephones are the standard way of communicating this information, usually it is provider-to-provider only and rarely family/patient-to-provider.

The videoconferencing format allows both. As such we consider telemedicine to be an adjunct to our outreach program and not a replacement.

Conclusion

Through the use of the telemedicine technology, geographic and time barriers are no longer a hindrance to receiving and providing healthcare to rural areas. The experiences from the Telemedicine Program at Shriners Hospitals for Children - Honolulu has proven to be an additional clinical and education tool that has value and potential to improve healthcare.

The human factor has a critical impact on success of a telemedicine program. It doesn't matter how good the technology is if two sites do not want to communicate with each other. The value of telemedicine and its frequency will increase as healthcare providers begin to accept and become comfortable in its applications. Collaboration and partnerships in sharing of resources such as network capabilities and video conferencing equipment is a demonstration of the synergistic effect to the development and maintenance of telemedicine programs. Sustainability will depend on organizations' commitment to supporting healthcare providers' initiatives. As in any clinical application, without the healthcare providers' participation, there would be no clinical value whether it is through telemedicine or the traditional hands-on assessment.

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