in Rural Panama

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In the United States, the exciting transformation from x-ray films to digital images continues to evolve rapidly, with the adoption of radiology information systems (RIS) and picture archiving and communication systems (PACS) becoming standards for many hospitals and outpatient facilities. This enables the radiologist to interpret diagnostic images independent of his, or the facility's, physical and geographic location, extending his work area to any dedicated medical computer workstation. There are many success stories in the United States of how telemedicine has made available adequate medical services and cutting-edge technology to serve people in remote areas where there are no, or few, adequate medical facilities. The teleradiology initiative in Panama is one example of a success story that crosses the U.S. boundary and will hopefully bring this aspect of telemedicine to all those, worldwide, who need it.

The introduction of the Internet into developing nations has also accelerated. One can now encounter Internet kiosks all over the world. Fiber optic networks now connect the capital cities of the world, including those of Central and South America. With the increase in Internet availability, there has also been a significant decrease in cost. However, despite the convergence of digital imaging and widespread Internet availability, international teleradiology programs have, for the most part, not been actively created in developing nations. First of all, the excitement of telemedicine one encountered five to ten years ago occurred at a time when Internet accessibility was poor and the cost high. Low bandwidth connections were inadequate to the needs of the technology. Additionally, the economics of the projects did not support the continued provision of these services. Reimbursement for medical services in the rest of the world is dramatically decreased compared to domestic reimbursement. Finally, cultural and language differences make the realization and maintenance of these partnerships difficult.

Geographically, Panama is a narrow isthmus divided across by the Panama Canal. Panama has a population of approximately three million people. Similar to development in most of the countries of Central America, the population is concentrated around the capital, Panama City, and the city of Colon. Panama City and Colon are situated at the extreme ends of the Panama Canal, the capital on the Pacific Ocean side and Colon on the Caribbean Sea side. The rest of the country has
isolated urban population concentrations, with a significant disparity in development when compared to Panama City and Colon.

The existence of duty-free commercial zones and the enormous concentration of international maritime traffic, have made the Canal Zone a place of sophisticated urban development. The concentration of wealth and population around the Canal Zone has brought, as a natural and undesirable consequence, the relative abandonment of development in the rest of the isthmus. If concentration of population, with its known urban and social problems, is the major issue facing the future of the Canal Zone, isolation and lack of modern resources are the challenges of the rural areas. Nowhere is this better demonstrated than in the domain of health care.

Isolated and deprived of modern medical technology, the only hope for the rural populace is to develop creative methods to access these resources.

Hospital “Chicho” Fábrega (HCF), constructed in 1999 by the Ministry of Health, is situated in Santiago de Veraguas, Panama. This 300-bed hospital is strategically located in the center of the country, a four-hour drive from Panama City. Half a million people live in the region, most indigent and without substantial resources. HCF is the only public hospital in the vicinity that provides indigent care. The hospital boasts a ten-bed ICU and a four-room OR. There are two medical-surgical wards, a pediatric unit, maternity unit, and emergency room. The surgical service features a strong orthopedic and trauma service. Tropical diseases, severe malnutrition,
tuberculosis and trauma are treated daily. HCF is one of the busiest facilities in Panama for the treatment of snakebites, a common problem during the rainy season in rural Panama. The hospital emergency room serves a geographical area that includes mountainous and remote undeveloped areas. For example, the area of Las Palmas, an hour drive away, is served by a single clinic that is staffed six hours a day, five days a week. There is no obstetrician or surgeon, and acutely ill or traumatized patients are transported to HCF by ambulance. These patients, once treated, often have no effective way to journey home and may linger for days.

Hospital “Chicho” Fábrega’s Radiology Department is equipped with computed tomography, ultrasound, and x-ray. Professional staffing consists of a single part-time radiologist, skilled in x-ray and ultrasound, but lacking in cross-sectional imaging training and intervention. The ordering physician performs preliminary CT image interpretation at the time of the exam. Before the implementation of the teleradiology program in 2003, the study was then filmed and couriered to the University Hospital in Panama City via bus or private transportation. Radiologists in Panama City were responsible for generating a final report, which was typically delivered within five to seven days. In the United States, one takes for granted the timely interpretation of radiographic studies by trained diagnostic radiologists. The typical hospital-based radiologist in Houston is available seven days a week, twenty-four hours a day, and works closely with hospital colleagues to ensure that timely and accurate diagnoses facilitate rapid delivery of care.

In Hospital “Chicho” Fábrega, interns and generalists typically perform emergency care. These physicians are trained to provide care in an environment where diagnostic tools are relatively unsophisticated. Subspecialty medical and surgical backup is often lacking. While the CT scanner is a powerful tool, the key to unlock its potential is knowledge and training. There are many subtle diagnoses that frankly are beyond the capability of most of these physicians to either identify or diagnose. In this context, the timely delivery of accurate interpretations is a powerful tool that enables these physicians to appropriately diagnose, treat, and expeditiously transfer patients to a center capable of providing a higher level of care if needed.
The need to develop a method to deliver a timely radiographic diagnosis was clear. A plan to provide teleradiology professional services to HCF was formulated, with the participation of several foundations and the medical and lay communities of Santiago de Veraguas. The HCF teleradiology project was initiated in May 2003. Initial investigators identified three key issues. First, there was no adequate Internet connection at the hospital, despite the fact that a fiber optic cable lay buried beneath the ground a mere 40 meters away. Second, the computed tomographic equipment had no networking capabilities at the time it was installed. Third, the communication infrastructure within the hospital prevented direct communication with the ordering physicians.

The positive effect on patients’ management and care became instantly apparent, based upon immediate and enthusiastic feedback. Installing an Internet connection system capable of handling the broadband needs of teleradiology technology solved the first issue. All installation fees, which were substantial, were waived. The second problem was solved by the donation of a rebuilt direct image capture computer. The third problem was creatively solved with the use of a web-based file-sharing program. This utility facilitates the secure, bi-directional, encrypted transfer of report documents. Local radiology technologists were trained to capture the images into the server and transmit patient information documents via the file-sharing utility. An interpreting radiologist performed diagnostic radiology service remotely in Houston, Texas. Images were retrieved from the Santiago image server, reviewed, and transcribed. The completed report was typed and then placed into a completed dictation file within the file-sharing folder. The radiology technologist at HCF could then immediately access this information and deliver the final reports to the ordering physicians. The typical turn-around time for a final diagnostic report decreased from several days to twenty-four hours or less. Between October 1, 2003 and August 30, 2004, seven hundred and five exams were transmitted and interpreted. Two hundred and eighty exams were positive for clinically significant pathology.

The positive effect on patients’ management and care became instantly apparent, based upon immediate and enthusiastic feedback from the physicians at Hospital “Chicho” Fábrega. Patients were taken to and from the operating room expeditiously. Other patients who might have been transferred out were appropriately managed at HCF. The following two examples illustrate how rapid clinical decisions affected the outcomes of two critically ill patients.

The first patient, a 43 year-old female, presented to the emergency room with a severe headache. She underwent an unenhanced CT brain scan. Images were reviewed in Houston within three hours of the exam. A diagnosis of acute subarachnoid hemorrhage, arising from the right posterior communicating artery, was rendered, and the radiology technologist at HCF was notified by phone. The patient was immediately transferred to the University Hospital in Panama City. A diagnostic cerebral arteriogram was performed, confirming the presence of an aneurysm. She was taken to the OR and the lesion was successfully clipped. She recovered uneventfully and is neurologically intact.

The second patient, a 19 year-old female, presented with severe abdominal pain. She had
been previously diagnosed with ulcerative colitis. Review of the abdominal CT demonstrated thickening of the transverse colon, with severe dilatation, and a small pneumoperitoneum. These findings were consistent with a diagnosis of toxic megacolon. She was transferred to Panama City and underwent surgery within twelve hours of her diagnosis, thereby surviving a life-threatening condition that physicians in Santiago were ill equipped to diagnose and manage.

Teleradiology has now been successfully implemented between Santiago de Veraguas and Houston, Texas. The use of a RIS-PACS system enables radiologists here in Houston to retrieve images and then dictate reports in a timely fashion. The system in Santiago has recently been upgraded and there are plans to expand the hospital network and add review stations in the emergency room and the physicians' library. Logically, the next step is to connect Hospital “Chicho” Fábrega with the University Hospital in Panama City. This may now be readily accomplished given the web access that a RIS-PACS system offers.

Teleradiology initiatives have previously been attempted in Panama without success. One of the primary obstacles has been the inability of these projects to generate revenue and thus attract outside international support. This project has succeeded through a combination of creativity, persistence, and goodwill. There have been obstacles, but none have been insurmountable. The Hospital “Chicho” Fábrega teleradiology initiative is currently being evaluated for potential implementation into additional rural areas in Panama. It is hoped that this program can serve as a model for teleradiology in rural areas of Central and South America — and worldwide.

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Dr. Stenoien has been in private practice in the Houston Medical Center since 1988. Currently, he is president of Innovative Radiology, PA and CEO of Houston Medical Imaging, LLC. His primary interests are interventional radiology, oncology and nuclear medicine. He travels to Panama several times each year and has lectured in the Santiago de Veraguas medical conference annually since 1998.

Dr. Adan Rios was born in Panama City, Republic of Panama. He received his M.D. degree from the University of Panama in 1970, after a residency in Internal Medicine at the U.S. Army Gorgas Hospital in Panama. He came to Texas where he completed a fellowship at the M.D. Anderson Cancer Center where he worked for several years. He reached the level of Associate Professor and Director of Clinical Research in Academic Affairs of the AIDS program.

In 1988 he founded the Conference on AIDS in America. This conference had a run of eleven years and became one of the most important National Conferences on AIDS in the nation. Dr. Rios has written extensively in the field of tumor immunology, cancer, and AIDS. He did the confirmatory work of the activity of Interpheron in AIDS related Kaposi’s sarcoma. He has received numerous national and international distinctions.

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