



## **Telemedicine and Teleradiology Link Between Pohakuloa Training Area, Hawaii And Tripler Army Medical Center**

### **Background**

Pohakuloa Training Area (PTA) is located in the center of the island of Hawaii in the saddle between Mauna Loa and Mauna Kea. It is a major training area in the Pacific Region that serves all branches of the United States Armed Forces. The area is used for live fire ranges for a variety of weapons systems, including artillery and aircraft bombing practice. Maneuver also occurs at PTA and parts of the adjacent Parker Ranch. There is a garrison that serves a small number of active duty troops and DoD civilians. During training exercises, up to several thousand soldiers occupy the garrison and bivouac sites in the field.

PTA has austere medical assets. There is an aid station that can perform sick call, ATLS, and ACLS functions, but little else. Recently, a digital X-ray machine was added, but its functioning depends on whether a radiology technician is present and the skill of the provider interpreting the film. Rudimentary lab service is available when laboratory technicians are present to train at PTA. The aid station is normally manned by either a physician or physician's assistant (PA) during active training cycles. The expertise of these physicians or PAs in the types of problems normally encountered at PTA is extremely variable and depends on the training background of the provider.

PTA is located at a geographically remote site. The nearest hospital is in the town of Kamuela (Waimea) approximately 25 miles north of PTA. When the capacities of the aid station are exceeded, most patients are sent to Hilo, about 35 miles away, where PTA has a contract with a civilian hospital for emergency or urgent consultative care. Should a soldier require evacuation to Tripler Army Medical Center (TAMC) on Oahu, he or she must first be transported to either the Hilo or Kona airports, about a 1 hour drive. The subsequent flight to Honolulu requires another 45-60 minutes.

Soldiers present to the aid station with a variety of illnesses and injuries that include everything from the routine to emergencies to rare and unusual illnesses. Given the austere facilities, remote location, and the variable experience of the providers, these soldiers are often either sent to Hilo or evacuated back to Tripler Army Medical Center for definitive care. Many dollars and man-hours are consumed to provide this care to the soldiers.

The permanent aid station and the adjacent temporary aid station, which has no organic medical equipment, are housed in Quonset huts. Medics man the permanent aid station, which serves only personnel stationed at PTA. There is no permanent physician or PA there. When units rotate at PTA, the visiting unit has to supply either a physician or PA to the temporary aid station in order for training to occur. There is only an eight bed holding area located in the temporary aid station. The only vehicle connection from PTA to the hospitals at Hilo or Kamuela is Saddle Road.

Saddle Road is a treacherous stretch of two-lane highway. The highway is in poor shape for most of its course. While the road has two lanes, most drivers travel in the middle to avoid the rough shoulders. The road is characterized by sharp turns, sudden

banks of fog, occasional ice, and poor visibility of the road ahead. Hilo is the wettest city in the United States and so the road to Hilo is often wet and slippery. Several traffic fatalities are recorded on Saddle Road every year and most car rental companies on Hawaii will not allow drivers to traverse this road.

When a soldier falls ill or becomes injured and cannot be adequately treated at PTA, a decision must be made whether to evacuate the soldier all the way back to Tripler Army Medical Center (TAMC) in Honolulu on Oahu or whether to send the patient to Hilo for evaluation. Given the limited medical resources at PTA, this is a common occurrence. If the soldier is sent to TAMC, he or she is lost for the remainder of the exercise. In addition, a significant expense is incurred by sending the soldier back by air to Oahu. If the soldier needs to be sent to Hilo, a number of problems arise. The soldier is lost for several hours while he or she is being transported to and from Hilo as well as during the time of the evaluation at Hilo. A driver is needed to take the patient to Hilo and if the transportation occurs with a military vehicle, a TC (a mandatory passenger to assist the driver) is also needed. These additional soldiers are also lost for the duration of the trip and the hospital visit. In addition to the man-hours lost, a vehicle is lost for that time. Should air evacuation be necessary, all training must stop at PTA until the helicopter returns from Hilo. The only exception is when there is more than one helicopter available for air evacuation. The cost of fuel needs to be added to the cost of the emergency room evaluation, tests, X-rays, interpretation of the X-rays, and any consultations ordered by the emergency room physician. Ordering a lab test or X-ray without the emergency room visit is not possible. The emergency evaluation alone costs approximately \$500.

Given the diverse background of the physicians and PAs on temporary duty at PTA, it is usual that patients with unusual problems needing routine care are sent to Hilo or evacuated back to Tripler. This is due to justified caution on the part of the provider at PTA. Servicemen and servicewomen deserve the best care provided. Having been a provider at PTA, it would have been very useful to have had the benefit of speaking with specialty or subspecialty consultant that would likely have saved sending a patient to Hilo or TAMC for evaluation.

This project plan outlines a telemedicine and teleradiology solution from the aid station at PTA to various specialists and subspecialists at Tripler Army Medical Center.

### **Specific research questions to be addressed by this project include:**

1. Will a telemedicine/teleradiology link between PTA and Tripler Army Medical Center reduce the number of consultations with the hospitals in Hilo and Waimea?
2. Can this system reduce evacuations from PTA to Tripler Army Medical Center?
3. How much money can this project save by avoiding consultations to Hilo or Waimea? Does the money saved justify the cost of constructing and maintaining the telemedicine system?
4. Will the telemedicine system improve the quality of care rendered to soldiers in the field? Did the telemedicine consultation change or confirm the care of the soldier?
5. How much time is needed to generate a telemedicine/teleradiology consult?
6. How many man-hours does avoiding unnecessary trips to Hilo or Waimea save?

## **Hypothesis**

**A telemedicine and teleradiology link between Pohakuloa Training Area (PTA) and Tripler Army Medical Center will reduce the number of consultations between PTA and neighboring civilian hospitals, thereby saving money and man-hours while improving the quality of care soldiers receive at this remote training site.**

## **Project Description**

Our solution to this problem is to link Pohakuloa Training Area to consultants at Tripler Army Medical Center using a COTS/GOTS store and forward telemedicine consultation system. The project's key feature will be the teleradiology component, linking the digital radiography developer already in existence at PTA to the MDIS system at Tripler. This will allow radiologists and consultants rapid and accurate access and interpretation of diagnostic quality roentgenograms done at PTA. The teleconsultation system to be used has been developed by the Theater Telemedicine Prototyping Project (T2P2). This system contains formatted templates for Orthopedic Surgery and Dermatology and a generic template for other participating specialties of interest: Internal Medicine, Otolaryngology, and Ophthalmology. Targeted conditions include skin rashes, various orthopedic injuries, eye injuries and diseases of the eyes, and asthma. The proposal includes equipment and infrastructure upgrades, where necessary, to allow these clinics to respond to appropriate consults to PTA. We will have the ability to embed digital photographs to include images from digital ophthalmoscopes and otoscopes in the consults. The combination of teleconsultation and teleradiology will be powerful tools in improving quality of care to soldiers at a remote training site, as well as saving man-hours and money by avoiding unnecessary referrals to hospitals in Hilo and Waimea.

The proposed telemedicine project would impact the greatest on the unusual routine cases and urgent cases where it cannot be immediately determined by the provider at PTA whether a period of observation would be justified, whether the patient deserves evacuation, or whether the patient could return to duty after appropriate therapy. The proposed changes would have no impact on routine care where there was no question about the diagnosis or treatment. It would also have no impact on emergent care where immediate evacuation is indicated.

The periods of chief interest in this project are the peak training periods when battalion-sized elements or greater train at PTA. To determine when these peak-training periods will occur, we will rely on the continued cooperation of the Commander of Pohakuloa Training Area, LTC David Hergenroeder. The project will also investigate the utility of teleconsultation and teleradiology in non-peak periods for routine care by smaller elements and by the permanent party at PTA. In this sense, the project is not as much a true scientific study as a pilot study to answer the questions posed in the introduction. If this system is successful at PTA, it may be a prototype for other geographically remote training areas.

## **Proposed Timeline**

The estimated timetable is as follows:

1. Baseline data collection begun 6 January 1999.
2. Equipment acquisition (teleradiology and T2P2) begin 15 May 1999 and will take approximately 30-60 days.
3. Training for providers and trainers on T2P2 will begin on 1 June 1999 and will be an ongoing process.
4. Installation, testing and training of teleradiology (Phase 1) should begin 1 July 1999 and last until about 15 July 1999.
5. Teleradiology Services will officially begin on July 15, 1999.
6. Installation and testing of T2P2 Version 2.0 (Phase 2) should occur in Sept –Oct 99.
7. Teleconsultation and teleradiology data collection to begin on or about 1 Oct 1999.
8. Data Analysis in May- June 2000
9. Formal study to conclude on or about 15 July 2000.
10. Quarterly analysis will be undertaken to assess baseline data and study data.  
Baseline data collection will end when the telemedicine system begins functioning on or about 15 July 1999.

### **Objectives and Milestones**

- The first milestone, beginning baseline data collection, has already begun.
- The first deliverables have already been developed for this project. In order to improve baseline data collection, a set of questionnaires and profiles were developed and delivered on January 6, 1999 during a site visit to PTA by Cynthia Kohuth, RN and MAJ(P) Michael Brumage, MC. They include: A provider profile for health care providers practicing at PTA, an x-ray order form that also acts as a questionnaire on current radiological practices at PTA, a patient log, and a evacuation log.
- After funding arrives, purchase of the basic acquisition station with all its peripherals, as well as the necessary software upgrades and servers, will be an important milestone.
- One milestone will be the installation of the T2P2 system at PTA.
- Another milestone will be the connection of the digital radiology machine to the MDIS system at TAMC.
- Other milestones will be the testing of the system with simulated patients.
- The next milestone will be the use of the teleconsultation and teleradiology system with real patients. Data collection on this system will occur concurrently.
- At the conclusion of the study period, our chief deliverables will be the data compilation and analysis of financial data, man-hour estimates, and quality of care surveys
- The economic analysis will be a key deliverable and will determine whether the system will remain viable for future use.
- The results of this project will include publishing the results in contemporary medical journals such as *Military Medicine* or *Telemedicine Today* such as the Annual Army Region Meeting of the American College of Physicians, the Asia-Pacific Military Medicine Meeting and other telemedicine-related seminars.
- Another product of this project will be the improved medical care to soldiers in a field-training environment. It is likely that this project will succeed in becoming a force-multiplier to deliver better health care to soldiers in the field. The key question involves its economic viability.

- Evaluation of T2P2 in a training environment will also be of interest.
- Deliverables will be made available to Tripler and delivering reports at medical meetings Army Medical Center and the Schofield Barracks Health Clinic as well as to Pohakuloa Training Area. Other interested parties will include Medical Research and Materiel Command, US Army Garrison, Hawaii, the 25<sup>th</sup> Infantry Division (Light), and the Theater Medical Information Program on the use of such systems at Echelons II and III. TRADOC may also use this information for the health care information management in training environments

The final deliverable, after all analyses are complete, will be the system itself. It is planned to turn this system over to Schofield Barracks Health Clinic (SBHC). SBHC administers PTA, and they would be the logical choice to oversee this system.