Comprehensive On-Line Referral for Critical Care (CORCC)

Background and Statement of the Problem

Transfer of critically ill patients over long distances is impractical, expensive, dangerous and frequently impossible due to the nature of illness. There are few critical care-trained specialists at overseas military medical facilities, which are frequently called upon to manage such patients. Telephonic consultation with board-certified critical care specialists at Medical centers is utilized to facilitate patient management at remote Military Treatment Facilities (MTFs), where specialty trained critical care physicians are not available. The information required to fully assess and treat such patients is complex, often difficult to verbalize, and varies minute to minute. Therefore the real-time or near-real time transfer of multimedia data to a consulting physician from a remote site would enhance the value and quality of such remote consultation. Potential benefits of such a program include decreased air evacuations, decreased ICU days and enhanced clinical outcomes. The data of particular value includes physiologic data such as EKG tracings; intravascular pressure tracings; ventilator waveforms, flow pressure; pulse oximetry waveforms and others. Non-physiologic data, which would also enhance consultation, includes digital imagery, such as, digital echocardiography and radiology and conventional laboratory data reports. Ideally, physicians and researchers should be able to access these data elements through personal computers from their offices, from their homes or even while on the road. It is envisioned that the system could query continuously acquired physiological data and update a database on all monitored parameters in data formats that can be remotely accessed for patient updates. This type of enhanced consultation is conceptualized as allowing patient presentation for the consultant as a provider at the bedside.

Naval Hospital Guam (NHG), a busy medical center in the Pacific, serves a population which includes the general active duty (USN, USAF, and USA) population, local Guamanian population, dependent and retired military population on the island. There are no critical care trained specialist assigned to NHG, despite a plethora of serious medical conditions, in patients presenting with critical illnesses. A six-bed critical care unit serves surgical, medical and pediatric patients. Medical staffing is by non-critical care trained internists, surgeons, family practitioners and pediatricians. NHG frequently refers consultations to TAMC either by MEDEVAC or by telephonic voice communication. Similar clinical situations exist in other DoD facilities located in the Pacific basin (Korea, Okinawa, Northern Japan).

Critically ill patients face great risks during air evacuation, if evacuation is possible. Improved data transmission to a critical care specialist may improve outcomes, prevent necessity for evacuation with attendant risks and costs, enhance care and improve the knowledge and skills of providers in the remote sites.

This telemedicine project will begin the investigation of the functional and technical feasibility of a teleconsultation for critically ill patients using near real-time transfer of physiologic and other data from ICU to ICU, using web-based technologies in the Pacific Rim. This service will be referred to as the Comprehensive On-line Referral for Critical Care (CORCC). This prototyping project will be conducted at Tripler Army Medical Center. It will establish the functional and technical requirements for a teleconsultation system, test a range of

solutions, design a prototype system and evaluate the quality and timeliness of the patient care data exchanged. In preparation for a follow-on demonstration between TAMC and NHG, evaluation metrics for analyzing costs, quality of care, length of stay, process improvements, provider satisfaction and distance learning opportunities will be developed and a technical and clinical concept of operations written.

Hypothesis

An advanced teleconsultation system for critical care can enhance the quality of patient care information exchanged between a remote provider and a critical care specialist and improve the overall management of the critically ill patient.

Research Questions

1. What types of critical care consultation are needed in the Pacific?
2. What are the essential data elements required for critical care consultation?
3. What are the functional requirements for a teleconsultation system for critical care?
4. What are the technical requirements to export physiologic data from standard ICU monitoring devices to a web-based teleconsultation system?
5. What are the telecommunication requirements to support a web-based teleconsultation system in the Pacific, in Oahu and between Guam and TAMC?
6. What are the data storage requirements for archiving data on a personal computer?
7. What COTS/GOTS solutions or other systems already exist to support the transfer of physiologic data using web-based technologies?
8. What is the quality of the data exchange, is it clinically relevant and does it arrive in a timely fashion?
9. What metrics would be needed to evaluate the impacts of teleconsultation for critical care?
10. What is the potential return on investment for implementing a teleconsultation system for critical care?

Project Description

This project will focus on the rigorous exploration of functional and technical requirements, the development of design specifications, the creation of partnerships with vendors and/or other institutions with prior experience in similar initiatives and system development and in-house testing at TAMC. In addition, evaluation metrics will be created for the collection of baseline data at NHG.

It is envisioned that a follow-on study would evolve testing the prototype solution between NHG and TAMC. This phase would focus on the quality and timeliness of data transfer from a remote location and uncover other challenges and issues associated with system performance, reliability and dependability over large distances and unpredictable telecommunications networks. A significant amount of attention would be given to clinician feedback on the acceptability of the user-interface and overall system performance.

Future Research Questions:

1. Does the quality of information exchanged between a remotely located provider and a critical care specialist improve, with the use of a web-based teleconsultation system?
2. Is the exchange of information from a remote location using a teleconsultation system timely?
3. Is this method of consultation acceptable and useful for providers?
4. Are the clinical knowledge and skills of remote providers improved?
5. What is the return on investment for implementing a teleconsultation system for critical care in the Pacific?

A full report will be published at the end of the first phase of this study. If the system is acceptable and outcomes seem positive, a proposal for further implementation and evaluation between TAMC and NHG will be submitted.

Proposed Project Timeline

- May 99- Hire Personnel
  Project Resource Allocation and Kick-off
  Milestone Review
- June/July 99- Develop Functional and Technical Requirements
  Conduct Market Surveys/Review the literature
  Meet with Vendors, other institutions
  Site Visit to Guam
  Develop a Plan of Approach
- Aug 99- Procure Equipment and Begin Baseline Data Collection in Guam
- Sept / Dec 99- Software Development/System Design
- Jan/Apr 00 Installation and Testing at TAMC
- May 00- Technical Demonstrations (In-house demo at TAMC)

Performance Objectives/Deliverables

- Quarterly Progress Reports
- Report of Findings/Lessons Learned
- Prototype Teleconsultation System for Critical Care
- Implementation Plan for TAMC/NHG