Annexure – 'C'

To TRF Matching Grant Application for TELEMEDICINE Project at Anadaman & Nicobar Islands.

Technology trends in telemedicine

Sushil Chandra

The concept of telemedicine was introduced more than 30 years ago through the use of telephone, facsimile machine, and slow-scan images. However, the enabling technology has grown considerably in the past decade. The term telemedicine, in short refers to the utilization of telecommunication technology for medical diagnosis, treatment and patient care.

Telemedicine enables a physician or specialist at one site to deliver health care, diagnose patients, give intra-operative assistance, provide therapy, or consult with another physician or paramedical personnel at a remote site. Telemedicine system consists of customized medical software integrated with computer hardware, along with medical diagnostic instruments connected to the commercial VSAT (Very Small Aperture Terminal) at each location or fibre optics.

Although, telemedicine could potentially affect all medical specialties, the greatest current applications are found in radiology, pathology, cardiology and medical education. Perhaps the greatest impact of telemedicine may be in fulfilling its promise to improve the quality, increase the efficiency, and expand the access of the healthcare delivery system to the rural population and developing countries.

Third-generation wireless cellular systems will offer video telephony that can facilitate the transfer of real-time images to help with communications between a patient or a caregiver and a health-care professional. Interestingly, this technology offers exactly the kind of cost effective solutions for the specific needs arise in rural area situation. Being cost effective, it opens an innovative way to connect rural areas to the cities that already have connectivity to the Internet or have resources available on LAN. Thus, it enables to bridge the digital divide and provides a channel for communication to the rural mass. It also makes it possible to get a timely feedback of the health problems taking place in remote areas. In situations of epidemic outbreaks such timely information can save a significant number of lives.

As wireless technology becomes more ubiquitous and affordable, applications such as video-telephony over POTS will gradually migrate towards third-generation wireless systems. These techniques promise to greatly improve the cost and convenience associated with long-term outpatient monitoring, and could potentially extend monitoring to the broader healthy population for preventative diagnostics and alerts.

Virtual reality as most of us are aware of is the ultimate simulation, like entering the rabbit hole in Alice in Wonderland.

Applications in virtual reality for medicine pertain to the planning of surgeries and use of data fusion, i.e., to fuse virtual patients onto real patients as navigation aid in surgery. While research into tele-surgery helps to jump-start robotics in the operating room, distant operations have remained an elusive application. However, it may eventually prove to be one of the most significant uses of robotic surgery.

Telemedicine in Defense

In early times, following a battle, the opposing forces retired or the day, leaving the surgeons to go to the battlefield and attend to the wounded. The focus of casualty care turned toward first aid with rapid evacuation to the surgeon and hospital, rather than upon immediate advanced medical care to the individual soldier. Regrettably, many soldiers did not arrive for treatment within this golden hour for trauma surgery. They never lived to receive the benefit of the sophisticated combat medical system in the rear echelons. Modern technology may make it possible to reduce mortality at the front lines by utilizing that golden hour and placing emphasis upon sending the surgeon back to the front lines in real time –- but with telepresence.

Medical efforts within the defense services show growing acceptance of telemedicine technologies. Surveying the leading edges of technology in remote sensing and medical informatics reveals an opportunity to fundamentally change the way battle-field casualty care is provided. The keys are remote monitoring of every soldier's location and vital signs with Personal Status Monitor (PSM) assistance at the casualty side to the medic from a remote physician with Telementoring, providing immediate surgical care on the battlefield with Telepresence surgery, monitoring en route therapeutics and transportation of casualties in a Trauma Pod, simulation of battle wounds for surgical practice and medical forces planning and training with virtual reality.

However, defense services place particular emphasis on encryption and other security measures for telemedicine. Computer based telemedicine systems for military or commercial customers can offer strong safeguards to keep unauthorized eyes and ears from sensitive information. Will the telemedicine practices that are novel for today's generation become routine for future active duty soldiers and veterans? The core technologies of medical informatics and networking are in existence today, but major commitment will be required to integrate them into a system for the medical battlefield of the coming century.

First application of telemedicine was made in disasters during the mid-1980s. Looking back provides perspective on what worked well and what did not and allows developers to extrapolate how telemedicine could evolve to meet future disaster needs. There are number of types of disasters such as earthquakes, nuclear/hazardous chemical accidents, civil disorder/riots, bomb threats/terrorist attacks, bio-wars etc. In such situations, the existing terrestrial infrastructure could be damaged. The space systems then suitably complement partly destroyed terrestrial infrastructure to answer the requirements of emergency healthcare services such as fast deployment of the management of logistic and medical means or remote medical expertise.

Ever since the December 13, 2002 attack at Parliament house, Delhi, September 11,2001 terrorist attacks in the USA and the spate of anthrax outbreaks there and elsewhere, the spectre of global terrorism has become more real. In recent times, the increasing threats to use biological weapons of mass destruction have triggered

off an urgent need to review current methods of disease surveillance. Some of the existing (or in the process of being developed) disease surveillance systems are as follows:

(a) Electronic Disease Reporting & Management System (EDRMS)
(b) Real-time Outbreak and Disease Surveillance (RODS)
(c) Lightweight Epidemiological Advanced Detection & Emergency Response system (LEADERS)

Moreover, there are endless numbers of bio-hazards, both naturally occurring and created, that can be found in rural areas. There are few teams trained in managing hazardous materials (HAZMAT teams). They are most often located in cities, where the sheer number of people makes it probabilistically more likely that they will be needed. The systems developed for disaster management are in charge of the victims search, identification and definition of evacuation priority level. They are equipped with portable telephone and PDA (Pocket Digital Assistant) for the transmission of the data locally recorded to the Permanent Centre or to the Mobile field Hospital (MFH) operators. First Medical Aid teams are equipped with a Portable Telemedicine Workstation (PTW) for recording & transmission of objective medical data (ECG, Heart rate, O2 saturation, Blood pressure) to the Permanent Centre or to the mobile field hospital. Such a hospital is deployed at disaster site to provide all activities related to co-ordination of mobile teams, victim's medical triage, first aid treatment and further medical expertise by videoconferencing between MFH & Reference Hospital.

Appropriate new telemedicine applications can improve future disaster medicine outcomes, based on lessons learned from a decade of civilian and military disaster (wide-area) telemedicine deployments. Emergency care providers must begin to plan effectively to utilize disaster-specific telemedicine applications to improve future outcomes.

As telemedicine technologies and processes gradually mature, the extent and breadth of medical specialties where telemedicine technologies could prove clinically useful should expand. Indeed, reports of telemedicine implementations are appearing in orthopedics, dermatology, psychiatry, oncology, neurology, pediatrics, internal medicine, ophthalmology and surgery.

The price of the underlying technologies for telemedicine is dropping, and so is the number of available specialist. Those trends, combined with the increased availability of telecommunications facilities, indicate that telemedicine will grow more common. As it becomes more routine, you will not hear the term 'telemedicine.'It won't be thought of as anything special.

(The author is scientist D, INMAS, Ministry of Defense)