

Medical evacuation training, Joint Guardian.



982 Signal Company (Alexander T. Rucke)

GOOD MEDICINE in Bad Places

By TIMOTHY D. KILVERT-JONES

The military has long realized the potential of telemedicine to impact on operational health care support. Initial research and development efforts, begun by the Army, established the Telemedicine and Advanced Technologies Research Center (TATRC) under the auspices of the U.S. Army Medical Research and Materiel Command. Today the Armed Forces field telemedicine teams in support of land, sea, and air operations worldwide, with TATRC and the Casualty Care Research Center also providing research, instruction, advice, and logistics to Federal agencies and various civilian health care organizations at home as well as abroad.

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New Requirements, New Capabilities

Expanding requirements for telemedicine reflect strategic priorities. Growing demands for medical support in a range of operations, often in austere environments, has accelerated the call for new technology. Like other sectors, the military needs increasingly timely, agile, and sophisticated health care to stay effective, operate within budget, and treat victims of conflict or natural disaster.

Telemedicine emerged in the 1990s as a means of enhancing health care for forces deployed apart from national or NATO infrastructure facilities associated with Cold War contingencies and permanent garrisons located in Europe and the Pacific. Small dispersed units operating far forward are characteristic of deployments today. Terrain, weather, enemy forces, and even minefields have isolated bases. Casualties, escorts, and medics are exposed to unnecessary

risk with conventional medical processes and evacuation techniques. Telemedicine communication architectures (in NATO protocols, among principle aid agencies, and within ad hoc coalitions) offer an alternative.

NATO-deployed forces usually have only generic medical support. They lack specialists or even senior doctors to cope with various injuries, diseases, and combat trauma patients. The British military tries to deploy the most experienced doctors into the field, enhancing the effectiveness of telemedicine architecture. Experienced and competent general surgeons are more able to respond to the directions of distant specialists in treating a broader range of casualties.

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Telemedicine Defined

Today technology is used to transmit medical information for diagnosis, therapy education, and data base development. This information may include medical images, live two-way audio and video, patient medical records, output data from medical devices, and sound files.

Two approaches are being developed. The first at the lower end, called store and forward, uses still or video images with attached medical notes that are forwarded to get a specialist second opinion, prepare a different medical site for receiving the casualty, and provide teaching material in an electronic medium. This approach has been refined in Kosovo by using a commercial carrier. In more benign environments telemedicine may involve live teleconferencing between patients and professionals, monitoring patient data from distant sites to clinics, or sending patient medical files from primary care providers or even first responders to specialists. This second and more sophisticated approach is not favored by deployed units because of cost and bandwidth limits on real time data transmission.

Not surprisingly the United States, which has given great impetus to the information based revolution in military affairs, has applied that technical vision, technological innovation, doctrinal adaptability, and organizational flexibility to military health care. The Armed Forces have emerged as the leader in both telemedicine research and application. Moreover, the technique is widely used throughout the national health care structure.

As the Air Force deputy for telemedicine and advanced technologies reported to Congress:

In deployment, the implications of telemedicine to health care delivery are dramatic, affecting readiness through training and wellness promotion, and operational efficiency as illustrated in Operation Joint Endeavor in Bosnia. The insertion of a teleradiology system changed the medical footprint and allowed x-ray interpretation to be conducted from afar. Through experience gained in military treatment facilities both overseas and at home, telemedicine technologies have begun to institute themselves into peacetime delivery of medical care.

The Department of Defense regards telemedicine as the convergence of technological advances in numerous fields including medicine, telecommunications, computer engineering, informatics, artificial intelligence, robotics, material science, and perceptual psychology. Admittedly broad that concept goes beyond the generally held notion that telemedicine is simply mitigating the tyranny of distance. It leverages myriad emerging technologies into the reengineering of health care practices.

In Britain the Defence Medical Services (DMS) hopes to soon issue the Surgeon General's Policy on Telemedicine. It has already created the DMS Telemedicine System to provide specialist advice on patient management to operationally deployed medical units. At present the system uses a digital camera to capture a clinical image which is transmitted with clinical notes via the Internet to the British Military Telemedicine Unit at the Royal Hospital Haslar. Satellite communications are used when telephone links are inadequate. Nine medical teams use the system worldwide.

Capability for the Future

Rapid technical and organizational advances have proved great enablers in providing good medicine in bad places. The potential of high-speed data and image transmission has increased and the cost of telecommunications technology is simultaneously falling. Telemedicine can assist not only the military but the health care community. Benefits include more flexible training of medical professionals and para-professionals. It will also enhance communications between providers and consumers and may help contain diseases or effects of chem-bio attacks by stimulating responses by Federal agencies and first responder medical units.

A technology transfer program has enabled several technologies devised for military health and logistics systems to be utilized by civilian health care providers. However, legal, regulatory, and financial barriers persist in telemedicine and telehealth. Apart from malpractice, licensure, and certification issues, contract and insurance laws



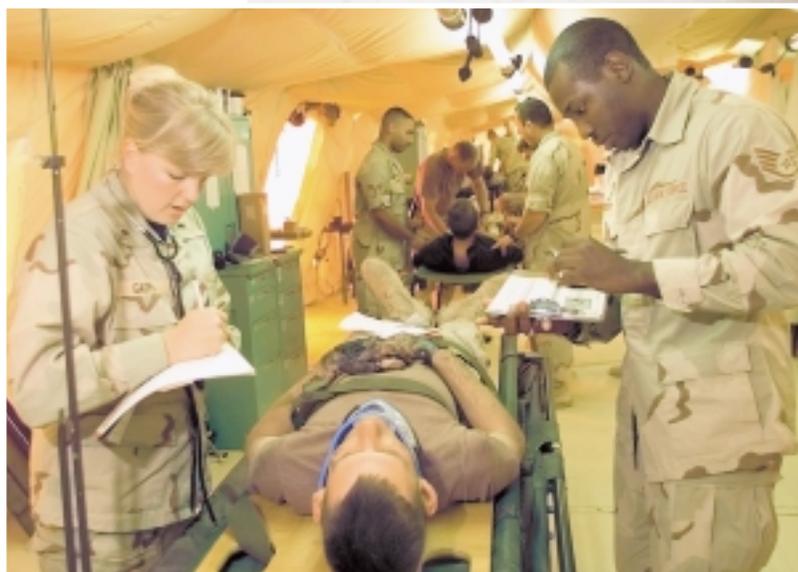
982² Signal Company (Willis G. Pelton)

Demonstrating telemedicine equipment.

Medical platoon arriving in Brdo, Kosovo.



55th Signal Company (Sean Terry)



1st Combat Camera Squadron (Jim Varhegyi)

Prioritizing patient care, Bright Star '99.

have not kept pace with the growth and application of technology to new fields of human activity. In addition, while information systems generally benefit from technical engineering developments, allies and even individual services lack a base of reliable and substantive networked health care information. Not only must they collate information into a standardized format; they also need affordable and reliable access to health information in all areas of emerging research, training, and health delivery.

Developing quality electronic content is paramount in the evolution and utilization of health informatics and telemedicine systems. Unless those in the military health care industry take charge of the content developed for dissemination over the Internet or in non-networked format, private enterprises which lack authentication and substantive knowledge will do it and do it poorly. Then there is a danger that a truncated version of health information, bits and bytes of care, will emerge. Equally important is the need to address security, protect the confidentiality of patient information, and provide operational security for the military. One can imagine an enemy monitoring the effect of a chemical or biological attack on a high-tech but vulnerable opponent. Electronic records are merely a first step in harnessing medical information. The search for a global (macro) solution has been an impediment to scaled interoperable applications that are useful safeguards and can be put in place today. Security protocols, which evolve into greater military and public assurance of privacy and



4th Combat Camera Squadron (Tolaydo Allen)

Joint medical staff,
Pacific Warrior '99.

confidentiality, will accelerate development of the existing knowledge base and utilization of telemedicine tools.

The U.S. Government, including DOD, is meeting health information and telemedicine challenges by developing uniform information systems and common encryption that cut across departmental and agency boundaries. However, many programs are still nascent, focusing on format and interoperability and not yet reaching the substantive content issues.

Creation of a viable repository of commercially available health care information, of use to practitioners and academicians all the way down to the average consumer, must start today. The National Library of Medicine has been electronically cataloguing a vast array of health materials

for several years but is only starting to make a dent in networking a massive archive, even though techniques such as data warehousing and

data mining proffer tools to achieve what once appeared to be impossible. Moreover, security software for encryption, authentication, and secure transfer of data exists in the form of virtual private networks and electronic data interchange. Partnerships with academic institutions, professional organizations, and health professionals will also be needed to develop a medical knowledge base and help consumers assess reliability and quality.

The challenge is resources. Medical acquisition staffs must harness a vast knowledge base electronically before it can be packaged for mass consumption. But it is no secret that academic medical centers are in trouble and medical research in general is suffering. Biomedical advances are struggling because of a lack of capital. Venture capitalists are pursuing Internet technologies with abandon, draining investments in medical research.

Reality Check

Telemedicine is not the panacea for either military health care or combat medical support. Wilder claims by its advocates have suggested that helmet cameras and two-way communications linked back to a field hospital from first responders (the combat medics) would substantially reduce combat fatalities. In reality only 5 percent of battlefield mortalities are salvageable, in general those from bleeding and chest wound categories. The critical issue is to identify and deploy technologies that can help rather than hinder combat medics.

Where telemedicine is appropriate is in the more benign environment out of the firing line. The U.S. Casualty Care Research Center studied effects of telemedicine on a battalion deployed in Macedonia. There was a 40 percent reduction in evacuations, with most emergency cases being quickly downgraded because of access to specialists in hospitals in Europe and the United States. This has significant implications: morale was high because a vast medical structure was backing up the troops and reduced evacuations had a concomitant effect on unit effectiveness. A similar study in the 7th Fleet in the Mediterranean found evacuations to mainland facilities reduced by 40 percent. Savings alone are considerable. The operational implications are also striking, because ships at sea can remain on task and maintain operational security as the communications bandwidth improves.

Telemedicine in Kosovo

The following case study taken from the archive telemedicine database being developed by the Casualty Care Research Center in Bethesda

came from a military hospital in Pristina, Kosovo. It highlights the need for an immediate review of how governments, relief agencies, and military organizations apply care in new world of disorders. Western powers must rationalize their efforts and create a more effective planning and execution process for telemedical assistance in conflicts, post-conflict reconstruction phases, and military operations other than war.

We as military doctors have come out here in the immediate aftermath of war. We came prepared for, and are coping alright with the acute trauma but we are not so prepared and have certainly not planned for the less acute but disabling injuries. My orthopaedic and other medical colleagues and I are daily being faced with such patients, who come of their own volition or with NGOs [non-government organizations] desperate for our help. We are repeatedly having to work on an ad hoc basis to try and find out how to organize medevacs for civilians, and we use our telemedicine satellite telephone to contact specialists we know back in U.K. who we think might be able to help. It is not just a matter of leaving it up to the NGOs or the government because it is glaringly evident the NGOs have not organized for this at all, so we are being faced with it. We as doctors are just as determined when patients come to find the best solutions for them. I have yet to meet one NGO who can show such a chain in action.

As an example, I am attaching a photo of one such patient, who had his right eye, maxilla, and nose blown off by a bullet whilst fleeing a massacre two months ago. On seeing him you will understand my wish to help him, and his desire to seek help. I used the Olympus C2000 loaned to me by Olympus to photograph his wound, and the Olympus C1400XL to photograph his x-rays, and then sent all the images via my telemedicine link to . . . a maxillofacial surgeon who specializes in reconstructive work at Leeds General Infirmary. . . . He has been galvanized by these images and accompanying clinical details into offering to help this patient—so he is now trying to get his [National Health Service] Trust to promise to fund the hospital stay and treatment. . . .

This has all been ad hoc and individually arranged. How much better it would be if preparation and planning at national level for these completely foreseeable war injuries had happened beforehand, so that we doctors could simply set a well-oiled chain in action for our patients.

Such cases are already daily occurrences in the United States, where the NEONET on the World Wide Web helps neonatal surgeons conduct active telemedicine with participating hospitals. That shared expertise is proving invaluable and is a lesson to all NGOs and governments.

The Way Ahead

Some NATO members favor benign roles in operational deployments. Their commitment to providing medical aid and combat service support functions can now be harnessed and focused. Under the leadership of NATO medical and information technology committees, a major step can be taken to establish an extensive medical and humanitarian aid database. Thus the Alliance could capitalize on the Internet revolution and telemedicine in the near term. As a former surgeon general commented in 1996, "Wherever you can put a telephone, you have the potential for telemedicine, you are expanding the doctor's office to the whole world." American and British telemedicine deployments in the Balkans and elsewhere have demonstrated the benefits of providing surgeons and medics with over-the-shoulder help from expert colleagues to offer diagnostic and therapeutic consultations. NATO must now address the issue and exploit synergies created by the innovative leadership of the United States and Great Britain.

Common NATO telemedicine policy will enhance equipment and software interoperability and further rationalize deployment programs scaled to the needs of particular operations. In five to eight years, most graduating military and general physicians, other health care professionals, and health technicians will be extremely computer and web literate. By then society will have calmed the hysteria of the information warfare gurus and mastered the potential of emerging technology. Commanders and policymakers must also be educated as to what telemedicine can and cannot do. This will allow the creation of a telemedical tool that will deliver better medicine in both good and bad places and meet the priorities identified by medical planners for Task Force Eagle that remain extant. Those priorities called for maintaining total patient-soldier accountability in real time from the first encounter with a physician; minimizing evacuations; providing rapid, definitive, world-class response to trauma; using specialty medical support from within the military health care system; and providing the medical leadership with an overview of all aspects to enable high-tempo medical support. **JFQ**



55th Signal Company (Gary A. Bryant)

Mobile medcam,
Roving Sands '97.