

Telemedicine and Information Technology for Disaster Medical Scenarios

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INTRODUCTION

Disasters constitute events which are catastrophic in nature. Such events critically threaten the health, safety, and lives of people and their environment (and even aspects of the global environment), and as a result, overwhelm the affected community's emergency response capacity. Globally, a major disaster occurs almost daily. Consequently, disaster events are virtually an everyday fact of life. Emergency medical services constitute one important aspect of disaster responses. Those populations affected by disasters require a complete range of health services and the appropriate mechanism of delivery. In this respect, increasingly, information technology is playing a greater role. Disaster medicine has become more than merely a mass-casualty, and affected health response; the affected population's needs are assessed, which range from medical requirements, to rapidly coordinating and providing casualty, routine, and preventive health services. These kinds of assessments are significantly more effective, given the appropriate deployment of current information technology.

There are three major time phases associated with disaster response (Patoli, 2005). In the Predisaster Phase, emphasis is placed on activities which address prevention and preparedness, which entail hazard and vulnerability assessments, human and material resource inventory, comprehensive planning, and exercises to test disaster and recovery plans, capabilities, and skills.

In the Disaster Relief Operations Phase (hours to weeks), assessment of damage and consequent recovery requirements, and the planning and implementation of emergency plans, have priority.

The Postdisaster Rehabilitation Phase may extend for months, or even years, as management, maintenance, and infrastructure, and various community activities are rehabilitated and restored.

Telemedicine can be integrated into all of the activities of medical disaster management. This article will explore the role of telemedicine in (medical) disaster management. The use of communications pathways—information technologies which include global positioning system (GPS) technologies, hypermedia, artificial intelligence, software and hardware for computer miniaturization, and advanced wireless sensor systems—in telemedicine will be discussed with respect to their advantages, disadvantages, and future potential.

WHAT IS TELEMEDICINE?

Scott (1996) indicates that telemedicine is “just a new label for applications of telecommunications and information technologies [applied to the area of medicine].” But more specifically, telemedicine can be defined as diagnosis, consultation, treatment, education, and the transfer of medical data (i.e., high resolution images, sounds, live video, and patient records) using interactive audiovisual and data communications (Jerant, Schlachta, Epperly, & Camp, 1998). What this means is that a physician located far from a reference center can consult his colleagues remotely in order to solve a difficult case, supplemented with continuing education course over the Internet, or by accessing medical information from digital libraries.

From Sunday and Pothier (2001), “telemedicine isn't a new medical specialty; it simply offers another

way to deliver existing services to people who can benefit from them no matter where they are.” Sunday and Pothier note that in the Telemedicine Report to U.S. Congress, 2001, telemedicine was defined as “the use of electronic communication and information technologies to provide or support clinical cases at a distance” (Sunday & Pothier, 2001). These same tools can also be used to facilitate exchanges between centers of medical expertise, at a national or international level (Geissbuhler, Ly, Lovis, & L’Haire, 2003).

In terms of its commonly understood sense, in which a doctor/patient interaction involves telecommunication, historically, this goes back at least to the use of ship-to-shore radio for giving medical advice to sea captains. A few years ago, the term “telemedicine” began to be supplanted by the term “telehealth,” which was thought to be more “politically correct,” but recently, this too has been overtaken by even more fashionable terms, such as “online health” and “ehealth.” (Wootton, 2001)

Telemedicine in Medical Disaster Management

As noted in brief in the Introduction, Patoli tells us (Patoli, 2005) that telemedicine in medical disaster management is divided into three areas. We will now explore those areas in more detail:

- **Phase 1: Predisaster Preparedness.** The first consideration is planning and development, and technological needs. In this planning stage, Patoli (2005) indicates there are six categories of information that are crucial: management, clinical, surveillance and epidemiological, literature in terms of documentation and reports, diagnostic knowledge, personal, and community knowledge. The second consideration is the human factor. Patoli (2005) indicates that the human factor is broken into four interrelated areas: management and administration of the telemedicine system, medical expertise and other health and medical activities, patients and telemedicine users, and e-training. Four more major areas for Phase 1 follow: databases, artificial intelligence, expert systems and decision support systems, geographical information systems, and research projects (Patoli, 2005).

- **Phase 2: Disaster Relief Operations.** In this phase, responses are activated as immediately as possible after the disaster is detected. The main areas in this phase are: robot assisted medical reachback, patient tracking systems, critical state patient’s telemonitoring through sensor devices, prehospital management through mobile technology, tediagnosics entailing both teleradiology and telepathology, clinical decision support systems, and finally, telesurgery and teleconsultation (Patoli, 2005).
- **Phase 3: Postdisaster Rehabilitation.** In this phase, many of the disaster victims live in camps and temporary shelters, suffering from depression and stress. The main areas in this phase are: telepsychiatric intervention, public health threats entailing early warning systems, disaster medicine, epidemiology, and telerehabilitation (Patoli, 2005).

APPLICATIONS OF TELEMEDICINE

To summarize from Tracy (2004):

Telehealth and telemedicine are becoming more and more engrained in the delivery of everyday healthcare, distance education and health care administration. Extensive numbers of patients in underserved areas are receiving services they may not have otherwise received without traveling great distances or overcoming other transportation barriers. Telemedicine services (from the youngest of patients to the frail elderly) range from primary care, to the highly specialized care found in leading academic medical centers. Telehealth systems can be found in hospitals, clinics, nursing homes, rehabilitation hospitals, homes, assisted living facilities, schools, prisons, or health departments. In fact, today you may find telehealth systems any place healthcare is provided. (Tracy, 2004)

TELEMEDICINE IN DISASTERS AND EMERGENCIES

Garshnek and Burkle (2000) very articulately sum up:

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