

Telemedicine in emergency home care—the 'Shahal' Experience

Arie Roth*, Ziv Carthy** and Michael Benedek**

*Intensive Cardiac Care Unit, Sourasky Medical Center, Tel Aviv, Israel;

**Shahal Medical Services Ltd., Tel Aviv, Israel

The following article was presented at the International Conference on Telemedicine and Telecare, London, UK, 13-14 November 1996:

Summary

Shahal serves over 36,000 cardiac, pulmonary, and blood pressure subscribers. The system combines emergency home care and telemedicine in a patient-initiated system geared toward the prevention of cardiac and pulmonary complications. About 150,000 calls are received per year. The median time from onset of symptoms to a call for help is 44 min. It is a unique system which has been shown to facilitate improved home health-care control, enabling patients to manage their own health condition and providing them with a higher quality of life and enhanced peace of mind.

Introduction

Telemedicine can be broadly defined as the use of telecommunication in an organized system to provide medical information and health care. While telemedicine systems, which are typically characterized by their particular application, have been in existence since the early 1960s, their evolution from being a research tool to being a practical tool for everyday use by physicians and other medical service personnel has only recently begun.

In most telemedicine applications, a certain amount of time is consumed while multidisciplinary inputs converge in order to reply to the needs of the remotely-located patients or form a link between one medical source and another. Unlike the majority of current telemedicine applications, Shahal¹ is a system in which the patient plays the primary role in setting the system in motion. Activation generally starts from home and medical information is used in realtime during any emergency, thus eliminating any undue waste of time. This redirection of the traditional focus from diagnosis to realtime intervention and prevention, and Shahal's emergency care orientation, make the system unique. This paper reports the effect of the Shahal system on home health-care control.

Methods

Shahal was founded in 1987 to provide efficient pre-hospital emergency medical care to its subscribers. It operates a monitoring centre staffed by intensive cardiac care unit (ICCU) nurses and physicians, and a fleet of mobile intensive care units (MICUs) staffed by physicians. Although dispatched from different locations throughout Israel, the MICUs are controlled by a single monitoring centre in Tel Aviv.

Upon joining Shahal, subscribers have a medical interview during which their medical record, including a 12-lead electrocardiogram (ECG) and personal details (such as place of residence, attending physician) are stored in a continuously updated computer at the monitoring centre. Subscribers carry with them a patient-operated device which enables them to transmit a complete 12-lead ECG via the telephone network (CardioBeeper 12L, Brunswick Biomedical Corporation, Marlboro, USA). They also carry an automatic intramuscular 300 mg lidocaine injector (LidoPen, Survival Technology Inc., Rockville, USA) for self-injection if instructed to do so by the centre.

Subscribers, who are encouraged to call the monitoring centre immediately upon recognition of any clinical symptoms, identify themselves by name or code number (i.e., telephone number), whereupon their personal medical file is displayed on a computer terminal. The nurse on-duty then engages in a questioning process while simultaneously receiving and recording the subscriber's ECG. Using the subscriber's self-described symptoms, computerized medical history, and the record of previous calls, the nurse acts as follows:

- (1) dispatch an MICU to the subscriber's location,
- (2) consult with a physician who is on-call at the monitoring centre, or
- (3) conclude the call by providing the subscriber with the appropriate advice and reassurance.

If the decision is made to dispatch an MICU to the subscriber's location, the emergency team (physician, paramedic, and driver-medic), monitored by a computerized command and control system, leaves immediately. The MICU, which is equipped with a mobile printer, receives the subscriber's medical file from the monitoring centre while en route to the scene. Upon arrival, the team initiates immediate treatment, including the administration of thrombolytic medication when necessary. Following treatment, the MICU staff may either leave the patient at home or transfer the patient to hospital. The monitoring centre may fax the subscriber's medical file to the emergency room (ER) for review prior to the arrival of the MICU. MICU staff may also provide ER personnel with the subscriber's medical file, ECG, and up-to-date treatment details in order to facilitate smooth entry to the hospital.

At the monitoring centre, each call is recorded for further review by the quality control team (Medical Director, Head Nurse, Operations Manager), and all case details (i.e. date and time of call, time from onset of symptoms, subscriber complaints, action taken by monitoring centre personnel) concerning the call are entered into the subscriber's medical file by the nurse on-duty. All decisions made by monitoring centre personnel are based on written guidelines and protocols prepared and updated by the Medical Director.

While the cardiac service is the principal telemedicine application, subscribers may elect to participate in other trans-telephonic monitoring programmes. Subscribers may acquire a personal emergency response system (distress button system) which facilitates instantaneous communication with the monitoring centre from anywhere in the home (Home Care Center, Shahal Medical Services Ltd., Tel Aviv, Israel); a unit for transmitting heart rate and blood pressure data from the home to the monitoring centre (TelePress, Shahal Medical Services Ltd., Tel Aviv, Israel); a unit for the measurement and transmission of relevant pneumological data from the home to the monitoring centre (TeleBreather, Shahal Medical Services Ltd., Tel Aviv, Israel); and a device which enables monitoring centre personnel remotely to unlock the door of a subscriber's home in order to permit the entry of the arriving MICU team (TeleDoor, Shahal Medical Services Ltd., Tel Aviv, Israel).

Results

Shahal serves over 36,000 subscribers ranging between the ages of 14 and 95. Fifty-five per cent of the subscribers are between the ages of 61 and 80 while 27% are between the ages of 41 and 60. The majority of the subscribers have a history of cardiac disease and their leading diagnosis is shown in Table 1.

Medical History	% of subscribers
Myocardial infarction	39.3
Angina pectoris	33.1
Congestive heart failure	1.1
Arrhythmias	23.8
Cardiac resuscitation	2.2
Heart surgery	9.2
Pacemaker	1.8
Coronary angioplasty	4.4
Other cardiac disorders	8.6
Coronary risk factors only	14.8
Healthy (no coronary risk factors)	19.4

The monitoring centre receives about 150,000 calls annually. Twenty-one percent of the calls result in the dispatch of an MICU, of which 46% result in transfer to hospital. Median subscriber 'decision time' (time from onset of symptoms to call for help) is 44 min., with 59% of subscribers calling within one hour and only 29% delaying their calls by more than three hours².

The Shahal system has had a beneficial effect on the level of subscriber anxiety. Results of an oral and written questionnaire from 1089 randomly selected subscribers revealed that 89% of those interviewed reported an improved level of self-confidence, with 54% of them claiming a remarkable improvement³.

Discussion

The Shahal system is a subscriber-initiated telemedicine system in which median 'decision time' has been maintained at 44 min. This may be attributed to the fact that the monitoring centre is open 24 hours a day and each subscriber's medical file is stored at the monitoring centre. Unlike callers to public emergency services, Shahal subscribers are calling to speak with professionals who have access to their updated medical history and personal details. A call to the monitoring centre, which may simply be for reassurance, does not often result in a subsequent transfer to hospital.

While the reduction of 'decision time' and the resultant preservation of myocardial tissue is an important achievement, no less important is the effect which the system has on the quality of life of its subscribers and their family members. Patients with a cardiac history or recognizable risk factors, are often anxious and uncertain whether their symptoms are related to an oncoming cardiac complication. Shahal's enhancement of subscriber self-confidence, as evidenced by the results of the 'self-confidence' study, demonstrates the system's value to subscribers.

While many calls to Shahal are made by individuals who do not require medical intervention, an important goal of the system is to educate subscribers to sound an alert early, facilitating the 'prevention' of oncoming attacks rather than only providing 'intervention' after the fact. Furthermore, the three levels of clinical screening (monitoring centre nurse, monitoring centre physician, MICU physician) may prevent hospital emergency rooms from being unnecessarily cluttered.

The Shahal system is a unique telemedicine application which combines a number of different levels of service to serve particular patient requirements. The MICUs provide patients who find themselves requiring emergency care with immediate treatment. Shahal's cardiac telemedicine application provides patients with an 'early warning' tool to identify and avoid oncoming emergency situations. Shahal's blood pressure and pulmonary test management telemedicine applications provide patients and their attending physicians with an effective tool for disease follow-up and management.

References

1. Roth A, Laniado S, Nebenzahl I, Vishlitzky V, Alroy Y, Kaplinsky E. Improved self-confidence in cardiac patients subscribed to a new medical emergency system. Proceedings of the 5th World Congress on Intensive and Critical Care Medicine, Kyoto, 3-8 September 1989. Amsterdam: Elsevier Science Publishers BV, 1990
2. Roth A, Herling M, Vishlitzky V. The impact of 'Shahal' (a new cardiac emergency service) on subscribers' requests for medical assistance: characteristics and distribution of calls. *European Heart Journal* 1995; 16: 129-33
3. Roth A, Kinan O, Vishlitzky V, Nebenzahl I, Laniado S, Kaplinsky E. Impact of Shahal (cardiac emergency services) on daily life of subscribers. *Harefuah (Journal of the Israeli Medical Association)* 1993; 125:7-8