Telecardiology – Close to the Heart, but Still out of Reach

Shaul Atar MD

Department of Cardiology, Western Galilee Hospital, Nahariya, affiliated to Faculty of Medicine, Bar-Ilan University, Ramat Gan, Israel

KEY WORDS: telecardiology, telemedicine, myocardial infarction, heart failure, arrhythmia

IMAJ 2011; 13: 496–497

The search for novel technologies that will enable the cardiologist to monitor, detect and treat heart disease from a distance seems to be an unending journey. Telecardiology is the ultimate effort to merge technology with cardiology in order to provide the patient with proper and accurate medical advice and medical care without interrupting his or her daily routine, while making the necessary information available for the consulting cardiologist as quickly and reliably as possible, thus alleviating the burden of clinic visits and unnecessary hospitalizations on the exhausted health systems [1,2]. During the last three decades, and most significantly the last decade, with the advent of Web-based applications, our potential ability to influence the natural course of events in cardiac patients in the ambulatory setting has led to a spate of clinical studies evaluating the feasibility, efficacy and cost-effectiveness of telecardiology.

In routine daily clinical practice, telecardiology is the 'bread and butter' of the cardiologist in either a hospital-based or community-based practice. Telephonic consultations, without seeing or examining the patient, with general practitioners, emergency department physicians or with fellow cardiologists are extremely common, creating a professional interface of possible hazardous clinical and medico-legal consequences for both the patient and the consulting cardiologist. Enabling the consulting cardiologist to receive as many objective and imaging data as possible, in real time, is the perfect scenario.

In this issue of *IMAJ*, Birati and Roth [3] review the latest data on the usefulness of telecardiology in various cardiac conditions. Although they focus on the Israeli experience and data, their article is most valuable for the questions and dilemmas it poses to the medical community and health systems worldwide. With the continuous reduction in post-myocardial infarction mortality and morbidity due to the routine use of primary percutaneous coronary intervention, statins, aspirin and clopidogrel [4], how many patients are truly at immediate high risk for severe life-threatening complications early post-MI? And should a telecardiology service be offered to every patient post-MI or to only a select few?

Improvement in survival can only be shown in a prospective randomized trial. But adequately sized randomized studies evaluating the role of telecardiology in post-MI patients are not yet available [5]. The most that can be said is that patients who subscribe to a telemonitoring service appear to have lower mortality than the general post-MI population, and this observation still requires prospective randomized validation in large-scale clinical trials.

Although telecardiology is still in its infancy, the data suggest that patients with congestive heart failure derive the greatest benefit from the current technology [6]. In CHF patients, it reduces mortality and hospitalizations, often through improved patient compliance to medical care. This was recently shown by a meta-analysis of 25 studies and 5 published abstracts by Inglis et al. [6]. Yet, questions still arise regarding this unique group, which consumes a great portion of the limited resources of health systems. If we take into account the increasing use, according to clinical guidelines, of current available technologies for prevention of sudden cardiac death (i.e., implantable cardiac defibrillators, cardiac resynchronization therapy, arrhythmia ablations, etc.) in CHF patients, specifically in those with reduced cardiac systolic function, then the need for online arrhythmia detection in patients who are at high risk of sudden cardiac death is significantly low. Nevertheless, in patients with implantable cardiac defibrillators and cardiac resynchronization therapy, wireless remote monitoring with automatic clinician alerts may still have a beneficial impact [7]. As compared with standard in-office follow-up, telemonitoring significantly reduced the time to a clinical decision in response to clinical events and was associated with a significant reduction in mean length of hospital stay [7].

There is a consensus that patients who can afford the telecardiology services have greater self-confidence, and as a consequence – improved quality of living. However, does telecardiology improve survival of cardiac patients and reduce morbidity in patients who cannot afford the service? It is well known that there is a linear correlation between socioeconomic class and mortality and morbidity from heart disease [8]. And even if we assume that telecardiology can potentially reduce morbidity and mortality in a variety of chronic cardiac conditions, how can it be applied to every patient in need, regardless of his or her

MI = myocardial infarction
CHF = congestive heart failure

socioeconomic status or the availability of a medical facility nearby? [9,10].

The widespread implementation of telecardiology needs further consideration and assessment in large-scale, long-term, randomized clinical trials. While telecardiology is being widely applied, there is still limited good quality evidence of its benefits to health care. Success in establishing the feasibility of telecardiology applications is currently offset by a failure to obtain convincing data on its effect on health outcomes and on their cost-effectiveness. To further complicate the issue, there is great variation in the cost of living and of provision of health services from country to country worldwide. Establishing the infrastructure in a given country may pose a significant burden on its economy, without any significant evidence that such an investment is cost-effective. Moreover, if a country does create such an infrastructure, it would have to estimate the charges to the subscriber that would make it economically sound for the provider and, at the same time, feasible for the average subscriber.

Nonetheless, despite these obstacles, telecardiology is here to stay. Continuous efforts are being made worldwide to increase its technological abilities and to identify the patients who may derive the greatest benefit from the technology. Currently, the HeartCycle project, for example, is developing technologies and services to facilitate the remote management of patients, motivate them to comply with treatment regimens and adopt a beneficial lifestyle [11]. The result will be a personalized care system utilizing new technology that will include 'smart' clothes with textile sensors, patient interaction software, and more. A 'smart bed', for example, that monitors electrocardiography, blood pressure, heart rate, respiration and activity, is being developed. The data will be transmitted online to a monitoring center to allow the initiation of immediate medical response, either by phone or by a medical on-call team. Moreover, in the near future, telecardiology may become the preferred method of care and surveillance for long-term cardiac conditions; as stated by John Cleland: "a revolution that may well be as seismic for healthcare as the industrial revolution was to Western countries 200 years ago" [12]. When and how this revolution will occur is unclear, but it will be driven by the increasing number of patients with chronic conditions because of the triad of earlier diagnosis, longer survival after diagnosis, and population aging.

The important review paper by Birati and Roth in this issue of the journal [3] should be used as a call for action. A call for action to the emergency medical services to acquire a technology that is capable of transmitting the 12-lead ECG from the ambulance or the patient's home to the admitting hospital in order to expedite provision of primary percutaneous coronary intervention in a timely manner, according to the guidelines. A call for action to the Ministry of Health and hospital managements to create a telecardiology system for real-time consultation between rural or community hospitals and cardiac surgeons in centers of expertise, for improved decision-making in emergency situations. A call for action to the biotechnology industry together with health economy decision-makers and government officials to seek new options and opportunities and apply the revolution of telecardiology to larger portions of the population, making it not only feasible for a few patients but also reachable and affordable for those truly in need. And a call for action to researchers to perform large-scale randomized clinical trials that will convince the medical community that telecardiology is the next medical revolution.

Corresponding author:
Dr. S. Atar
Dept. of Cardiology, Western Galilee Hospital, Nahariya 22100, Israel
Phone: (972-4) 910-7273
Fax: (972-4) 910-7438
email: shaul.atar@naharia.health.gov.il

References

1. Backman W, Bendel D, Rakhit R. The telecardiology revolution: improving the management of cardiac disease in primary care. *J R Soc Med* 2010; 103: 442-6.
2. Boriani G, Diemberger I, Martignani C, et al. Telecardiology and remote monitoring of implanted electrical devices: the potential for fresh clinical care perspectives. *J Gen Intern Med* 2008; 23 (Suppl 1): 73-7.
3. Birati E, Roth A. Telecardiology. *IMAJ Isr Med Assoc J* 2011; 13: 498-503.
4. McManus DD, Gore J, Yarzebski J, et al. Recent trends in the incidence, treatment, and outcomes of patients with STEMI and NSTEMI. *Am J Med* 2011; 124: 40-7.
5. Hailey D, Ohinmaa A, Roine R. Published evidence on the success of telecardiology: a mixed record. *J Telemed Telecare* 2004; 10 (Suppl 1): 36-8.
6. Inglis SC, Clark RA, McAlister FA, el al. Structured telephone support or telemonitoring programs for patients with chronic heart failure. *Cochrane Database Syst Rev* 2010; 8: CD007228.
7. Crossley GH, Boyle A, Vitense H, et al. The CONNECT (Clinical Evaluation of Remote Notification to Reduce Time to Clinical Decision) trial. The value of wireless remote monitoring with automatic clinician alerts. *J Am Coll Cardiol* 2011; 57: 1181-9.
8. Chang WC, Kaul P, Westerhout CM, et al. Effects of socioeconomic status on mortality after acute myocardial infarction. *Am J Med* 2007; 120: 33-9.
9. Mortara A, Pinna GD, Johnson P, et al. Home telemonitoring in heart failure patients: the HHH study (Home or Hospital in Heart Failure). *Eur J Heart Fail* 2009; 11: 312-18.
10. Dar O, Riley J, Chapman C, et al. A randomized trial of home telemonitoring in a typical elderly heart failure population in North West London: results of the Home-HF study. *Eur J Heart Fail* 2009; 11: 319-25.
11. Reiter H. HeartCycle: beyond building demonstrators. A structured approach to develop, implement and validate healthcare innovations in telemonitoring. *Conf Proc EMBC* 2010; 1: 6847-9.
12. Cleland JG, Lewinter C, Goode KM. Telemonitoring for heart failure: the only feasible option for good universal care? *Eur J Heart Fail* 2009; 11: 227-8.

"Our scientific power has outrun our spiritual power: we have guided missiles and misguided men"

Martin Luther King Jr. (1929-1968), American clergyman, activist and prominent leader in the African-American Civil Rights Movement. Using non-violent methods following the teachings of Mahatma Gandhi, King is considered a heroic leader in the history of modern American liberalism