Telemonitoring for patients with heart failure

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There is increasing evidence that remotely monitoring patients with heart failure using information technology can help improve outcomes and quality of care. Integrating such telemonitoring into existing health care practice is challenging. The technology used varies from simple to complex, although the transmission of the data to the health care team is straightforward. The best method of displaying the data is yet to be determined, as is the best combination of variables to monitor. Patient acceptability is rarely a problem, but reimbursement of the costs associated with telemonitoring is often a barrier to implementation.

Multidisciplinary programs have been developed to optimize the management of chronic conditions such as heart failure. Such programs are often coordinated by a nurse specializing in secondary care. These practitioners provide education to facilitate self-care (including self-monitoring), ensure appropriate dosages for drug therapy and facilitate collaboration within the multiprofessional team. Results from randomized controlled trials have shown that these programs reduce the risks of death and admission to hospital as compared with the traditional approach to managing disease.[1] These programs are also recommended in international guidelines.[2,3]

Patients with heart failure are often elderly, have decreased mobility and have less social support. This can make clinic attendance difficult. Local review by the family doctor may be more convenient, but the primary care team may lack the specialist knowledge and experience to optimally monitor heart failure. Home visits by a specialist nurse are helpful but expensive, and few health care systems can provide this service for any length of time.

Telehealth ("health care at a distance") has the potential to improve access to high-quality disease management, and telemonitoring has developed rapidly over the past decade.[4]

There are several types of remote monitoring, ranging from simple to complex. In the simplest model, a patient receives support from a health care professional over the telephone. The patient monitors his or her symptoms and weight and reports these during a structured telephone call. This form of remote monitoring is usually incorporated into a more formal program for the management of a chronic disease.

Moving up the scale of complexity is patient-initiated electronic monitoring with the transfer of physiologic data and a record of symptoms by telephone or broadband Internet connection from the patient's home to the health care professional. On reviewing the data, the health care professional can contact the patient to request further information before making a decision about disease management.

Finally, implanted monitoring devices transmit data wirelessly from the patient to a unit that is connected to a telephone or the Internet. Once again, if the data raise concern, the health care professional can contact the patient to request further information before making a decision about care.

The signs and symptoms of deterioration in heart failure are typically increasing fluid retention, breathlessness and effort intolerance. For many patients, but not all, the deterioration of their condition is gradual, so decompensation can be detected.

No single variable has yet been identified that is simple and convenient to measure, reproducible, sensitive and specific, and subject to change quickly enough to act as an early warning of deterioration. Health care professionals must rely on measurements from several variables in practice.

Some telemonitoring systems ask the patient questions about a range of symptoms that are useful in identifying whether the patient's condition is worsening, particularly when the responses are combined with daily monitoring of the patient's weight. Blood pressure and heart rate can also easily be monitored remotely. A recent Cochrane

Key points

- Meta-analysis of randomized trials of telemonitoring in heart failure has shown a reduction in admission to hospital and risk of death compared with usual care.
- The technology used to remotely monitor patients ranges from simple communication by telephone to more complex devices that transmit data from the patient to the health care professional over broadband Internet connections.
- The educational needs of patients and health care professionals, the locus of responsibility for decision-making and the local structure of health care each need to be considered before telemonitoring can be integrated into the clinical pathway of care.

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review of randomized controlled trials of several approaches to telemonitoring suggested a large clinical benefit: a 34% reduction in mortality and a 21% reduction in admission to hospital for heart failure compared with usual care.[5] Less reliance should be placed on numerous small nonrandomized studies in the published literature, where biases might tend toward overestimations of the benefits of telemonitoring.

Device-based therapies are increasingly common among patients with heart failure. Implantable defibrillators and cardiac resynchronization devices are able to monitor many physiologic variables. These variables can be combined with noninvasive measurements of blood pressure, weight and symptom control, if desired. Sensors are available for monitoring transthoracic impedance (falling impedance suggests an increase in intrathoracic fluid), pressure in the right ventricular and pulmonary arteries or in the left atrium, heart rhythm and heart rate, variability in heart rate and mean daily physical activity. Small studies suggest reasonable utility for the early detection of decompensation; however, it is possible that false-positive alerts or health care professionals unfamiliar with the dynamic nature of these variables could trigger unneccessary health care activity. Recent evidence from a larger randomized controlled trial of implanted devices that monitor pressure in the pulmonary artery, which involved patients with moderately severe symptoms, suggested a 30% reduction in admission to hospital for heart failure at six months.[6] A similar effect size (albeit statistically nonsignificant) was seen in an earlier study that indirectly estimated pressure in the pulmonary artery in advanced heart failure.[7]

Increasingly, commercial platforms integrate information from multiple variables to provide a "risk indicator" for the health care professional, allowing them to triage patients according to level of risk. This prevents health care professionals being inundated with data and assists them in accurately identifying patients who require immediate attention.

Not all patients will require continuous remote monitoring. Most programs have focused on patients at higher risk — particularly those patients who have recently been admitted to hospital or who have severe symptoms.

Health care professionals involved in the remote monitoring of patients should receive adequate support. This support includes education in several areas, including the disease being monitored, how to interact with data rather than with a patient and when to contact the patient for further assessment. The professional can then decide which action(s) to take: providing reassurance, reinforcing lifestyle advice, adjusting drug dosages (particularly diuretics) or arranging for clinical review in primary or secondary care.

The safe and reliable functioning of the monitoring equipment and data transmission is rarely problematic — what is more difficult is training the health care team to integrate remote monitoring into the disease management program. Different models will work in different areas: in some settings, the monitoring is done locally by interested and skilled members of the primary care team; in other areas, the initial triage of data is done at a "call centre." The evidence base for this latter approach is limited and requires strengthening. As for all clinical issues, it is important to have clear policies on who deals with the information, what actions they can take, where the information flows and what training is provided.

Many health care systems pay for patients to be admitted to hospital or for face-to-face clinical review, but they do not easily refund the costs of remote monitoring. More robust evidence of the clinical and cost benefits associated with the integration of telemonitoring into a coordinated approach to the treatment of heart failure is urgently required and would help facilitate funding.

Although remote access to data and expertise in health care has taken some time to get off the ground, this is likely to change rapidly in the coming decade — at least for patients with heart failure.

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