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Reference


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Is There a Future for Remote Cardiac Implantable Electronic Device Management?

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Abstract
In the era of communication technology, remote monitoring has been a paradigm shift in the way patients with cardiac implantable electronic devices are managed. It has been endorsed by scientific societies and is being increasingly adopted in the clinical setting. Despite the various advantages associated with this strategy, data on improved clinical outcome are still sparse. The recently published study on the remote management of heart failure using implanted devices and formalised follow-up procedures, which turned out to be negative, has cast doubt on whether remote monitoring should still be used. This article provides a critical appraisal of the study, and discusses the issue of remote data management.

Keywords
Remote monitoring, cardiac implantable electronic devices, implantable cardioverter defibrillator, cardiac resynchronisation therapy

Remote follow-up and monitoring of patients implanted with cardiac implantable electronic devices (CIEDs) has been introduced over a decade ago, and is now indicated according to European (class IIa indication) and American (class I indication) guidelines. There have been high expectations that this technology will improve patient outcome, as it significantly shortens response to actionable events (e.g. AF) compared with standard in-office follow-up. However, several randomised trials have failed to meet this promise.

In any process aiming to improve patient outcome, three fundamental factors are implicated: 1) availability of good data, 2) proper interpretation of these data and 3) generation of meaningful action. This is certainly higher towards the end of patient enrolment. Only 226 (0.3 %) transmissions resulted in medication change by the monitor and only 910 (1.1 %) resulted in the patient being advised to seek medical attention. Therefore, very few actions resulted from transmissions in the remote management group.

Second, this was not a study randomising remote device management with standard in-office care, as patients in the control group could be remotely monitored (except to manage heart failure). Third, the active group required weekly transmissions to be actively performed by the patients, with almost 40 % of patients transmitting <75 % of the time at 2 years. This is in contrast to automatic pre-defined alerts, which are the usual form of remote management, and that achieve successful transmissions in >90 % of the time.

The key to improving outcome with remote CIED management lies most probably in data management. Triage of alerts into actionable events (e.g. transthoracic impedance, heart rate variability etc.). This is probably one of the reasons why so little action was taken. For the reasons detailed above, it is not surprising that the study was negative. The key to improving outcome with remote CIED management lies most probably in data management. Triage of alerts into actionable events is probably one of the reasons why so little action was taken.
risk categories enables healthcare personnel to focus attention on those patients who are most likely to require medical intervention, thereby avoiding clinical deterioration. Cowie (who is also the last author of REM-HF) and collaborators devised the Medtronic “Heart Failure Risk Status” score based on an automatic algorithm that combines data extracted from remote monitoring transmissions (on intrathoracic impedance, nocturnal heart rate, heart rate variability, daily activity and arrhythmic events), to stratify patients into high, medium and low risk. Patients with a high risk score had a significant six-fold increased likelihood of being admitted for heart failure in the following month compared with those with a low risk score. These findings were later confirmed in independent cohorts from the Resynchronization-Defibrillation for Ambulatory Cardiac Heart Failure Trial (RAFT) and Monitoring Resynchronization Devices And Cardiac Patients (MORE-CARE) trials. Of note, the proportion of high-risk alerts was 10% in all three reports, underlining the potential not only for improving data interpretation using integrated diagnostics, but also for facilitating data triage. Other devices companies are also working on risk stratification tools. In the Multisensor Chronic Evaluation In Ambulatory Heart Failure Patients (MultiSENSE) study, an algorithm by Boston Scientific combining different parameters (heart sounds, respiration, thoracic impedance, heart rate, and activity) showed promising results for predicting heart failure events. Algorithms from other companies using fewer parameters such as transthoracic impedance only or minute ventilation combined with daily activity were less predictive, and response to data that are non-specific may even result in inappropriate treatment that is harmful. It nevertheless remains to be proven by randomised trials that the use of risk-stratification algorithms leads to improved patient outcomes.

Beyond improvement in patient outcome, remote CIED management is a matter of convenience, both for patients as well as for caregivers. It reduces healthcare utilisation and is invaluable for monitoring device function. Furthermore, it allows generation of large amounts of data for scientific research and quality control (e.g. lead survival and device longevity for manufacturer product performance reports).

In conclusion, the results of REM-HF merely show that remote CIED management should not be performed by weekly manual transmissions, which are cumbersome for the patient and lead to data overflow for device clinics, without any improvement in patient outcome. Modern-day technology allows more streamlined solutions, which continue to evolve. Without any doubt, remote CIED patient management is not only here to stay, but will continue to grow.