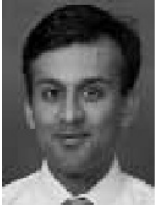


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### Report on Remote Monitoring for Cardiology



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**Over the past 12 months, there has been a rapid and widespread introduction of remote monitoring systems by most manufacturers of implantable cardiac devices. While there are differences in these systems, the underlying premise and benefits to patients and healthcare providers are similar.**

For many years, there have been remote transtelephonic systems to assess pacemaker battery life, but the new generation of remote monitoring systems are more powerful, both in terms of diagnostic information from the device and information about the patient's disease process. Current systems can provide the same information that can be obtained in an in office visit, with the exception of pacing thresholds.

#### **Why Use Remote Monitoring Systems?**

Remote monitoring has numerous benefits. First, patients will not have to be seen in the office as frequently, in some cases, saving 3 - 4 trips to the physician per year. This increases patient satisfaction, time savings, cost savings to the patient and easier follow-up. This is particularly useful for patients that travel extensively in the US and for "snowbirds" who reside away from their primary residence for part of the year, yet want continuity of care with their primary device clinic.

Despite these advantages, some patient barriers do exist. Patients worry they will lose contact with their physician with fewer face-to-face visits. These fears are easily addressed by the fact that the patient will still have as much or more contact with the physician over the phone, and more frequent interrogations when needed. With the recent device company recalls and advisories, remote monitoring is a way for clinicians to follow patients closely and offer security to patients that are fearful of the implications of these advisories on their health.

#### **Remote Monitoring Addresses Capacity Concerns for Clinics**

A second beneficiary of remote monitoring is the clinician and Arrhythmia Device Clinic. With the rapid increase in device implantation, many clinics are dealing with capacity concerns. Remote monitoring will decrease the frequency of in-office visits over time, freeing up the staff to perform other duties. By converting patients to remote monitoring, a clinic can take advantage of batch processing. One can schedule all the remote monitoring patient follow-ups to occur on a particular day or days, thus making clinic staffing more predictable.

For example, in our clinic, we have designated two days of the week for remote monitoring. Thus, we can download a large volume of data at these times, and provide analysis at some time thereafter. By allowing for controlled use of one's time, planning a day's activities can be made easier. Nurses that perform other duties (EP lab, etc.) can perform those duties and remote monitoring tasks at other times of the day, in between cases, early in the day, or when downtime occurs. Additionally, remote monitoring can reduce the number of emergency department visits for both appropriate and inappropriate device therapies, with both physician and nurse being able to evaluate the therapy from their office or home.

#### **Increasing Clinic Coverage**

This efficiency also applies to the physician managing a busy device clinic. Balancing the need to do cases and provide coverage for a clinic can be a daunting task. With remote monitoring and fewer in-office visits, a physician can devote more time to other tasks, and yet still monitor patients closely by over reading remote monitoring interrogations later in the day or during downtime. Over time, the adoption of remote monitoring will decrease office visits, increase remote monitoring visits and increase nurse and physician efficiency.

Finally, remote monitoring opens a new frontier of disease management and database analysis. With advances in sensor technologies and heart rate data, information is available that can help manage disease processes such as congestive heart failure or even predict decompensation. This helps prevent hospitalisations or clinical events. In database management, data accumulated by remote monitoring can be queried for early signs of issues with leads or devices.

#### **Our Clinic's Experience with Remote Monitoring Adoption**

Our clinic began using Guidant's LATITUDE remote monitoring system in the spring of 2006 and the Medtronic Care link system in the spring of

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2007. We currently have over 350 patients in these systems. As a busy urban tertiary care academic centre, our device clinic volume has seen dramatic increases. In addition, our nursing staff are cross trained and run both the device clinic as well as our busy inpatient electrophysiology laboratory. Thus, as our volume of implants increased, driving up our device clinic visits, our staff was affected both on the inpatient and outpatient side. Device clinic follow-up days were full and often double-booked. In addition, wait times for visits were increasing.

As with any new technology, there was a learning curve for remote monitoring. Initially, there were issues regarding technology, patient enrolment, patient interrogations and downloading data. There were frustrations with the technology that soon yielded to the increased efficiencies that the technology promised. Using two dedicated days for remote monitoring, slowly the number of in office visits decreased. Given the large volume of our clinic, it may be some time before every patient is on remote monitoring, but the benefits grow with each passing month. We have seen a decrease in wait times for the clinic and less double booking of clinic days.

We have already seen several examples of successes of remote monitoring. These have included numerous evaluations of patients with appropriate ICD discharges that could be reassured that their device functioned properly. Several others have had "phantom shocks", which allowed our staff to reassure the patient that their device had not discharged. Patients who were started on antiarrhythmic medications have been followed remotely to assess response to medications.

We have also avoided re-operation and repositioning of leads by remotely intensifying follow-up, of patients who had early post-operative changes in sensing.

Finally, trending of lead and battery data have identified battery depletions, lead dislodgements, left ventricular lead issues, silent atrial arrhythmias and lead fractures. These are examples of issues that were identified before a clinical event or an office visit.

#### **DECODE Trial**

As part of our desire to adopt remote monitoring in a multidisciplinary manner, we were eager to be involved in the DECODE (DECOmpensation Detection Study) trial, sponsored by Guidant Corporation (now Boston Scientific). We recognised that even though there is tremendous power in device management with remote monitoring, the true holy grail is disease management. Can remote monitoring alter the outcomes of congestive heart failure in patients implanted with a cardiac resynchronisation therapy (CRT) device?

The objectives of the study are to develop and test algorithm-based early detection of heart failure events and to develop and test an index of heart failure risk. This will be achieved by acquiring data from the LATITUDE system of remote monitoring by Guidant. Information collected included: activity logs, heart rate variability, programmed parameter values, arrhythmia logbook, therapy history, histograms, paced/sensed counters and lead impedances. In addition, patients will answer a heart failure questionnaire, record their daily weights and be contacted periodically to document heart failure clinical events.

#### **Conclusion**

Remote monitoring has reached mainstream practice for many reasons. It offers patients the security of closer device follow up and more convenience without sacrificing thorough physician involvement. Remote monitoring promises to make device clinics and physicians more efficient while continuing to provide high quality and thoughtful care to their patients. This will allow the clinic to run more smoothly, offer better time management of staff and physicians and provide more timely evaluation of patients with shocks or potential device malfunctions. Finally, remote monitoring promises to open a door into the future with disease management tools that will hopefully prevent hospitalisations and improve patient outcomes.

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