Establishing a Remote Monitoring Program

Martha Ferrara, FNP
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What is Remote Monitoring?

Martha Ferrara, FNP, CCDS
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CIED Timeline:
Cardiovascular Implantable Electronic Devices

1952
Dr. Paul M. Zoll
Helped develop the first successful cardiac pacemaker

1958
Arne Larsson
First PPM recipient

1966
Dr. Mirowski
ICD Conception

1980
First ICD Human Implant

1985
First Approved ICD Device

1997
First ICD Dual Chamber

In-Office Checks Q 3 months
Device Follow-up: In the clinic

In clinic follow-up:

- Use programmer
- Test lead systems
- Check battery status
- Collect stored information
- Adjust parameters as needed
CIEDs Follow-Up Economics

1. In the U.S.A. in 2007:
   - PPM follow-up visits: estimated 1.6 million.
   - ICD follow-up visits: estimated 2.1 million.
   - These in-office visits are mostly normal and no changes are needed.
   - This causes a significant burden on the cardiovascular workforce and
   - Contributes to increasing health-care costs.

Pioneers & Timeline in Remote Monitoring:

2001
- Biotronik CardioMessenger
  Approved by FDA

2003
- Biotronik First Internet-Based Home Monitoring

2005
- Medtronic Carelink
  Approved by FDA

2006
- CMS reimburses Remote monitoring Evaluations/checks

2007
- St. Jude Medical Merlin approved by FDA

2008
- HRS/EHRA Expert Consensus on the Monitoring of Cardiovascular Implantable Electronic Devices (CIEDs): Description of Techniques, Indications, Personnel, Frequency and Ethical Considerations

2011
- Biotronik HF Diagnostic Monitoring

2008
- HRS/EHRA Expert Consensus on the Monitoring of Cardiovascular Implantable Electronic Devices (CIEDs): Description of Techniques, Indications, Personnel, Frequency and Ethical Considerations

St. Jude Medical HF Diagnostic Monitoring-Cor-Vue

Schematic Remote Monitoring Set-Up

Integration of other home monitoring systems

Blood pressure
Weight
Digital pillbox

Patient

Remote transmitter

Central database

Physician office

Transmission feedback

Remote programming

Configuration change

Configuration change

Phone

RF telemetry

Cellular network

Internet

Phone line

Internet

Fax

SMS

Phone

Automated analysis

Roka, A & Schoenfeld, M. J Inno CRM 2011
Benefits of Remote Monitoring

**Early Identification**
- Atrial Fibrillation
- Ventricular Tachycardia
- Heart Failure Progression
- Loss of CRT Therapy\(^1\)

**Clinical Action**
- Anticoagulation
- Cardioversion
- Ablation
- Device reprogramming
- Ablation
- Office visit
- Medication
- Electronic Repositioning™

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\(^1\) Nesbitt, W., HRS Guidelines and the use of remote patient monitoring: alignment to help enhance patient care. EP Lab Digest. 2007:7(1);17–18.
PREFER Trial 2009\(^1\) : Clinical Benefits of Remote Versus Transtelephonic Monitoring of Implanted Pacemakers

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<thead>
<tr>
<th></th>
<th>CareLink (n=602)</th>
<th>TTM (n=295)</th>
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<tr>
<td>Patients with Events</td>
<td>45% (271)</td>
<td>37.6% (111)</td>
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The number of clinically actionable events (CAEs) by their source. The number of CAEs discovered by transtelephonic monitoring (TTM) per year in the TTM arm was very small (0.01).

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<th>Clinical Trial/Study</th>
<th>Key Data</th>
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| **TRUST**            | - Time from onset to evaluation: 1 day in HM group vs. 35.5 days in control group (>34 days gained) for arrhythmias  
                          - 81% of clinically relevant device-related events were detected via HM alert notifications  
                          - Median daily transmission success per patient was >90% |
| 1,450 pts. enrolled; 1,339 pts. analyzed  
  Followed up to 15 months |          |
| **COMPAS**           | - 75% reduction in hospitalization for device related adverse events  
                          - 66% reduction in hospitalization for atrial arrhythmia and related stroke |
| 538 pts.  
  18-month follow-up |          |
| **ECOST**            | - HM significantly reduces the rate of patients with inappropriate shocks by 52% and related hospitalizations by 72%  
                          - HM is associated with a 76% reduction in the number of charged shocks, which had a significant positive impact on battery longevity |
| 433 pts.  
  Mean follow-up 27 ± 7 mo. |          |

Varma N et al. *Circulation* 2010; 122: 325-332


ESC 2011
Impact on Survival

Saxon LA et al. Circulation 2010 122: 2359-2367

ICD Networked
CRT Networked
ICD Non-Networked
CRT Non-Networked

Survival

Years From Implant

ICD
CRT-D

HR
0.57
0.67

95% CI
(0.545 - 0.593)
(0.643 - 0.689)

p-value
<.0001
<.0001

39 546
30 010
68 481
47 741
Medtronic Carelink Transmissions

08/20/2010

Active patients 174,531

Potential patients 265,024

Penetration rate 65.85%

Movsowitz C, Mittal C. JICE 2011; 31: 81-90
Barriers to Remote Monitoring

- **Technology**: 40%
- **Remote Monitoring vs Follow-Up**: 31%
- **Cardiologist**: 13%
- **Not necessary**: 11%
- **Language**: 5%
Movsowitz C, Mittal C. *JICE* 2011; 31: 81-90
More Information...Not less Work:
Impact on AHP Workflow

- In-clinic: follow up and data entry post patient check 2%
- Remote: triage and review txs 20%
- In-clinic: follow up for missed appts (2%)
- Clinic Billing 8%
- Tilts 7%
- Remote: follow up for missed appts 7%

In-clinic: time with patients 55%
PA Pressure Sensors
LA Pressure Sensors

- Lead
- Sensor
- Coil Antenna
- Proximal Anchor
- Distal Anchor
- Sensor Diaphragm

Courtesy of St Jude Medical; INVESTGATIONAL
LA Pressure Sensors

Modified PDA

Stores telemetry
Alerts patient to monitor
‘DynamicRX®’ instructs
Meds
Activity
Clinician contact
based on LAP values and physician’s prescription

Courtesy of St Jude Medical; INVESTGATIONAL
Remote Monitoring Time-Frames:

- Remote monitoring is delivered over the course of a defined time period, either 30 or 90 days depending on the service.
- The time period starts with the first monitoring service and continues through 30 or 90 days.
- A new time period begins on the 31\textsuperscript{st} or 91\textsuperscript{st} day.
  - A 30 day time period is used for ILR and ICM remote interrogation codes.
  - A 90 day time period is used for pacemaker and ICD remote interrogation codes.
Billing Codes 2012:

**ICD® DEVICE MONITORING**
Common CPT® Codes and National Average Medicare Payments

- **In-Person**
  - (In-Person) Interrogation Evaluation
    - Any # of Leads: 93289
    - Single Lead: 93282
    - Dual Lead: 93283
    - Multiple Lead: 93284

- **Remote**
  - Remote Interrogation Evaluation
    - Professional: 93295
    - Technical: 93296

**PACEMAKER DEVICE MONITORING**
Common CPT® Codes and National Average Medicare Payment

- **In-Person**
  - (In-Person) Interrogation Evaluation
    - Any # of Leads: 93288
    - Single Lead: 93279
    - Dual Lead: 93280
    - Multiple Lead: 93281

- **Remote**
  - Remote Interrogation Evaluation
    - Professional: 93294
    - Technical: 93296
    - Transtelephonic Rhythm Strip Evaluation: 93293

Photo Courtesy of Biotronik
Defining the Opportunity

IPG, CRTP

Actual: 94
Desired: 710
Desired based on 4 Remotes a Year

ICD, CRTD

Actual: 1,062
Desired: 2,876
Desired based on 4 Remotes a Year

Reveal

Actual: 355
Desired: 696
Desired based on 12 Remotes a Year

Ferrara M, Mittal S et al. HRS 2012
Defining the Opportunity

- Costs
- In-Office Follow-Up Revenue
- Remote Follow-Up Revenue

Device Follow-Up Costs

Actual Follow-Up Revenue

Potential Follow-Up Revenue @ Desired Frequency

Ferrara M, Mittal S et al. HRS 2012
Remote Monitoring: Helping Hands -- 3rd Party Vendors
Keeping the Data in the Hospital

ER

OR

Patient

MRI

Floors
Subscription Models

CareLink Express™ Service Subscription Plans

90 Day No-Obligation Pilot.

Required: $3,000 Account set-up fee. $600 per monitor kit
Average monthly transmission volumes during 90 day trial will be used to place account into the appropriate plan at end of pilot. Account usage will be reported monthly, with option to switch plan at that time.

Bronze
- Small Account
- Ideal for <7 transmissions per month
- $175 fee per transmission

Silver
- Medium Account
- Up to 12 transmissions per Month
- $1,250 Monthly Subscription*

Gold
- Large Account
- Up to 25 transmissions per Month
- $2,000 Monthly Subscription*  

* Accounts with more than 12 trans / month will be billed $100 for each additional transmission.

* Accounts with more than 25 trans / month will be billed $80 for each additional transmission.
Cardiovascular medicine is witnessing an explosion in capability for remote monitoring of implantable electronic devices, which provide great potential for improved clinical outcomes and enhanced device safety and efficacy, as well as more efficient and cost-effective care.

There are numerous devices now utilized in remote monitoring, including ambulatory ECG recorders, implanted loop recorders, pacemakers, cardiac defibrillators, and cardiac resynchronization systems. Cardiovascular physicians, allied health professionals, and office staff need to understand the merits and weaknesses of existing technology. They also need to become well versed in management of the new wealth of data these devices provide, design and use of appropriate systems to support monitoring technology, and proper utilization of remotely acquired data in clinical decision making, as well as the demands for patient education and orientation to assure compliance.

Remote Patient Monitoring in Cardiology outlines the strengths and weaknesses of existing technology; provides a framework for incorporating existing technology into clinical practice with emphasis on professional society guidelines; illustrates, through a multitude of real-world clinical vignettes, how data retrieved remotely can be used to drive clinical decision making to positively affect patient outcome; highlights existing barriers that limit the widespread implementation of remote patient monitoring into practice; and proposes areas for development.