Device Management in Heart Failure Patients

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Many patients with congestive heart failure have abnormal ventricular depolarization which leads to worsening congestive symptoms.

Pacing the Right ventricle and Left ventricle simultaneously can significantly improve CHF symptoms, LV function and mortality in those with evidence of dyssynchrony.

Appropriate device programming is critical.

How can an Electrophysiologist help my CHF patients?
Cardiac Resynchronization Therapy
Heart Failure Management

- Heart failure management is expensive\(^1\)
- Heart failure has the highest admission and re-hospitalization rate\(^1,2\)
- Timely treatment is a challenge
- Symptoms are difficult to assess\(^3\)
- Assessment tools have limited abilities\(^4,5\)
- Typical clinical measures don't provide a complete picture
- Measures depend on patient compliance

Device diagnostics may provide additional insight!
Goals and Strategies

Heart Failure Management Goals:
- Reduce symptoms
- Prolong life
- Decrease hospitalization
- Increase quality of life

- Patient Education
- Manage Fluid Trends
- Manage Arrhythmias
- Optimize CRT Therapy
- Manage/Optimize Drug Therapies
Goals and Strategies

Patient Education

Patient education is an important variable in heart failure care. Clinicians continually educate patients on the importance of their prescribed medications, diet and exercise programs and need continual reminders about how each of these variables can impact their clinical status.

Diagnostics can provide monitoring options for assessing patient lifestyle issues and compliance:
• Heart Rate Variability Trend
• Patient Activity Trend
• OptiVol® Trends
Goals and Strategies

Manage Fluid Trends

Device diagnostics can provide monitoring capabilities to assess and manage fluid status, congestion, perfusion and dyspnea including:

- OptiVol® Trends
- Heart Rate Variability
- Night Heart Rate Trends
- Patient Activity

![Graph showing fluid index trends over time with thresholds and dates marked.]
Goals and Strategies

Manage Arrhythmias

Device diagnostics provide information to assess arrhythmias:
- AT/AF total minutes/day
- V Rate During AT/AF and VT/VF
- Non-sustained and Treated VT episodes/day
- Episode Logs and Stored EGMs

Device features to help manage arrhythmia episodes include:
- SmartShock Technology™
- ATP During Charging™
- PainFREE™ Rx Programming Strategies
- Conducted AF Response
- Ventricular Sense Response
- Atrial Tracking Recovery
- Reactive ATP
- Atrial Preference Pacing
- Post Mode Switch Overdrive Pacing
Goals and Strategies

Optimize CRT Therapy

Device diagnostics provide information on percent of CRT:
• Percent Pacing Trend
• Histograms
• Capture Management® Trends

Device features provide tools for ensuring CRT:
• Complete Capture Management
• AdaptivCRT™*
• CardioSync™ Optimization*
• Conducted AF Response
• Ventricular Sense Response
• Atrial Tracking Recovery

*Available beginning with the Viva™ CRT-D device models.
Goals and Strategies

Manage/Optimize Drug Therapies

Optimal drug therapy may include Beta blockers, ACE Inhibitors/ARBs, Aldo-blockers, Hydralazine/Nitrates and Diuretics.

Device diagnostics provide the clinician with trends to aid in monitoring drug therapies, including:
- Episode logs with detailed episode information (i.e. time of episode, duration, rate)
- Average V Rates and Heart Rate Variability to monitor and/or adjust heart failure medications
- AT/AF Trends to evaluate efficacy of anti-arrhythmic drugs as well as risk for stroke and need for anticoagulation
Importance of Diagnostic Trends

- Provides system information to help assess device and lead integrity
- Demonstrates what is happening between office visits and long-term disease progression (temporally aligned)
- Provides 24/7 trending data in an easy-to-interpret format
- Identifies presence of symptomatic and asymptomatic arrhythmias
- May help evaluate arrhythmia treatment efficacy (drugs, device)
- Corroborates patient symptoms and aids in assessment

A detailed look into a patient's clinical status in terms of arrhythmias, heart failure, and other measures, can be obtained using the diagnostics recorded and stored by the device.
CareLink® Network Overview

1. Clinic staff can **preschedule** automatic device **checks** for each.

2. The Medtronic CareLink Monitor is set up within 10 feet of where the patient sleeps. The device **automatically “wakes up”** at the scheduled time and communicates with the Medtronic CareLink Monitor. Data are transferred automatically as the patient sleeps.

3. Data are transferred to a secure server via the patient’s **standard phone line**.

4. The clinician **reviews** the patient’s device data on the secure **website**.

*Slide borrowed courtesy of Medtronic, Inc.*
Confirm Proper Device Operation

Remaining Longevity: 8.9 years

% of Time
- Total VP: 96.5%
- AS-VS: 2.8%
- AS-VP: 97.1%
- AP-VS: <0.1%
- AP-VP: 0.2%

Treated
- VT/VF: 0
- AT/AF: 0

Shocks: 0

Monitored
- VT: 0
- SVT: 0
- VOS: 0
- AT/AF: 0

Cardiac Compass

Observations (0)

Pacing (ohms):
- >2000
- >1500
- >1000
- >500

Threshold:
- >6
- 4
- 2

Wave Amplitude:
- >15
- >10
- >5

Data - Quick Look II

Last Session: 11-Sep-2012
Managing Heart Failure with OptiVol®

- Provides useful insight into the patient’s clinical status
- Assists therapy titration and disease stabilization through continuous monitoring of fluid status
- Offers an educational tool for patients on medication and dietary adherence
OptiVol® Fluid Status Monitoring

Objectively tracks fluid changes using intrathoracic impedance.¹
OptiVol® Fluid Status Monitoring

If fluid retention goes up... impedance goes down²
How is OptiVol® measured?

Thoracic Impedance*

*Best practice is to review this graph first.

Measurements taken from 12:00 - 5:00pm (20min increments)
| Factors Affecting Changes in Intrathoracic Impedance |
|---------------------------------------|-------------------------------------|
| **Declining Impedance** may be the result of: | **Rising Impedance** may be the result of: |
| • Appropriate reduction of diuretics in the dehydrated patient\(^7\) | • Volume depletion\(^1\) |
| • Pleural effusion\(^8\) | • Dialysis/ultrafiltration\(^9\) |
| • Wound fluid from pocket revision or infection\(^8\) | • Positive pressure ventilation\(^6\) |
| • Lead dislodgement\(^4,5\) | • Pneumothorax\(^8\) |
| • IV fluids/blood transfusion\(^6\) | • **Dehydration**\(^1\) |
| • Blood volume\(^6\) | • **Diuretics (increases)**\(^7\) |
| • **HF congestion** (with or without symptoms)\(^1,3,6\) | |
Sample OptiVol® Trends

Medication Nonadherence

Dietary Nonadherence

Stable Patient

Medication Nonadherence Patient

OptiVol Fluid Index

OptiVol Threshold

Thoracic Impedance (ohms)

Reference
Sample OptiVol® Trends

Medication Nonadherence

Dietary Nonadherence

Stable Patient
Sample OptiVol® Trends

Medication Nonadherence

Dietary Nonadherence

Stable Patient
Low Risk Example

OptiVol 2.0 fluid index is an accumulation of the difference between the daily and reference impedance.

All patient and clinical data displayed are fictitious and for demonstration purposes only.
High Risk Example

OptiVol 2.0 fluid index is an accumulation of the difference between the daily and reference impedance.

All patient and clinical data displayed are fictitious and for demonstration purposes only.
OptiVol® Threshold Programming

- The nominal threshold setting (60ohms) is recommended unless clinical observations suggest otherwise
- When threshold programming changes are necessary:
  - Increase when there are too many OptiVol observations with no clinical evidence of heart failure decompensation
  - Decrease if OptiVol observations are absent when patient has symptomatic thoracic fluid accumulation
Rate Histograms

Used to assess:
- Pacing and sensing percentages
- Patient's conduction status
- Bi-V pacing percentages
- Heart rate distributions
- Rate control during AT/AF
- Changes between patient sessions

Data storage is automatic, no setup required.

*Available beginning with Viva™ CRT-D device models.
Rate Histogram Report

Ventricular Rate During AT/AF

Time in AT/AF = 32 seconds
- VP: 64.3%
- VSR Pace: 0.0%
- VS: 35.7%

Time in AT/AF = 50 seconds
- VP: 52.6%
- VSR Pace: 0.0%
- VS: 47.4%
Arrhythmias

- Intrathoracic impedance changes can precede VT/VF episodes\textsuperscript{1}
- Decreases in intrathoracic impedance can precede storms of VT\textsuperscript{2}
- AT episodes preceded (43\%) or occurred almost simultaneously (22\%) with the threshold crossing in greater than half the patients\textsuperscript{3}


Weight Monitoring, 6-MHW, BNP Markers

- OptiVol® detects 3 times more heart failure events than weight monitoring alone¹
Risk of Heart Failure Re-admissions\textsuperscript{1-6}

- Device diagnostics may help identify the patients at greatest risk of heart failure re-admission.\textsuperscript{5,6}

- Device derived heart failure diagnostic criteria identified patients at significantly higher risk of a heart failure event within 30 days post-discharge.\textsuperscript{5,6}

*Kaplan-Meier curves showing readmissions for HF after discharge after index HF hospitalization according to the combination of diagnostic parameters.*
Mortality Risk

- Diagnostic data was analyzed from 21,217 patients who were remotely monitored for > 6 months\(^1\)

- Patients who experienced threshold crossings within the initial 6 months of remote monitoring had a 2.15-fold increased long-term mortality risk\(^1\)