# Programming Overview

## Step 1: Assess Chronotropic Competence

1. Chronotropic competence is defined by the Model of the Cardiac Chronotropic Response to Exercise.

## Step 2: Prepare Calibration and Sensor Baseline

2. Calibration and sensor baseline preparation is necessary before implantation.

## Step 3: Optimize Sensor Trending Data


### Rate Adaptive Pacing

A motion-based accelerometer may not always detect when the patient is exercising, potentially resulting in inadequate rate response.

- **Riding a bicycle**
- **Walking a dog**
- **Holding a grandchild**
- **Carrying groceries**
- **Lifting weights**
- **Working in the garden**

### RightRate™

RightRate™ is a physiologic minute ventilation sensor that is highly correlated with breathing.

1. The only sensor clinically proven to restore chronotropic competence.

### VISIONIST™ X4

- **VISIONIST™ X4** is labeled for up to 13.1 years projected longevity even when RightRate is turned ON.

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1. Chronotropic competence is defined by the Model of the Cardiac Chronotropic Response to Exercise.

2. Assumes: 2.0 mV/step; RA SENS; RV SENS/Lead No. 3414; 6 V pulse width, 100% BiV pacing, 15% atrial pacing; 1.2 ms pulse width.
Heart Rate Score is defined as the height of the tallest atrial histogram bin. A broader range of HR is typically better for the patient. Therefore, a lower HR Score is preferred.

**Heart Rate Score** was an independent predictor of mortality.\(^3\)

**Impact of Rate Responsive Programming on survival based on Heart Rate Score**

<table>
<thead>
<tr>
<th>HR Score</th>
<th>N</th>
<th>Hazard Ratio ± 95% CI</th>
<th>HR 60% CI</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30%</td>
<td>398</td>
<td>0.96 ± 0.64 - 1.44</td>
<td>0.64</td>
<td>0.826</td>
</tr>
<tr>
<td>30-70%</td>
<td>4982</td>
<td>0.07 ± 0.01 - 1.01</td>
<td>0.04</td>
<td>0.674</td>
</tr>
<tr>
<td>≥70%</td>
<td>3468</td>
<td>0.66 ± 0.59 - 0.75</td>
<td>0.001</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Log-rank p-value < 0.001

**RightRate™ Blended Sensor** was shown to improve Heart Rate Score more than accelerometer alone.\(^5\)

**Impact of Rate Responsive Programming on Heart Rate Score** (among patients with baseline heart rate score of ≥70%)

- **P = 0.001**

**Analysis of 501 patients from the LIFE Study**

RightRate Blended sensor (MV+XL) resulted in:
- Heart Rate Score reduction of 18%.
- Converted almost twice as many patients to Heart Rate Score < 70% when compared to XL only.


\(^3\) Wilkoff et al., A Device Histogram Based Simple Predictor of Mortality Risk in ICD and CRT-D Patients. The Heart Rate Score. PACE 2017.

**LATITUDE™ analysis of 67,929 CRT-D patients**

Patients with a HR Score ≥ 70 had a 43% 5-year survival rate.

Patients with a HR Score < 30 had a 68% 5-year survival rate.

**LATITUDE™ analysis of 6,164 patients**

For patients with Heart Rate Score > 70, switching to DDDR was associated with improved mortality.

Patients with baseline Heart Rate Score > 70% significantly improved their Heart Rate Score with DDDR (from 88±9% to 78±15%; P<0.001).
