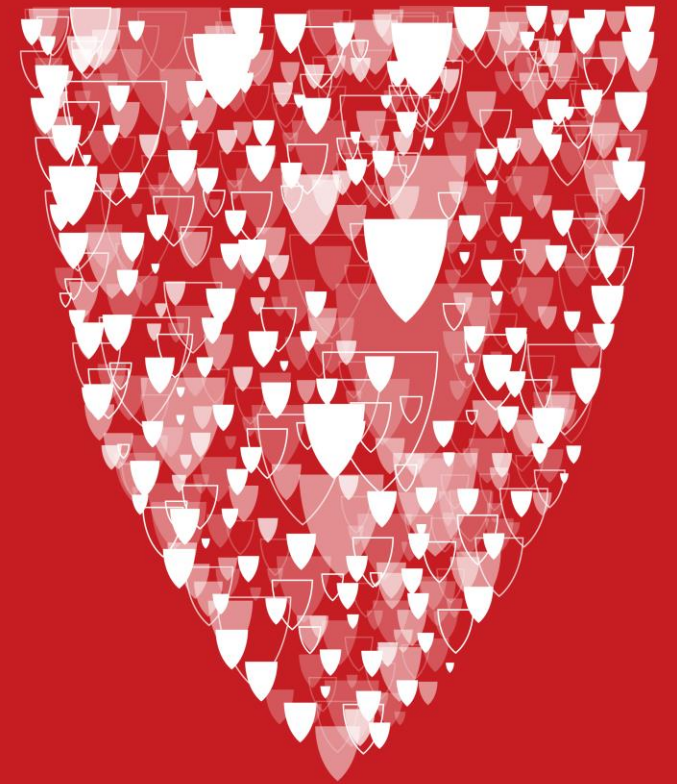
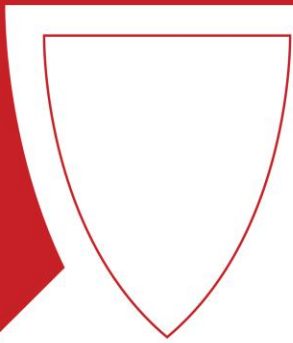


# Utilization of Implantable Pulmonary Artery Pressure Monitoring Systems in Heart Failure

Ohio-ACC 2023 Annual Meeting  
September 30, 2023





# **Disclosures Consultant, Abbott**

# Management of Worsening Heart Failure

- Prevalence of heart failure is projected to increase to greater than 8 million people in the United States by 2030 (Salah HM et al, 2022)
- Leading cause of hospitalization among older adults
- Second most common overall cause of hospitalization in the United States

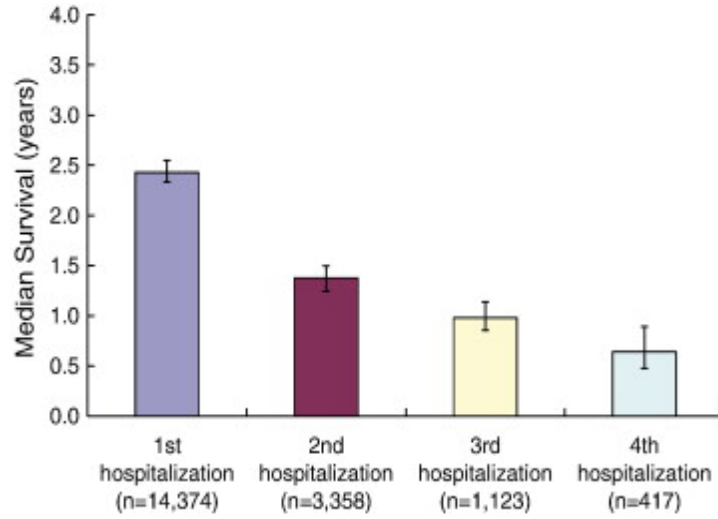


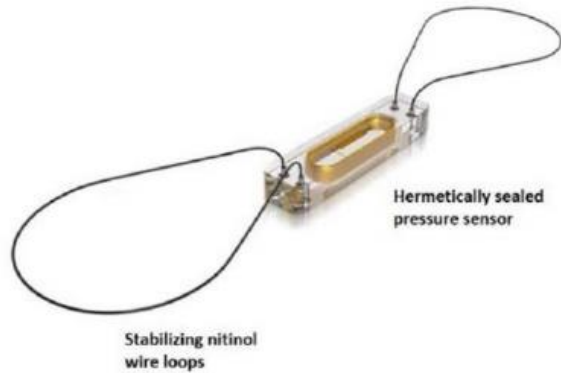
Figure 2

Median survival (50% mortality) and 95% confidence limits in patients with HF after each HF hospitalization.

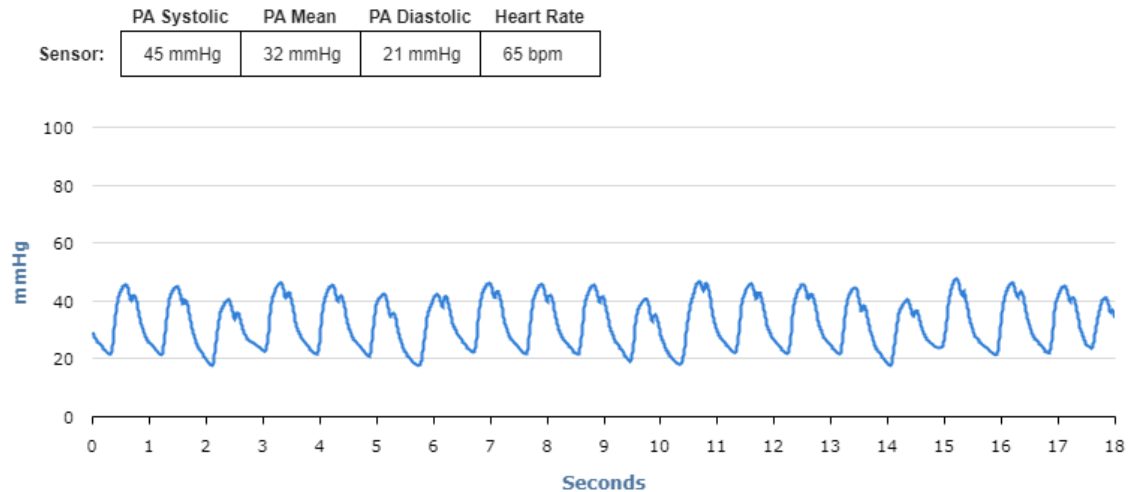
(Setoguchi S et al, 2007)

- In an effort to reduce 30-day hospital readmission, the Hospital Readmission Reduction Program (2012) financially assesses hospitals if they have higher than predicted risk-adjusted 30-day readmission rates for major conditions (including heart failure)

# Invasive Pressure Monitoring: CardioMEMS HF System



- Pulmonary Artery Sensor
- Patient Electronic System (PES)
- Hospital Electronics System (HES)



# CHAMPION trial

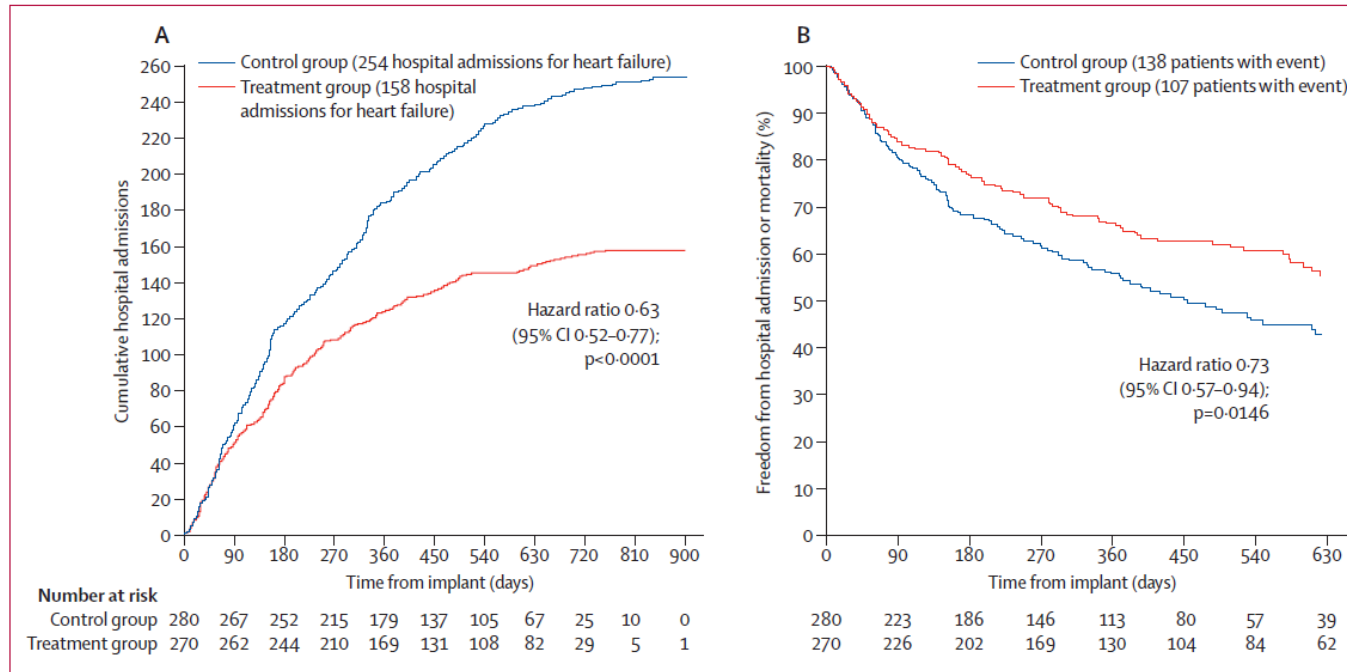


Figure 3: Cumulative heart-failure-related hospitalisations during entire period of randomised single-blind follow-up (A), and freedom from first heart-failure-related hospitalisation or mortality during the entire period of randomised follow-up (B)

- Primary endpoint, rate of heart failure hospitalization
- Treatment group
  - Significant reduction in pulmonary artery mean pressure
  - Fewer patients admitted to hospital for heart failure, shorter length of stay
  - More days alive outside hospital
  - Better quality of life
- 28% reduction in heart failure hospitalizations at 6 months
- 33% reduction in HF hospitalizations annualized over 19 months (Abraham WT et al., 2011)
- Suggests that using implantable pressure monitoring systems reduce rates of hospital admission for heart failure in patients with NYHA Class III

# GUIDE-HF Trial

- Largest trial of CardioMEMS HF system
- Expand indications to NYHA Class II-IV
- Establish elevated BNP/NT-proBNP OR heart failure hospitalization as selection criteria
- Primary outcomes included all-cause mortality, HF hospitalizations, and urgent heart failure visits
- Impacted by COVID-19 pandemic
- Hemodynamic-guided management significant reduced primary endpoint events by 19% (pre-pandemic analysis) and 12% (overall), driven by 28% (pre-pandemic analysis) and 17% (overall) reduction in heart failure hospitalizations (Lindenfeld J et al, 2019)

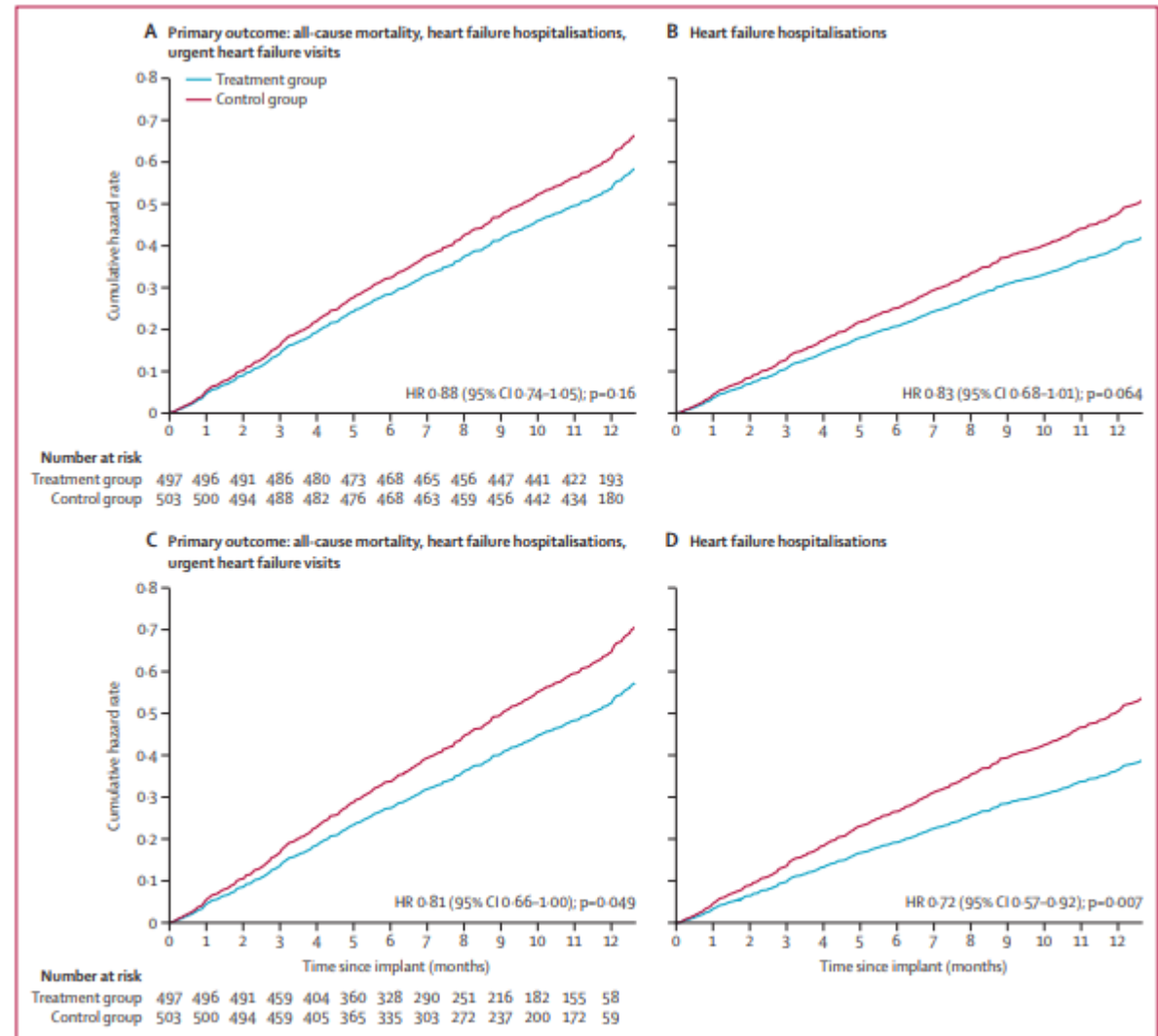


Figure 2: Cumulative hazard rate curves and 95% CIs for the primary composite endpoint and heart failure hospitalizations (A) Overall analysis—primary outcome of all-cause mortality, heart failure hospitalizations, and urgent heart failure hospital visits. (B) Overall analysis—heart failure hospitalizations. (C) Pre-COVID-19 impact analysis—primary outcome of all-cause mortality, heart failure hospitalizations, and urgent heart failure visits. (D) Pre-COVID-19 impact analysis—heart failure hospitalizations. HR=hazard ratio.

# Device-Based Intervention & Integration

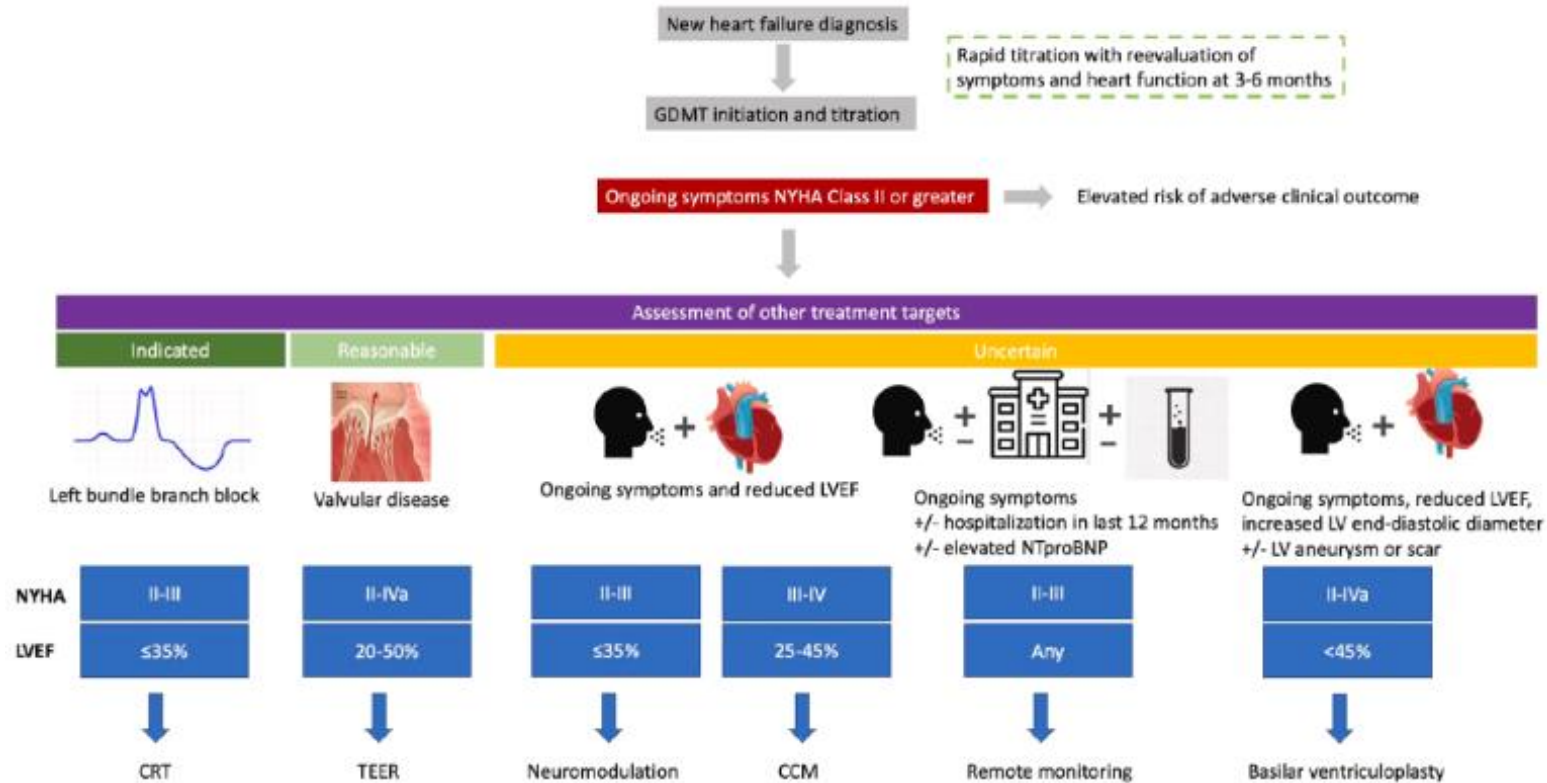


Figure 6

Proposed Workflow for Implementation of Device-Based Interventions in Heart Failure

CCM = cardiac contractility modulation; CRT = cardiac resynchronization therapy; GDMT = guideline-directed medical therapy; LV = left ventricular; LVEF = left ventricular ejection fraction; NT-proBNP = N-terminal pro-B-type natriuretic peptide; TEER = transcatheter edge-to-edge repair.

(Salah HM, et al., 2023)

## Indications

- NYHA Class II or III
- Heart Failure Hospitalization in the last year
- Elevated BNP

## Considerations

- Diuretic Resistance
- Obesity
- Coordination of other cardiac device procedures

## Contraindications

- Inability to tolerate dual antiplatelet therapy (30 days)
- History of multiple deep vein thrombosis (DVT and/or pulmonary embolism (PE))

# Device Intervention: Application in Practice

- An anonymous, voluntary, web-based survey for clinicians at centers with AHM in the United States.
- Survey questions were related to program volume, staffing, monitoring practices, and patient selection criteria.
  - Cardiology providers contribute the greatest number of referrals
  - Most centers have modest volumes, with rare centers having high volumes (>150)
  - APPs are most frequently responsible for remote monitoring
  - Protocol-based management is limited (28%).
  - Most respondents practice at centers that offer LVAD and/or transplant and are staffed by AHF cardiologists
  - Perceived patient nonadherence and insurance coverage are cited as the primary contraindications

(Bhimaraj et al, 2023)

# Multidisciplinary Team Approach

## Referral Process

### Identify Potential Referring Providers

- Heart Failure Cardiologists, Heart Failure Navigators, Cardiologists, Electrophysiologists, APPs, Primary Care

### Pre-implantation Process

- Patient/family instructions & expectations
  - Implant process
  - Product Use
  - Patient/Provider Communication
- Insurance Prior Authorization
- Implantation
  - Scheduling
  - Interventional Cardiologist
  - Post-procedure follow up

# Remote Monitoring: Workflow

Provider and/or team approach

Set thresholds and goal ranges

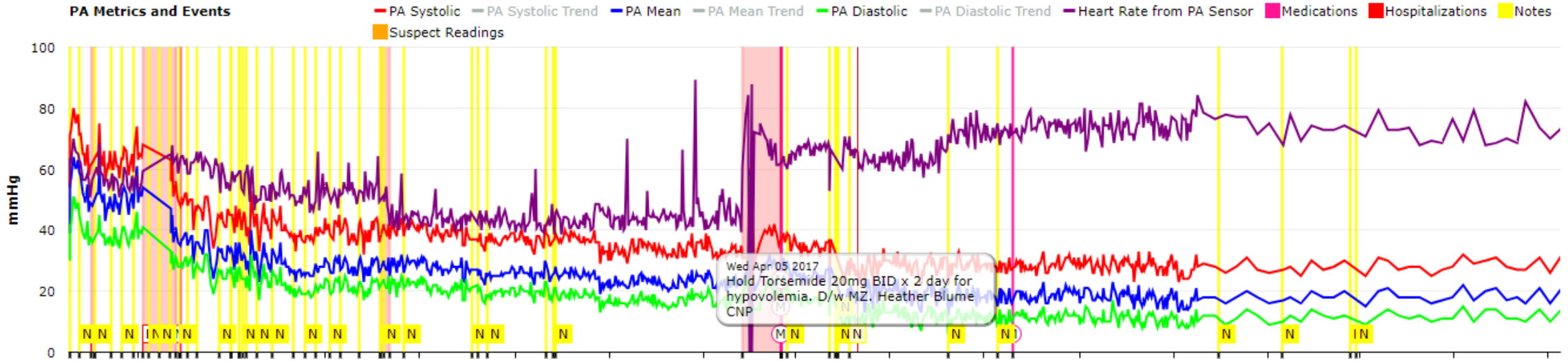
Focus on Guideline-Directed Medical Therapy Optimization

Formulate Response Algorithm

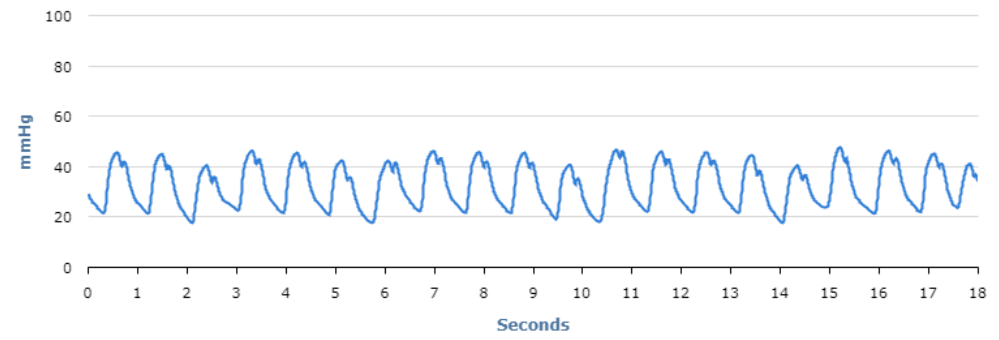
Considerations

- Elevated Vascular Resistance
  - Optimize GDMT/vasodilation
    - i.e. If PAd > goal range x 3 days, increase ACEI/ARB/ARNI or Hydralazine/Isordil
- Elevated PA pressures and PW
  - Optimize diuresis
    - i.e. If PAd > goal range x 3 readings, double loop diuretic for 3 days
- Elevated PA systolic in setting of normal PW
  - Further evaluation for PAH

# Remote Monitoring: Data Access & Management



	PA Systolic	PA Mean	PA Diastolic	Heart Rate
Sensor:	45 mmHg	32 mmHg	21 mmHg	65 bpm



# Remote Monitoring: Documentation, Coding, and Reimbursement

## Remote Monitoring

CPT Code 93264 (Work RVU 0.7)

Remote monitoring of a wireless pulmonary artery pressure sensor for up to 30 days including at least weekly downloads of pulmonary artery pressure recordings, interpretation, trend analysis and report by a physician or other qualified health care professional.

- Do not report more than once in 30 days
- Do not report if <30 days
- Do not report if download, interpretation, trend analysis, and report did not occur at least weekly in 30-day period

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