Azerbaijan Society of Cardiology

ZURICH HEART HOUSE
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Guy's and St Thomas' NHS Foundation Trust

HFA Heart Failure Association

Master Course in Heart Failure 25 BAKU

AZERBAIJAN

30th May - 1st June

Remote Patient Monitoring. Can digital medicine create a revolution in Heart Failure Management?

Ulvi Mirzoyev, MD, PhD, FESC

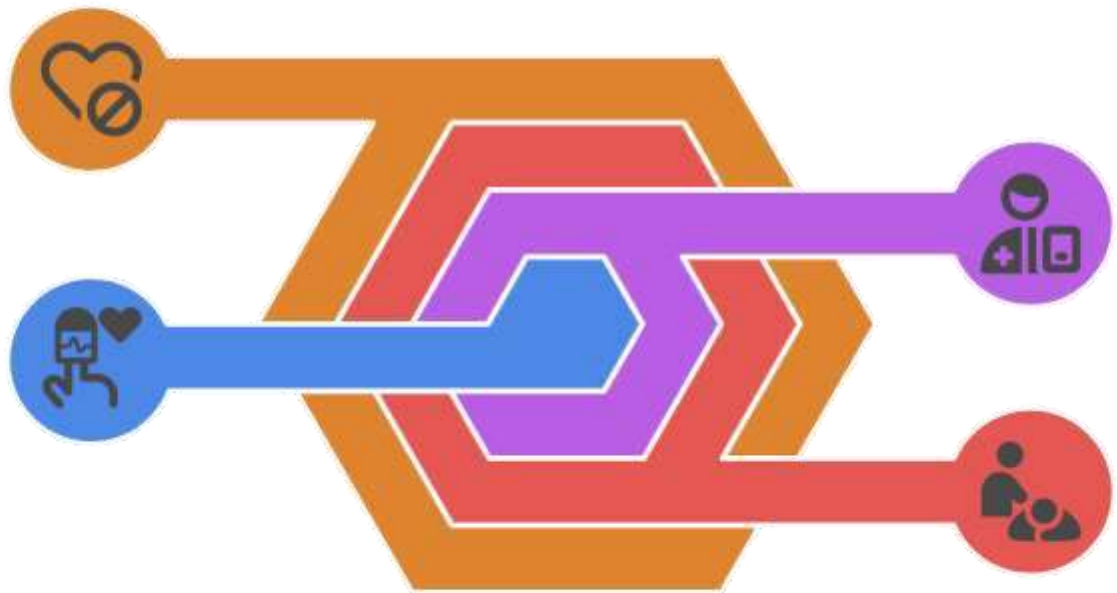
Why This Topic?

Chronic Condition

Prevalent and costly health problem

Heart Failure Care Improvement

Enhancing patient outcomes and reducing costs

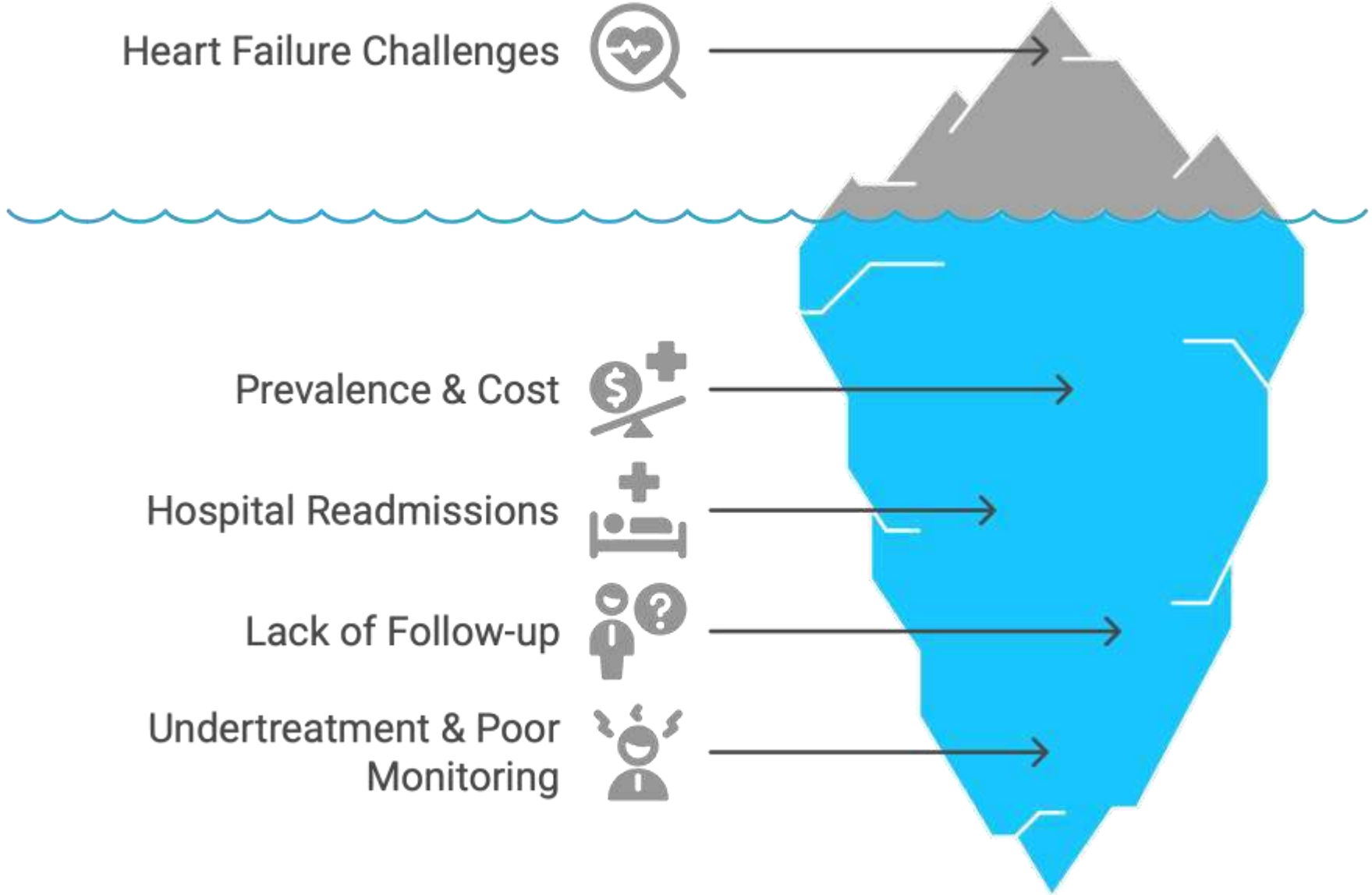


Remote Patient Management

Technology-driven care model

Care Gaps

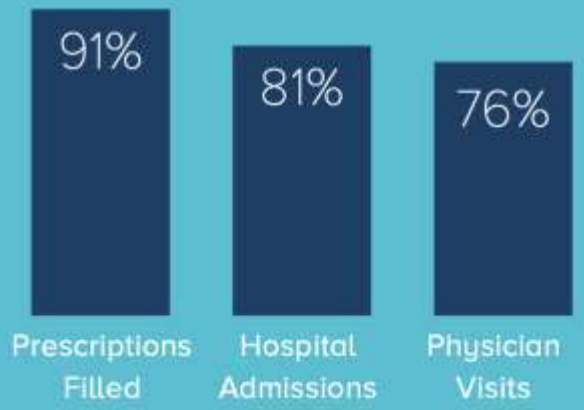
Issues in monitoring and treatment


Heart Failure Challenges
Prevalence & Cost
Hospital Readmissions
Lack of Follow-up
Undertreatment & Poor Monitoring

OBJECTIVES


1
Define RPM
Establish a clear understanding of RPM's role in heart failure management.
2
Review Evidence
Examine clinical trials to understand RPM's effectiveness.
3
Discuss Benefits
Explore the potential positive impacts of RPM on outcomes and costs.
4
Address Challenges
Identify and tackle obstacles in implementing RPM.
5
Stimulate Discussion
Encourage dialogue on integrating RPM into national health strategies.

PERCENT OF HEALTH RESOURCES USED BY PEOPLE WITH CHRONIC CONDITIONS



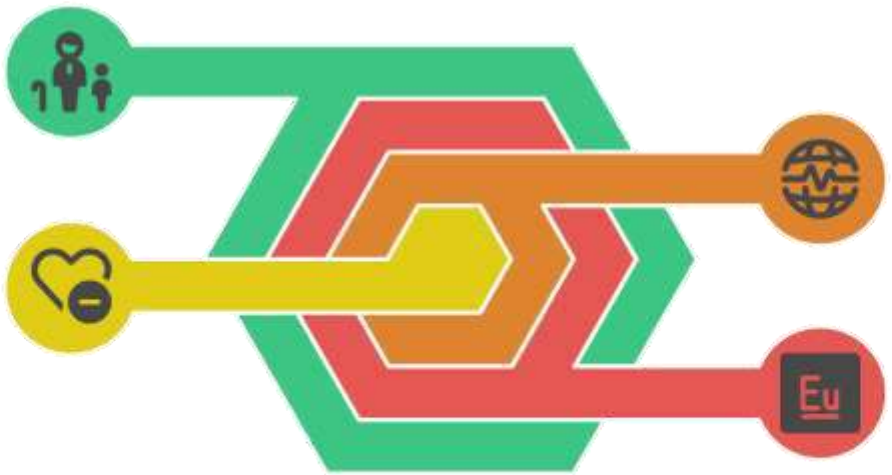
Heart Failure: A Costly and Deadly Burden

Age-Specific Prevalence

10% in those over 70

Heart Failure

A global health challenge



Global Prevalence

64 million people affected worldwide

European Prevalence

1-2% of adults affected

#1

Hospital admission reason
is Heart Failure

$346 bn

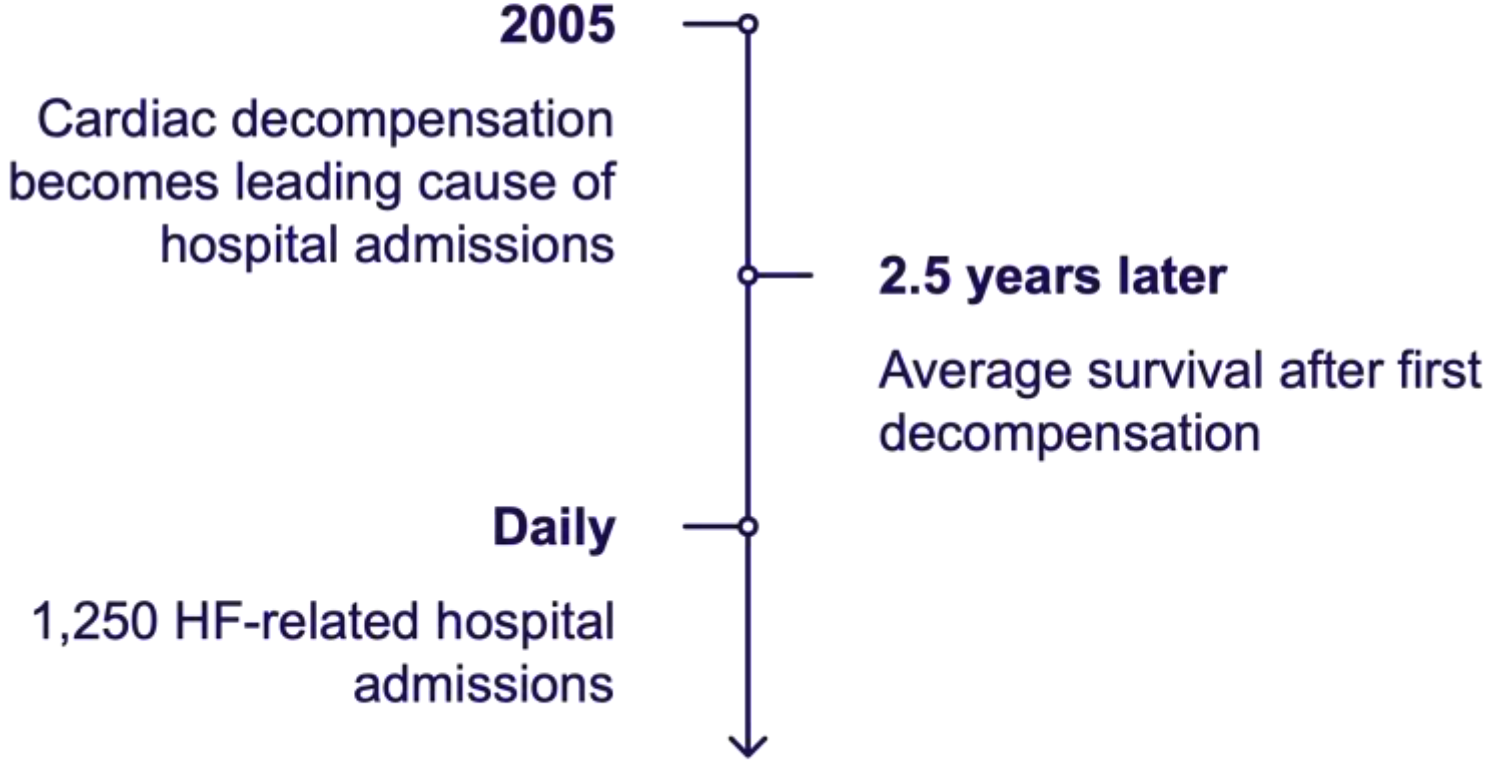
Heart Failure **costs worldwide**

50-75 %

of costs **due to hospitalizations**

Sources: European Society of Cardiology (2023), Diamond et al. (2022), Hessel et al. (2021), Lippi et al. (2020).

Cardiac Decompensation and Hospital Admissions in Germany🇩🇪



“Avoiding Re-hospitalizations is the Holy Grail of Heart Failure“

Within 5 years, over 50% of CHF patients still die

Sources: Huusko, Jenni & Kurki, Samu & Toppila, Iiro & Purmonen, Timo & Lassenius, Mariann & Gullberg, Elisabet & Wirta, Sara & Ukkonen, Heikki. (2019). Heart failure in Finland: clinical characteristics, mortality, and healthcare resource use. ESC Heart Failure. 6. 10.1002/ehf2.12443.

The Problem with Traditional Management

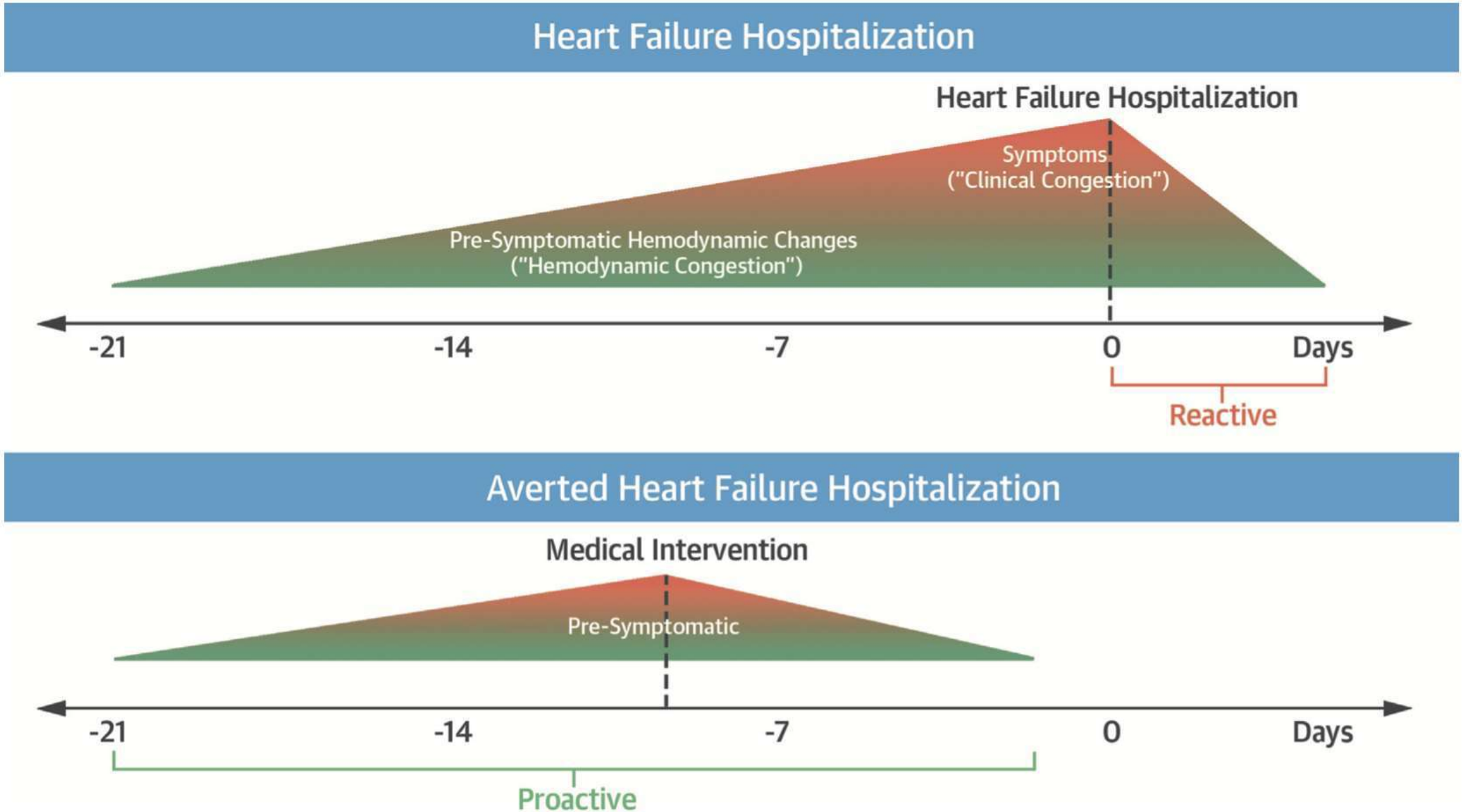
🧩 Fragmentation in Care
•Lack of real-time communication between GPs, cardiologists, and hospitals.
•Discharge plans often lack follow-up structure or patient monitoring

🧍‍♂️📉 Limited Patient Engagement
•Patients forget instructions: **40–80% of verbal advice is forgotten**.
•Lack of tools for self-monitoring and active participation in care.

💸 Outcome: Poor Results, High Costs
•↑ Rehospitalizations
•↑ Emergency Room visits
•↑ Length of Stay
•↑ Healthcare costs
•↓ Quality of life

🚨 Reactive, Not Proactive
- Most HF care still follows a **“crisis-response” model**:
  - Patients present late with decompensation.
  - Interventions happen **after deterioration**, not before

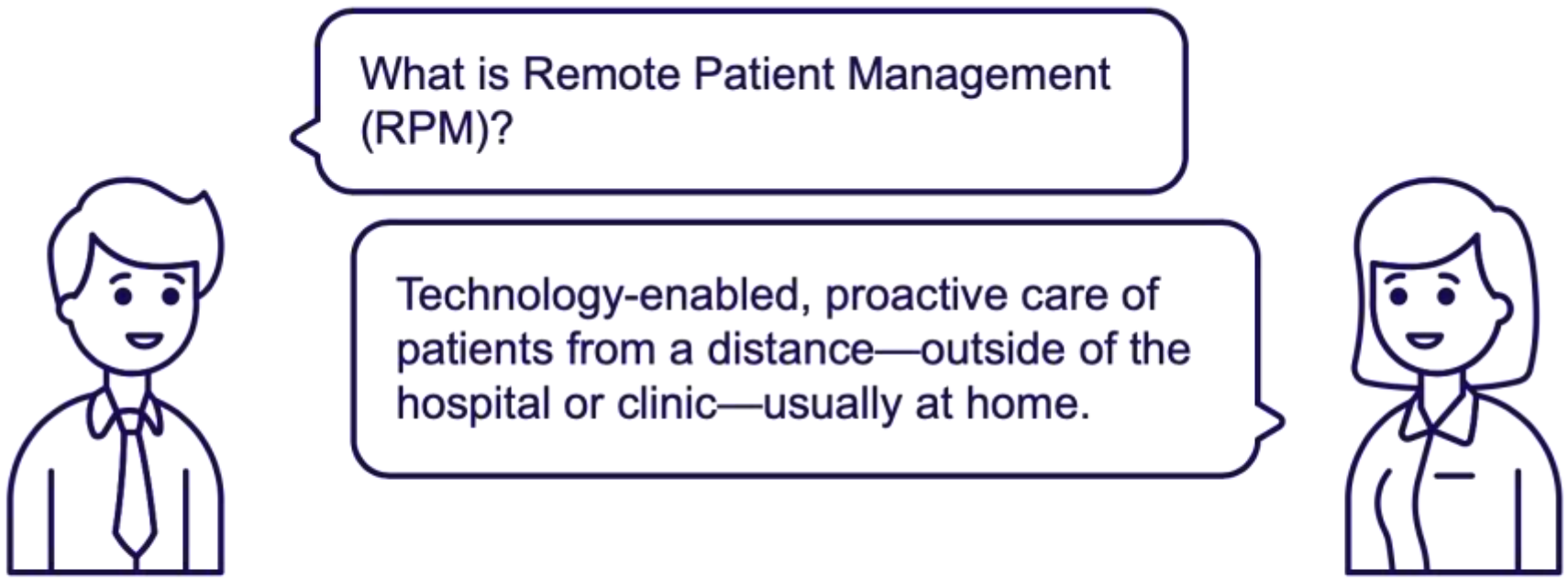
👨‍⚕️❓ Blind Spot for Clinicians
•Clinicians **don’t know**:
  - If patients are taking medications correctly.
  - If symptoms are worsening at home.
•No alerts until the patient is **already unstable**.



Abraham, W.T. et al. J Am Coll Cardiol. 2017;70(3):389-98.

Solution: Remote Patient Management

Remote Patient Management (RPM) Explained



Components of Remote Patient Management

Daily Monitoring

Continuous tracking of vital signs and symptoms

Bidirectional Communication

Two-way interaction between patients and providers

Connected Devices

Use of wearables and apps for data collection

Weights and Vital Signs

Symptoms

Lung Congestion

Dielectric Sensing through vest

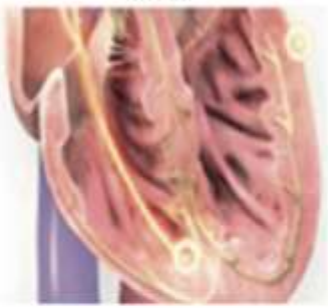
Radiofrequency through adhesive patch

Thoracic Impedance through device lead

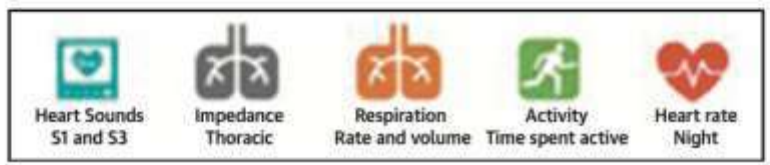
Multi-parameter scoring of risk through implanted rhythm devices

ICD

CRT



Proprietary algorithms with different components



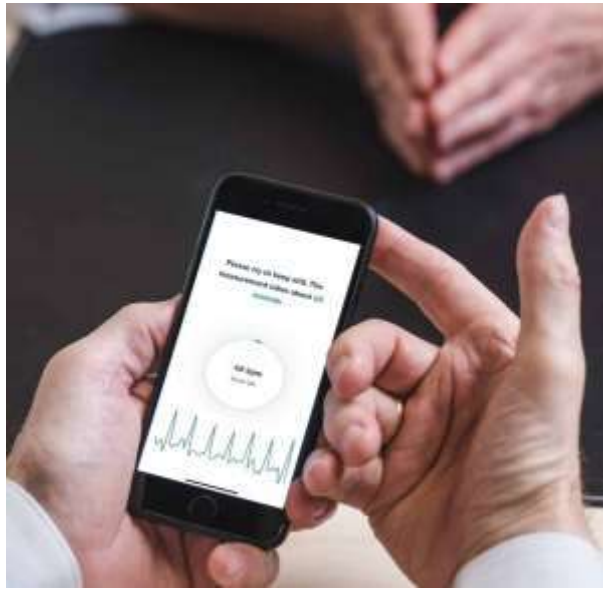
Direct measurement of cardiac pressures

Pulmonary artery pressures

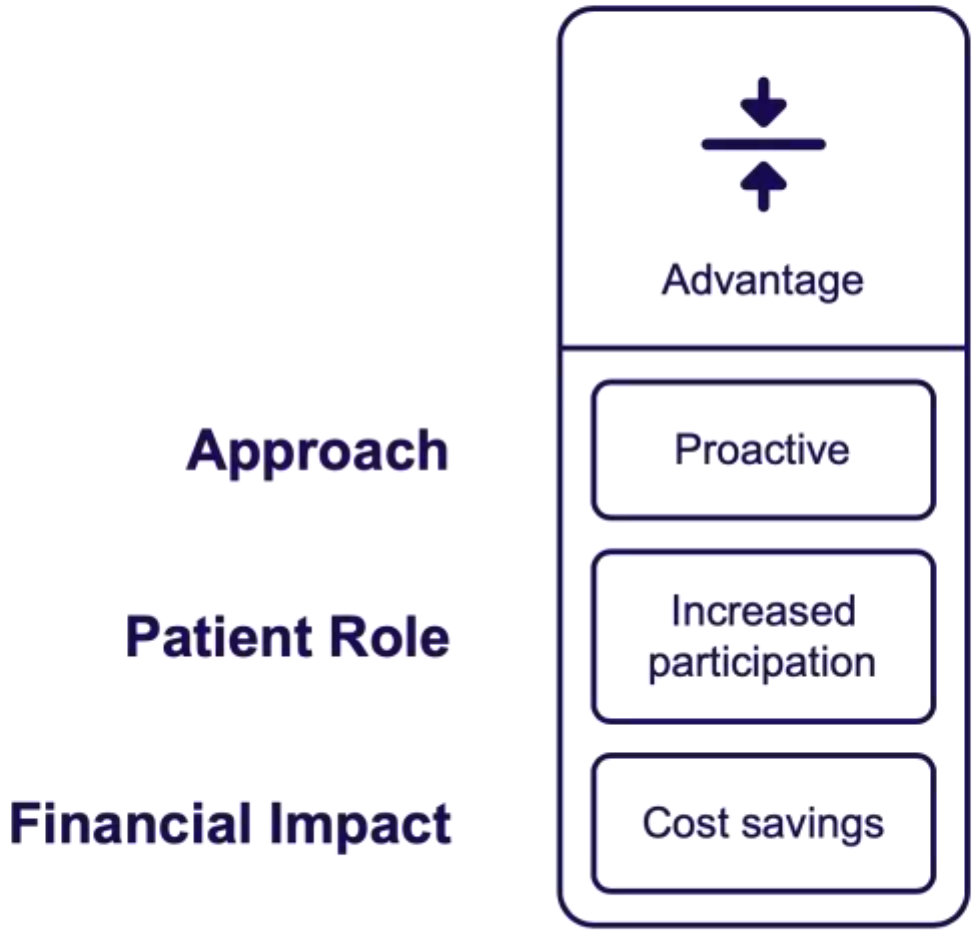
Left atrial pressures

biobeat Medical Smartmonitoring

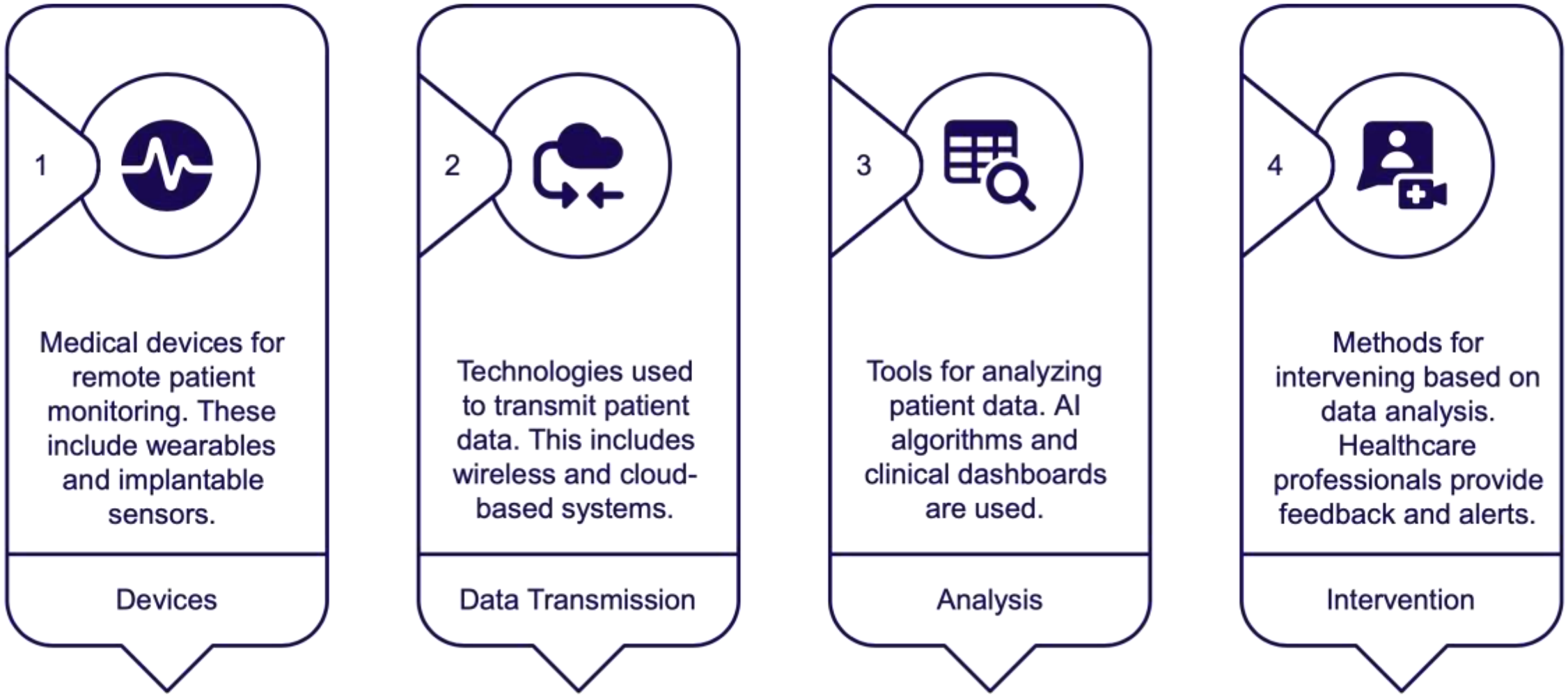

120
70
17
100
120
98%
37.2
Continue



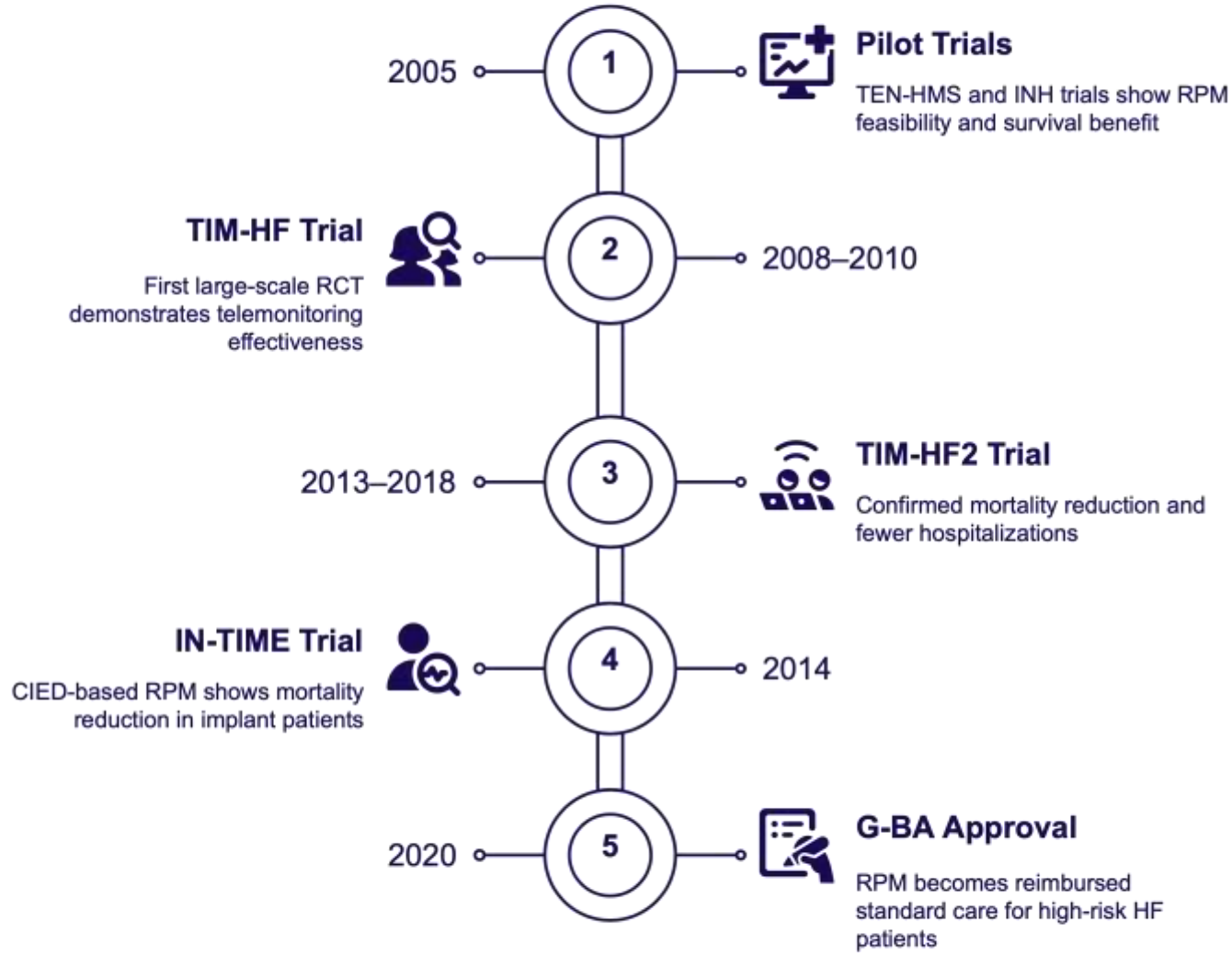
RPM Advantages



Remote Heart Failure Monitoring Components



Key Milestones in Remote Patient Management (RPM) Adoption in Germany



RPM Clinical Workflow in Germany

Daily Data Analysis

1

Patient data from devices analyzed by RPM team

24/7 monitoring and alert generation

Alerts trigger intervention within 24–48 hours

Rapid response to critical health changes

2

Clinical Intervention

Devices for non invasive measurement

© Charité

CIEDs for invasive measurement

© Biotronik

Implants for hemodynamic telemonitoring: pressure sensors

© Abbott

Germany's Pioneering RPM Integration

The current inclusion criteria for heart failure telemonitoring (according to Gemeinsamer Bundesausschuss decision and reimbursement for private insurance)

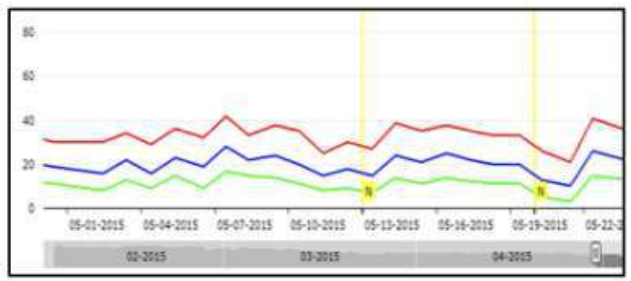
- New York Heart Association II-III stage heart failure with a left ventricular ejection fraction <40%.
- Implanted cardiac device (implantable cardiac defibrillator or cardiac resynchronization therapy with a pacemaker/defibrillator) or heart failure hospitalization due to cardiac decompensation in the past year
- Present treatment according to current guidelines (guideline-directed medical therapy).
- Absence of identifiable factors that compromise the transfer of monitoring data or that would interfere with patient self-management.
- If other prerequisites are fulfilled, patients with private health insurance who have chronic heart failure and exhibit a left ventricular ejection fraction > 40%, including hospitalization for decompensated heart failure within the last 12 months

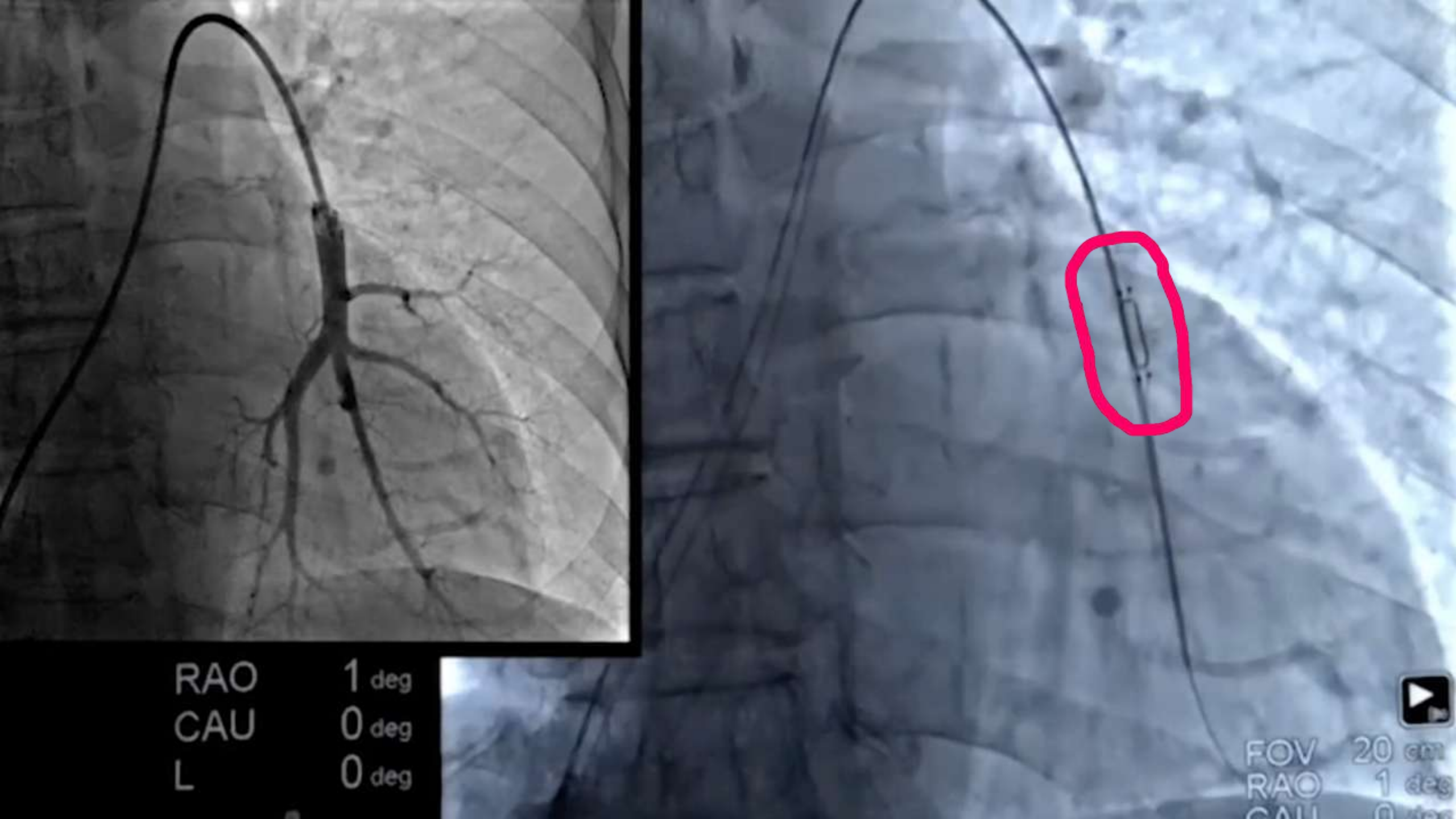
Key Trials on RPM in Heart Failure

Trial	Country	Sample Size	Key Technology	Primary Outcome
TIM-HF2	Germany	1,538	Non-invasive RPM	↓ Days lost + ↓ Mortality
IN-TIME	Germany	664	CIED-based RPM	↓ Mortality (3% vs 8.2%)
TELESAT-HF	France	5,357 vs 13,525	Phone/Web RPM	↓ Mortality (HR 0.64)
INH	Germany	1,022	Telephone + Nurse Support	↓ Long-term mortality and hospitalization
CHAMPION (CardioMEMS)	USA	550	Pulmonary Artery Pressure Sensor	↓ HF hospitalizations (39%)

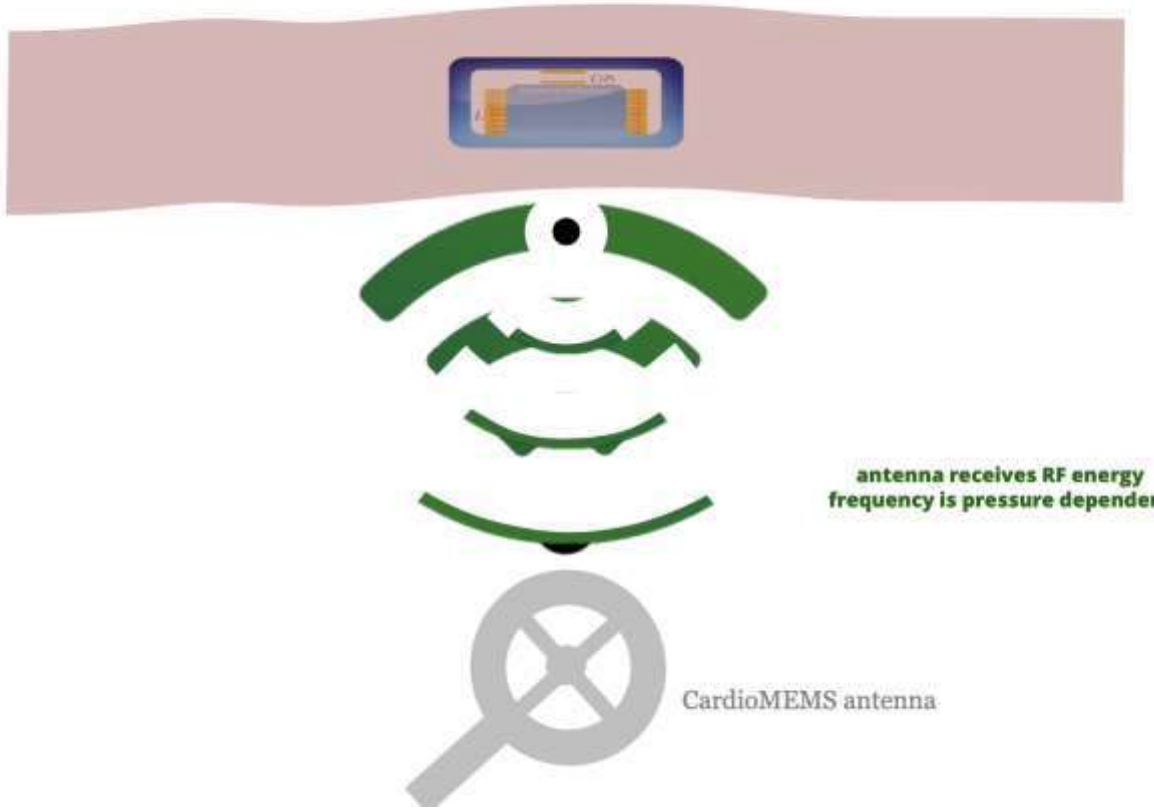
CardioMEMS HF System

Pulmonary Artery Pressure Sensor + Patient Electronics System + CardioMEMS Website Merlin.net




RAO 1 deg
CAU 0 deg
L 0 deg
FOV 20 cm
RAO 1 deg

Taking a PAP Reading



antenna receives RF energy
frequency is pressure dependent

CardioMEMS antenna

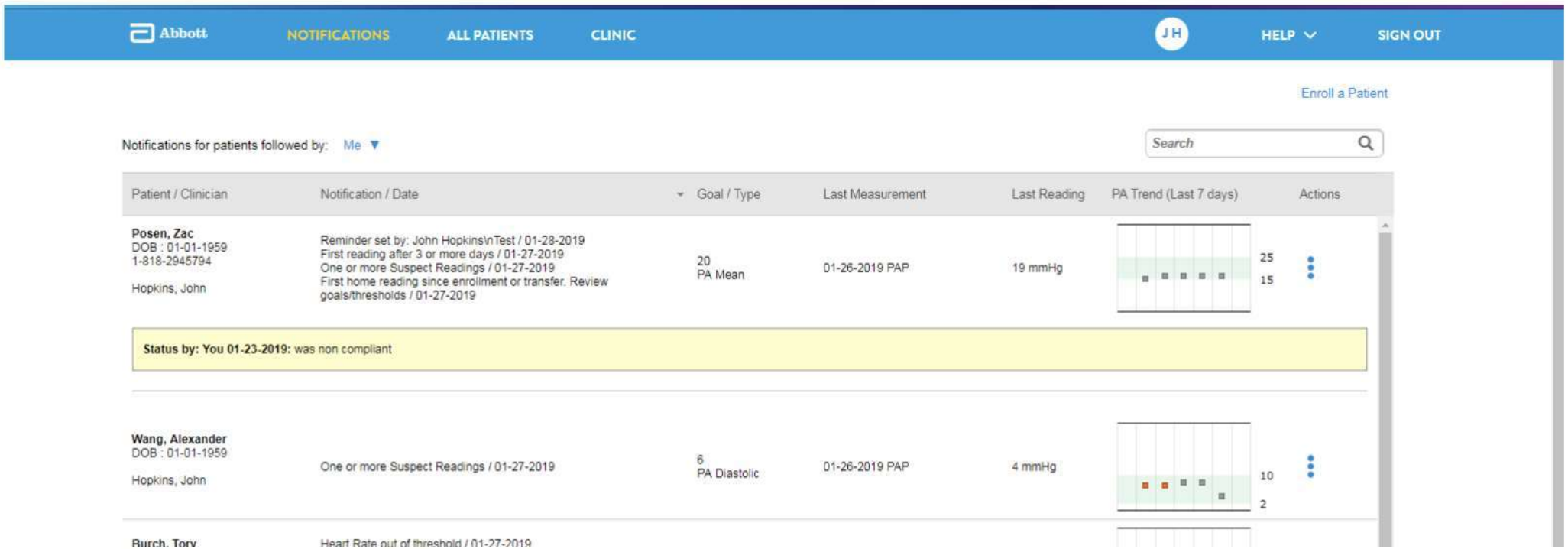
Patient Electronics Unit

Patient Electronics Unit

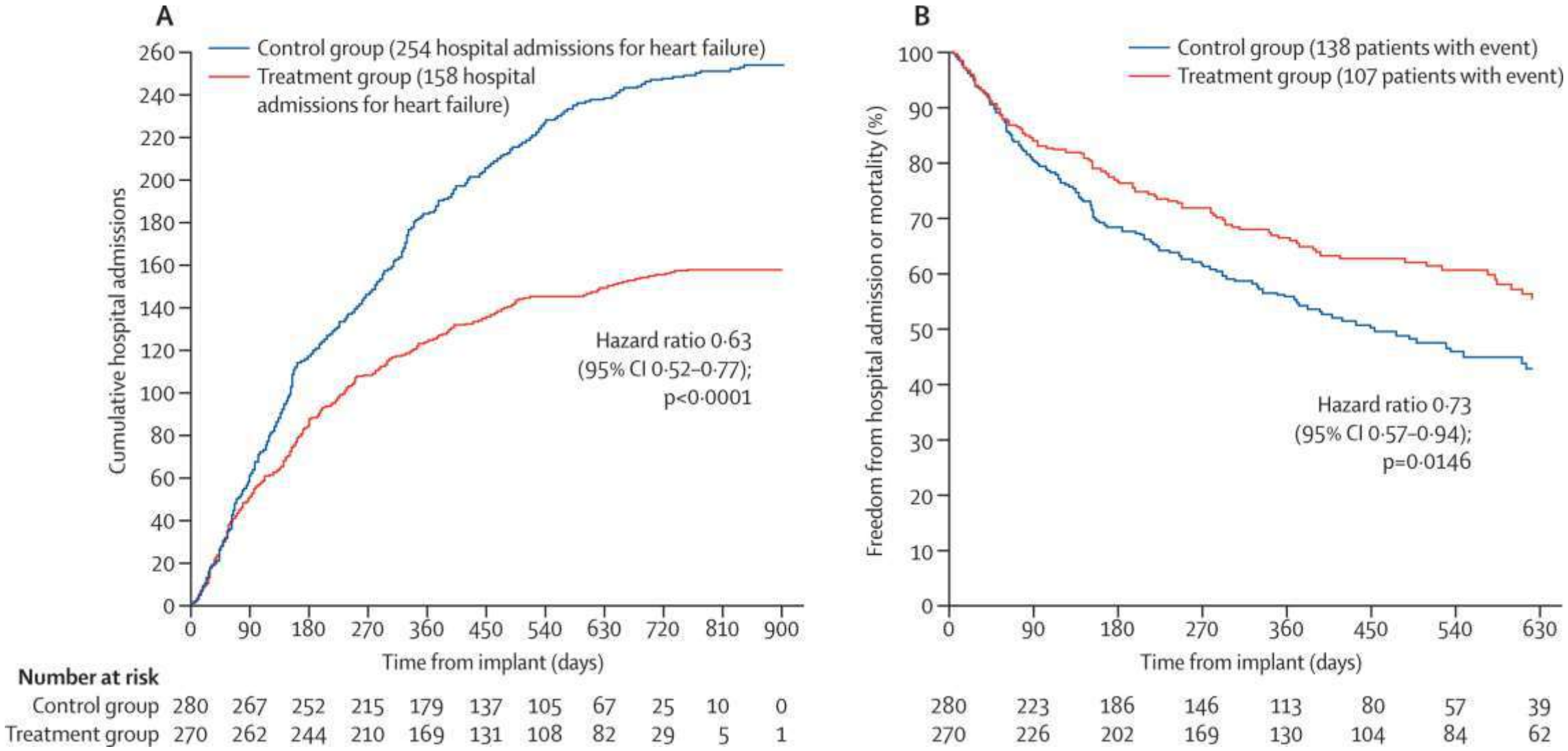
- Handheld display shows relevant information e.g.

- The Patient Electronics Unit provides spoken instructions in local language
- After the implant the patient is trained how to use of the PEU at home

The Notifications List: Only The Patients Who Need My Attention



CHAMPION


A
Control group (254 hospital admissions for heart failure)
Treatment group (158 hospital admissions for heart failure)
Cumulative hospital admissions
Hazard ratio 0·63
(95% CI 0·52–0·77);
p<0·0001
Time from implant (days)
Number at risk
Control group 280 267 252 215 179 137 105 67 25 10 0
Treatment group 270 262 244 210 169 131 108 82 29 5 1
B
Control group (138 patients with event)
Treatment group (107 patients with event)
Freedom from hospital admission or mortality (%)
Hazard ratio 0·73
(95% CI 0·57–0·94);
p=0·0146
Time from implant (days)
280 223 186 146 113 80 57 39
270 226 202 169 130 104 84 62

Remote haemodynamic monitoring of pulmonary artery pressures in patients with chronic heart failure (MONITOR-HF): a randomised clinical trial

Jasper J Brugts, Sumant P Radhoe*, Pascal R D Clephas†, Dilan Aydin†, Marco W F van Gent, Mariusz K Szymanski, Michiel Rienstra, Mieke H van den Heuvel, Carlos A da Fonseca, Gerard C M Linssen, C Jan Willem Borleffs, Eric Boersma, Folkert W Asselbergs, Arend Mosterd, Hans-Peter Brunner-La Rocca, Rudolf A de Boer for the MONITOR-HF investigators*

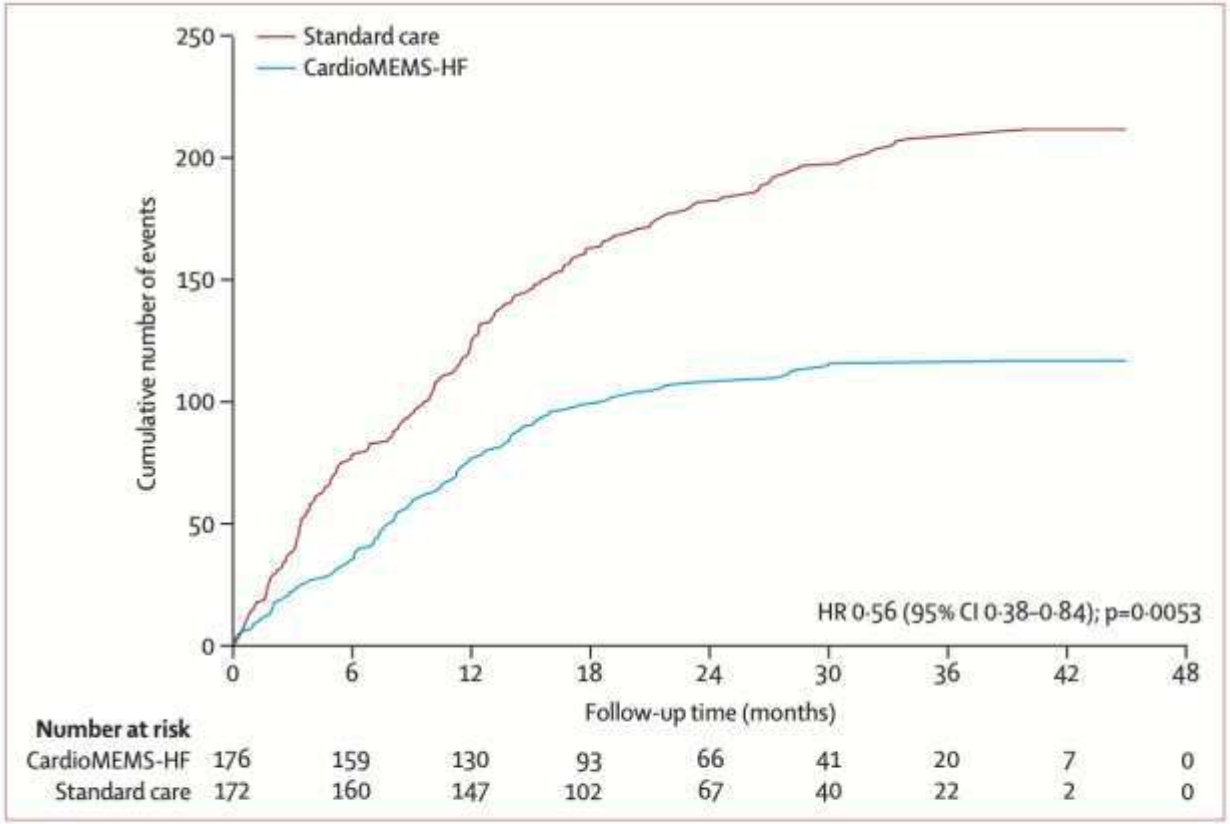


Figure 4: **Cumulative number of total heart failure hospitalisations (heart failure hospitalisations and urgent visits with necessity of iv diuretics) during entire follow-up**

colleagues,[14] "to master heart failure, first master congestion"; no invasive tool will improve patients without acting on pressures. Clearly, remote monitoring triggered this interaction between patient and caregiver as reflected in the number of drug changes that primarily targeted fluid status and the decline in mean pulmonary artery pressure and natriuretic peptide concentration. Most changes were made in diuretics, which could be in both directions, up-titration in case of hypervolaemia and down-titrations in case of hypovolaemia in a safe and controlled way.

Our results might support the heart failure community to embrace e-health, digital technology, and telemonitoring to reduce the burden on our hospitals.

ESC HEART FAILURE
ESC Heart Failure 2021; **8**: 3613–3620
Published online 28 June 2021 in Wiley Online Library (wileyonlinelibrary.com) **DOI:** 10.1002/ehf2.13413

ORIGINAL RESEARCH ARTICLE

Is 24/7 remote patient management in heart failure necessary? Results of the telemedical emergency service used in the TIM-HF and in the TIM-HF2 trials

Sebastian Winkler[1,2*], Kerstin Koehler[2], Sandra Prescher[2], Magdalena Koehler[3,4], Bridget-Anne Kirwan[5], Milos Tajsic[6] and Friedrich Koehler[2,7]

[1]*Department of Internal Medicine, Unfallkrankenhaus Berlin, Berlin, Germany;* [2]*Medical Department, Division of Cardiology and Angiology, Centre for cardiovascular Telemedicine, Charité–Universitätsmedizin Berlin, Charitéplatz 1, Berlin, D-10117, Germany;* [3]*Ludwig-Maximilians Universität München, Munich, Germany;* [4]*Department of Prevention, Rehabilitation and Sports Medicine, University Hospital 'Klinikum rechts der Isar', School of Medicine, Technical University Munich, Munich, Germany;* [5]*Department of Clinical Research, SOCAR Research SA, Nyon, Switzerland; Faculty of Epidemiology and Public Health London School of Hygiene & Tropical Medicine, University College London, London, UK;* [6]*Emergency Department, Wilhelminenspital Wien, Vienna, Austria; and* [7]*German Centre for Cardiovascular Research Partner Site Berlin, Charité – Universitätsmedizin Berlin, Berlin, Germany*

Mortality and unplanned hospitalizations of patients with/without an emergency call (EC) in TIM-HF and TIM-HF2

	TIM HF			TIM HF2		
	Without EC $n = 216$	With EC $n = 138$	P	Without EC $n = 468$	With EC $n = 279$	P
All-cause death	24 (11%)	30 (22%)	0.007	22 (4%)	45 (16%)	<0.001
Total number of hospitalization	162	324	<0.001	180	545	<0.001
Total number of cardiovascular hospitalization	80	208	<0.001	109	279	<0.001
Number of hospitalization per patient	0.6 (0.5–0.7)	2.6 (2.2–3.0)	<0.001	0.4 (0.3–0.4)	2.0 (1.8–2.2)	<0.001
Days lost due to all-cause hospitalization	9.2 (6.0–12.3)	31.3 (23.9–38.8)	<0.001	6.3 (5.1–7.6)	23.3 (20.2–26.5)	<0.001
Days lost due to cardiovascular hospitalization	3.2 (1.9–4.6)	22 (15.3–28.6)	<0.001	2.9 (2.1–3.7)	11.5 (9.4–13.6)	<0.001
Days lost due to cardiovascular hospitalization or all-cause death during 1 year follow-up	*	*		3.6	13.9	<0.001

EC, emergency call.
*TIM-HF had a fixed stopping date resulting in an individualized patient follow-up time.

Remote Monitoring in Real-world HF Cuts All-Cause Mortality: TELESAT-HF

These data are observational but suggest that basic remote monitoring of weight and symptoms can cut patient risk.

by Michael O'Riordan | MAY 12, 2024

NYHA Functional Class II or Higher

Patients with NYHA functional class II or higher, indicating moderate to severe heart failure.

Elevated BNP/NT-proBNP Levels

Patients with elevated BNP or NT-proBNP levels, indicating heart failure severity.

Recent Hospitalization for HF Decompensation

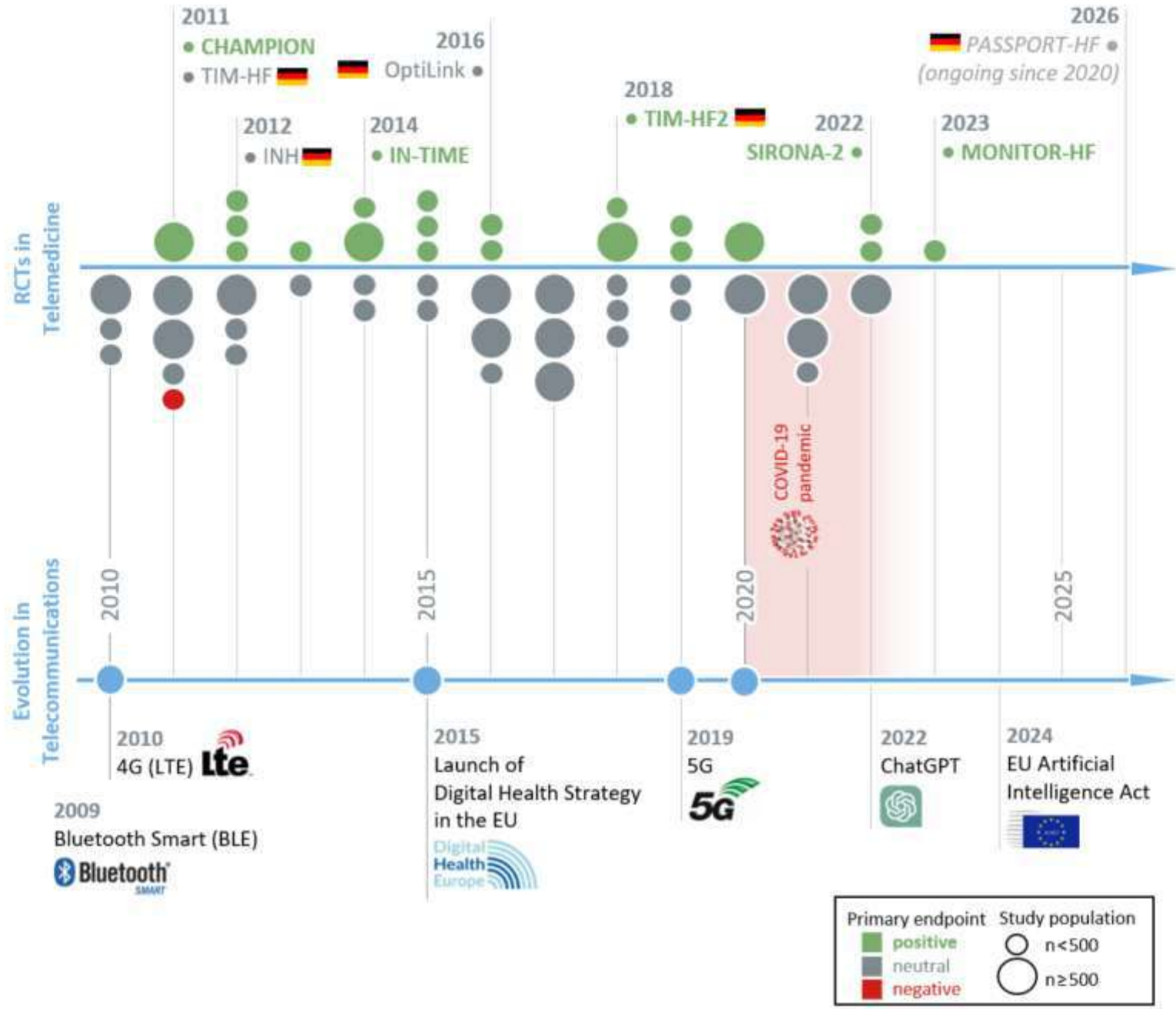
Patients hospitalized within the past 12 months for heart failure decompensation.

✅ **TELESAT-HF (France, 2024, Real-World Evidence)**

- **N = 5,357 RPM patients** vs 13,525 matched controls
- **Result**:
  - ↓ All-cause mortality (HR 0.64)
  - Bigger benefit even in **digitally illiterate patients** using phone-based reporting

Girerd N, on behalf of the TELESAT investigators. Impact of a remote monitoring program on all-cause mortality of patients with heart failure: National, real-world evidence of the TELESAT study. Presented at: ESC Heart Failure 2024. May 11, 2024. Lisbon, Portugal

Chronicle of RCTs in Telemedicine



AI Algorithms

Telehealth platform

Self management of patients

Pulmonary Arery Pressure

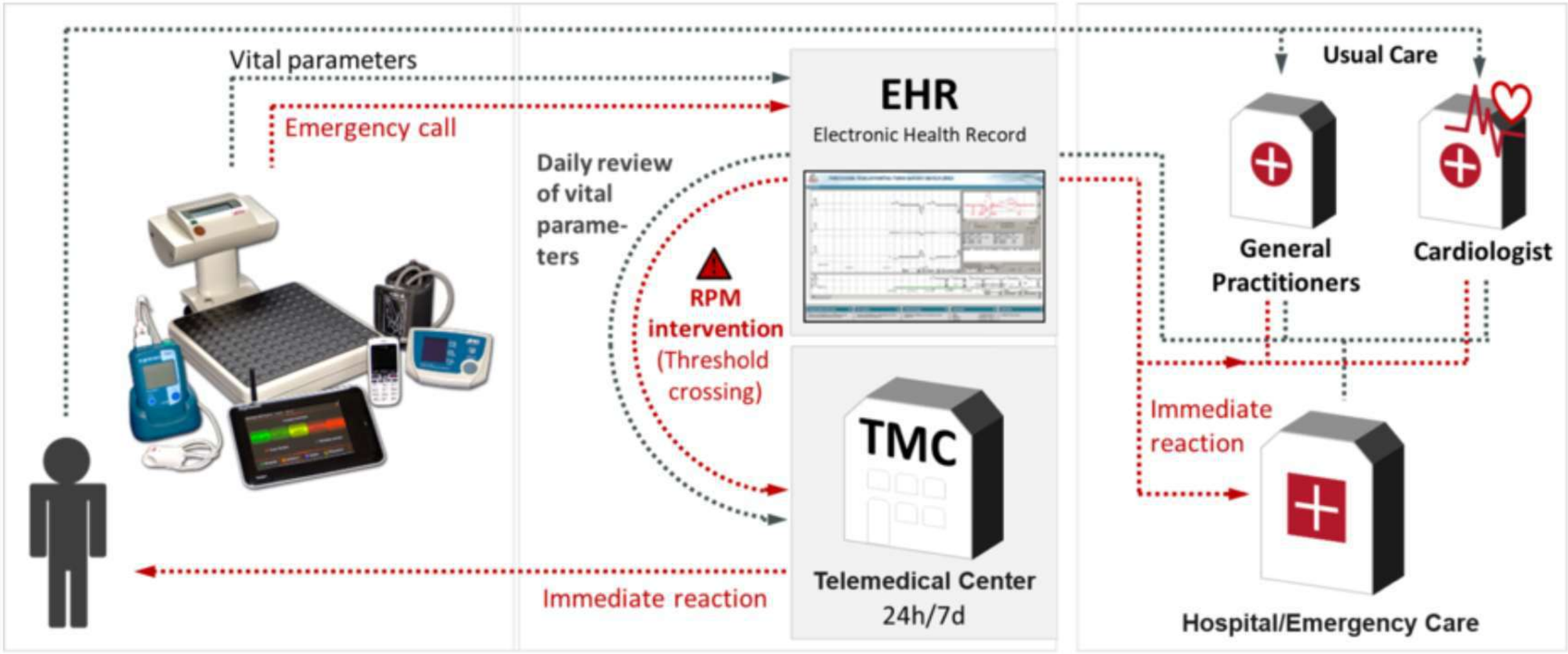
Lifestyle

Fluid balance

Medication adherence

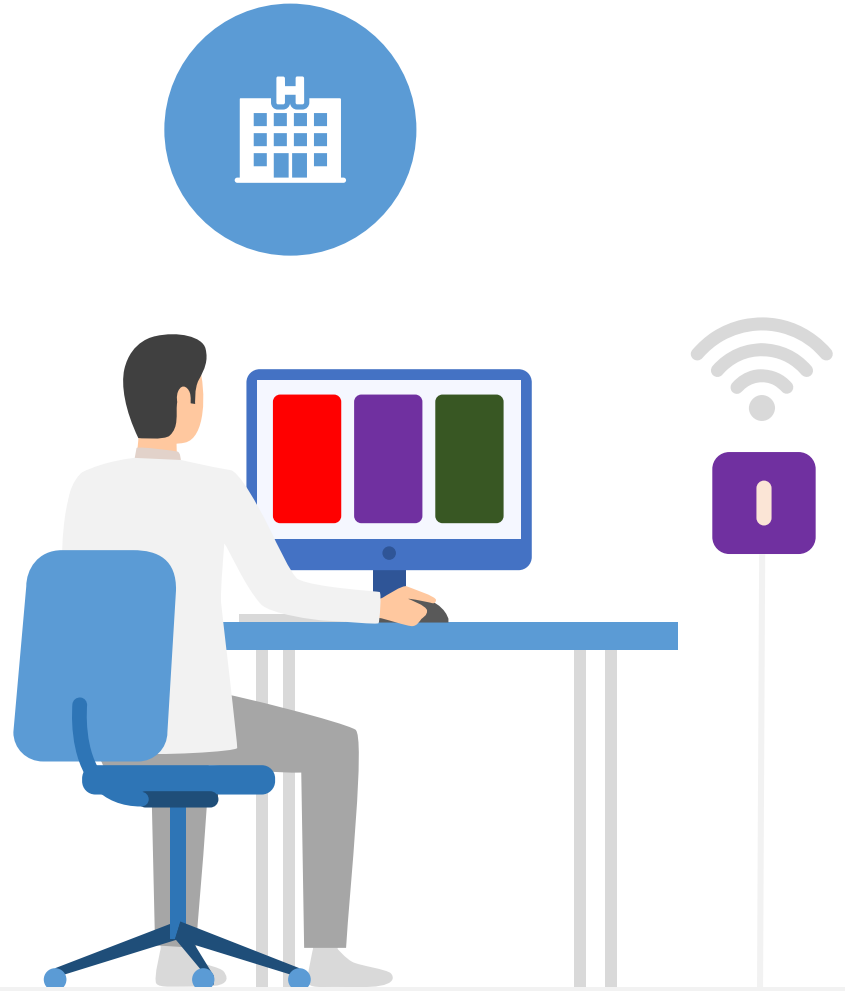
Connection with DR

Components of telemonitoring in heart failure according to the G-BA (Federal Joint Committee/Gemeinsamer Bundesausschuss) approval in Germany



Hospital@Home

Hospital at Home is a healthcare model that allows patients to receive acute care services in the comfort of their own homes instead of a traditional hospital setting

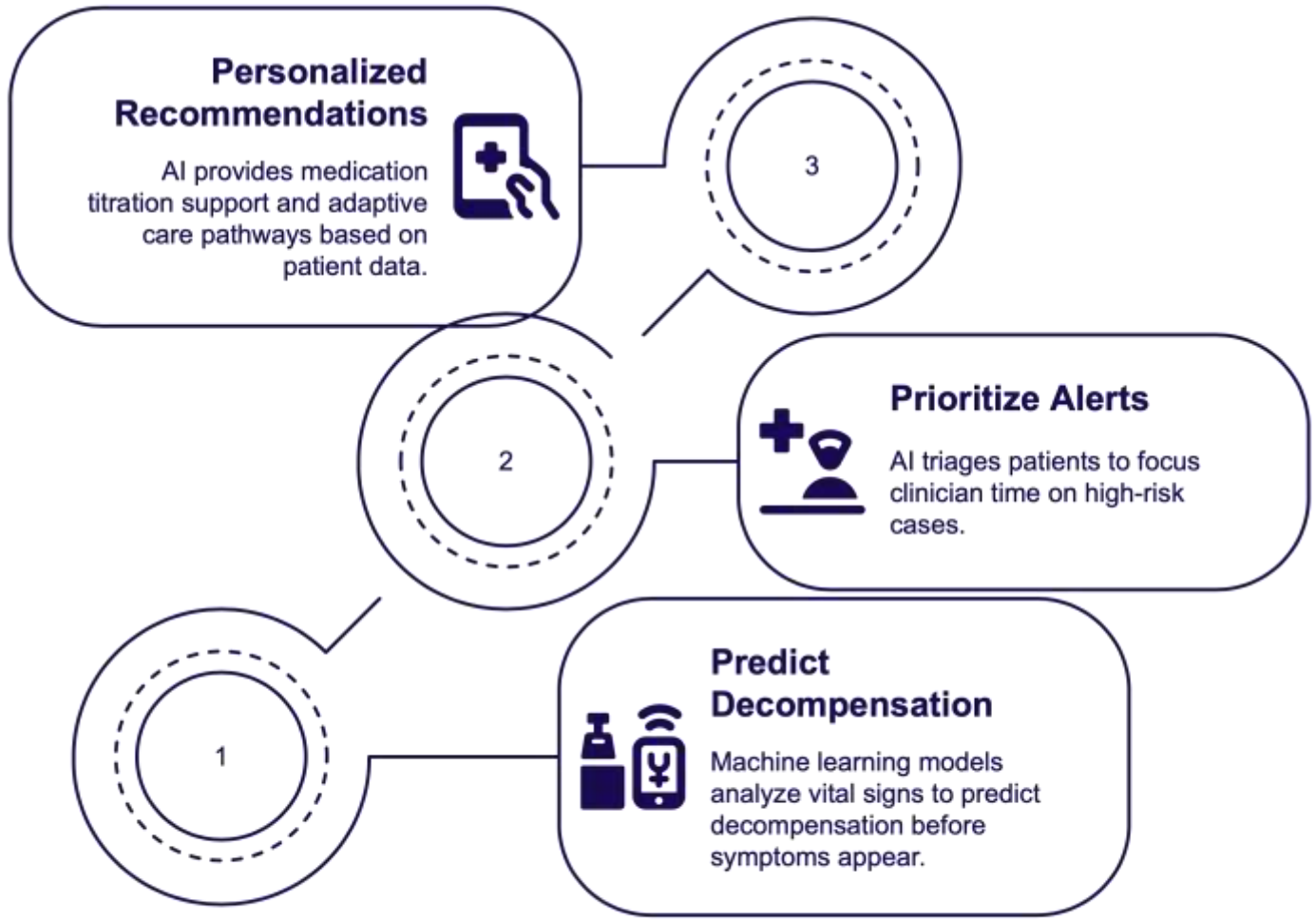


Main Advantages

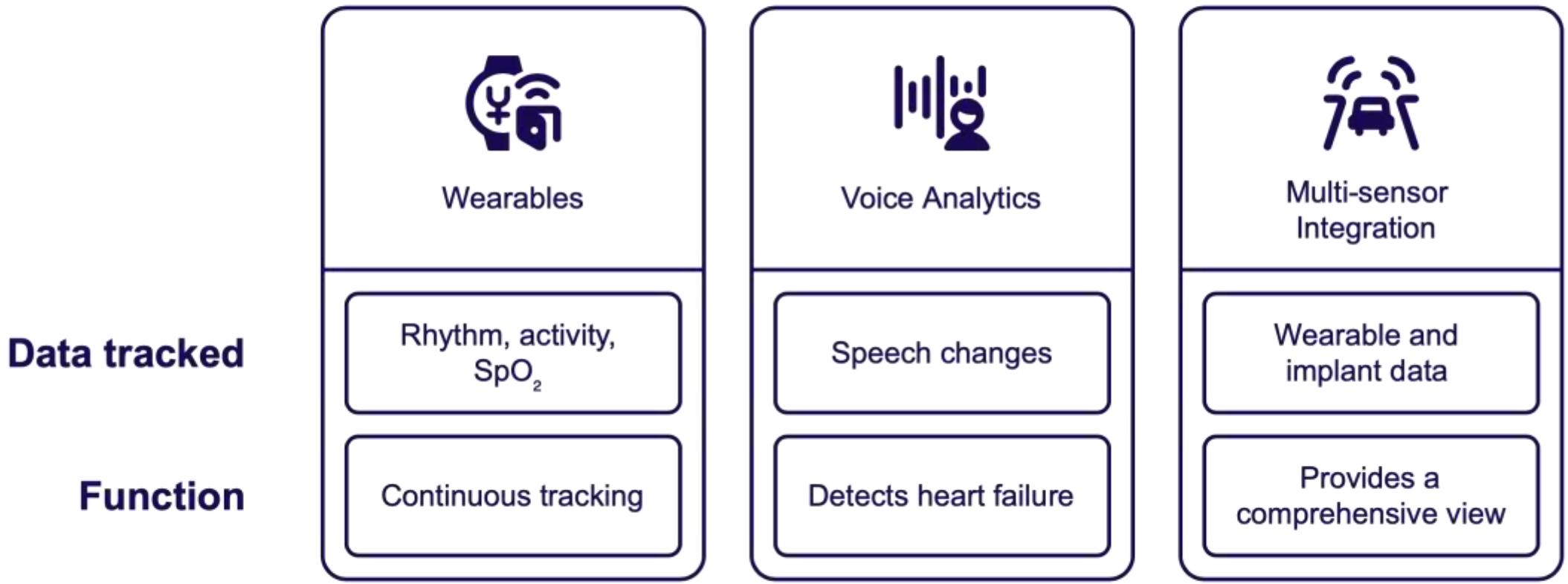
- **Patient-Centered Care**
- **Cost-effective**
- **Resource efficient**

- It can help address capacity issues in hospitals during periods of peak demand
- It offers a valuable alternative for patients who need acute care but do not need the full resources of a hospital
- Patients treated at home experience fewer hospital-acquired infections, which promotes a safer and more comfortable recovery environment

🤖 Artificial Intelligence in RPM
📈 What AI Can Do:

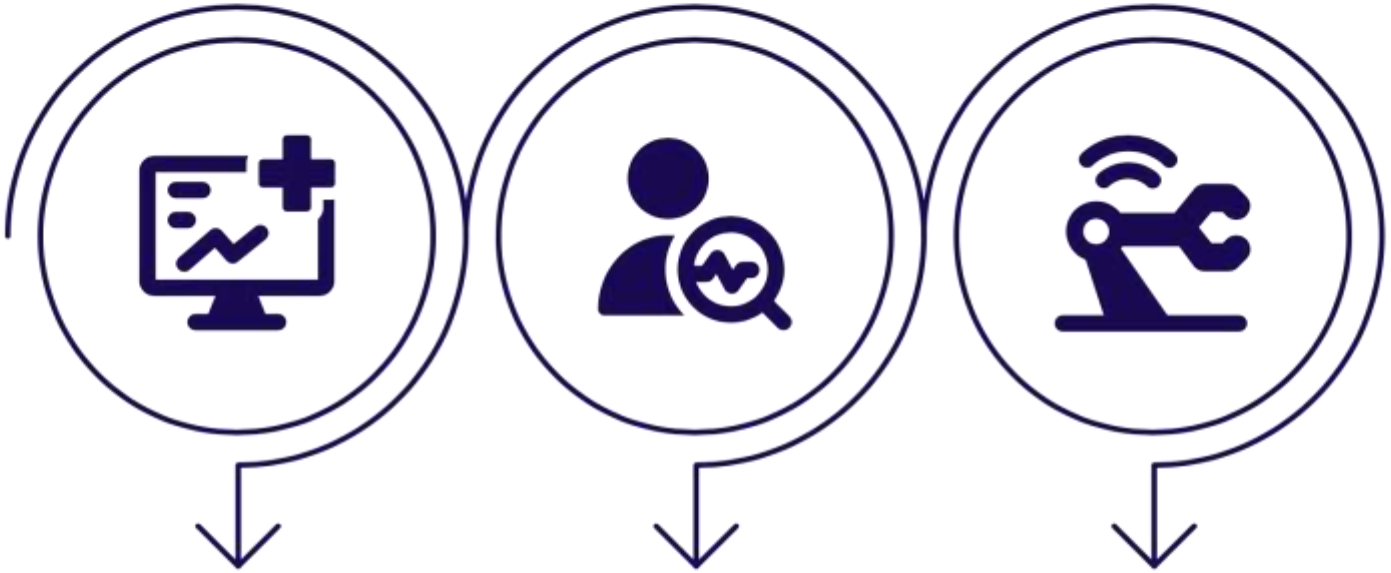


🧬 Next-Gen Monitoring Tools



Beyond the Device:
Integration with Health Systems

Smarter Ecosystems



Clinician Dashboards

Smart dashboards designed for clinicians

Patient Insights

Patient-facing insights promoting self-care

Automated Tools

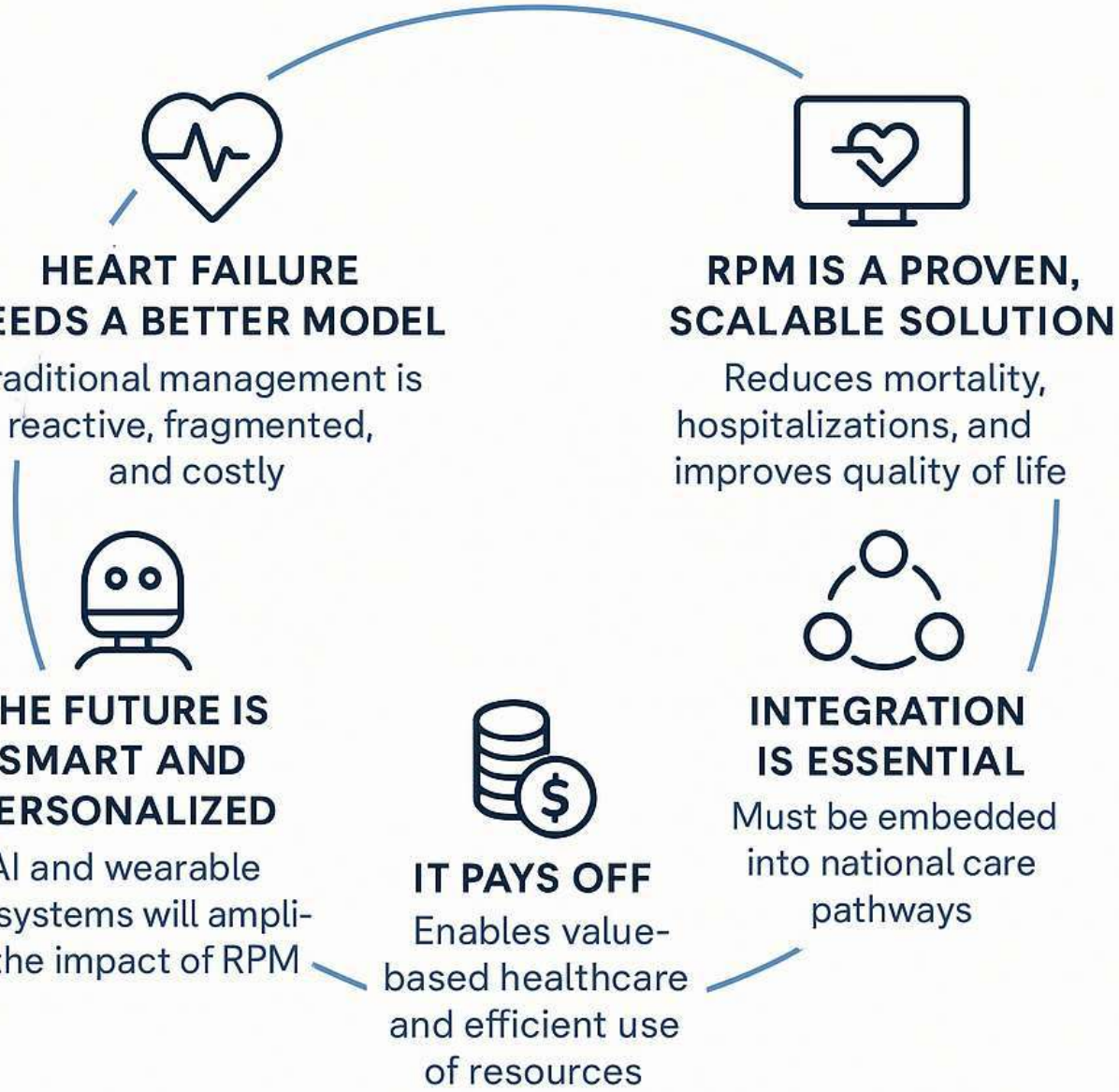
Automated nudges, reminders, behavior change tools

Difficulties and Challenges

- Data privacy and security
- Digital Divide
- Training of health care providers
- Legal issues
- Patient involvement
- Solutions and Strategies:

Solving these problems requires a combination of policy, technology and education

KEY TAKEAWAYS



HEART FAILURE NEEDS A BETTER MODEL

Traditional management is reactive, fragmented, and costly

RPM IS A PROVEN, SCALABLE SOLUTION

Reduces mortality, hospitalizations, and improves quality of life

THE FUTURE IS SMART AND PERSONALIZED

AI and wearable ecosystems will amplify the impact of RPM

IT PAYS OFF

Enables value-based healthcare and efficient use of resources

INTEGRATION IS ESSENTIAL

Must be embedded into national care pathways