Como estratificar o risco de *Worsening Heart Failure?*

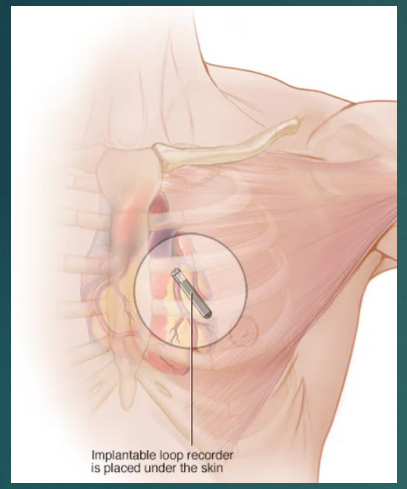
Parâmetros de diagnóstico em monitores cardíacos implantáveis

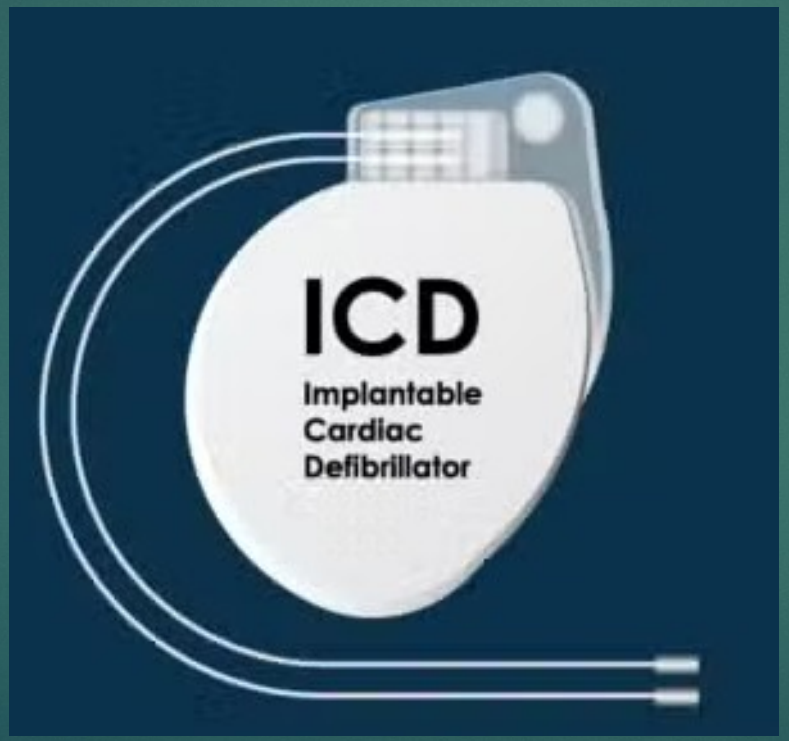
Sérgio Barra

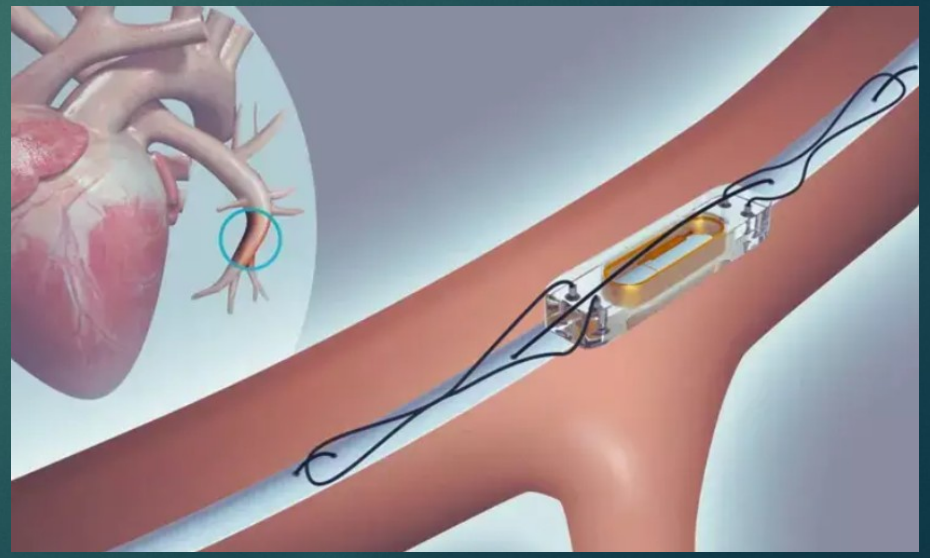
Hospital da Luz Arrábida

Follow-up of chronic HF

Remote monitoring with implanted devices







Follow-up of chronic HF

Data from implanted devices

- Information about the device function (generator and lead function)
- Arrhythmias
- Patient physiology (heart rate, activity, heart sounds, bio-impedance)

Follow-up of chronic HF

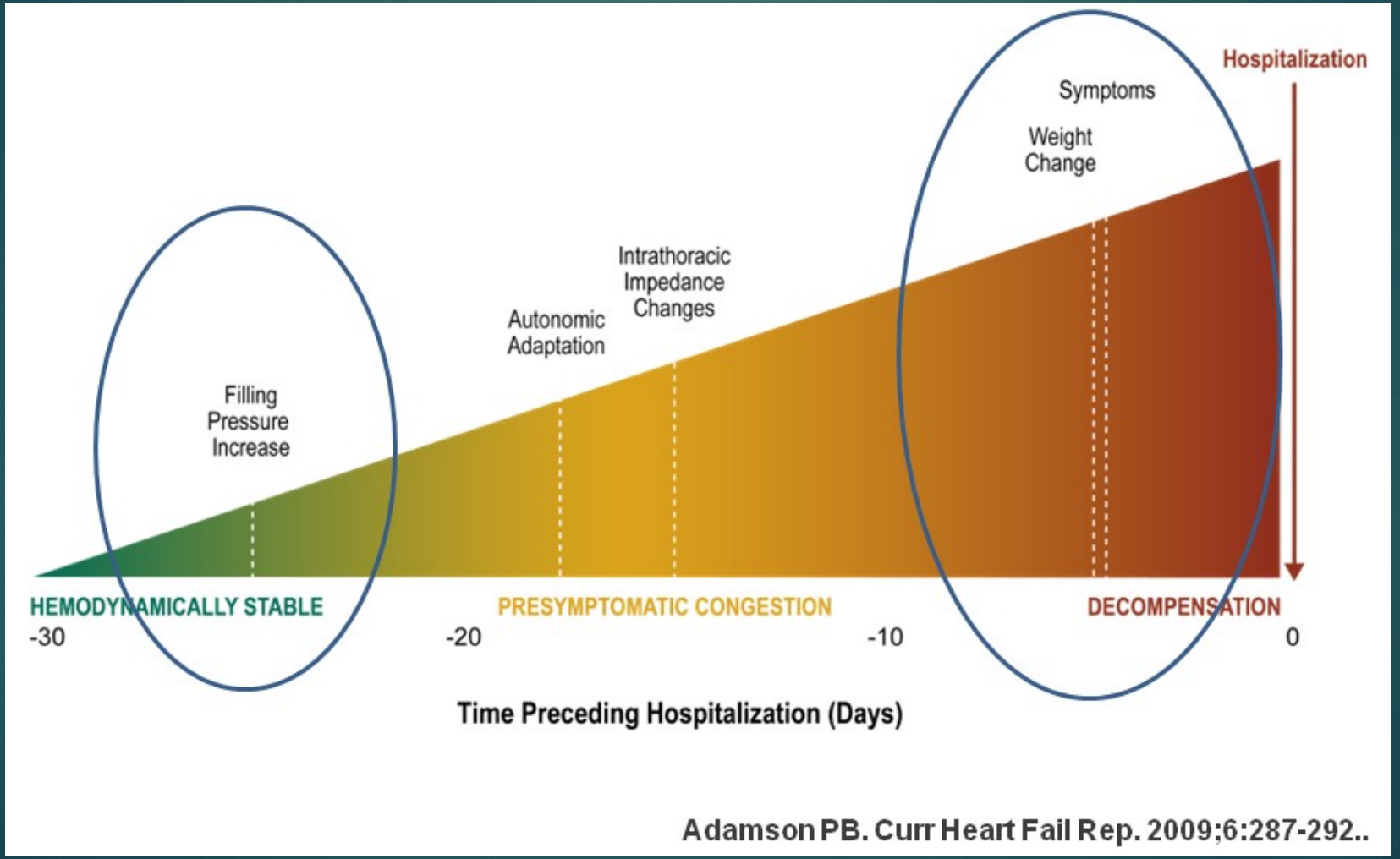
Data from implanted devices – Why ?

- Identification of HF patients who may decompensate ?

- Prognostic benefit ?
  - Fewer hospitalizations
  - Milder symptoms → improved QoL
  - Improved mortality

Follow-up of chronic HF

Markers of acute decompensation



Adamson PB. Curr Heart Fail Rep. 2009;6:287-292..

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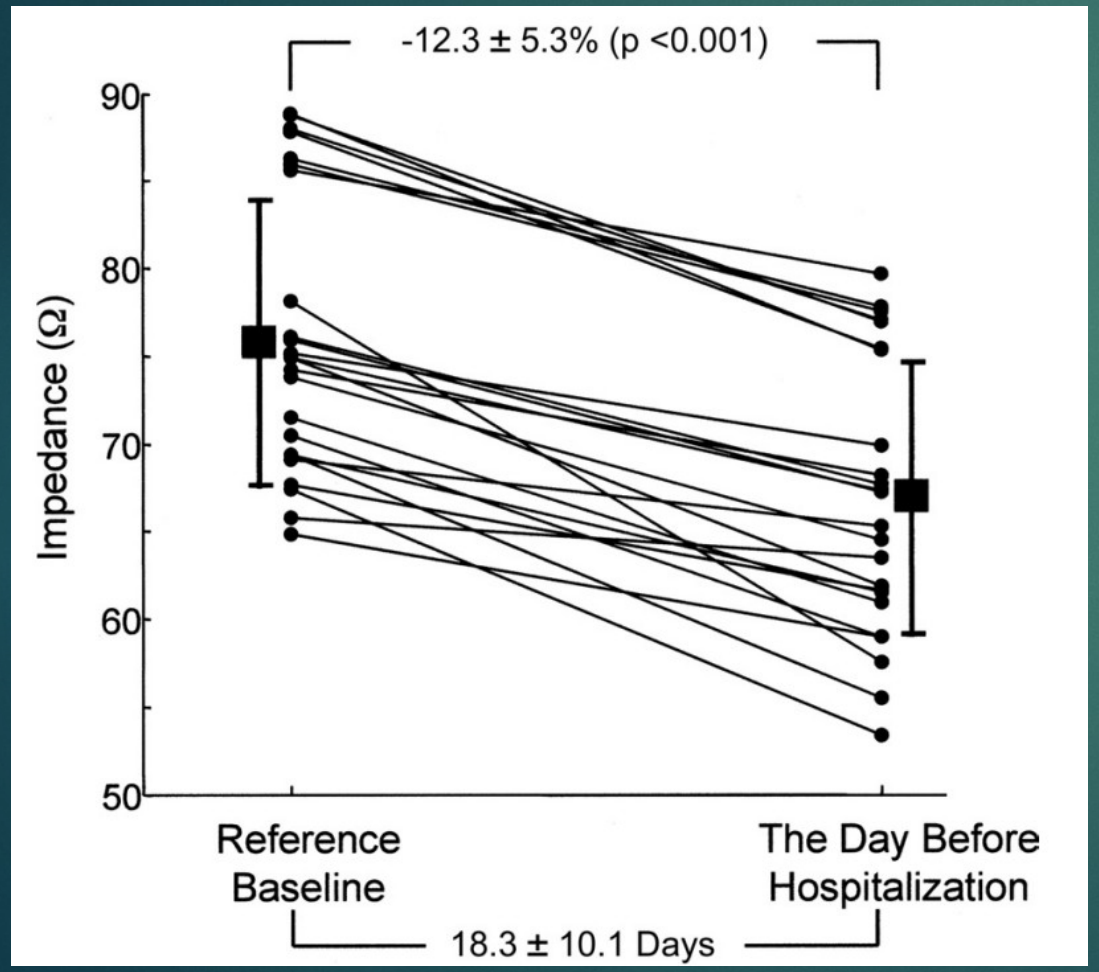
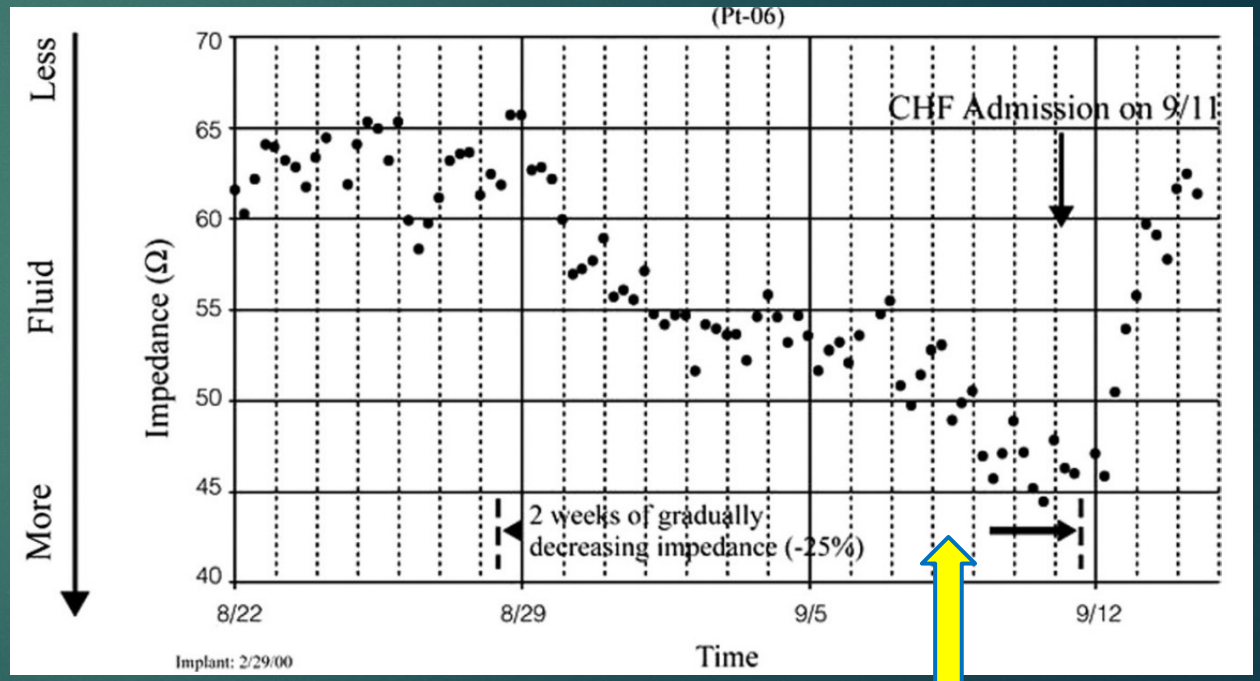
Information from implanted devices – impedance





True positive

Li Wang. AJC 2007.

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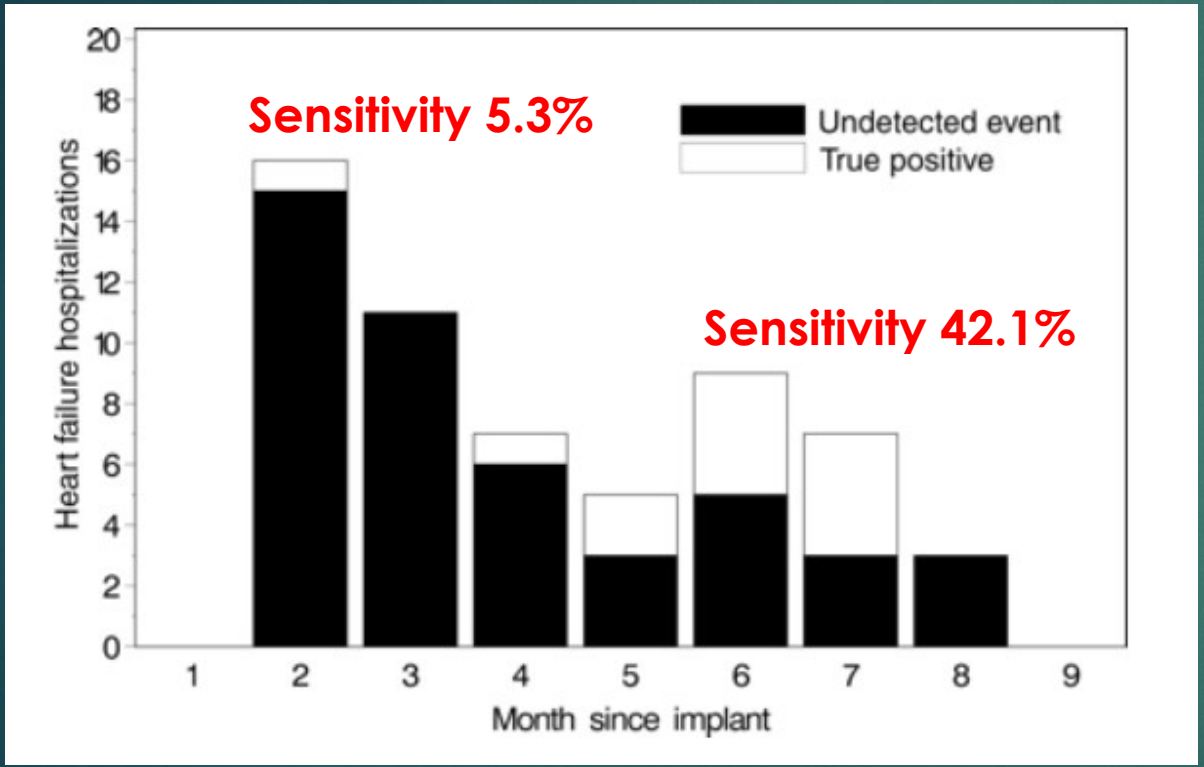
Information from implanted devices – SENSE-HF (impedance)



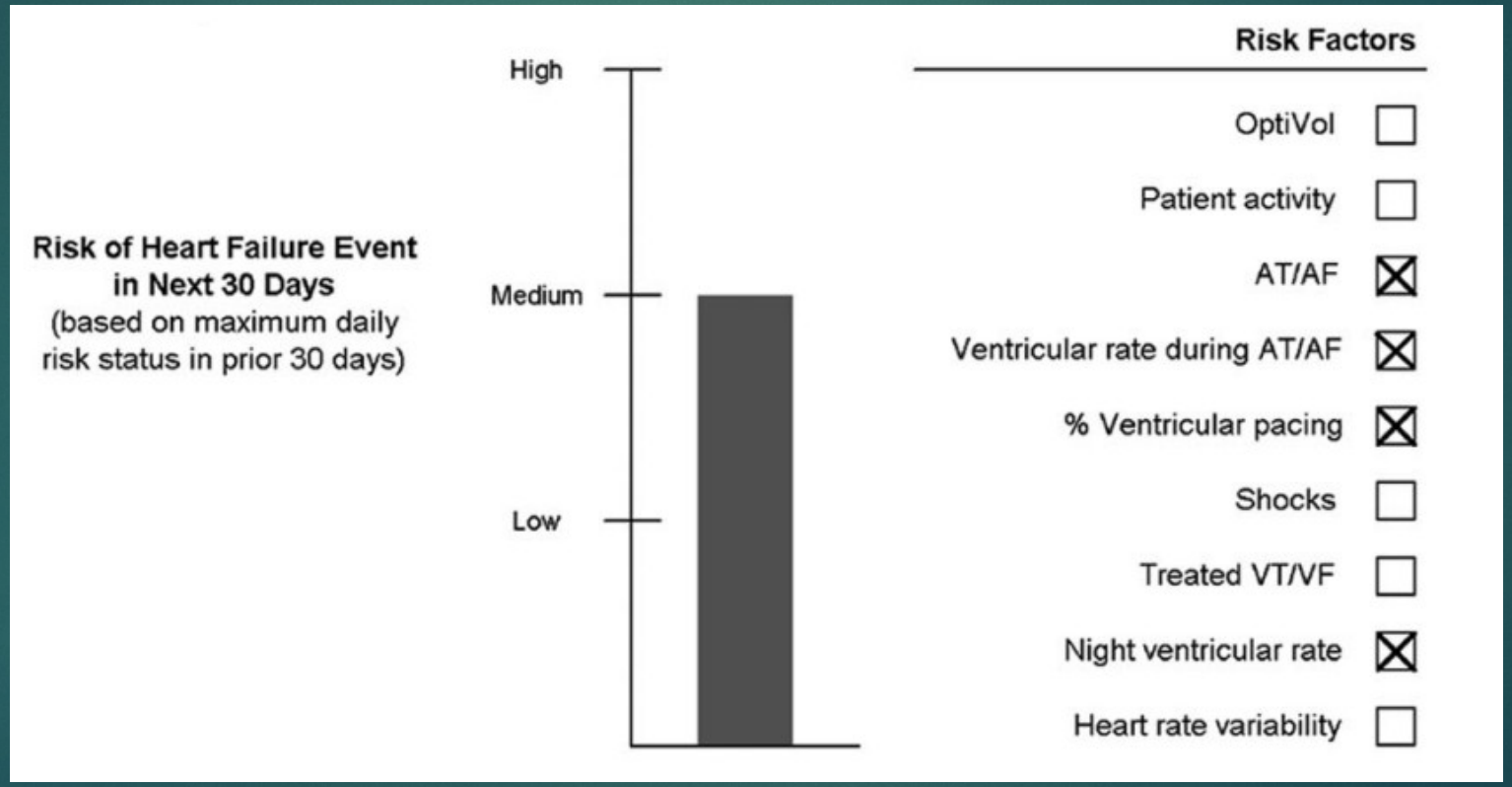
~60% of hospitalizations were not predicted !

~60-90% of alerts were false alarm !

Viviane M. Conraads. EHJ 2011.

Follow-up of chronic HF

Information from implanted devices – Multiparameter scores



Sean A. Virani. ESC Heart Failure 2018.

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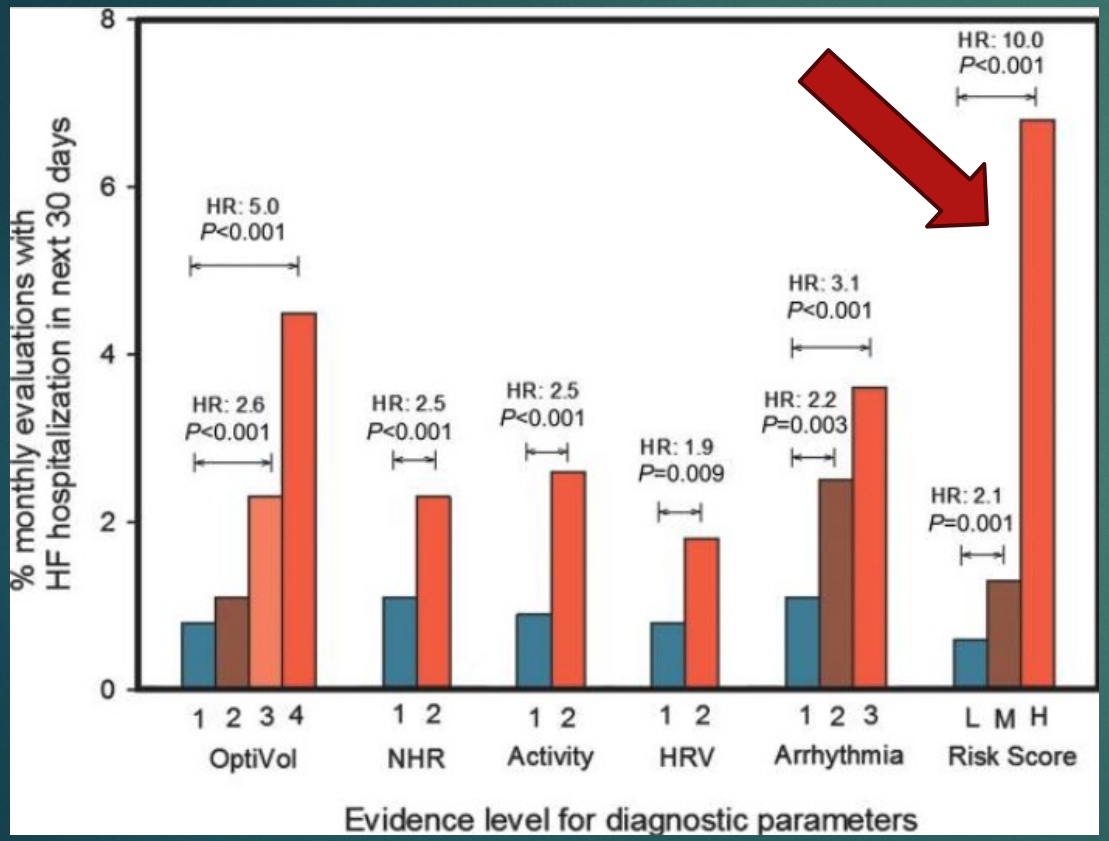
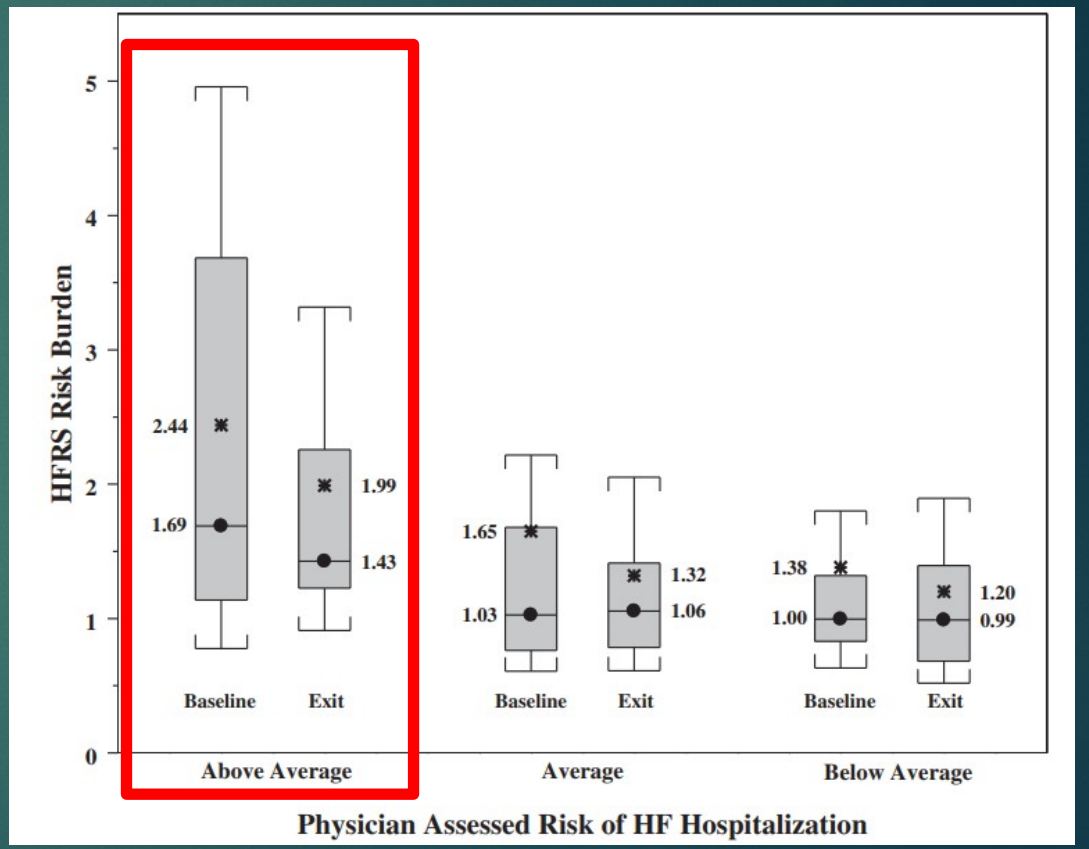
Information from implanted devices – TRIAGE-HF



Martin Cowie et al. EHJ 2013.



Sean A. Virani. ESC Heart Failure 2018.

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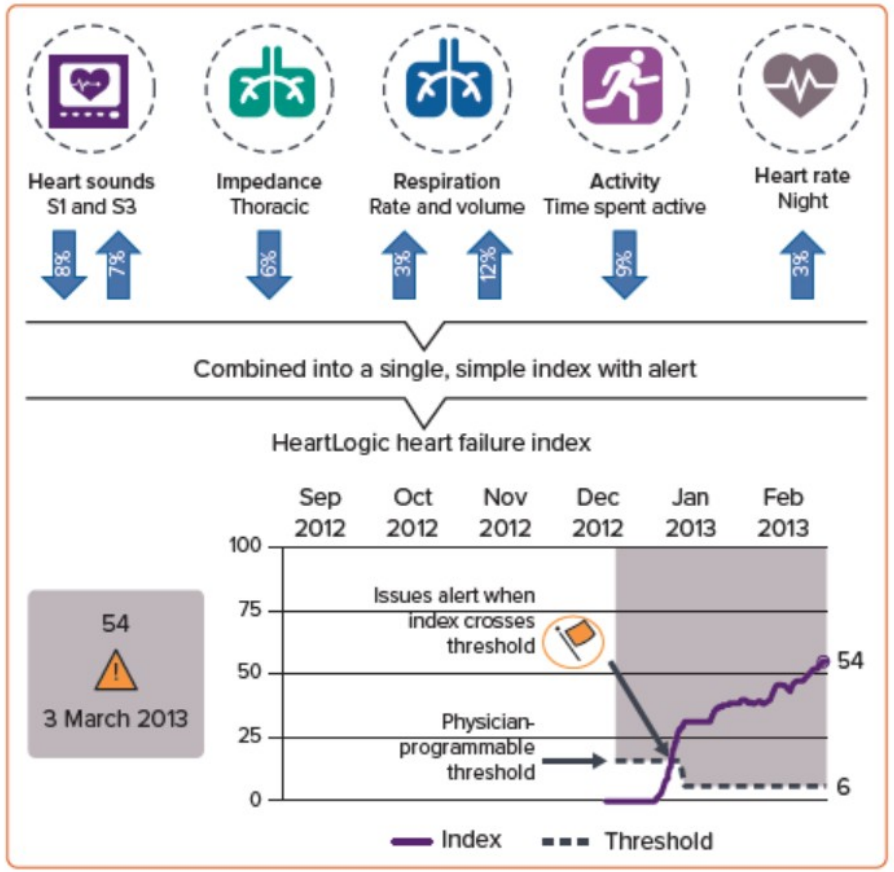
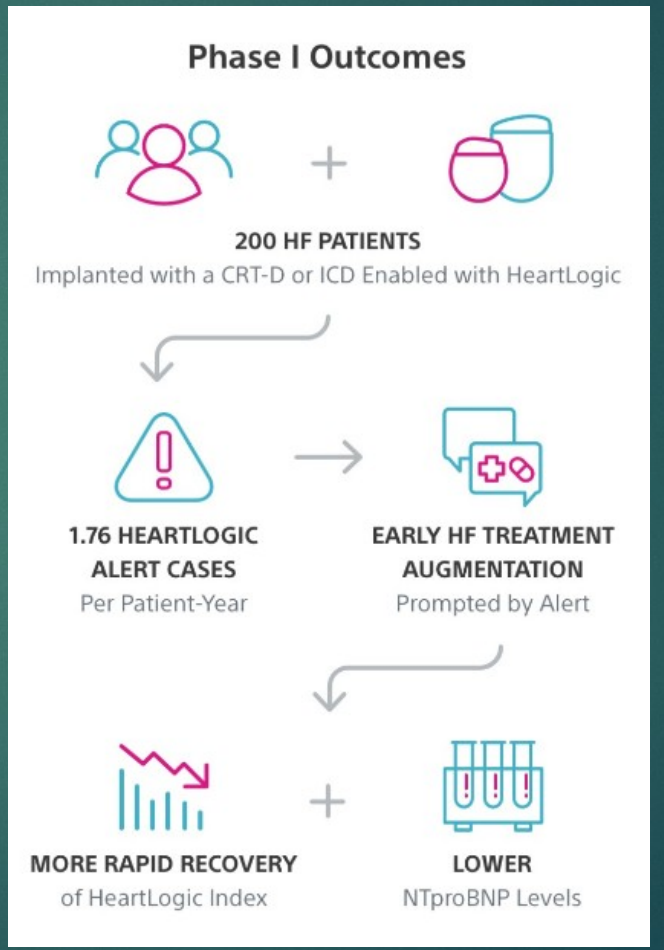
Information from implanted devices – MANAGE-HF

Figure 2: HeartLogic Algorithm



Percentages inside the arrows reflect the mean sensor variations (all p<0.01) between baseline (20–60 days) and the days (1–3) prior to hospitalisation. Source: Boehmer et al.[26]



67% ↓ hospitalization compared to pre-study

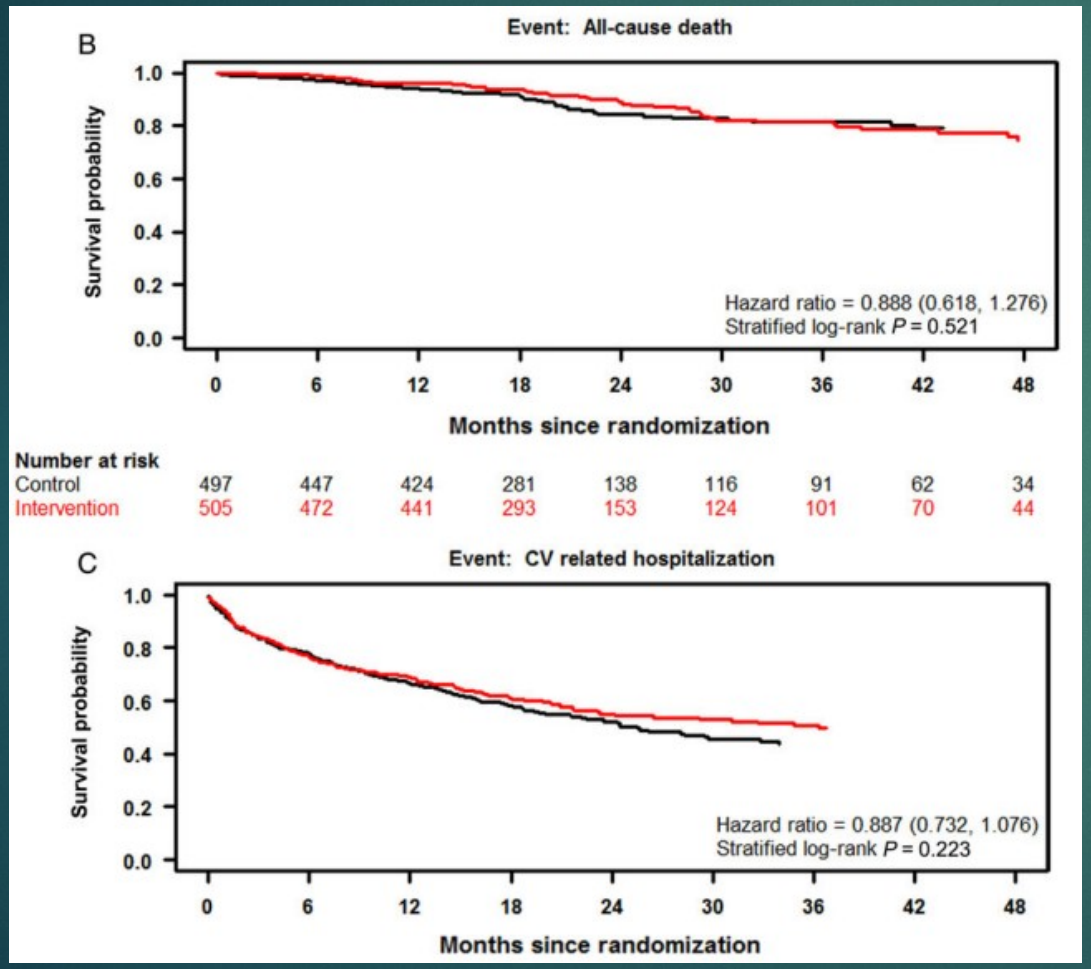
Lower mean NT-proBNP

Juan Carlos López-Azor et al. Card Fail Rev 2022.
Adrian Hernandez et al. J Cardiac Fail 2022.

IMPACT ON PROGNOSIS ?

Follow-up of chronic HF

Impact on prognosis – OptiLink-HF (impedance)



Only 26% of fluid crossings led to medication change

The rate of telemonitor-guided medical intervention was low

Michael Bohm et al. EHJ 2016.

Follow-up of chronic HF

Impact on prognosis – DOT-HF (multiparameter, no RM)

Intrathoracic impedance	alert
OptiVol® Fluid Index	
Number of VT/VF episodes per day	
Number of ICD shocks per day	
Ventricular rate during VT/VF	
Hours of AT/AF per day	
Ventricular rate during AT/AF	
Percent atrial and ventricular pacing per day	
Average ventricular rate (day and night)	
Patient activity	
Heart rate variability	

Dirk J. van Veldhuisen et al. Circulation 2011.

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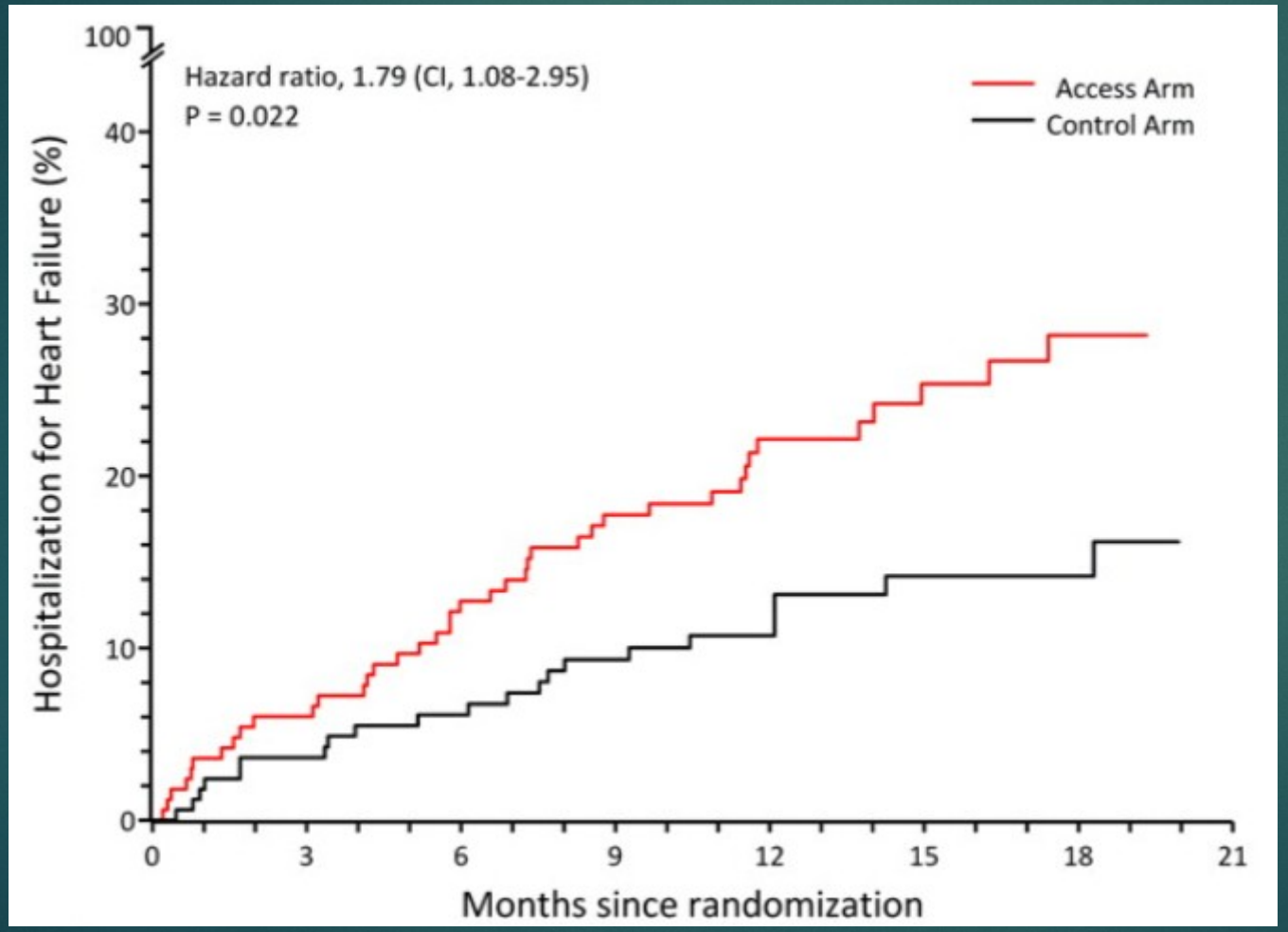
Information from implanted devices – DOT-HF



Increased hospitalization!

Dirk J. van Veldhuisen et al. Circulation 2011.

Follow-up of chronic HF

Impact on prognosis – DOT-HF

Table 3. Outpatient Visits

	Access Arm (n=168), n (%)	Control Arm (n=167), n (%)	*P*, Access vs Control*
Total visits	250	84	<0.0001
Primary reason for visit			†
Signs/symptoms of cardiac decompensation alone	11 (4)	22 (26)	
OptiVol threshold crossing (exclusive)	114 (46)	NA	
Signs/symptoms and OptiVol crossing	30 (12)	NA	
Intervention algorithm (exclusive)	11 (4)	5 (6)	
Other reason	84 (34)	57 (68)	

A strategy that triggers healthcare use on the basis of patient alerts for possible fluid overload may not be the appropriate!

Dirk J. van Veldhuisen et al. Circulation 2011.

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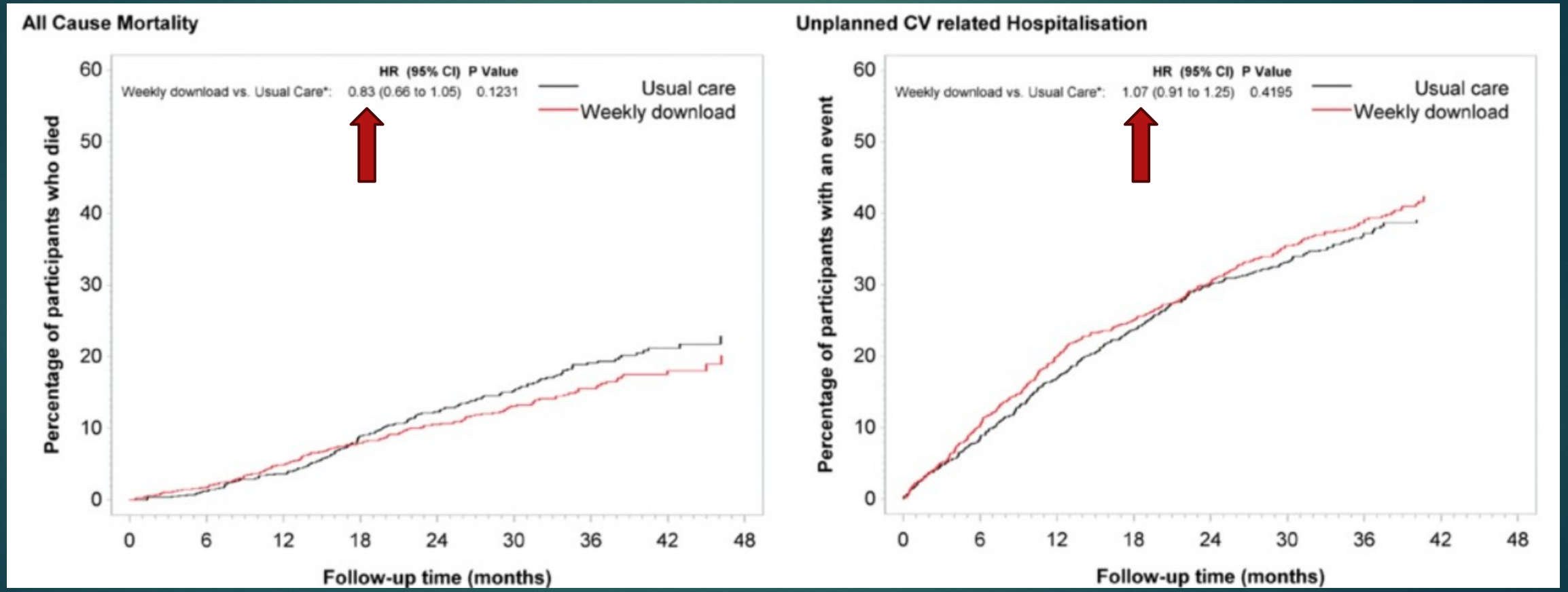
Impact on prognosis – REM-HF (multiparameter)



John Morgan et al. EHJ 2017.

Follow-up of chronic HF

Impact on prognosis – IN-TIME (multiparameter)

Implant-based multiparameter telemonitoring of patients with heart failure (IN-TIME): a randomised controlled trial

*Gerhard Hindricks, Milos Taborsky, Michael Glikson, Ullus Heinrich, Burghard Schumacher, Amos Katz, Johannes Brachmann, Thorsten Lewalter, Andreas Goette, Michael Block, Josef Kautzner, Stefan Sack, Daniela Husser, Christopher Piorkowski, Peter Søgaard, for the IN-TIME study group**

Daily automatic transmissions

More severe LV systolic dysfunction

Thoracic impedance excluded

Gerhard Hindricks et al. The Lancet 2014.

Follow-up of chronic HF

Impact on prognosis – IN-TIME (multiparameter)

Mostly in AF patients!

	Telemonitoring group (n=333)	Control grou (n=331)	p value
Worsened	63 (18·9%)	90 (27·2%)	0·013*
Death	10 (3·0%)	27 (8·2%)	0·004*
Overnight admission to hospital for worsening heart failure†	23 (6·9%)	27 (8·2%)	..
Worsened NYHA functional class and global self-assessment	0 (0·0%)	1 (0·3%)	..
Worsened NYHA functional class only	23 (6·9%)	31 (9·4%)	..
Worsened global self-assessment only	7 (2·1%)	4 (1·2%)	..

Gerhard Hindricks et al. The Lancet 2014.

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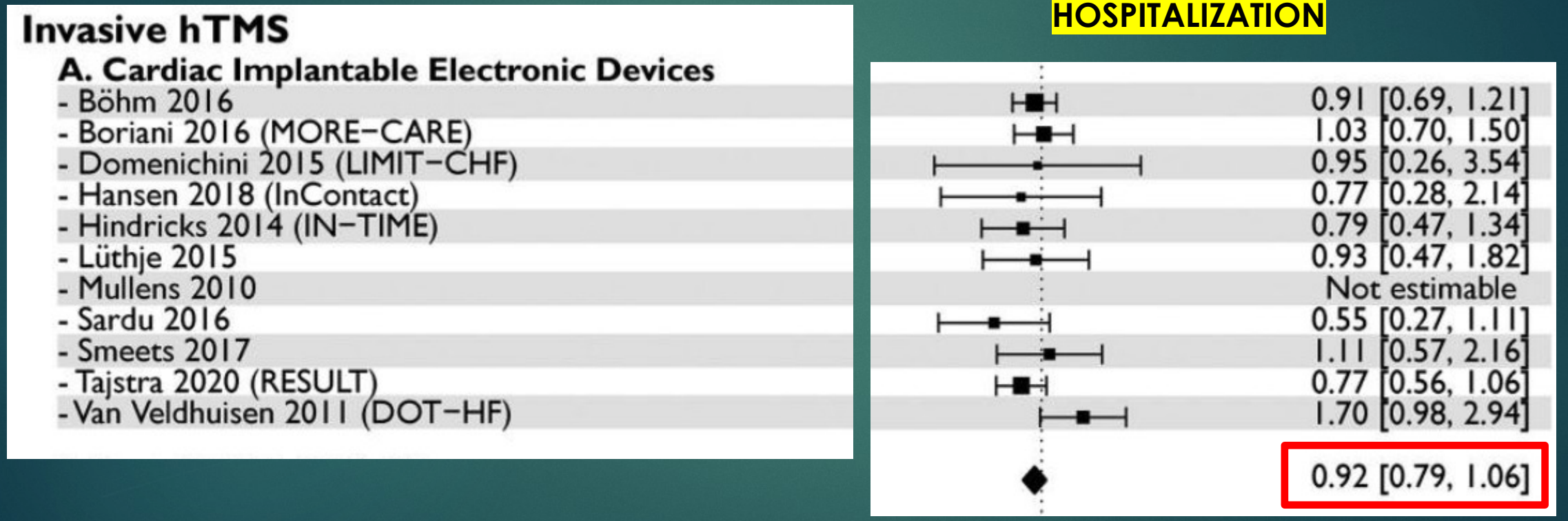
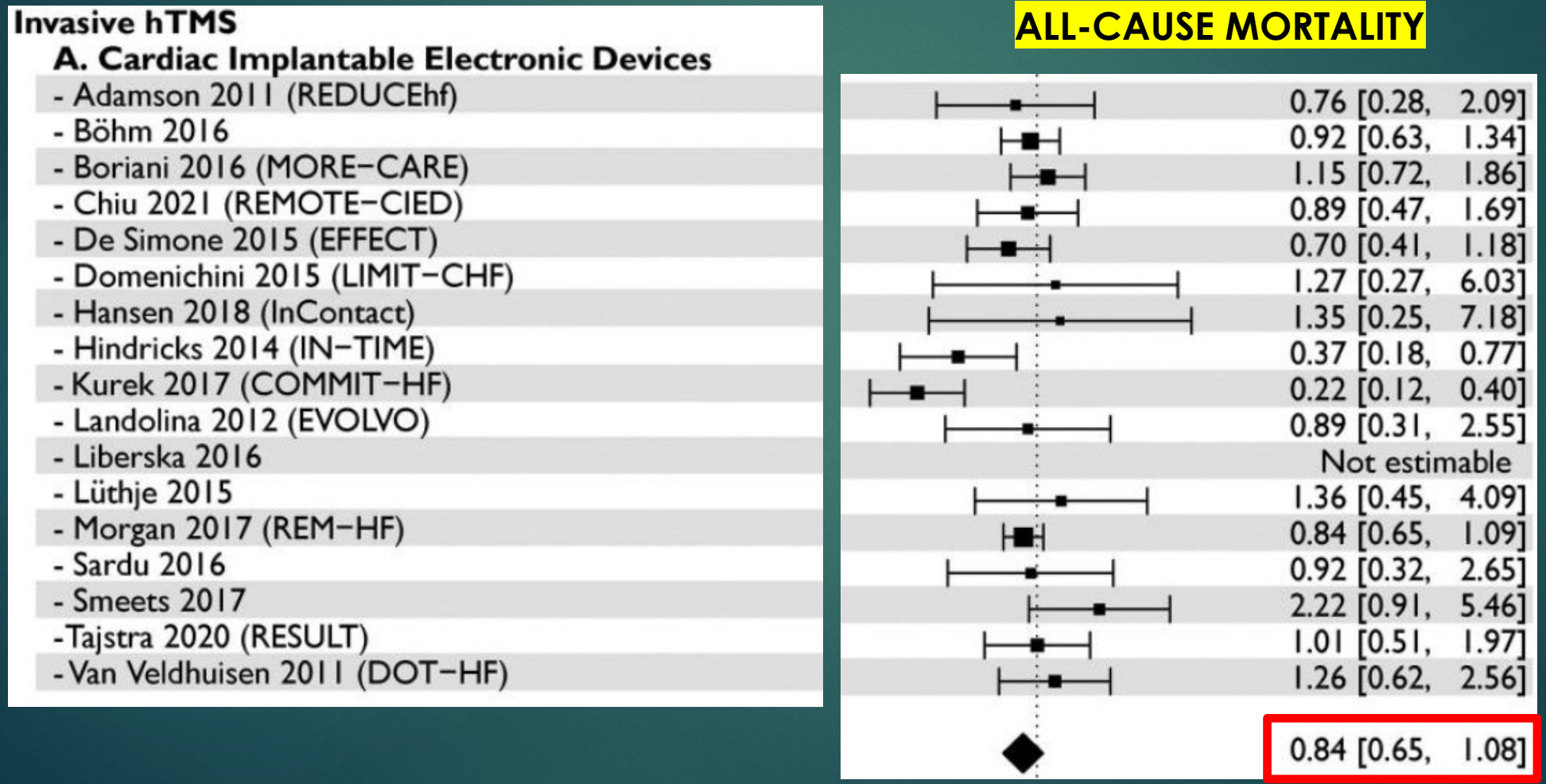
Impact on prognosis – summary of studies



Niels Scholte et al. EHJ 2023.

Follow-up of chronic HF

Impact on prognosis – summary of studies

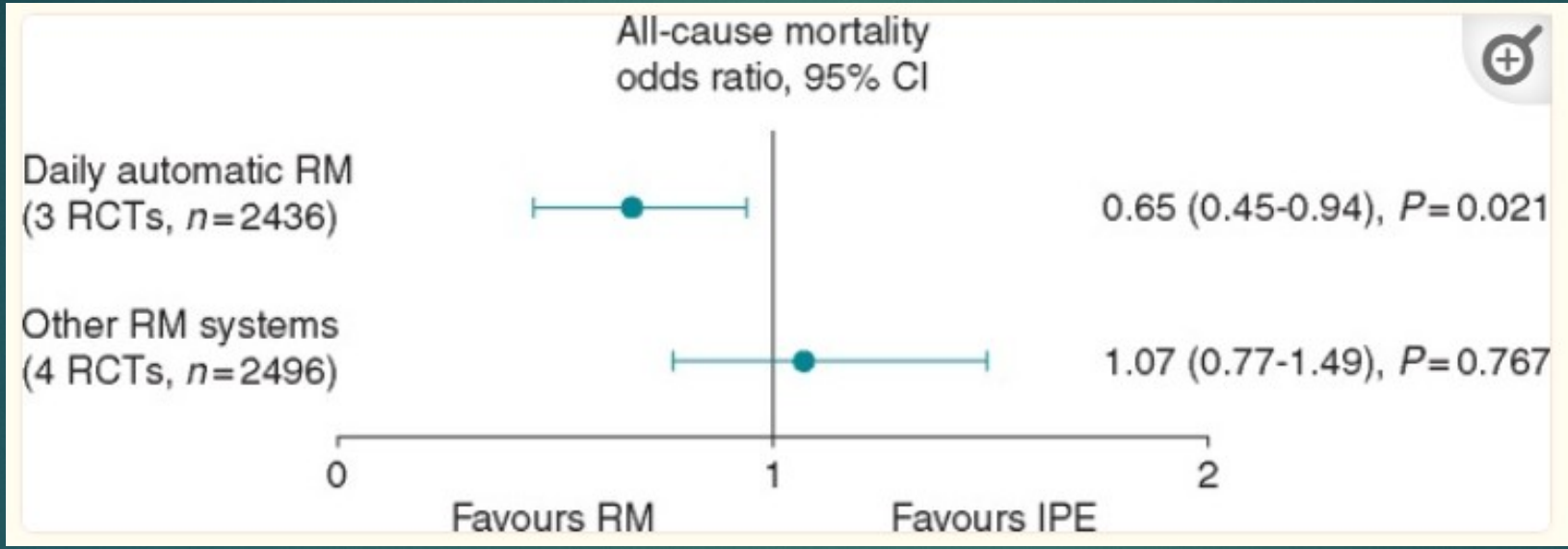


Niels Scholte et al. EHJ 2023.

Follow-up of chronic HF

Impact on prognosis – summary of studies

ALL-CAUSE MORTALITY

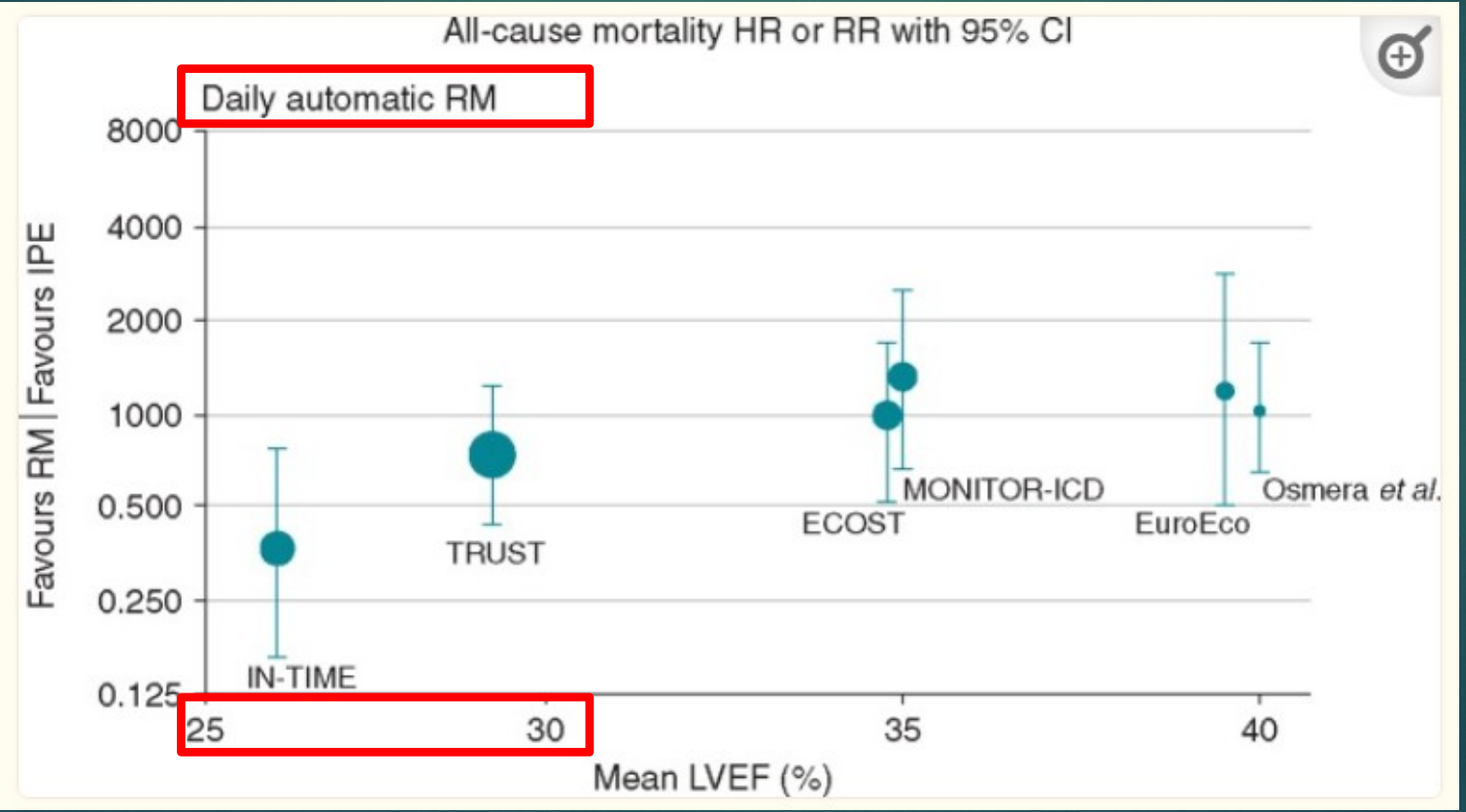


Parthiban N et al. *J Am Coll Cardiol* 2015.

Follow-up of chronic HF

Impact on prognosis – summary of studies

ALL-CAUSE MORTALITY



Frieder Braunschweig et al. Europace 2019.

DISCUSSION

Follow-up of chronic HF

CIED data and remote monitoring – summary

- No unequivocal prognostic benefit

  But not inferior to standard follow-up!

  Possible mortality benefit in more severe HF and higher AF risk

- Preferential use of
  - Multiparameter scores
  - Automatic daily remote monitoring (IN-TIME)

  Technology platform and workflow matter!

Follow-up of chronic HF

CIED data and remote monitoring – summary

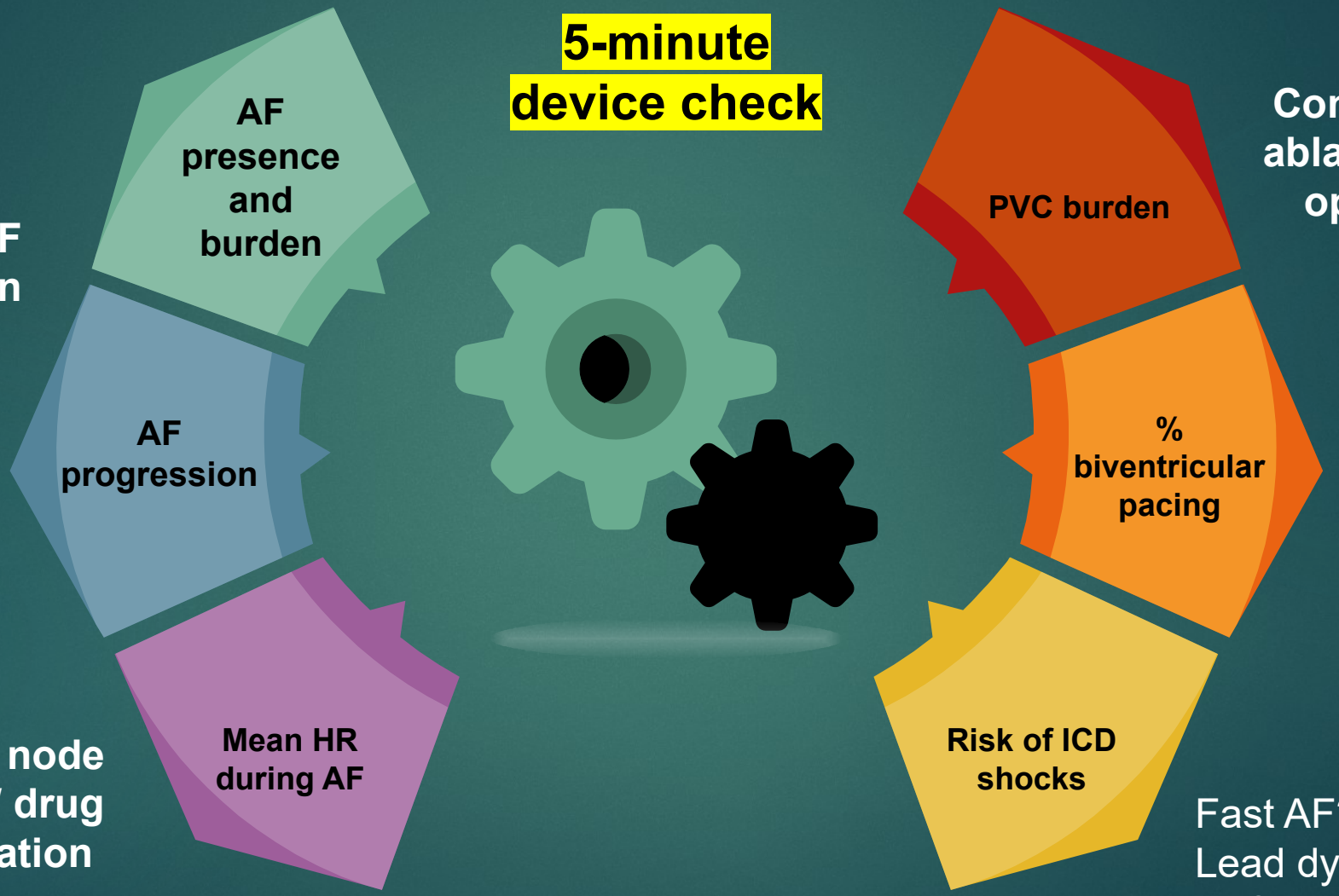
- Additional (randomized) studies required

How to capitalize on the early detection (‘same day') power of continuous monitoring?

Follow-up of chronic HF

Data from implanted cardiac devices

5-minute device check



Consider AF ablation

Consider AV node ablation / drug optimization

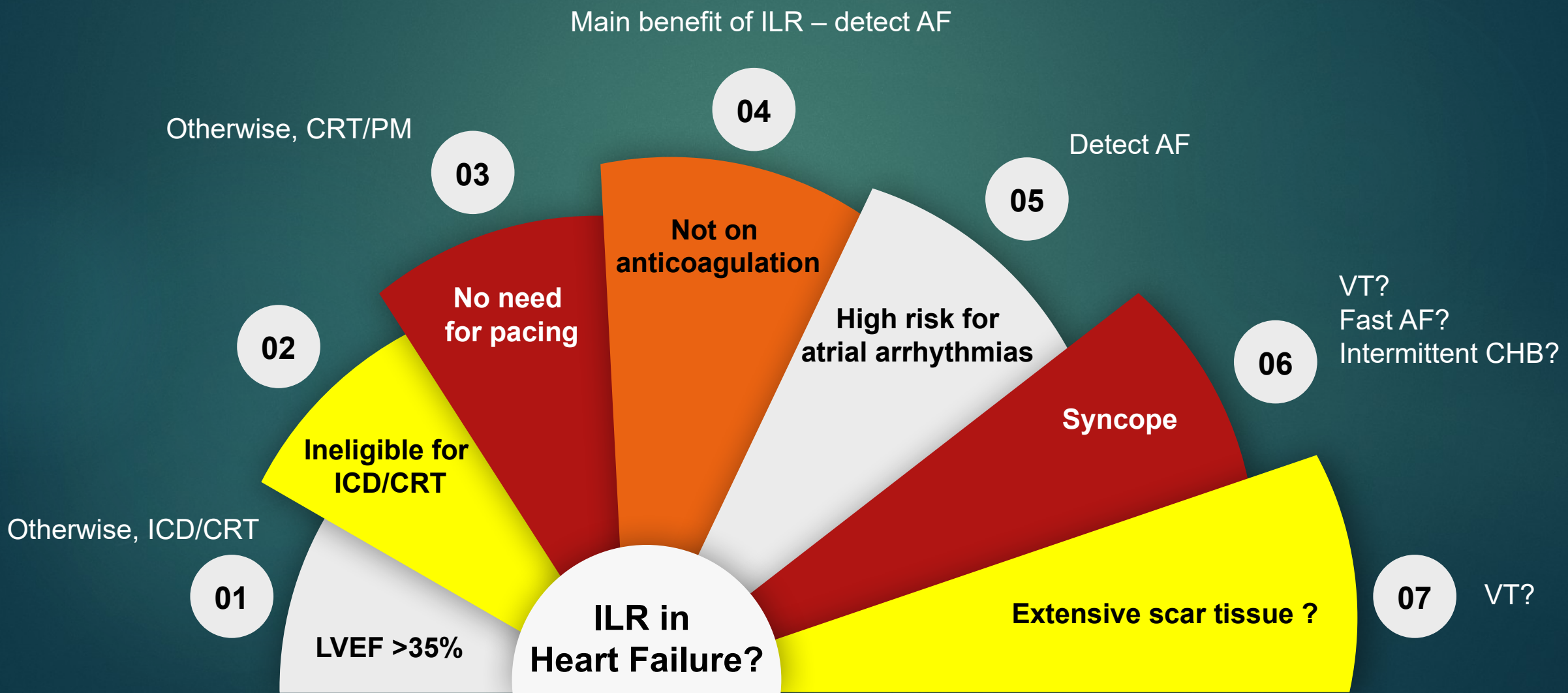
Consider PVC ablation / drug optimization

Fast AF?
Frequent PVCs?
Lead dysfunction?
Loss of capture?

Fast AF?
Lead dysfunction?
VT?

Follow-up of chronic HF

ILR ?



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