Como estratificar o risco de Worsening Heart Failure?

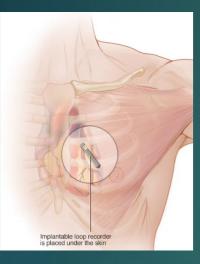
Parâmetros de diagnóstico em monitores cardíacos implantáveis

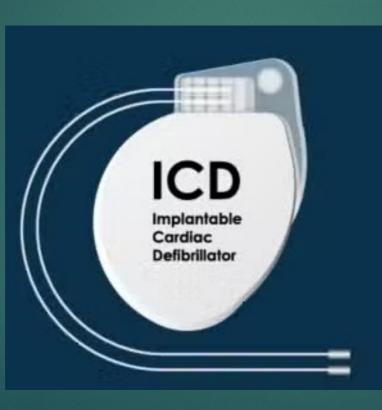


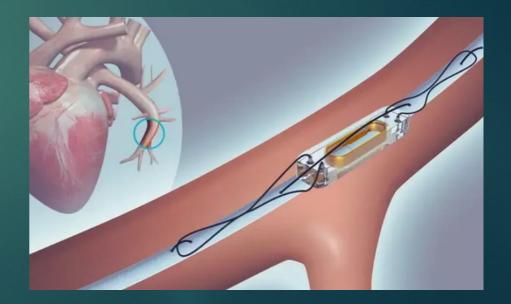
Sérgio Barra

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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)

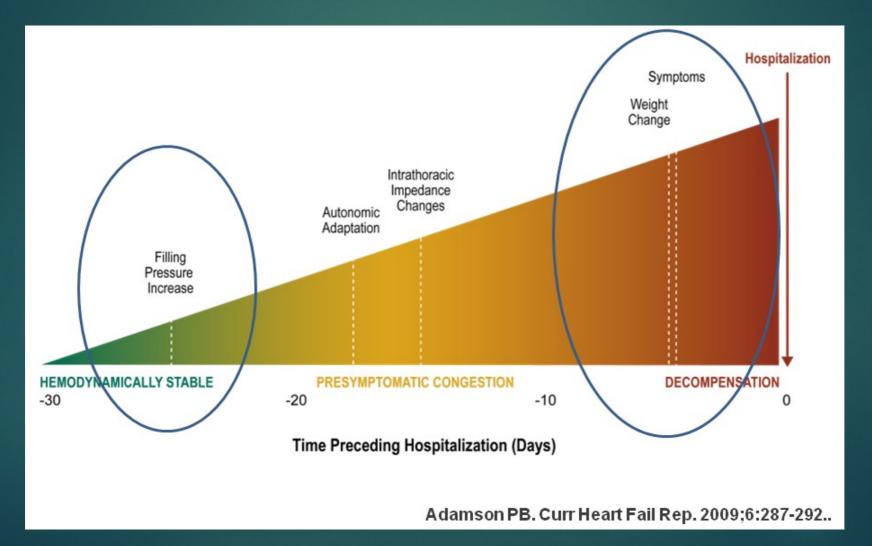
Follow-up of chronic HF Data from implanted devices – Why ?

Identification of HF patients who may decompensate ?

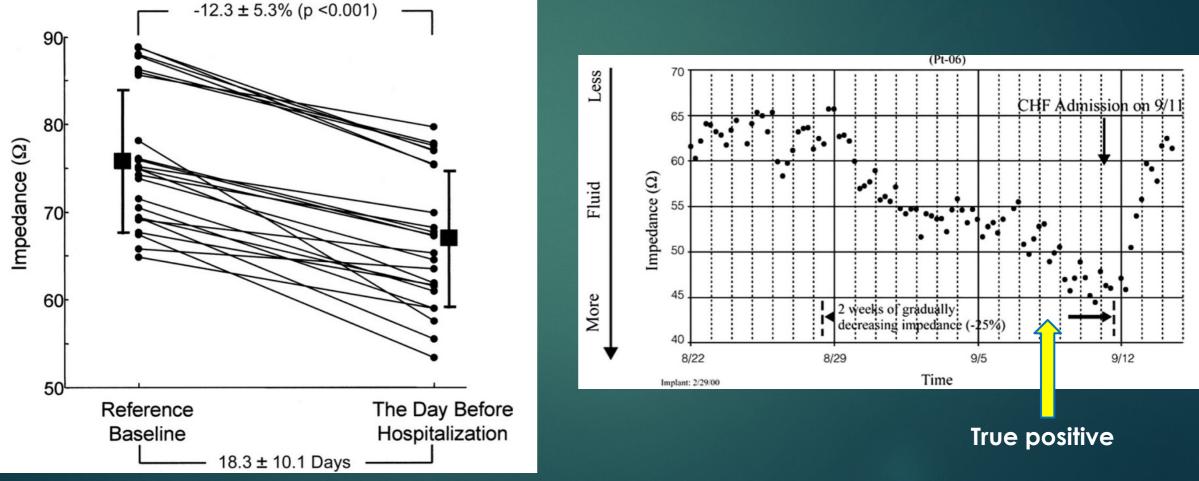
Prognostic benefit ?

- Fewer hospitalizations
- Improved mortality

Follow-up of chronic HF Markers of acute decompensation

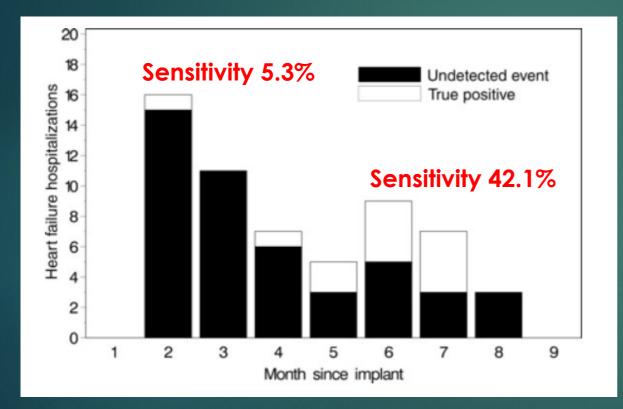


Follow-up of chronic HF Information from implanted devices – impedance



Li Wang. AJC 2007.

Follow-up of chronic HF Information from implanted devices – SENSE-HF (impedance)

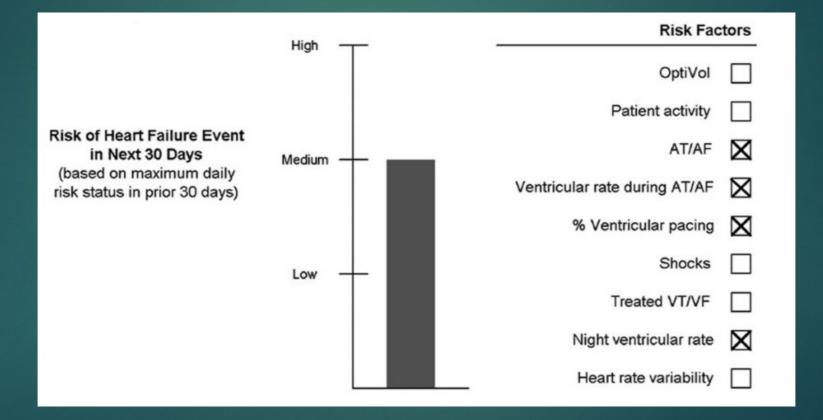


~60% of hospitalizations were not predicted !

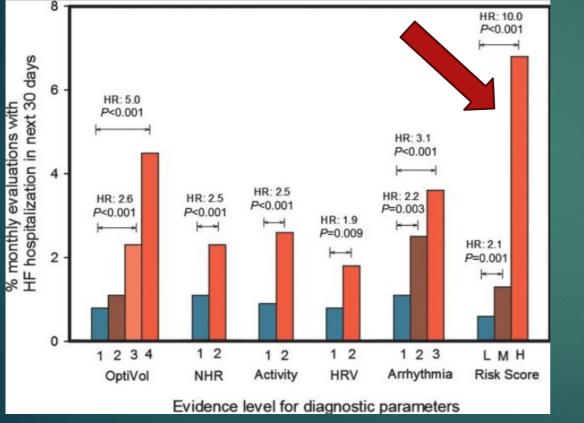
~60-90% of alerts were false alarm !

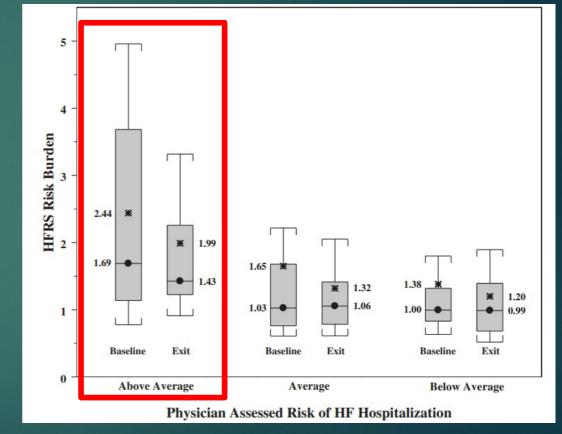
Viviane M. Conraads. EHJ 2011.

Follow-up of chronic HF Information from implanted devices – Multiparameter scores



Follow-up of chronic HF Information from implanted devices – TRIAGE-HF





Sean A. Virani. ESC Heart Failure 2018.

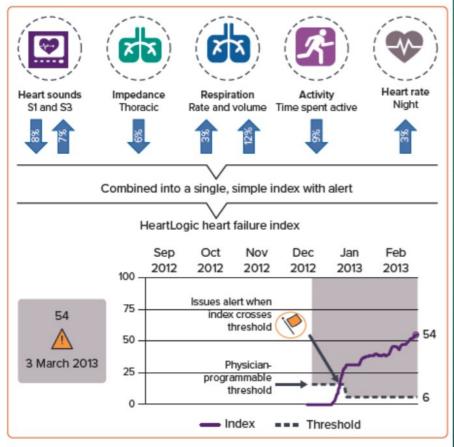
Martin Cowie et al. EHJ 2013.



Follow-up of chronic HF

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

Phase I Outcomes 200 HF PATIENTS Implanted with a CRT-D or ICD Enabled with HeartLogic 1.76 HEARTLOGIC EARLY HF TREATMENT ALERT CASES AUGMENTATION Per Patient-Year Prompted by Alert MORE RAPID RECOVERY LOWER

of HeartLogic Index

NTproBNP Levels

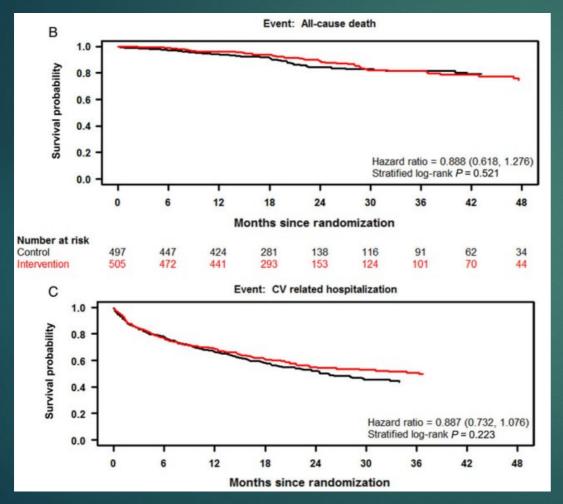
67% \downarrow hospitalization compared to pre-study

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

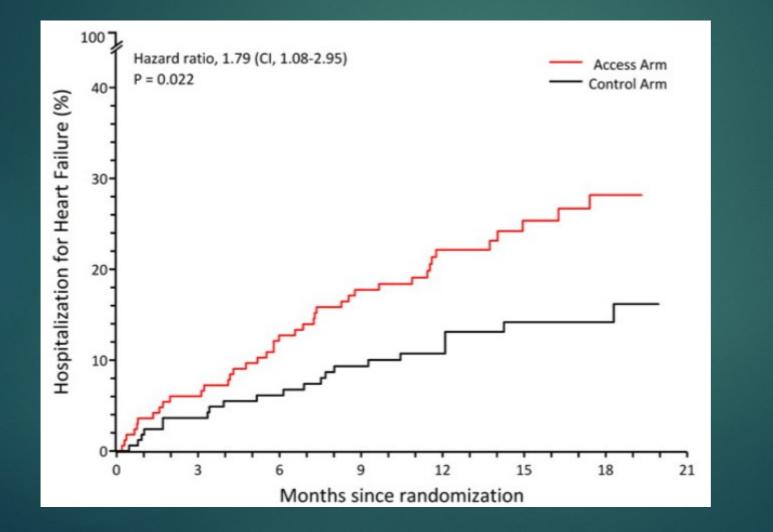
Michael Bohm et al. EHJ 2016.

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.

Follow-up of chronic HF Information from implanted devices – DOT-HF



Increased hospitalization!

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!

Follow-up of chronic HF Impact on prognosis – REM-HF (multiparameter)

All Cause Mortality 60 60 HR (95% CI) P Value HR (95% CI) P Value Usual care Usual care Weekly download vs. Usual Care*: 0.83 (0.66 to 1.05) 0.123 Weekly download vs. Usual Care*: 1.07 (0.91 to 1.25) 0.4195 Percentage of participants with an event Weekly download Weekly download Percentage of participants who died 50 50 40 40 30 30 20 20 10 10 0 0 12 18 30 36 6 12 24 30 36 48 Follow-up time (months) Follow-up time (months)

Unplanned CV related Hospitalisation

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

Follow-up of chronic HF Impact on prognosis – IN-TIME (multiparameter)

Mostly in AF patients!

		4	_
	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%)	<u>31 (9·4%)</u>	
Worsened global self-assessment only	7 (2.1%)	4 (1·2%)	

HOSPITALIZATION Invasive hTMS A. Cardiac Implantable Electronic Devices - Böhm 2016 0.91 [0.69, 1.21] .03 0.70, 1.50 - Boriani 2016 (MORE-CARE) - Domenichini 2015 (LIMIT-CHF) - Hansen 2018 (InContact) 0.95 0.26, 3.54 0.28, 2.14 0.77 - Hindricks 2014 (IN-TIME) 0.79 0.47, 1.34 - Lüthje 2015 0.93 0.47, 1.82 - Mullens 2010 Not estimable - Sardu 2016 0.55 [0.27, 1.11] 1.11 [0.57, 2.16] - Smeets 2017 0.77 0.56, 1.06 - Tajstra 2020 (RESULT) - Van Veldhuisen 2011 (DOT-HF) 1.70 0.98, 2.94 0.92 [0.79, 1.06]

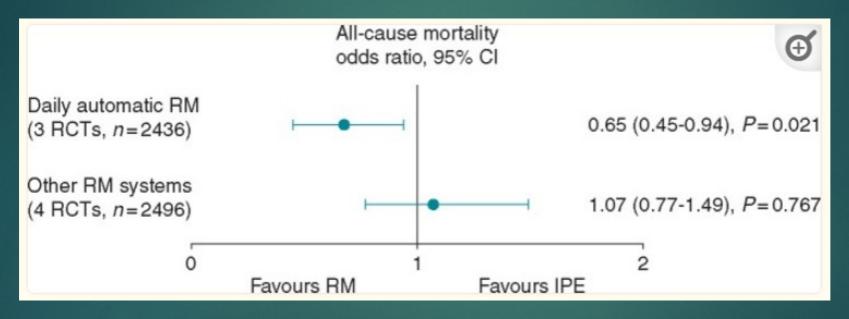
Niels Scholte et al. EHJ 2023.

Invasive hTMS	ALL-CAUSE M	ORTALITY		
A. Cardiac Implantable Electronic Devices				
- Adamson 2011 (REDUCEhf)		0.76 [0.28,	2.09]	
- Böhm 2016	. ⊢ ∎ -1	0.92 [0.63,	1.34	
- Boriani 2016 (MORE-CARE)		1.15 [0.72,	1.86]	
- Chiu 2021 (REMOTE-CIED)		0.89 [0.47,	1.69	
- De Simone 2015 (EFFECT)	i i i i i i i i i i i i i i i i i i i	0.70 [0.41,	1.18]	
- Domenichini 2015 (LIMIT-CHF)	<u>⊢</u>	1.27 [0.27,	6.03	
- Hansen 2018 (InContact)	i i i i i i i i i i i i i i i i i i i	1.35 [0.25,	7.18]	
- Hindricks 2014 (IN-TIME)		0.37 0.18,	0.77	
- Kurek 2017 (COMMIT-HF)		0.22 [0.12,	0.40]	
- Landolina 2012 (EVOLVO)	· · · · · · · · · · · · · · · · · · ·	0.89 0.31,		
- Liberska 2016		Not estimable		
- Lüthje 2015	<u>⊢</u>	1.36 [0.45,	4.09]	
- Morgan 2017 (REM-HF)	Hand I have a second seco	0.84 [0.65,	1.09]	
- Sardu 2016	<u>⊢_</u>	0.92 0.32,	2.65]	
- Smeets 2017		2.22 [0.91,	5.46]	
-Tajstra 2020 (RESULT)	<u>⊢</u> ∔	1.01 [0.51,	1.97	
- Van Veldhuisen 2011 (DOT-HF)		1.26 [0.62,	and the second se	

Niels Scholte et al. EHJ 2023

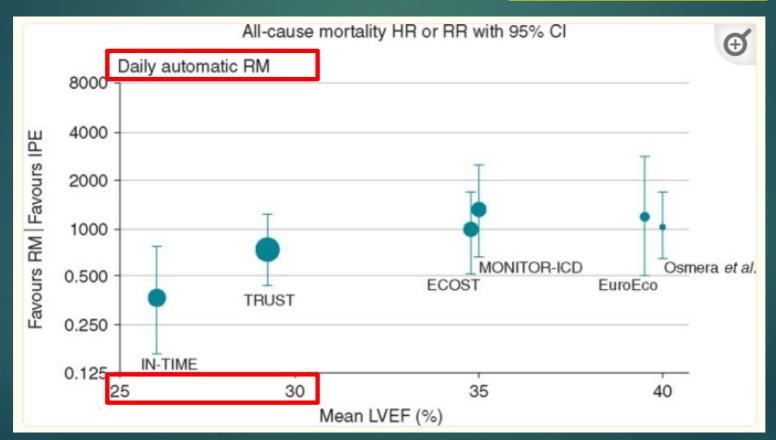
0.84 [0.65, 1.08]

ALL-CAUSE MORTALITY



Parthiban N et al. J Am Coll Cardiol 2015.

ALL-CAUSE MORTALITY





Follow-up of chronic HF CIED data and remote monitoring – summary

No unequivocal prognostic benefit

But not inferior to standard follow-up!

Possible <u>mortality</u> 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!

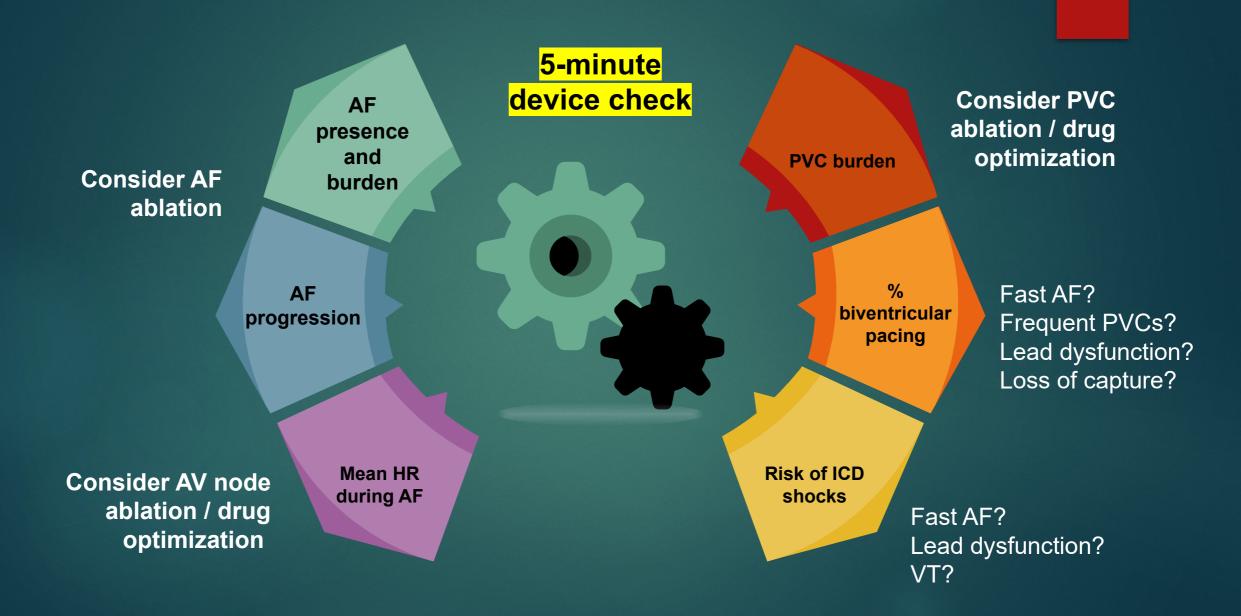
Follow-up of chronic HF CIED data and remote monitoring – summary

Additional (randomized) studies required

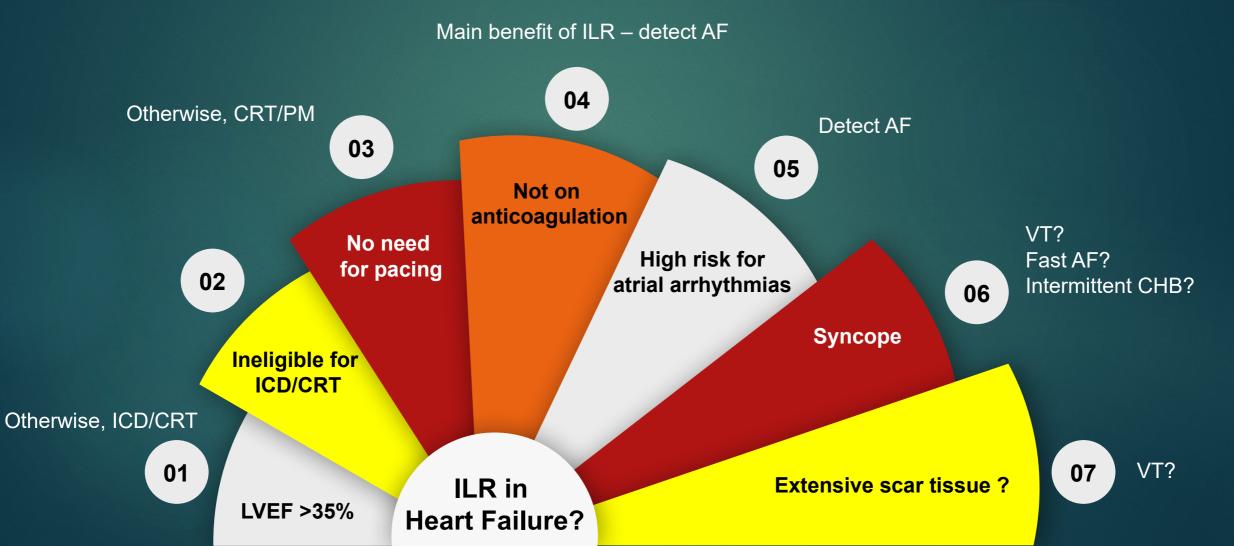
How to capitalize on the early detection ('same day') power of continuous monitoring?

Follow-up of chronic HF Data from implanted cardiac devices





Follow-up of chronic HF



Como estratificar o risco de Worsening Heart Failure?

Parâmetros de diagnóstico em monitores cardíacos implantáveis



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