XII Meeting. State of the Art in

HEART FAILURE

CLINICAL PRACTICE AND ORGANIZATIONAL MODELS

Venue: Hotel Meliá María Pita, A Coruña

A Coruña 26-27 September 2025

A Coruña Heart Failure Academy

#ACORUÑAHF2025

Arrhythmic risk in heart failure.

Evaluation and management

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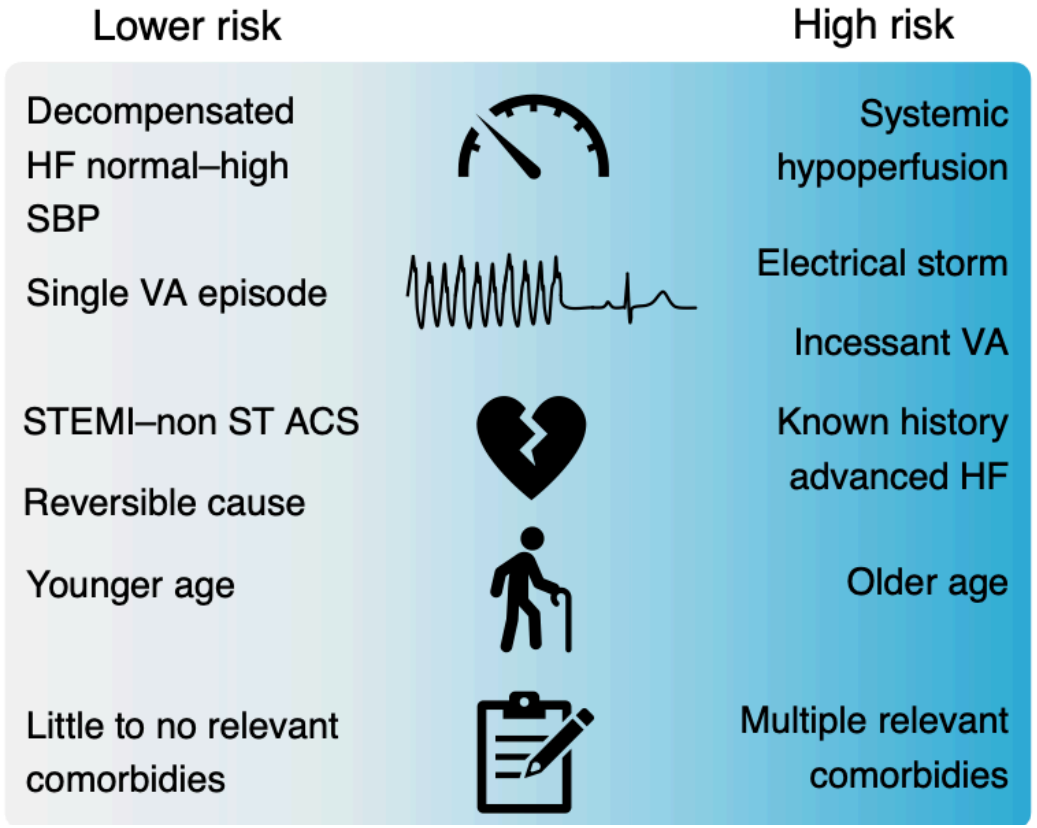
1. VA in Symptomatic HF

2. VA in “Asymptomatic” HF

ESC European Society of Cardiology
Europace (2024) 26, euae235
https://doi.org/10.1093/europace/euae235
EHRA DOCUMENT
EHRA European Heart Rhythm Association

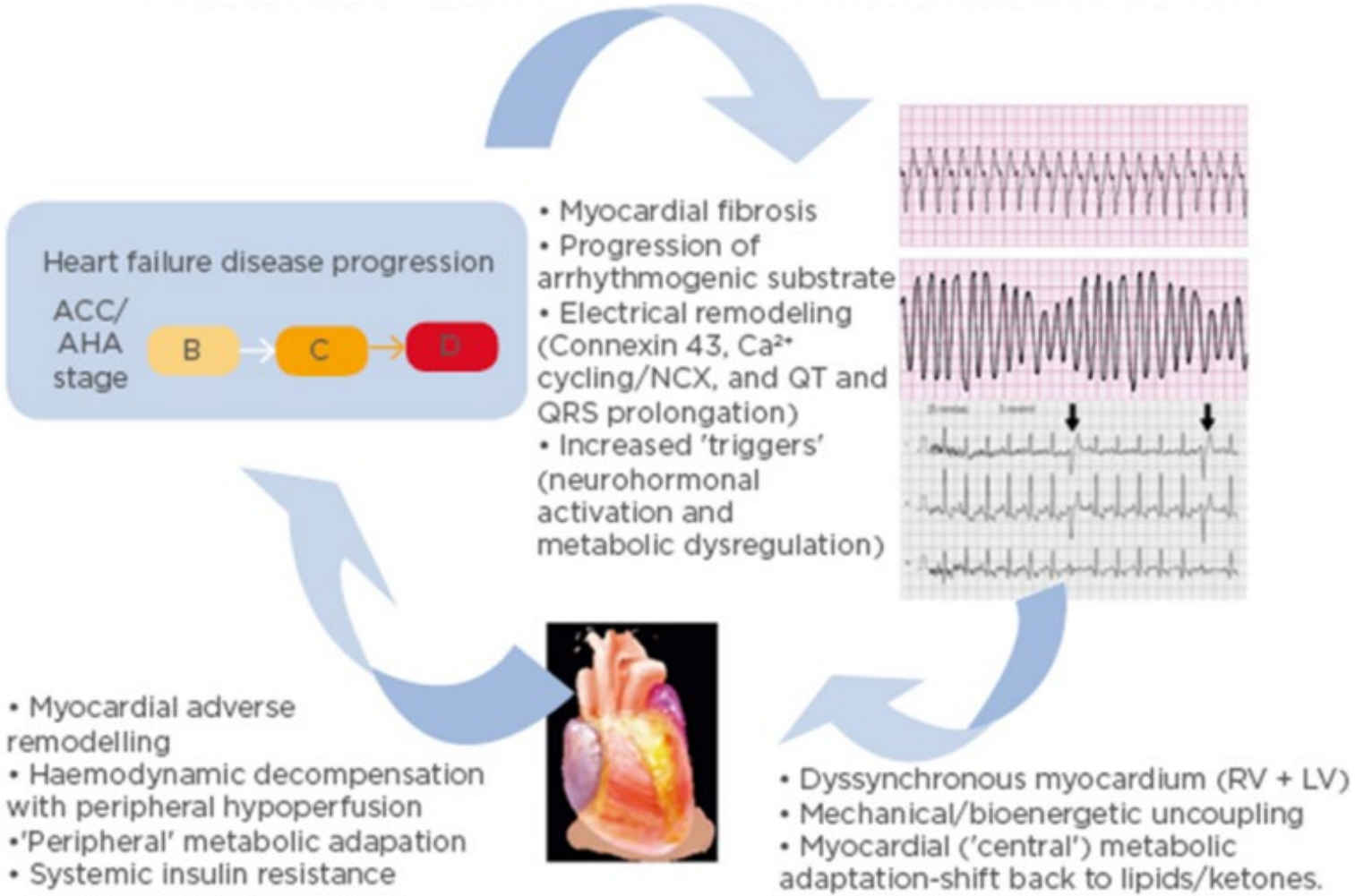
1. VA in Symptomatic HF

Ventricular arrhythmias in acute heart failure: a clinical consensus statement of the Association for Acute CardioVascular Care, the European Heart Rhythm Association, and the Heart Failure Association of the European Society of Cardiology

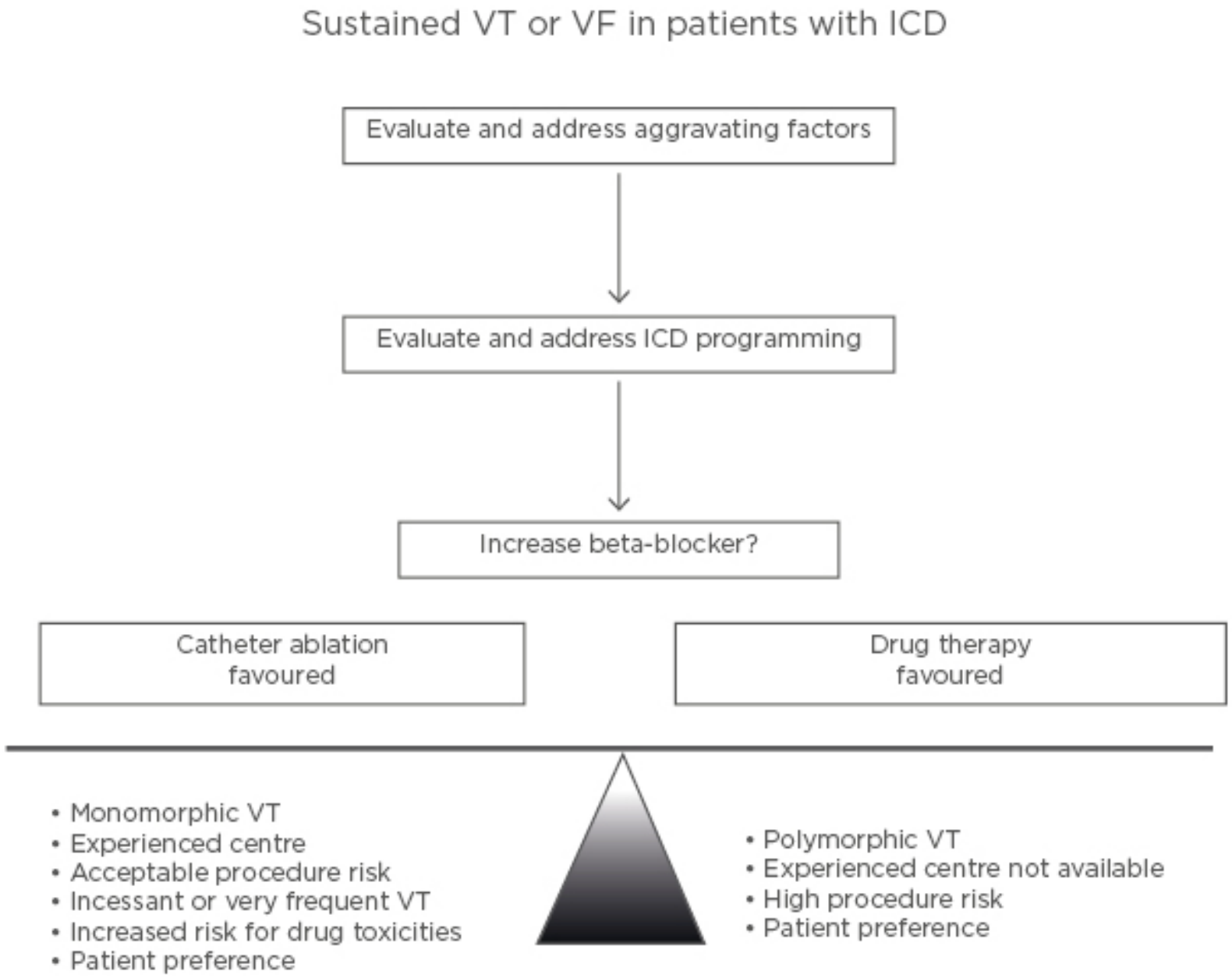


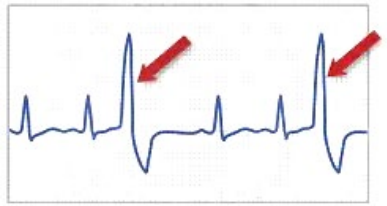
Structural and functional factors	Arrhythmogenesis mechanism
Electrophysiologic remodelling	
• Action potential prolongation	• Early afterdepolarization—focal
• Altered Ca^{2+} reuptake and SR leak	• Delayed afterdepolarization—focal
• Altered K^{+} currents	• Increased dispersion of repolarization
• Increased automaticity	• Automatic tachycardias
• Abnormal cell coupling	• Re-entry
	• Re-entry
Structural and functional remodelling	
• Fibrosis and scar	• Re-entry
• Chamber stretch	• Automatism
• Ventricular dilatation	• Bundle branch re-entry
• Hypertrophy	• Multiple mechanisms
• Ischaemia	• Multiple mechanisms
Neurohormonal mechanisms	
• Increased adrenergic tone	• Multiple mechanisms and enhancing arrhythmia propensity of other mechanisms
• Increased RAAS activation	
• Electrolyte abnormalities	
Drugs interactions	
• Anti-arrhythmics, antibiotics, anti-fungal, psychoactive	• QT prolongation
	• Increased VT/VF risk
• Sympathomimetic drugs	• Triggered activity, ischaemia
• Phosphodiesterase inhibitors[10]	• Electrolyte disturbances
	• Delayed after depolarization
• Diuretics	
• Digoxin	

Pathophysiological cycle of ventricular arrhythmias and progressive pump failure



EMJ Cardiol. 2019; DOI/10.33590/emjcardiol/10311539


Sustained VT or VF in patients with ICD
Evaluate and address aggravating factors
Evaluate and address ICD programming
Increase beta-blocker?
Catheter ablation favoured
Drug therapy favoured
• Monomorphic VT
• Experienced centre
• Acceptable procedure risk
• Incessant or very frequent VT
• Increased risk for drug toxicities
• Patient preference
• Polymorphic VT
• Experienced centre not available
• High procedure risk
• Patient preference



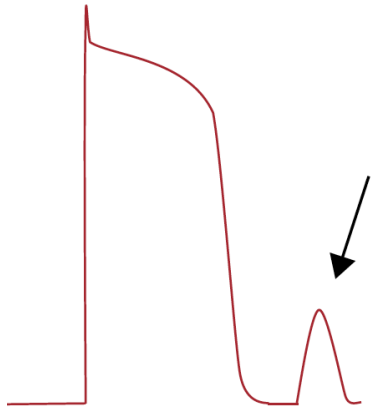
LVEF	PVC burden for 1 week Hotler			
	Infrequent (<5%) (*n*=108)		Frequent (≥5% or NSVT) (*n*=196)	
	No	%	No	%
Severely reduced LVEF<30 (Group A)	56	51.9	112	57.1
Reduced LVEF≥30 (Group B)	52	48.1	84	42.9

	Cardiomyopathy			
	Ischemic (*n* 236)		Non-ischemic (*n* 68)	
	No.	%	No.	%
Infrequent PVCs (<5%)	84	35.6	24	35.3
Frequent (≥5%)	152	64.4	44	64.7

Sanhoury, M., Mohamed, F., Sadaka, M. *et al.* The impact of asymptomatic ventricular arrhythmias on the outcome of heart failure patients with reduced ejection fraction

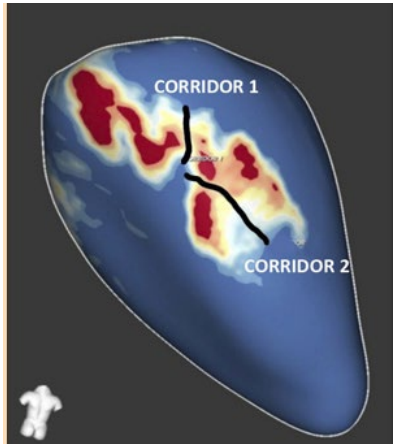
2. VA in “Asymptomatic” HF

Automaticity and triggered activity are achievable in individual cells



HFpEF

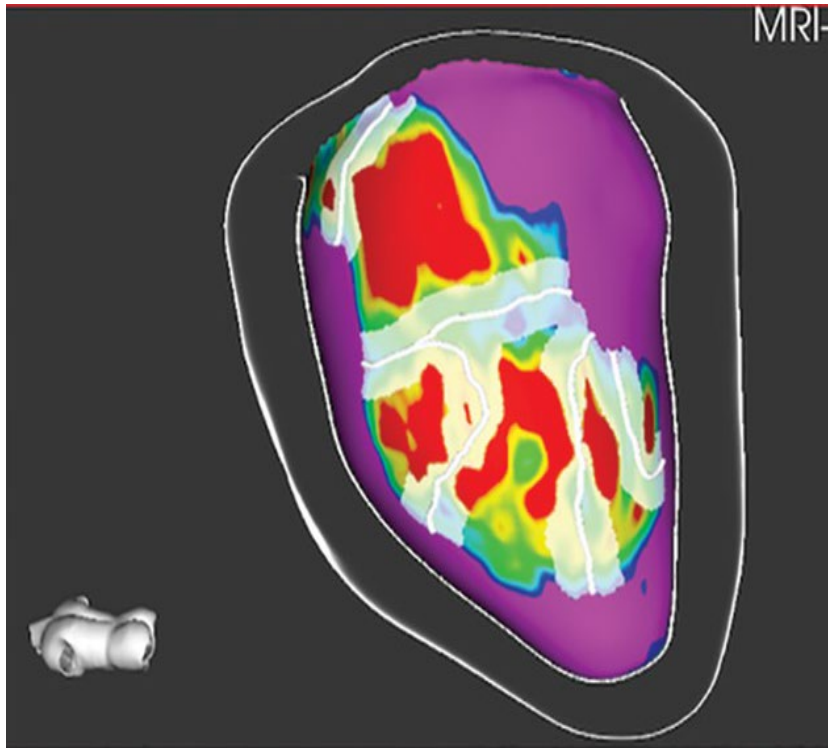
Reentry exists within a mass of myocardial tissue



HFrEF

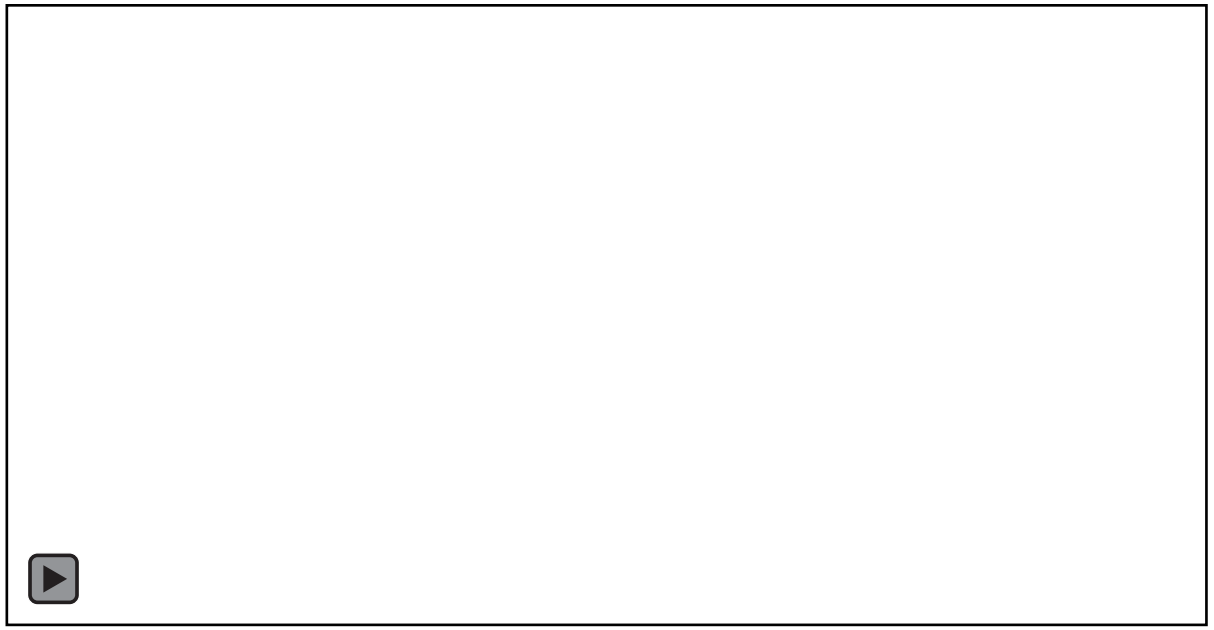
No structural disease

Scar cardiomyopathy



No structural disease

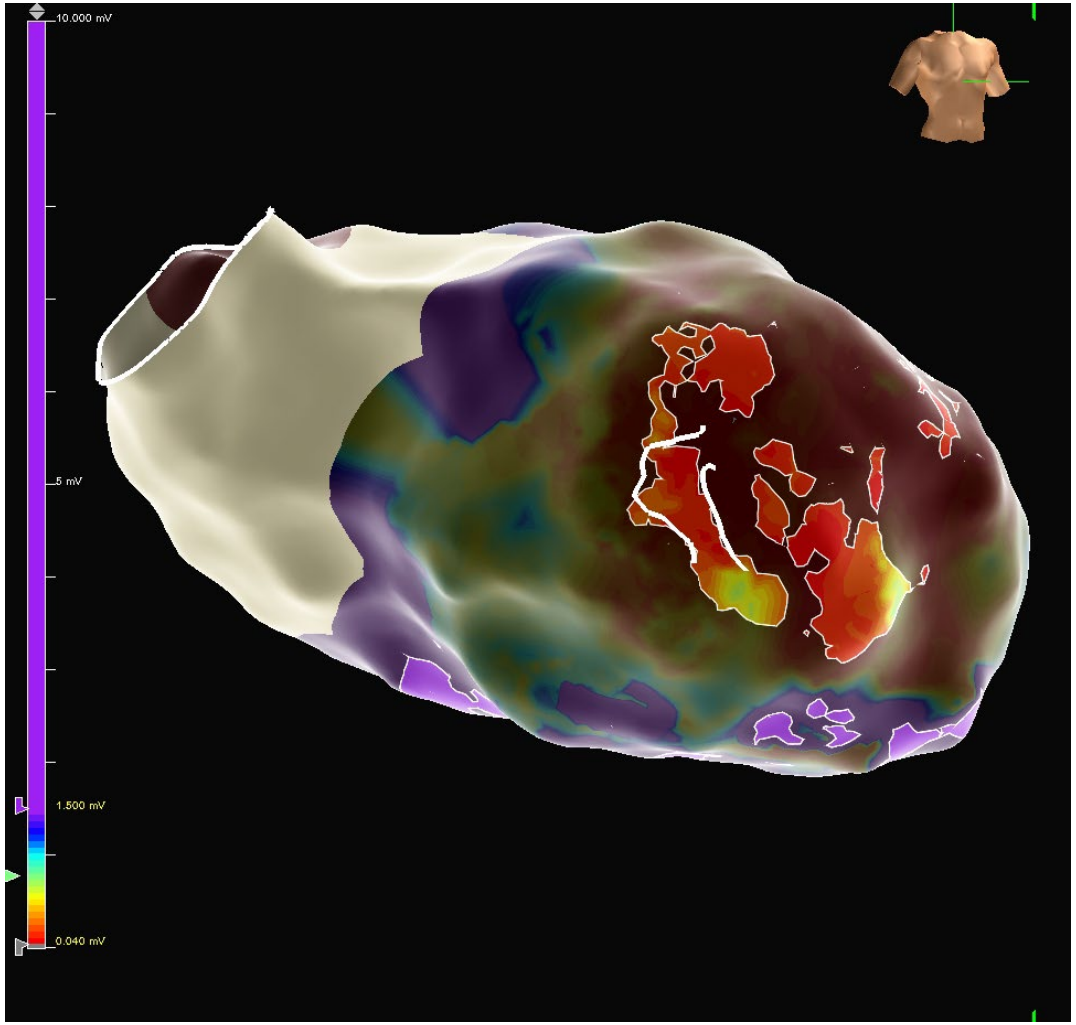
Scar cardiomyopathy



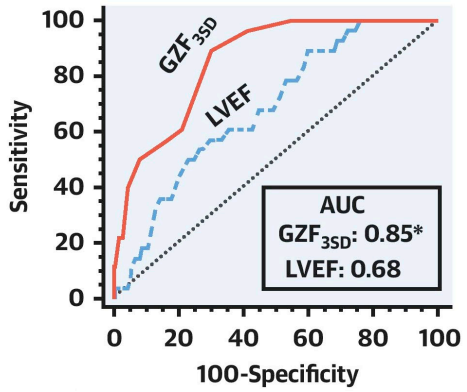
Ischemic cardiomyopathy

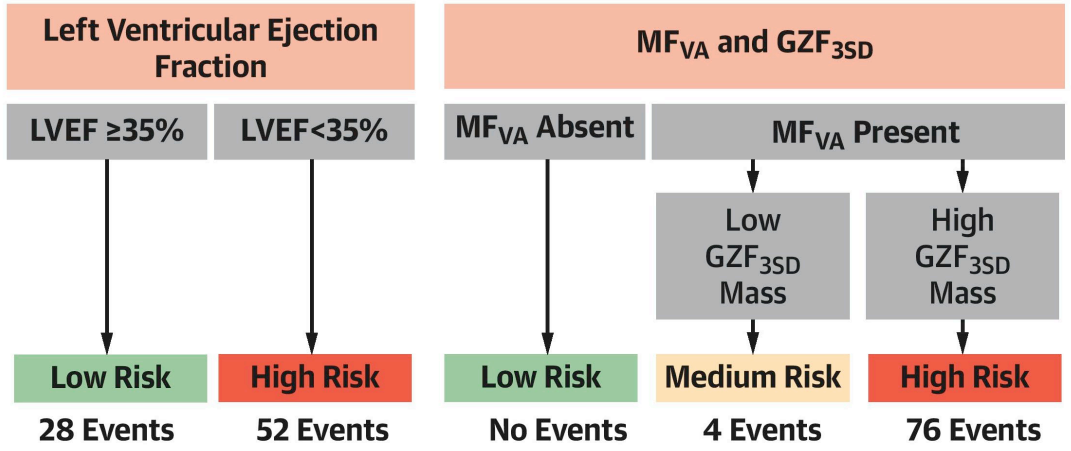
100% myocardial fibrosis

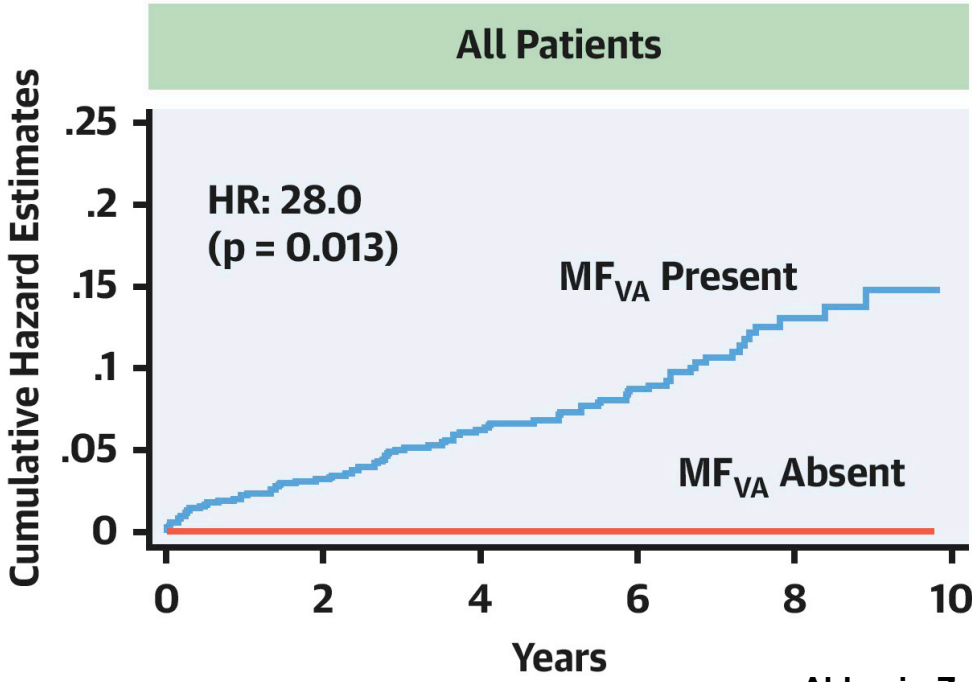
Ischemic cardiomyopathy

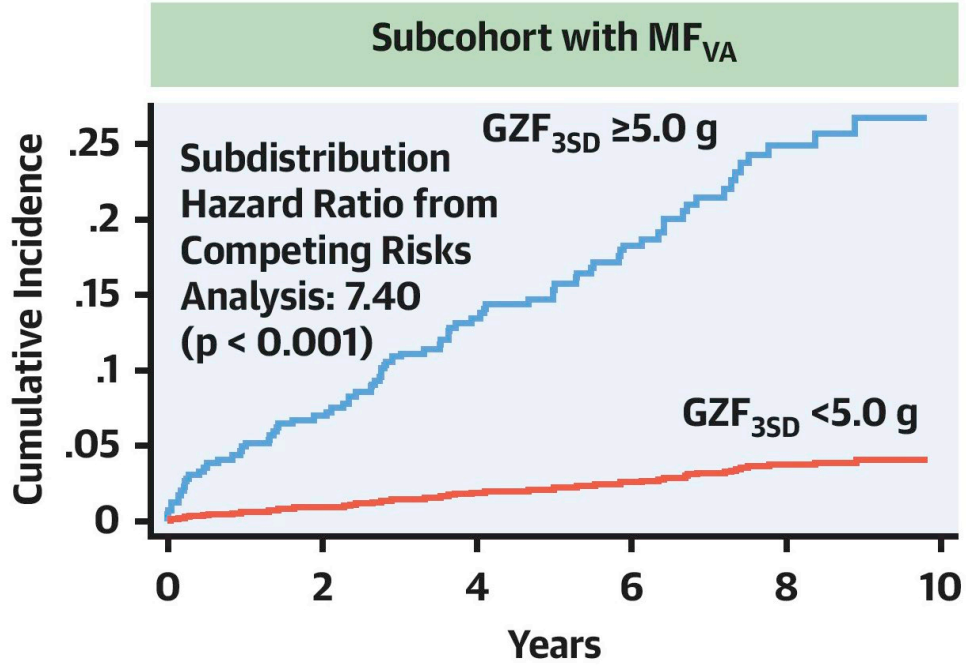


Ischemic cardiomyopathy









Abbasin Zegard et al. *JACC* 2021; 77:29-41.

Non-ischemic cardiomyopathy

¿?% myocardial fibrosis

Non-ischemic cardiomyopathy

Sudden death

Table 1 Incidence of sudden death in NICM

Study	Year of publication	Follow-up	SCD	SCD/year in placebo/control group
Von Olshausen *et al*[28]	1984	1 y	7%	7%
Meinertz *et al*[29]	1984	11 m	16%	17.5 %
Costanzo-Nordin *et al*[30]	1985	14.1 m	20%	17%
Stewart *et al*[31]	1990	24 m	18%	9%
CAT[32]	2002	1 y	0	0 (1st year)
AMIOVIRT[33]	2003	1.8 y	3.80%	2.1%
DEFINITE[34]	2004	29 m	6%	2.5%
DANISH[35]	2017	67.6 m	8.2%	1.46%

AMIOVIRT, Amiodarone vs Implantable Cardioverter-Defibrillator; CAT, Cardiomyopathy Trial; DANISH, Danish Study to Assess the Efficacy of ICDs in Patients With Non-Ischaemic Systolic Heat Failure on Mortality; DEFINITE, Defibrillators in Non-Ischaemic Cardiomyopathy Treatment Evaluation; m, month; NICM, non- ischaemic dilated cardiomyopathy; SCD, Sudden Cardiac Death; y, year.

Cannatà A, et al. Heart 2020;106:656–664.

Non-ischemic cardiomyopathy

EP study

Table 3 Role of electrophysiological studies on the arrhythmic stratification of patients with NICM

Study	Population	N	Definition of positive EPS	Percentage of positive EPS	Result	
Meinertz *et al*, *Am J Cardiol*, 1985[29]	Non-ischaemic DCM	42	Electrically-induced VT or VF	7.1%	Positive EPS predictive of SCD*.	√
Poll *et al*, *Am J Cardiol*, 1986[42]	Non-ischaemic DCM and EF≤45% with major ventricular arrhythmias	47	Electrically-induced sustained VT or VF	53%	Positive EPS not predictive of SCD*.	X
Brembilla-Perrot *et al*, *Am Heart J*, 1991[43]	Non-ischaemic DCM and EF≤45%	103	Electrically-induced sustained VT or VF	11%	Positive EPS predictive of SCD	√
Turitto G *et al*, *J Am Coll Cardiol*, 1994([44]	Non-ischaemic DCM and EF≤50% without major ventricular arrhythmias	80	Electrically-induced sustained VT or VF	22%	Positive EPS not predictive of MVA	X
Rankovic V *et al*, *Am J Cardiol*, 2002[45]	Non-ischaemic DCM (ICD carriers)	42	Electrically-induced sustained VT or VF	50%	Positive EPS not predictive of MVA	X
Becker *et al*, *Basic Res Cardiol*, 2003[46]	Non-ischaemic DCM and EF ≤50% with documented NSVT	99	Electrically-induced sustained VT or VF	7%	Positive EPS not predictive of MVA	X
Morgera *et al*, *Ital Heart J*, 2004[47]	Non-ischaemic DCM without major ventricular arrhythmias	78	Electrically-induced VT or VF	21%	Positive EPS not predictive of MVA	X
Daubert *et al*, *Pacing Clin Electrophysiol*, 2009[48]	Non-ischaemic DCM (ICD carriers)	204	Electrically-induced sustained VT or VF	14%	Positive EPS predictive of MVA	√
Gatzoulis *et al*, *Circ Arrhythmia Electrophysiol*, 2013[49]	Non-ischaemic DCM	158	Electrically-induced sustained VT or VF	27,8%	Positive EPS predictive of appropriate ICD therapy	√
Stabile, *et al*, *Hellenic J Cardiol*, 2015[50]	HFrEF (ICD carriers)	206*	Electrically-induced sustained VT or VF	14%	Positive EP-study not predictive of mortality	X

Cannatà A, et al. Heart 2020;106:656–664.

Non-ischemic cardiomyopathy

Genetic test

Table 2 Role of genetic studies on the arrhythmic risk stratification

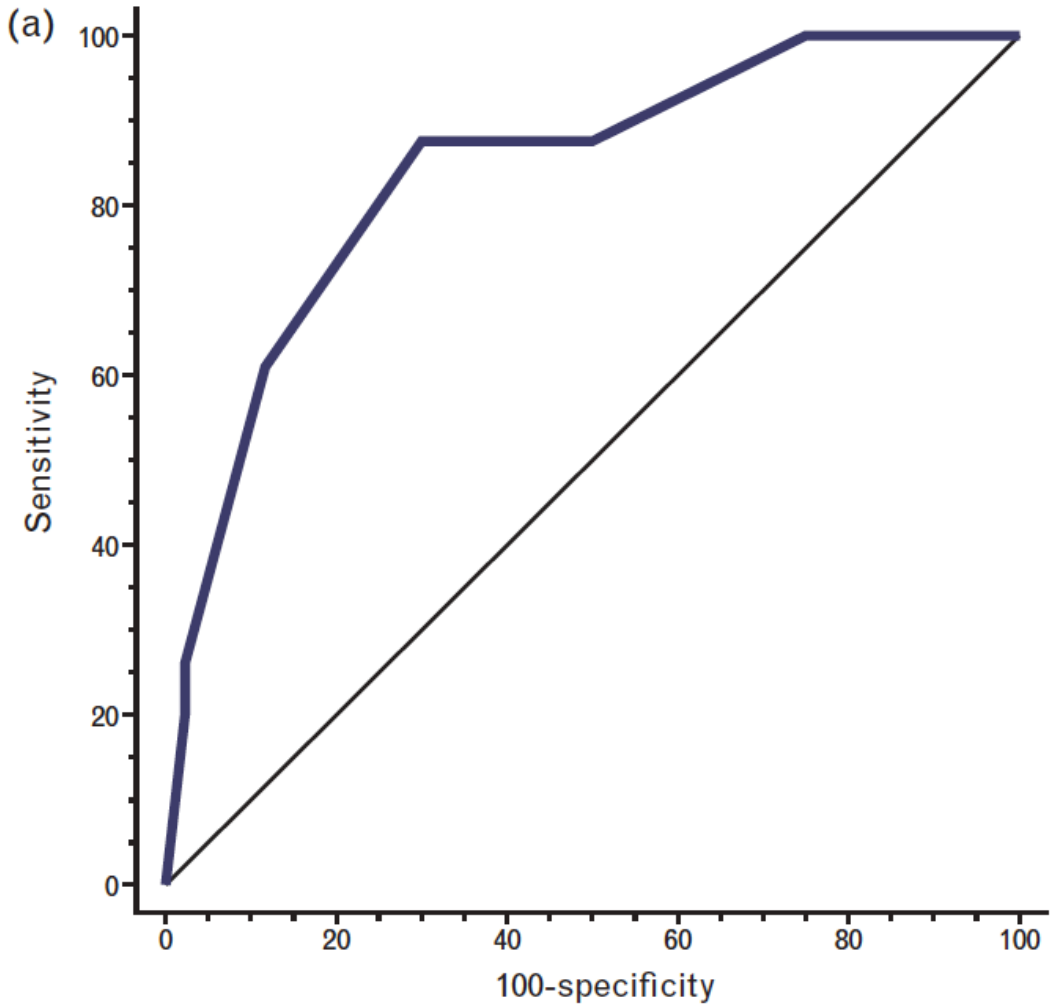
Study	Population	Genes tested	N	Percentage of mutations	Percentage of arrhythmic events
Fatkin *et al*, *N Eng J Med*, 1999[36]	DCM and conduction defects (patients and healthy relatives)	LMNA	11 families	NS	44% SCD in patients
Van Rijsingen *et al*, *J Am Coll Cardiol*, 2012[16]	LMNA mutation carriers.	LMNA	269	100%	18% MVA
Van der Zwaag *et al*, *Eur J Heart Fail*, 2012[37]	Patients with ARVC and DCM	PLN	354 (257 DCM, 97 ARVC)	11%	46% MVA
Ortiz-Genga *et al*, *J Am Coll Cardiol*, 2016[17]	Inherited cardiovascular disease	FLNC	2177	3,9%	18% MVA 16% SCD
Kumar *et al*, *J Am Coll Cardiol*, 2016[38]	LMNA mutation carriers	LMNA	122	100%	19% sustained VT 8% VF
Nishiuchi *et al*, *Circ Cardiovasc Genet*, 2017[39]	LMNA mutation carriers	LMNA	77	100%	26% MVA
Hasselberg *et al*, *Eur Heart J*, 2018[40]	LMNA mutation carriers	LMNA	79	100%	18% MVA
Begay *et al*, *J Am Coll Cardiol*, 2018[41]	DCM (patients and healthy relatives)	FLNC	319	4%	85% MVA or SCD
Verdonschot *et al*, *Eur Heart J*, 2018[20]	Patients with DCM	TTNtv	303	13%	24% MVA
Parikh *et al*, *Circ Heart Fail*, 2019[18]	RBM20 mutation carriers	RBM20	74	100%	43% MVA
Gigli *et al*, *J Am Coll Cardiol*, 2019[19]	Patients with DCM	23 genes	487	37%	20% MVA or SCD

Cannatà A, et al. Heart 2020;106:656–664.

Non-ischemic cardiomyopathy

score ≥ 3 S 87.5% E 69.8%

- ✓ **Hypertension**
- ✓ **Diabetes**
- ✓ **chronic renal failure**
- ✓ **atrial fibrillation**
- ✓ **COPD**
- ✓ **NYHA ≥ III**



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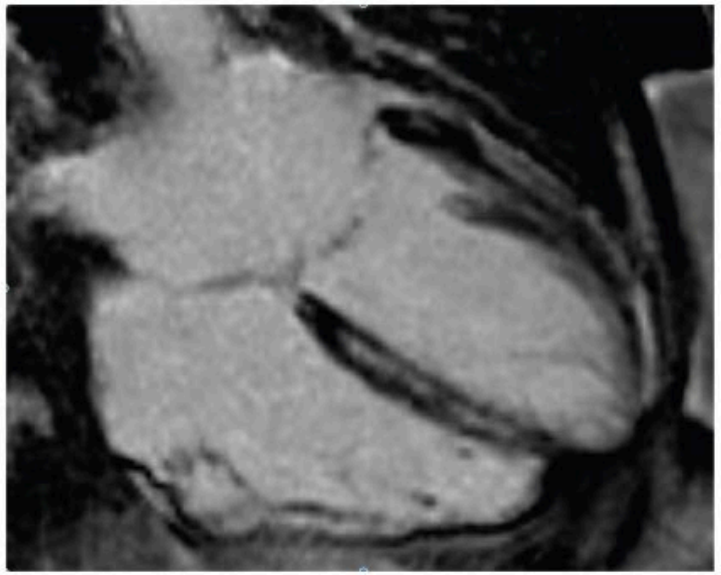
Non-ischemic cardiomyopathy

ARRHYTHMIC PREDICTORS IN DCM	
CLINICAL	
	Etiological characterization
	Personal and family history (syncope, familial history of SCD)
ECG and Holter ECG	
	Fragmented QRS
	Long QRS
	Low QRS amplitude
	Anterolateral T wave inversion
	NSVT (≥5 beats, ≥150 bpm)
	Frequent PVCs (1000/24h) and couplets (≥50/24h)
ECHOCARDIOGRAPHY	
	LVEF ≤ 35%
	Reduced GLS
GENETIC TESTING	
	LMNA
	FLNC, PLN, RBM20
	SCN5A
	TTN *
ELECTROPHYSIOLOGICAL PARAMETERS	Abnormal mTWA test

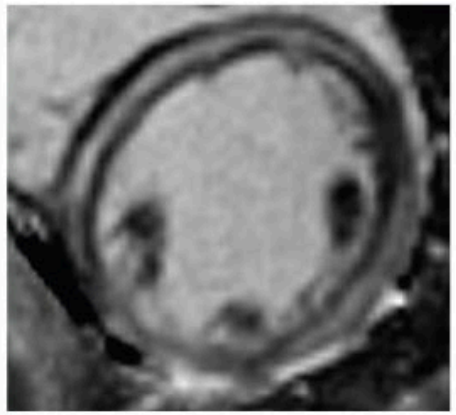
Strong evidence — Weak evidence

Cannatà A, et al. Heart 2020;106:656–664.

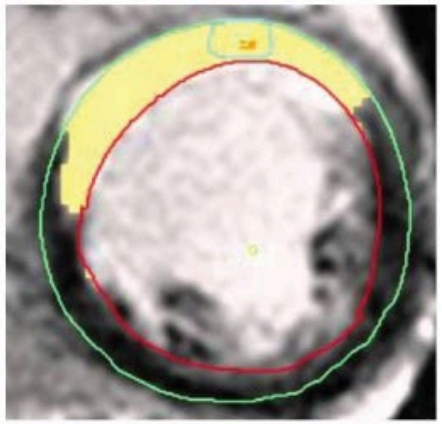
Non-ischemic cardiomyopathy



PRESENCE / ABSENCE
Strong association with worse outcomes



LOCALIZATION
Concomitant presence of septal and free wall LGE associated with worse outcome. In the future LGE localization might provide further prognostic impact



EXTENSION
Quantitative assessment might provide further prognostic impact in the future

Strong evidences in large studies and metanalyses

Conflicting evidences from smaller studies

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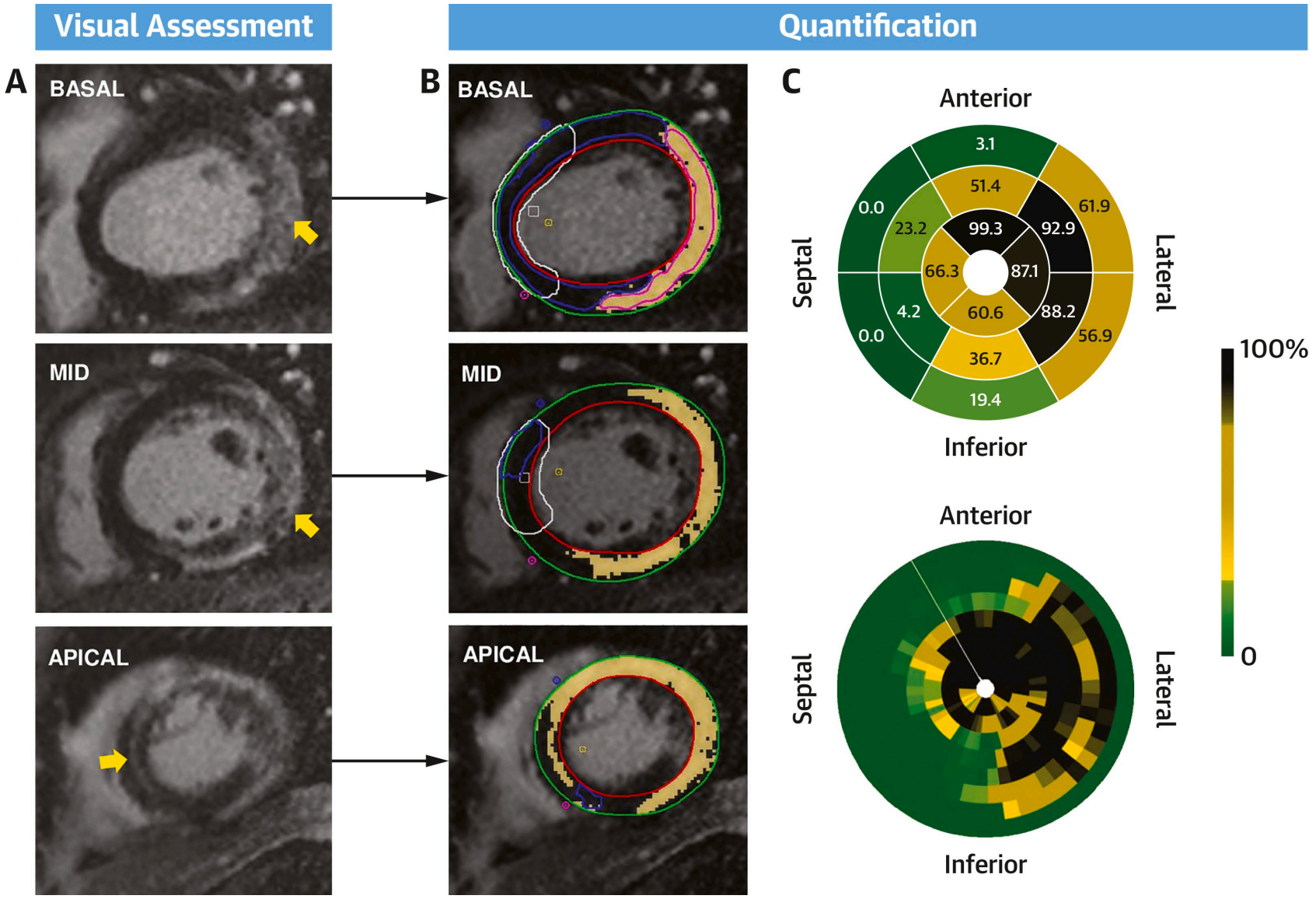
Non-ischemic cardiomyopathy



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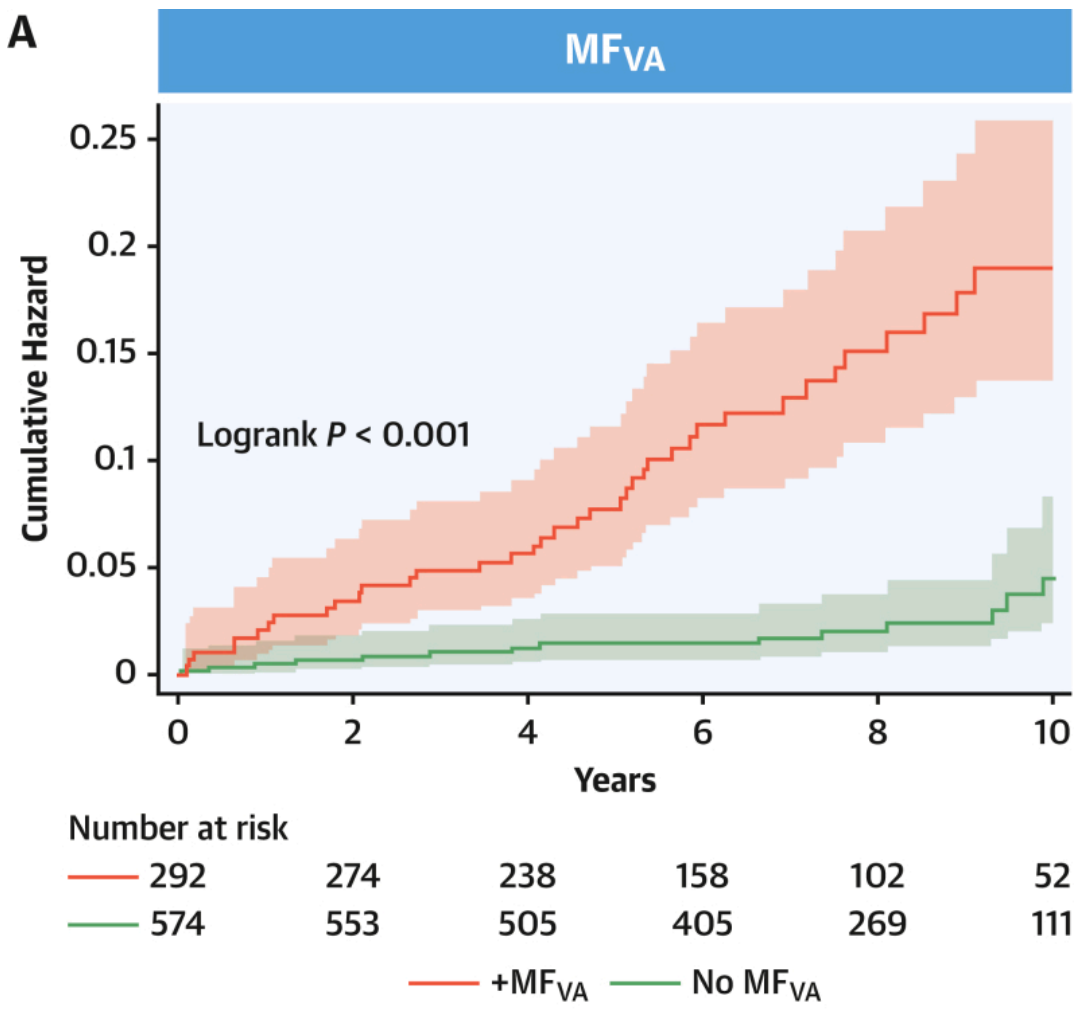
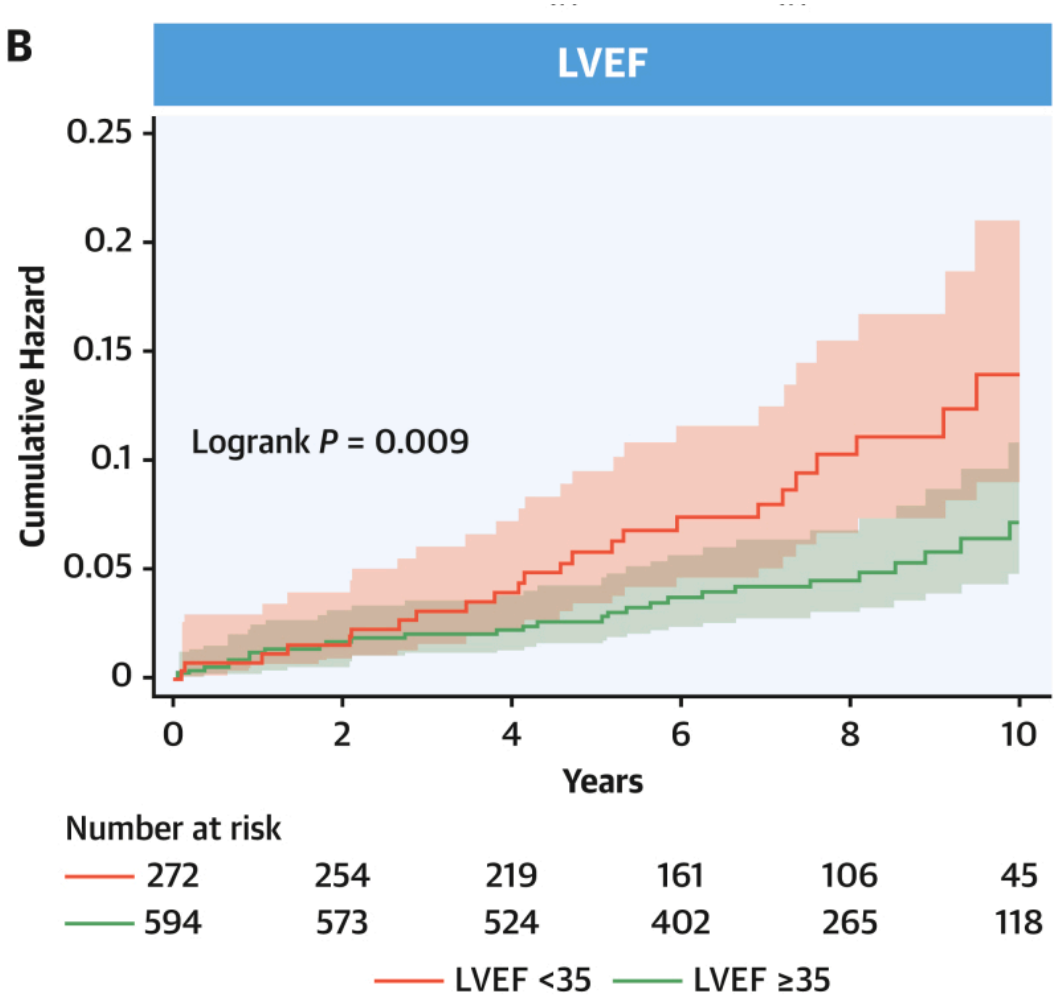
Non-ischemic cardiomyopathy





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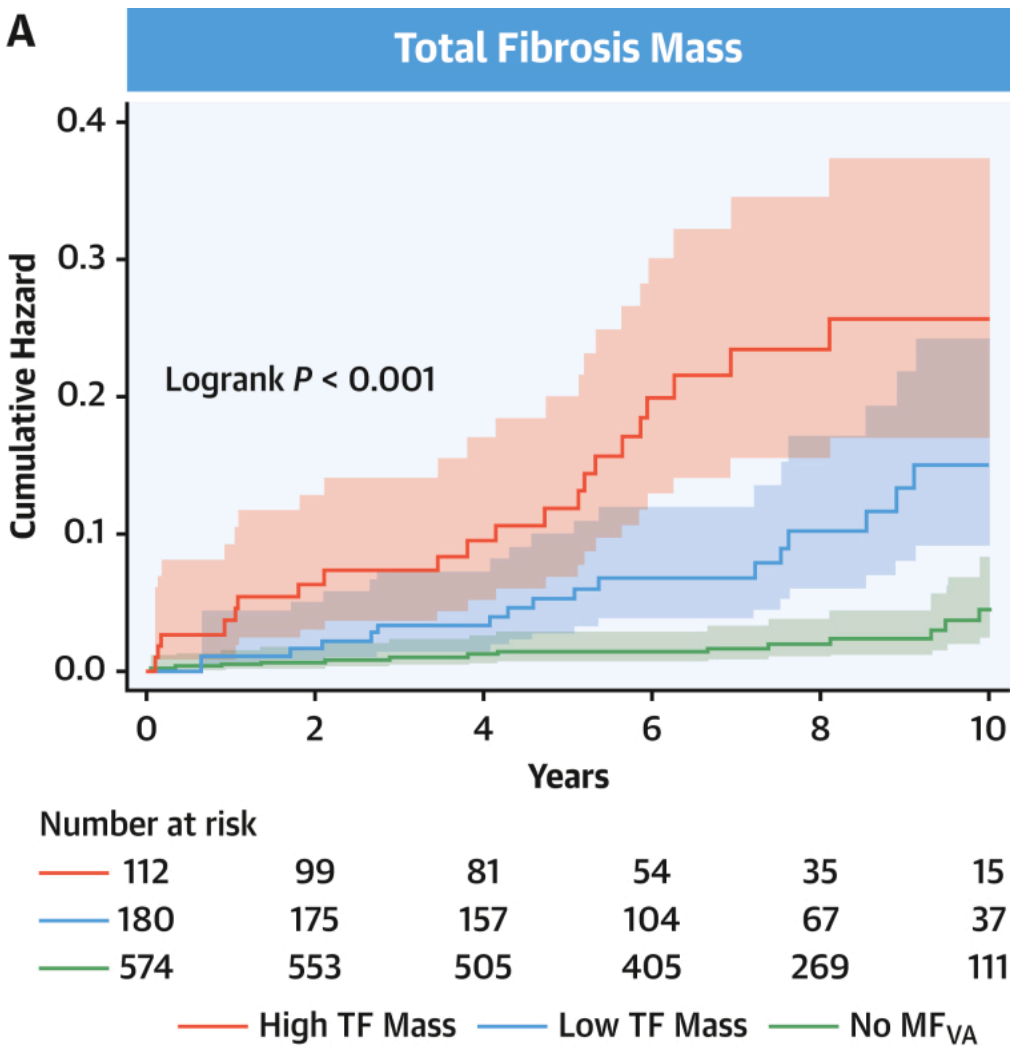

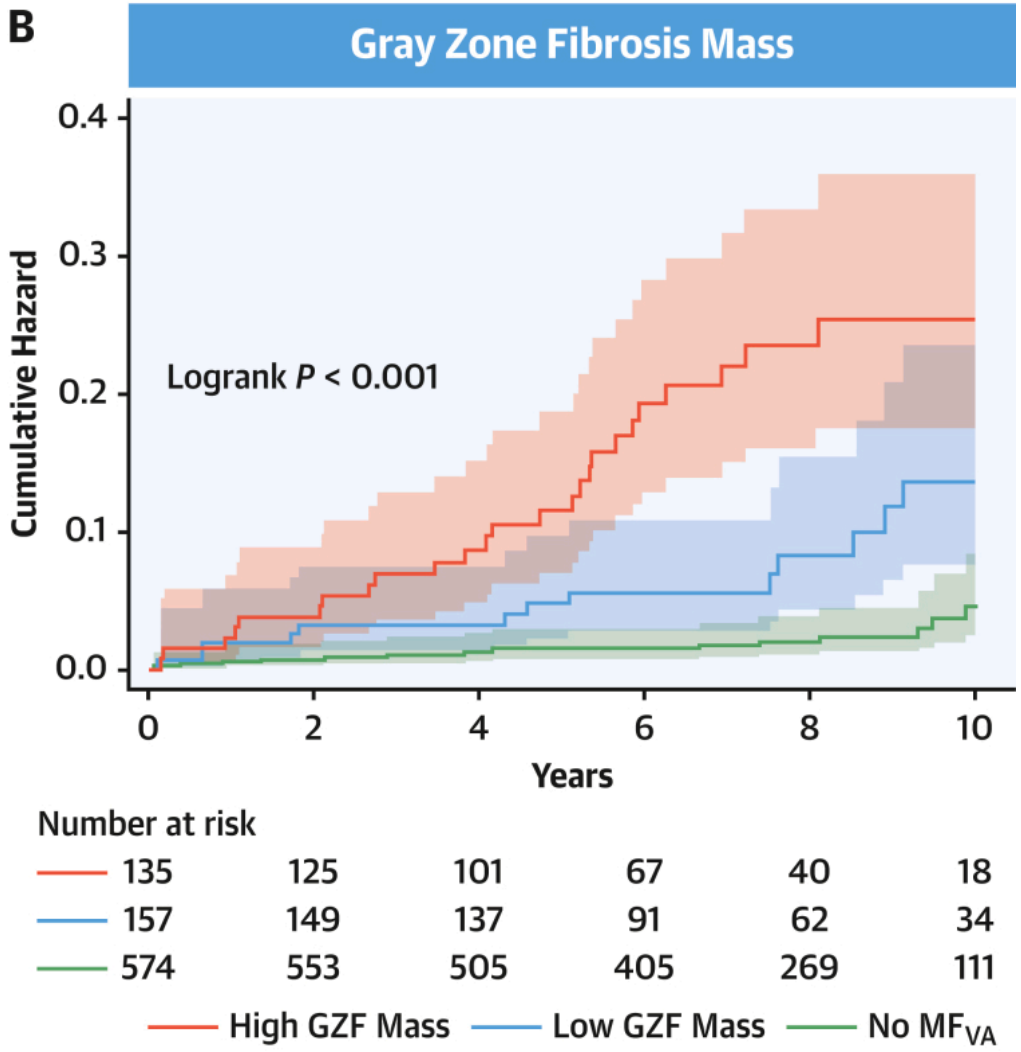

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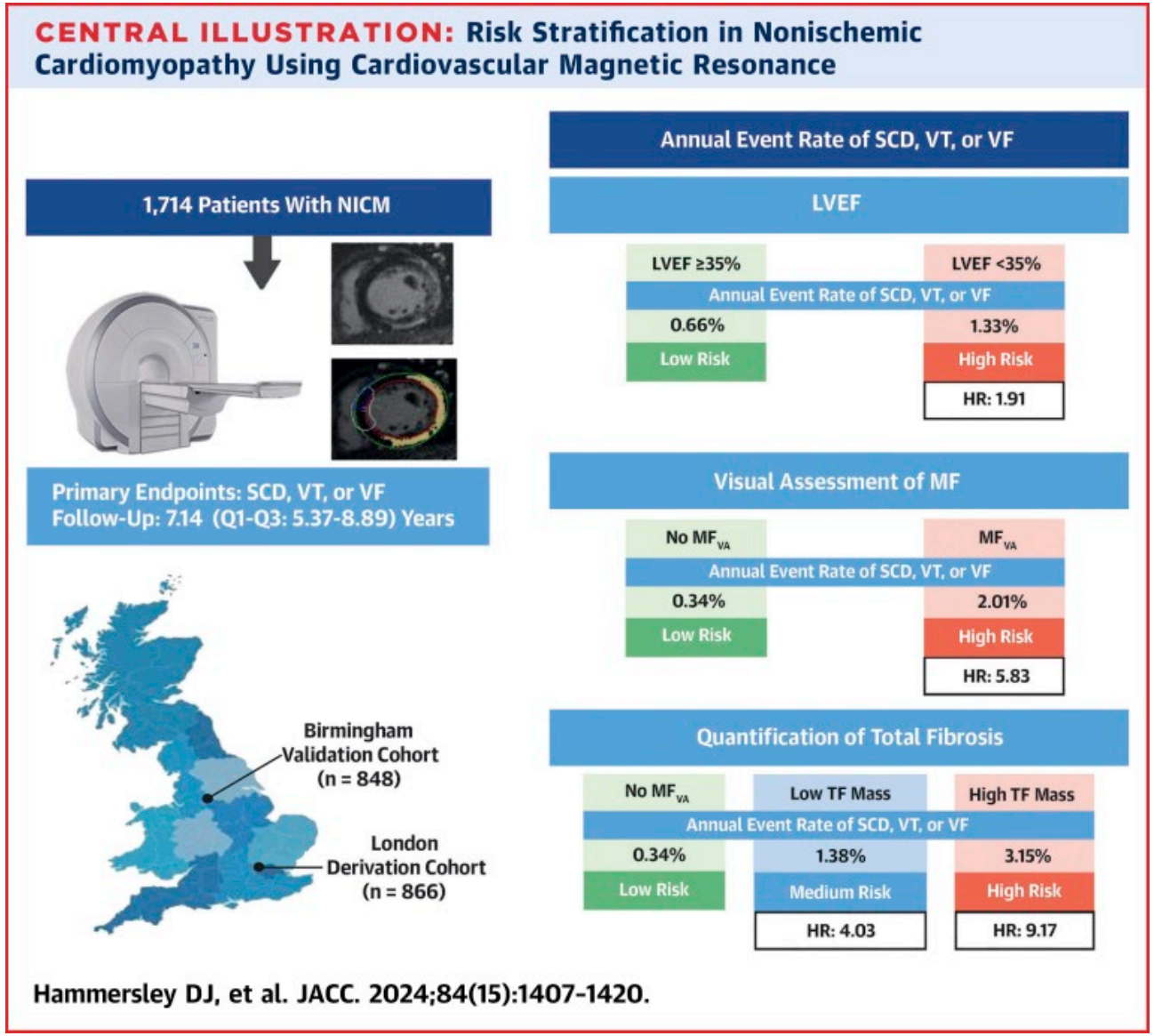
Non-ischemic cardiomyopathy



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VT in recovered EF

Centro referencia: Unidad de Arritmias Hospital Universitario de A Coruña, Galicia. España.
Investigador principal: Jorge Rodríguez Garrido, MD.

N= 945 home monitoring (2010-2023)

Excluded
N= 327 secondary prevention, channelopathies …

N= 497
(EF < 50)

N= 121
(> 35%EF)

6 (4.95%) VA
Follow up: 4 y

100% myocardial fibrosis
4 (66%) ischemic

Summary

- Different ways ventricular arrhythmias develop in patients with acute heart failure.

- Myocardial fibrosis can predict ventricular events and is especially useful for ruling them out.

- However, it is not included in ESC or AHA/ACC guidelines because:
    - Lack of robust prospective validation
    - No standardized measurement methods
    - No trials proving clinical benefit from fibrosis-guided decisions