„LV size matters“

LV size needs to be incorporated in LV function assessment in HFrEF patients

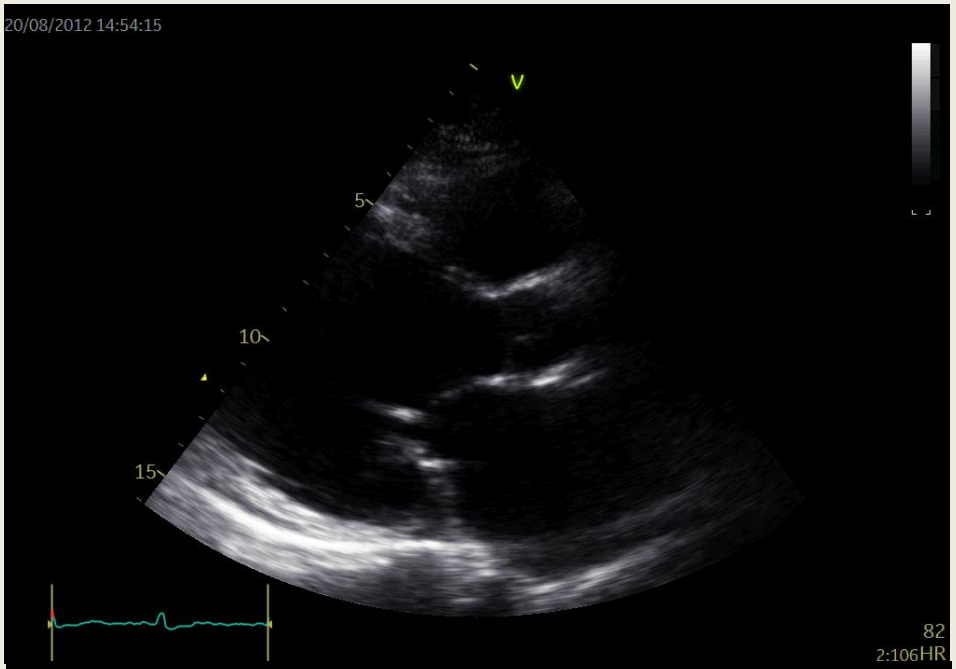
IKEM

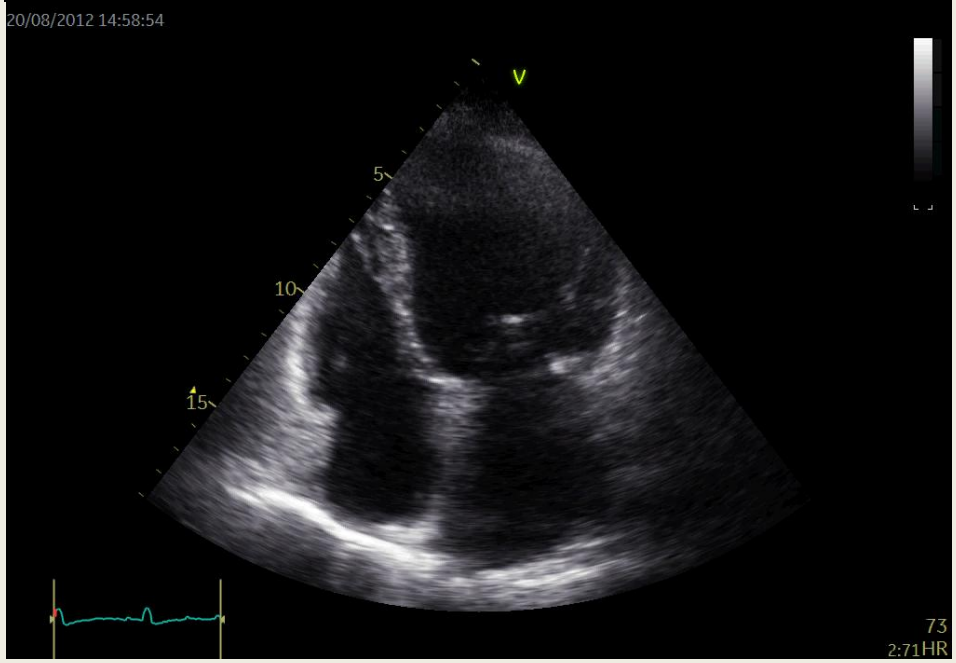
CCRID 2022

28.11.2022

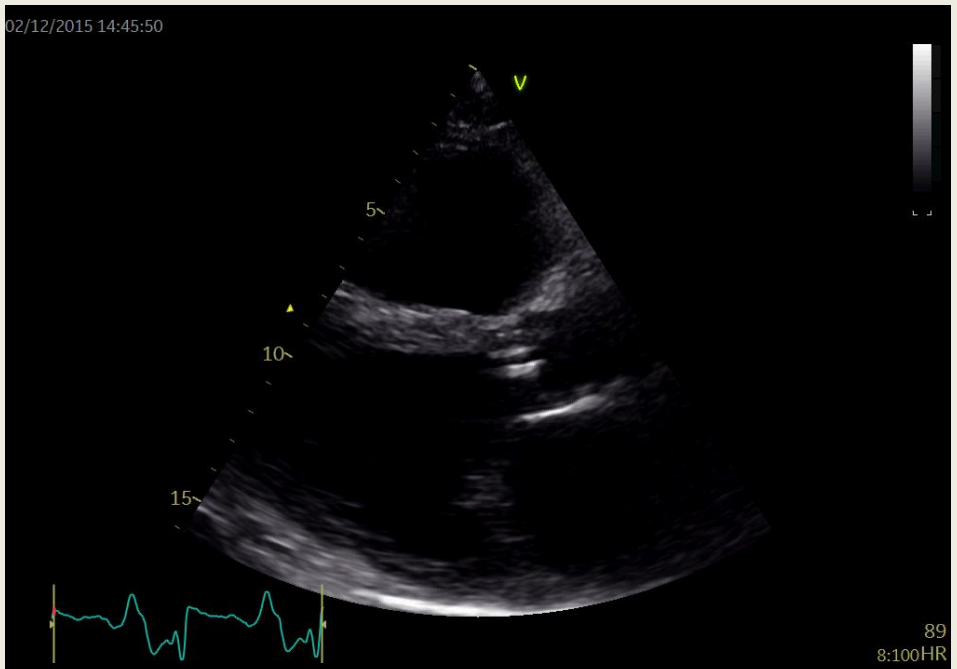
K. KROUPOVA, IKEM

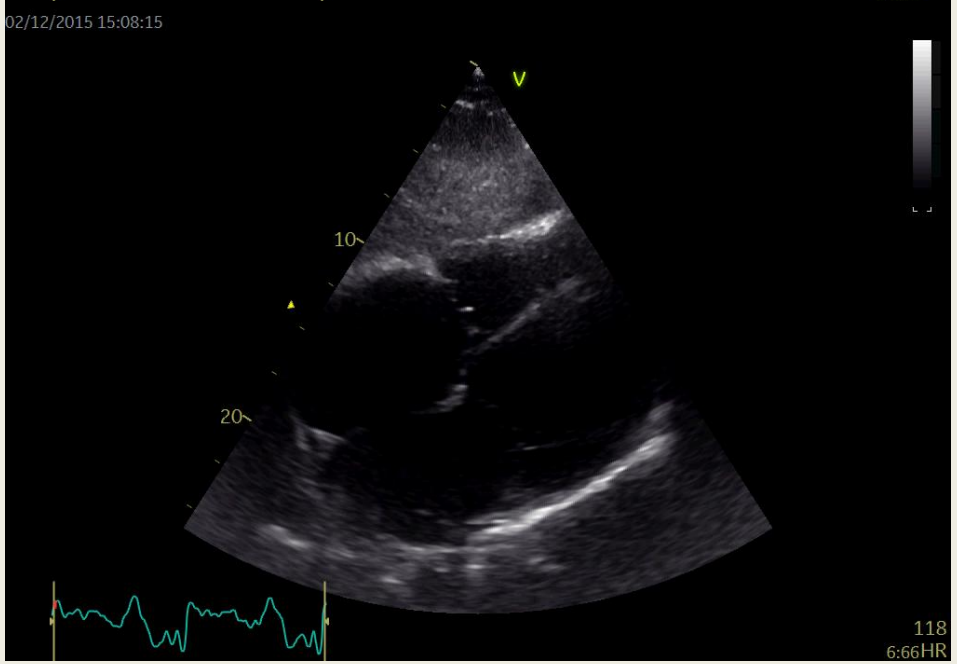
Patient no. 1



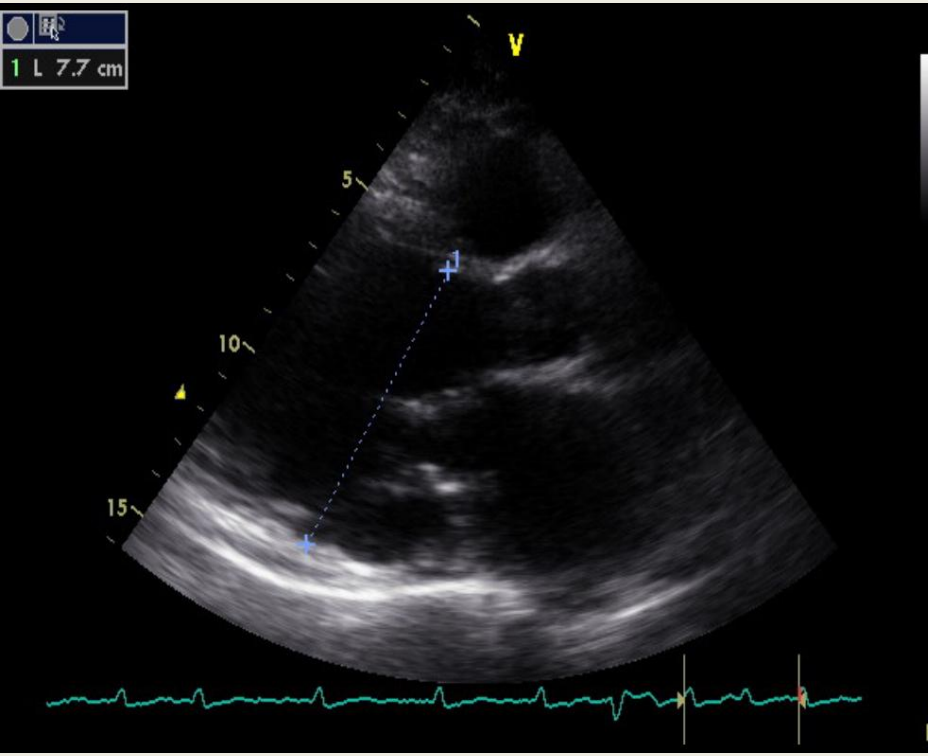


Patient no. 2





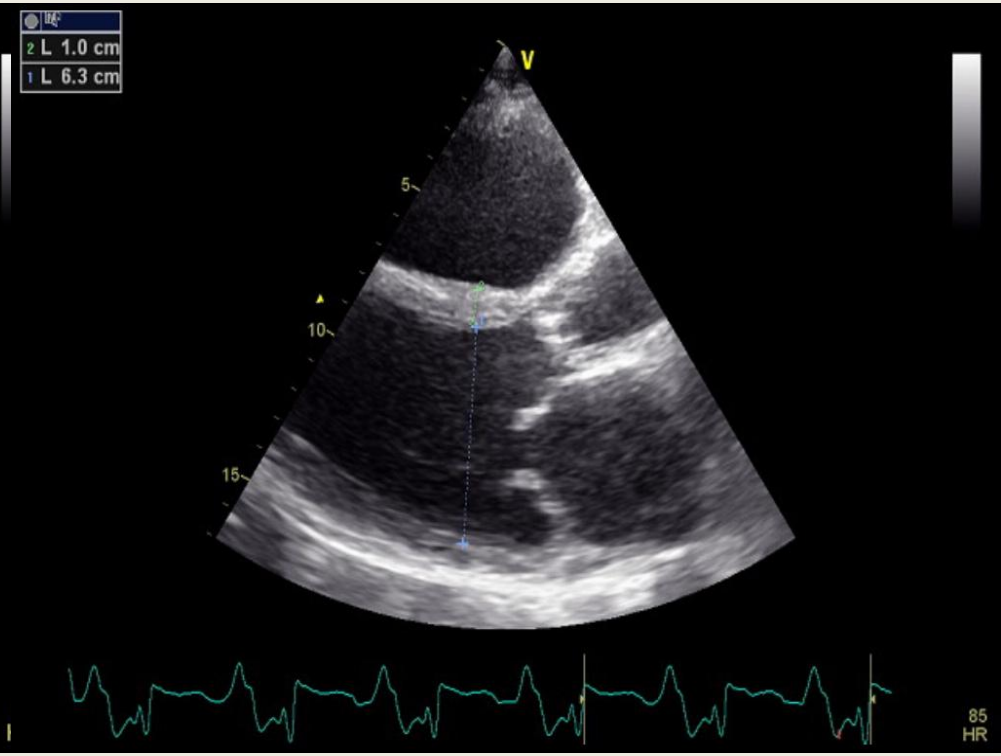
Patient no. 1



LVEDD 77 mm
LVEDDi 38,9 mm/m2

LVEF 30-35%

Patient no. 2



LVEDD 63 mm
LVEDDi 29,7 mm/m2

LVEF <20%

LV function X LV size

ESC European Society of Cardiology

European Heart Journal (20
doi:10.1093/eurheartj/ehab

2021 ESC Guidelir treatment of acut

Developed by the Task For and chronic heart failure o

With the special contribu

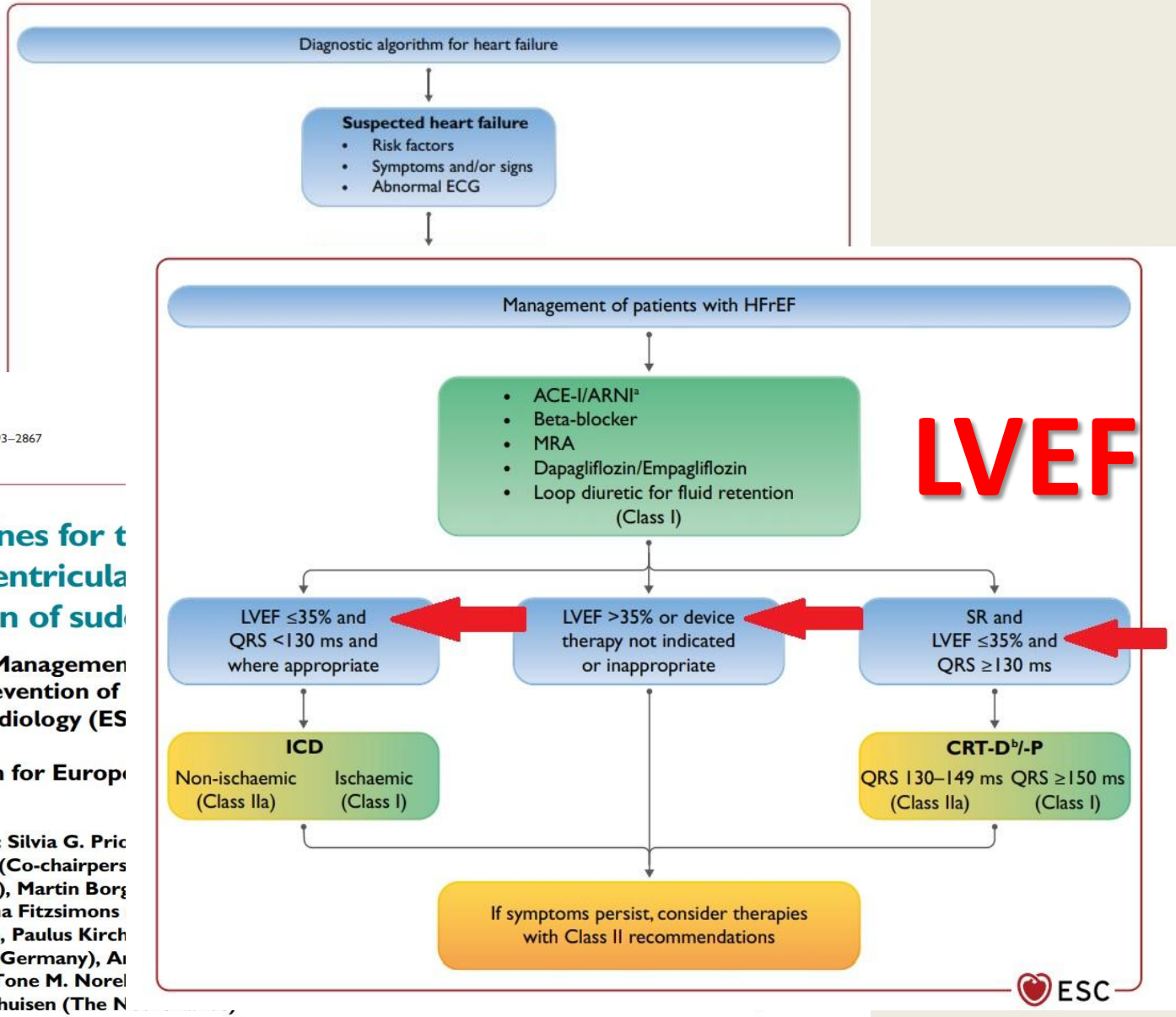
European Heart Journal (2015) **36**, 2793–2867
doi:10.1093/eurheartj/ehv316

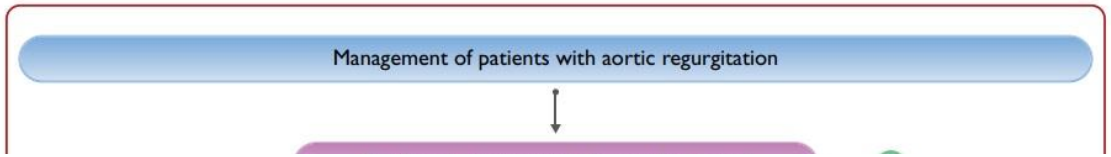
2015 ESC Guidelines for t of patients with ventricula and the prevention of sud

The Task Force for the Managemen Arrhythmias and the Prevention of European Society of Cardiology (ES

Endorsed by: Association for Europe Cardiology (AEPC)

Authors/Task Force Members: Silvia G. Pric Carina Blomström-Lundqvist*(Co-chairpers Nico Blom[a] (The Netherlands), Martin Borg Perry Mark Elliott (UK), Donna Fitzsimons Gerhard Hindricks (Germany), Paulus Kirch (Denmark), Karl-Heinz Kuck (Germany), A Nikolaos Nikolaou (Greece), Tone M. Norel (France), and Dirk J. Van Veldhuisen (The N





ESC
European Society of Cardiology

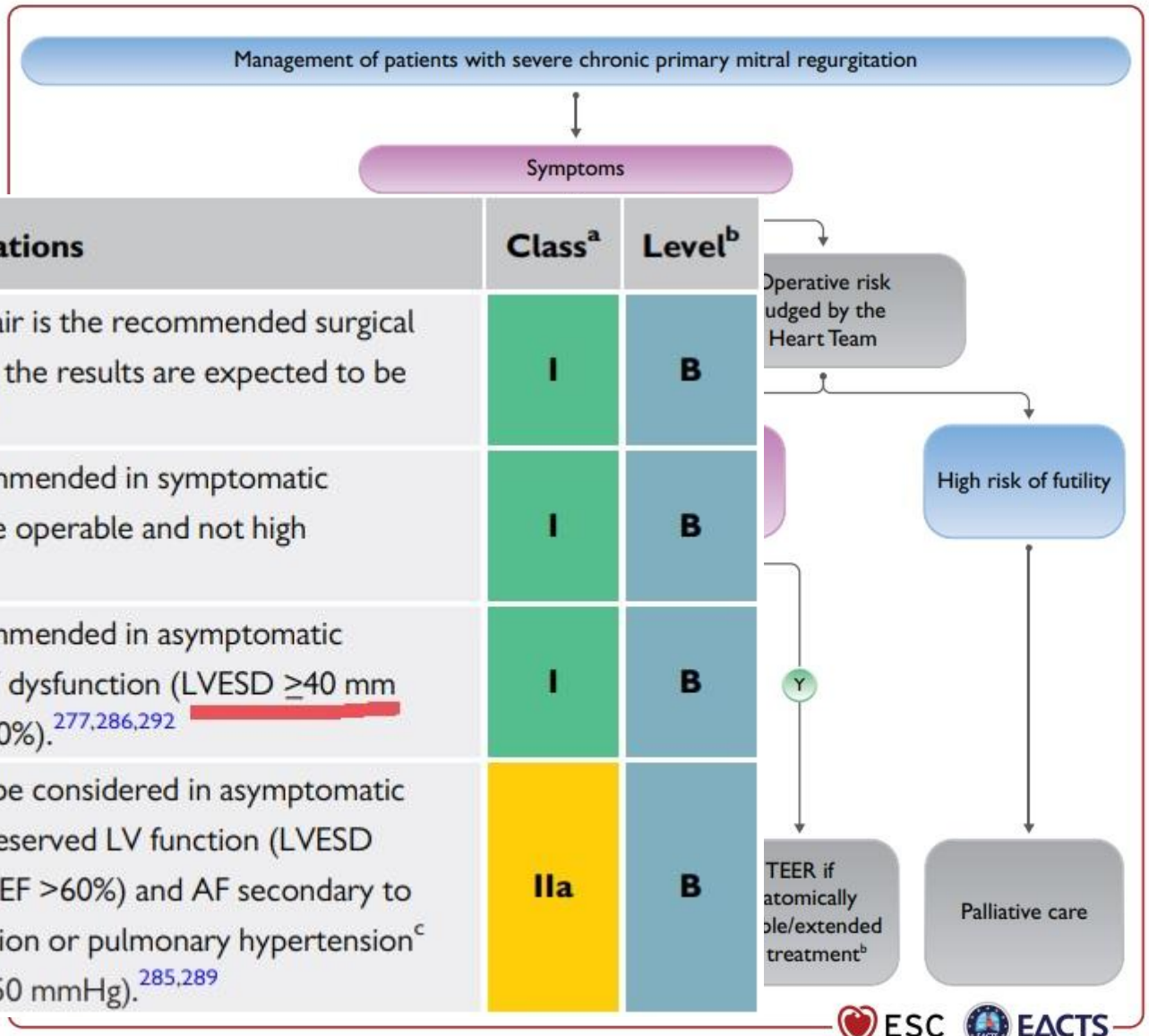
European Heart Jour
https://doi.org/10.109

Indications for surge

A) Sever

Surgery is
patients re
Surgery is
patients w
>25 mm/m
size) or re
Surgery m
patients w
in patients
≤55%, if su

* Corresponding authors: Al
Henri Huchard, 75018 Paris,
Center, University Hospital F
+49 761 270 28180. E-mail:



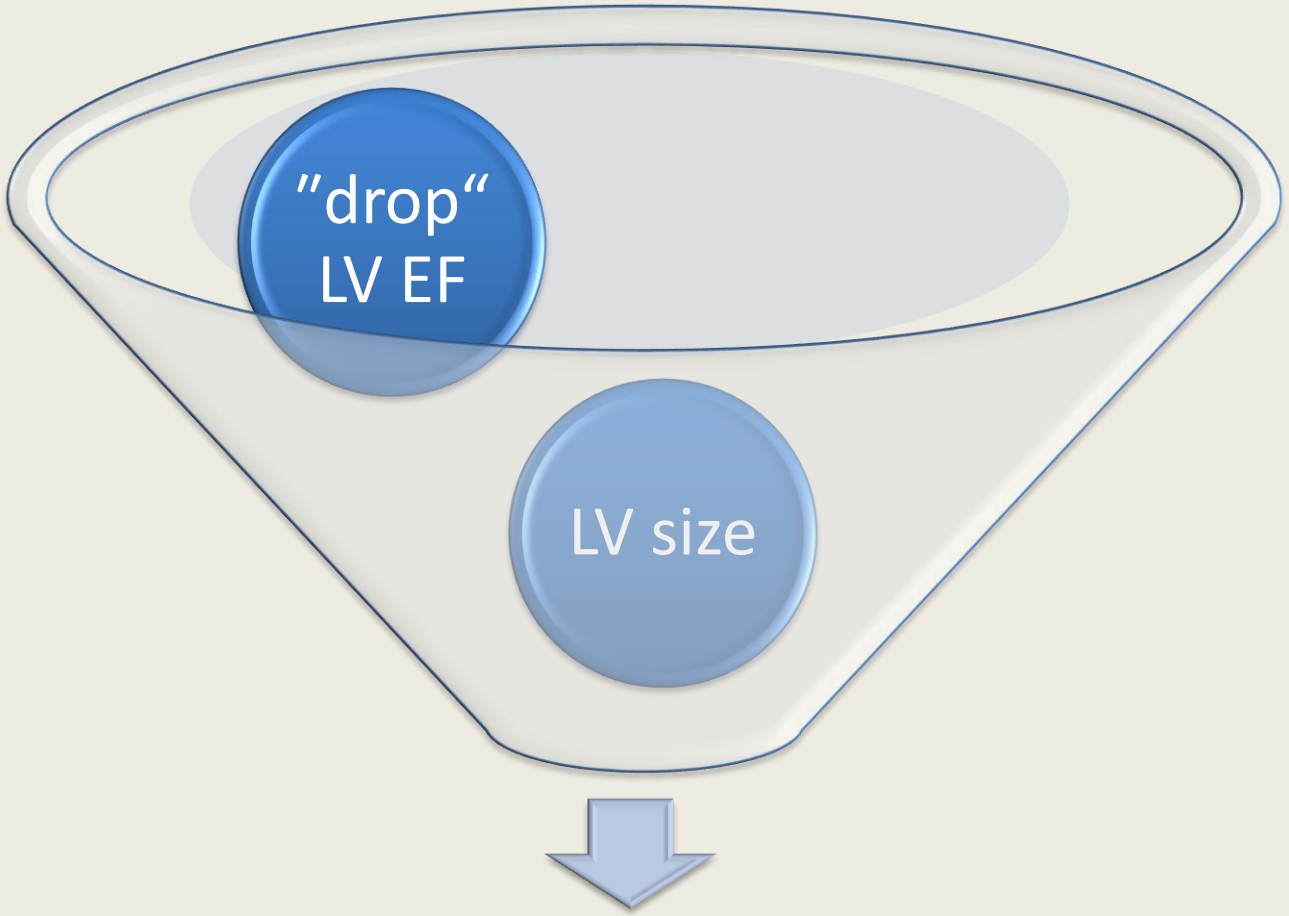
Recommendations	Class[a]	Level[b]
Mitral valve repair is the recommended surgical technique when the results are expected to be durable.[293–296]	I	B
Surgery is recommended in symptomatic patients who are operable and not high risk.[293–296]	I	B
Surgery is recommended in asymptomatic patients with LV dysfunction (LVESD ≥40 mm and/or LVEF ≤60%).[277,286,292]	I	B
Surgery should be considered in asymptomatic patients with preserved LV function (LVESD <40 mm and LVEF >60%) and AF secondary to mitral regurgitation or pulmonary hypertension[c] (SPAP at rest >50 mmHg).[285,289]	IIa	B

NOVEL CONCEPT

- Current guidelines recommend to evaluate LV size and function as separate entities

- **INTEGRATION of LV size and LV function into ONE parameter**

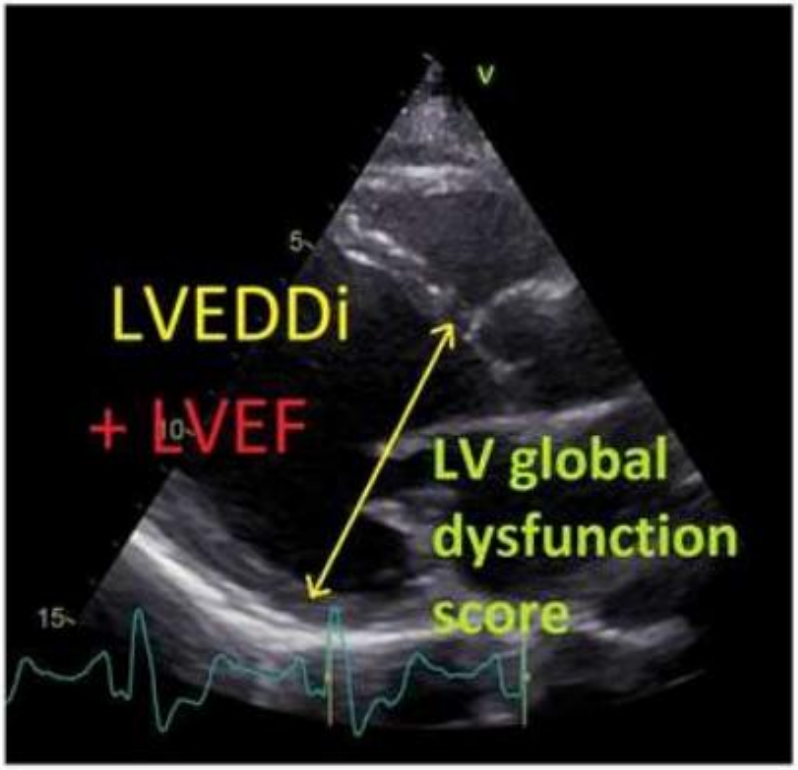
NOVEL CONCEPT



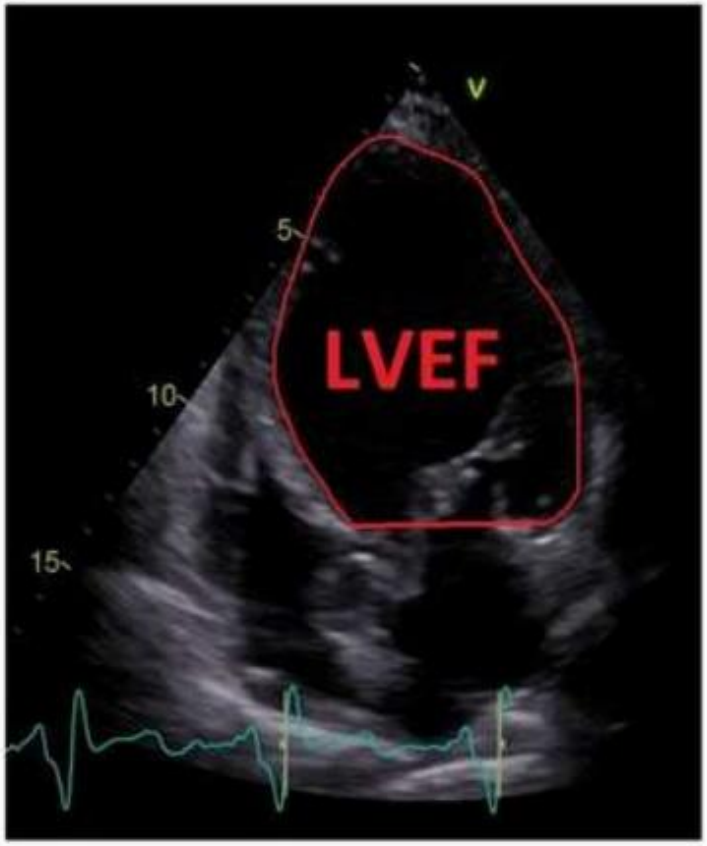
LV GLOBAL DYSFUNCTION SCORE

HYPOTHESIS

LV dysfunction assessed as LV global dysfunction score (combination of LVEDDi and LVEF) is a superior parameter than LVEF only in HFrEF patients



HFrEF



LVGDs

- With advancing HF:
  LVEF numerically decreases
  LV size increases →

- **„EF drop“ = 55 – measured LVEF**

- **LVGDs = LVEDDi × LV EF drop**

  (indexed to BSA)

LVGDs

LVEDD = 60 mm BSA = 2m^2 LVEF = 30%

LVEDDi = 30 mm/m^2 EF drop = 25

LVGDs = LVEDDi × ”drop“ LV EF

LVGDs = 30 × 25 = 750

METHODS

- **Enrollment:**

- stable HFrEF (LVEF ≤ 40%) of at least 6 months
- stable medical therapy at least 3 months
- 2008-2016, followed until 7/2019

- **Exclusion criteria**:

- potentially reversible LV dysfunction (planned valve surgery, revascularization, tachycardia-induced cardiomyopathy)

METHODS

Combined endpoint:

- death
- urgent HTx or
- VAD implantation

RESULTS

- Enrolled: **844 patients** with advanced HF (NYHA III-IV 67,9%)

- Follow up: median **1110 days** (IQRs 407, 1780 days)

- Adverse outcome: **60,7%** (+ 4,1% underwent heart transplantation as non-urgent recipients)

RESULTS

- High degree of guideline-directed pharmacotherapy and device therapy

  - **78.7% ACEi/ARB**
  - **87.6% beta-blockers**
  - **77.0% MRA**
  - **59.3% ICD**
  - **32% CRT**

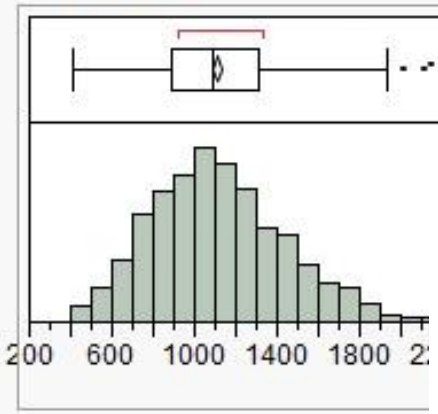
PATIENTS CHARACTERISTIC

Age (years)	**57.88 ± 11.29**
Males (%)	**82.7**
HF etiology (% CAD)	**50.1**
BMI ($kg.m^{-2}$)	27.83 ± 5.09
NYHA (2-4,%)	32.1/60.4/7.5
BNP ($ng.l^{-1}$)	464 (207; 1076)
SBP (mmHg)	116.27 ± 19.08
LVEDD (mm)	**69.41 ± 9.11**
LVEF (%)	**23.58 ± 5.79**
LVEDDi ($mm.m^{-2}$)	**34.98 ± 5.17**
RVD1 (mm)	36.37 ± 9.27

LVGDs

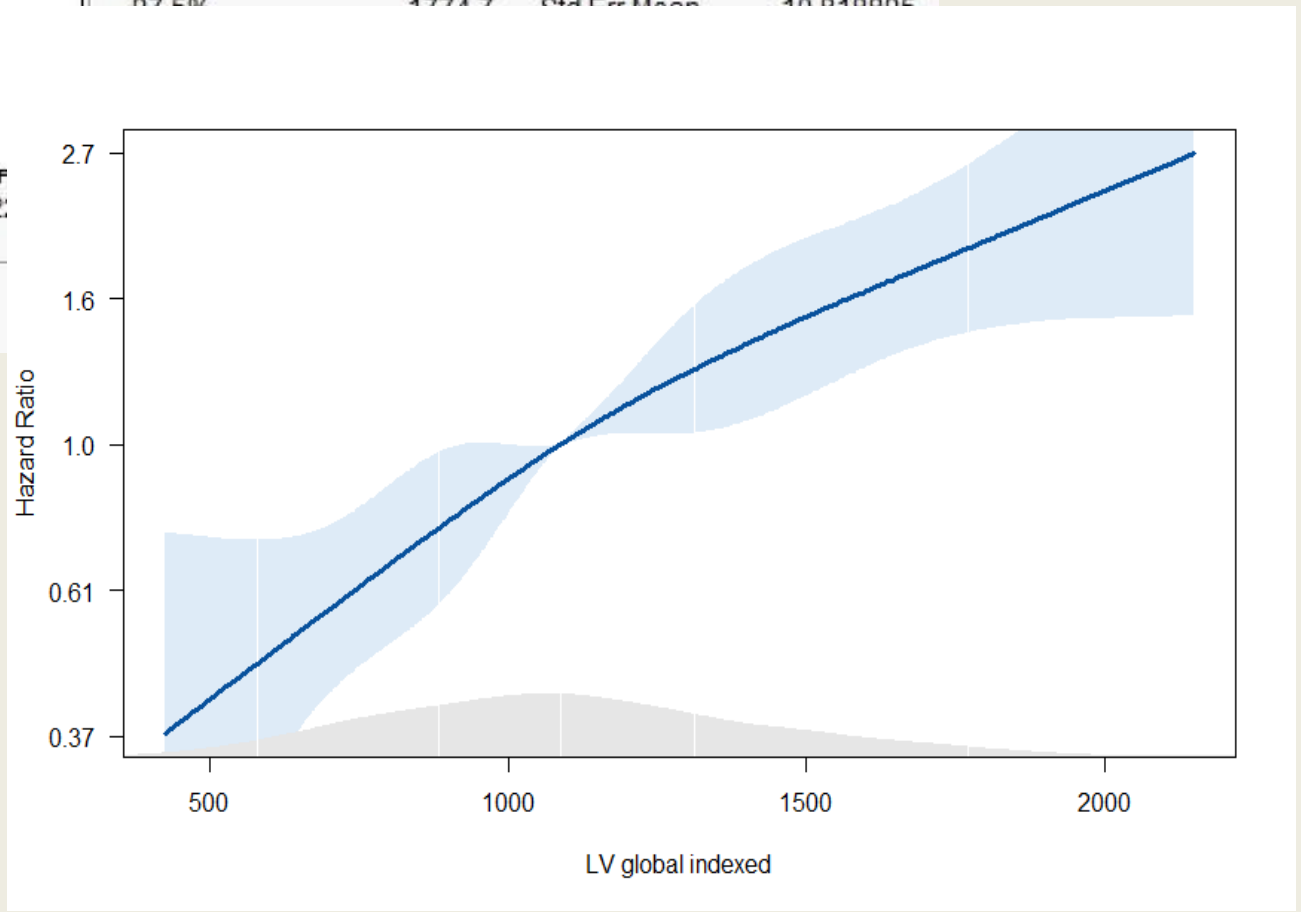
Distributions

LV global dysf/BSA

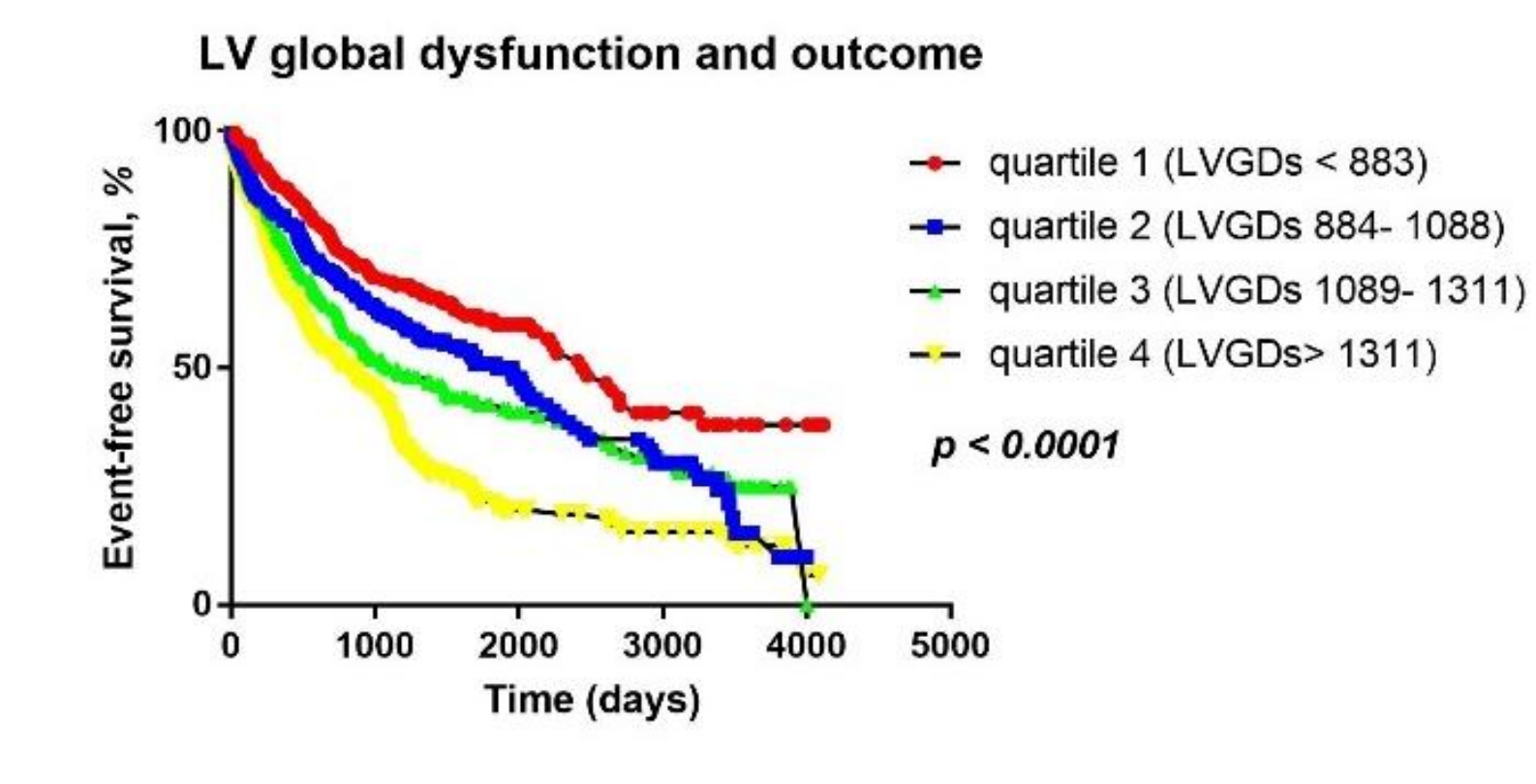


Quantiles		
100.0%	maximum	2293,26
99.5%		2092,59

Summary Statistics	
Mean	1112,7145
Std Dev	314,30705



LVGDs and outcome



Each increase in LVGDs by 100, increases the risk of adverse outcome by 12%

Comparison of LVEF and LVGDs

Time	AUC				
	LVEF	LVGDs	Delta AUC	95% CI	p
1st year	63.6	66.2	**2.6**	0.1;5.1	**0.04**
2nd year	61.4	63.7	**2.3**	0.4;4.3	**0.02**
3rd year	63.0	65.1	**2.2**	0.3;4.0	**0.02**
4th year	64.9	67.4	**2.5**	0.6;4.4	**0.01**

LV size and outcome

	HR	CI	p
LVEDDi	**1.04**	**1.02 - 1.06**	**0.0001**
LVEF	0.96	0.94 - 0.97	<0.0001
Interaction			0.53

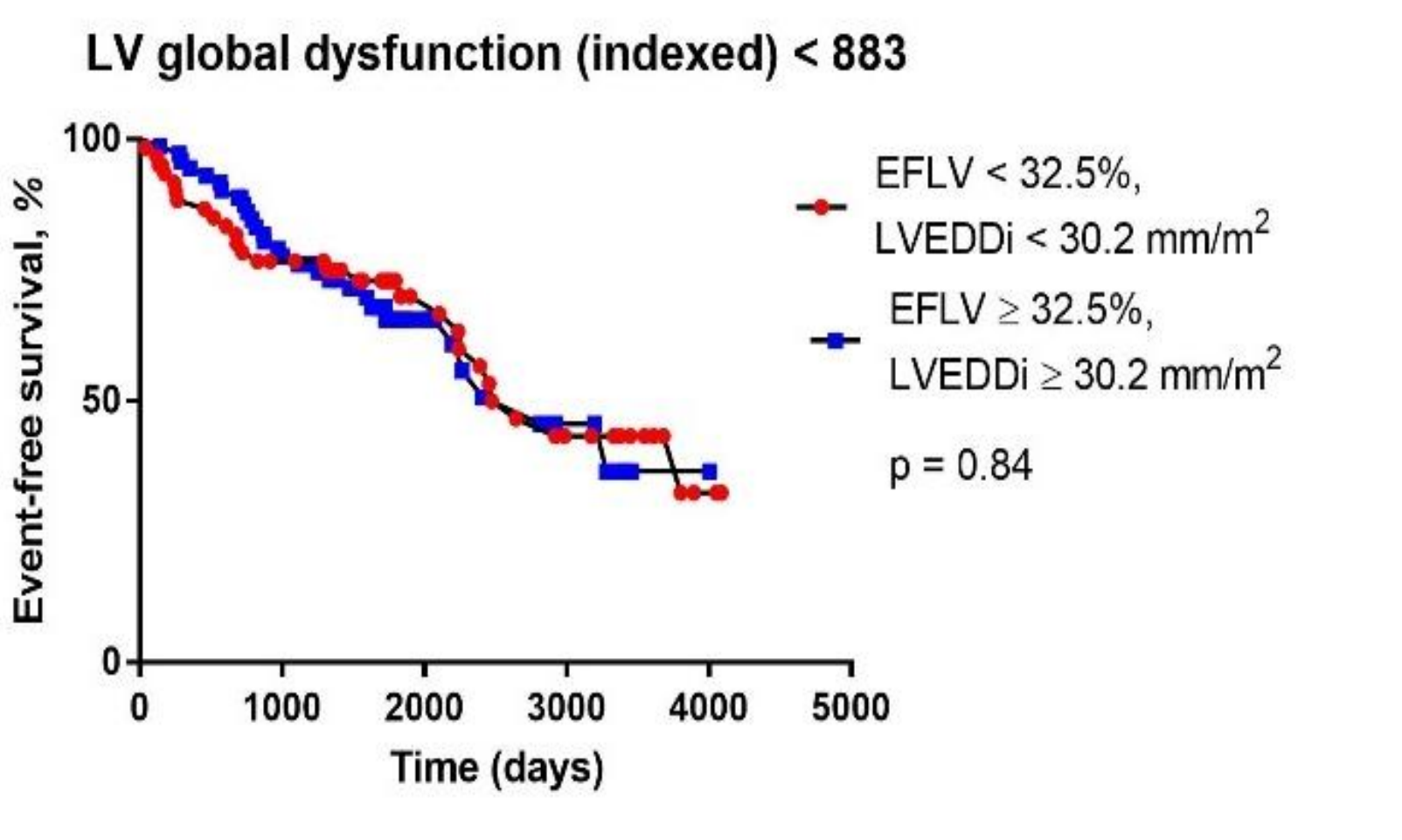
LVGDs further analysis

- 4 groups according to quartiles of LVGDs
- Comparing the subgroups – better function and more dilated LV

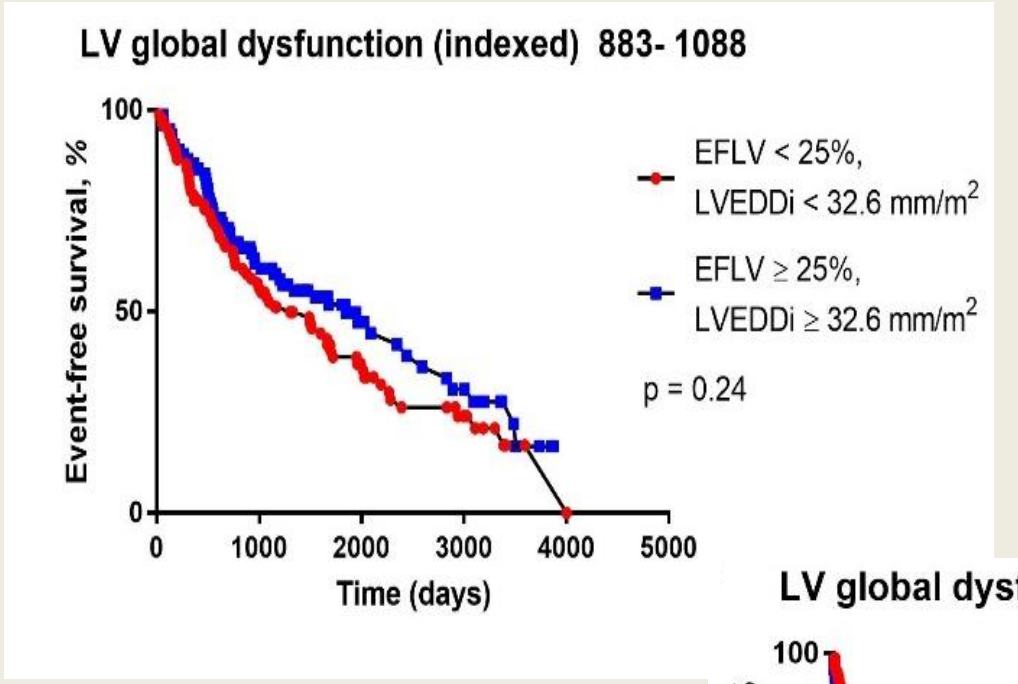
X

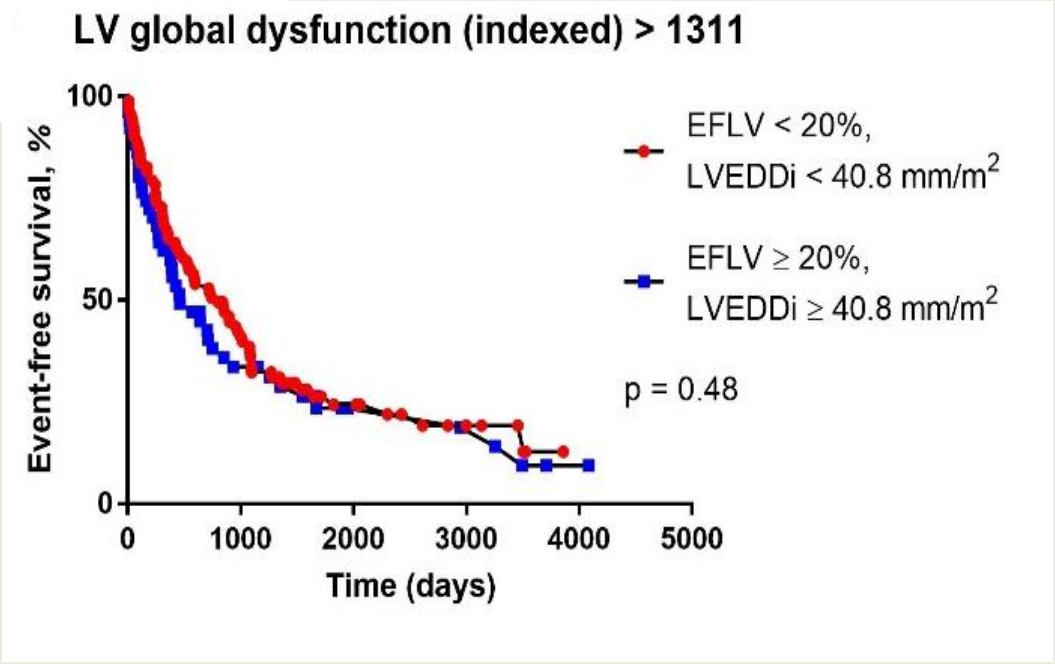
- worse LV function but smaller LV size

LVGDs-quartiles and outcome



LVGDs-quartiles and outcome



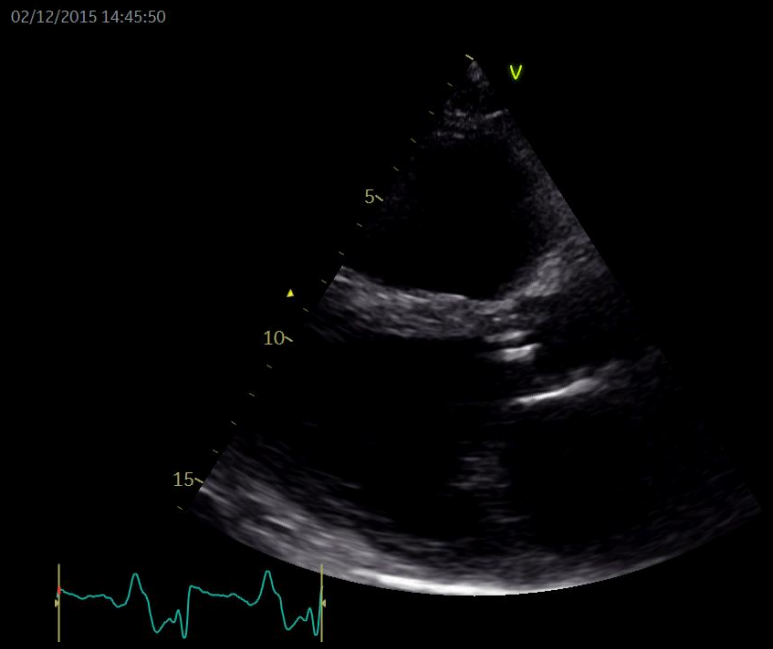


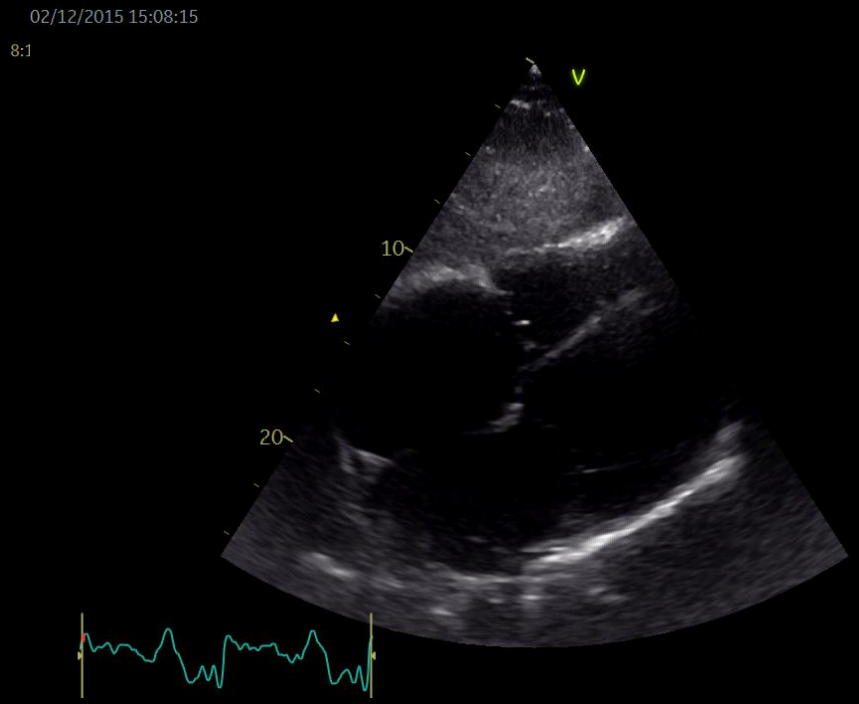
CONCLUSION

- **LV dilatation in HFrEF patients adds independentely to an adverse outcome** and should be considered as a marker of impared LV function per se
- **Integrating LV size and degree of dysfunction** provides **more accurate information** about degree of LV disease and prognosis
- **Similar prognosis** in patients with better LV function but more dilated LV x worse LV function but smaller LV size

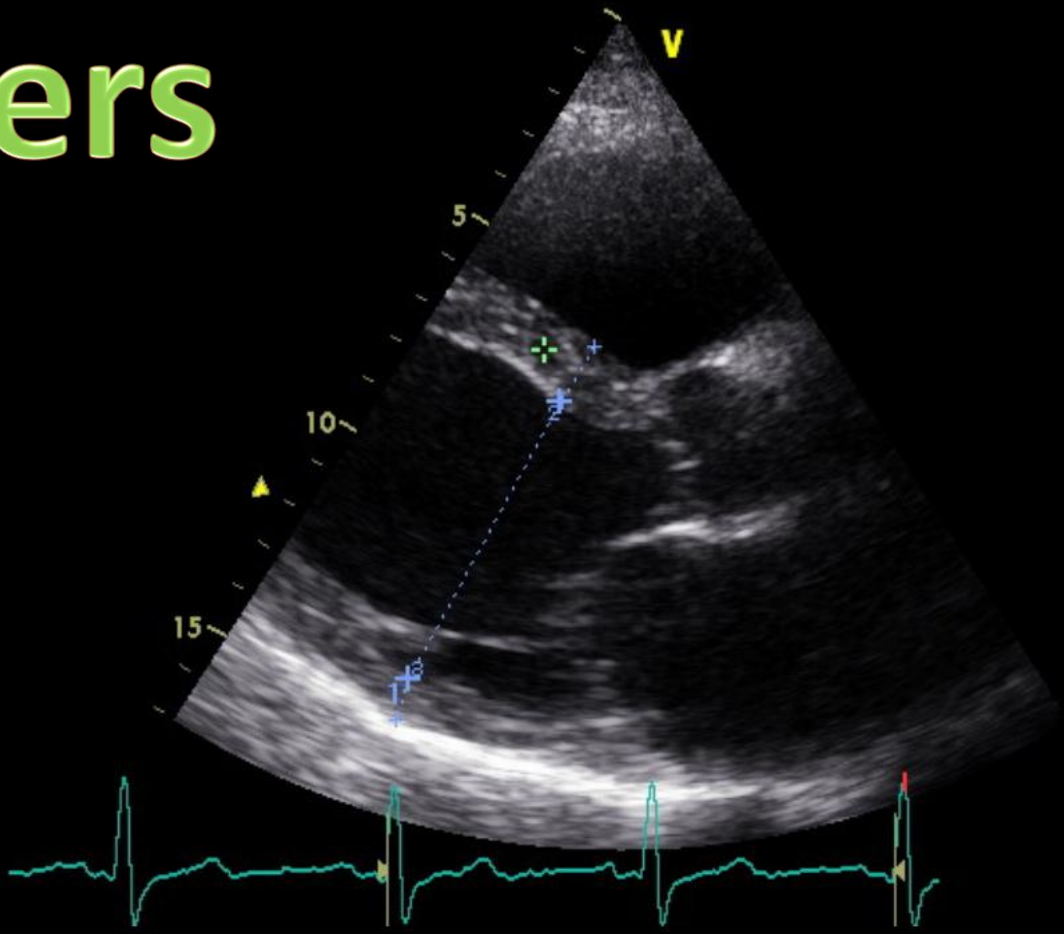
ALIVE :

Patient no. 2





LV size matters



THANK YOU FOR YOUR ATTENTION

LV size & LVEF predictors of outcome

- **LVEF –** oldest and most widely used variable to assess LV performance and the key parameter for the diagnosis of heart failure
- * **Assessing left ventricular systolic function: from ejection fraction to strain analysis**, European Heart Journal (2021) 42, 789–797, Brian P. Halliday 1,2, Roxy Senior1,3, and Dudley J. Pennell1,2*
- * . **The Seattle Heart Failure Model: prediction of survival in heart failure.** Circulation 2006;**113(11):1424-33.** WC, Mozaffarian D, Linker DT, Sutradhar SC, Anker SD, Cropp AB, Anand I, Maggioni A, Burton P, Sullivan MD, Pitt B, Poole-Wilson PA, Mann DL, Packer M
- * **Influence of ejection fraction on cardiovascular outcomes in a broad spectrum of heart failure patients.** Circulation 2005;**112(24):3738-44.** Solomon SD, Anavekar N, Skali H, McMurray JJ, Swedberg K, Yusuf S, Granger CB, Michelson EL, Wang D, Pocock S, Pfeffer MA.
- * **2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure**, Eur Heart J 2021;42(36):3599-3726

- **LV size –** prognostic predictor
- * **Left Ventricular Dilation and Incident Congestive Heart Failure in Asymptomatic Adults without Cardiovascular Disease. MESA,** *J Card Fail. 2014 December ; 20(12): 905–911.*
- Joseph Yeboah, MD, MSa,b, David A. Bluemke, MDc, W Gregory Hundley, MDa, Carlos J Rodriguez, MD, MPHa,b, Joao A C Lima, MDd, and David M Herrington, MD, MHSa,b

- * **Left ventricular dimensions and cardiovascular outcomes in systolic heart failure: the WARCEF trial** ESC Heart Fail 2021 Dec;8(6):4997-5009. Kazato Ito, Siyuan Li, Shunichi Homma, John L P Thompson, Richard Buchsbaum, Kenji Matsumoto, Stefan D Anker, Min Qian, Marco R Di Tullio, WARCEF Investigators

* **Impact of let ventricular cavity size on survival in advanced heart failure.** Am J Cardiol 1993;72(9):672-6, Lee Th, Hamilton MA, Stevenson LW, Moriguchi JD, Fonarow GC, Child JS, Laks H, Walden JA.