

What's new in heart failure treatment?

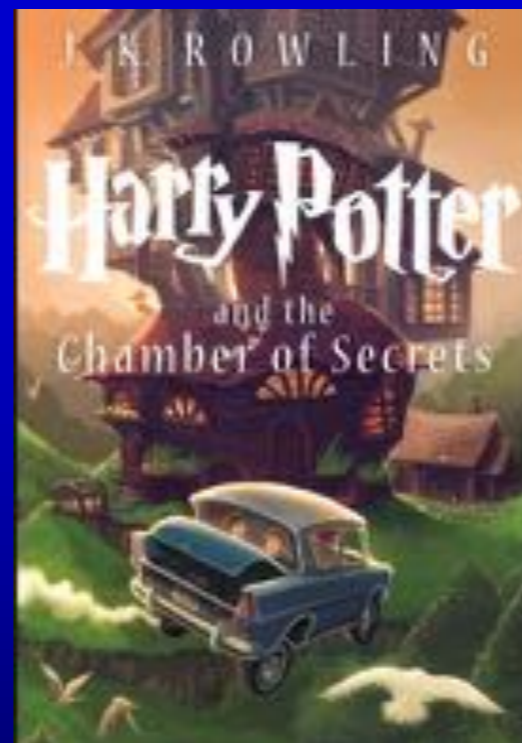
Assessment of RV function

Simone Frea

Division of Cardiology
Città della Salute e della Scienza
Torino



the Chamber of Secrets



Assessment of right ventricular function using two-dimensional echocardiography

With the use of two-dimensional echocardiography (2DE), we analyzed apical and subcostal four-chamber views for evaluation of right ventricular (RV) function in 30 individuals as compared to RV ejection fraction (RVEF) obtained by radionuclide angiography. In addition to previously reported parameters of changes in areas and chords, a new simple measurement of tricuspid annular excursion was correlated with RVEF. A close correlation was noted between tricuspid annular plane systolic excursion (TAPSE) and percentage of systolic change in area. The correlation with RVEF ($r = -0.76$ and 0.76) was traced in about half of our patients. The percentage of systolic change in chord length was also correlated with RVEF. The correlation between RVEF and chord length was poor. It is concluded that the measurement of TAPSE is a simple parameter which reflects RVEF. This measurement is superior to other measurements. (Circulation 88:1075-1080, 1993. HEART J 107:526-530, 1984.)

Sanjiv Kaul, M.D.,* Chuwa Tei, M.D.,
Pravin M. Shah, M.D. *Los Angeles*

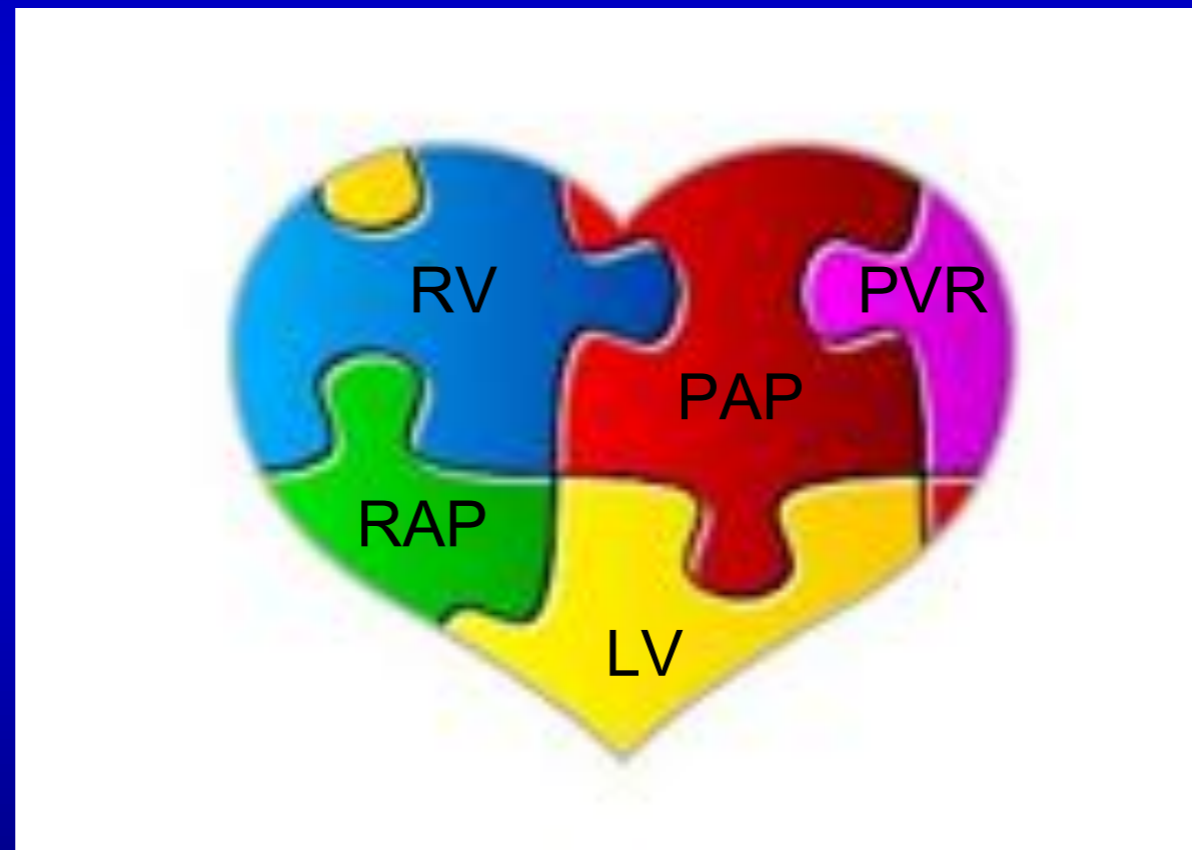


140 consecutive patients

ejection fraction <35%.



the art of put pieces together



Prognostic relevance of a non-invasive evaluation of right ventricular function and pulmonary artery pressure in patients with chronic heart failure

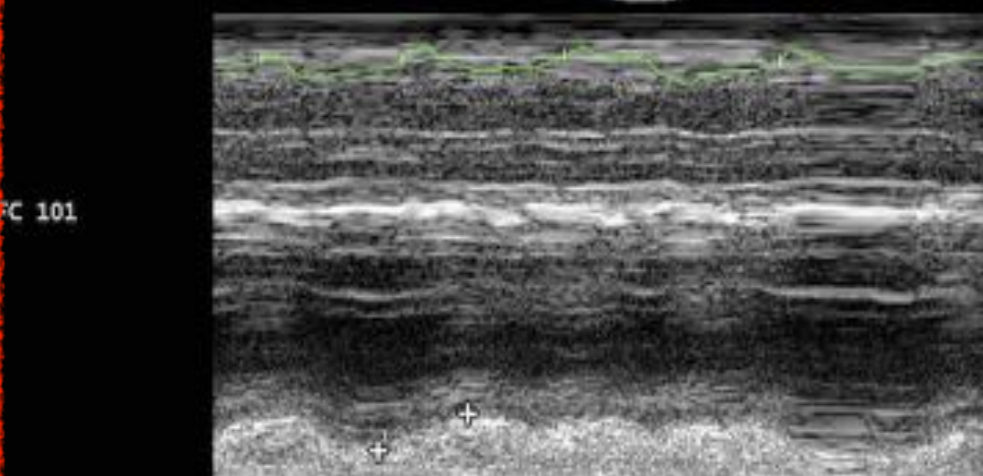
Stefano Ghio^{1,†}, Pier Luigi Temporelli^{2,†}, Catherine Klersy³, Anca Simioniu⁴, Bruna Girardi¹, Laura Scelsi¹, Andrea Rossi⁵, Mariantonietta Cicoira⁵, Franco Tarro Genta⁶, and Frank L. Dini⁴

658 outpatients with CHF and LVEF < 45%.

NYHA functional class I, II, III, IV, n (%) 120, 362, 162, 14 (18, 55, 25, 2)

LVEF (%) 30 ± 8

TAPSE 13.4 mm



**sPAP 60 mmHg
(45 + 15)**

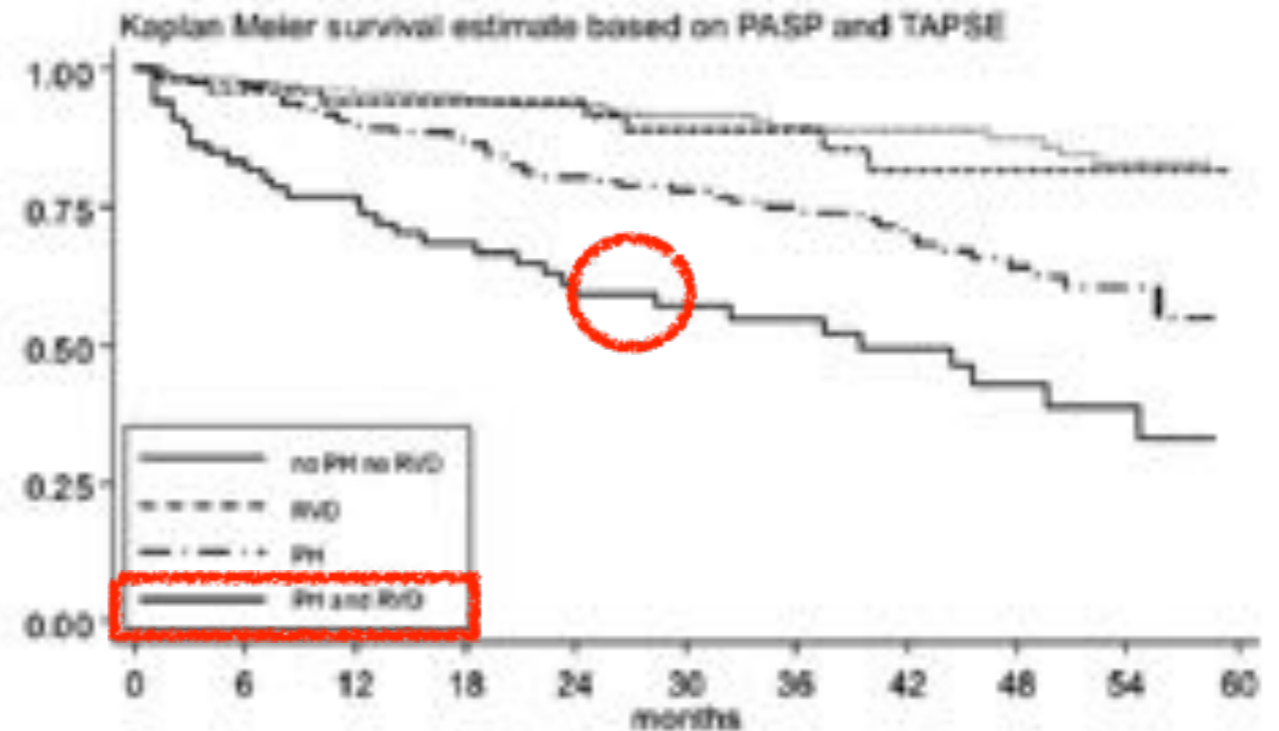
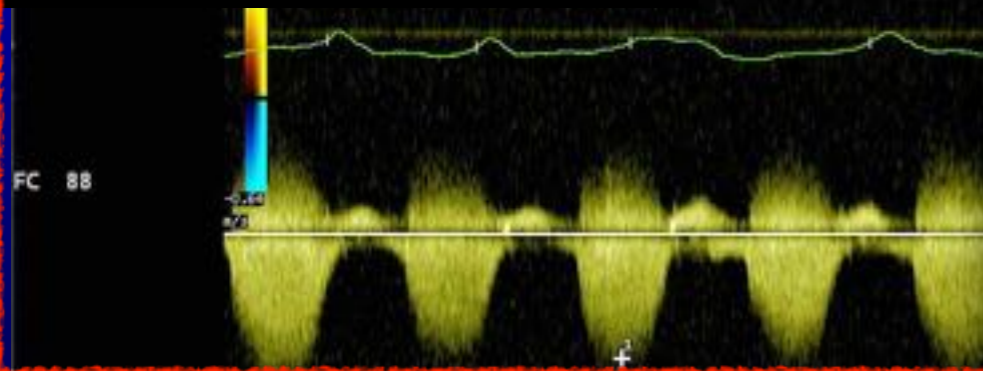


Figure 1 Kaplan-Meier estimates based on pulmonary artery systolic pressure and tricuspid annular plane systolic excursion. PH, pulmonary hypertension; RVD, right ventricular dysfunction.

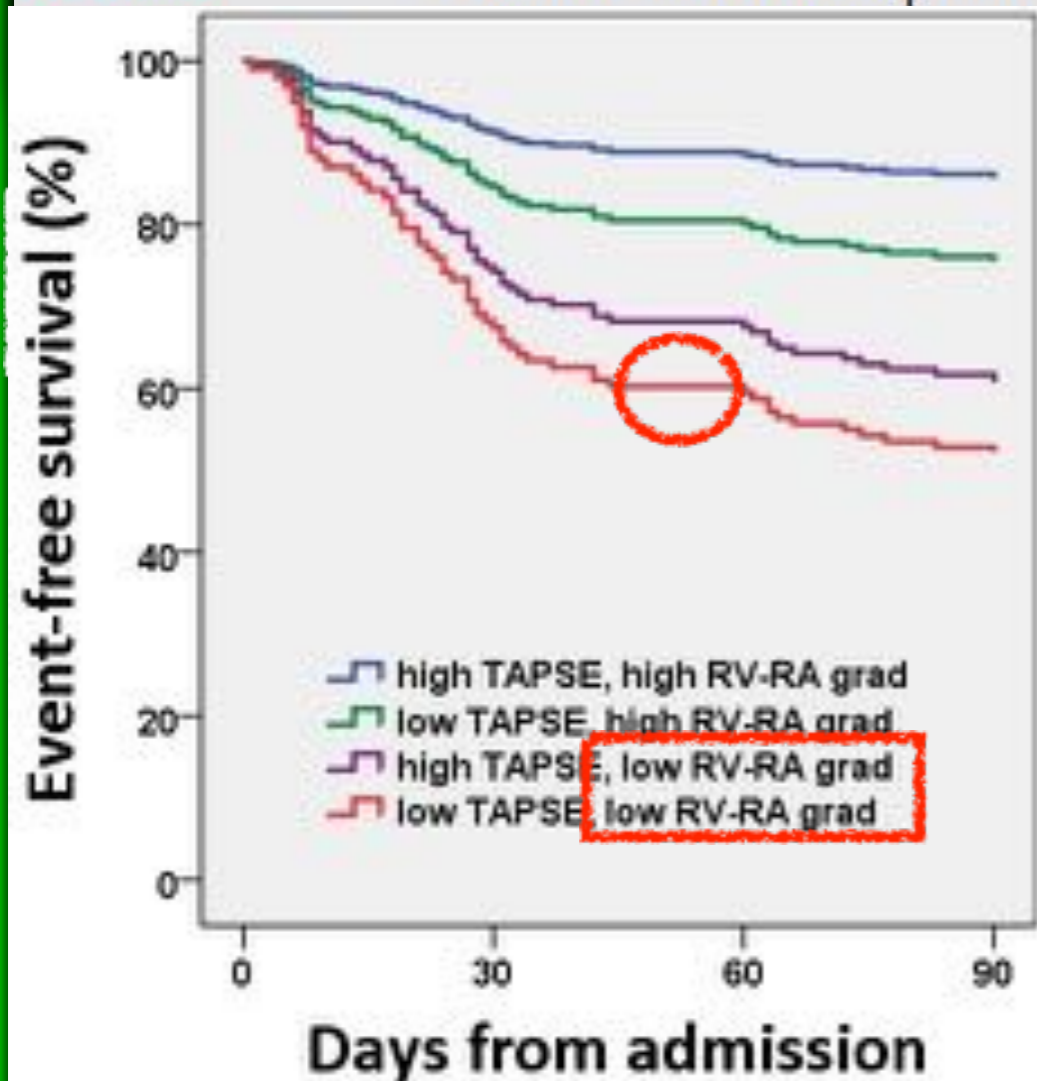
different patient
different setting
different rules



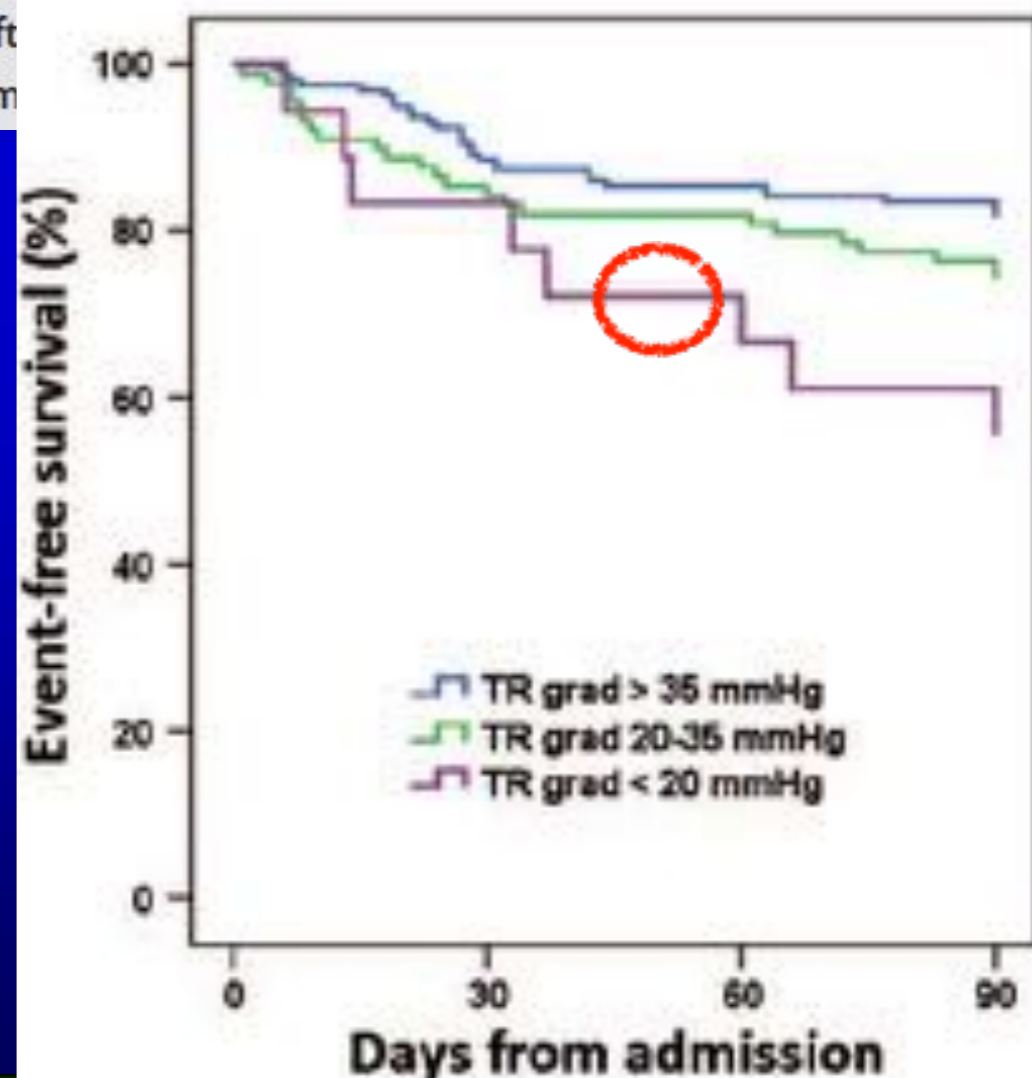
Prognostic incremental role of right ventricular function in acute decompensation of advanced chronic heart failure

Simone Frea^{1*}, Stefano Pidello¹, Virginia Bovolo¹, Cristina Iacovino¹, Erica Franco², Francesco Pinneri², Alessandro Galluzzo¹, Alessandra Volpe¹, Massimiliano Visconti¹, Andrea Peirone¹, Mara Morello¹, Serena Bergerone¹, and Fiorenzo Gaita¹

Methods A total of 265 NYHA IV patients admitted for acute decompensation of advanced CHF (EF $22 \pm 7\%$, systolic blood pressure 120 ± 15 mmHg) were prospectively enrolled. Fifty patients were eventually transplanted, and urgent mortality was defined as the primary endpoint.

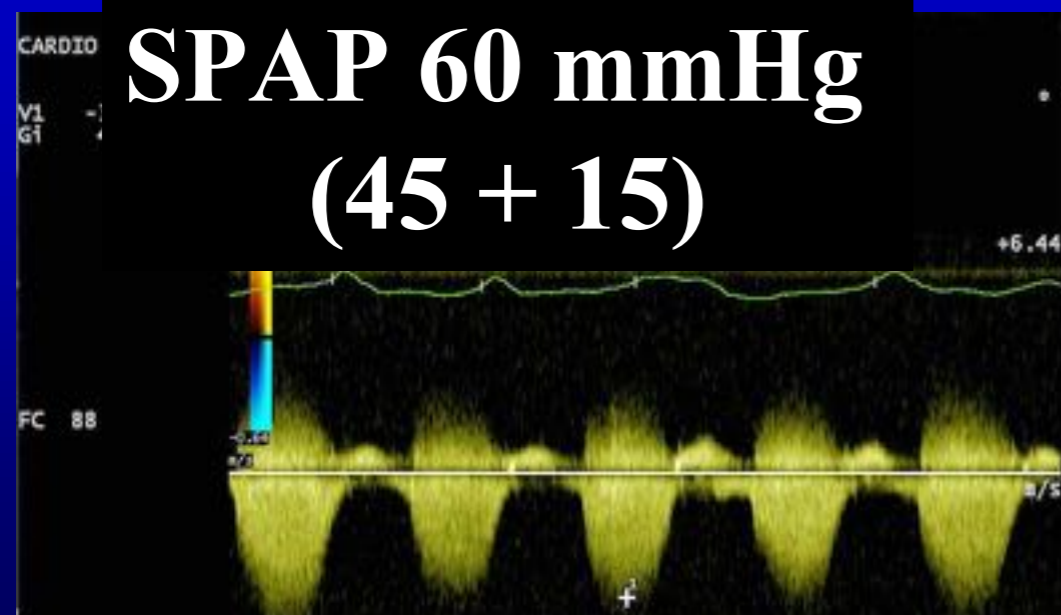
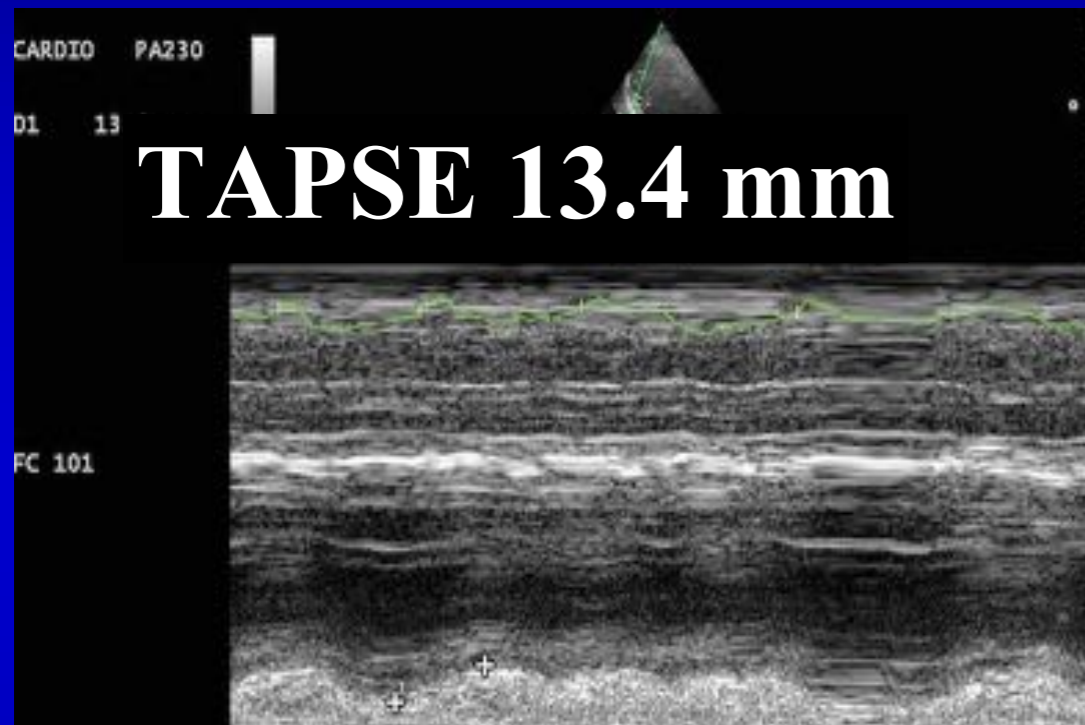


and urgent mortality. The primary endpoint was defined as the time to the first occurrence of any of the following events: death, transplantation, and urgent mortality.



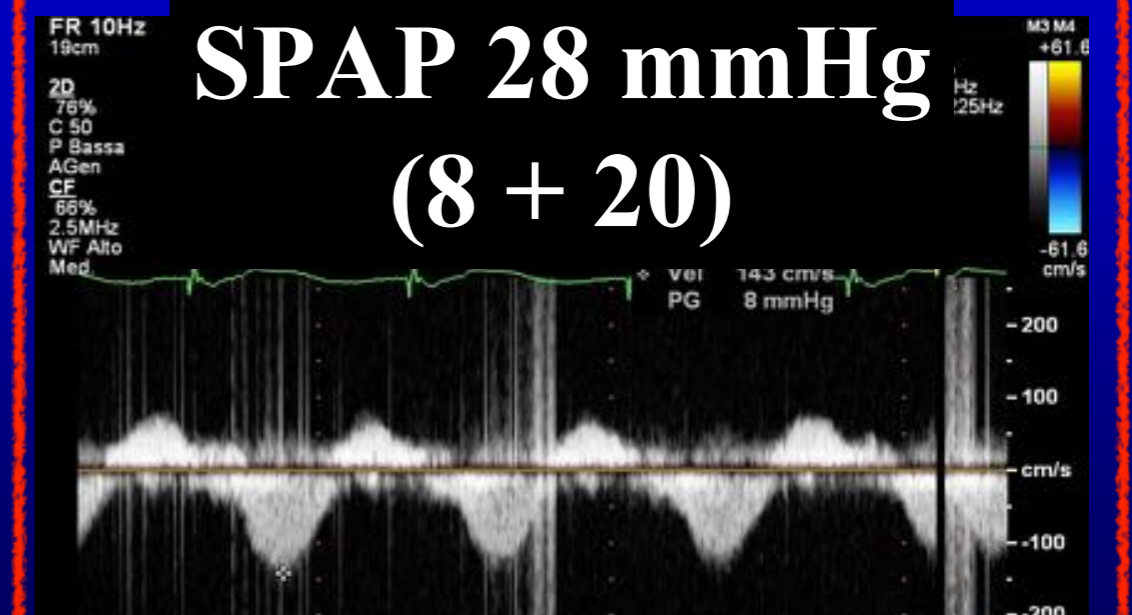
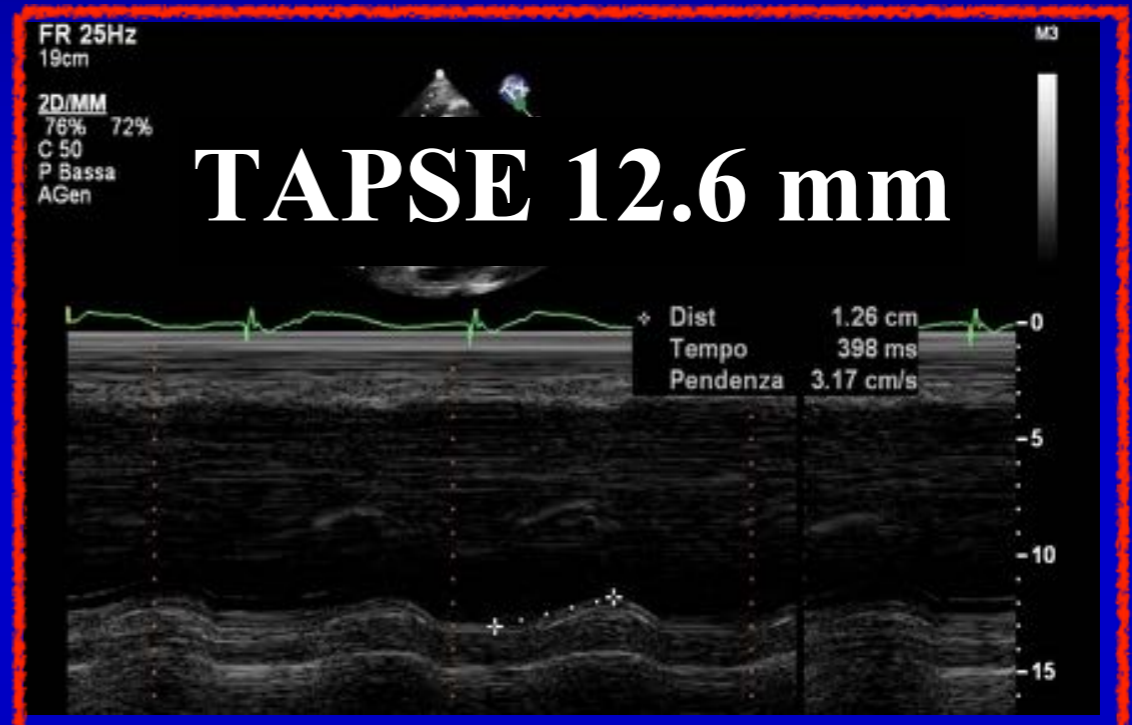
Prognostic relevance of a non-invasive evaluation of right ventricular function and pulmonary artery pressure in patients with chronic heart failure

Stefano Ghio^{1†}, Pier Luigi Temporelli^{2†}, Catherine Klersy³, Anca Simioniu⁴, Bruna Girardi¹, Laura Scelsi¹, Andrea Rossi⁵, Mariantonietta Ciccoira⁵, Franco Tarro Genta⁶, and Frank L. Dini⁴



Prognostic incremental role of right ventricular function in acute decompensation of advanced chronic heart failure

Simone Frea^{1*}, Stefano Pidello¹, Virginia Bovolo¹, Cristina Iacovino¹, Erica Franco², Francesco Pinneri², Alessandro Galluzzo¹, Alessandra Volpe¹, Massimiliano Visconti¹, Andrea Peirone¹, Mara Morello¹, Serena Bergerone¹, and Fiorenzo Gaita¹



Clinical Trials

Echocardiographic Evaluation of Right Ventricular Stroke Work Index in Advanced Heart Failure: A New Index?

SIMONE FREA, MD, VIRGINIA BOVOLO, MD, SERENA BERGERONE, MD, FABRIZIO D'ASCENZO, MD,
MARINA ANTOLINI, MD, MICHELE CAPRIOLO, MD, FEDERICO GIOVANNI CANAVOSIO, MD,
MARA MORELLO, MD, AND FIORENZO GAITA, MD

$$\text{RVCPI} = \text{TAPSE} \times (\text{RV-RA gra}$$

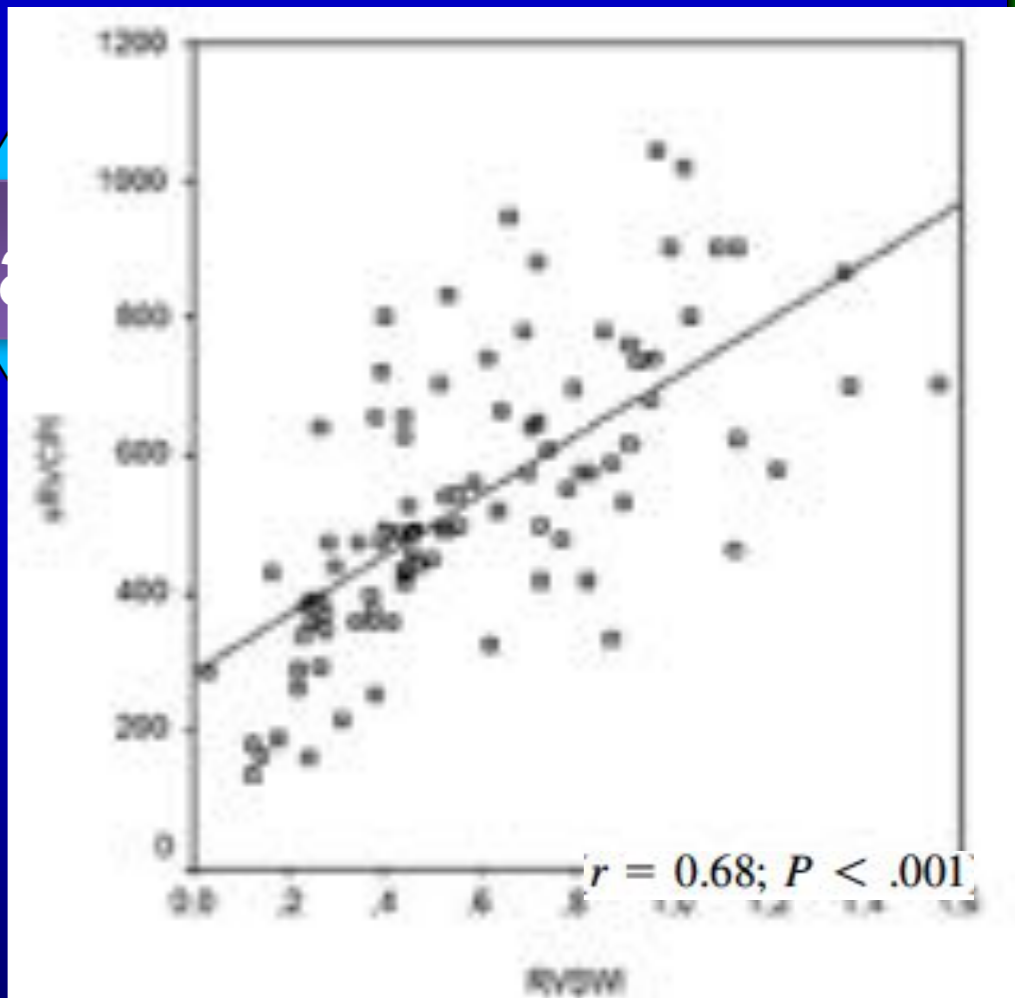


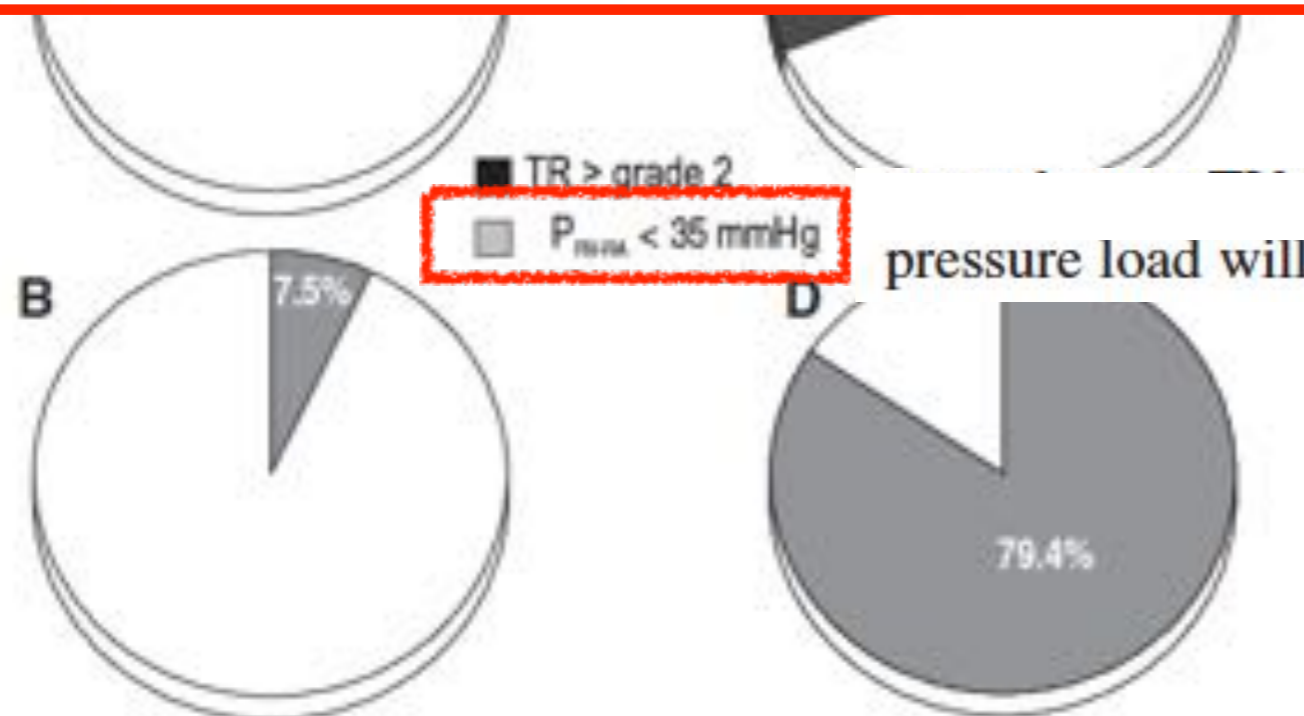
Fig. 3. Correlation between simplified right ventricular contraction pressure index (sRVCPI) and right ventricular stroke work index (RVSWI). Pearson correlation of 0.68; $P < .001$.

Load Dependency of Right Ventricular Performance Is a Major Factor to be Considered in Decision Making Before Ventricular Assist Device Implantation

Michael Dandel, MD, PhD; Evgenij Potapov, MD, PhD; Thomas Krabatsch, MD, PhD; Alexander Stepanenko, MD; Alexandra Löw, MD; Juliane Vierecke, MD; Christoph Knosalla, MD, PhD; Roland Hetzer, MD, PhD *Circulation.* 2013;128[

Table 5. Predictive Value of Preoperatively Measured Echocardiographic Variables for Postoperative RV Function in Patients Who Underwent LVAD Implantation

Variables	Cutoff*	Sensitivity % (CI)†	Prediction of RV Function		
			Specificity % (CI)†	NPV‡ % (CI)	PPV§ % (CI)
ΔP_{RV-RA}	35 mm Hg	84 (73–92)	93 (89–95)	96 (92–98)	76 (66–83)



The RV with better adaptation to pressure load will show a higher ΔP_{RV-RA} , less dilation, and less TR.

Figure 2. Prevalence of relevant tricuspid regurgitation (TR grade >2) and low-pressure gradient (<35 mmHg) between right ventricle and right atrium in patients without (A and B) and with (C and D) right heart failure (RHF) after left ventricular assist device (LVAD) implantation. data collected from 205 patients

one size fits all ?



IVC Diameter in Patients With Chronic Heart Failure

Relationships and Prognostic Significance

Pierpaolo Pellicori, MD, Valentina Carubelli, MD, Jufen Zhang, PhD, Teresa Castiello, MD, Nasser Sherwi, MSc, MD, Andrew L. Clark, MA, MD, John G. F. Cleland, MD

Cottingham, Kingston upon Hull, United Kingdom

Total (n = 693)	No HF (n = 125)	HF (n = 568)
--------------------	--------------------	-----------------

Table 4. A "Parsimonious" Multivariable Cox

Variables	HR (95% CI)
Age, yrs	1.01 (0.99, 1.03)
NYHA functional class III vs. I/II	1.51 (1.03, 2.21)
SBP, mm Hg	0.99 (0.98, 1.00)
Urea, mmol/l	1.05 (1.03, 1.07)
Hemoglobin, g/dl	0.92 (0.89, 0.95)
Log [NT-proBNP], pg/ml	1.36 (0.88, 2.08)
IVC, mm	1.10 (1.01, 1.20)
LVEF, %	1.00 (0.99, 1.01)
LAVI, ml/m ²	1.00 (0.99, 1.01)
TR gradient, mm Hg	1.02 (1.01, 1.03)

To avoid over-fitting, 8 candidate variables of interest were selected. Abbreviations as in Tables 1, 2, and 3.

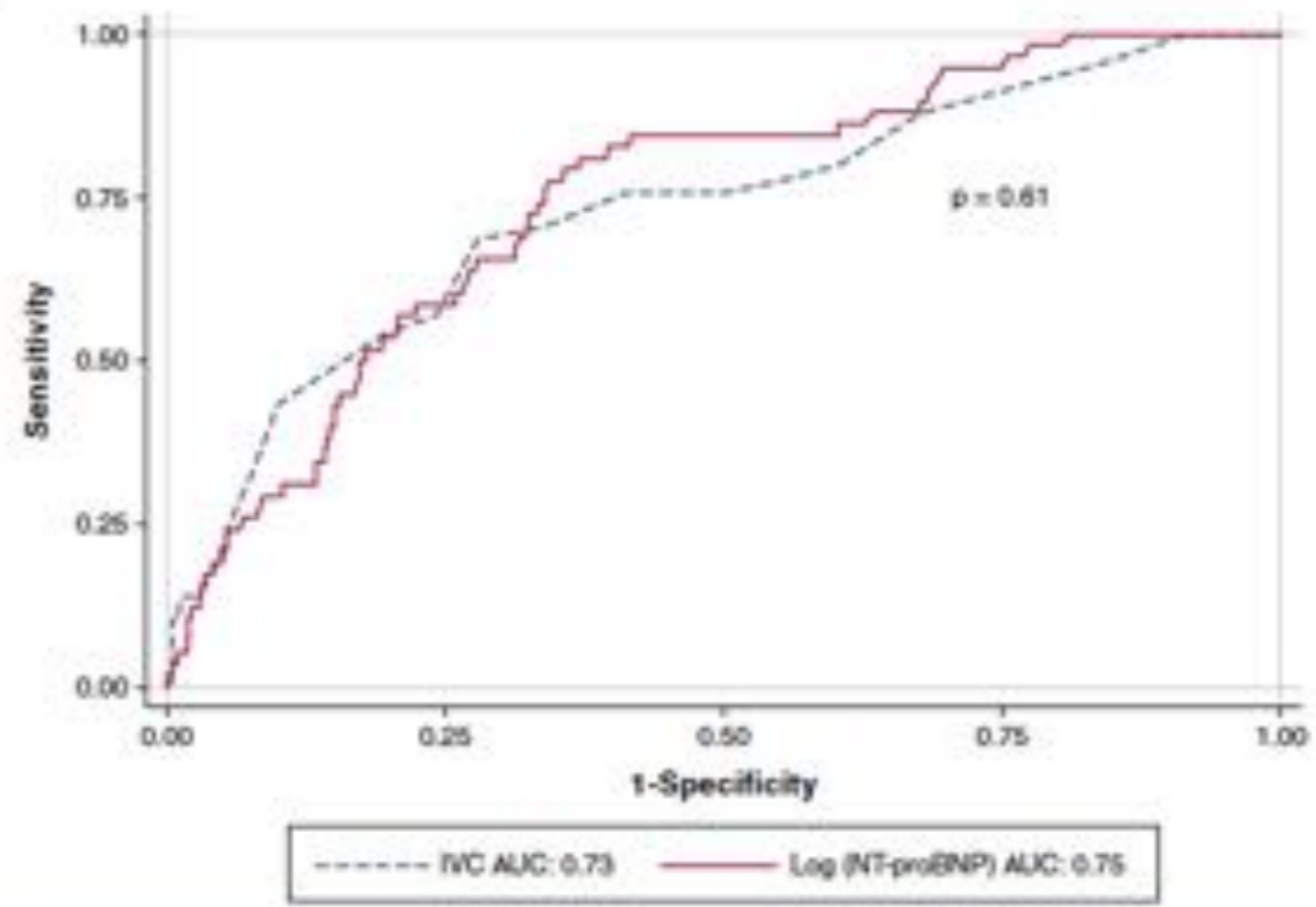


Figure 5. IVC Diameter and Log [NT-proBNP] as Predictors of All-Cause Mortality

Receiver-operating characteristic curves are used to compare log [NT-proBNP] and IVC diameter as predictors of all-cause mortality at 1 year (58 deaths). The AUCs for both variables were similar: IVC diameter (blue line) AUC: 0.73 (95% CI: 0.66 to 0.80); log [NT-proBNP] AUC: 0.75 (95% CI: 0.69 to 0.81) ($p = 0.61$ for the comparison). Abbreviations as in Figures 3 and 4.

Variable	Chi-Square	p Value
Age	0.01	0.57
NYHA functional class III vs. I/II	4.72	0.02
SBP	12.84	<0.01
Urea	12.84	<0.01
Hemoglobin	1.16	0.16
Log [NT-proBNP]	12.84	<0.01
IVC	—	—
LVEF	0.01	0.76
LAVI	0.01	0.03
TR gradient	12.84	<0.01

IVC was excluded.

Prognostic incremental role of right ventricular function in acute decompensation of advanced chronic heart failure

Simone Frea^{1*}, Stefano Pidello¹, Virginia Bovolo¹, Cristina Iacovino¹, Erica Franco², Francesco Pinneri², Alessandro Galluzzo¹, Alessandra Volpe¹, Massimiliano Visconti¹, Andrea Peirone¹, Mara Morello¹, Serena Bergerone¹, and Fiorenzo Gaita¹

Table 2 Multivariate analysis of the primary endpoint (mortality plus urgent transplantation plus urgent left ventricular assist device) at 90 days, cardiovascular death at 90 days, and evolution to cardiogenic shock at 48 h

Variables	Primary endpoint						CV death			Evolution to shock		
	Univariate			Multivariate			OR	(95% CI)	P-value	OR	(95% CI)	P-value
	OR	(95% CI)	P-value	OR	(95% CI)	P-value						
SBP <115 mmHg	7.7	2.7–22.2	<0.001	9.8	2.3–42.9	0.002	–	–	0.07	–	–	0.10*
High ADHERE risk	2.2	1.2–4.0	0.012	–	–	0.30*	–	–	0.12*	–	–	0.16*
Composite congestion score $\geq 14/18$	3.0	1.6–5.6	<0.001	–	–	0.09*	–	–	0.11*	–	–	0.45*
NT-proBNP >8229 pg/mL	2.2	1.2–4.0	0.008	–	–	0.13*	–	–	0.79*	–	–	0.43*
Ejection fraction <20%	2.7	1.5–4.9	0.001	–	–	0.22*	–	–	0.92*	–	–	0.31*
Deceleration time <125 ms	2.4	1.2–4.9	0.018	–	–	0.07*	–	–	0.62*	–	–	0.20*
Severe mitral regurgitation	1.45	0.94–2.26	0.06	–	–	0.10*	–	–	0.33*	–	–	0.14*
eRAP ≥ 20 mmHg	4.3	2.3–7.9	<0.001	3.6	1.8–7.5	<0.001	1.59	1.03–2.54	0.003	1.09	0.94–1.26	0.011
TAPSE ≤ 14 mm	2.2	1.2–3.9	0.008	–	–	0.55	–	–	0.33	–	–	0.50
RVCPI <400 mm ² mmHg	3.7	2.0–6.7	<0.001	2.4	1.2–4.9	0.008	1.06	1.00–1.12	0.006	1.08	1.00–1.16	0.048

CI, confidence interval; CV, cardiovascular; SBP, systolic blood pressure; eRAP, estimated right atrial pressure; OR, odds ratio; RVCPI, right ventricular contraction pressure index = TAPSE \times tricuspid systolic gradient; TAPSE, tricuspid annular plane systolic excursion.

*P-value for variables not in the equation.

Early Right Ventricular Assist Device Use in Patients Undergoing Continuous-Flow Left Ventricular Assist Device Implantation

Incidence and Risk Factors From the Interagency Registry for Mechanically Assisted Circulatory Support *Circ Heart Fail.* 2017;10:

Of 9976 patients undergoing continuous-flow left ventricular assist device surgery in the Interagency Registry for Mechanically Assisted Circulatory Support, ≈4% required a right ventricular assist device within 2 weeks of implantation.

Table 3. Profiles of Risk: Patient Characteristics by Prediction of Risk

	Median	Estimated Probability of RVAD Within 14 d of CF-LVAD			
		<1%	1 to <5%	5 to <10%	≥10%
RAP, mmHg		8	12.3	17	18.6

Table 2. Multivariable Predictive Risk Model for Early Right Ventricular Assist Device

Term	OR	95% CI	P Value
Intercept*	0.04	(0.01–0.16)	<0.0001
Prior CABG/valve surgery	1.70	(1.34–2.14)	<0.0001
INTERMACS profile 1†	2.79	(2.00–3.88)	<0.0001
INTERMACS profile 2†	1.98	(1.49–2.64)	<0.0001
ECMO within 48 h	2.71	(1.82–4.05)	<0.0001
Hemodialysis or UF within 48 h	1.67	(1.08–2.57)	0.02
Creatinine (per 1-mg/dL increase)	1.25	(1.07–1.46)	0.005
BNP (per unit increase)	1.50	(1.02–2.22)	0.04
Total bilirubin (per 1-mg/dL increase)	1.13	(1.04–1.23)	0.003
WBC (per ×10 ³ /dL increase)	1.04	(1.01–1.07)	0.008
RA pressure (per 1-mmHg increase)	1.05	(1.03–1.08)	0.0001
Stroke volume ×100 (per unit increase)	0.89	(0.80–0.99)	0.03
RA pulse pressure (per 1-mmHg increase)	0.96	(0.94–0.98)	0.0002
IVCO (per 1-cm increase)	0.80	(0.67–0.95)	0.01
Tricuspid regurgitation (severe)	1.61	(1.18–2.19)	0.002
Other concomitant procedure	1.47	(1.14–1.88)	0.003
Concomitant TV repair*	1.06	(0.78–1.45)	0.70

who's guilty?



Right ventricular failure in patients with the HeartMate II continuous-flow left ventricular assist device: Incidence, risk factors, and effect on outcomes

Robert L. Kormos, MD,^a Jeffrey J. Teuteberg, MD,^b Francis D. Pagani, MD,^c Stuart D. Russell, MD,^d Ranjit John, MD,^e Leslie W. Miller, MD,^f Todd Massey, MD,^g Carmelo A. Milano, MD,^h Nader Moazami, MD,ⁱ Kartik S. Sundareswaran, PhD,^j and David J. Farrar, PhD,^j for the HeartMate II Clinical Investigators

Patients (n = 484) enrolled in the HeartMate II left ventricular assist device retrospective

inotropes?

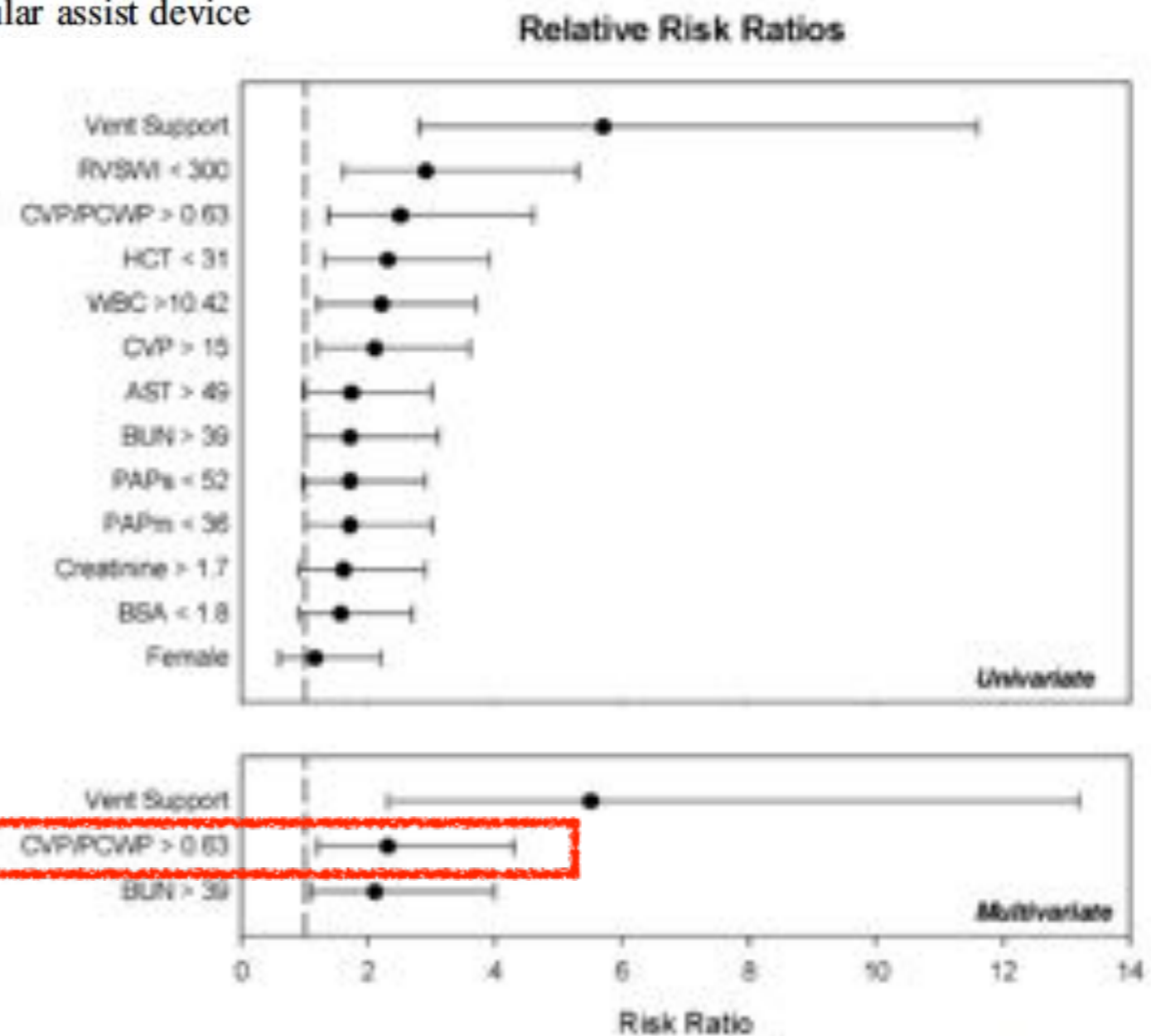


FIGURE 2. Relative risk ratios of univariate and multivariate predictors of RVF during LVAD support.

Pulmonary Artery Pulsatility Index Is Associated With Right Ventricular Failure After Left Ventricular Assist Device Surgery

KEVIN J. MORINE, MD, MICHAEL S. KIERNAN, MD, DUC THINH PHAM, MD, VIKRAM PARUCHURI, MD, DAVID DENOFRIO, MD, AND NAVIN K. KAPUR, MD

Boston, Massachusetts

Methods and Results: We retrospectively reviewed 132 consecutive CF-LVAD implantations at Tufts Medical

(*J Cardiac Fail* 2016;22:110–116)

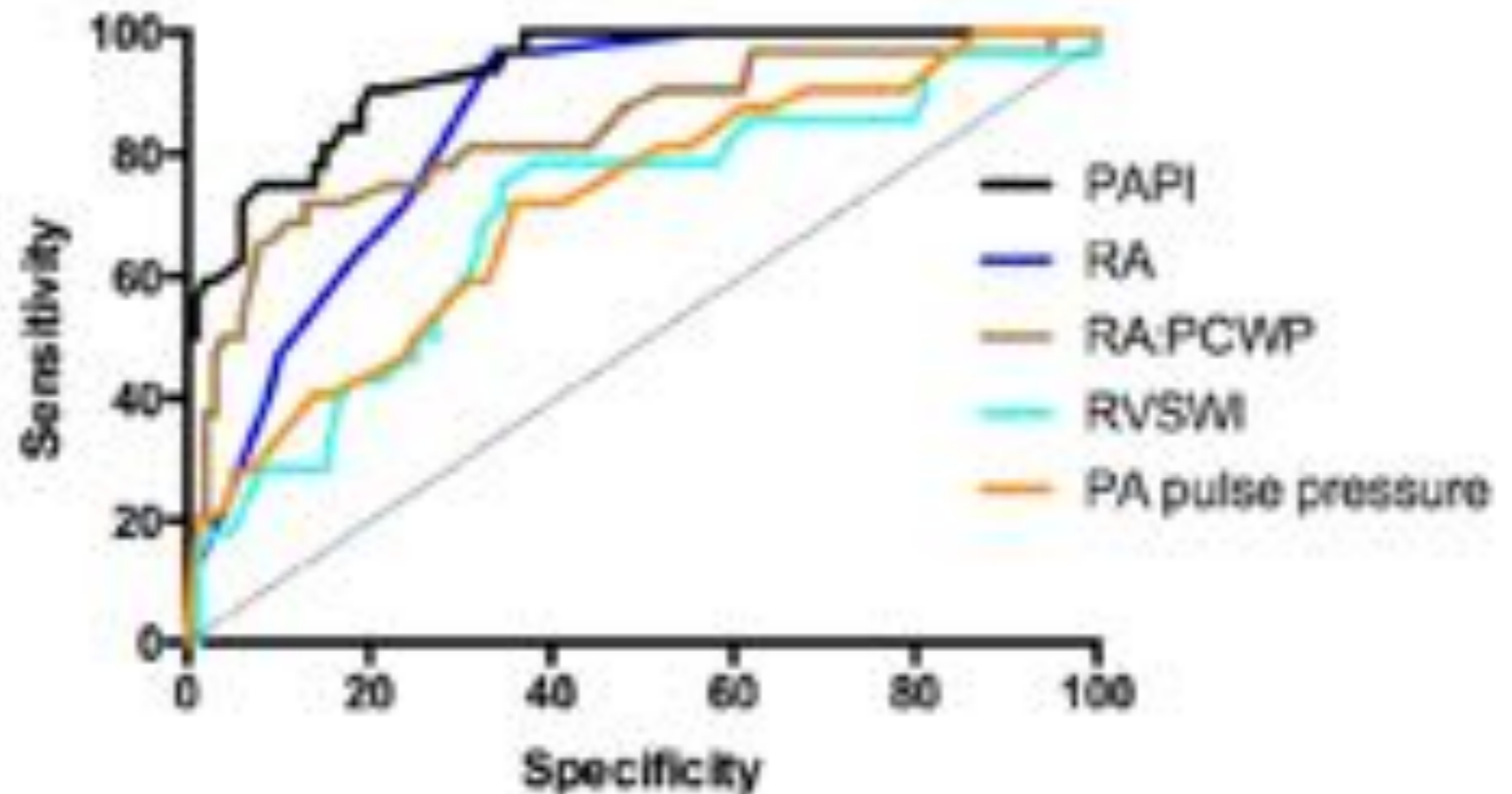
$$PAPi = \frac{(PA_{systolic} - PA_{diastolic})}{RA}$$

retrospective, single-center

Table 3 Effect of Inotropes At Time of Ventricular Assist Device Use^a

Measurement	Inotropes during RHC
PAPi	No (n = 43)
	Yes (n = 40)
RA pressure	No
	Yes
CVP/PCWP	No
	Yes

CI, confidence interval; CVP, central venous pressure; RA, right atrial; RHC, right heart catheterization.
^aMultivariate analysis was adjusted for age, body mass index, and preoperative renal function.
^bORs calculated per 1-unit change, except as noted.



- **la valutazione della pressione atriale destra è un parametro cardine nella valutazione del paziente con scompenso in ogni stadio e fase di malattia**
- **la valutazione della funzione ventricolare destra va integrata con il quadro clinico e le condizioni emodinamiche del paziente**
- **nei pazienti candidabili ad assistenza meccanica sinistra occorre distinguere fra la disfunzione VD intrinseca e la disfunzione VD secondaria (parzialmente correggibile con LVAD)**

grazie

frea.simone@gmail.com

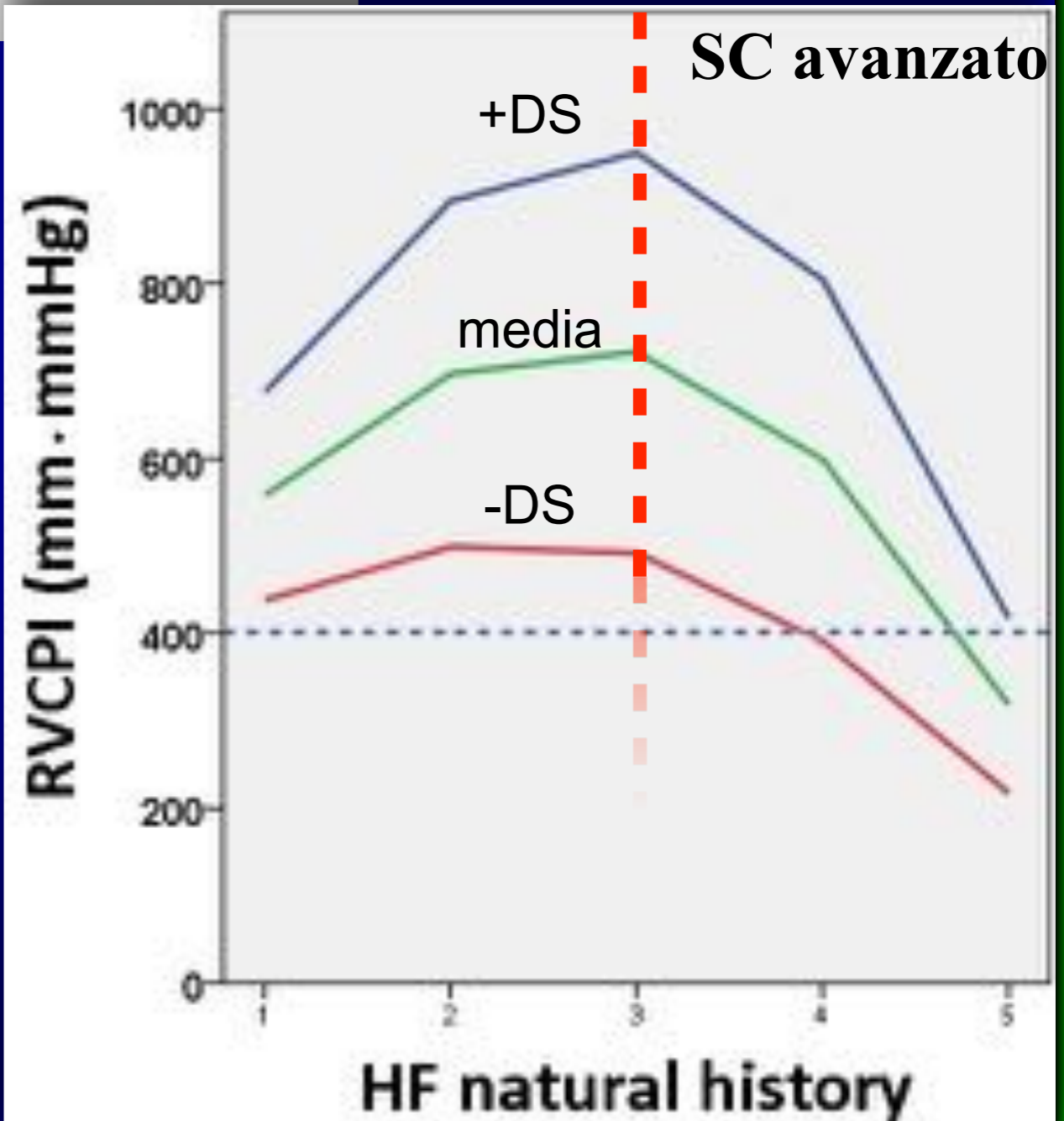
Clinical Trials

Echocardiographic Evaluation of Right Ventricular Stroke Work Index in Advanced Heart Failure: A New Index?

SIMONE FREA, MD, VIRGINIA BOVOLO, MD, SERENA BERGERONE, MD, FABRIZIO D'ASCENZO, MD,
MARINA ANTOLINI, MD, MICHELE CAPRIOLO, MD, FEDERICO GIOVANNI CANAVOSIO, MD,
MARA MORELLO, MD, AND FIORENZO GAITA, MD

**evoluzione del VD nello SC:
30 pz con follow up eco
completo**

maneggiare con cura





da

