



ECOCARDIOCHIRURGIA®
ECO-RM-TC CHIRURGIA-INTERVENTISTICA

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ECOCARDIOCHIRURGIA 2016

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L'ECOGRAFIA DEL POLMONE E VENA CAVA NEL PAZIENTE CON SCOMPENSO CARDIACO

Massimiliano Etteri

massimiliano.etteri@asst-lariana.it

MEDICINA D'URGENZA E PRONTO SOCCORSO – DEA
AZIENDA OSPEDALIERA SANT'ANNA -COMO

SCOMPENSO CARDIACO MEDICO URGENZA E CARDIOLOGO



TROVIAMO UNA STRADA MIGLIORE ...



NEW APPROACH: ULTRASOUND CHALLENGE



SCOMPENSO CARDIACO

Definizione

Nuova insorgenza o peggioramento di sintomi/segni secondari ad una alterazione anatomica o funzionale cardiaca che portano ad ospedalizzazione o visita medica non programmata

Felker. Am Heart J 2003

Lo scompenso cardiaco **Acuto** o **Cronico** si differenzia a seconda della velocità con cui si sviluppa la sindrome

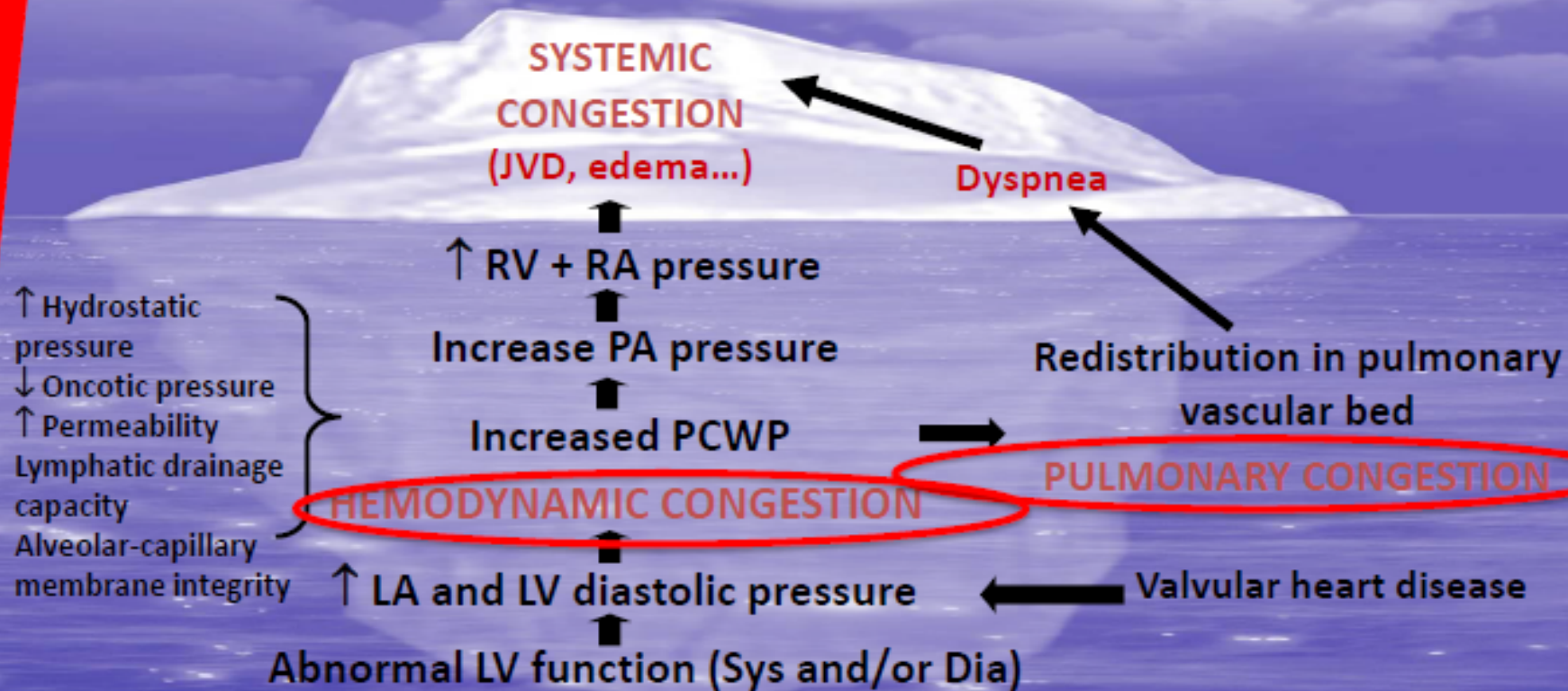
Heart Disease. Braunwald.

Lo scompenso cardiaco si differenzia in **Sistolico** (LVEF < 40%) e/o **Diastolico** (LVEF > 40%)

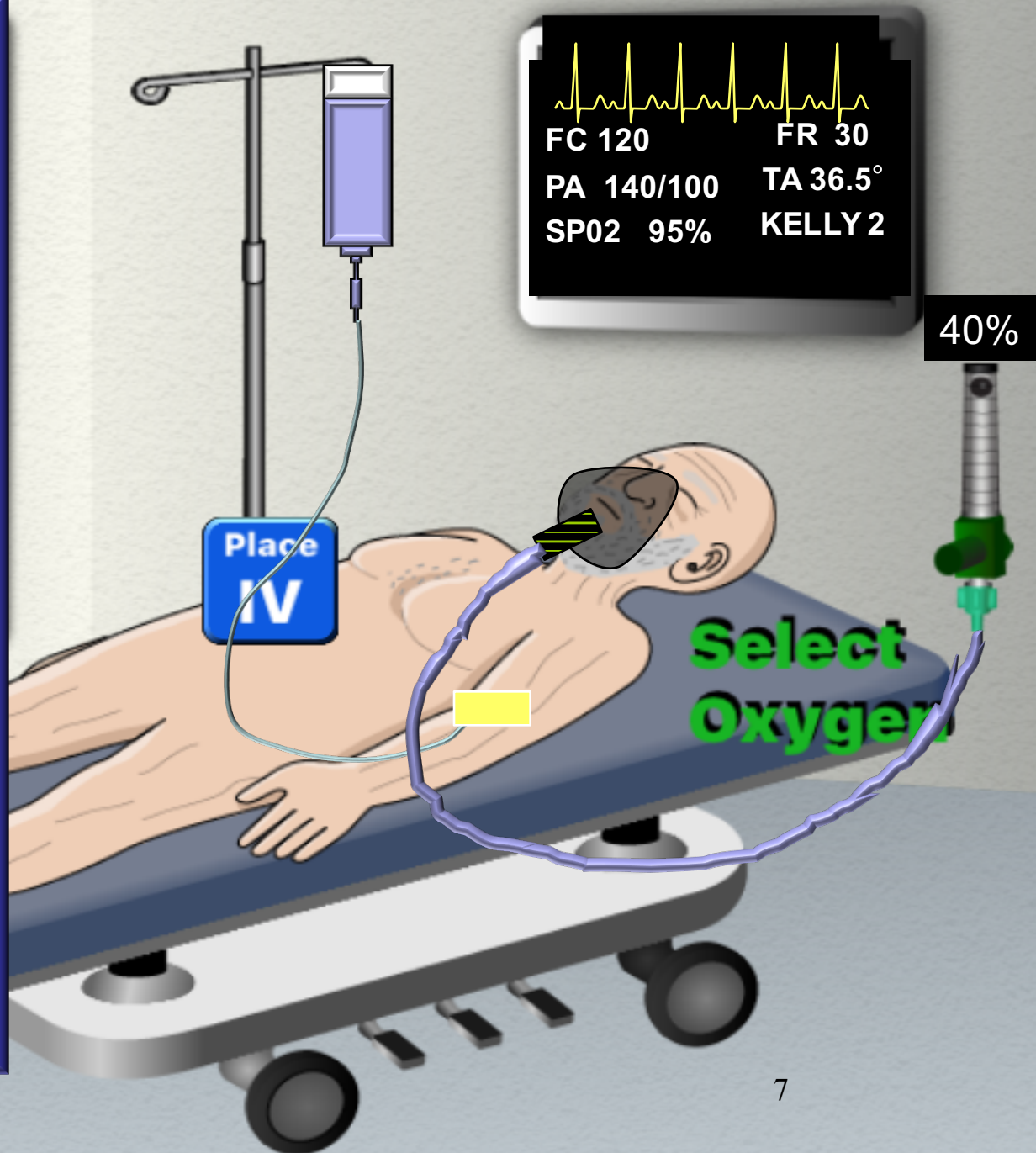
Yancy CW. 2013 ACCF/AHA guidelines. Circulation 2013;128(16):1810

ICEBERG FISIOPATOLOGICO

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- UOMO 65 ANNI, BPCO
- GIUNGE PER DISPNEA PROGRESSIVA DALLA NOTTE
- E.O
- DISTRESS RESPIRATORIO
- RANTOLI E RONCHI
- RX TOR: NON DIR
- ECG: NON DIR
- EE: CONFONDENTI



CLINICA DELLA DISPNEA ACUTA

	BPCO a.	EPA
TACHIPNEA	+	+
SUDORAZIONE	+	+
AGITAZIONE	+	+
RANTOLI POLMONARI	+	+
EDEMI	+	+
CIANOSI	+	+
DISTRESS RESPIRATORIO	+	+

Sensibilità e Specificità di Ascoltazione, Rx torace ed Ecografia Polmonare per la diagnosi di ARDS.

Lichtenstein D, et al. Anesthesiology. 2004 Jan;100(1):9-15.

	Ascol- tazione %	Rx torace %	Ecografia Polmonare %
VERSAMENTO PLEURICO			
Sensibilità	42	39	92
Specificità	90	85	93
Accuratezza diagnostica	61	47	93
Consolidamento alveolare			
Sensibilità	8	68	93
Specificità	100	95	100
Accuratezza diagnostica	36	75	97
Sindrome interstizio-alveolare			
Sensibilità	34	60	98
Specificità	90	100	88
Accuratezza diagnostica	55	72	95

GUARDARE DENTRO AL PAZIENTE

Volume periferico
**INTRA
VASCOLARE**

**POMPA
CARDIACA**

Volume centrale
**EXTRA
VASCOLARE**



SCOMPENSO CARDIACO SEC. CARDIOLOGO

Volume periferico
**INTRA
VASCOLARE**

**POMPA
CARDIACA**

Volume centrale
**EXTRA
VASCOLARE**



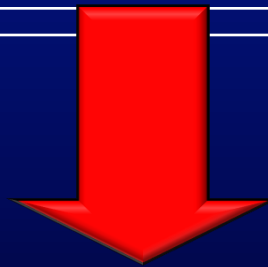
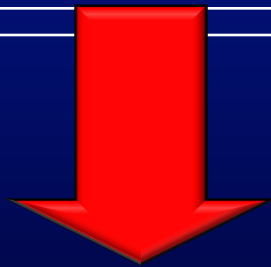
**ECOCARDIOGRAFIA
"Ambulatoriale"**

SCOMPENSO CARDIACO SEC.INTENSIVISTA

Volume periferico
**INTRA
VASCOLARE**

**POMPA
CARDIACA**

Volume centrale
**EXTRA
VASCOLARE**



CVC

**SWAN-GANZ CAT.
PiCCO**

PiCCO

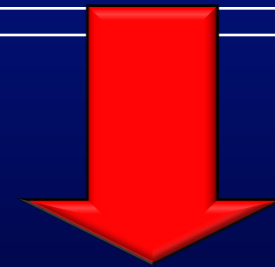
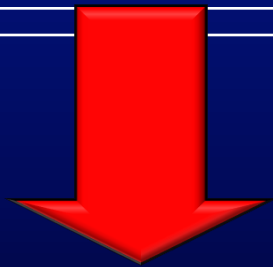
**VALUTAZIONE
CARDIOLOGICA**

SCOMPENSO CARDIACO SEC.MEDICO D'URGENZA

Volume periferico
**INTRA
VASCOLARE**

**POMPA
CARDIACA**

Volume centrale
**EXTRA
VASCOLARE**



ECOGRAFIA VCI

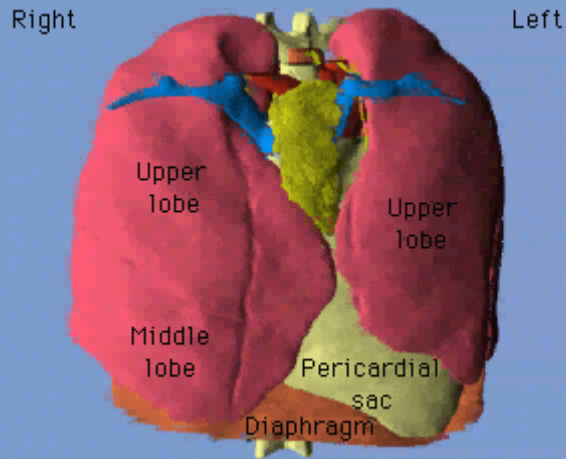
**ECOCARDIOGRAFIA
mirata**

ECOGRAFIA POLMONE

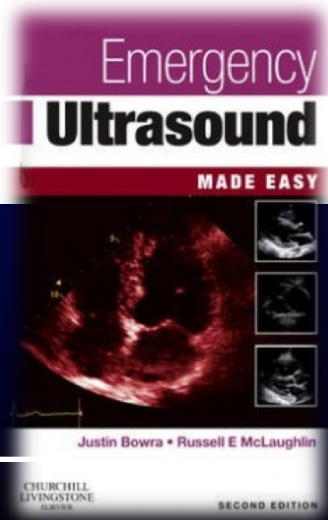
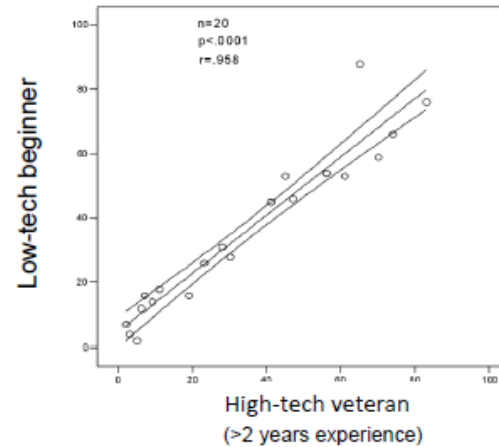
**VALUTAZIONE
CARDIOLOGICA**

LUNG E IVC ULTRASOUND

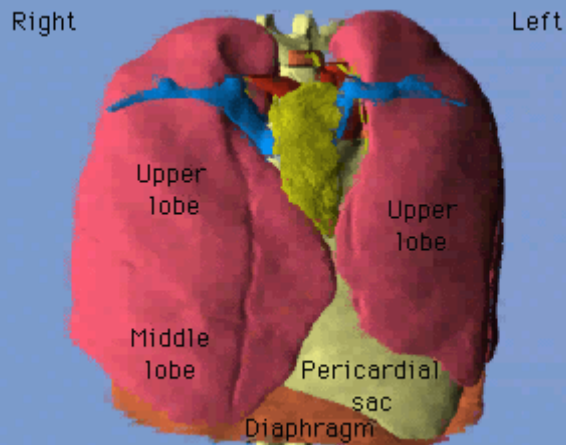
Metodica intuitiva e di veloce apprendimento



(<1 hour experience)



LUNG E IVC ULTRASOUND NELLO SCOMPENSO CARDIACO

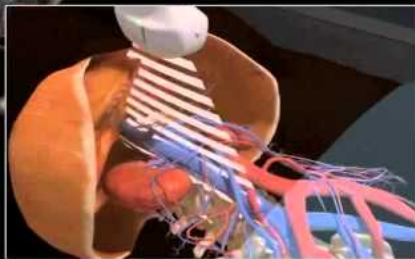


DIAGNOSI

MONITORAGGIO

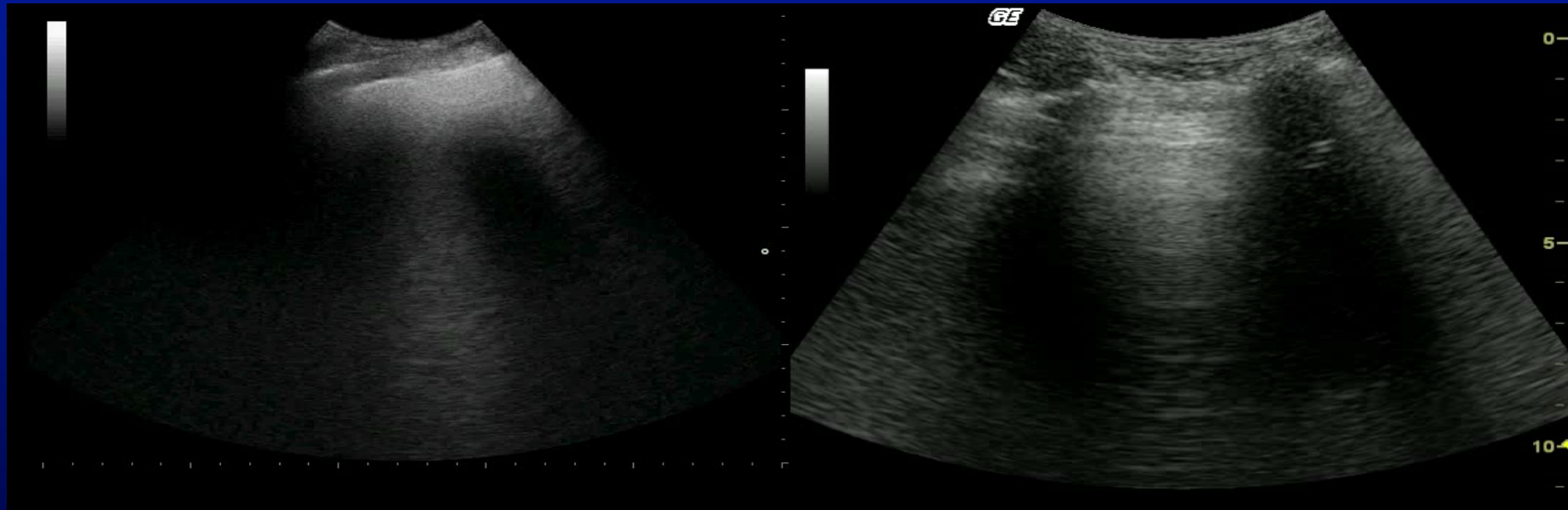


PROGNOSI



VOLUME CENTRALE EXTRA-VASCOLARE

Comparsa di linee B polmonari =
sdr interstiziale (“wet lung” o polmone umido)



Polmone B

Polmone A

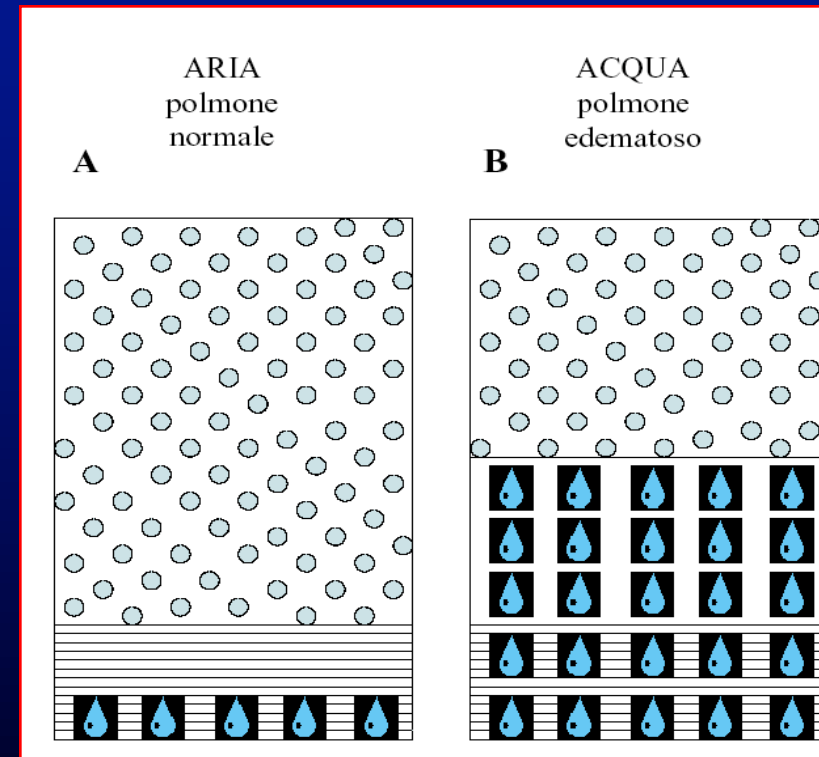
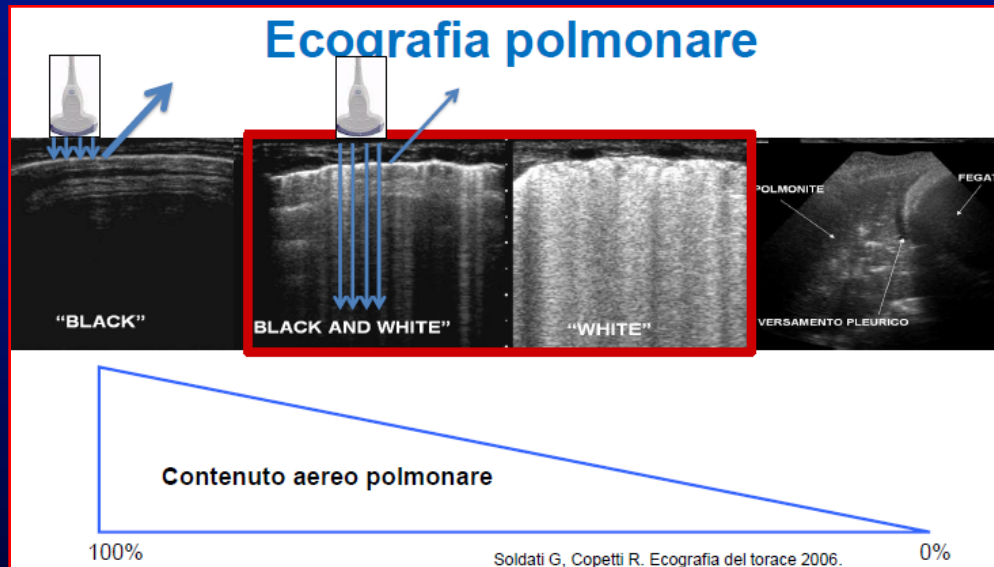
D.Lichtenstein. Lung ultrasound in the critically ill. Ann Int Care 2014

G.Volpicelli . Lung sonography. J Ultrasound Med 2013; 32:165–171

Soldati G et al, Chest sonography for extravascular lung water. Am J Cardiol 2005, 96:322-23

VALORE DIAGNOSTICO

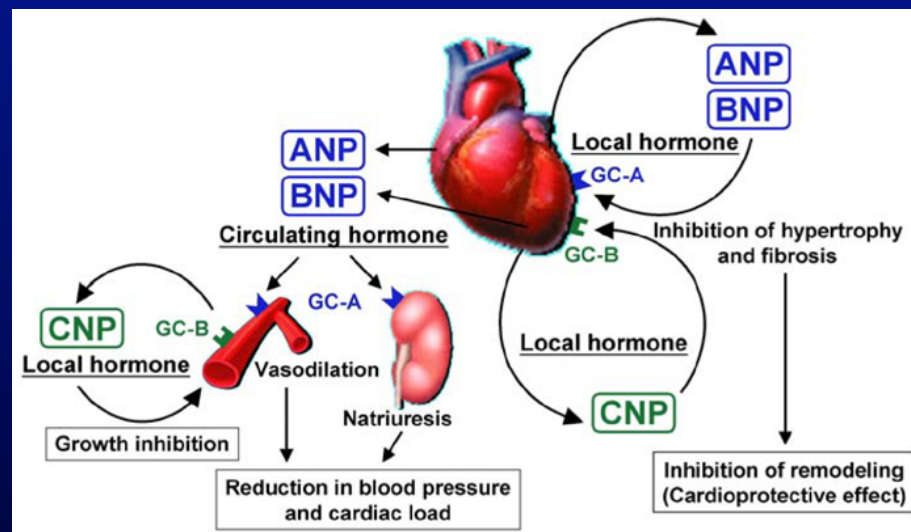
Le linee B sono il segno ecografico dell'acqua extravascolare centrale (EVLW) nel polmone umido (EPA)



VALORE DIAGNOSTICO

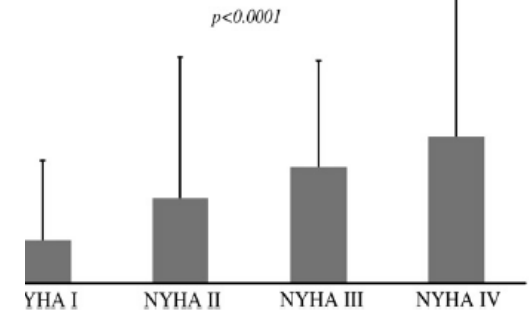
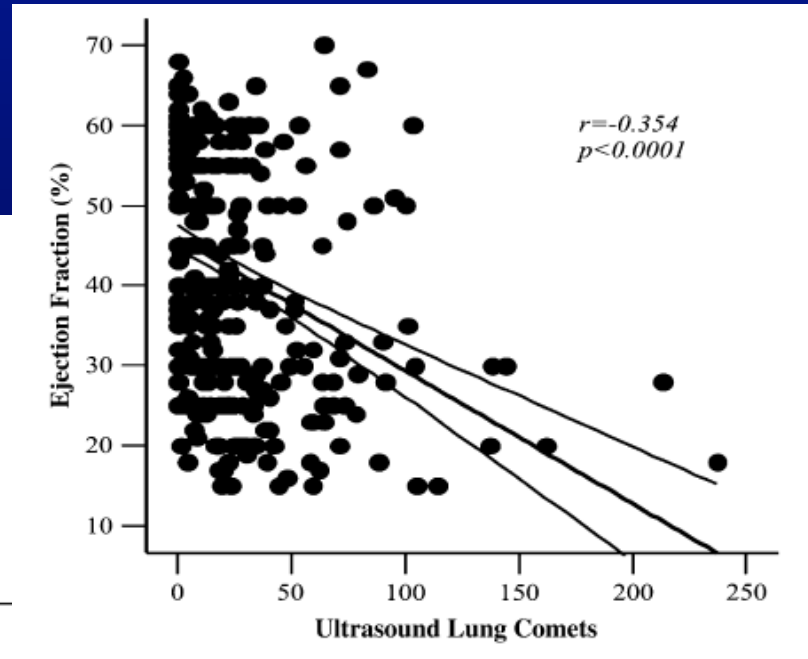
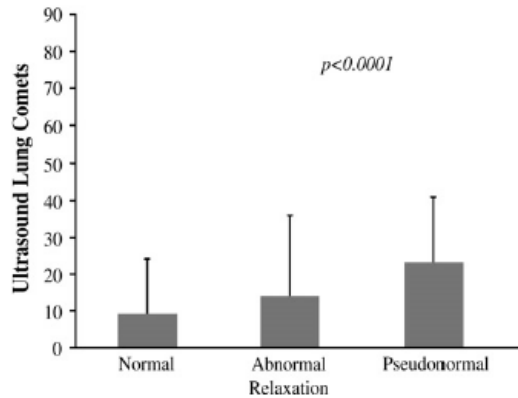
Le linee B correlano con BNP nella dispnea cardiogena

Vantaggio Diagnostico B +: VPN ++ VPP +



VALORE DIAGNOSTICO

Le linee B correlano con il grado di disfunzione VS
sistolica / diastolica



MONITORAGGIO

Le linee **B** scompaiono dopo terapia dell' EPA con la risoluzione del quadro clinico



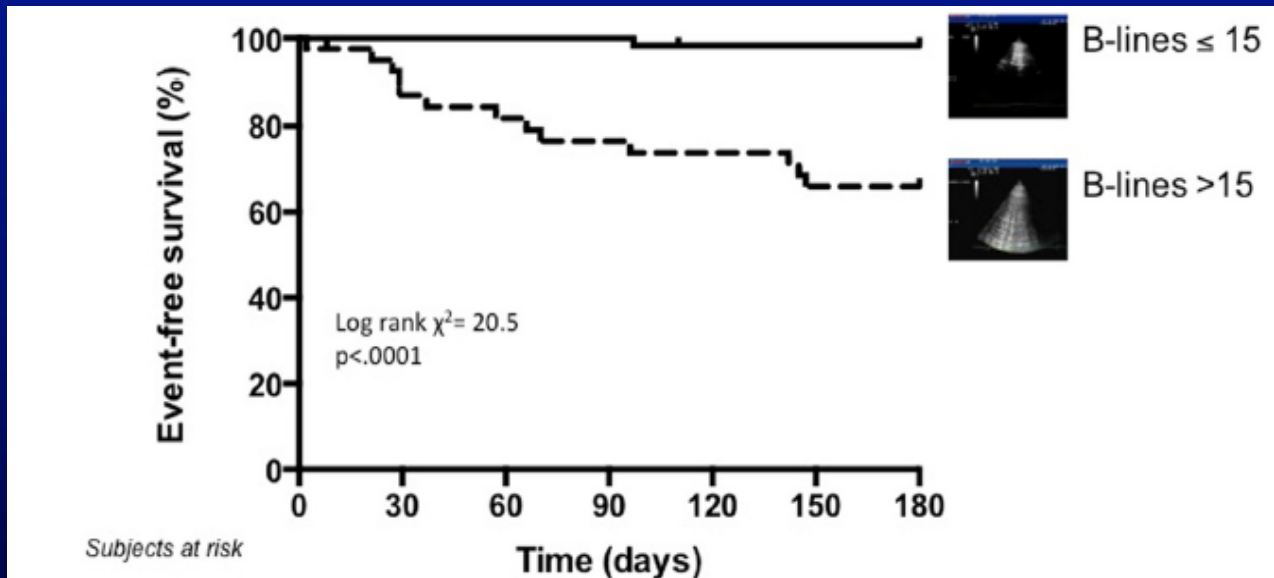
Thoracic area	Phase 1 ^a	Phase 2 ^a	<i>P</i> (<i>W</i>)
Anterior superior right	51 (73%)	3 (4.3%)	<.001
Anterior medium right	54 (77%)	2 (2.9%)	<.001
Anterior basal right	65 (93%)	4 (5.7%)	<.001
Lateral superior right	64 (91%)	5 (7.1%)	<.001
Lateral medium right	67 (96%)	10 (14%)	<.001
Lateral basal right	68 (97%)	21 (30%)	<.001
Anterior superior left	52 (74%)	6 (8.6%)	<.001
Anterior medium left	58 (83%)	6 (8.6%)	<.001
Lateral superior left	63 (90%)	6 (8.6%)	<.001
Lateral medium left	70 (100%)	11 (16%)	<.001
Lateral basal left	70 (100%)	20 (29%)	<.001



VALORE PROGNOSTICO

KEY MESSAGE

Pattern B+ predice prognosi peggiore



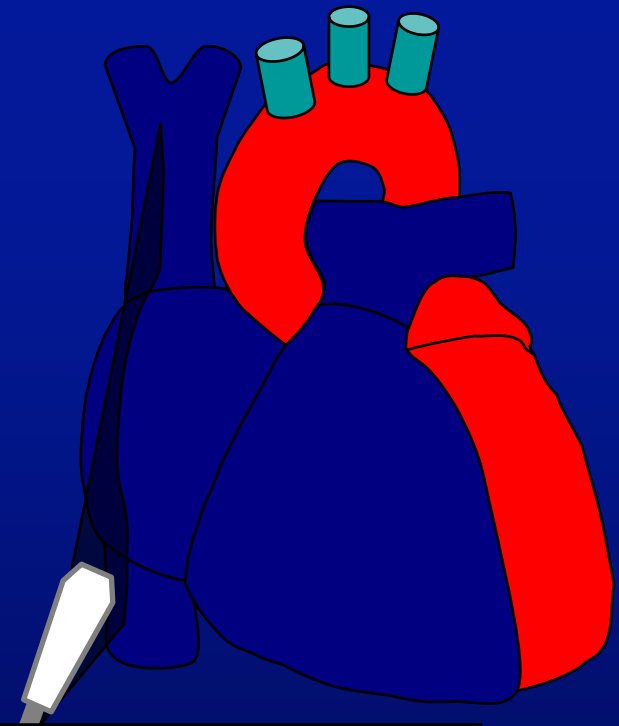
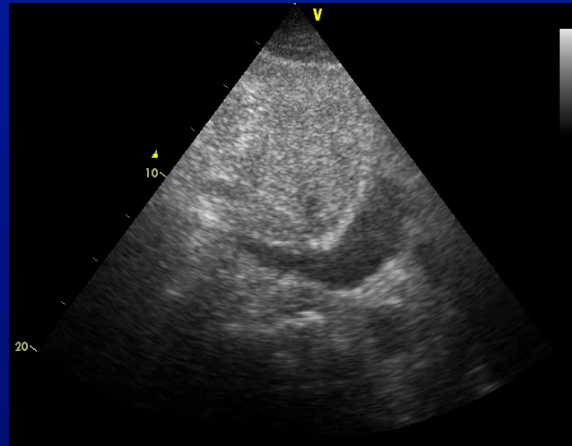
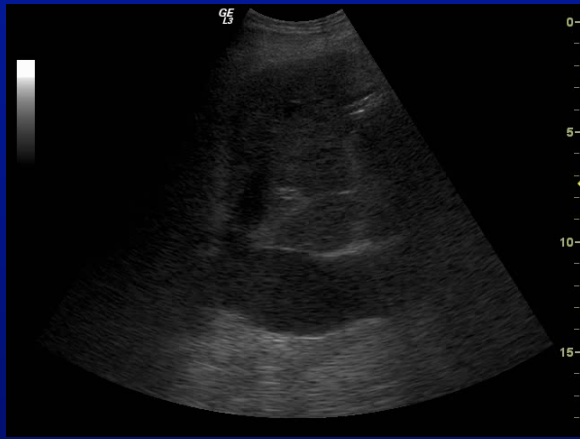
Gargani L, et al. Persistent pulmonary congestion before discharge predicts rehospitalization in heart failure: a lung ultrasound study. Cardiovascular Ultrasound (2015) 13:40

Gargani L et al. ESC Congress .2010

LUNG ULTRASOUND

	DIAGNOSTICO	MONITORAGGIO	PROGNOSTICO
ECOGRAFIA POLMONARE			

ECOGRAFIA VENA CAVA



*Riduzione inspiratoria
misura AP*

PVC (mmHg)

collasso

0-5

> 50%

5-10

33-50%

10-15

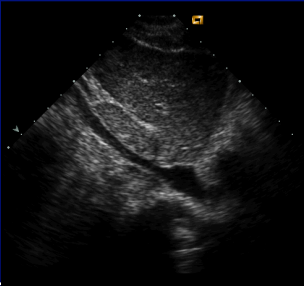
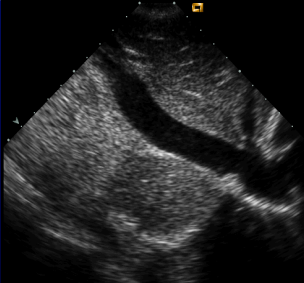
0-33%

15-20

assente

> 20

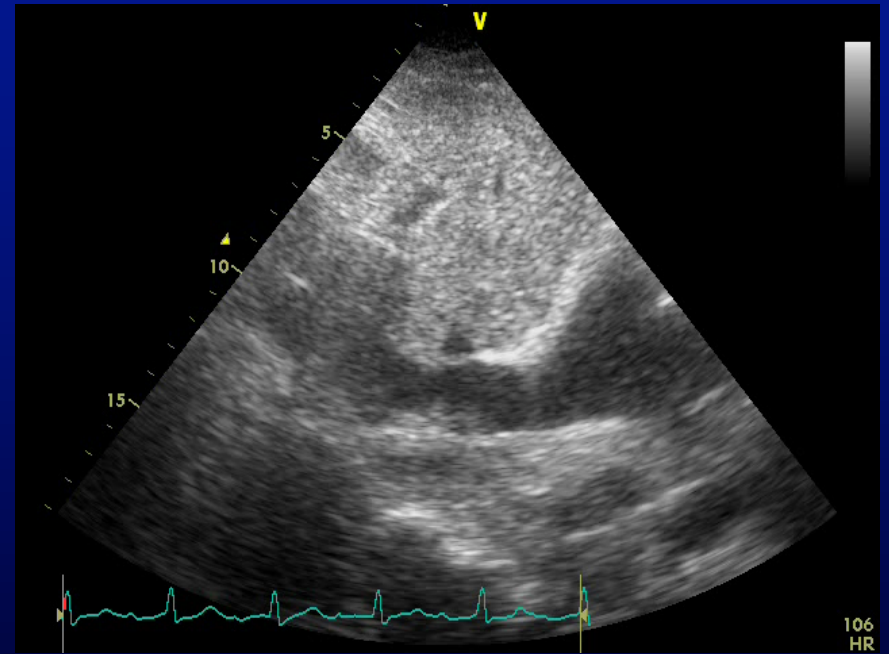
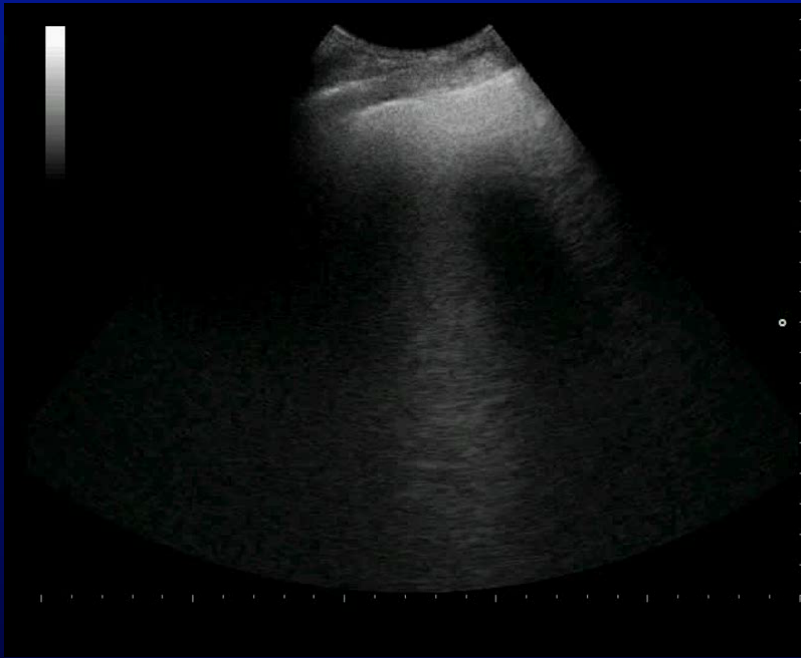
STATO VOLEMICO

PROBLEMA DIVOLUME			ECOGRAFIA VENA CAVA INFERIORE
Intravascolare periferico	↓		VCI Vuota IC Alto
Intravascolare periferico	↑		VCI Piena IC Basso

$$IC\ VCI = D_{max} - D_{min} / D_{max}$$

VALORE DIAGNOSTICO

Δ VCI ridotta puo' essere indicativa per scompenso cardiaco.



Virginia Hebl et al. Correlation of natriuretic peptides and inferior vena cava size in patients with congestive heart failure. *Vascular Health and Risk Management*. 2012;8:213–218

Blehar DJ, et al. Identification of congestive heart failure via respiratory variations of inferior vena cava diameter. *Am J Emergency Med* 2009;27:71–5.

INSUFFICIENZA CARDIACA ACUTA

IOPERFUSIONE

CONGESTIONE

ECO VCI

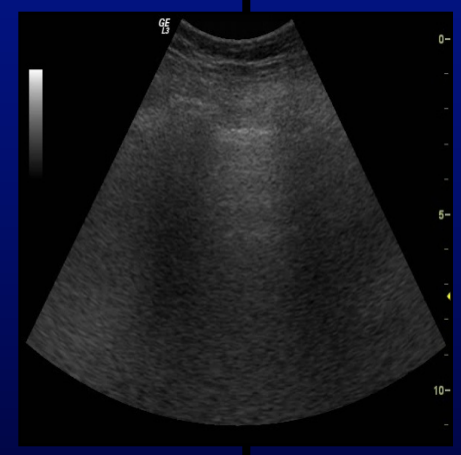
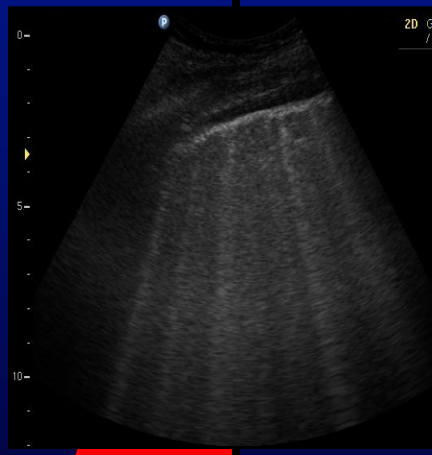
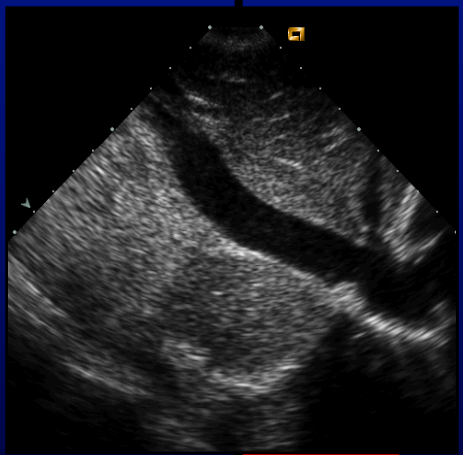
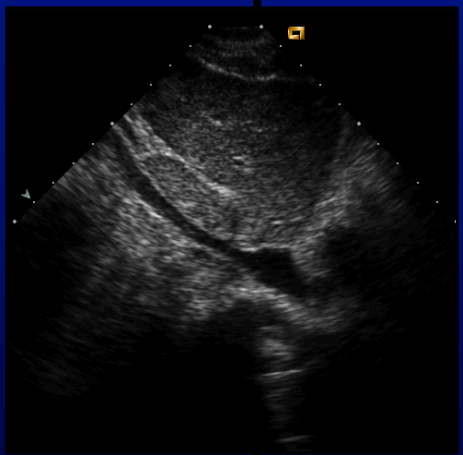
ECO pulm

VCI vuota

VCI non vuota

Polmone bagnato

Polmone asciutto



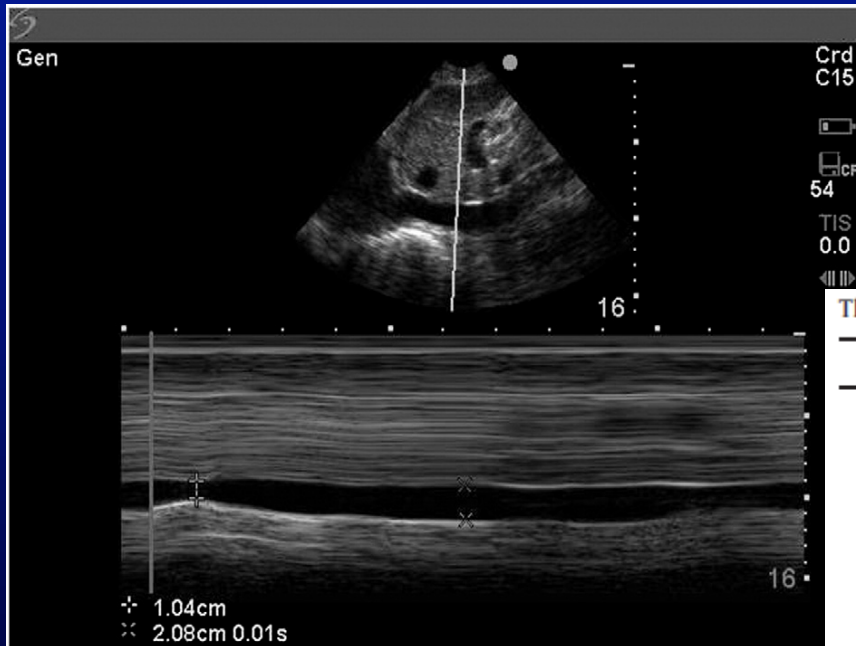
**IOPERFUSIONE
NON CARDIOGENA**

**NO
DISFUNZIONE VS**

**ECOCARDIO
ISPETTIVO**

MONITORAGGIO

IC VCI utile nel monitoraggio del paziente



The IVC parameters of the control and patient groups before and after treatment

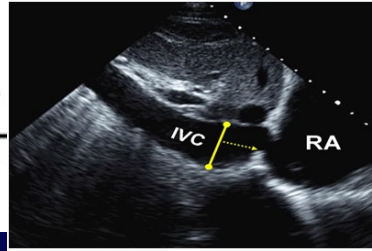
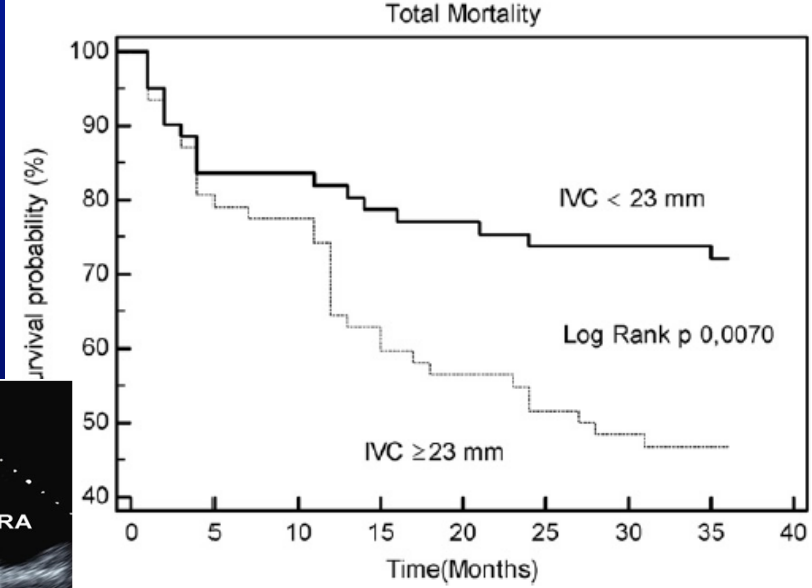
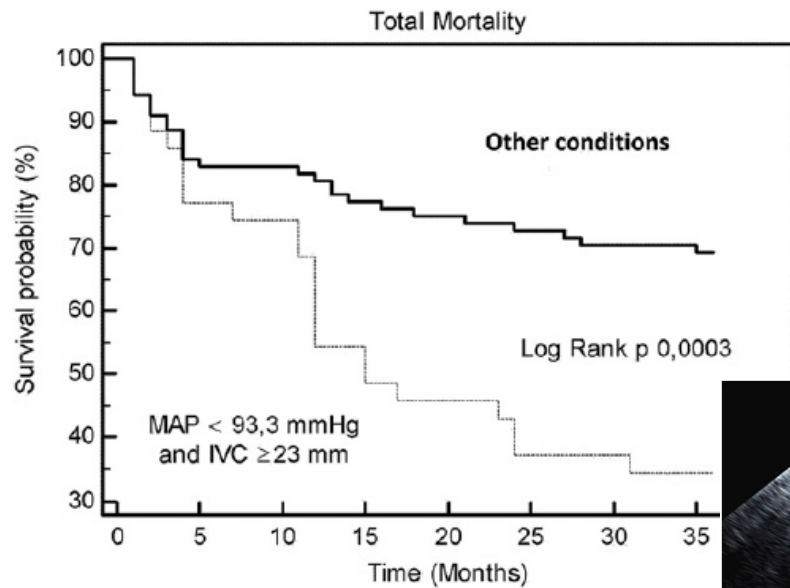
	IVCexp	IVCins	IVC-CI
Before treatment	2.10 ± 0.37	1.63 ± 0.40	22.80 ± 10.97
Control group	1.57 ± 0.24	0.90 ± 0.26	43.09 ± 13.63
<i>P</i>	<.001	<.001	<.001
Before treatment	2.10 ± 0.37	1.63 ± 0.40	22.80 ± 10.97
After treatment	1.85 ± 0.41	1.14 ± 0.42	39.75 ± 14.48
<i>P</i>	<.001	<.001	<.001
After treatment	1.85 ± 0.41	1.14 ± 0.42	39.75 ± 14.48
Control group	1.57 ± 0.24	0.90 ± 0.26	43.09 ± 13.63
<i>P</i>	<.001	<.001	.246

Yavasi O. et al. Monitoring the response to treatment of acute heart failure patients by ultrasonographic inferior vena cava collapsibility index. American Journal of Emergency Medicine 32 (2014) 403–407

VALORE PROGNOSTICO

KEY MESSAGE

IC VCI / D IVC correla con prognosi peggiore



Torres D et al. Bed-side inferior vena cava diameter and mean arterial pressure predict long-term mortality in hospitalized patients with heart failure: 36 months of follow-up. *European Journal of Internal Medicine* 28 (2016) 80–84

Goonewardena SN, et al. Comparison of hand-carried ultrasound assessment of the inferior vena cava and n-terminal pro-brain natriuretic peptide for predicting readmission after hospitalization for acute Clin Esp. 2016 Jan.

H.Fu-Lee et al. prognostic significance of dilated inferior vena cava in advanced decompensated heart failure. *Int J Cardiovascular Imaging*. 2014(30).1289-1295

Carbone F et al. Inferior vena cava parameters predict re-admission in ischaemic heart failure. *Eur J Clin Invest* 2014; 44 (4): 341–349

IVC ULTRASOUND

	DIAGNOSTICO	MONITORAGGIO	PROGNOSTICO
ECOGRAFIA VENA CAVA			

EMERGENCY

TAKE HOME MESSAGE

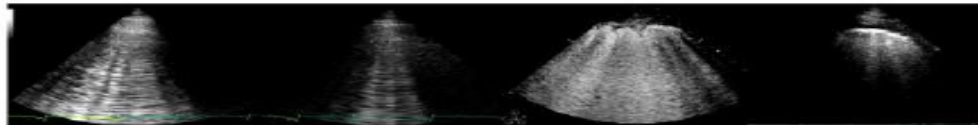
EMERGENCY ULTRASOUND

BACK TO BASIC

REVIEW

Open Access

Lung ultrasound: a new tool for the cardiologist



Cardiology
Department



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ECO-RM-TC CHIRURGIA-INTERVENTISTICA

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