Fisiología y monitoreo hemodinámico I

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Universidad de Buenos Aires.
Cátedra de Anestesiología y algiología
UCICOOP

Como definimos el estado de shock?

Intensive Care Med (2014) 40:1795–1815
DOI 10.1007/s00134-014-3525-z

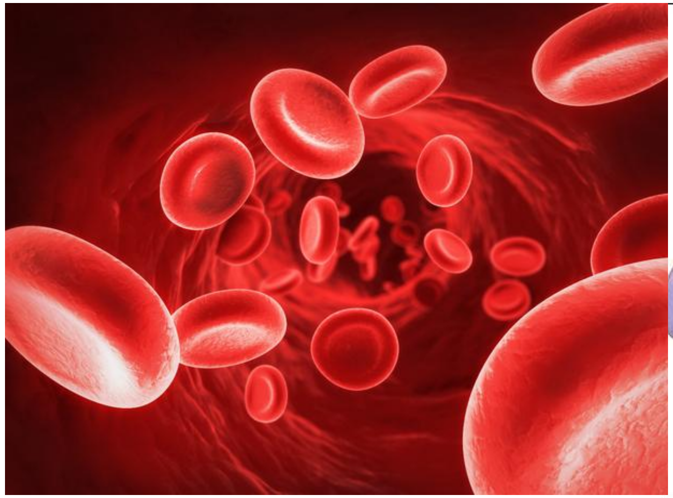
CONFERENCE REPORTS AND EXPERT PANEL

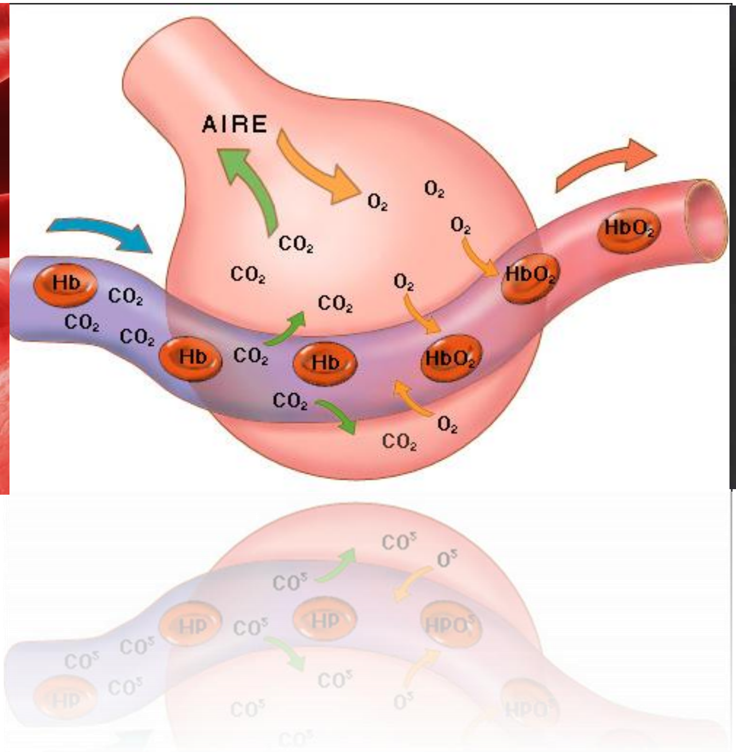
Maurizio Cecconi
Daniel De Backer
Massimo Antonelli
Richard Beale
Jan Bakker
Christoph Hofer
Roman Jaeschke
Alexandre Mebazaa
Michael R. Pinsky
Jean Louis Teboul
Jean Louis Vincent
Andrew Rhodes

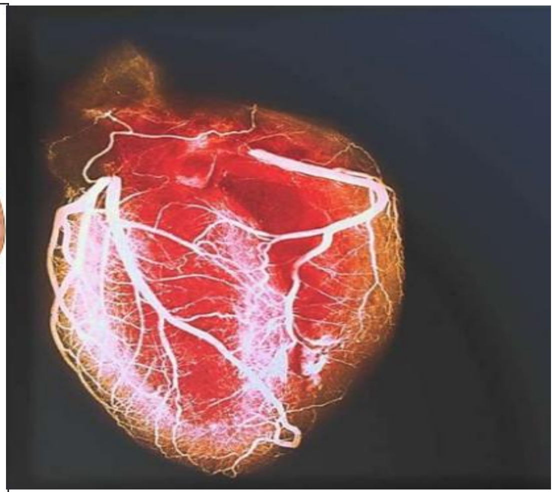
Consensus on circulatory shock and hemodynamic monitoring. Task force of the European Society of Intensive Care Medicine

Shock is best defined as a life-threatening, generalized form of acute circulatory failure associated with inadequate oxygen utilization by the cells. It is a state in which the circulation is unable to deliver sufficient oxygen to meet the demands of the tissues, resulting in cellular dysfunction. The result is cellular dysoxia, i.e. the loss of the physiological independence between oxygen delivery and oxygen consumption, associated with increased lactate levels. Some clinical symptoms suggest an impaired microcirculation, including mottled skin, acrocyanosis, slow capillary refill time and an increased central-to-toe temperature gradient.

Disponibilidad de Oxígeno



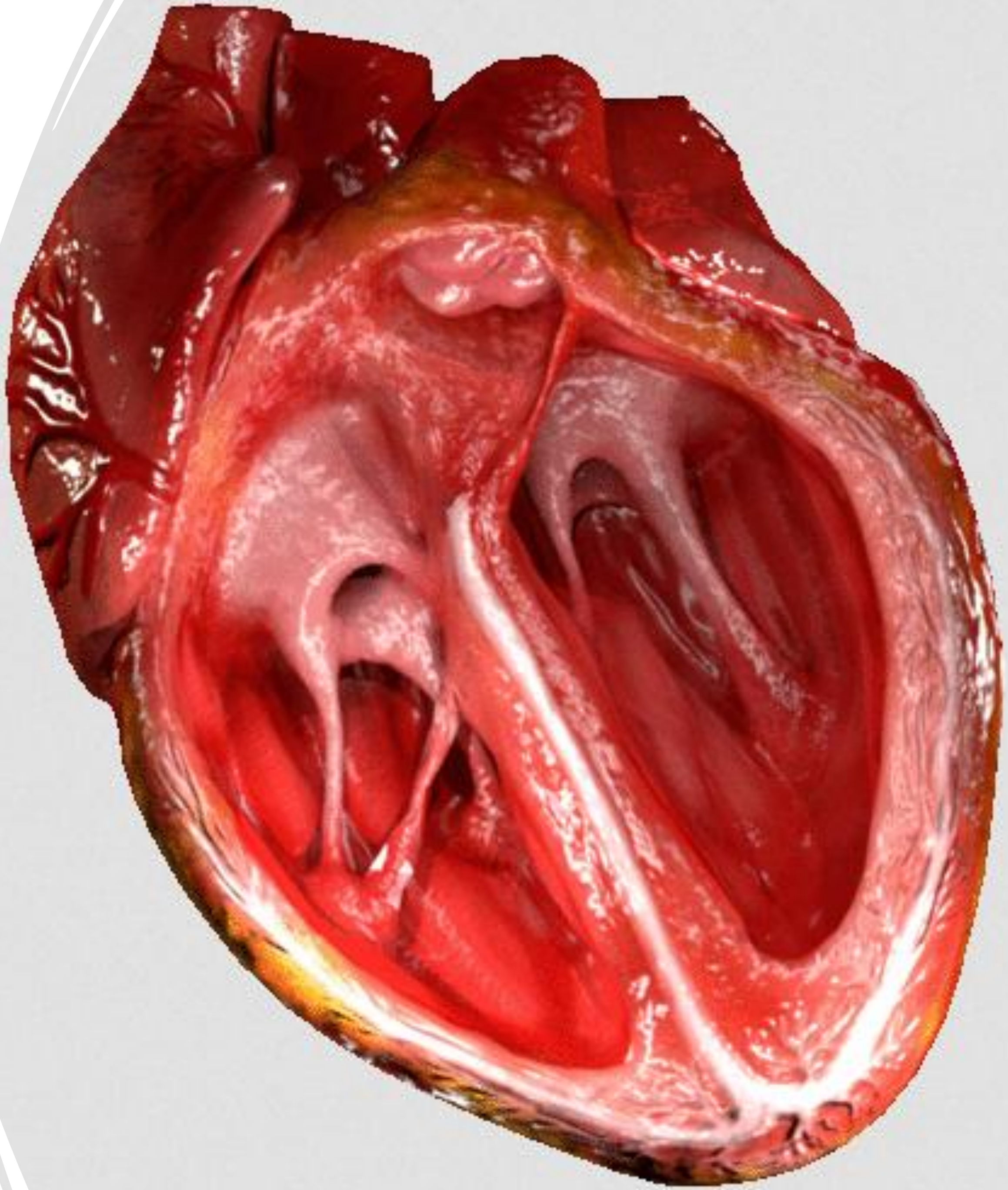




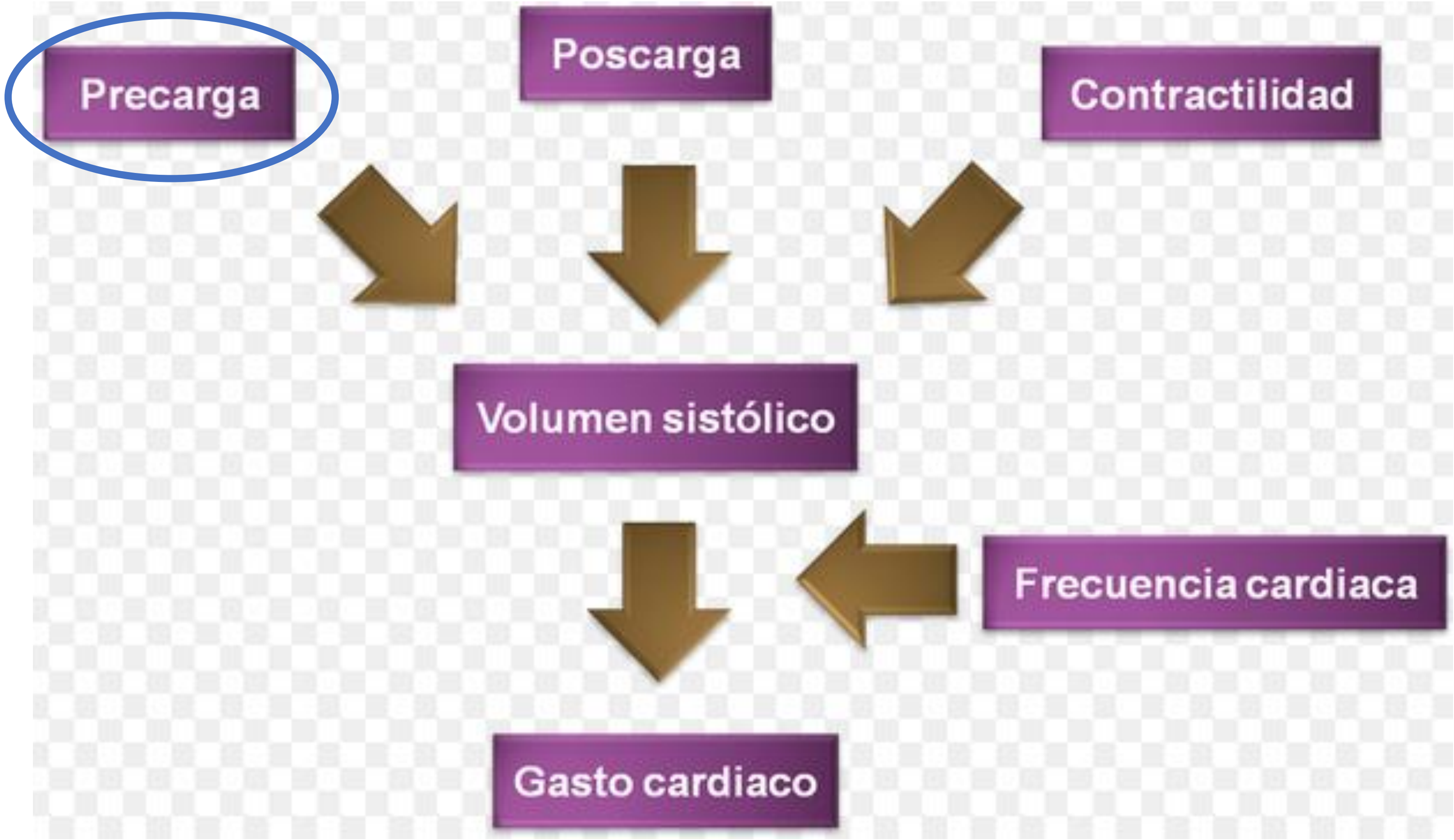
$$DO2 = [1.39 \times Hb \times SaO_2 + (0.003 \times PaO_2)] \times Q$$

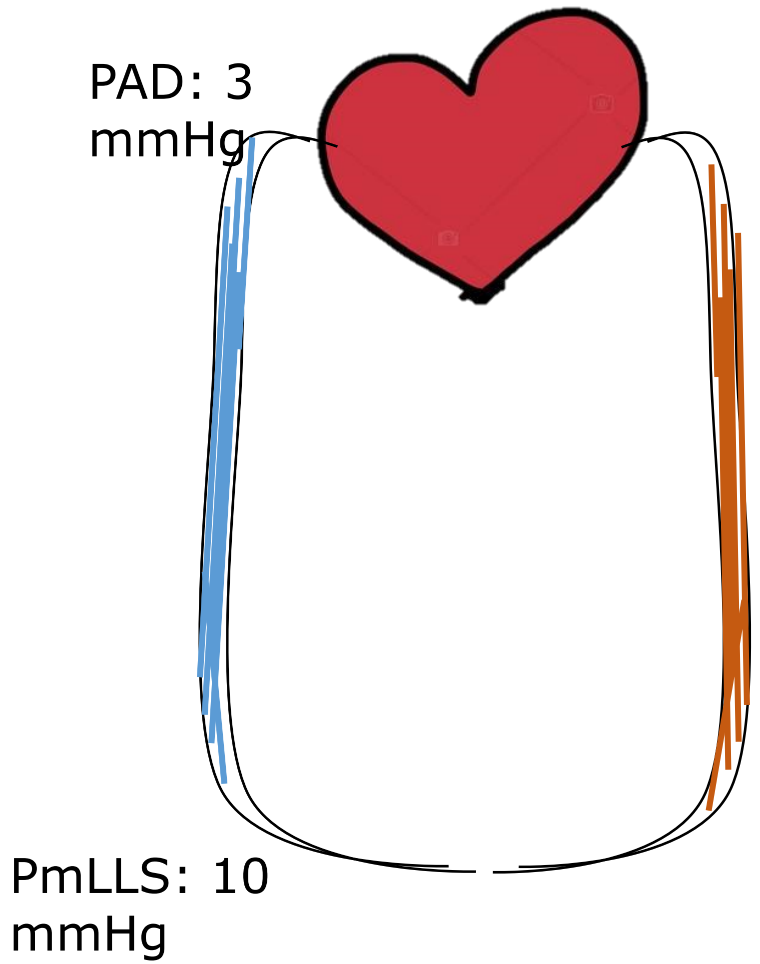
- Un aumento de la SPO2 de 85 a 100 % solo aumenta la DO2 un 18 %

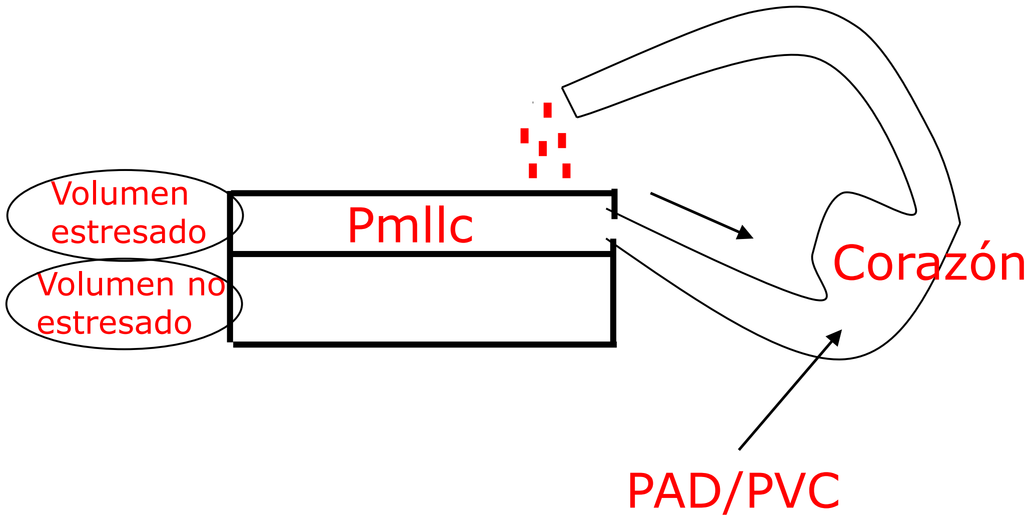
- Un aumento de la Hb de 90 a 100 g/l aumenta la DO2 en un 11 %



Determinantes del Gasto cardíaco




PAD: 3 mmHg
PmLLS: 10 mmHg

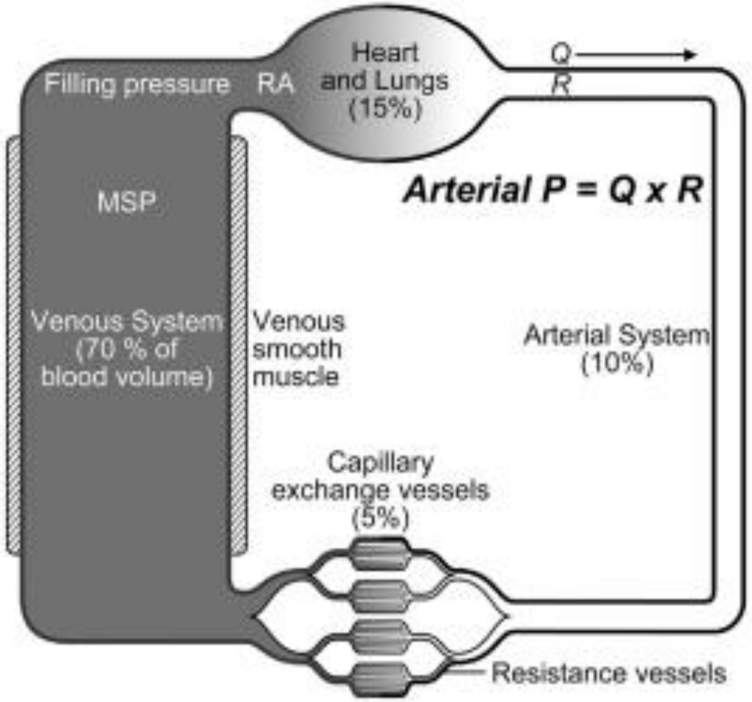

Volumen estresado
Volumen no estresado
Pmllc
Corazón
PAD/PVC

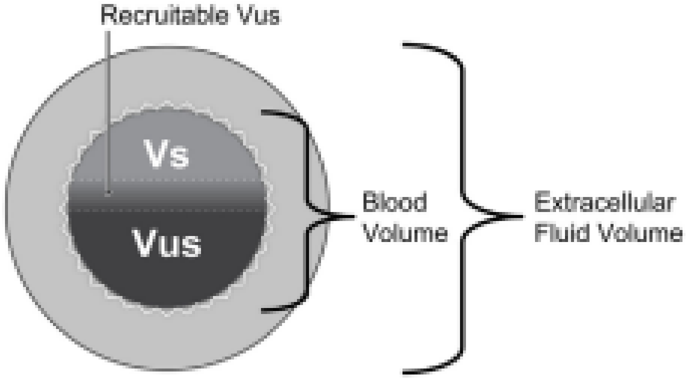
Anesthesia-Associated Relative Hypovolemia: Mechanisms, Monitoring, and Treatment Considerations

frontiers in Veterinary Science

published: 16 March 2018
doi: 10.3389/fvets.2018.00053

Jessica Noel-Morgan[1] and William W. Muir[2,3]*





(Vs: approximately 30% of the blood volume) and unstressed intravascular volume (Vus: approximately 70% of the blood volume

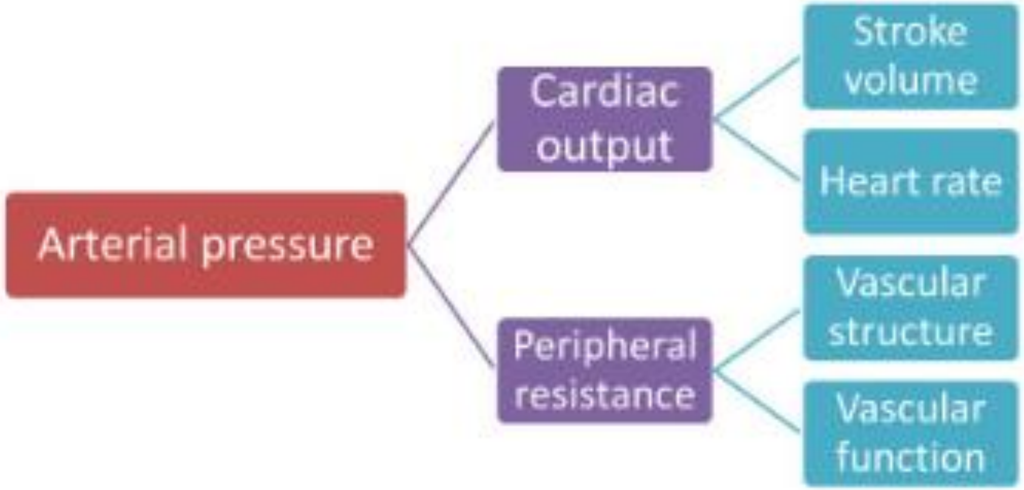
A portion of the Vus (up to 15–20 mL/kg; shaded area between the dashed horizontal lines) serves as a blood reservoir and can be recruited to augment the Vs during times of stress or replenish the Vs during hypovolemia

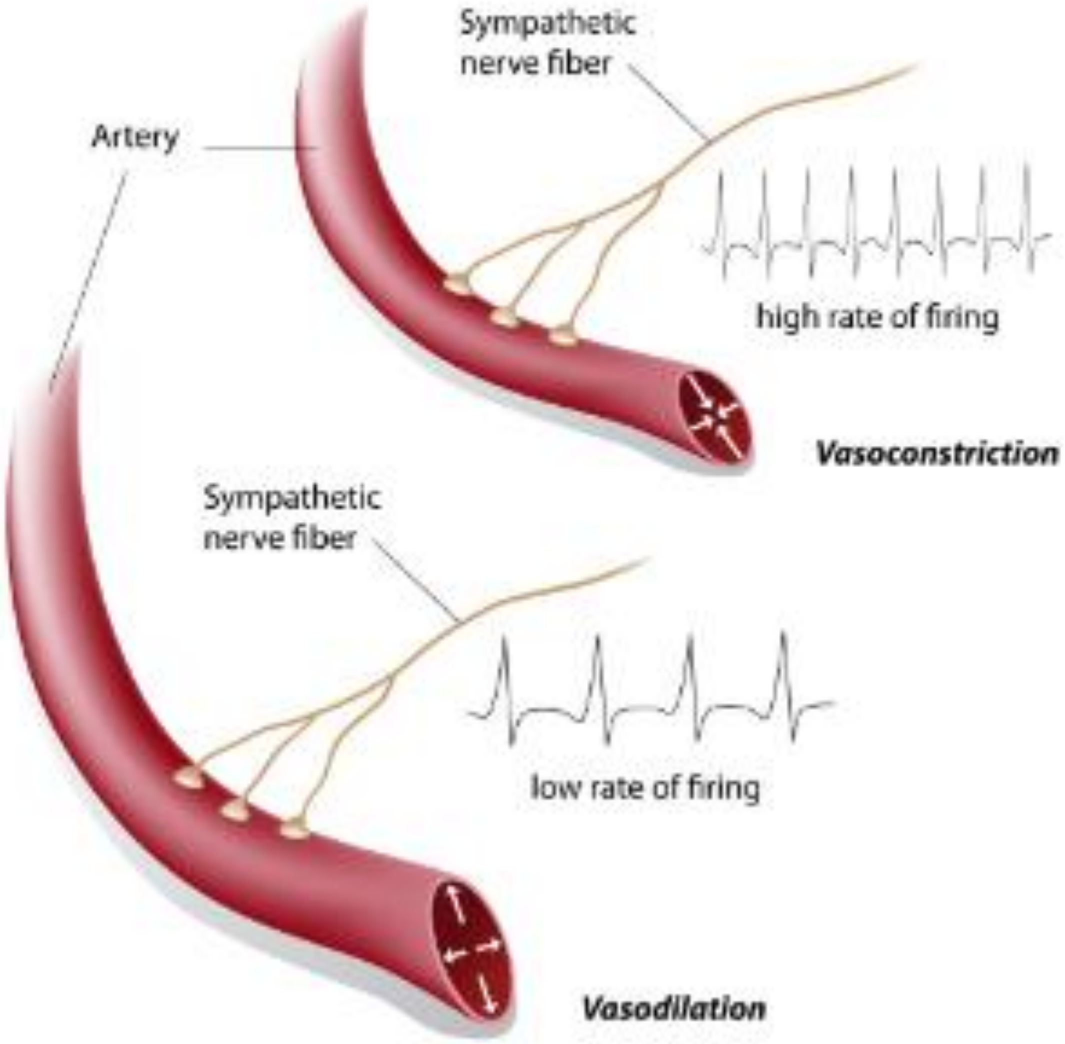
Estrategias para aumentar Rv

Fluidos

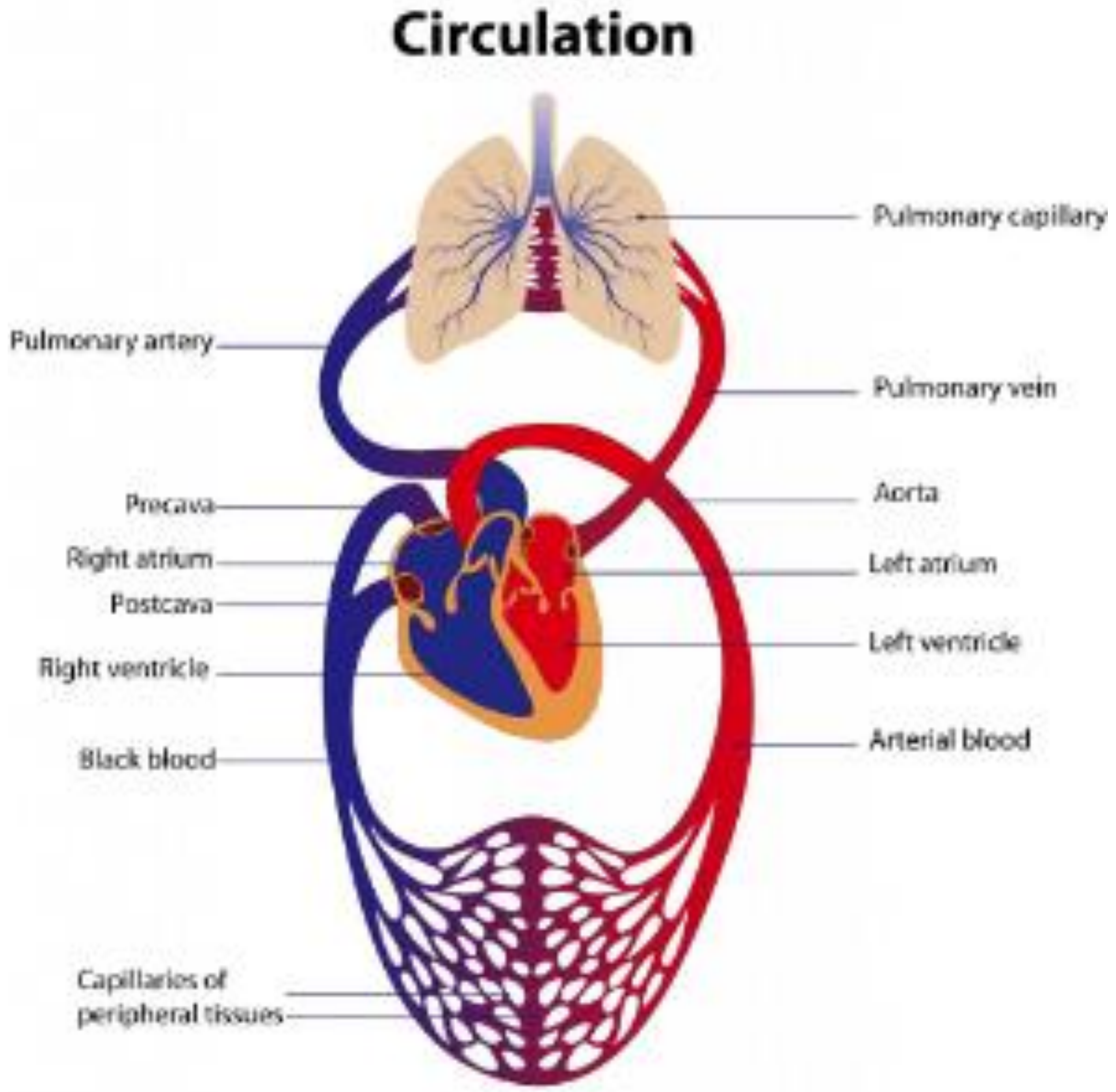
Vasopresores

↑ Volumen estresado → ↑ Pmllc


Arterial pressure
Cardiac output
Peripheral resistance
Stroke volume
Heart rate
Vascular structure
Vascular function


Sympathetic nerve fiber
Artery
high rate of firing
Vasoconstriction
Sympathetic nerve fiber
low rate of firing
Vasodilation

¿Porque es importante corregir tempranamente la hipotensión?



Relationship between Doppler blood pressure and survival or response to treatment in critically ill cats: 83 cases (2003–2004)

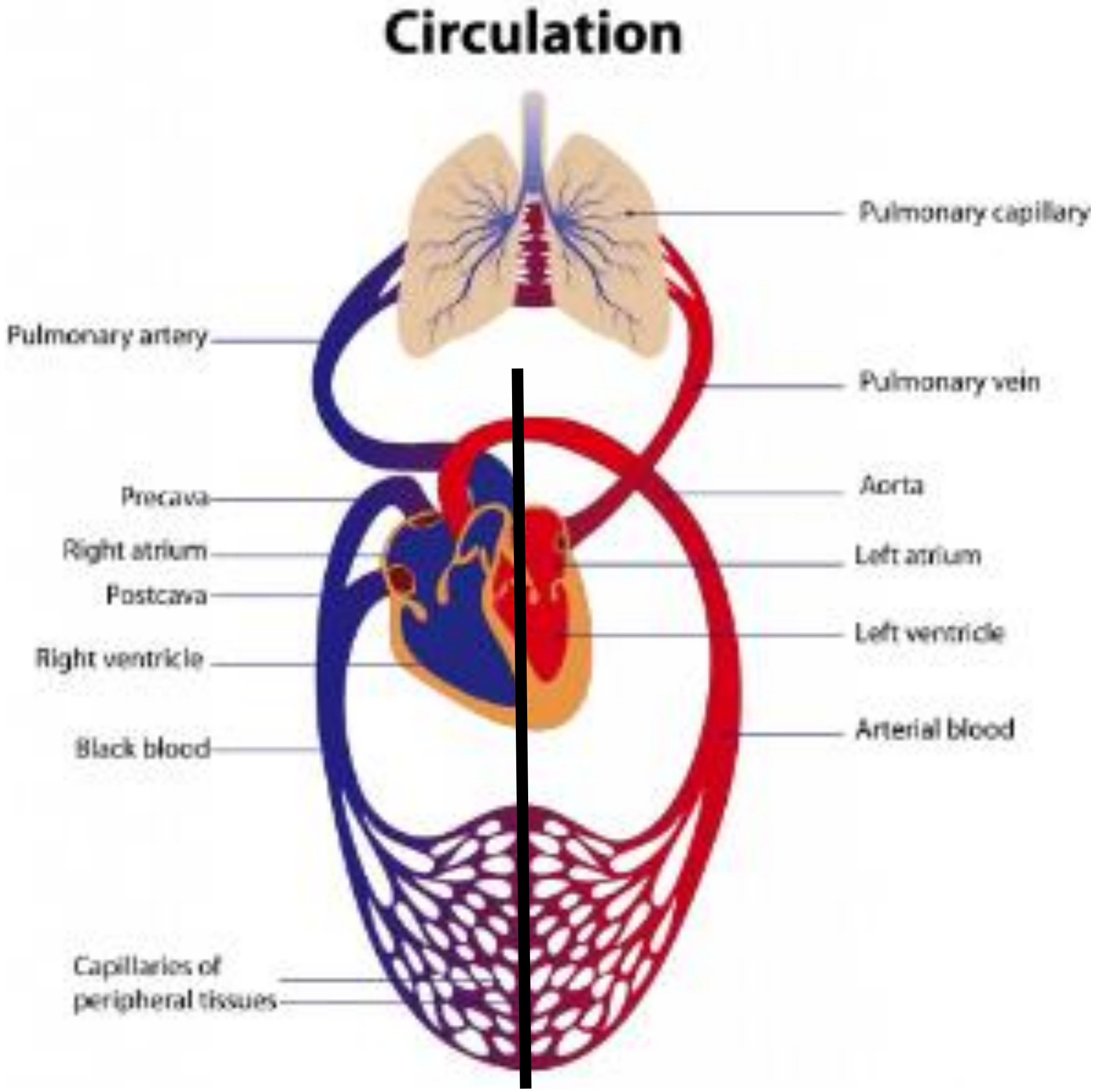
Deborah C. Silverstein, DVM, DACVECC; Fred A. Wininger, VMD; Frances S. Shofer, PhD; Lesley G. King, MVB, DACVECC, DACVIM

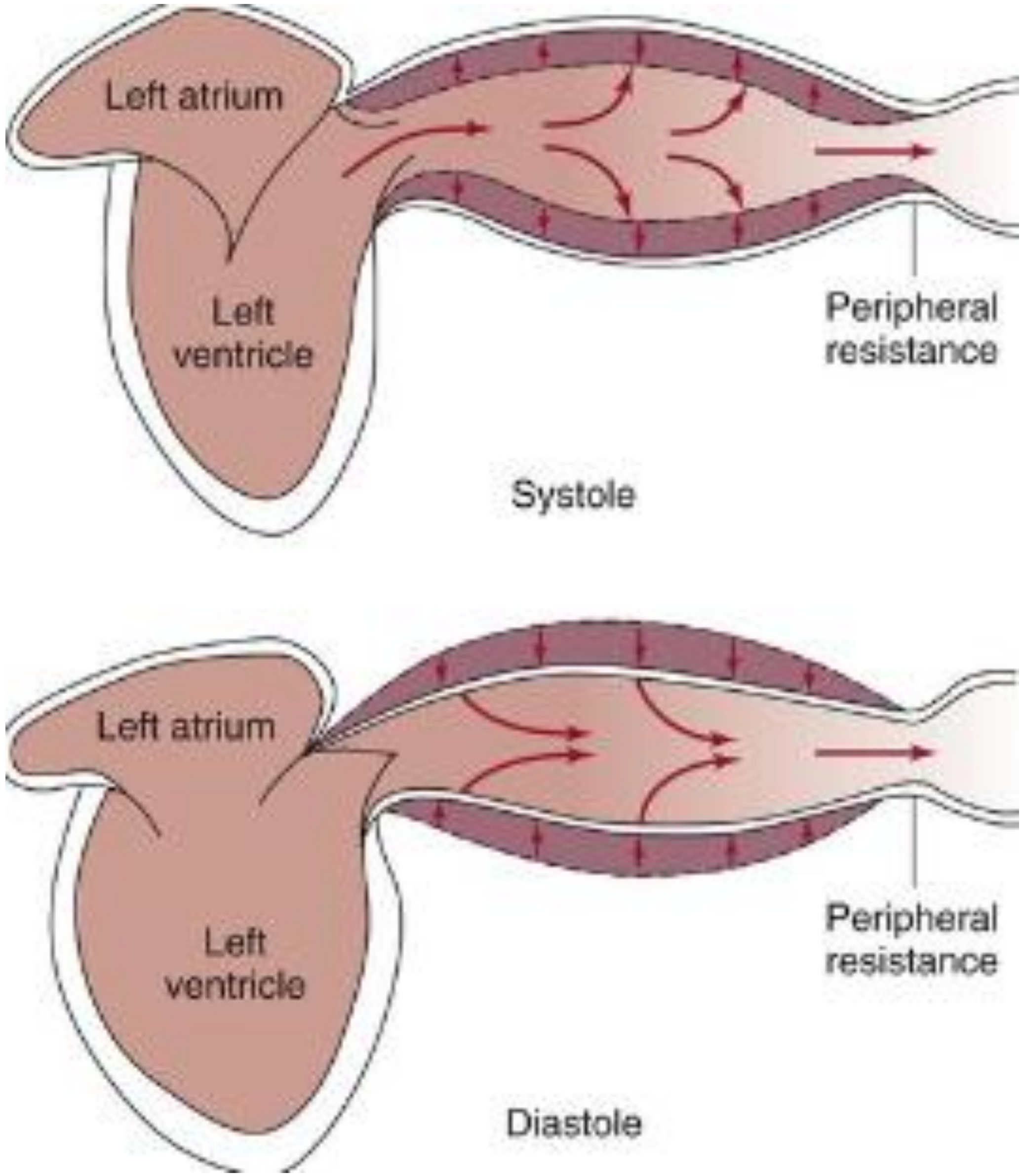
JAVMA, Vol 232, No. 6, March 15, 2008

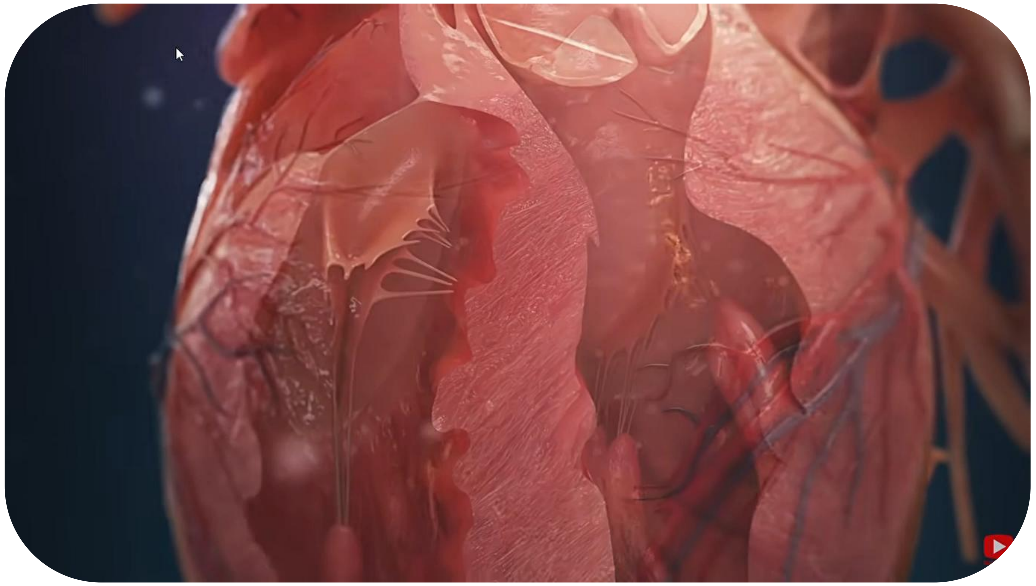
SMALL ANIMALS

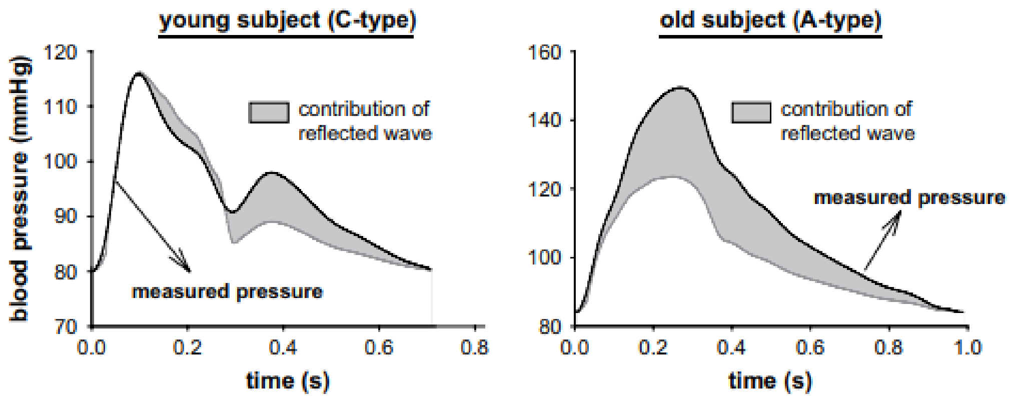
Variable	Hypotensive (n = 39)	Normotensive (n = 44)	*P* value
Mean initial DBP (mm Hg)	86 ± 25	130 ± 25	NA
Age (y)	9.7 ± 3.8	8.0 ± 3.9	0.1
Body weight (kg [lb])	4.3 ± 1.3 (9.5 ± 2.9)	10.3 ± 2.4 (4.7 ± 1.1)	0.3
Temperature (°C [°F])	37.2 ± 1.1 (99.0 ± 1.9)	38.0 ± 1.2 (100.4 ± 2.1)	0.02
Heart rate (beats/min)	176 ± 27	183 ± 26	0.40
PCV (%)	28.6 ± 7	34.2 ± 7	0.01
Sex, male	23	27	0.8
Type of disease			0.7
Medical	32	34	
Surgical	3	6	
Both	4	4	
Outcome, died	25	14	< 0.001

Fisiología


Circulation
Pulmonary capillary
Pulmonary artery
Pulmonary vein
Aorta
Precava
Right atrium
Left atrium
Postcava
Left ventricle
Right ventricle
Arterial blood
Black blood
Capillaries of
peripheral tissues


Left atrium
Left ventricle
Peripheral resistance
Systole
Left atrium
Left ventricle
Peripheral resistance
Diastole





Artery Research (2008) **2**, 122–131

available at www.sciencedirect.com

ScienceDirect

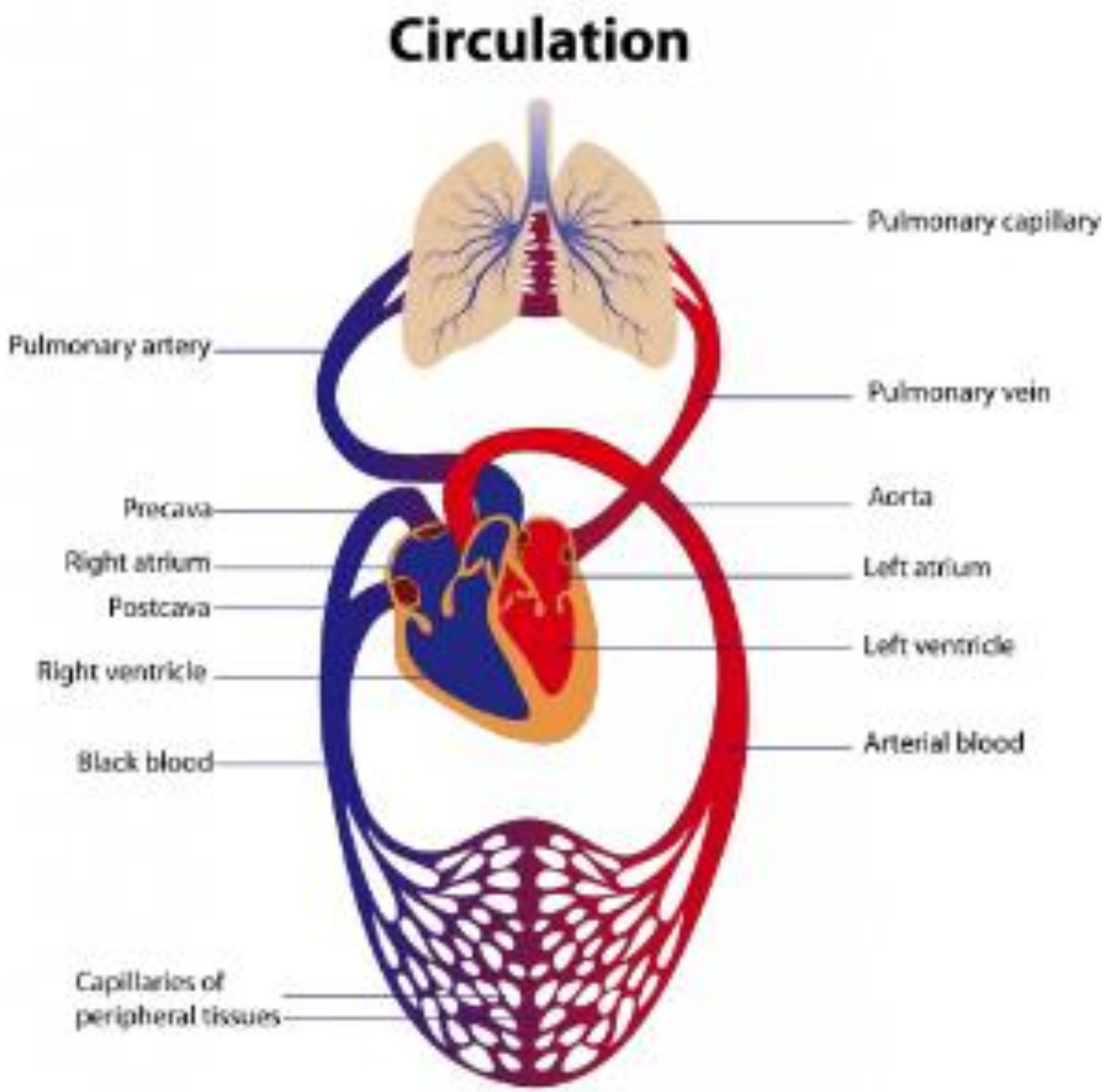
journal homepage: www.elsevier.com/locate/artres

HOW TO

Assessment of arterial pressure wave reflection: Methodological considerations

Abigail Swillens, Patrick Segers*

Presión de perfusión orgánica
(depende del órgano y de la presión local)



Kato and Pinsky Ann. Intensive Care (2015) 5:41
DOI 10.1186/s13613-015-0085-5

Annals of Intensive Care
a SpringerOpen Journal

REVIEW   Open Access

Personalizing blood pressure management in septic shock

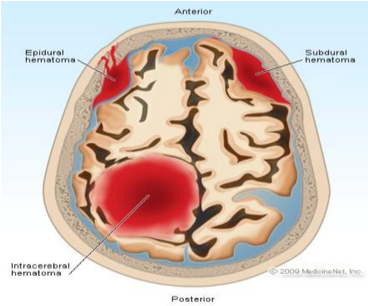
Ryotaro Kato and Michael R. Pinsky*

Table 1 Perfusion pressure for different organs

Organs	Inflow pressure	Outflow pressure (whichever is higher)	Perfusion pressure
Brain	MAP	CVP or intracranial pressure (ICP)	MAP—CVP or ICP
Heart	Diastolic BP	CVP or intrathoracic pressure (ITP)	Diastolic BP—CVP or ITP
Kidney	MAP	CVP or intra-abdominal pressure (IAP)	MAP—CVP or IAP
Bowel	MAP	CVP or intra-abdominal pressure (IAP)	MAP—CVP or IAP

MAP mean arterial pressure, *BP* blood pressure, *CVP* central venous pressure

PPC: TAM - PIC



PPA: TAM - PIA

Kato and Pinsky *Ann. Intensive Care* (2015) 5:41
DOI 10.1186/s13613-015-0085-5

Annals of Intensive Care
a SpringerOpen Journal

REVIEW Open Access

Personalizing blood pressure management in septic shock

Ryotaro Kato and Michael R. Pinsky*

Organ-specific perfusion pressure targets include 60–70 mmHg for the brain, 65 mmHg for renal perfusion and >50 mmHg for hepato-splanchnic flow

Table 1 Perfusion pressure for different organs

Organs	Inflow pressure	Outflow pressure (whichever is higher)	Perfusion pressure
Brain	MAP	CVP or intracranial pressure (ICP)	MAP—CVP or ICP
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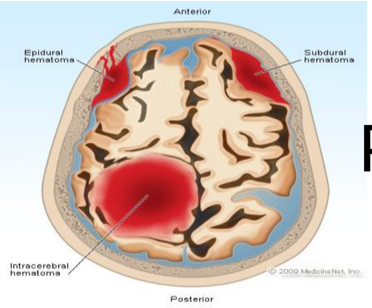


PPA: TAM - PIA

JOURNAL OF SURGICAL RESEARCH 43, 14–20 (1987)

Changes in Visceral Blood Flow with Elevated Intraabdominal Pressure

CHRISTOPHER B. CALDWELL, M.D., AND JOHN J. RICOTTA, M.D.

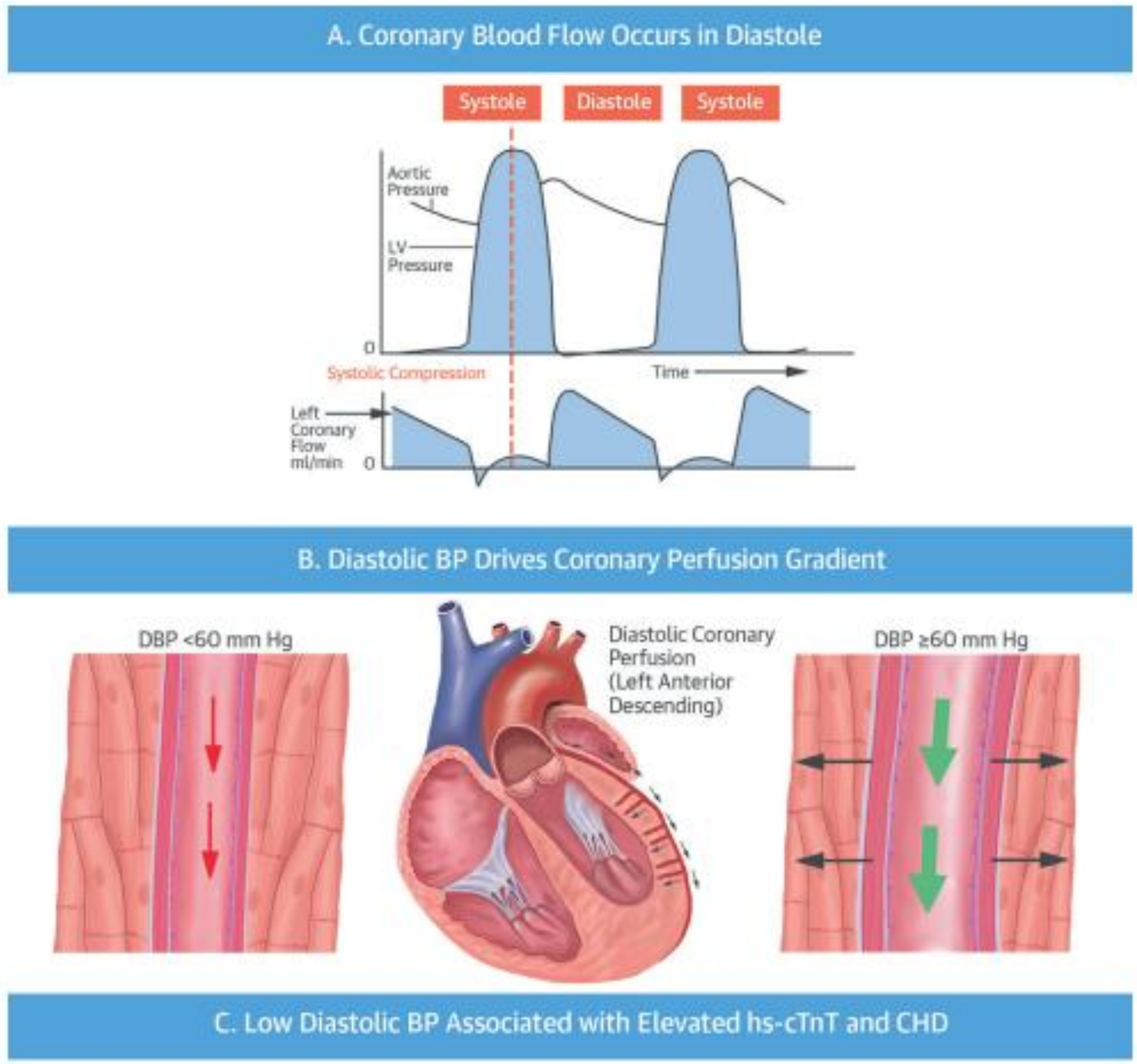
Department of Surgery, University of Rochester School of Medicine and Dentistry, Rochester, New York 10021

Presented at the Annual Meeting of the Association for Academic Surgery, Washington, D.C., November 5–8, 1986

ORGAN BLOOD FLOW AND INTRAABDOMINAL PRESSURE

	IAP (mm Hg)		
Organ	0	20	40
	Organ blood flow (cc/g/min)		
Omentum	0.43 ± 0.15	0.24 ± 0.05	0.10 ± 0.02**
Esophagus	0.11 ± 0.01	0.06 ± 0.01**	0.04 ± 0.01**
Stomach	0.41 ± 0.07	0.27 ± 0.05*	0.11 ± 0.01**
Gastric mucosa	0.63 ± 0.10	0.28 ± 0.04**	0.14 ± 0.03**
Duodenum	1.19 ± 0.16	0.71 ± 0.08**	0.55 ± 0.09**
Jejunum	1.18 ± 0.13	0.67 ± 0.07**	0.41 ± 0.06**
Ileum	0.66 ± 0.12	0.32 ± 0.05**	0.27 ± 0.07**
Colon	0.63 ± 0.17	0.36 ± 0.09**	0.26 ± 0.07**
Pancreas	0.43 ± 0.08	0.28 ± 0.06**	0.15 ± 0.03**
Gall bladder	0.35 ± 0.07	0.28 ± 0.04	0.17 ± 0.03**
Liver	0.42 ± 0.09	0.25 ± 0.10*	0.15 ± 0.06**
Spleen	2.25 ± 0.51	1.23 ± 0.27*	0.69 ± 0.08**

Presión de perfusión miocárdica: PAD - PAD



JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
VOL. 68, NO. 16, 2016

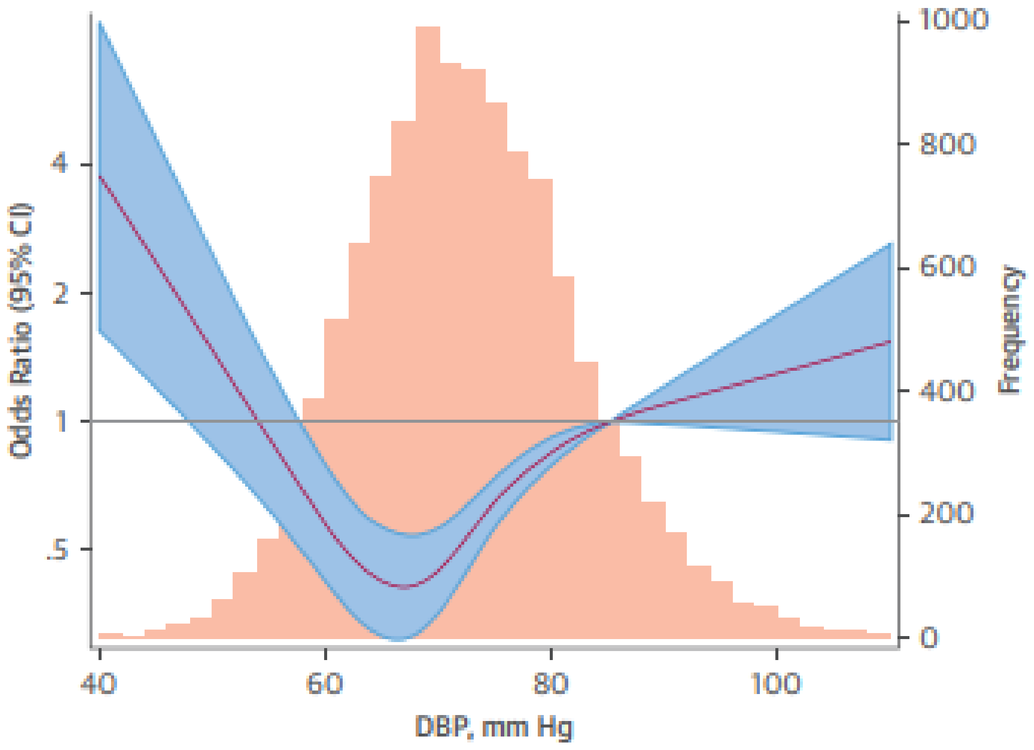
ISSN 0735-1097/$36.00
PUBLISHED BY ELSEVIER
http://dx.doi.org/10.1016/j.jacc.2016.07.754

Diastolic Blood Pressure, Subclinical Myocardial Damage, and Cardiac Events

Implications for Blood Pressure Control

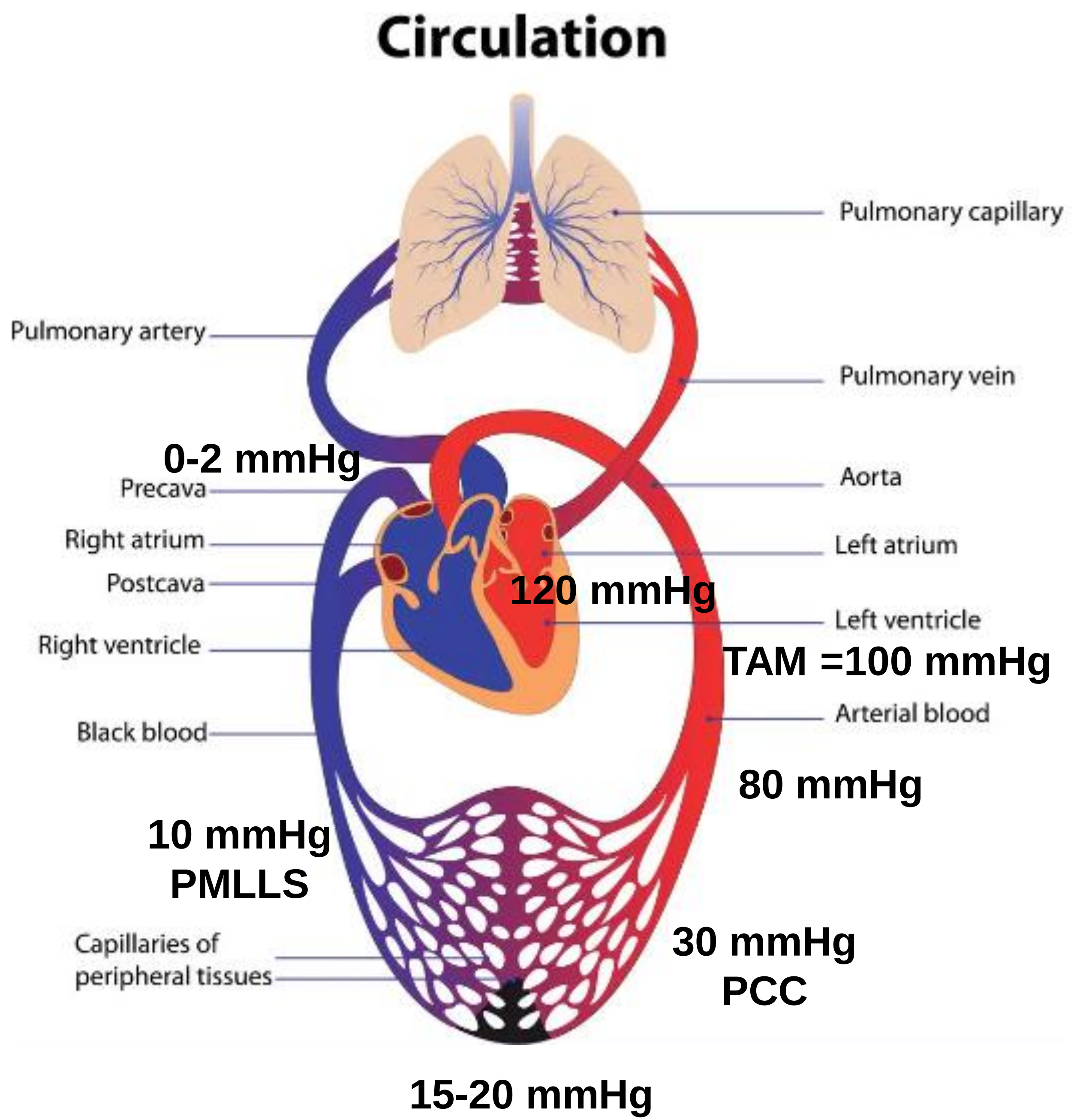
John W. McEvoy, MB, BCh, BAO, MHS,[a,b] Yuan Chen, MS,[a] Andreea Rawlings, PhD,[a] Ron C. Hoogeveen, PhD,[c] Christie M. Ballantyne, MD,[c] Roger S. Blumenthal, MD,[b] Josef Coresh, MD, PhD,[a] Elizabeth Selvin, MPH, PhD[a]

FIGURE 1 Relationship Between DBP and Elevated hs-cTnT



Critical closing pressure

Critical closing pressure (CCP) is an arterial pressure threshold below which small arterial vessels collapse.



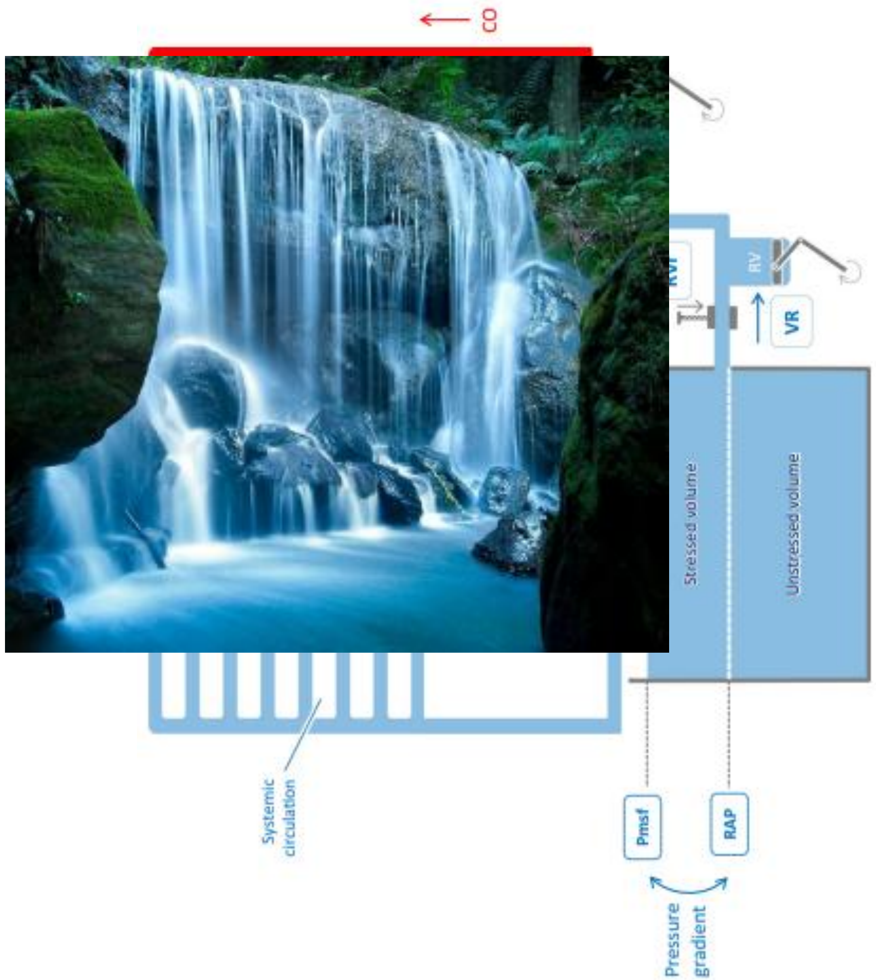
Persichini *et al. Critical Care* (2022) 26:150
https://doi.org/10.1186/s13054-022-04024-x

Critical Care

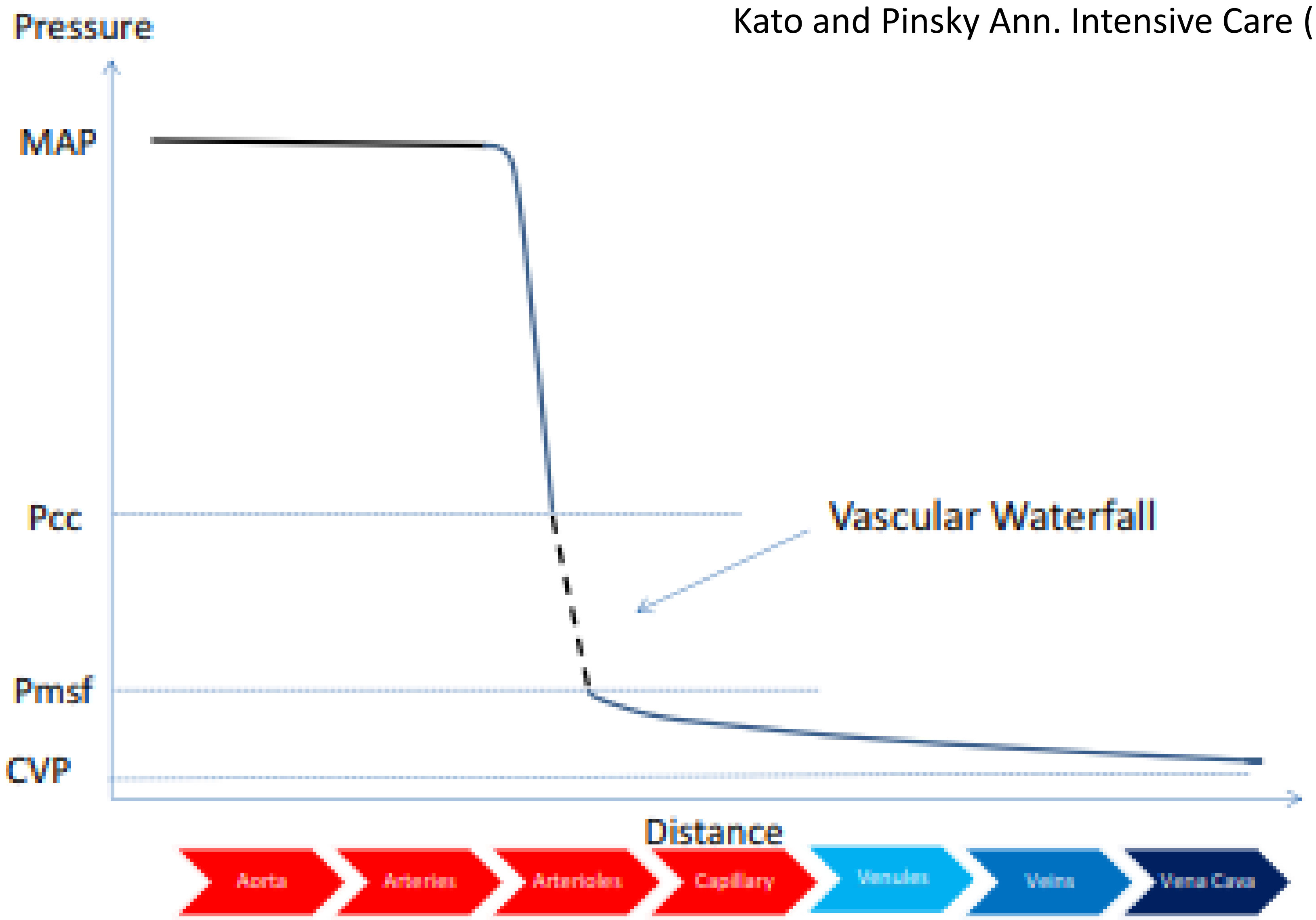
REVIEW **Open Access**

Venous return and mean systemic filling pressure: physiology and clinical applications

Romain Persichini[1*], Christopher Lai[2], Jean-Louis Teboul[2], Imane Adda[2], Laurent Guérin[2] and Xavier Monnet[2]



Kato and Pinsky Ann. Intensive Care (2015) 5:41

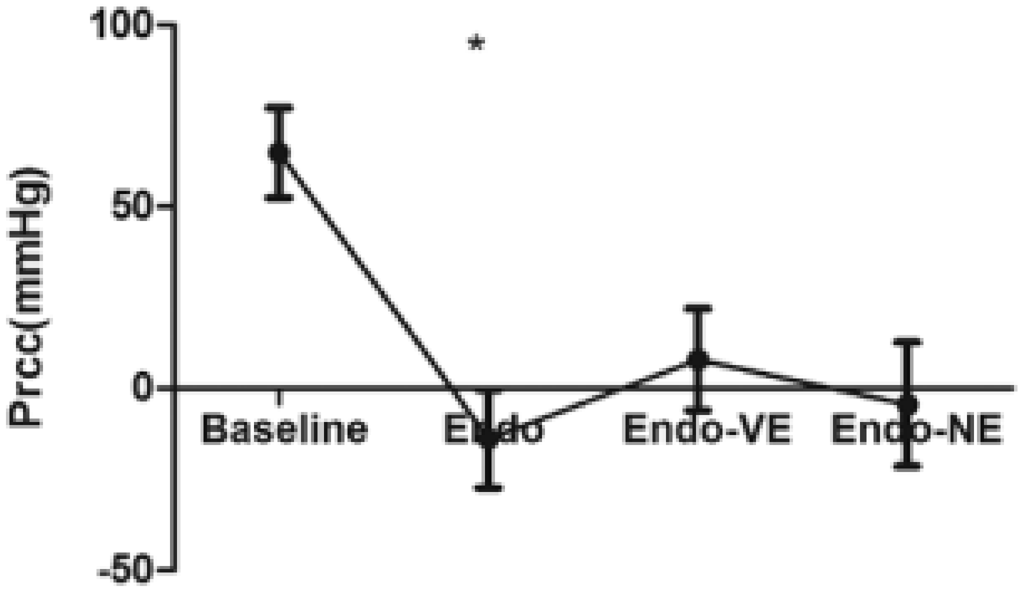


The β-Blocker Esmolol Restores the Vascular Waterfall Phenomenon After Acute Endotoxemia

Wei Du, MD; Dawei Liu, MD; Yun Long, MD; Xiaoting Wang, MD

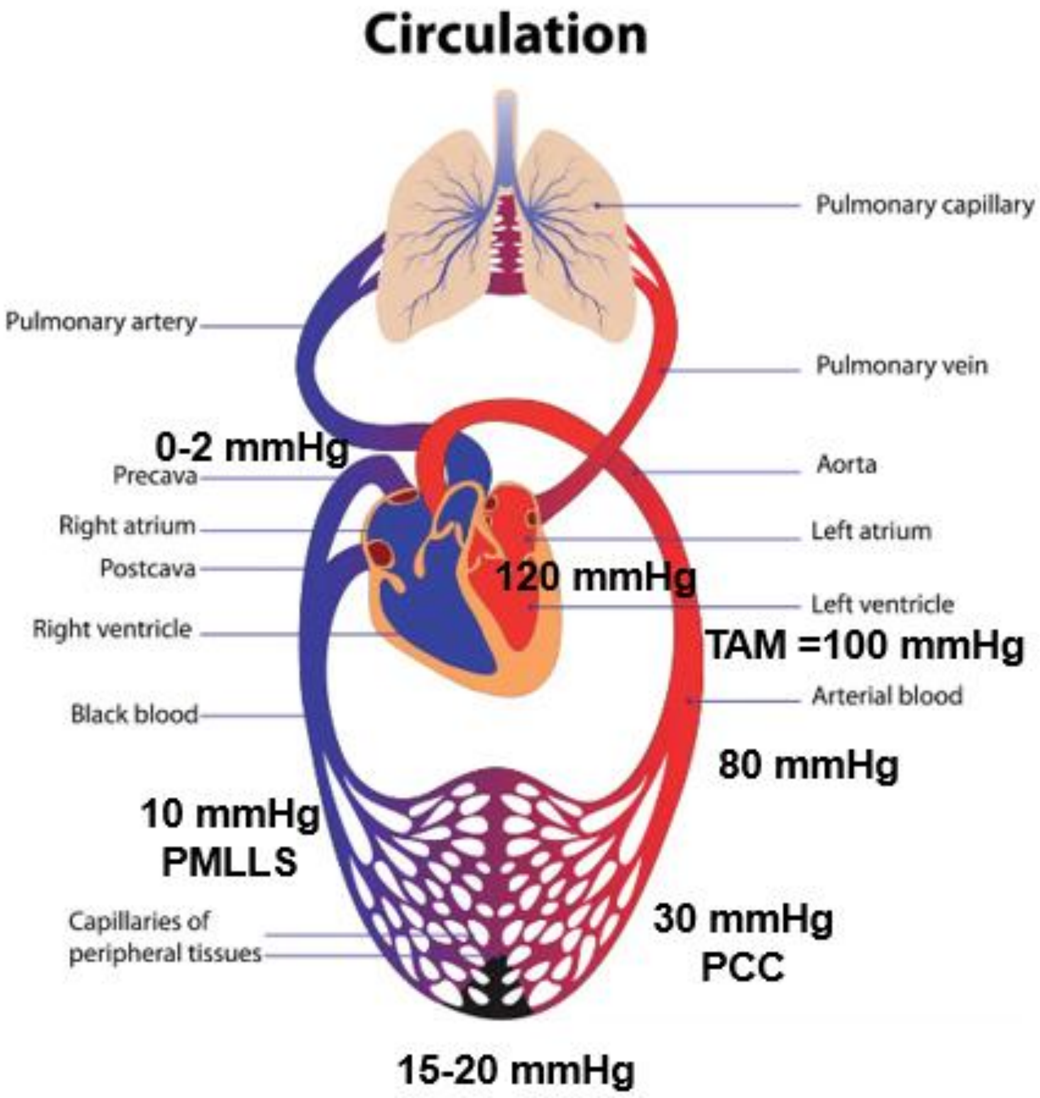
DOI: 10.1097/CCM.0000000000002721

The pressure difference between the Prcc and the Prmsf was considered the height of the renal VW.
If the Prcc was lower than the Prmsf, the height of the renal VW was considered to be 0; in such an instance, the waterfall phenomenon would have disappeared



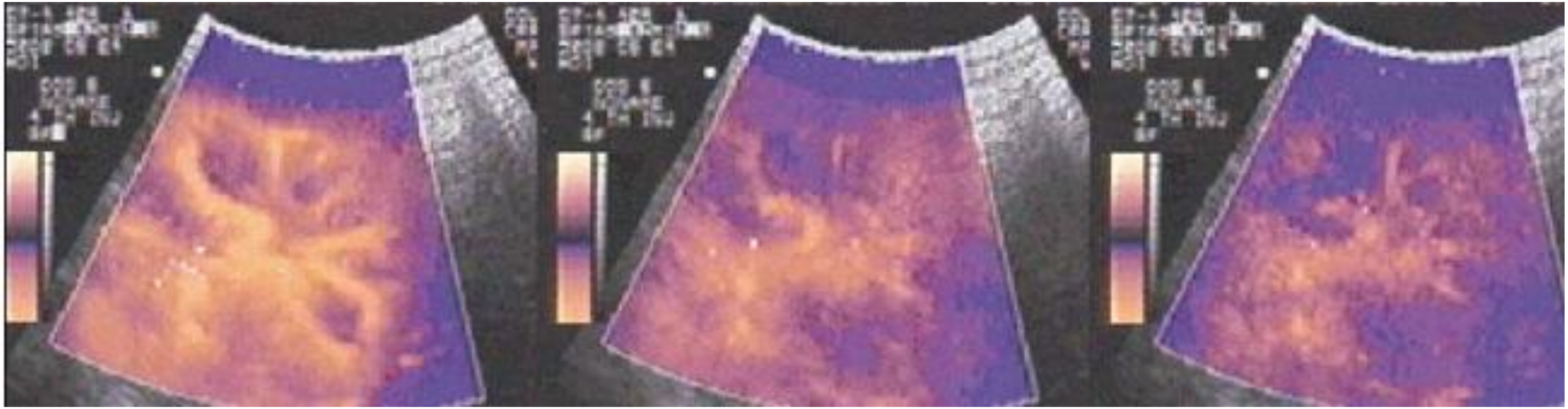
The present study showed that acute endotoxemia decreases systemic Prcc and "inactivates" the waterfall phenomenon.

Aumento TAM aumenta PCC aumenta Cascada Vascular



Evaluation of Change in Blood Flow by Contrast-Enhanced Power Doppler Imaging During Norepinephrine-Induced Renal Vasoconstriction

Peter H. Arger, MD, Chandra M. Sehgal, PhD, Charles R. Pugh, DVM, James I. Kirchoffer,
Elon Y. Kotlar, Kenneth C. Bovee, DVM

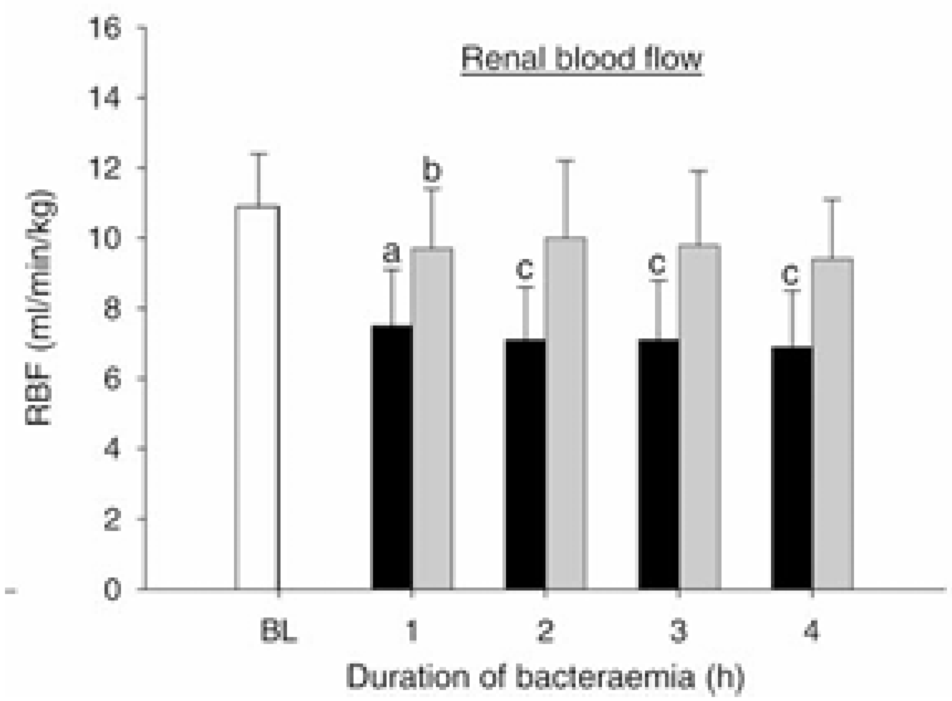


Intensive Care Med (2005) 31:1558–1563
DOI 10.1007/s00134-005-2741-y

EXPERIMENTAL

Zhi-Yong Peng
Lester A. H. Critchley
Benny S. P. Fok

The effects of increasing doses of noradrenaline on systemic and renal circulations in acute bacteraemic dogs



Abstract *Objective:* To determine the dose-response effects of noradrenaline on the systemic and renal circulations during septic shock. *Design and setting:* Prospective controlled experiment in a university animal laboratory. *Subjects:* Eight anaesthetized dogs. *Interventions:*

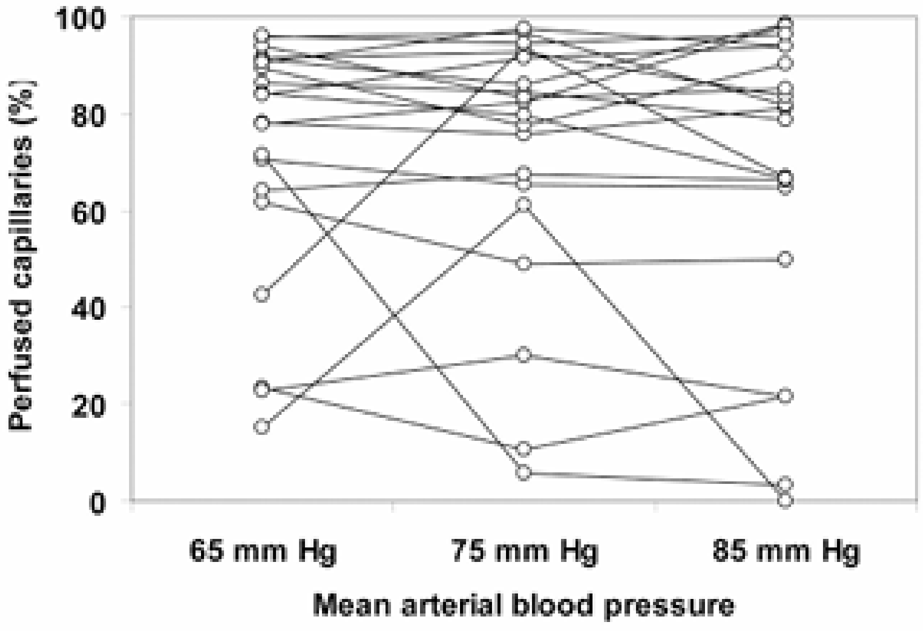
Available online http://ccforum.com/content/13/3/R92

Research

Open Access

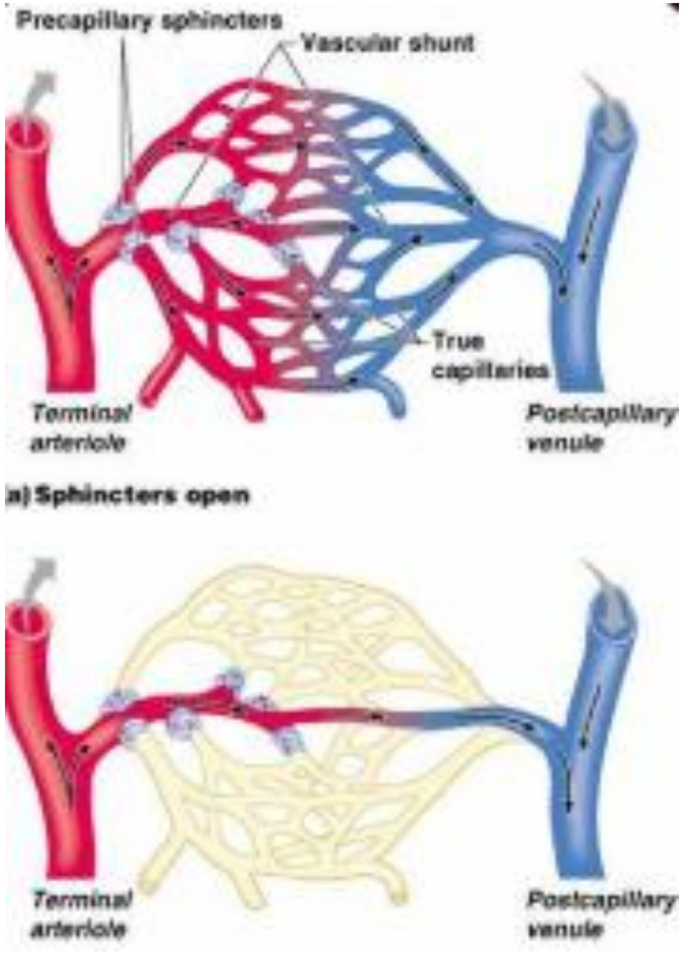
Increasing arterial blood pressure with norepinephrine does not improve microcirculatory blood flow: a prospective study

Arnaldo Dubin[1,2], Mario O Pozo[3], Christian A Casabella[1], Fernando Pálizas Jr[3], Gastón Murias[3], Miriam C Moseinco[1], Vanina S Kanoore Edul[1,2], Fernando Pálizas[3], Elisa Estenssoro[4] and Can Ince[5]



Efecto de la intervención en la Presión crítica de cierre

PCC



Pmlls

Andrei *et al.*
Intensive Care Medicine Experimental (2023) 11:52
https://doi.org/10.1186/s40635-023-00539-x

Intensive Care Medicine
Experimental

RESEARCH ARTICLES **Open Access**

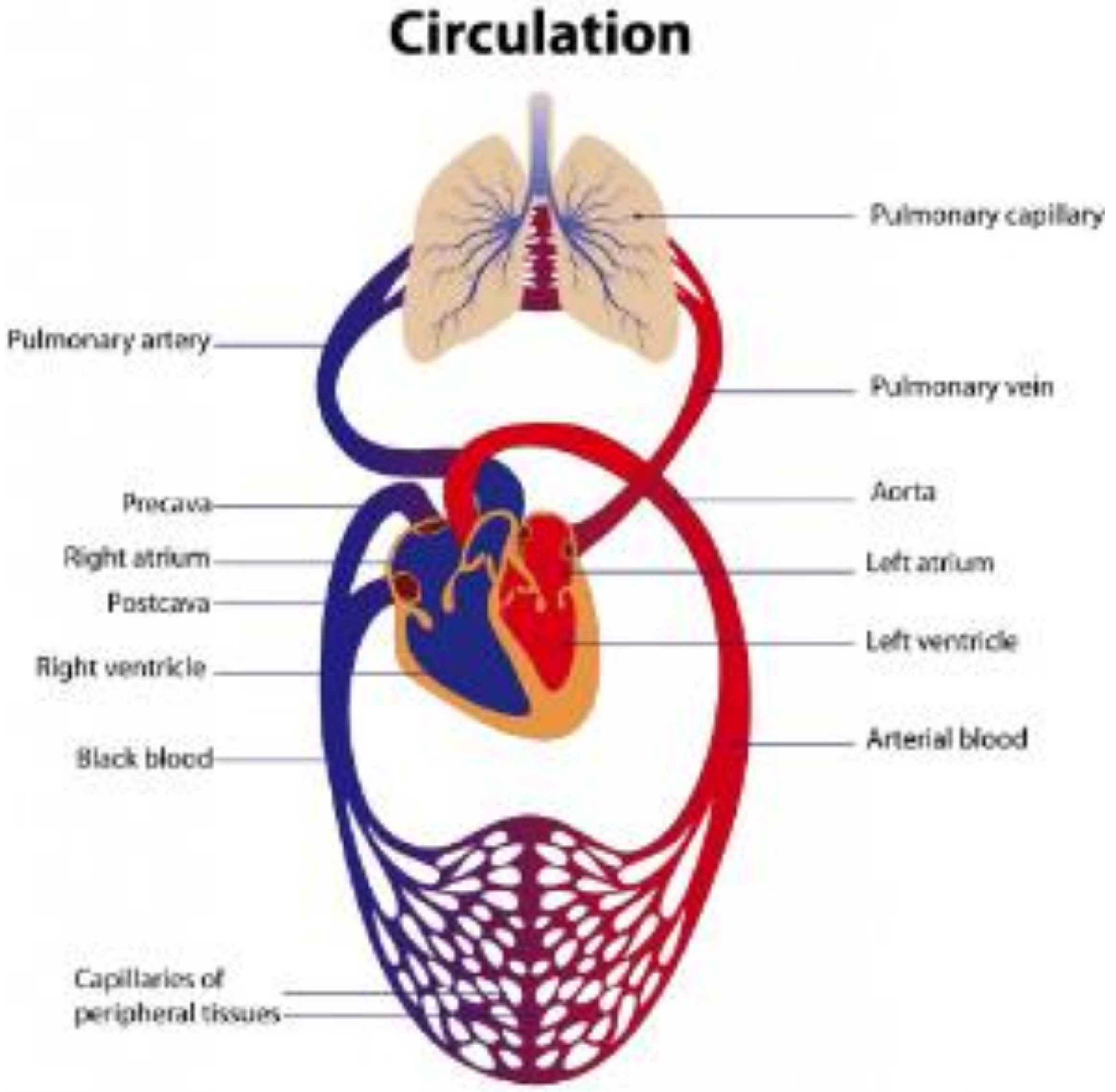
Effect of norepinephrine on the vascular waterfall and tissue perfusion in vasoplegic hypotensive patients: a prospective, observational, applied physiology study in cardiac surgery

Stefan Andrei[1,2*], Stéphane Bar[3], Maxime Nguyen[1,4], Bélaid Bouhemad[1,4] and Pierre-Grégoire Guinot[1,4]

Results Thirty patients were included. Norepinephrine increased arterial pressure and total peripheral resistances in all cohort. The cohort was dichotomized as VW responders (patients with a change of VW over the least significant change (≥93% increase in VW)), and as VW non-responders. In 19 (63%) of the 30 patients, VW increased from 3.47 [− 14.43;7.71] mmHg to 43.6 [25.8;48.1] mmHg, $p < 0.001$) with norepinephrine infusion, being classified as VW responders. The VW responders improved cardiac index (from 1.8 (0.6) L min^{-1} m^{-2} to 2.2 (0.5) L min^{-1} m^{-2}, $p = 0.002$), capillary refill time (from to 4.2 (1.1) s to 3.1 (1) s, $p = 0.006$), and pCO_2 gap (from 9 [7;10] mmHg to 6 [4;8] mmHg, $p = 0.04$). No baseline parameters were able to predict the VW response to norepinephrine. In comparison, VW non-

Variable	Baseline	After NE	p-value[1]
Mean arterial pressure (mmHg), mean (SD)			
All cohort	59 (7)	80 (12)	< 0.001
- VW responders	60 (5)	85 (13)	< 0.001
- VW non-responders	58 (9)	77 (8)	< 0.001
Mean systemic pressure (mmHg), median [IQR]			
All cohort	23 [18; 26]	22 [15; 26]	0.269
- VW responders	22 [17; 26]	20 [16; 25]	0.15
- VW non-responders	23 [17; 26]	24 [22; 28]	0.59
Critical closure pressure (mmHg), median [IQR]			
All cohort	25 [14; 34]	45 [27;60]	< 0.001
- VW responders	26 [20; 29]	58 [46;71]*	< 0.001
- VW non-responders	25 [18 ;37]	27 [15;40]*	0.58
Vascular waterfall (mmHg), median [IQR]			
All cohort	3.5 [− 10; 10]	23 [− 2; 47]	< 0.001
- VW responders	4 [− 14; 8]	44 [26; 48]*	0.001
- VW non-responders	5 [− 5; 16]	− 2 [− 12; 15]*	0.17

Medición


Circulation
Pulmonary capillary
Pulmonary artery
Pulmonary vein
Precava
Aorta
Right atrium
Left atrium
Postcava
Left ventricle
Right ventricle
Arterial blood
Black blood
Capillaries of
peripheral tissues

Presión arterial invasiva (Estándar de oro)

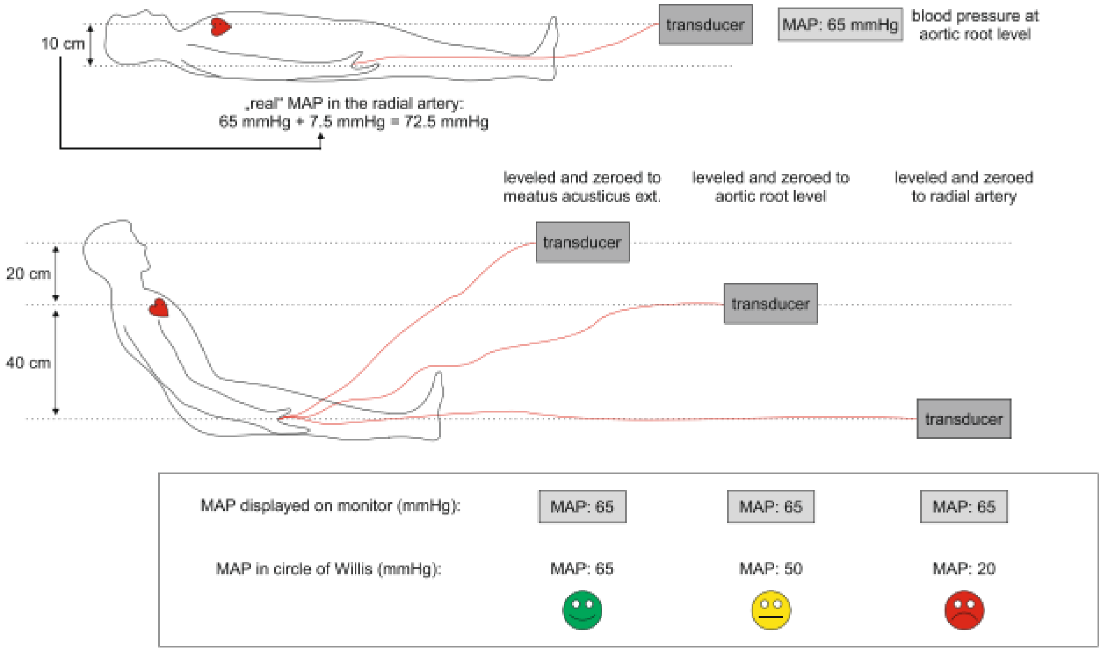
Saugel et al. Critical Care (2020) 24:172
https://doi.org/10.1186/s13054-020-02859-w

Critical Care

REVIEW Open Access

How to measure blood pressure using an arterial catheter: a systematic 5-step approach

Bernd Saugel[1,2*†], Karim Kouz[1†], Agnes S. Meidert[3], Leonie Schulte-Uentrop[1] and Stefano Romagnoli[4,5]



Saugel et al. Critical Care (2020) 24:172
https://doi.org/10.1186/s13054-020-02859-w

Critical Care

REVIEW Open Access

How to measure blood pressure using an arterial catheter: a systematic 5-step approach

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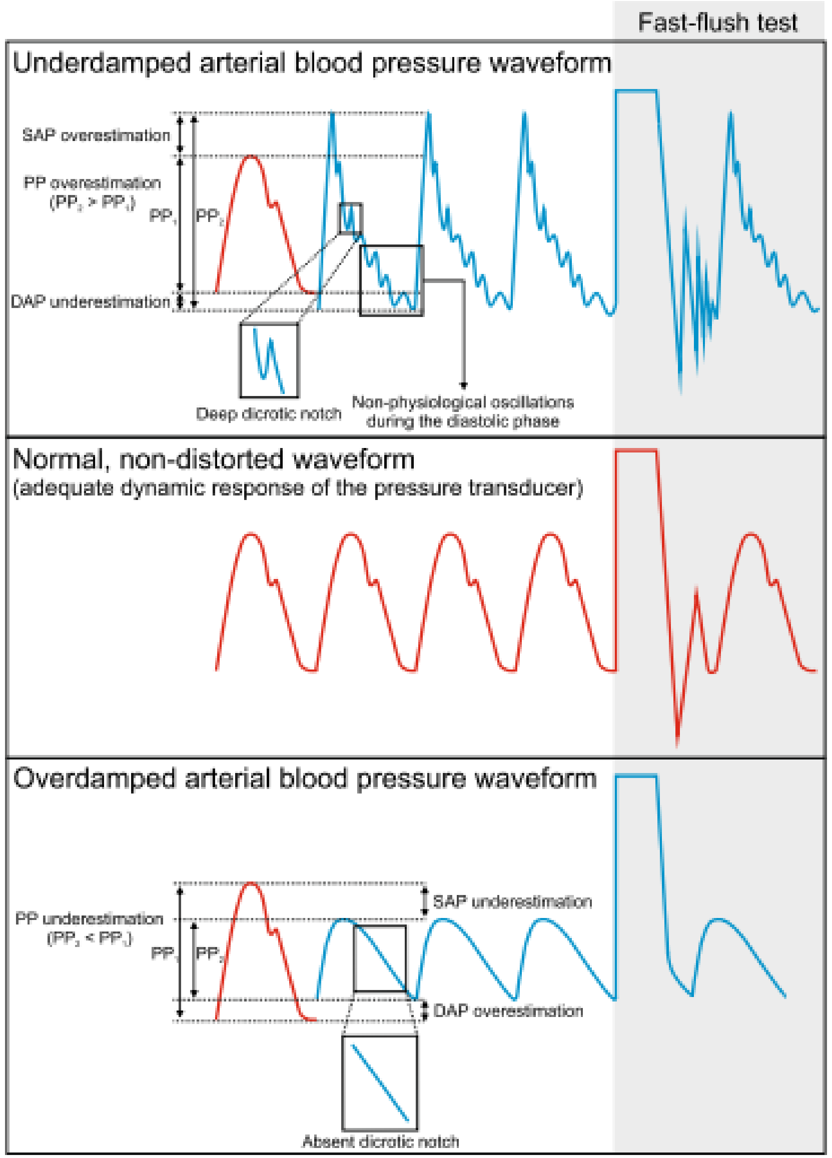


Medición de presión arterial

Figure 7 Examples of (a) Doppler sphygmomanometry and (b) high-definition oscillometry (HDO) equipment

Journal of Feline Medicine and Surgery (2017) **19**, 288–303

SPECIAL ARTICLE

ISFM Consensus Guidelines on the Diagnosis and Management of Hypertension in Cats

Journal of Veterinary Emergency and Critical Care

Original Study

Journal of Veterinary Emergency and Critical Care () 2018, pp 1–6
doi: 10.1111/vec.12718

Evaluation of the relationship between peripheral pulse palpation and Doppler systolic blood pressure in dogs presenting to an emergency service

Laura B. Ateca, VMD, DACVECC; Erica L. Reineke, VMD, DACVECC and
Kenneth J. Drobatz, DVM, MSCE, DACVIM, DACVECC

($P = 0.002$). Dogs with absent metatarsal pulses were 7.6 times more likely to be hypotensive with a SBP < 90 mm Hg (OR, 7.6; 95% CI, 1.8–32) as compared to dogs with palpable metatarsal pulses. The sensitivity of absent metatarsal pulses to diagnose hypotension (SBP < 90 mm Hg) was 33% (95% CI, 10–65%) and the specificity was 94% (95% CI, 86–98%).

Conclusions – Absent metatarsal pulses are highly specific in the diagnosis of hypotension. However, dogs with palpable metatarsal pulses can still be hypotensive. Dorsal metatarsal pulse palpation is useful during triage assessment of dogs presenting to an emergency service, though it should not be used as the only indicator of a dog's cardiovascular stability and should not replace an actual blood pressure measurement.

(J Vet Emerg Crit Care 2018; (): 1–6) doi: 10.1111/vec.12718

Journal of Veterinary Emergency and Critical Care

Original Study

Journal of Veterinary Emergency and Critical Care **26**(1) 2016, pp 52–57
doi: 10.1111/vec.12418

Prediction of systolic blood pressure using peripheral pulse palpation in cats

Erica L. Reineke, VMD, DACVECC; Colleen Rees, CVT and Kenneth J. Drobatz, DVM, DACVIM, DACVECC, MSCE

Absent metatarsal pulses correctly identified cats with a blood pressure of 75 mm Hg or less 84% the time (area under the curve: 0.89, confidence interval 0.81, 0.97)

Table 2: Femoral pulse quality and median systolic blood pressure

Femoral pulse quality	Median SBP (range)	*P* value
Absent	30 mm Hg (30–105 mm Hg)	*0.0022*
Poor	64 mm Hg (30–240 mm Hg)	< *0.0001*
Moderate	107.5 mm Hg (78–160 mm Hg)	*0.043*
Strong	132.5 mm Hg (58–210 mm Hg)	< *0.001*

SBP, systolic blood pressure.

Table 3: Metatarsal pulse quality and median blood pressure

Metatarsal pulse quality	Median SBP (range)	*P* value
Absent	30 mm Hg (30–120 mm Hg)	< *0.0001*
Poor	80 mm Hg (30–140 mm Hg)	0.108
Moderate	110 mm Hg (78–160 mm Hg)	0.064
Strong	135 mm Hg (58–210 mm Hg)	< *0.0001*

SBP, systolic blood pressure.

Cómo subimos la presión arterial?

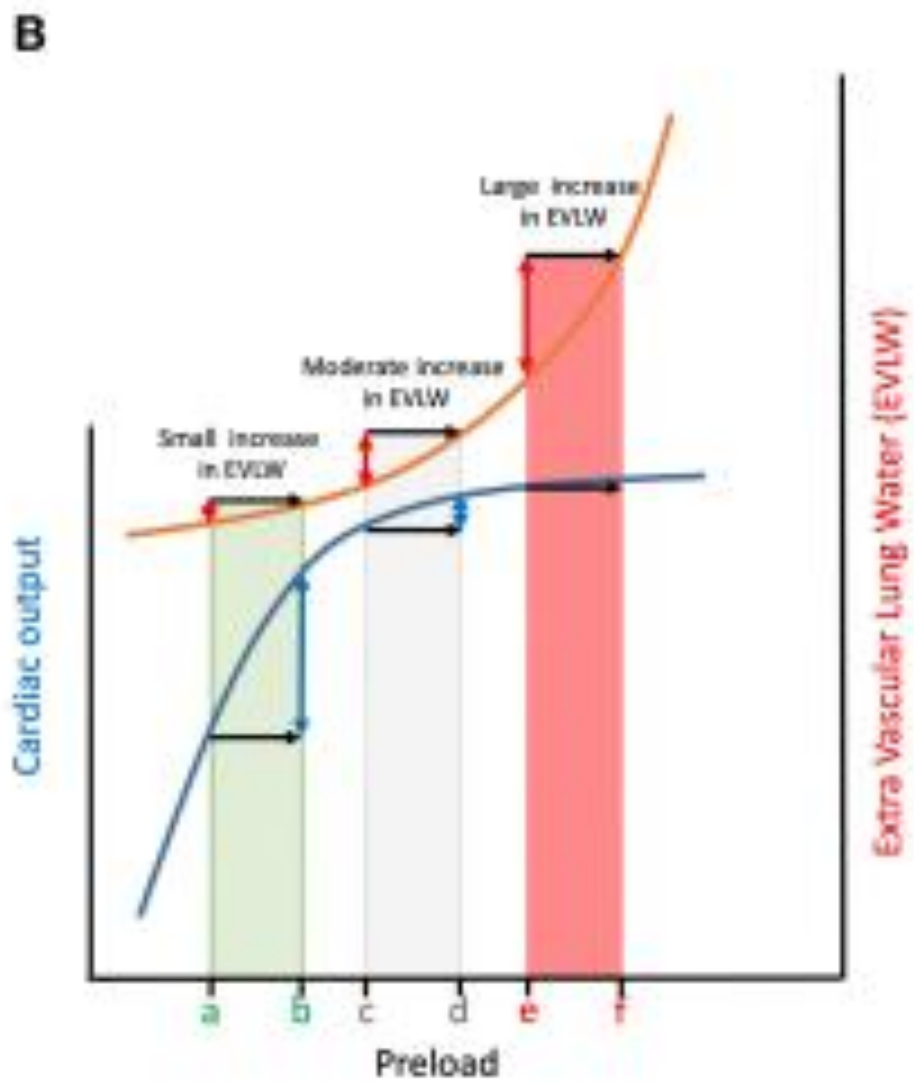
Fluido o vasopresores?:

frontiers
in Veterinary Science

REVIEW
published: 28 May 2021
doi: 10.3389/fvets.2021.630643

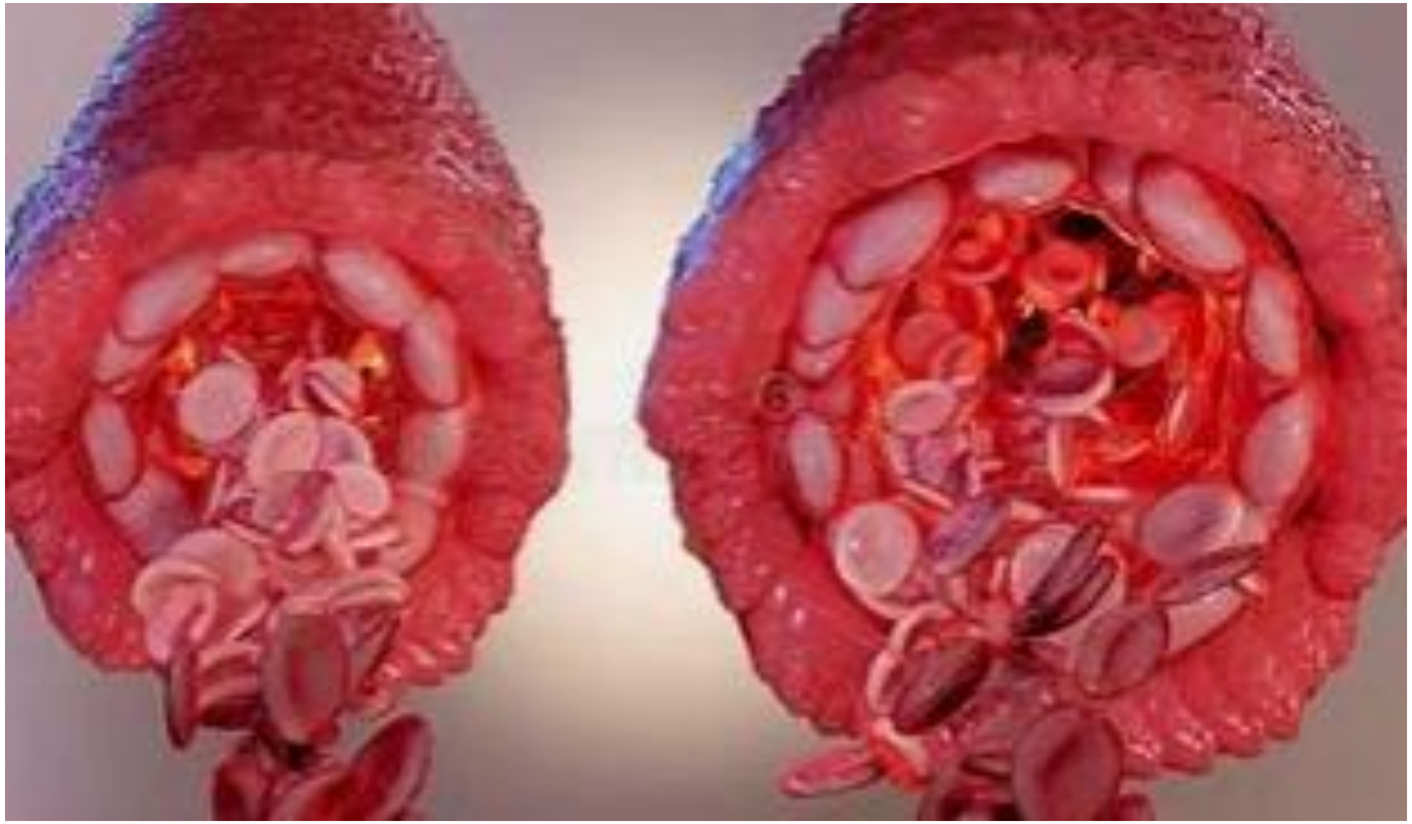
Assessment of Volume Status and Fluid Responsiveness in Small Animals

Søren R. Boysen[1] and Kris Gommeren[2]*



¿Cuando dar vasopresores?

Paciente hipotenso no respondedor a fluidos!!



Analytic Review

Journal of Intensive Care Medicine
1-14

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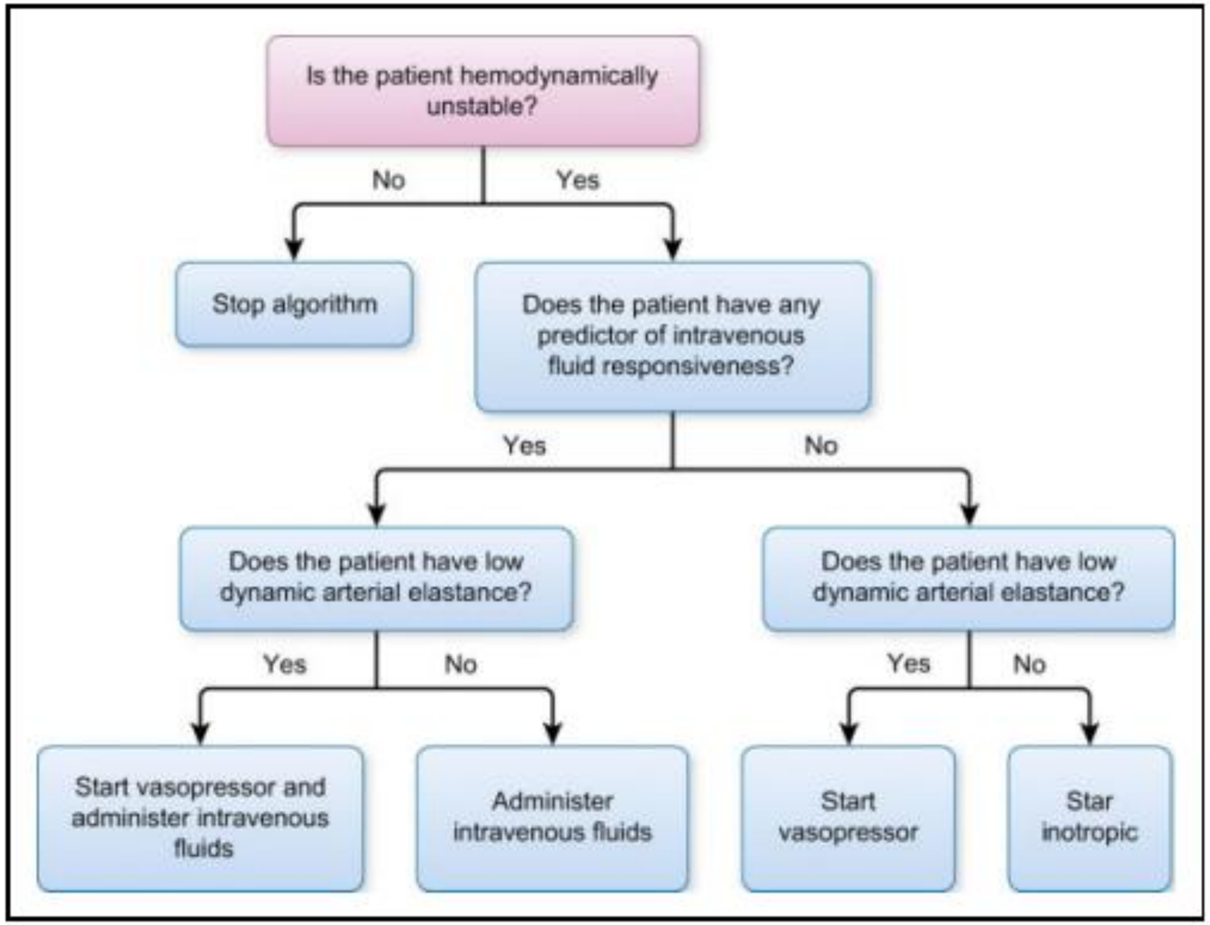
DOI: 10.1177/0885066617709434
journals.sagepub.com/home/jic
SAGE

Predictors to Intravenous Fluid Responsiveness

Jorge Iván Alvarado Sánchez, MD[1,2], William Fernando Amaya Zúñiga, MD[3], and Manuel Ignacio Monge García, MD[4]



animals

MDPI

Article

A Comparison of Dobutamine, Norepinephrine, Vasopressin, and Hetastarch for the Treatment of Isoflurane-Induced Hypotension in Healthy, Normovolemic Dogs

Natalia Henao-Guerrero [1], Carolina H. Ricco-Pereira [2] and Vaidehi V. Paranjape [1,*]

In healthy, anesthetized Beagle dogs undergoing acute, severe isoflurane-induced hypotension, NEP administered as an infusion was the most efficient therapy for correcting MAP. However, the DOB, VAS, and HES treatments were unsuccessful in stabilizing the MAP to >65 mmHg, even at maximum doses.

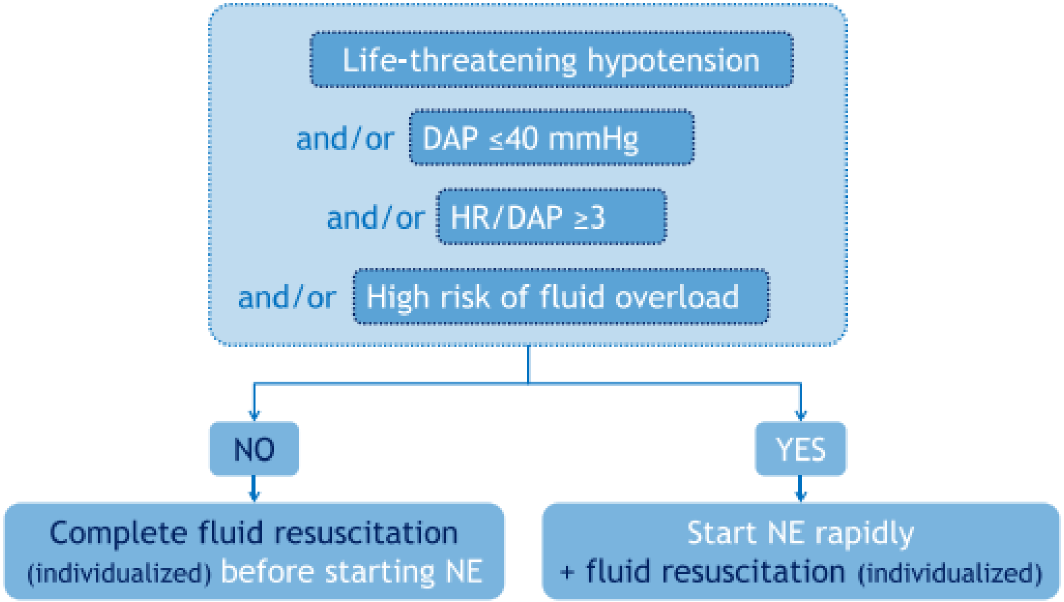
Monnet *et al. Critical Care* (2023) 27:322
https://doi.org/10.1186/s13054-023-04593-5

Critical Care

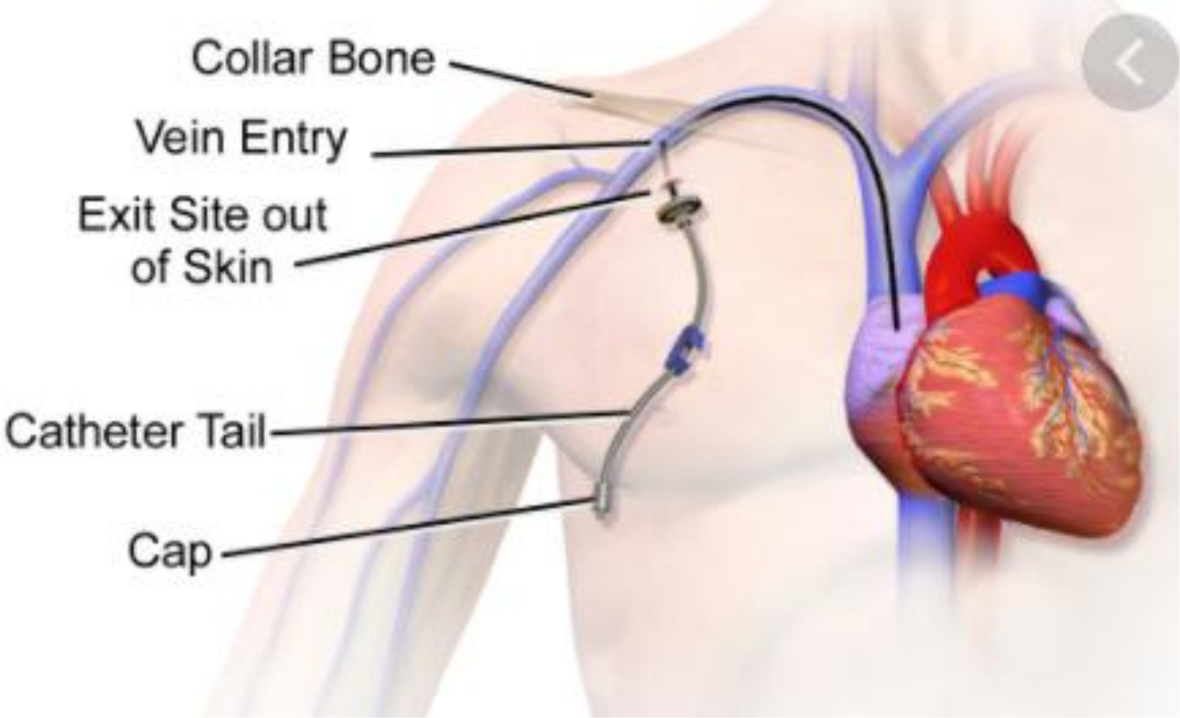
COMMENT **Open Access**

Evidence for a personalized early start of norepinephrine in septic shock

Xavier Monnet[1*], Christopher Lai[1], Gustavo Ospina-Tascon[2,3] and Daniel De Backer[4]



Cuestionamiento como “Target de resucitación”

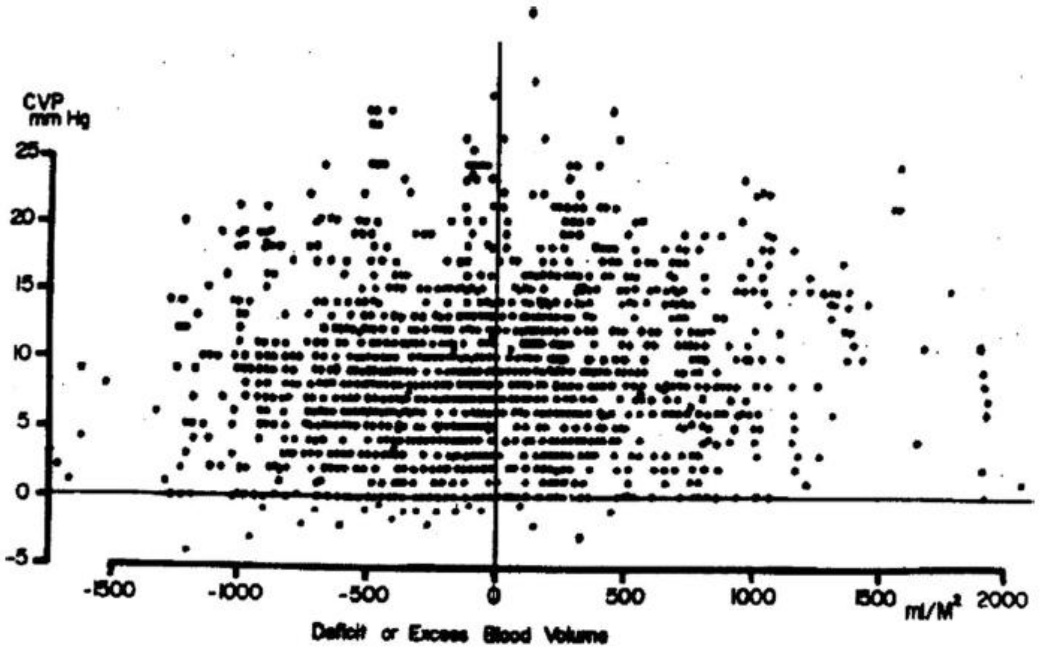


CHEST
Special Feature

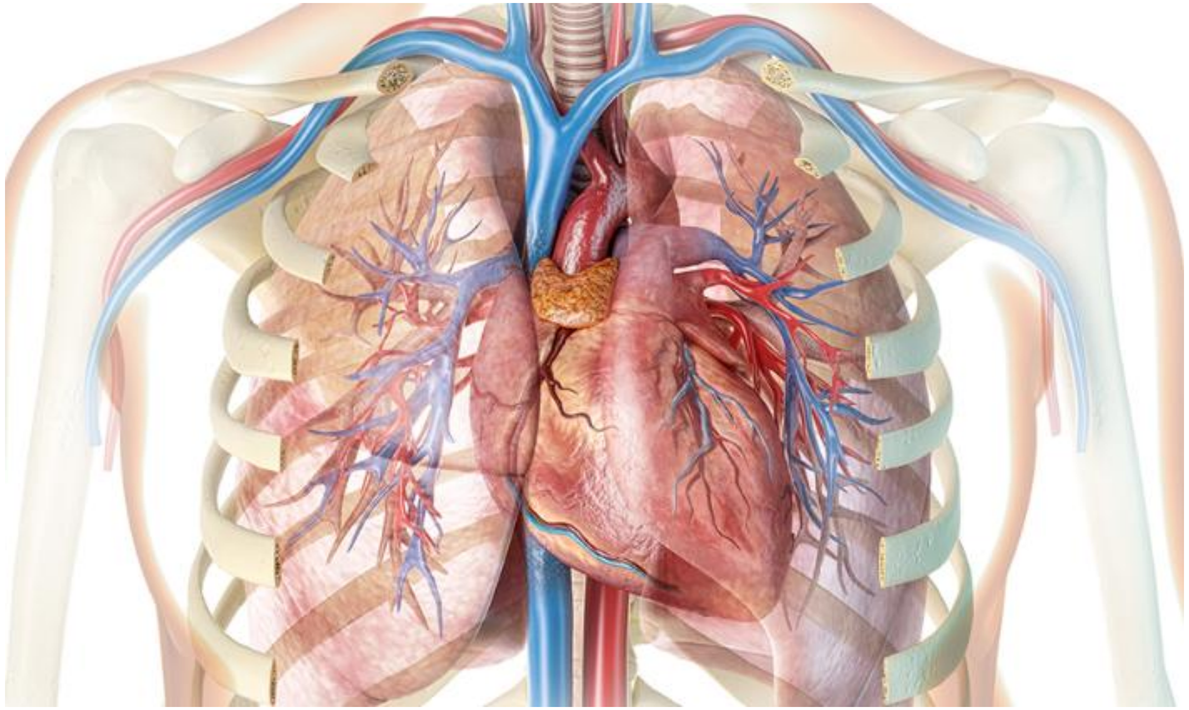
Does Central Venous Pressure Predict Fluid Responsiveness?*

A Systematic Review of the Literature and the Tale of Seven Mares

Paul E. Marik, MD, FCCP; Michael Baram, MD, FCCP; and Bobbak Vahid, MD



Determinación de la precarga dependencia. Variables dinámicas



RESEARCH Open Access

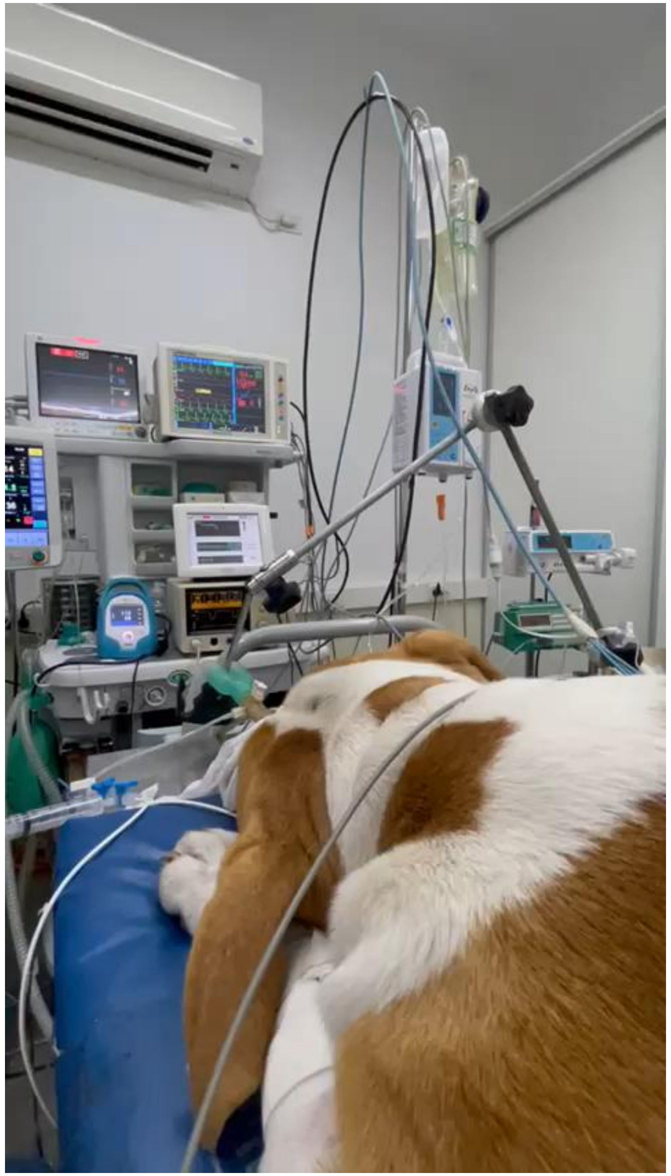
Characteristics of resuscitation, and association between use of dynamic tests of fluid responsiveness and outcomes in septic patients: results of a multicenter prospective cohort study in Argentina

Arnaldo Dubin[1*], Cecilia Loudet[2], Vanina S. Kanoore Edul[3], Javier Osatnik[4], Fernando Ríos[5], Daniela Vásquez[6], Mario Pozo[7], Bernardo Lattanzio[8], Fernando Pálizas[7], Francisco Klein[9], Damián Piezny[5], Paolo N. Rubatto Birri[1], Graciela Tuhay[9], Analía García[10], Analía Santamaría[11], Graciela Zakalik[12], Cecilia González[13] and Elisa Estenssoro[2] on behalf of the investigators of the SATISEPSIS group

Dubin *et al. Ann. Intensive Care* (2020) 10:40
https://doi.org/10.1186/s13613-020-00659-7
Annals of Intensive Care

Variable	Odds ratio	[CI 95%]	P
Charlson score	1.21	[1.07–1.36]	0.002
SOFA score	1.16	[1.07–1.26]	< 0.0001
Serum lactate	1.21	[1.08–1.37]	0.001
Mechanical ventilation	12.2	[5.73–26.00]	< 0.0001
Dynamic tests of fluid responsiveness	0.37	[0.21–0.67]	0.001

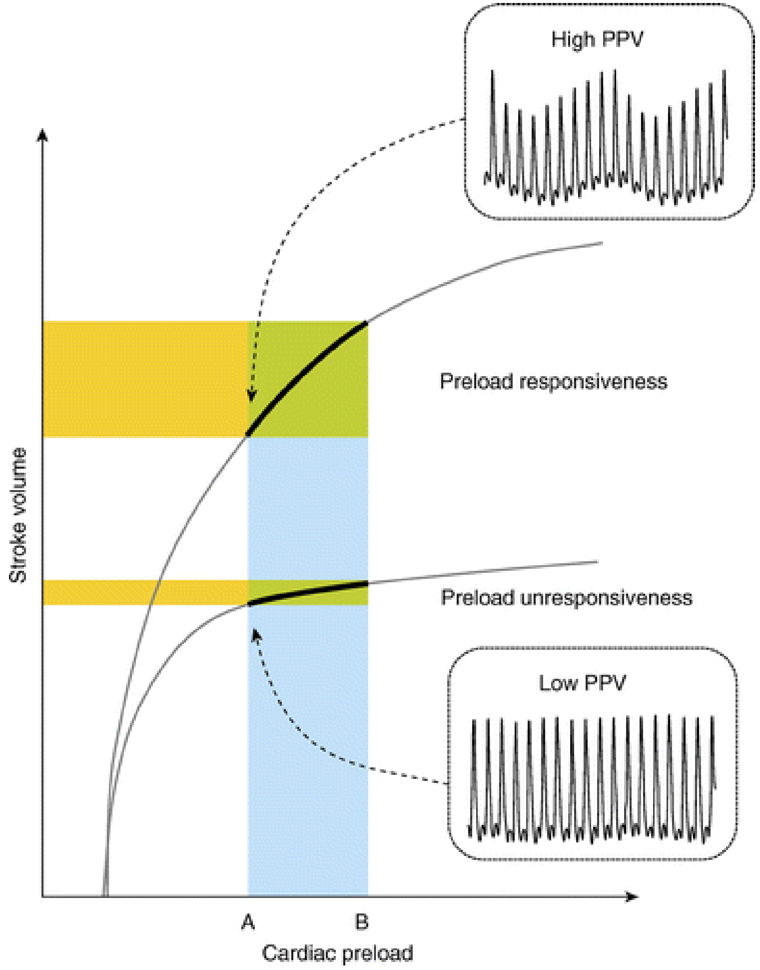
Area under the ROC curve = 0.84. Hosmer–Lemeshow test = 0.45



14:44
Capacidad vital
VCV
14
13
5
4.8
414
36
2
10
48
1.2
1.4
1.0
12
16
Aire
2.00
VCV
450
10
1:5
20
4
40

Ventilación mecánica

Ventilación a presión positiva



REVIEW

Assessment of fluid responsiveness: recent advances

Xavier Monnet[a] and Jean-Louis Teboul[b]

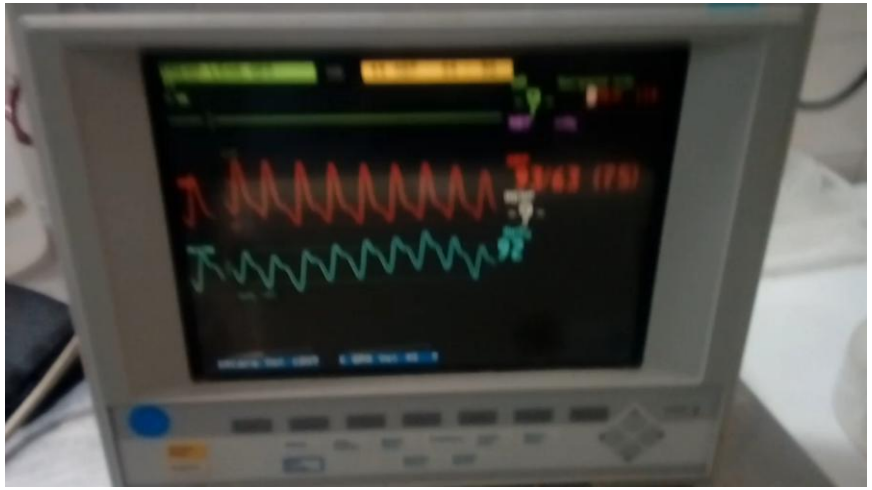


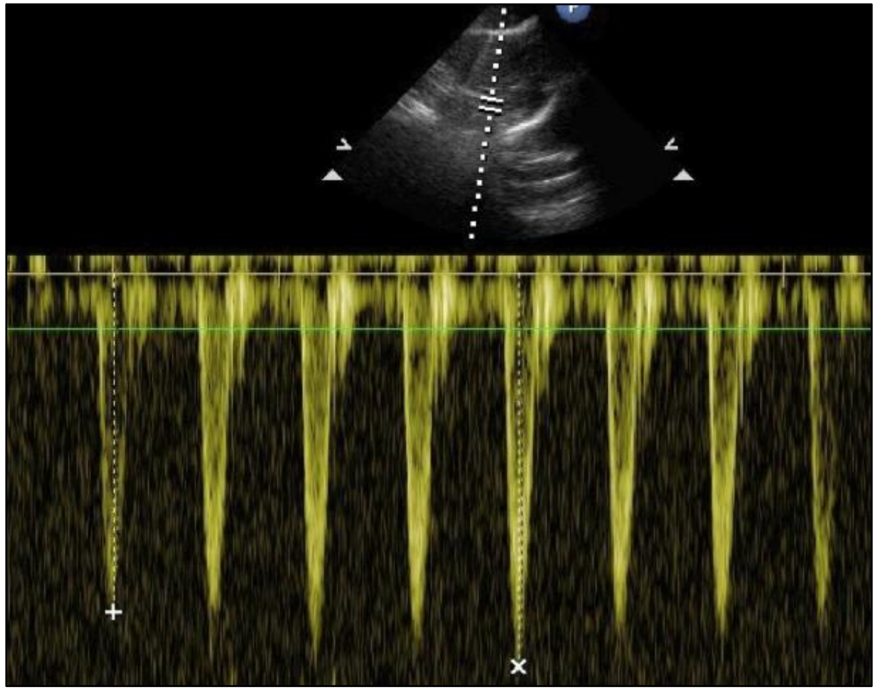
Table 1. Summary of methods predicting preload responsiveness with diagnostic threshold and limitations

Method	Variable	Threshold	Main limitations
Pulse pressure/Stroke volume variations	Pulse pressure or stroke volume	12%	Cannot be used in case of spontaneous breathing, cardiac arrhythmias, low tidal volume/lung compliance

Title: Respiratory variation in aortic blood peak velocity and caudal vena cava diameter can predict fluid responsiveness in anaesthetised and mechanically ventilated dogs

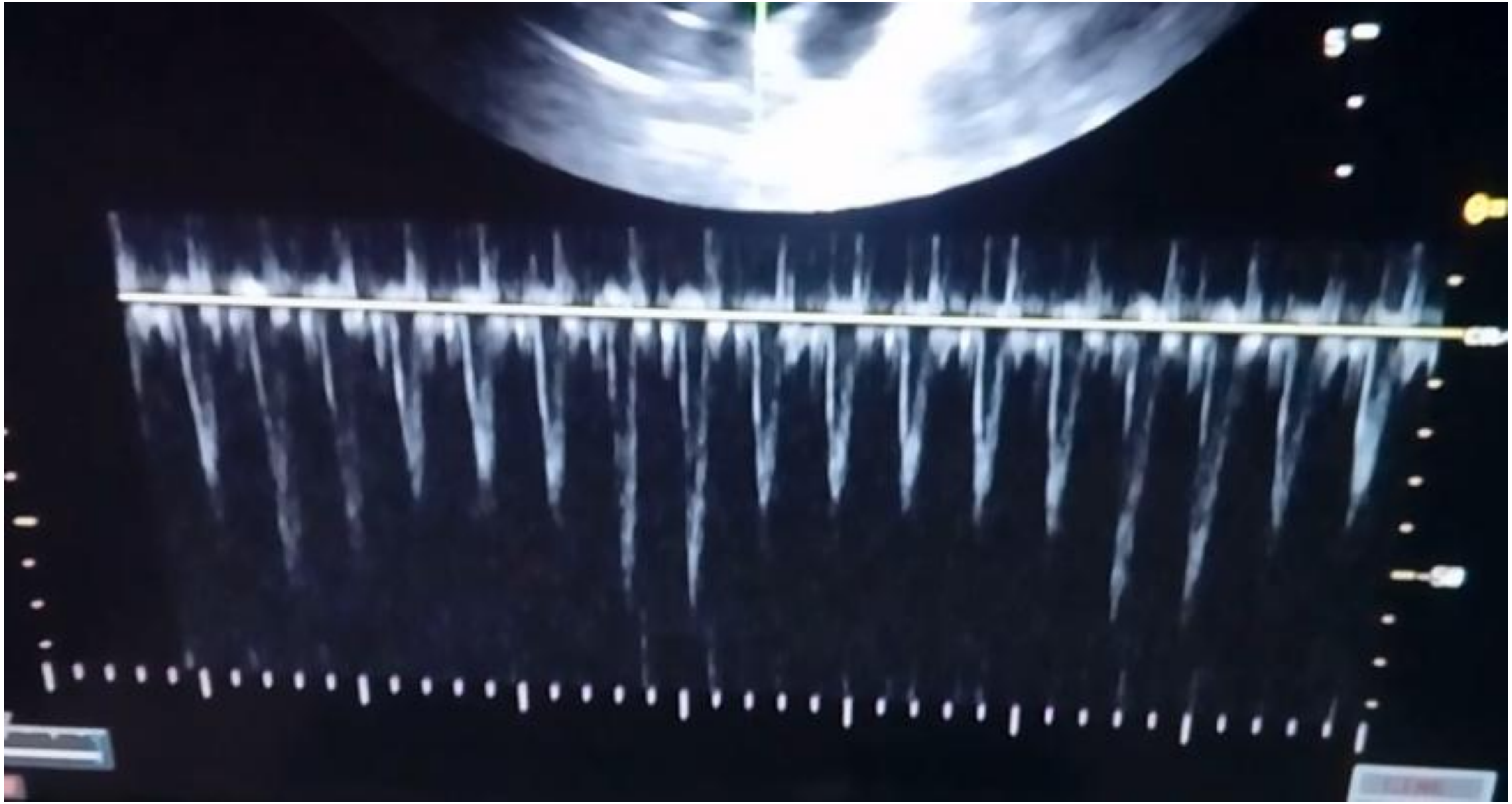
Authors: M. Bucci, R. Rabozzi, C. Guglielmini, P. Franci

The areas under the ROC curves for SPV, ΔVpeak, were 0.91 (CI 0.73–0.99; *P* = 0.0001), 0.95 (CI 0.77–1; *P* = 0.0001), respectively.
The best cut-offs were 6.7% for SPV (sensitivity, 77.78%; specificity, 93.33%), 9.4% for ΔVpeak (sensitivity, 88.89%; specificity, 100%)



Controlled mechanical ventilation commenced immediately, and the tidal volume was set such that a plateau pressure of 10 cmH_2O was maintained

Pico flujo Ao



Meta-análisis variables dinámicas

Study	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
Dalmagro 2021	19	1	2	17	0.90 [0.70, 0.99]	0.94 [0.73, 1.00]
Fantoni 2017	13	0	12	8	0.52 [0.31, 0.72]	1.00 [0.63, 1.00]
Goncalves 2020	31	0	4	15	0.89 [0.73, 0.97]	1.00 [0.78, 1.00]
Skouropoulou 2021	49	2	1	28	0.98 [0.89, 1.00]	0.93 [0.78, 0.99]

PPV Experimental

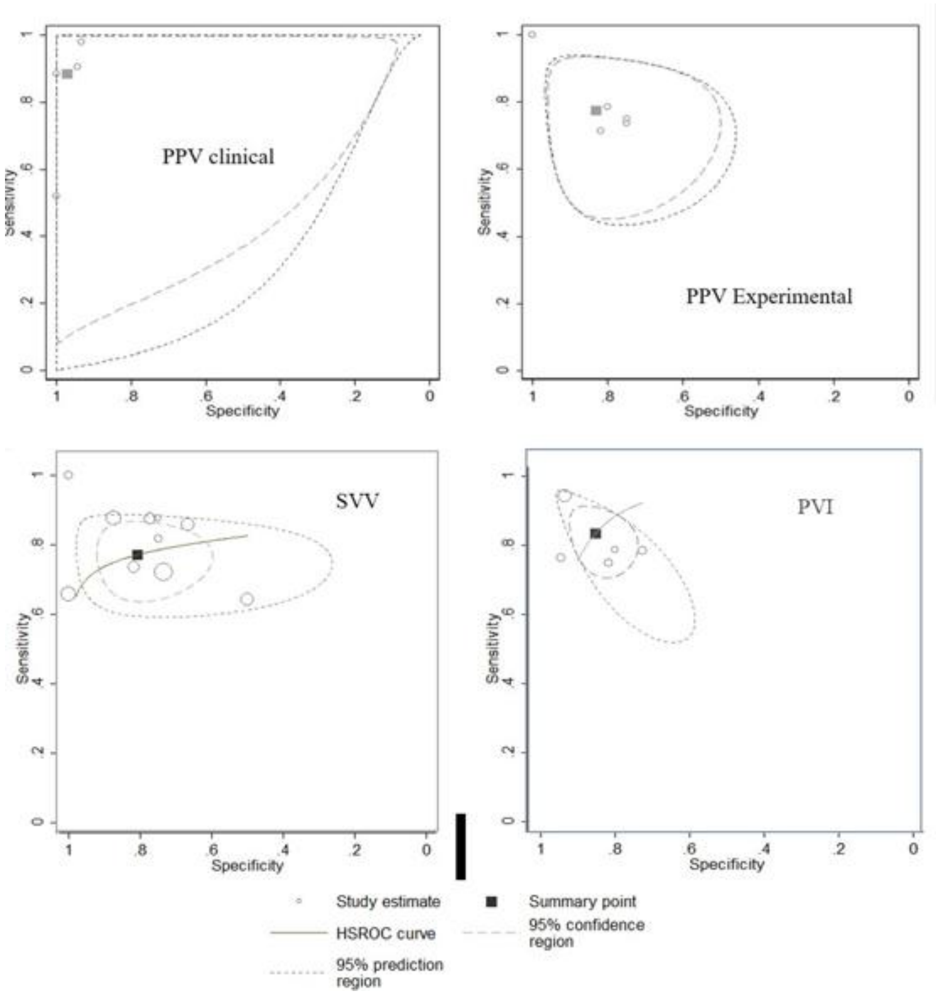
Study	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
Endo 2017a	7	0	0	13	1.00 [0.59, 1.00]	1.00 [0.75, 1.00]
Endo 2017b	10	4	4	18	0.71 [0.42, 0.92]	0.82 [0.60, 0.95]
Muehlestein 2021	14	4	5	12	0.74 [0.49, 0.91]	0.75 [0.48, 0.93]
Sano 2018	11	2	3	8	0.79 [0.49, 0.95]	0.80 [0.44, 0.97]
Sasaki 2018a	6	1	2	3	0.75 [0.35, 0.97]	0.75 [0.19, 0.99]

PVI

Study	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
Celita-Rodriguez 2019	16	1	5	17	0.76 [0.53, 0.92]	0.94 [0.73, 1.00]
Endo 2017b	11	6	3	16	0.79 [0.49, 0.95]	0.73 [0.50, 0.89]
Sandez 2024	6	4	2	18	0.75 [0.35, 0.97]	0.82 [0.60, 0.95]
Sano 2018	11	2	3	8	0.79 [0.49, 0.95]	0.80 [0.44, 0.97]
Skouropoulou 2021	47	2	3	28	0.94 [0.83, 0.99]	0.93 [0.78, 0.99]

SVV

Study	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
Celita-Rodriguez 2019	18	6	3	12	0.86 [0.64, 0.97]	0.67 [0.41, 0.87]
de Oliveira 2021	21	3	3	21	0.88 [0.68, 0.97]	0.88 [0.68, 0.97]
Endo 2017a	7	0	0	13	1.00 [0.59, 1.00]	1.00 [0.75, 1.00]
Endo 2017b	9	11	5	11	0.64 [0.35, 0.87]	0.50 [0.28, 0.72]
Goncalves 2020	23	0	12	15	0.66 [0.48, 0.81]	1.00 [0.78, 1.00]
Sandez 2024	7	5	1	17	0.88 [0.47, 1.00]	0.77 [0.55, 0.92]
Sasaki 2017	14	2	5	9	0.74 [0.49, 0.91]	0.82 [0.48, 0.98]
Sasaki 2018a	7	1	1	3	0.88 [0.47, 1.00]	0.75 [0.19, 0.99]
Sasaki 2018b	9	1	2	3	0.82 [0.48, 0.98]	0.75 [0.19, 0.99]
Skouropoulou 2021	36	8	14	22	0.72 [0.58, 0.84]	0.73 [0.54, 0.88]



Algunos aspectos técnicos de los estudios

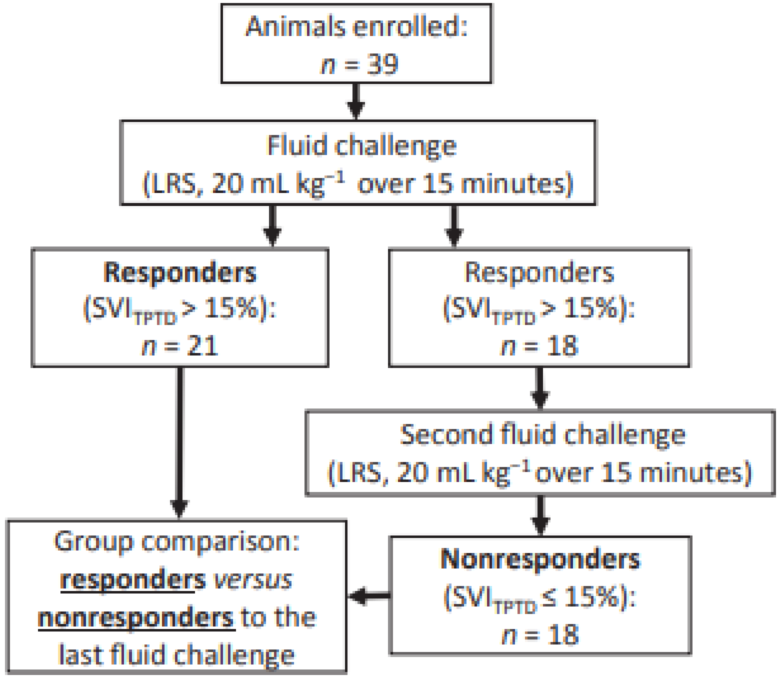
- Alta tasa de respuesta a fluidos
- Volumen corriente empleado
- Tamaño del bolo de expansión
- Gold standar

RESEARCH PAPER

Comparison of the diagnostic accuracy of dynamic and static preload indexes to predict fluid responsiveness in mechanically ventilated, isoflurane anesthetized dogs

Nathalia Celeita-Rodríguez[a], Francisco J Teixeira-Neto[a,b], Natache A Garofalo[b], Tábata L Dalmagro[a], Carolina H Girotto[a], Guillermo CV Oliveira[a] & Ivan FC Santos[b]

Veterinary Anaesthesia and Analgesia 2019, **46**, 276–288



J Vet Sci. 2019 May;20(3):e21
https://doi.org/10.4142/jvs.2019.20.e21
pISSN 1229-845X·eISSN 1976-555X

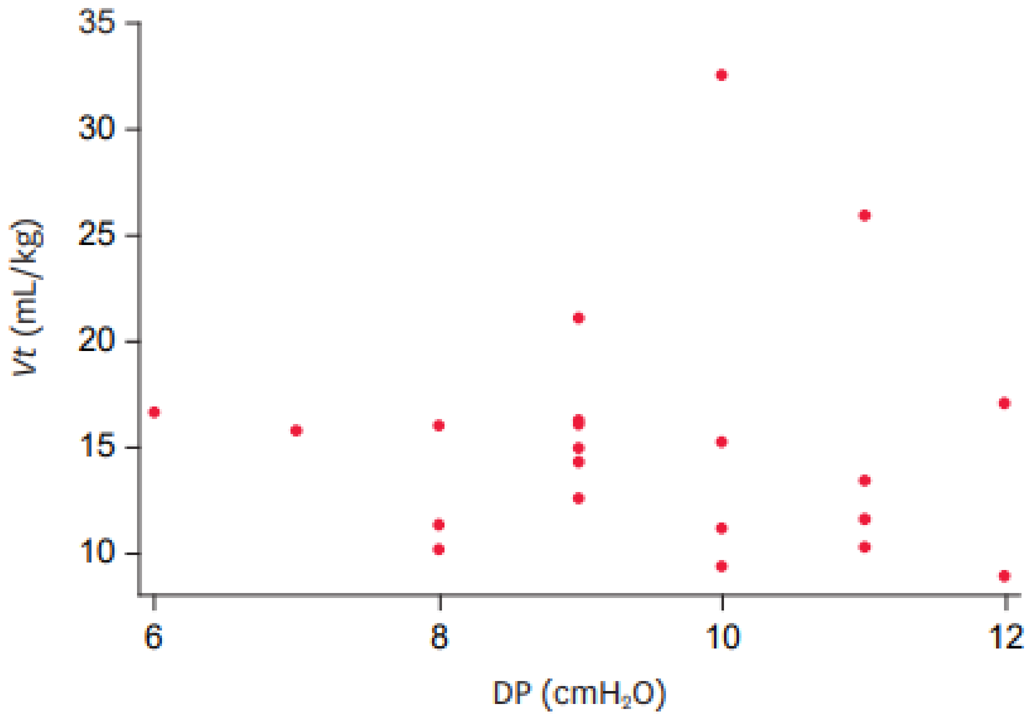
Journal of Veterinary Science

Original Article

Check for updates

Tidal volume in mechanically ventilated dogs: can human strategies be extrapolated to veterinary patients?

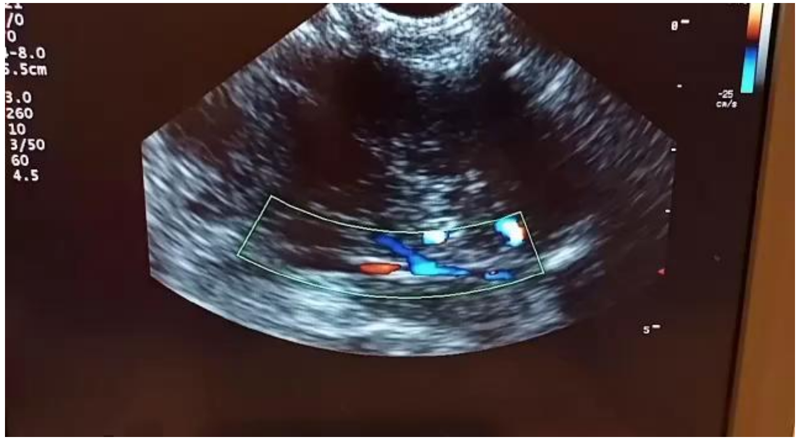
Pablo A Donati [1,*], Gustavo Plotnikow [2,3], Gloria Benavides[1], Guillermo Belerenian[4], Mario Jensen [5], Leonel Londoño [6]




%SpO2
PR bpm
96
99
239
85
Color Pulse Oximeter

Ventilación espontánea

Evaluación de la Vena cava caudal



Received: 23 September 2018 | Revised: 3 February 2019 | Accepted: 9 March 2020

DOI: 10.1111/vec.13009

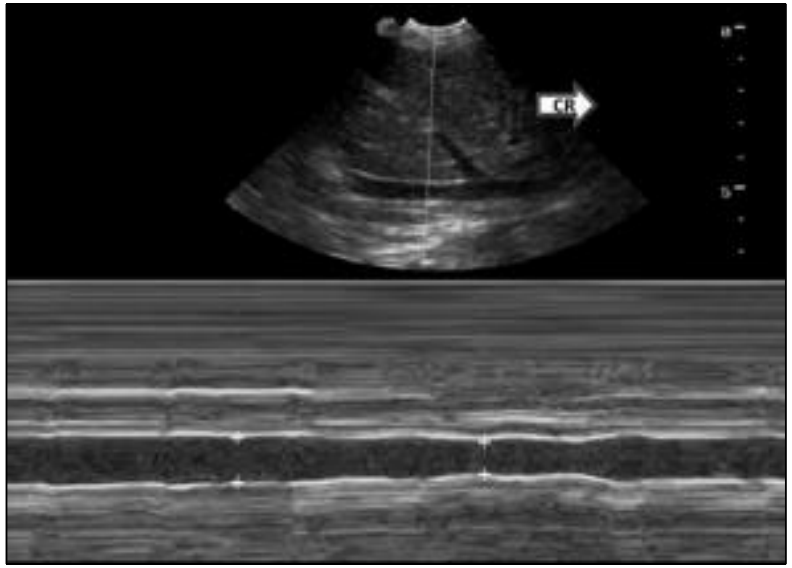
Journal of Veterinary Emergency and Critical Care

WILEY

ORIGINAL STUDY

Caudal vena cava collapsibility index as a tool to predict fluid responsiveness in dogs

Pablo A. Donati MS, DVM[1] | Juan M. Guevara DVM[1] | Victoria Ardiles MS, MD[2] | Eliana C. Guillemi PhD, DVM[1] | Leonel Londoño DVM[3] | Arnaldo Dubin PhD, MD[4]



The cut-off CVCCI that better discriminated between responder and nonresponder dogs to fluids was 26.7% with 100.0% sensitivity and 83.3% specificity, respectively

Received: 23 September 2018 | Revised: 3 February 2019 | Accepted: 9 March 2020
DOI: 10.1111/vec.13009

ORIGINAL STUDY

Veterinary Emergency and Critical Care WILEY

Caudal vena cava collapsibility index as a tool to predict fluid responsiveness in dogs

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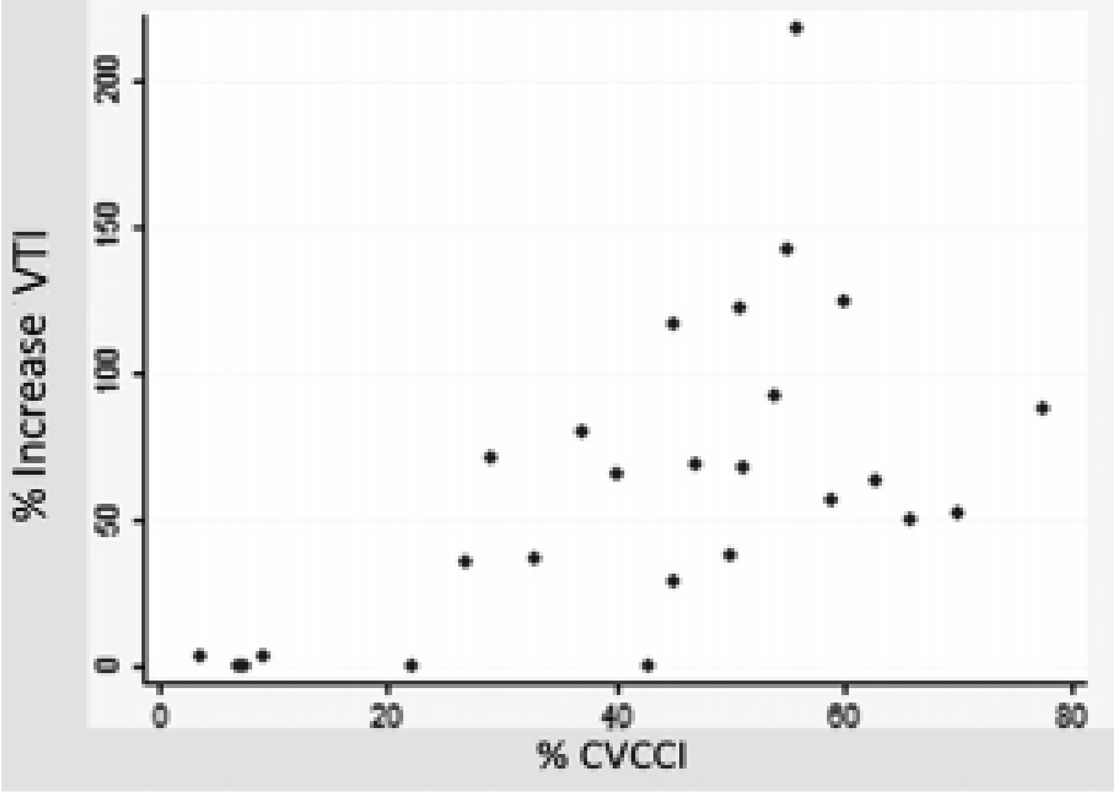


No respondedor a fluidos

WHAT'S NEW IN INTENSIVE CARE

Ten situations where inferior vena cava ultrasound may fail to accurately predict fluid responsiveness: a physiologically based point of view

G. Via[1*], G. Tavazzi[1,2,3] and S. Price[3]

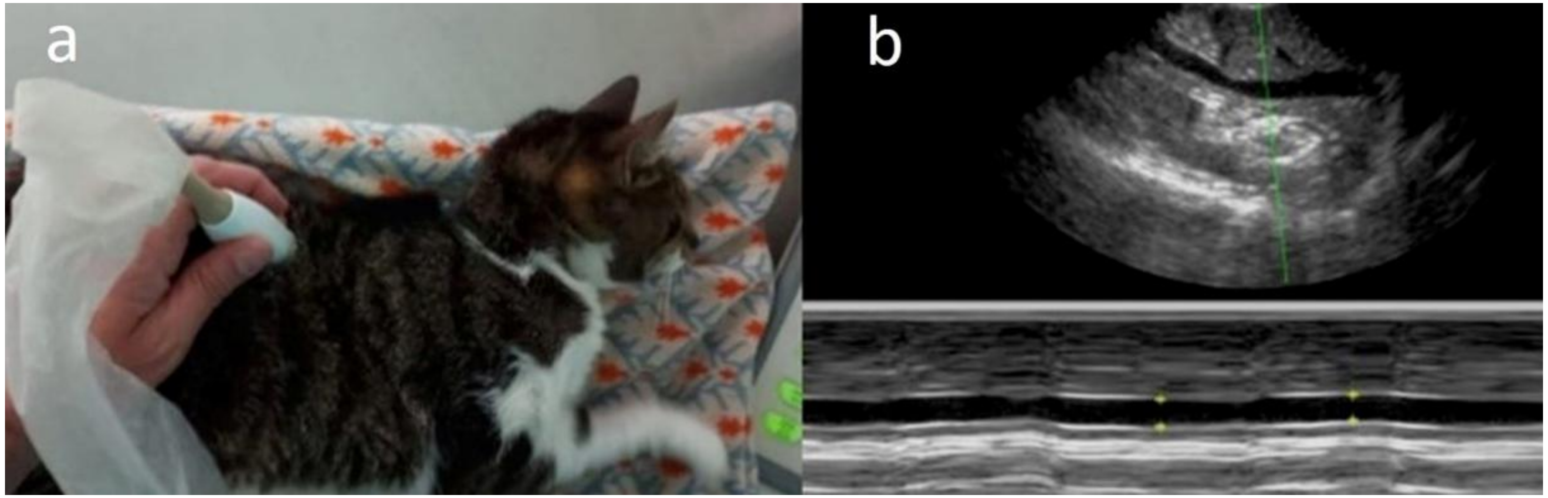
Ventilator settings	1. Mechanical ventilation with high PEEP and/or low tidal volumes	Larger IVC size, potentially with systemic venous congestion and low respiratory variations, but coexisting with FR
Patient's inspiratory efforts	2. Assisted ventilation modalities, NIV, CPAP	Spontaneous breathing activity makes IVC variation unpredictable
	3. Varying respiratory pattern in spontaneous breathing	Significant inspiratory effort, producing markedly negative intrathoracic pressures may induce IVCc in absence of FR
		Shallow breathing, with small intrathoracic pressure changes, may induce absence of IVCc in presence of FR
Lung hyperinflation	4. Asthma/COPD exacerbation	Lung hyperinflation and auto-PEEP simultaneously reduce venous return and induce IVC distension: this may mimic absence of FR
		Forced expiration ("abdominal breathing" causing expiratory collapse) may mimic IVCc
Cardiac conditions impeding venous return	5. Chronic RV dysfunction, severe TR	Chronic enlargement of IVC and reduced IVCc may erroneously rule out FR
	6. RV myocardial infarction	RV dilatation and systemic venous congestion (large IVC) may be associated with FR
	7. Cardiac tamponade	Marked venous return hindrance: fluid challenge may be a beneficial haemodynamic intervention despite IVC plethora
Increased abdominal pressure	8. Intra-abdominal hypertension	Smaller IVC size, IVCd or IVCc abolition (depending on type respiration/ventilation mode)
Other factors	9. Local mechanical factors	Venous return hindrance, IVC dilatation (stenosis, thrombosis)
		IVC compression (masses)
		Hindrance to IVC size change (ECMO cannulae, cava filters)

ORIGINAL STUDY

Veterinary Emergency and Critical Care WILEY

Caudal vena cava measurements and fluid responsiveness in hospitalized cats with compromised hemodynamics and tissue hypoperfusion

Pablo A. Donati MS, DVM[1,2] | Marcela Tunesi DVM[2] | Joaquin Araos PhD, DVM[3]

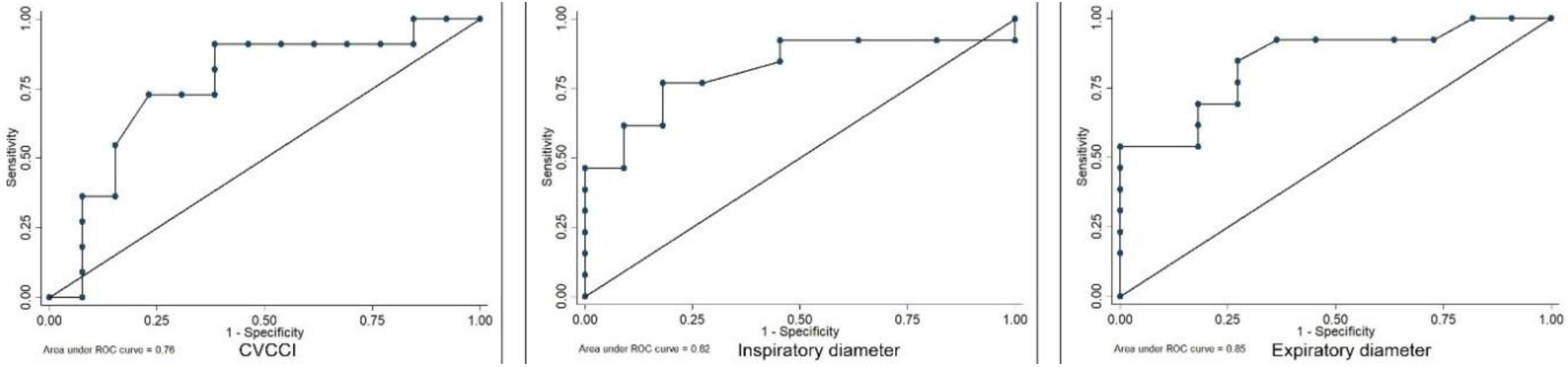


Veterinary Emergency and Critical Care
WILEY

ORIGINAL STUDY

Caudal vena cava measurements and fluid responsiveness in hospitalized cats with compromised hemodynamics and tissue hypoperfusion

Pablo A. Donati MS, DVM[1,2] | Marcela Tunesi DVM[2] | Joaquin Araos PhD, DVM[3]



The area under the receiver operating characteristic curve (AUROC) with their 95% confidence interval for the predictors and the best cutoff values were as follows: CVCCI, AUROC = 0.83 (0.66-1.00) and cutoff = 31%; inspiratory/minimum diameter, AUROC = 0.86 (0.70-1.00) and cutoff = 0.24 cm; expiratory/maximum diameter, AUROC = 0.88 (0.74-1.00) and cutoff = 0.22 cm.

Ventilación mecánica o espontánea

frontiers
in Veterinary Science

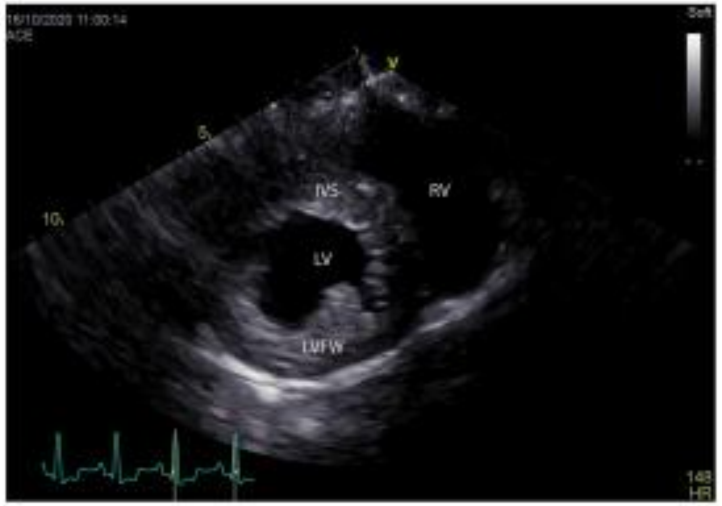
REVIEW
published: 28 May 2021
doi: 10.3389/fvets.2021.630643

Assessment of Volume Status and Fluid Responsiveness in Small Animals

Søren R. Boysen[1]* and Kris Gommeren[2]

[1] Department of Veterinary Clinical and Diagnostic Sciences, Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada, [2] Department of Companion Animals, Faculty of Veterinary Medicine, University of Liège, Liège, Belgium

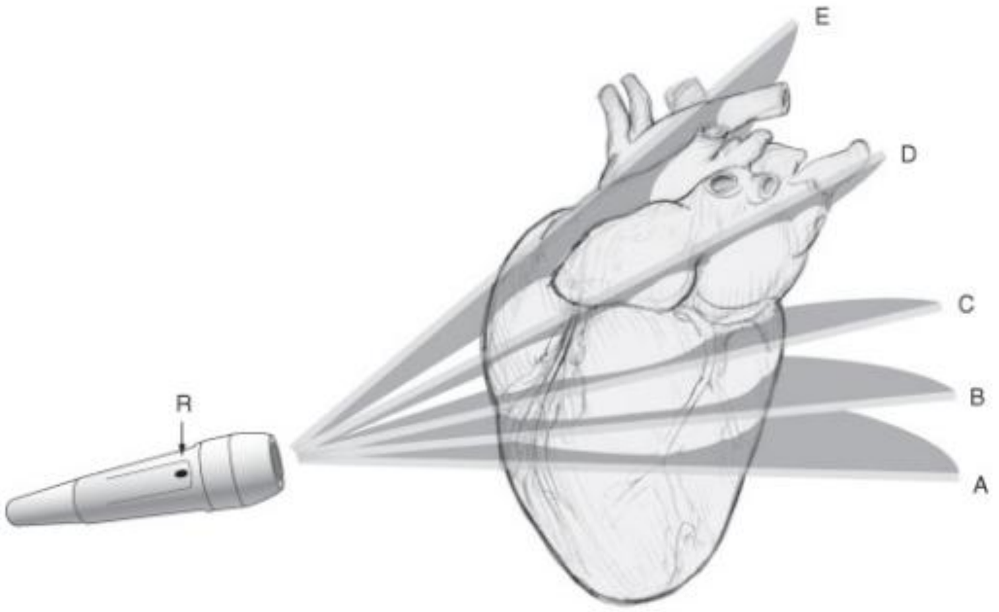
B

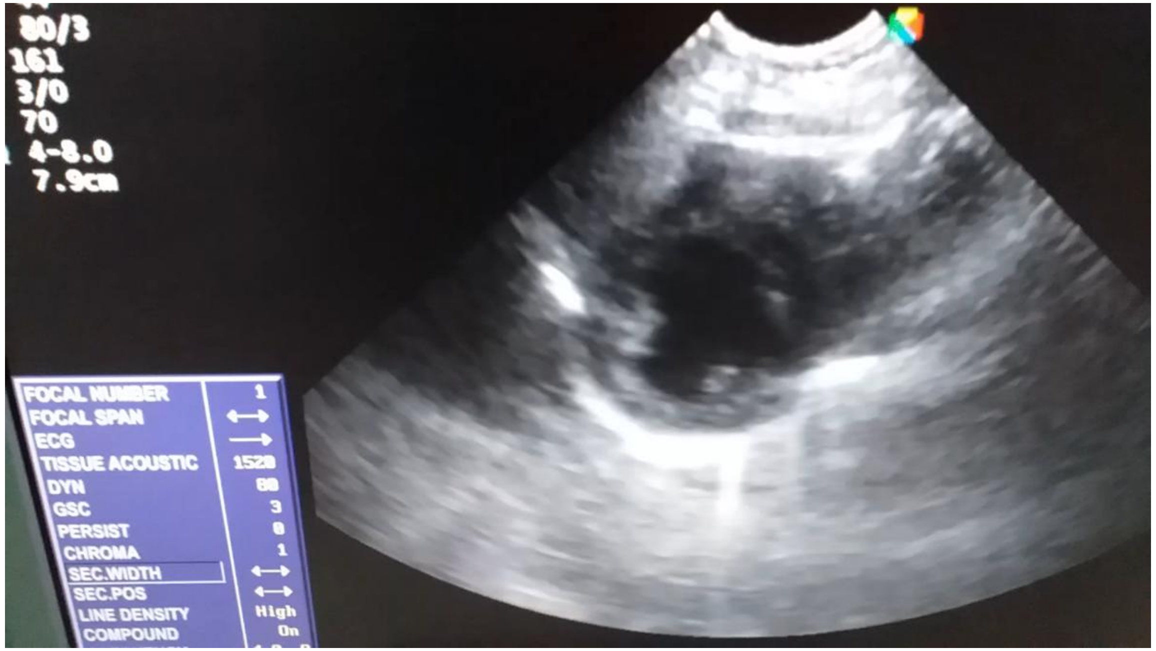


Corazón

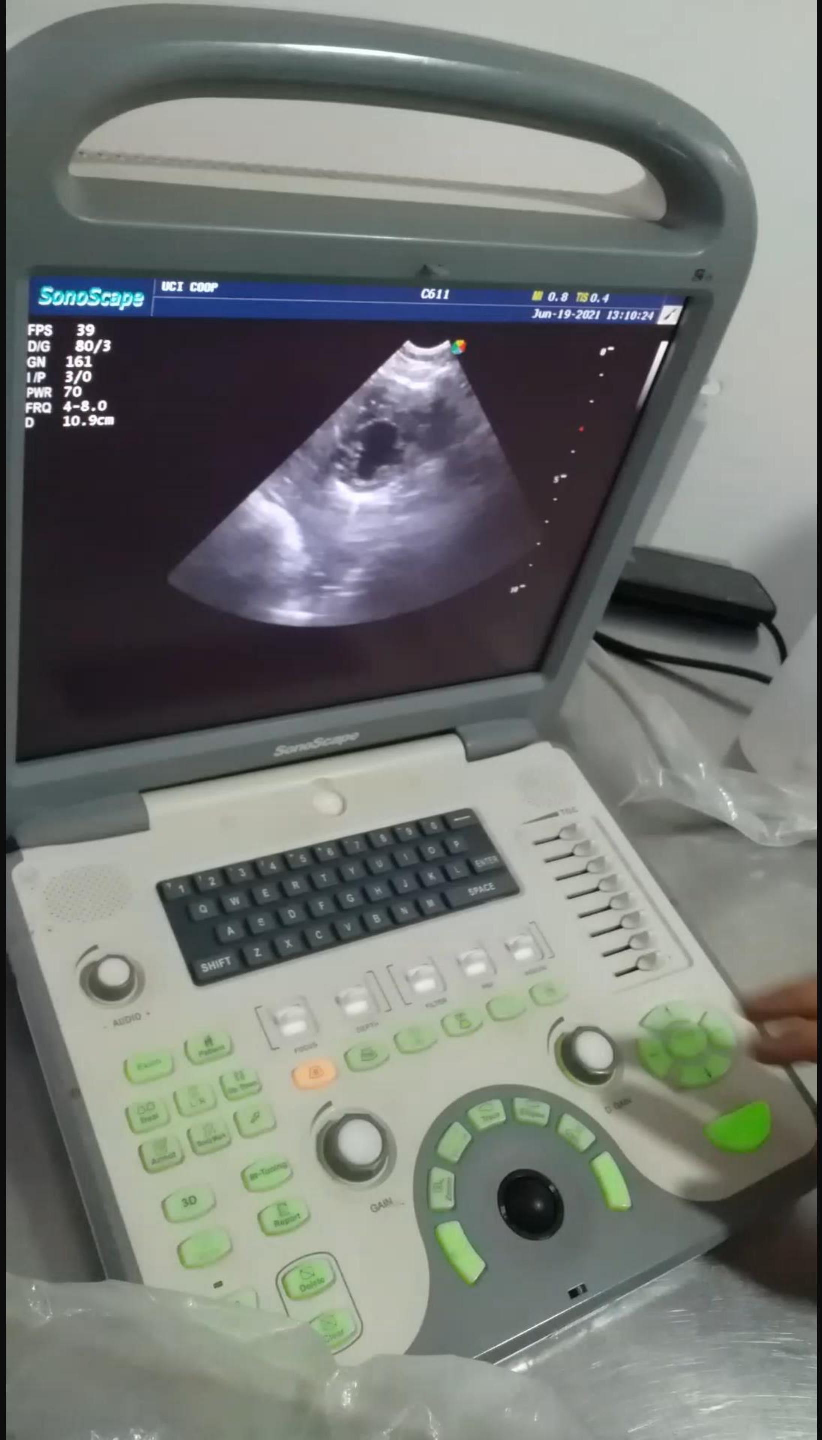
- LVIdDn
- E transmitral
- VTI
- TAPSE

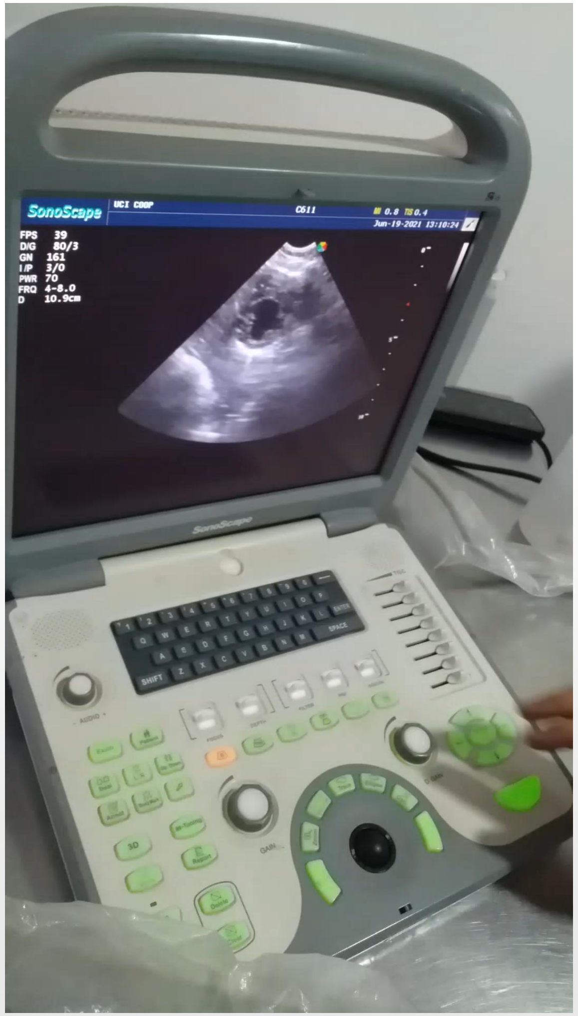
LVIDdN

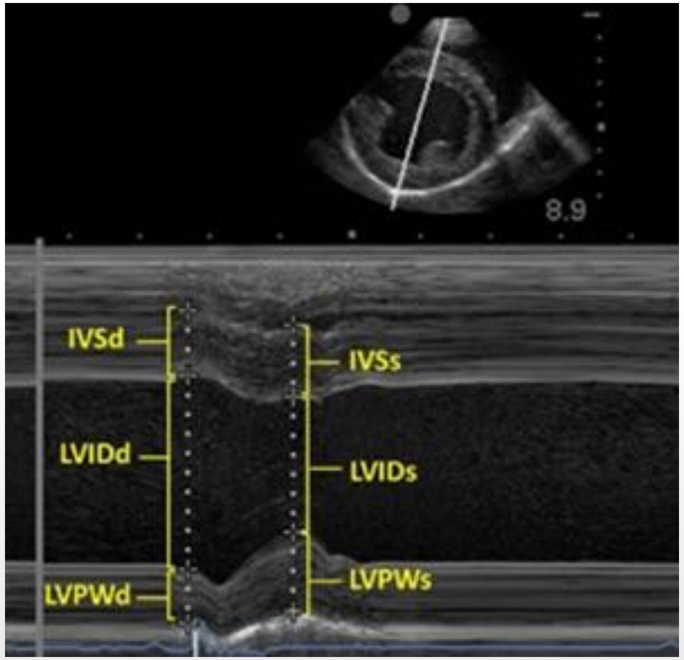

E
D
C
B
A
R


80/3
161
3/0
70
4-8.0
7.9cm
FOCAL NUMBER 1
FOCAL SPAN
ECG
TISSUE ACOUSTIC 1520
DYN 80
GSC 3
PERSIST 0
CHROMA 1
SEC.WIDTH
SEC.POS
LINE DENSITY High
COMPOUND On

- Profundidad
- Ancho del sector
- Ganancia
- Foco







M-Mode Images

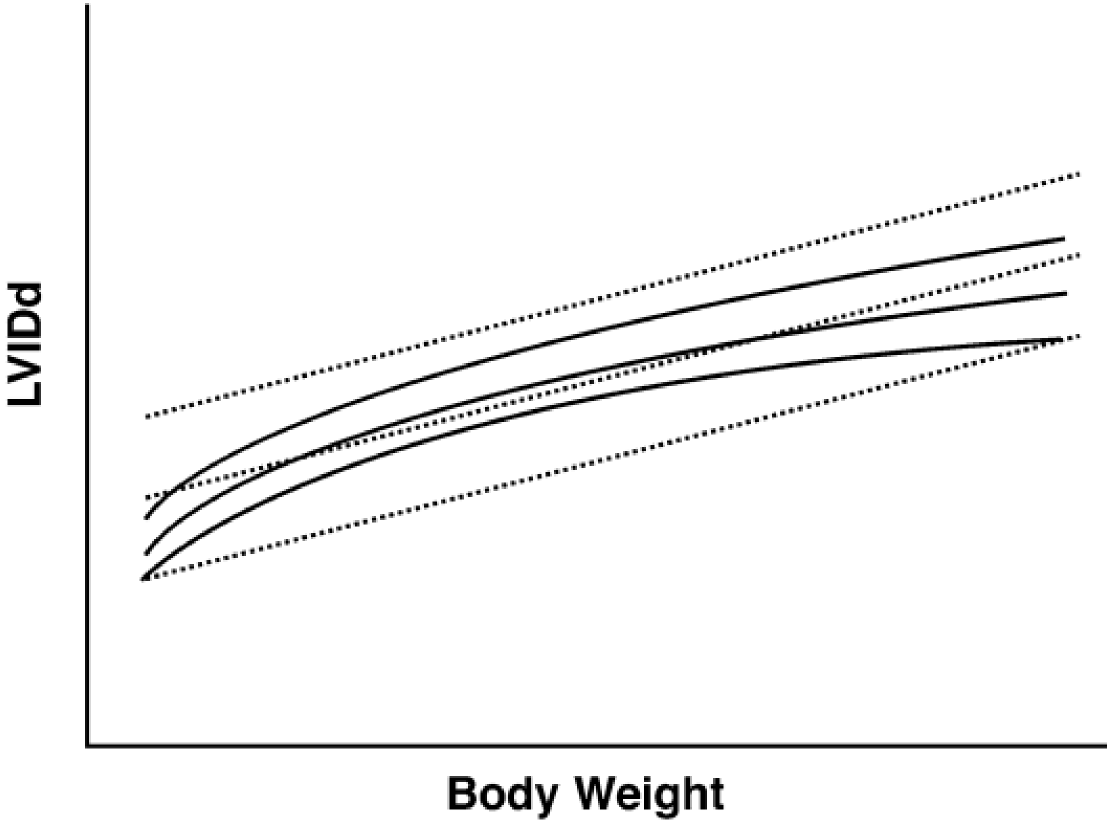
- One-dimensional image of structures
- Only structures associated with the cursor are seen
- Depth on the Y axis
- Time on the X axis
- Records subtle changes in wall and valve motion
- Used for accurate measurements of size

Advances in echocardiography

Mark A. Oyama, DVM

Department of Veterinary Clinical Medicine, College of Veterinary Medicine, University of Illinois, 1008 West Hazelwood Drive, Urbana, IL 61802, USA

Vet Clin Small Anim 34 (2004) 1083–1104



LVIdDN = LVIDd (cm)/ Peso (Kg)$^{0.294}$

Received: 5 March 2017 | Revised: 4 October 2017 | Accepted: 17 October 2017

DOI: 10.1111/vec.12883

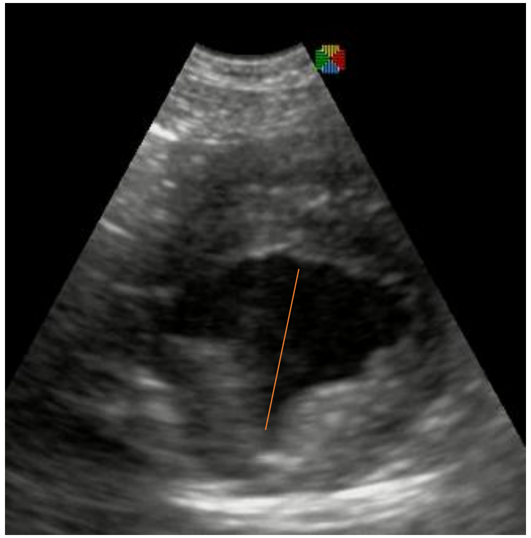
Veterinary Emergency and Critical Care WILEY

ORIGINAL STUDY

Interobserver agreement between non-cardiologist veterinarians and a cardiologist after a 6-hour training course for echographic evaluation of basic echocardiographic parameters and caudal vena cava diameter in 15 healthy Beagles

Elodie Darnis DVM, DECVIM[1] | Anne Christine Merveille DECVIM, PhD[2] | Loïc Desquilbet PhD[3] | Soren Boysen DVM, DACVECC[4] | Kris Gommeren DMV, DECVIM, DECVECC, PhD[5]

Right parasternal short axis (transventricular)	From the long axis view rotate 90 degrees (reference toward elbows). Slide and/or angle until a view of the papillary muscles (just below the mitral valve) appears. For MM, place the cursor perpendicular to the septum, between the papillary muscles at the largest left ventricular dimension. The left ventricle should be divided into equal and identical halves.	LVIDDN	Volemic parameter



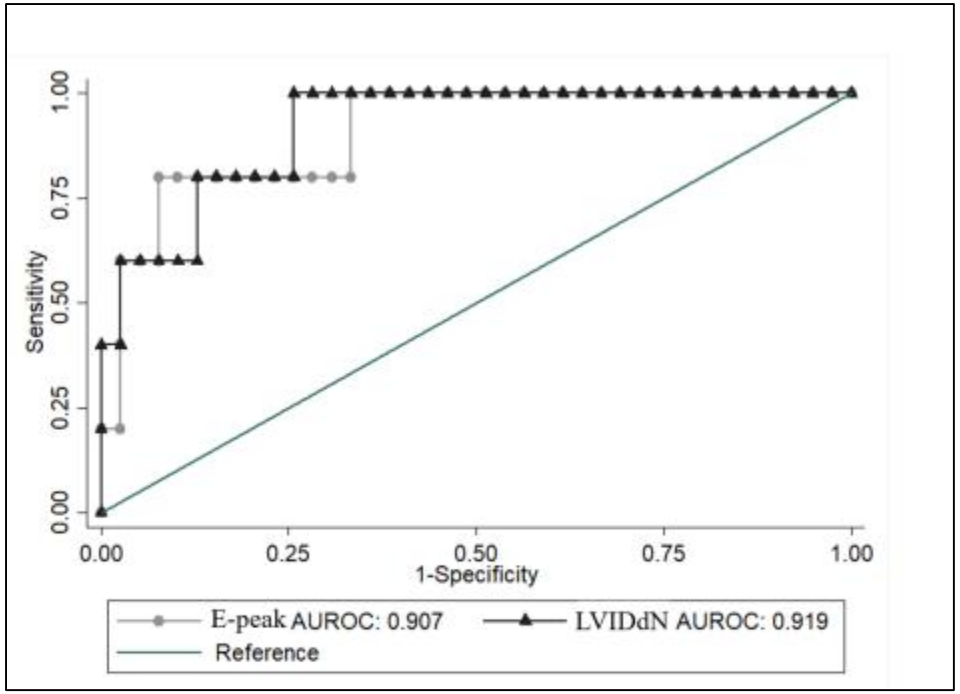
JOURNAL OF
Veterinary Emergency
AND Critical Care

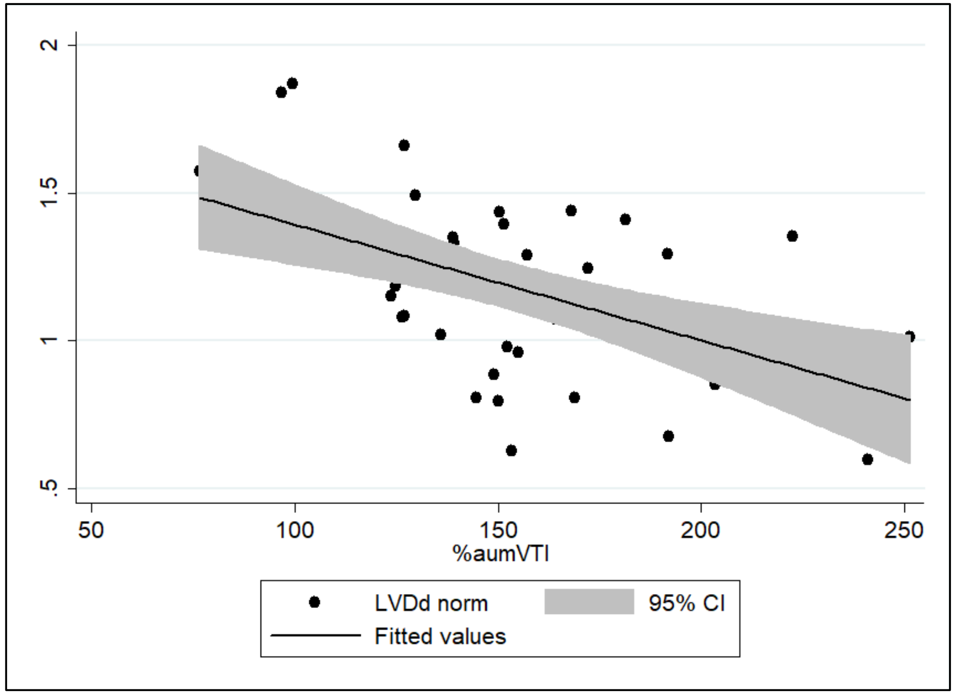
Echocardiographic indicators of fluid responsiveness in hospitalized dogs with compromised hemodynamics and tissue hypoperfusion

Pablo A Donati, Ms, DVM *€¥, Cesar Villalta, DVM µ; Tarragona lisa, PhD, DVM €,

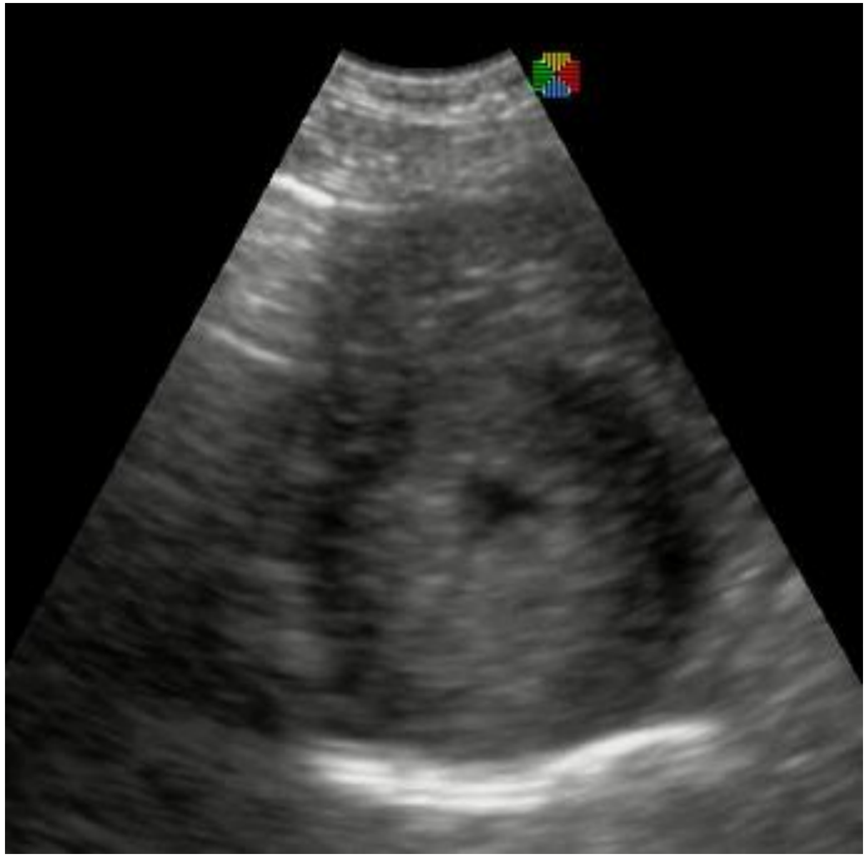
Rodrigo Fravega, DVM Ω; Ignacio Sandez Cordero, DVM α; Marcela Tunesi, DVM ¥;

Juan Manuel Guevara, DVM ¥; Pablo E. Otero PhD, DVM €





Variable	AUROC (95% CI)	Cutoff value	Sensitivity (95% CI)	Specificity (95% CI)	Positive predictive value (95% CI)	Negative predictive value (95% CI)	*P*-value
LVIDdN	0.919 (0.801–1.000)	1.32	100 (47.8–100)	74.4 (57.9–87)	33.3 (11.8–61.6)	100 (88.1–100)	<0.001



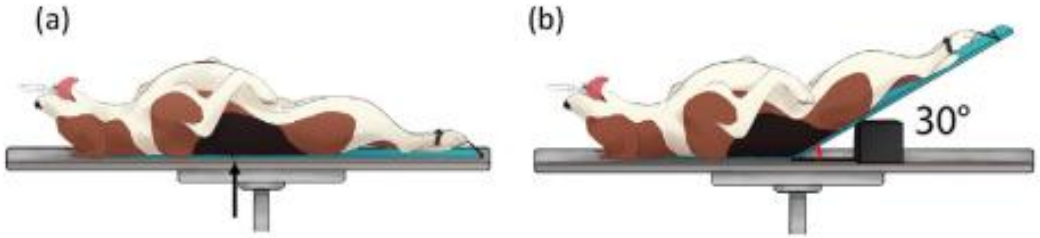
Cuidado!!! Hipovolemia o Fenotipo CMH?

Veterinary Anaesthesia and Analgesia 2023, **50**, 211–219 https://doi.org/10.1016/j.vaa.2023.02.009

RESEARCH PAPER

Volumetric evaluation of fluid responsiveness using a modified passive leg raise maneuver during experimental induction and correction of hypovolemia in anesthetized dogs

Vaidehi V Paranjape[a], Natalia Henao-Guerrero[a], Giulio Menciotti[a] & Siddharth Saksena[b]

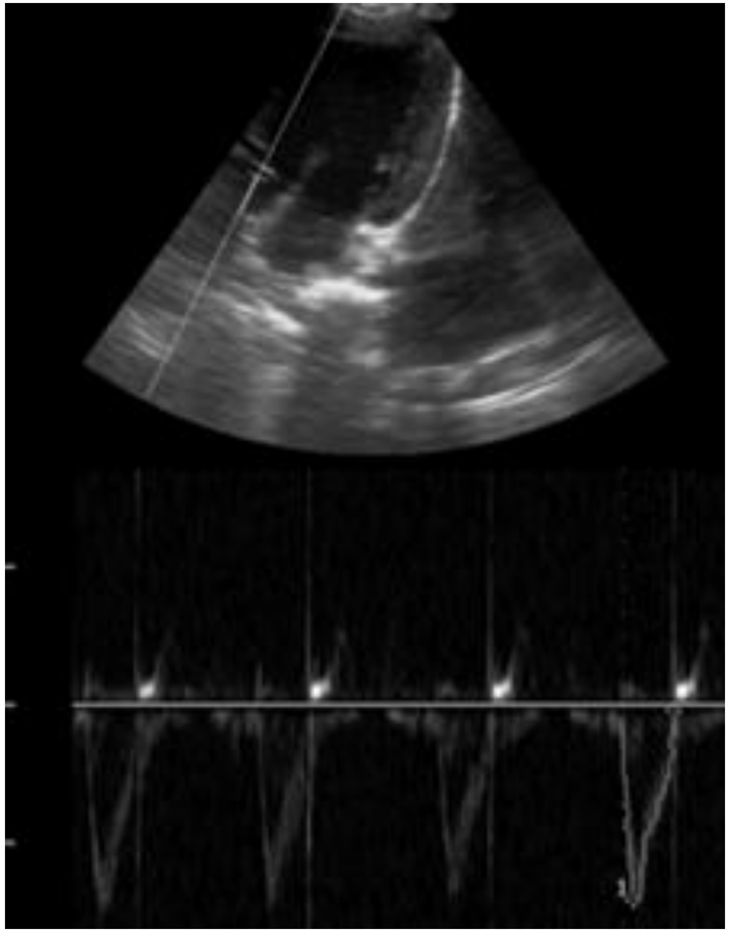


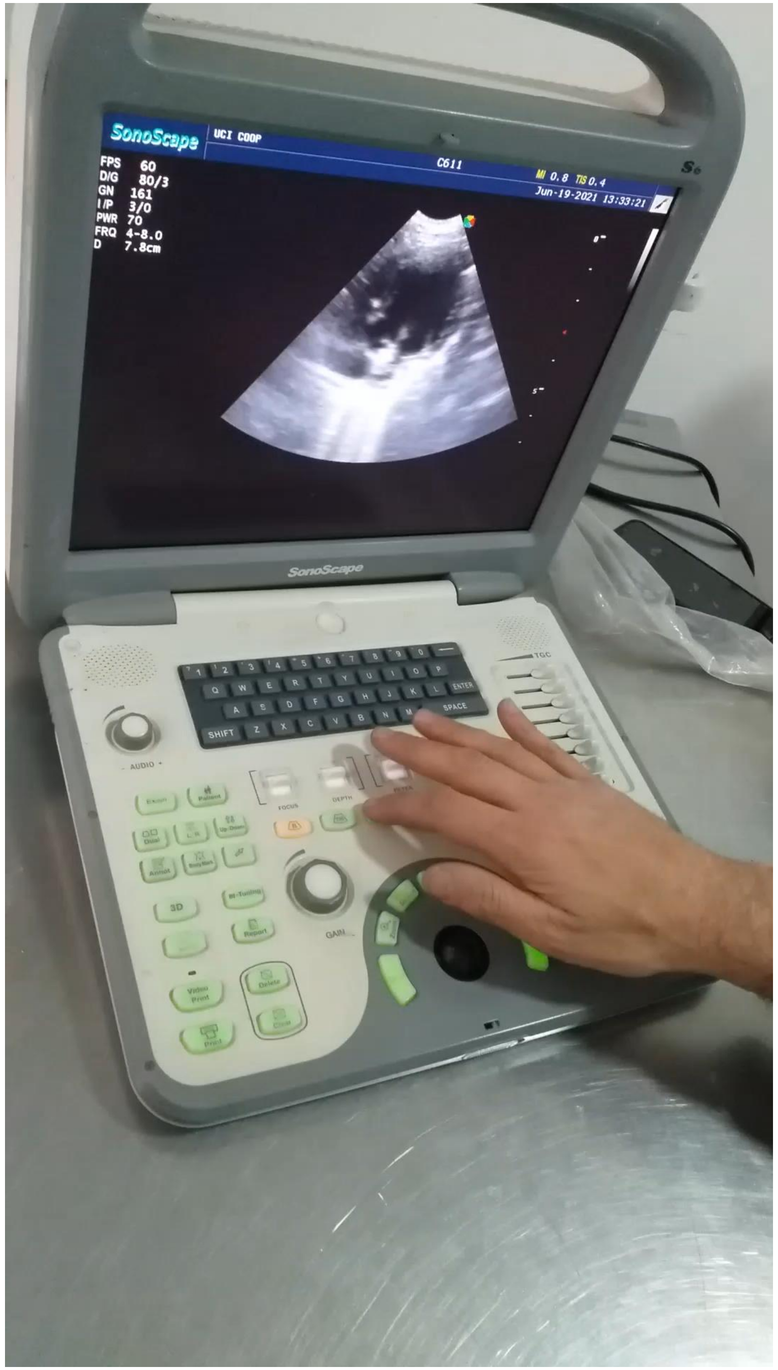
Variable	Stage	Time of data collection		
		Pre-PLR$_M$	PLR$_M$	Post-PLR$_M$
CO (L minute^{-1})	1	1.7 ± 0.4	1.8 ± 0.6	1.7 ± 0.5
	2	1.0 ± 0.1*	1.3 ± 0.1*§	1.0 ± 0.2*¶
	3	2.1 ± 0.3*†	2.0 ± 0.4*†	2.1 ± 0.2*†
	4	3.2 ± 0.1*†‡	3.3 ± 0.3*†‡	3.2 ± 0.2*†‡

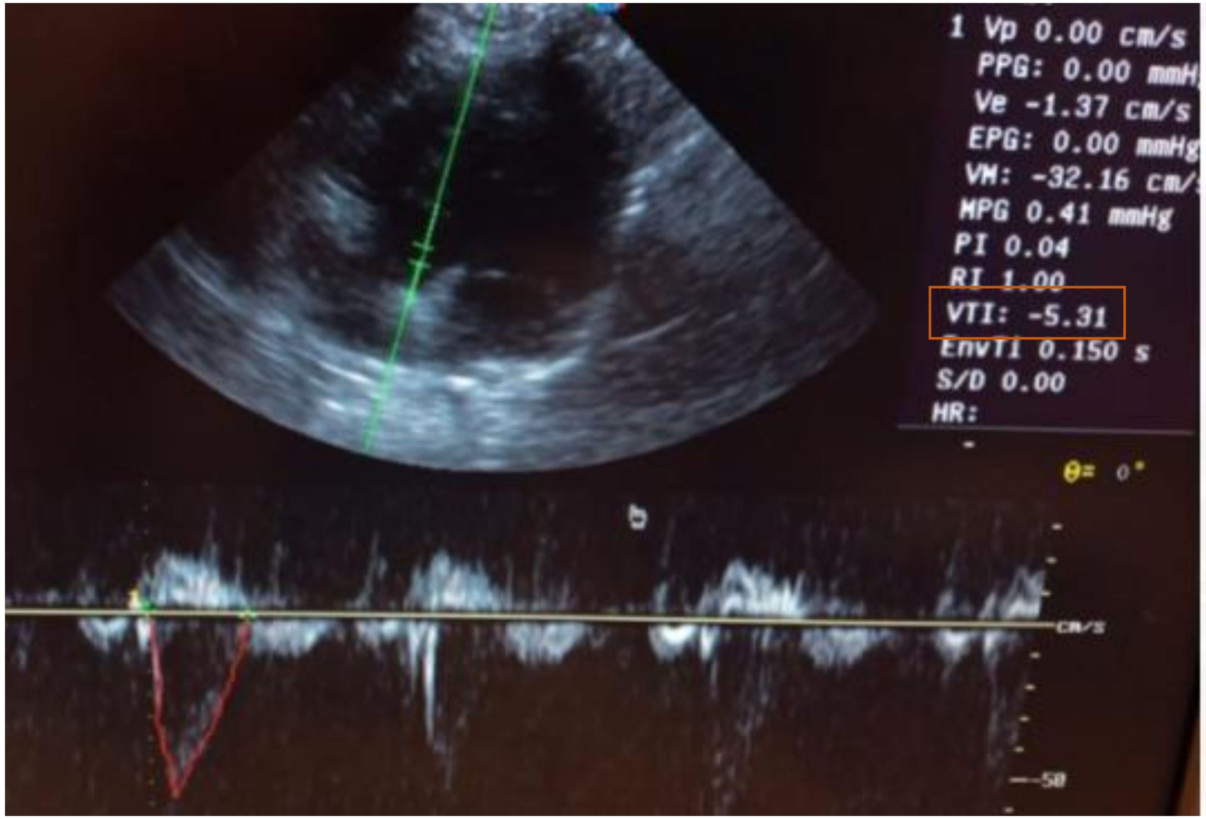
Certificación de la respuesta a fluidos

Aumento del SV o CO ≥ 15 %

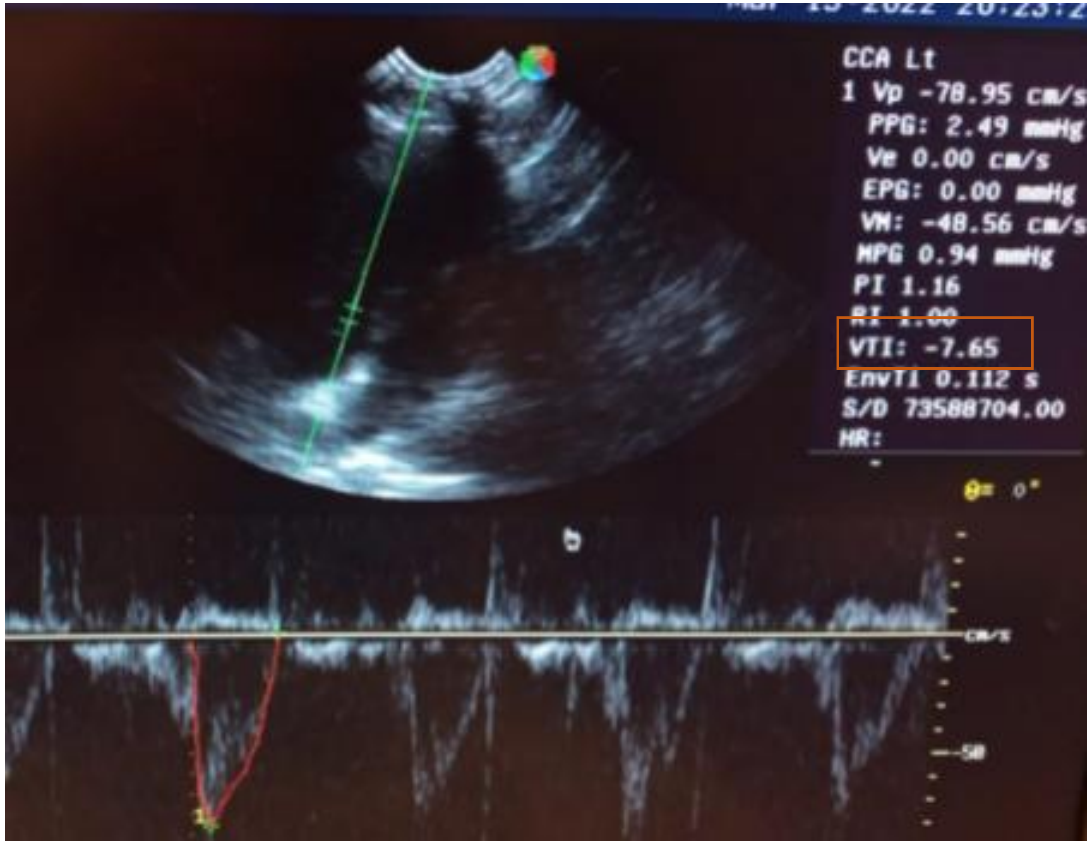
Integral Velocidad- Tiempo (VTI)






1 Vp 0.00 cm/s
PPG: 0.00 mmH
Ve -1.37 cm/s
EPG: 0.00 mmHg
VM: -32.16 cm/
MPG 0.41 mmHg
PI 0.04
RI 1.00
VTI: -5.31
EnvTI 0.150 s
S/D 0.00
HR:
θ= 0°
cm/s
-50

20
ml/kg
SRL


CCA Lt
1 Vp -78.95 cm/s
PPG: 2.49 mmHg
Ve 0.00 cm/s
EPG: 0.00 mmHg
VM: -48.56 cm/s
MPG 0.94 mmHg
PI 1.16
RI 1.00
VTI: -7.65
EnvTI 0.112 s
S/D 73588704.00
HR:
θ= 0°
cm/s
-50

Veterinary Anaesthesia and Analgesia 2021, **48**, 501−508 https://doi.org/10.1016/j.vaa.2021.01.009

RESEARCH PAPER

Comparison between pulse pressure variation and systolic pressure variation measured from a peripheral artery for accurately predicting fluid responsiveness in mechanically ventilated dogs

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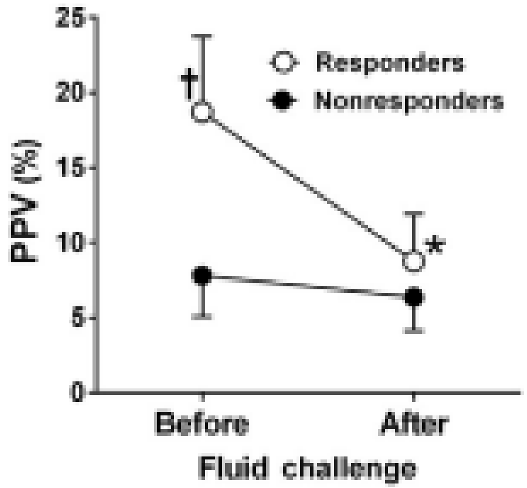

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DOI: 10.1111/vec.13435

PROSPECTIVE STUDY

Veterinary Emergency and Critical Care WILEY

Assessment of change in end-tidal CO_2 after fluid challenge as a marker of fluid responsiveness as measured by the aortic velocity time integral in healthy anesthetized mechanically ventilated dogs

Lisa Tarragona DVM, MS, PhD | Pablo A. Donati DVM, MS | Andrea S. Zaccagnini DVM | Alfredo J. Díaz DVM | Martín R. Ceballos DVM, PhD | Nestor M. Nigro DVM | Santiago E. Fuensalida DVM | Pablo E. Otero DVM, PhD

Test characteristics	T1	T5	T10
AUROC	0.71 (95% CI: 0.54–0.88)	0.69 (95% CI: 0.50–0.89)	0.75 (95% CI: 0.56–0.93)
Optimal cutoff (mm Hg)	1	1	1
Sensitivity (%)	53.85 (95% CI: 25.1–80.0)	69.23 (95% CI: 38.6–90.9)	84.62 (95% CI: 54.6–98.1)
Specificity (%)	85.71 (95% CI: 57.2–98.2)	64.29 (95% CI: 35.1–87.2)	64.29 (95% CI: 35.1–87.2)
Positive predictive value (%)	77.8 (95% CI: 40–97.2)	64.3 (95% CI: 35.1–87.2)	68.8 (95% CI: 41.3–89)
Negative predictive value (%)	66.7 (95% CI: 41–86.7)	69.2 (95% CI: 38.6–90.9)	81.8 (95% CI: 48.2–97.7)

Muchas Gracias