Cours DESAR 30 sept 2015

L Muller. MD, PhD.

Actualités en échographie et hémodynamique

Quoi de neuf fin 2015 ?

AZUREA

Université Montpellier 1 Faculté de Médecine Montpellier - Nîmes

CHU Nîmes

Actualités en échographie

Qui fait une échographie avant de remplir ?

Outils d'évaluation de la volémie :
Place de l'échocardiographie en pratique

Volume expansion in the first 4 days of shock: a prospective multicentre study in 19 French intensive care units n = 777

Primary cause of shock	
Severe sepsis or septic shock	333 (42.9 %)
Cardiogenic shock	54 (6.9 %)
Haemorrhagic shock	36 (4.6 %)
Other shock	354 (45.6 %)
Haemodynamic tools used during the period of shock (during at least one fluid bolus)	
Cardiac output monitoring	69 (8.9 %)
Central venous pressure measurement	131 (16.9 %)
Echography	56 (7.2 %)
Functional predictive indices of fluid responsiveness	134 (17.2 %)

Boulain et al Intensive Care Med 2015

Outils d'évaluation de la volémie :
Place de l'échocardiographie en pratique

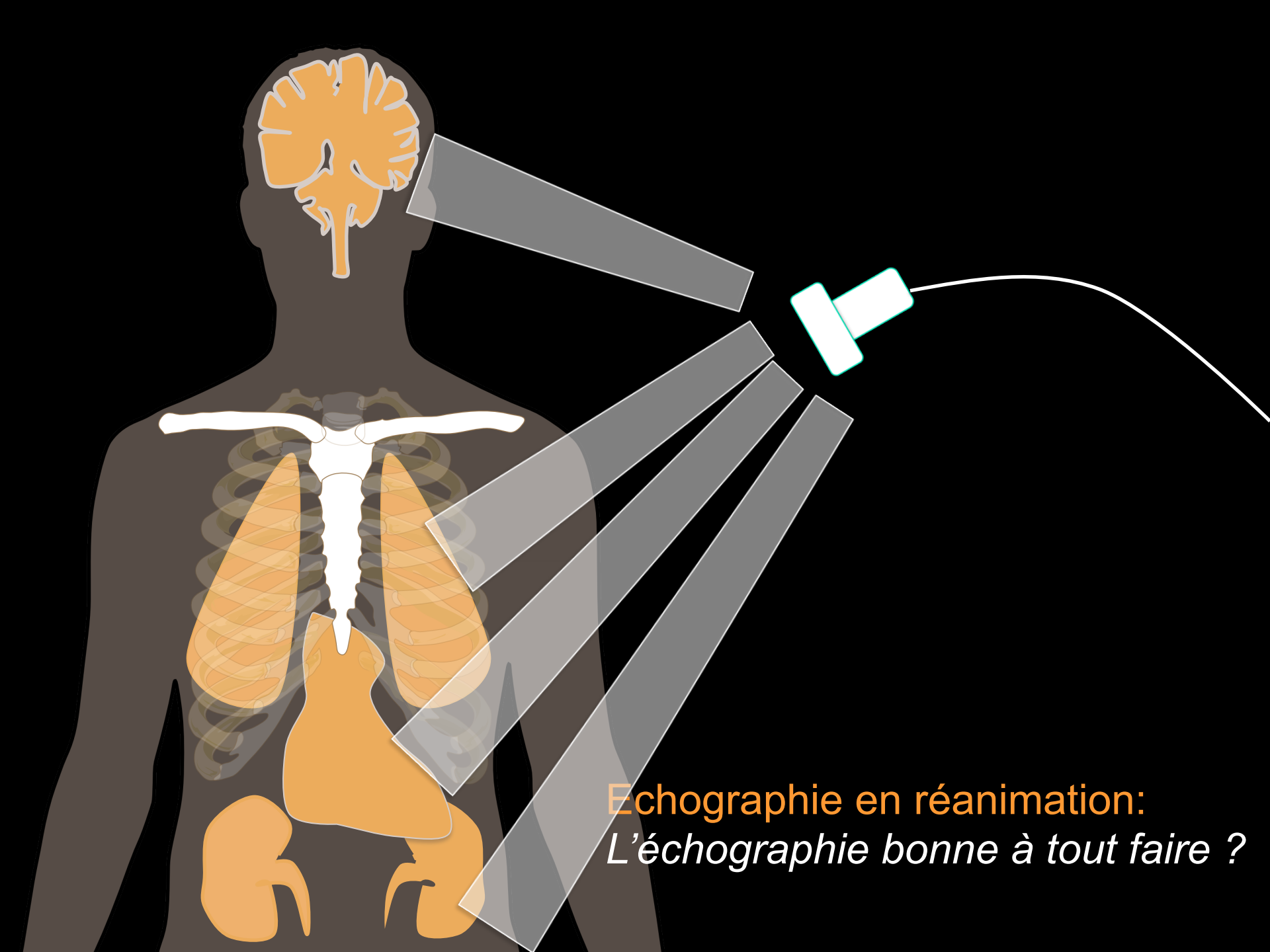
Fluid challenges in intensive care: the FENICE study

A global inception cohort study 2213 patients

Maurizio Cecconi
Christoph Hofer
Jean-Louis Teboul
Ville Pettila
Erika Wilkman
Zsolt Molnar
Giorgio Della Rocca
Cesar Aldecoa
Antonio Artigas
Sameer Jog
Michael Sander
Claudia Spies
Jean-Yves Lefrant
Daniel De Backer

Hemodynamic variable used to predict fluid responsiveness	*n*	% Of category	% All
No variable used	945		42.7 [40.6–44.8]
Any variable used	1268		57.3 [55.2–59.4]
Static	785		35.5 [33.5–37.5]
CVP	572	89.9 [87.8–92.0]	25.8 [24.0–27.6]
PAOP	31	4.9 [3.4–6.4]	1.4 [0.9–1.9]
GEDVI	33	5.2 [3.6–6.8]	1.5 [1.0–2.0]
Other	149	23.4 [20.4–26.4]	6.7 [5.7–7.8]
Dynamic	483		21.9 [20.2–23.6]
PPV	88	18.2 [14.8–21.6]	4.0 [3.2–4.8]
SVV	88	18.2 [14.8–21.6]	4.0 [3.2–4.8]
PPV + SVV	24	5.0 [3.1–6.9]	1.1 [0.7–1.5]
PLR	238	49.3 [44.8–53.8]	10.7 [9.4–12.0]
Echo variables	45	9.3 [6.7–11.9]	2.0 [1.4–2.6]

Cecconi et al Intensive Care Med 2015


Echographie en réanimation:
L'échographie bonne à tout faire ?

Echographie en réanimation :
… Utile, peu cher et pertinent : EchoDay Study

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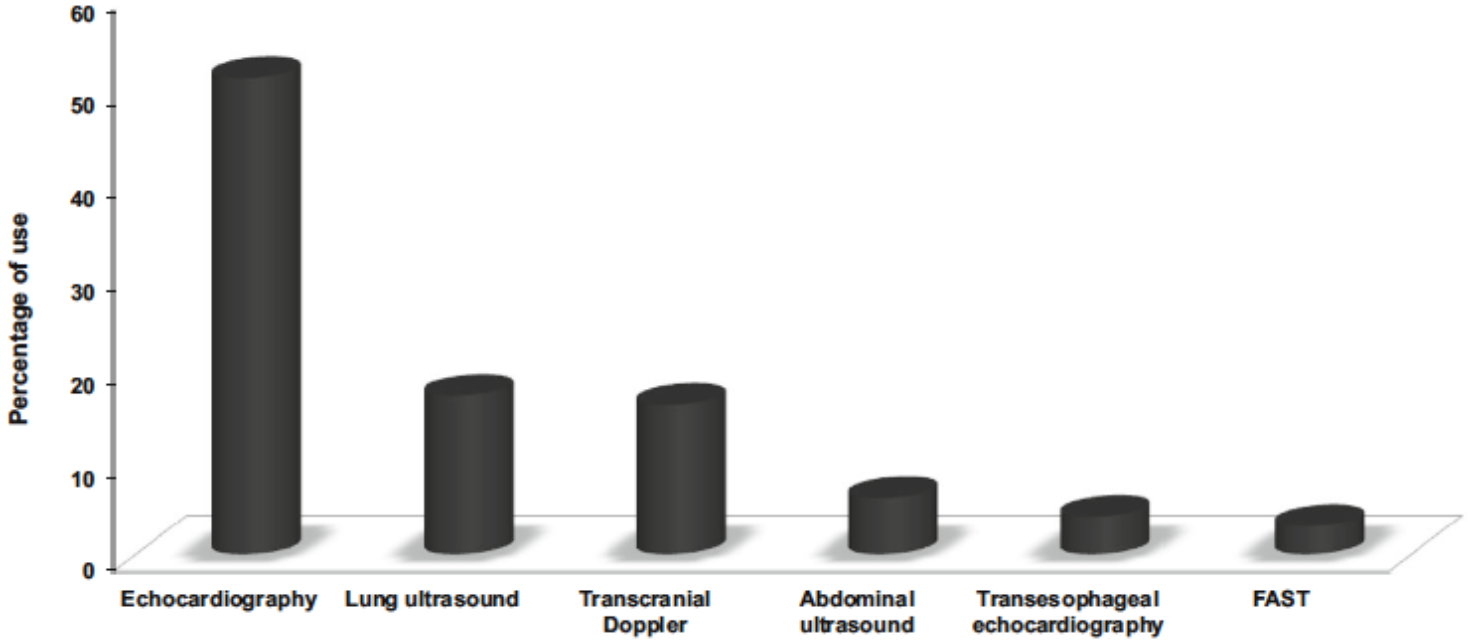
Point-of-care ultrasound in intensive care units: assessment of 1073 procedures in a multicentric, prospective, observational study



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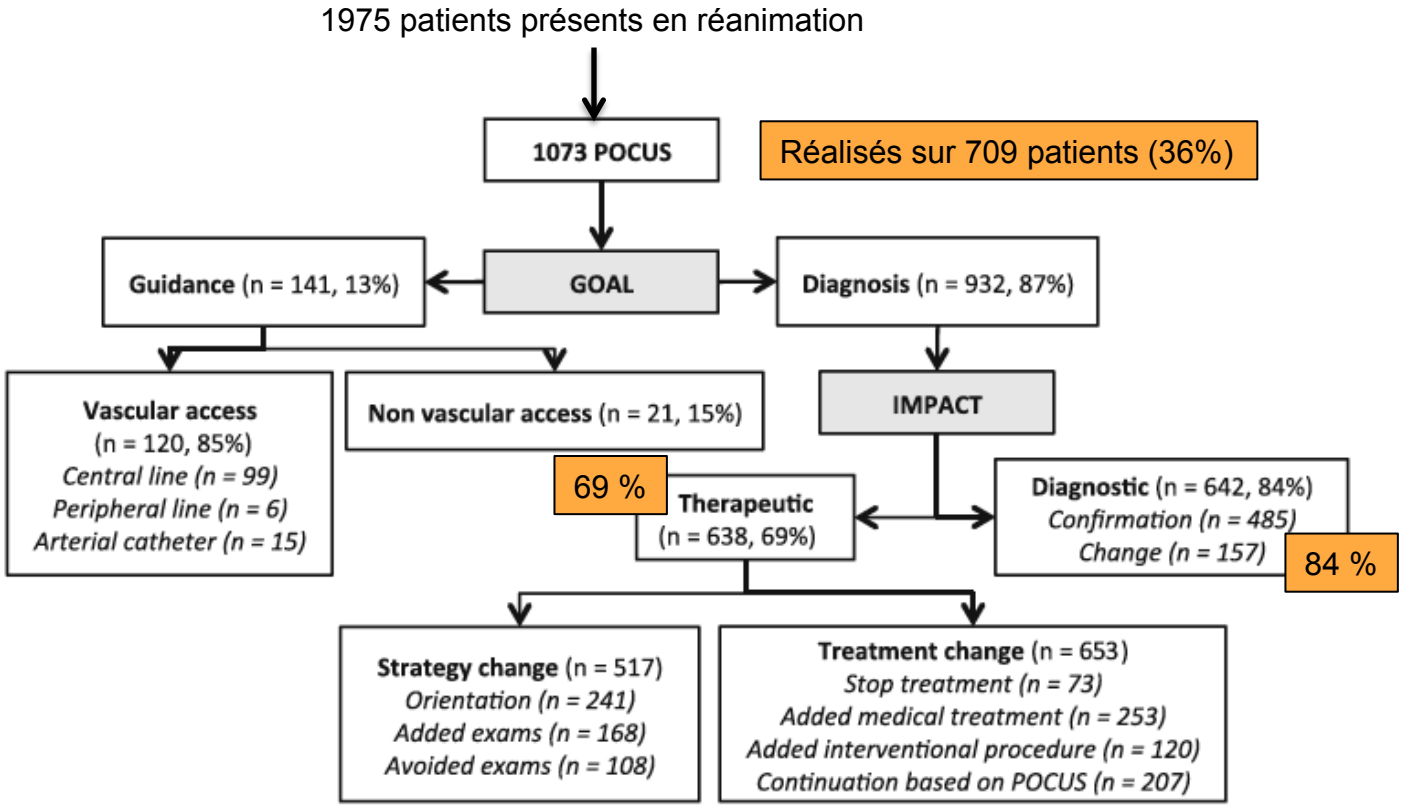

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Table 2 Interventions associated with point-of-care ultrasound performance

Intervention	$n = 373$ (%)
Hemodynamics	
Fluid bolus	115 (31)
Fluid depletion	80 (21)
Catecholamines	43 (12)
Pulmonary artery hypertension treatment	11 (2.9)
Invasive procedures	
Surgery/interventional radiology	13 (3.4)
Chest tube insertion	48 (13)
Medical treatments	
Antibiotics	10 (2.6)
Sedation	6 (1.6)
Mechanical ventilation setting	9 (2.4)
Anticoagulation	7 (1.8)
Others (miscellaneous)	31 (8.3)

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Table 3 Factors associated with diagnostic and therapeutic impacts

Variable	Univariate analysis			Multivariate analysis	
	Yes *n* (%)	No *n* (%)	*p*	OR (95 % CI)	*p*
Diagnostic impact					
US certified	464 (86)	178 (78)	0.005	2.0 (1.2–3.1)	0.002
Disinfection protocol	311 (90)	312 (80)	<0.001	2.4 (1.5–3.7)	0.004
Shock	293 (88)	337 (80)	0.05	1.5 (1.0–2.4)	0.01
Management algorithm	136 (75)	487 (87)	<0.001	0.4 (0.3–0.7)	<0.001
Pediatric patient	66 (71)	560 (86)	<0.001		
Adult patient	560 (86)	66 (71)	<0.001		
Emergency US	312 (87)	318 (80)	0.02		
PaO_2/FiO_2 <300 mmHg	268 (86)	354 (82)	0.1		
Therapeutic impact					
Operator: intensivist	579 (71)	55 (55)	0.04	1.7 (1.0–2.9)	0.002
Daily practice of US	509 (71)	124 (61)	0.001	1.8 (1.2–2.7)	0.01
TTE	349 (75)	284 (63)	0.001	1.7 (1.2–2.3)	<0.001
Emergency US	319 (79)	312 (61)	<0.001	2.6 (1.9–3.8)	<0.001
University hospital	430 (65)	180 (79)	0.01	0.6 (0.4–0.9)	<0.001
Pediatric patient	70 (52)	550 (72)	<0.001	0.4 (0.3–0.7)	<0.001
US certified	528 (71)	110 (62)	<0.001		
Ward US	166 (75)	457 (67)	0.03		
Shock	287 (73)	342 (66)	0.03		

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7.5 examens / j / réanimation

Un appareil = 7 à 10 ans

Un appareil = 30 à 60 000 euros

Un examen = 2 € hors maintenance

Intensive Care Med 2015

Echographie en réanimation :

Réduction globale des examens d'imagerie sans aggraver le pronostic

The Effect of Point-of-Care Ultrasonography on Imaging Studies in the Medical ICU. A Comparative Study

TABLE 1 | Patient Group Characteristics

Characteristic	Réa sans écho = 294)	Réa avec écho = 328)	*P* Value
Age, y	65.5 ± 17.31	64.6 ± 18.61	NS
Male (female) sex	147 (147)	177 (151)	NS
Length of stay, d	3.59 ± 3.10	3.00 ± 3.00	NS
CCI	5	5.5	< .0001
Predicted mortality based on CCI at 1 y, %	11.5	12.65	...

TABLE 2 | Number of Studies per Patient

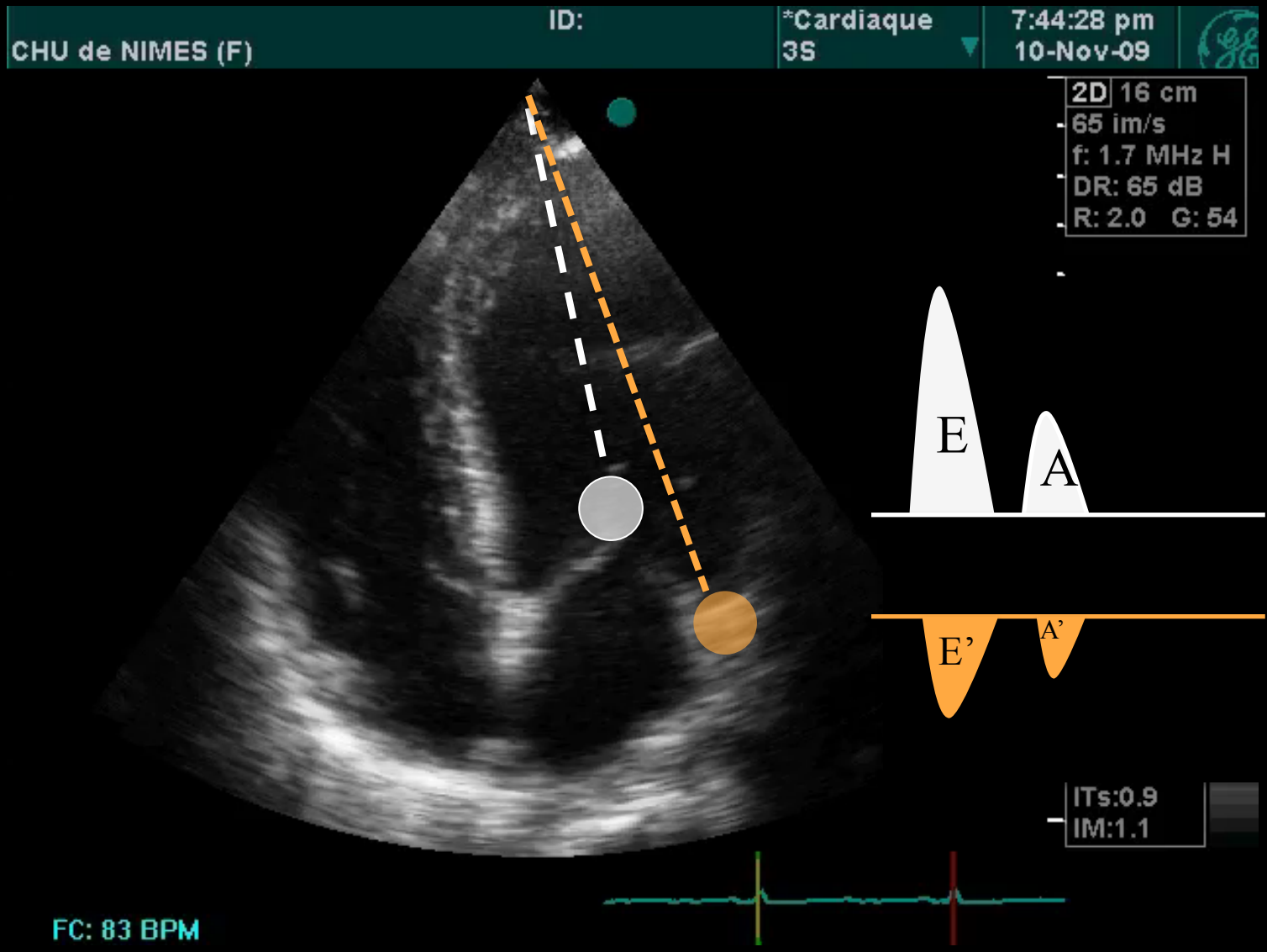
Study	Réa sans écho = 294)	Réa avec écho (n = 328)	*P* Value
Chest radiograph	3.75 ± 4.6 (1,102)	0.82 ± 1.85 (269)	< .0001
Chest CT scan	0.10 ± 0.31 (29)	0.04 ± 0.20 (14)	.0007
Abdomen/pelvis CT scan	0.17 ± 0.44 (49)	0.05 ± 0.24 (16)	< .0001
Radiology service-performed DVT	0.20 ± 0.47 (58)	0.02 ± 0.14 (7)	< .0001
Cardiology service-performed TTE	0.18 ± 0.40 (54)	0.07 ± 0.26 (22)	< .0001

Oks et al Chest 2014

Actualités en échographie

Etre au clair avec le rapport E/E'

Rapport E / E’


CHU de NIMES (F)
ID:
*Cardiaque
3S
7:44:28 pm
10-Nov-09
2D 16 cm
65 im/s
f: 1.7 MHz H
DR: 65 dB
R: 2.0 G: 54
E
A
E’
A’
ITs:0.9
IM:1.1
FC: 83 BPM

Rapport E/E’

… principes

E = Charge x Compliance

E’ = Compliance

Théoriquement, l’onde E’ est précharge indépendante

Rapport E/E’

... principes

$$\frac{E}{E'} = \frac{\text{Charge x Compliance}}{\text{Compliance}}$$

Rapport E/E’

… principes

$$\frac{E}{E'} = \frac{\text{Charge x Compliance}}{\text{Compliance}}$$

Rapport E/E’

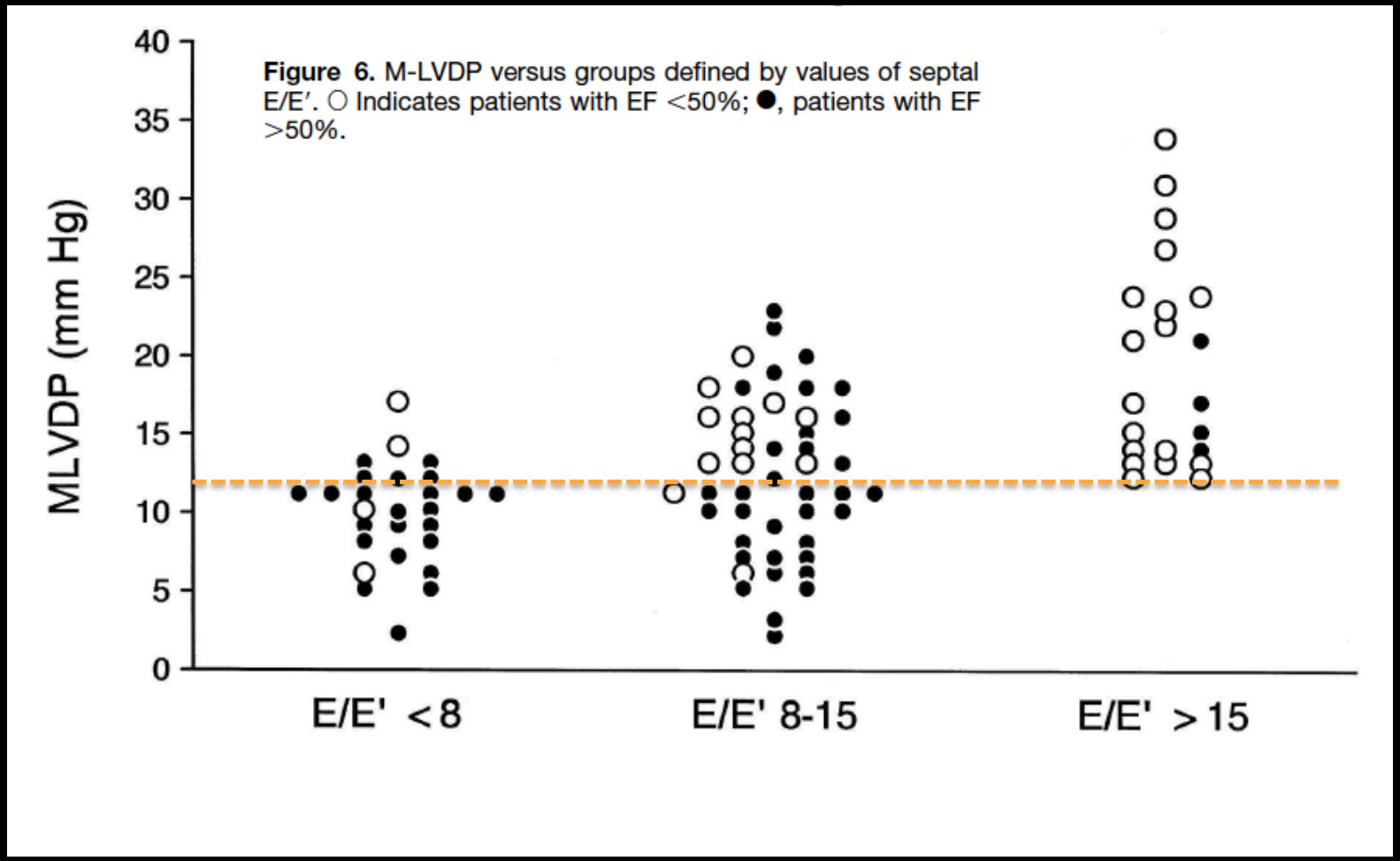
… principes

Pour les cardiologues : E/E’ > 10 = pressions hautes

Pour les cardiologues : E/E’ < 10 = pressions basses

En réanimation : zone grise de 6 à 11

Rapport E/E': *surtout utile pour les pressions hautes ++++ en cardiologie*



Ommen et al Circulation 2000

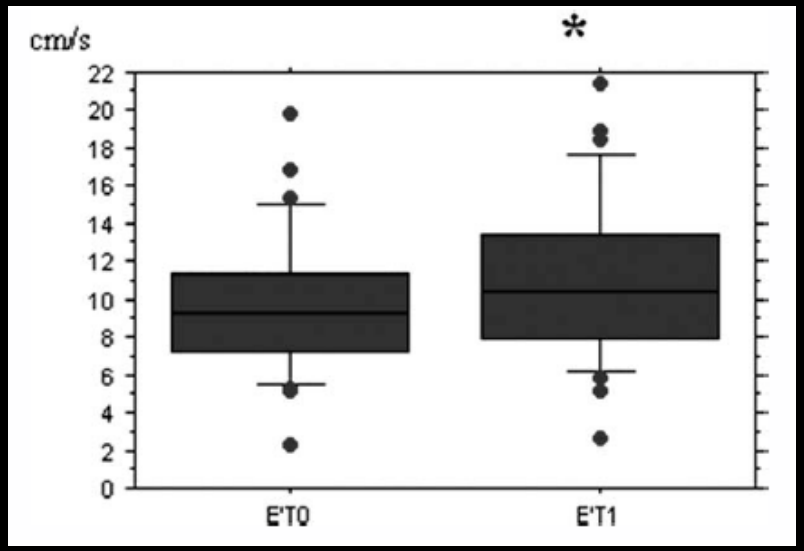
TDI en réanimation : *Onde E' précharge dépendante !*

Influence of Acute Preload Changes on Mitral Annulus Velocity Measured by Tissue Doppler Echocardiography in Critically Ill Patients

Hervé Quintard, MD,[1] Laurent Muller, MD,[2] Ivan Philip, MD,[3] Pierre Lena, MD,[4] Carole Ichai, MD, PhD[1]

TABLE 2
Echocardiographic Data Before and After Fluid Infusion (median ± interquartile range)

	Before Fluid Infusion (T0)	1 hour After Fluid Infusion (T1)	*p*
E mitral velocity (cm/s)	50.5 ± 25.9	62.6 ± 21.9	0.001
A mitral velocity (cm/s)	54.5 ± 21	53.3 ± 19	ns
E/A ratio	1.04 ± 0.5	1.2 ± 0.5	ns
E′ lateral mitral velocity (cm/s)	9.3 ± 3.8	10.5 ± 4.3	0.02
A′ lateral mitral velocity (cm/s)	8.5 ± 4.3	9.5 ± 4.7	ns
E/e′ lateral ratio	6.6 ± 3.8	7.2 ± 2.9	ns
E′ septal mitral velocity (cm/s)	7.5 ± 2.5	9.1 ± 3.8	<0.05
A′ septal mitral velocity (cm/s)	6.9 ± 2.8	9 ± 3.8	<0.05
E/e′ septal ratio	6.7 ± 7	6.8 ± 5	ns
LV area (cm^2)	17.2 ± 5.4	18.5 ± 5.5	<0.05

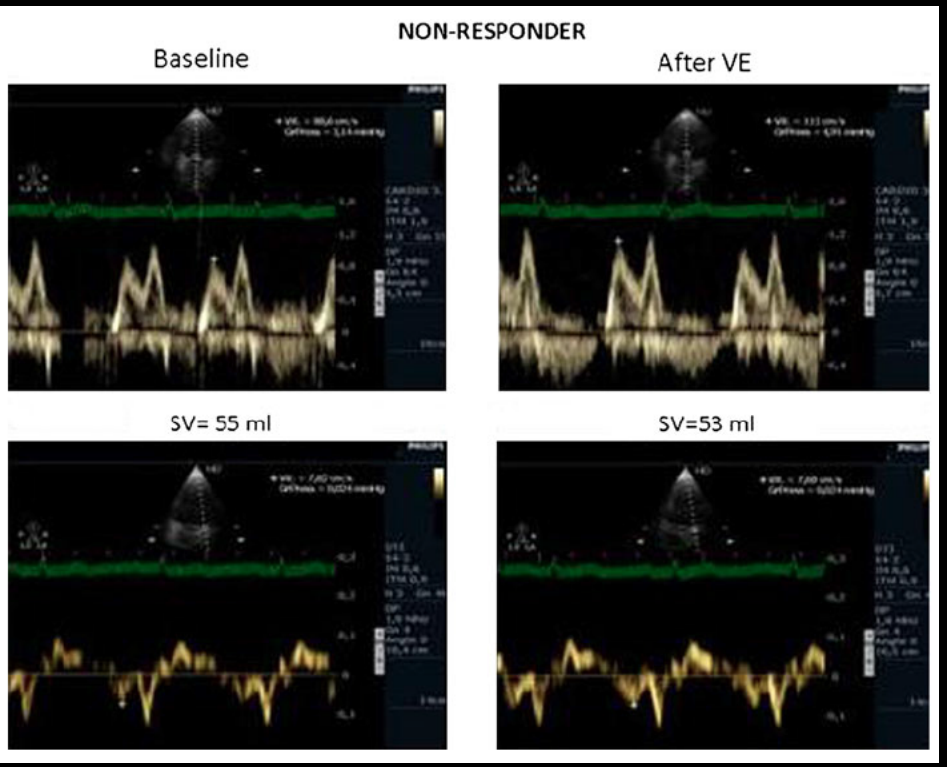


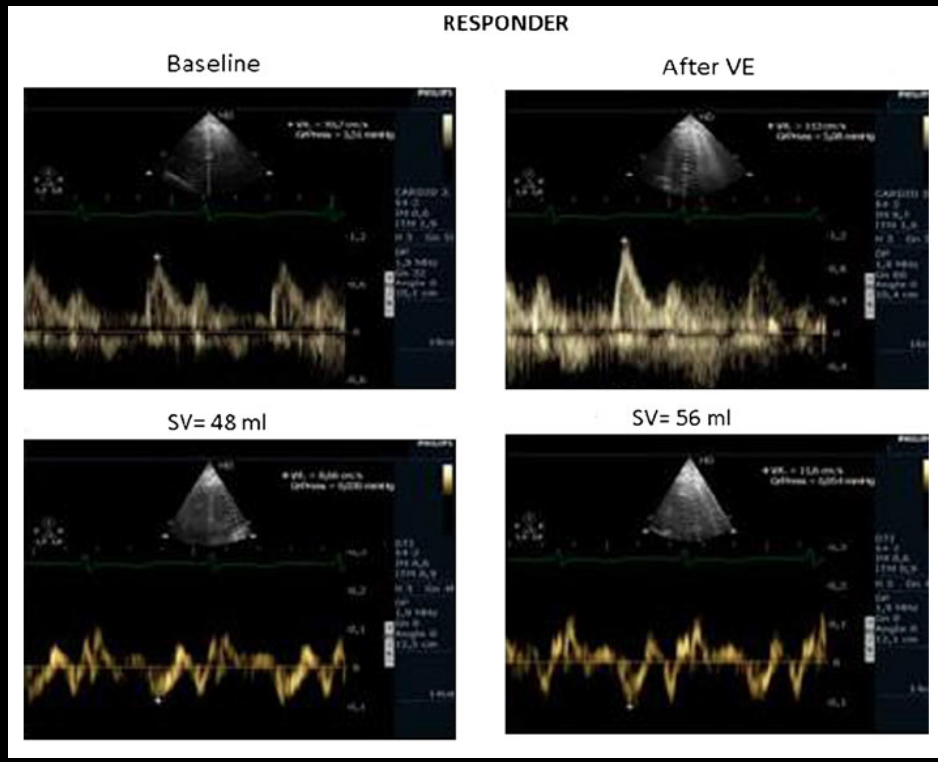
Quintard et al JCU 2011

TDI en réanimation : *Onde E' précharge dépendante !*

Non réponse au RV : E' inchangée sous remplissage

Réponse au RV : augmentation de E' sous remplissage





Mahjoub et al Intensive Care Med 2013

TDI en réanimation : *Onde E' précharge dépendante !*

Variation de + 30% de la vélocité de E' sous remplissage chez les répondeurs au remplissage
Variation de 5 % chez les non répondeurs

Table 4 Comparison of VE–induced variation (Δ) of haemodynamic data between the two groups for patients with left ventricular diastolic dysfunction at baseline (E′ wave <0.12 m/s)

VE-induced variation in haemodynamic parameters	Responders ($n = 33$)	Non-responders ($n = 14$)	p
ΔHR % (bpm)	−5 ± 1 (−5 ± 1)	−4 ± 2 (−3 ± 2)	0.43
ΔSAP % (mmHg)	13 ± 3 (12 ± 3)	4 ± 3 (4 ± 2)	0.10
ΔDAP % (mmHg)	8 ± 4 (5 ± 3)	1 ± 2 (1 ± 2)	0.07
ΔMAP % (mmHg)	9 ± 3 (7 ± 3)	3 ± 4 (2 ± 3)	0.09
ΔCVP % (mmHg)	23 ± 15 (2.4 ± 0.9)	36 ± 16 (3.5 ± 1.1)	0.56
ΔSV % (ml)	31 ± 2 (16 ± 1)	−3 ± 3 (−2 ± 2)	<0.001
ΔCO % (l/min)	24 ± 3 (1.2 ± 0.1)	−4 ± 4 (−0.2 ± 0.2)	<0.001
ΔLVEDA % (cm^2)	13 ± 6 (3.0 ± 1.0)	−5 ± 8 (−2.5 ± 1.5)	0.04
ΔE wave % (m/s)	27 ± 7 (0.17 ± 0.03)	42 ± 11 (0.17 ± 0.05)	0.25
ΔA wave % (m/s)	11 ± 3 (0.08 ± 0.02)	−3 ± 5 (−0.02 ± 0.04)	0.03
ΔE/A ratio %	18 ± 1 (0.13 ± 0.05)	6 ± 17 (0.28 ± 0.08)	0.04
ΔEDT % (ms)	−4 ± 5 (−37 ± 13)	−14 ± 6 (−61 ± 18)	0.18
ΔE′ wave % (m/s)	29 ± 5 (0.022 ± 0.004)	5 ± 8 (0.005 ± 0.006)	0.01
ΔA′ wave % (m/s)	27 ± 17 (0.02 ± 0.02)	83 ± 28 (0.10 ± 0.04)	0.10
ΔE/E′ %	2 ± 6 (0.03 ± 0.39)	35 ± 9 (1.75 ± 0.61)	0.02
ΔTei index %	−25 ± 11(−0.20 ± 0.06)	4 ± 8 (−0.02 ± 0.10)	0.01
ΔEF %	0.1 ± 1.5 (−0.1 ± 0.9)	−6 ± 2 (−4.0 ± 1.0)	0.06
ΔS′ wave % (m/s)	6 ± 5 (0.06 ± 0.05)	1 ± 8 (0.01 ± 0.09)	0.63

Mahjoub et al Intensive Care Med 2013

TDI en réanimation : *Onde E' précharge dépendante !*

Variation de + 35% de E/E' chez les non répondeurs sous remplissage
=> Bon indice pour les pressions hautes

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Mahjoub et al Intensive Care Med 2013

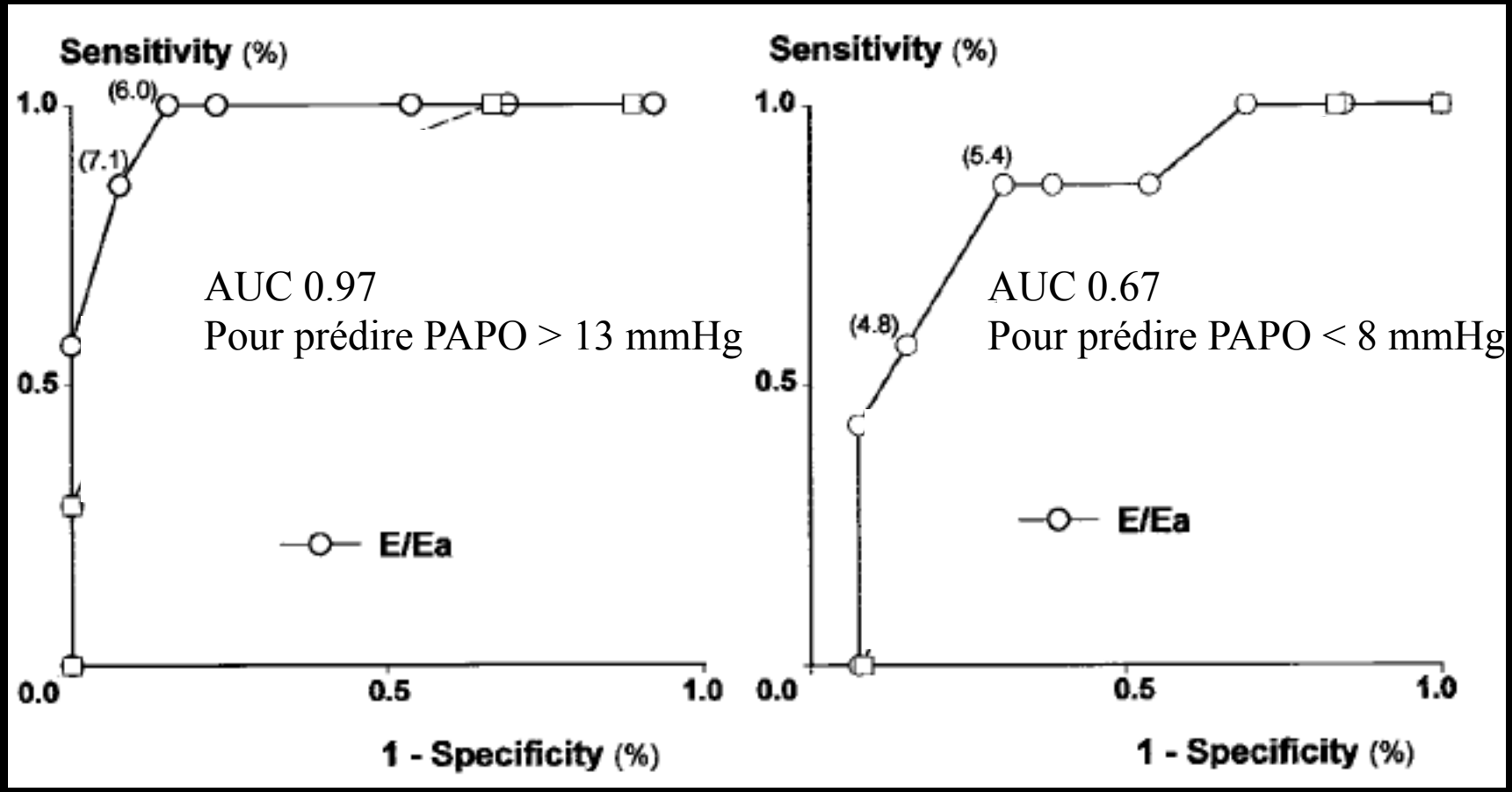
TDI en réanimation :

Rapport E/E' mauvais pour prédire les pressions basses

Baseline haemodynamic parameters	Responders ($n = 59$)	Non responders ($n = 24$)	p
HR (bpm)	100 ± 18	96 ± 21	0.32
SAP (mmHg)	99 ± 20	100 ± 20	0.36
DAP (mmHg)	55 ± 12	55 ± 13	0.33
MAP (mmHg)	69 ± 13	70 ± 20	0.84
CVP (mmHg)	8.8 ± 6.6	11.5 ± 4.0	0.30
Stroke volume (ml)	52 ± 16	67 ± 22	0.006
Lactates (mmol/l)	3.0 ± 1.8	3.4 ± 2.3	0.40
Cardiac output (l/min)	5.2 ± 1.6	6.3 ± 2.3	0.04
LVEDA (cm^2)	28 ± 6	28 ± 10	0.64
E wave (m/s)	0.70 ± 0.20	0.76 ± 0.22	0.23
A wave (m/s)	0.80 ± 0.21	0.80 ± 0.21	0.95
E/A ratio	0.92 ± 0.41	0.98 ± 0.35	0.58
EDT (ms)	248 ± 107	226 ± 108	0.34
E′ wave (m/s)	0.12 ± 0.04	0.12 ± 0.05	0.60
A′ wave (m/s)	0.12 ± 0.04	0.11 ± 0.04	0.31
E/E′ ratio	6.5 ± 2.2	6.9 ± 2.7	0.41
Tei index	0.78 ± 0.38	0.54 ± 0.16	0.04
EF (%)	55 ± 15	53 ± 16	0.49
S′ wave (m/s)	0.16 ± 0.04	0.15 ± 0.06	0.4

Mahjoub et al Intensive Care Med 2013

Rapport E/E': *surtout utile pour les pressions hautes ++++ en réanimation*



Bouhemad et al Anesthesiology 2003

Rapport E/E’

… take home messages

Le rapport E/E’ est inutile pour l’hypovolémie

Plus il est élevé, plus les pressions sont hautes

Cutoff sup = 11 à 15 en réanimation (pressions hautes)

Cutoff inférieur : 4 à 5 ??? (pressions basses)

Actualités en échographie

Etre au clair avec l'onde E'

Dysfonction diastolique comme marqueur de gravité :
Prendre en compte une valeur effondrée de l'onde E'

Filippo Sanfilippo
Carlos Corredor
Nick Fletcher
Giora Landesberg
Umberto Benedetto
Pierre Foex
Maurizio Cecconi

Diastolic dysfunction and mortality in septic patients: a systematic review and meta-analysis n = 636, dysf diasto = 48 %

Author/year	Population	TTE vs TEE	Age	% MV	DD cut-off	SD cut-off	Longest follow-up
Etchecopar-Chevreuil et al. [23]	35 ICU patients with septic shock	TEE within 12 h	Alive 54 ± 18, died 68 ± 14	100 %	Lateral e′ < 8.5 cm/s	LVEF < 50 %	28 days
Landesberg et al. [24]	106 ICU patients with severe sepsis and septic shock	TTE on admission or asap	Alive 56 ± 21, died 70 ± 17*	100 %	Septal e′ < 8 cm/s	LVEF < 50 %	12 months
Landesberg et al. [12]	262 ICU patients with severe sepsis and septic shock	TTE asap + day after admission	Alive 60 ± 20, died 71 ± 15*	100 %	Septal e′ < 8 cm/s	LVEF < 50 %	12 months
Mokart et al. [25]	45 ICU oncological patients with septic shock	TTE within 24 h	56 ± 13	49 %	ASE guidelines (lateral e′)	LVEF < 45 %	ICU stay
Mourad et al. [26]	72 ICU oncological patients with septic shock	TTE within 48 h[b]	58 ± 12	54 %	Lateral e′ < 8 cm/s	LVEF < 50 %	ICU stay
Pulido et al. [13]	106[a] ICU patients with severe sepsis or septic shock	TTE within 24 h	65 ± 15	N/A	ASE guidelines (septal and lateral e′)	LVEF < 50 %	12 months
Sturgess et al. [27]	21 ICU patients with septic shock	TTE within 72 h[c]	65 ± 17	76 %	ASE guidelines (septal e′)	LVEF < 55 %	Hospital stay

Sanfilippo et al Intensive Care Med 2015

Dysfonction diastolique comme marqueur de gravité :
Onde E' effondrée plus grave qu'une FEVG basse !

Filippo Sanfilippo
Carlos Corredor
Nick Fletcher
Giora Landesberg
Umberto Benedetto
Pierre Foex
Maurizio Cecconi

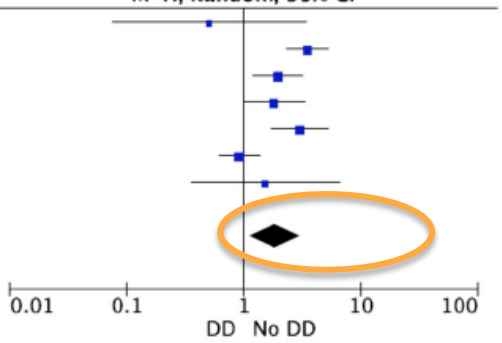
Diastolic dysfunction and mortality in septic patients: a systematic review and meta-analysis

Dysf Diastolique

a

Study or Subgroup	DD Events	DD Total	No DD Events	No DD Total	Weight	Risk Ratio M-H, Random, 95% CI
Ethecopar 2008	1	7	8	28	5.0%	0.50 [0.07, 3.37]
Landesberg 2012	88	143	21	119	18.6%	3.49 [2.32, 5.25]
Landesberg 2014	29	53	15	53	17.5%	1.93 [1.18, 3.17]
Mokart 2007	12	18	10	27	16.3%	1.80 [1.00, 3.25]
Moraud 2014	25	33	10	39	16.6%	2.95 [1.67, 5.22]
Pulido 2012	19	39	30	56	18.6%	0.91 [0.61, 1.36]
Sturgess 2010	4	12	2	9	7.4%	1.50 [0.35, 6.46]
Total (95% CI)		**305**		**331**	**100.0%**	**1.82 [1.12, 2.97]**
Total events	178		96			

Heterogeneity: $Tau^2 = 0.29$; $Chi^2 = 26.42$, df = 6 (P = 0.0002); $I^2 = 77\%$
Test for overall effect: Z = 2.40 (P = 0.02)

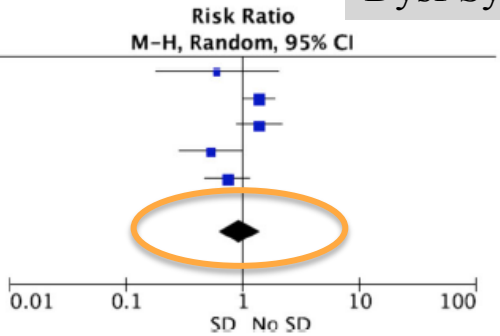


Dysf Systolique

b

Study or Subgroup	SD Events	SD Total	No SD Events	No SD Total	Weight	Risk Ratio M-H, Random, 95% CI
Ethecopar 2008	3	16	6	19	8.2%	0.59 [0.18, 2.00]
Landesberg 2012	32	61	77	201	27.7%	1.37 [1.02, 1.84]
Landesberg 2014	14	27	30	79	22.9%	1.37 [0.86, 2.16]
Moraud 2014	10	39	16	33	17.9%	0.53 [0.28, 1.00]
Pulido 2012	13	29	47	77	23.4%	0.73 [0.47, 1.14]
Total (95% CI)		**172**		**409**	**100.0%**	**0.93 [0.62, 1.39]**
Total events	72		176			

Heterogeneity: $Tau^2 = 0.13$; $Chi^2 = 12.31$, df = 4 (P = 0.02); $I^2 = 68\%$
Test for overall effect: Z = 0.34 (P = 0.73)

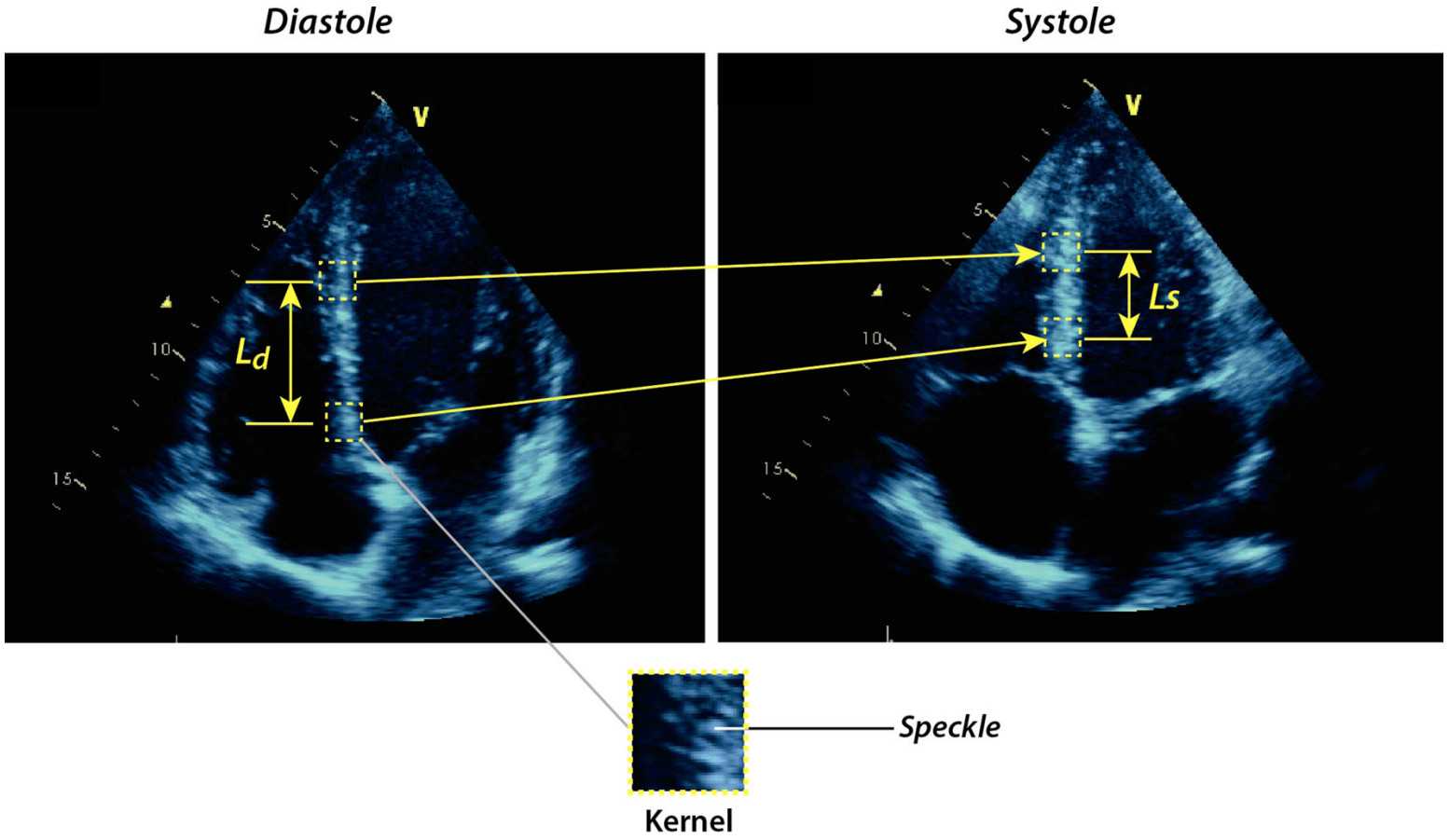


Sanfilippo et al Intensive Care Med 2015

Actualités en échographie

2D strain en anesthésie réanimation

Nouveautés en échographie en réanimation :
2D Strain - speckle tracking : echo de suivi des marqueurs acoustiques



$$\text{Systolic strain} = (L_s - L_d)/L_d \times 100\%$$

Vignon, Huang. Intensive Care Med 2015

Strain longitudinal global :
Une valeur de fonction systolique

- S = (Ls - Ld) / Ld
- C'est un raccourcissement (systole)
- DONC = Le *strain normal est* négatif
- Unité = %

Valeurs normales du *strain* et du *strain rate* longitudinal

un marqueur très robuste de contractilité régionale et globale

Normale = 18 %

	Femmes		Hommes	
	Strain télésystolique (%)	Pic systolique de SR	Strain télésystolique (%)	Pic systolique de SR
< 40 ans	-17,9 % (2,1)	$-1,09 s^{-1}$ (0,12)	-16,8 % (2,0)	$-1,06 s^{-1}$ (0,13)
40-60 ans	-17,6 % (2,1)	$-1,06 s^{-1}$ (0,13)	-18,8 % (2,2)	$-1,01 s^{-1}$ (0,12)
> 60 ans	-15,9 % (2,4)	$-0,97 s^{-1}$ (0,14)	-15,5 % (2,4)	$-0.,97 s^{-1}$ (0,14)
Total	-17,4 % (2,3)	$-1,05 s^{-1}$ (0,13)	-15,9 % (2,3)	$-1,01 s^{-1}$ (0,13)

Dalen et al Eur Jechocardiogr 2010

Strain longitudinal global :

Une valeur de fonction systolique

Strain global normal = - 14 à -22 % %

En moyenne = - 18 %

Strain longitudinal global :
*Peu opérateur dépendant**

Variabilité intra-observateurs du 2D strain = 3,6% à 5,3 %

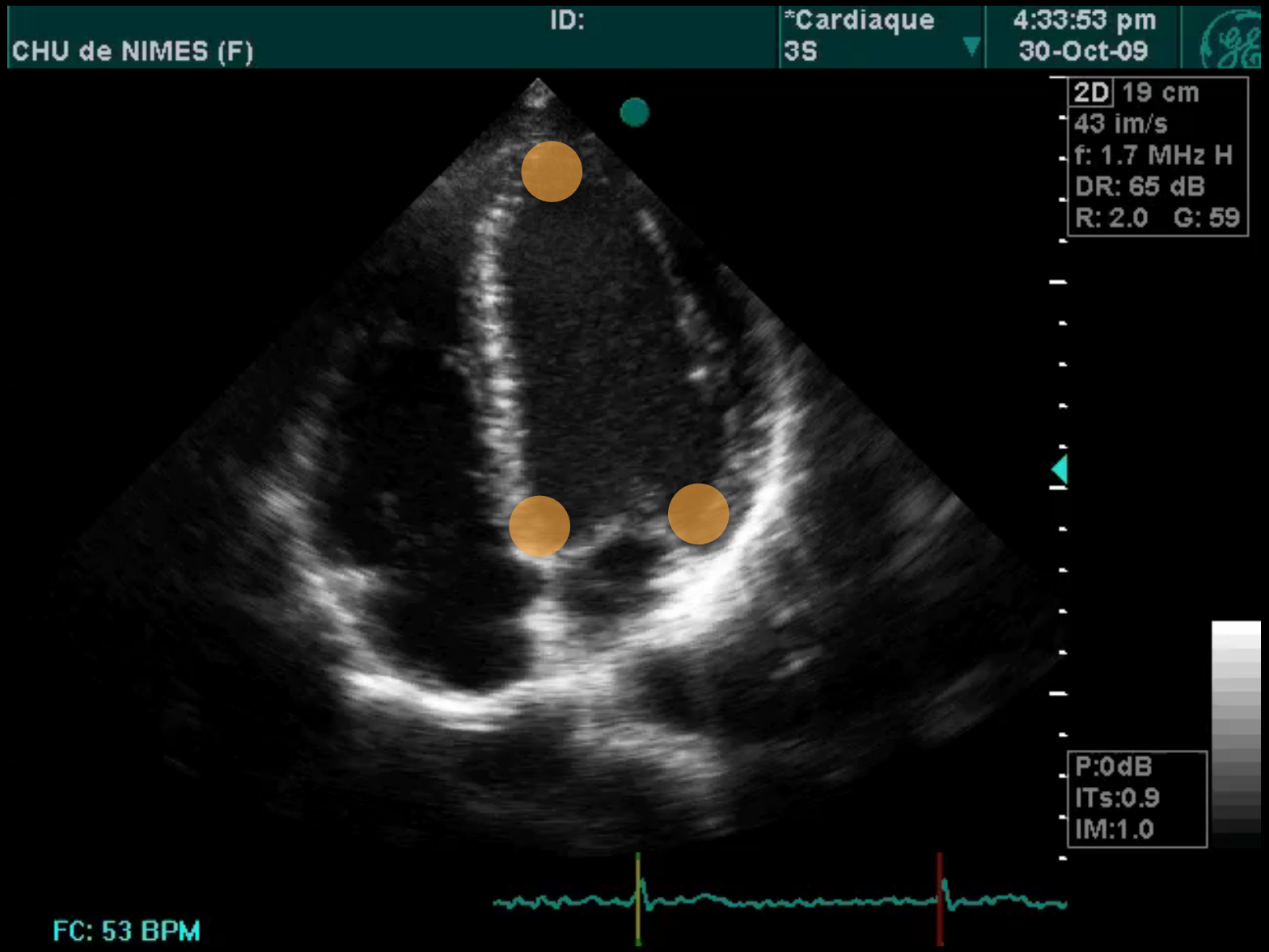
Variabilité inter-observateurs du 2D strain = 7 % à 11,8 %

Variabilité Simpson > 10%

Bergenzaum et al Crit Care 2011
Perk et al JASE 2007

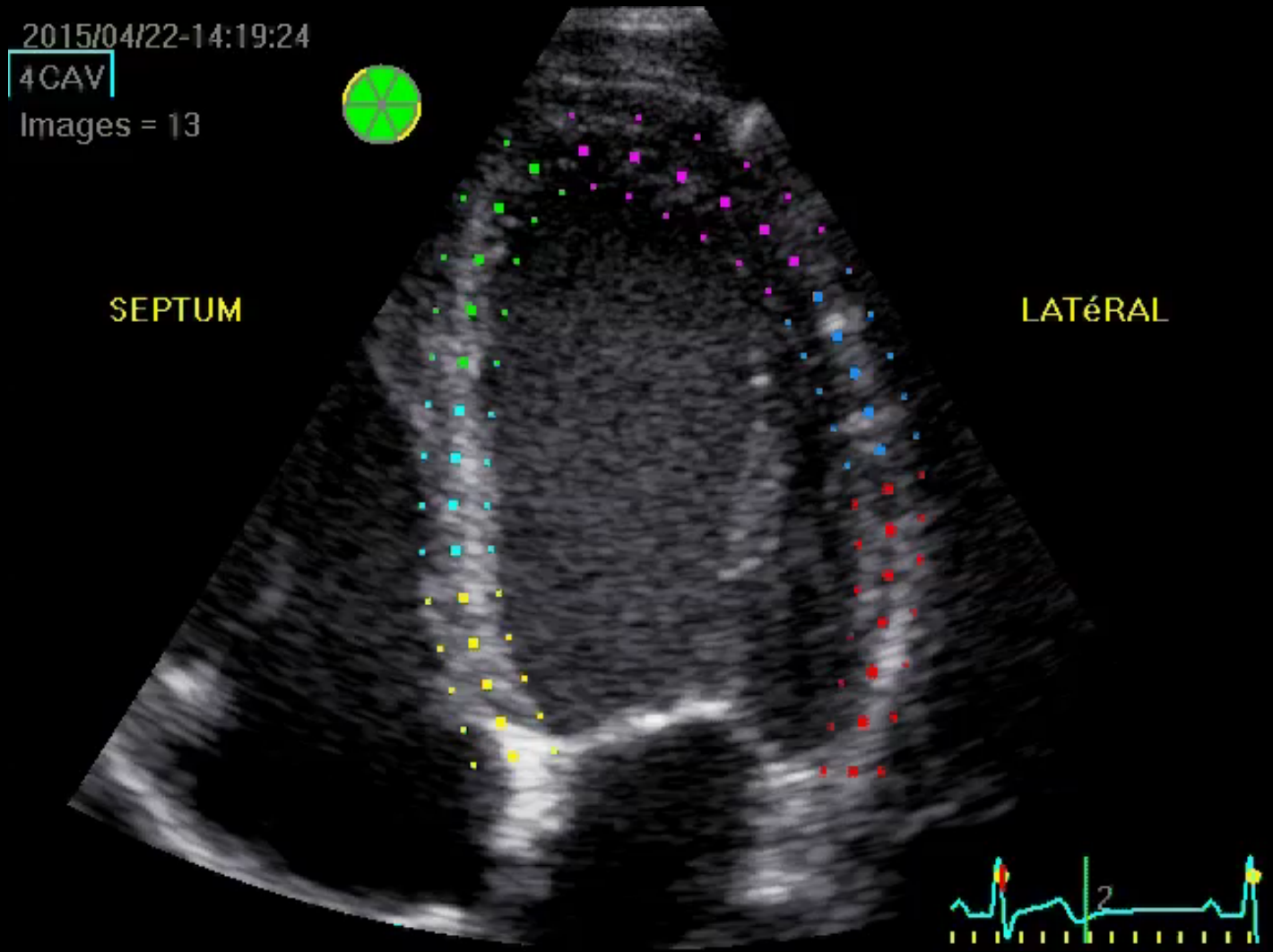
How to record longitudinal strain ?

Step 1



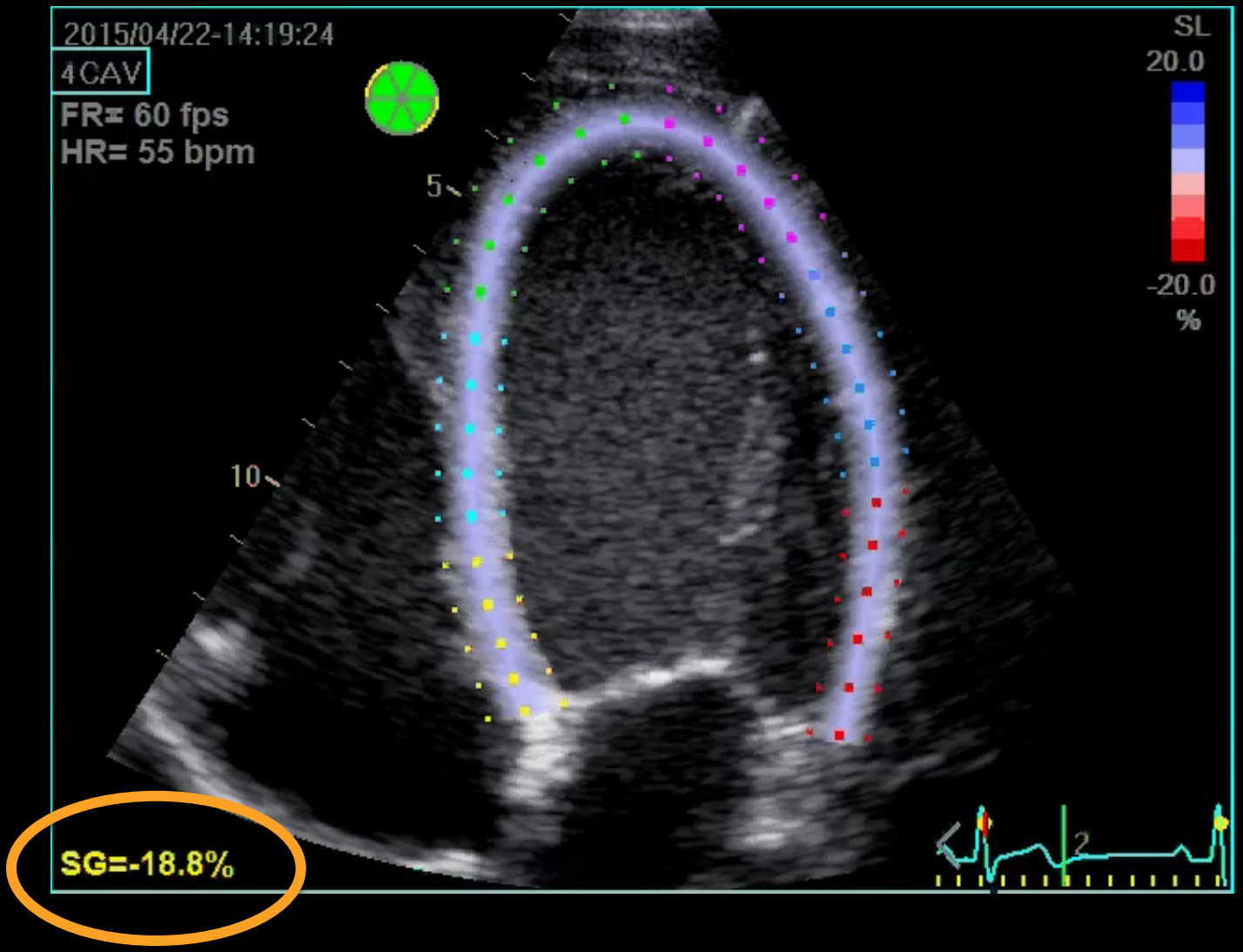
How to record longitudinal strain ?

Step 2 : tracking validation by physician

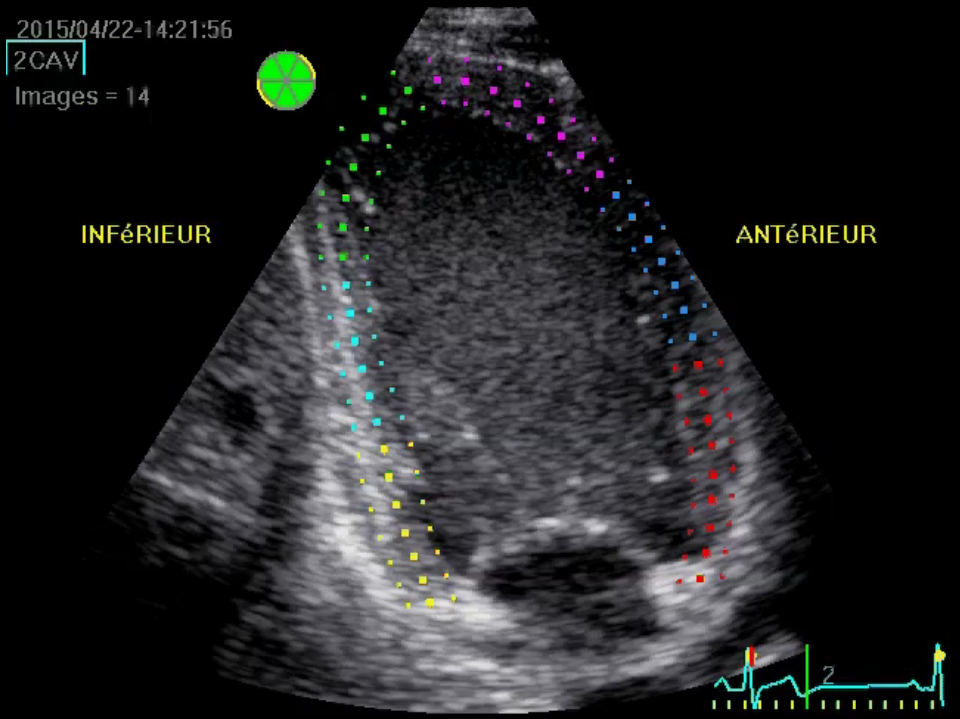


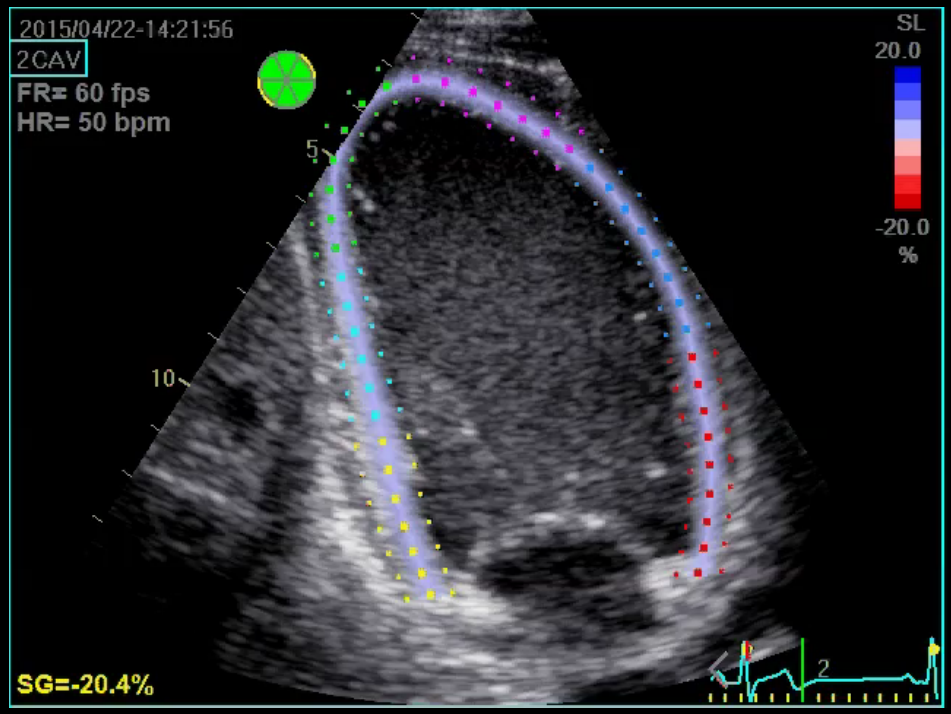
How to record longitudinal strain ?

Step 3 : global and regional strain



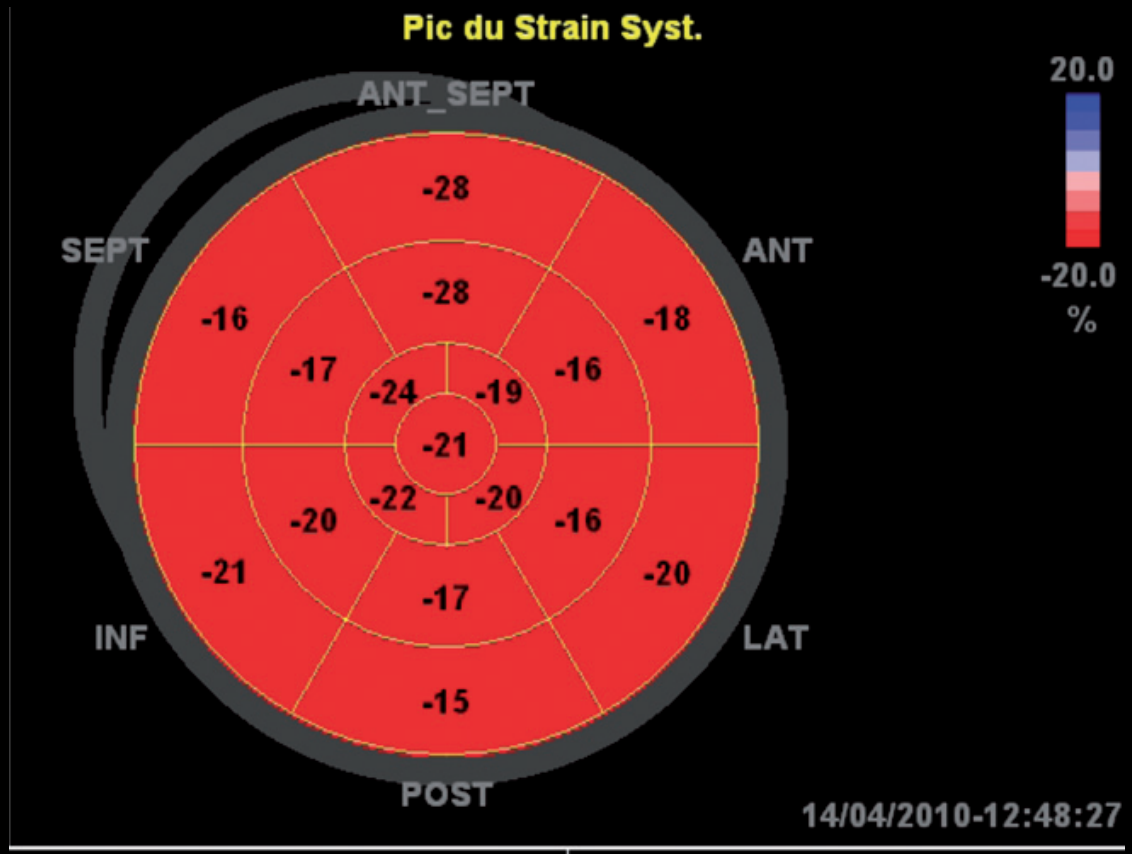
Mesure du strain : Faire en 4, 2 et 3 cavités





Speckle tracking, strain en 2, 3 et 4 cavités

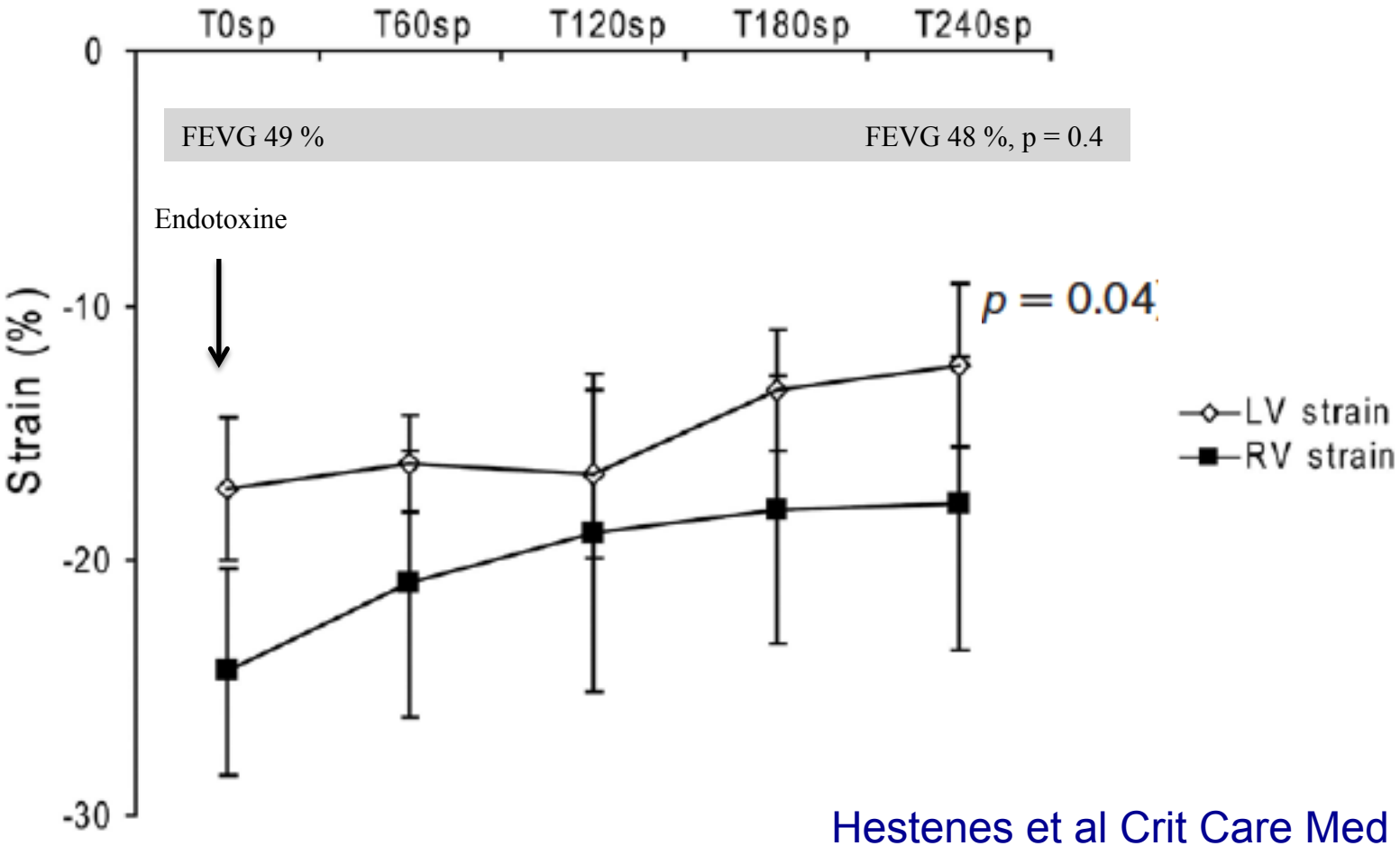
Cartographie ventriculaire gauche = « Bulleye »



GLPS_LAX	-22.6 %	AVC_STORED	333 msec
GLPS_A4C	-19.1 %	HR_ApLAX	93.2 bpm
GLPS_A2C	-17.9 %		
GLPS_Avg	-19.8 %		

2D Strain en réanimation :
… Etude animale

Advantages of Strain Echocardiography in Assessment of Myocardial Function in Severe Sepsis: An Experimental Study*



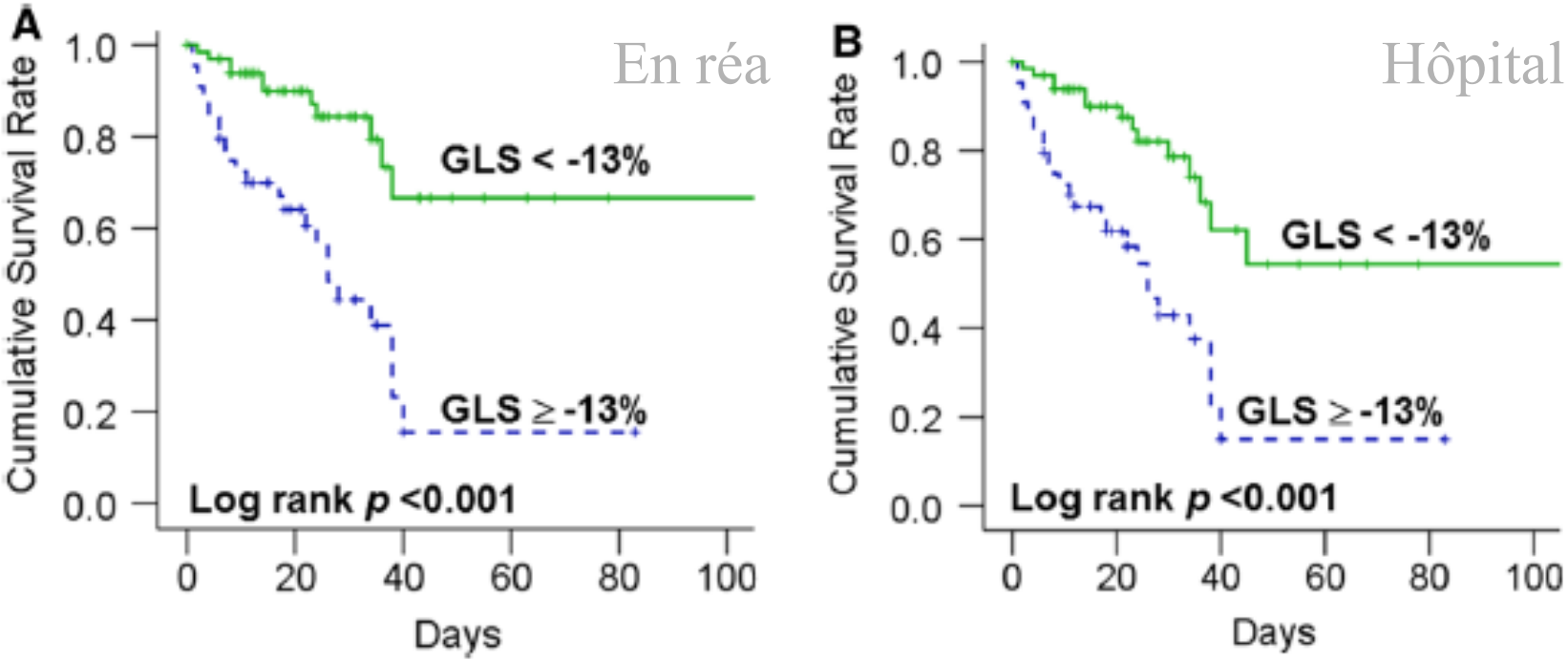
Hestenes et al Crit Care Med 2014

2D Strain en réanimation :

… Facteur pronostique au cours du sepsis (n = 111)

Wei-Ting Chang
Wen-Huang Lee
Wei-Ting Lee
Po-Sheng Chen
Yu-Ru Su
Ping-Yen Liu
Yen-Wen Liu
Wei-Chuan Tsai

Left ventricular global longitudinal strain is independently associated with mortality in septic shock patients



Chang et al Intensive Care Med 2015

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Table 3 Univariable and multivariable predictors of ICU mortality

	Univariable		Multivariable			
			Model 1		Model 2	
	HR (95 % CI)	*p*	HR (95 % CI)	*p*	HR (95 % CI)	*p*
Age	1.00 (0.98–1.02)	0.75	–	–	–	–
Male gender	0.66 (0.32–1.35)	0.26	–	–	–	–
Hypertension	0.89 (0.41–1.93)	0.76	–	–	–	–
Alcoholism	1.12 (0.48–2.65)	0.79	–	–	–	–
APACHE II score (24 h)	1.05 (1.01–1.10)	0.03	1.06 (1.02–1.10)	0.01	1.06 (1.02–1.11)	0.006
Heart rate	1.01 (0.99–1.03)	0.28	–	–	–	–
Reduced GLS (GLS ≥ −13 %)	4.34 (2.10–8.92)	<0.001	4.21 (2.02–8.80)	<0.001	–	–
GLS	1.15 (1.07–1.23)	<0.001	–	–	1.14 (1.06–1.23)	<0.001

Chang et al Intensive Care Med 2015

Actualités en échographie

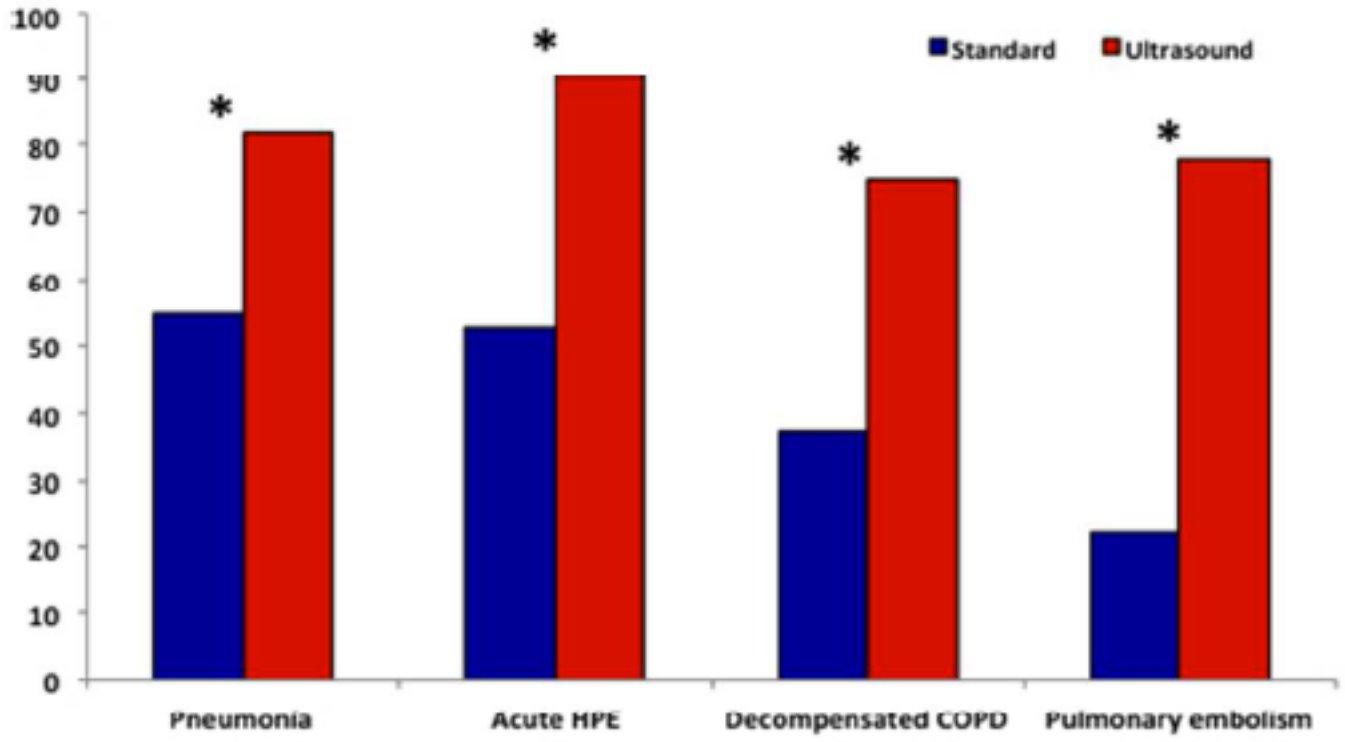
Coupler écho cardio et écho pleuro pulmonaire

Association echocardio et pleuro pulmonaire:
Une approche logique

	Lung	Heart
Pulmonary embolism	A-profile with deep venous thrombosis	RV failure (acute)
Acute haemodynamic pulmonary oedema	B-profile	High end-diastolic LV pressure
Decompensated COPD	A-profile	RV failure (chronic)
Pneumothorax	A'-profile	Non-specific
Pneumonia	C-profile A-profile plus PLAPS A/B-profile	Non-specific

Silva et al Chest 2013

Association echocardio et pleuro pulmonaire:
Une approche logique

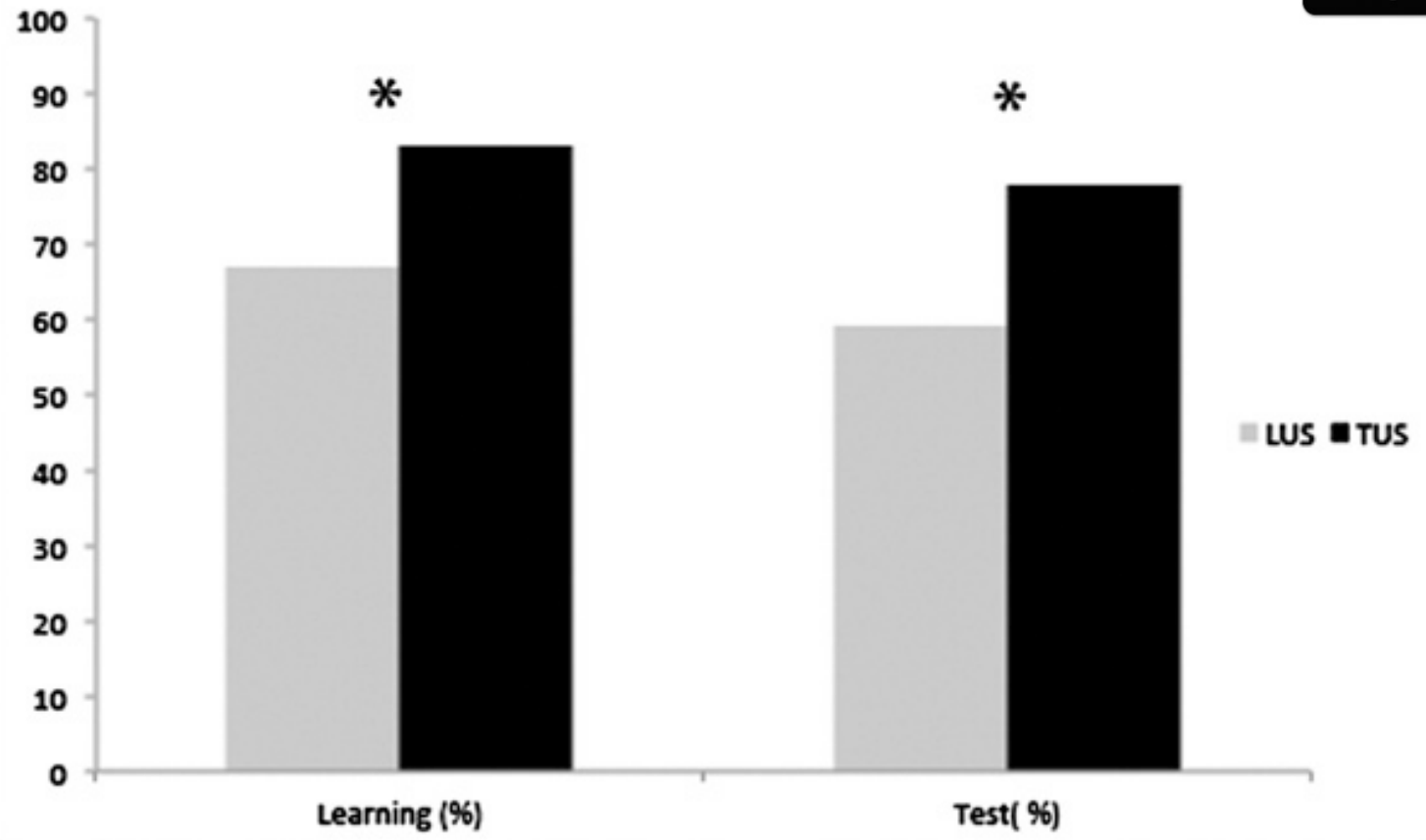


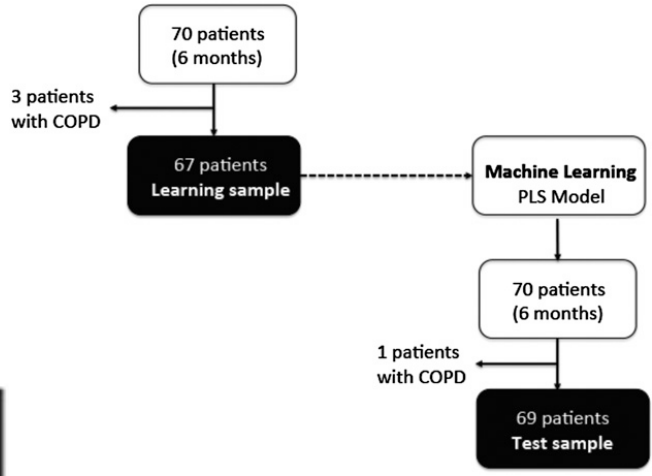
Silva et al Chest 2013

Association echocardio et pleuro pulmonaire au cours des dyspnées: *Supérieur à l'écho pleuro pulm seule*

Integrated Use of Bedside Lung Ultrasound and Echocardiography in Acute Respiratory Failure

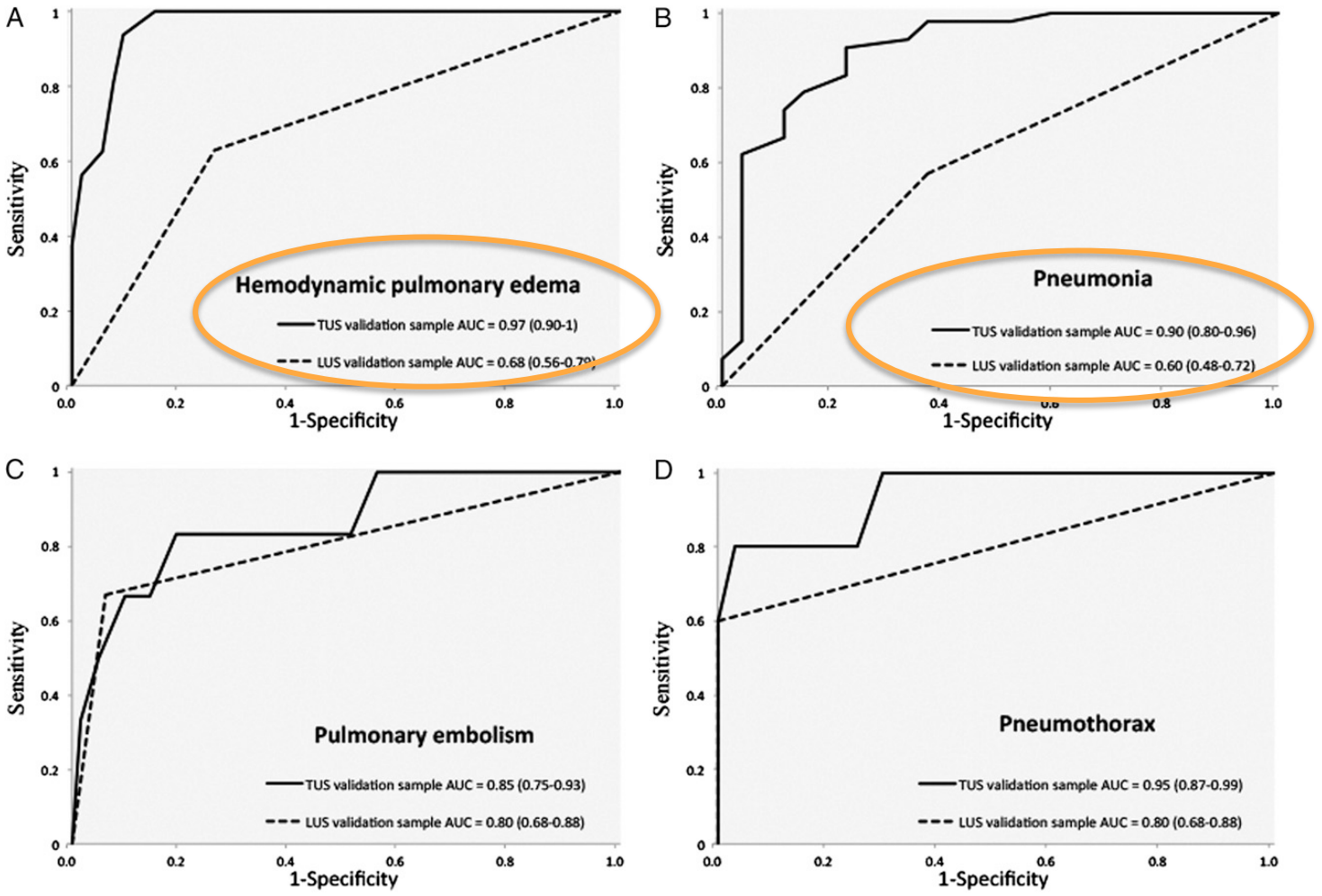
A Prospective Observational Study in ICU





Bataille et al Chest 2014

Association echocardio et pleuro pulmonaire au cours des dyspnées: *Supérieur à l'écho pleuro pulm seule*



Bataille et al Chest 2014

Actualités en échographie

Quelques nouveautés sur les machines…

Les dispositifs ultra portables pour les debutants ?:
Attention

Does physician experience influence the interpretability of focused echocardiography images performed by a pocket device?

Xavier Bobbia[1*], Christophe Pradeilles[1], Pierre Géraud Claret[1], Camille Soullier[2], Patricia Wagner[1], Yann Bodin[1], Claire Roger[1], Guillaume Cayla[2], Laurent Muller[1] and Jean Emmanuel de La Coussaye[1]

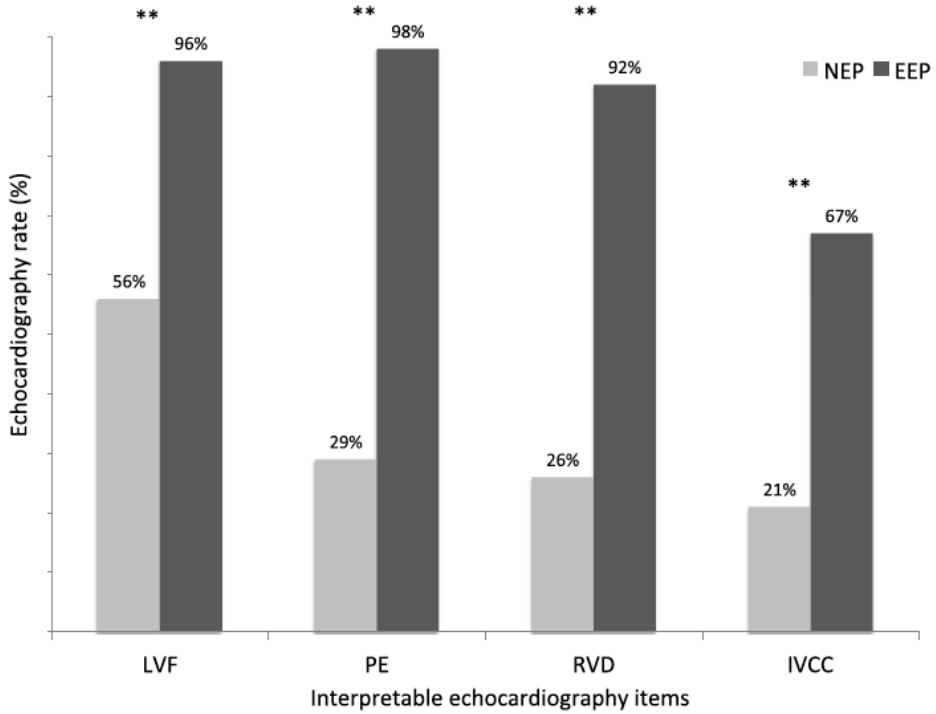


Fig. 2 Interpretable echocardiography items according to physician experience. EEP: experienced emergency physician; NEP: novice emergency physician (almost 50 echocardiographies after initial training); "Echography rate" is the number of examinations in which the item is interpretable; LVF: qualitative left ventricular function; PE: pericardial effusion; RVD: right ventricular dilation; IVCC: inferior vena cava compliance; ** $p < .05$

Bobbia et al Scand J Trauma Resusc Emerg Med 2015

ETO miniaturisés?
Aussi efficaces,

Emmanuelle Begot
François Dalmay
Caroline Etchecopar
Marc Clavel
Nicolas Pichon
Bruno Francois
Roberto Lang
Philippe Vignon

Hemodynamic assessment of ventilated ICU patients with cardiorespiratory failure using a miniaturized multiplane transesophageal echocardiography probe

Begot et al Intensive Care Med 2015

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Table 2 Proposed therapeutic changes directly resulting from hemodynamic assessment using the standard and miniaturized TEE probes

Therapeutic changes	Standard TEE probe (*n*)	Miniaturized TEE probe (*n*)	Kappa (95 % CI)
Fluid loading	14 (40 %)	12 (35 %)	0.80 (0.62–0.99)
Vasopressor support (initiation or increasing dose)	5 (14 %)	4 (12 %)	0.90 (0.65–1.0)
Inotropes (initiation or increasing dose)	8 (23 %)	9 (26 %)	0.90 (0.40–1.0)
Diuretics/negativation of fluid balance	2 (6 %)	3 (9 %)	0.80 (0.40–1.0)
Protective mechanical ventilation	3 (9 %)	3 (9 %)	1 (1.0–1.0)
Inhaled NO	2 (6 %)	2 (6 %)	1 (1.0–1.0)
Pericardiocentesis	0	0	1 (1.0–1.0)
Emergency cardiac valve surgery	4 (11 %)	3 (9 %)	0.80 (0.56–1.0)

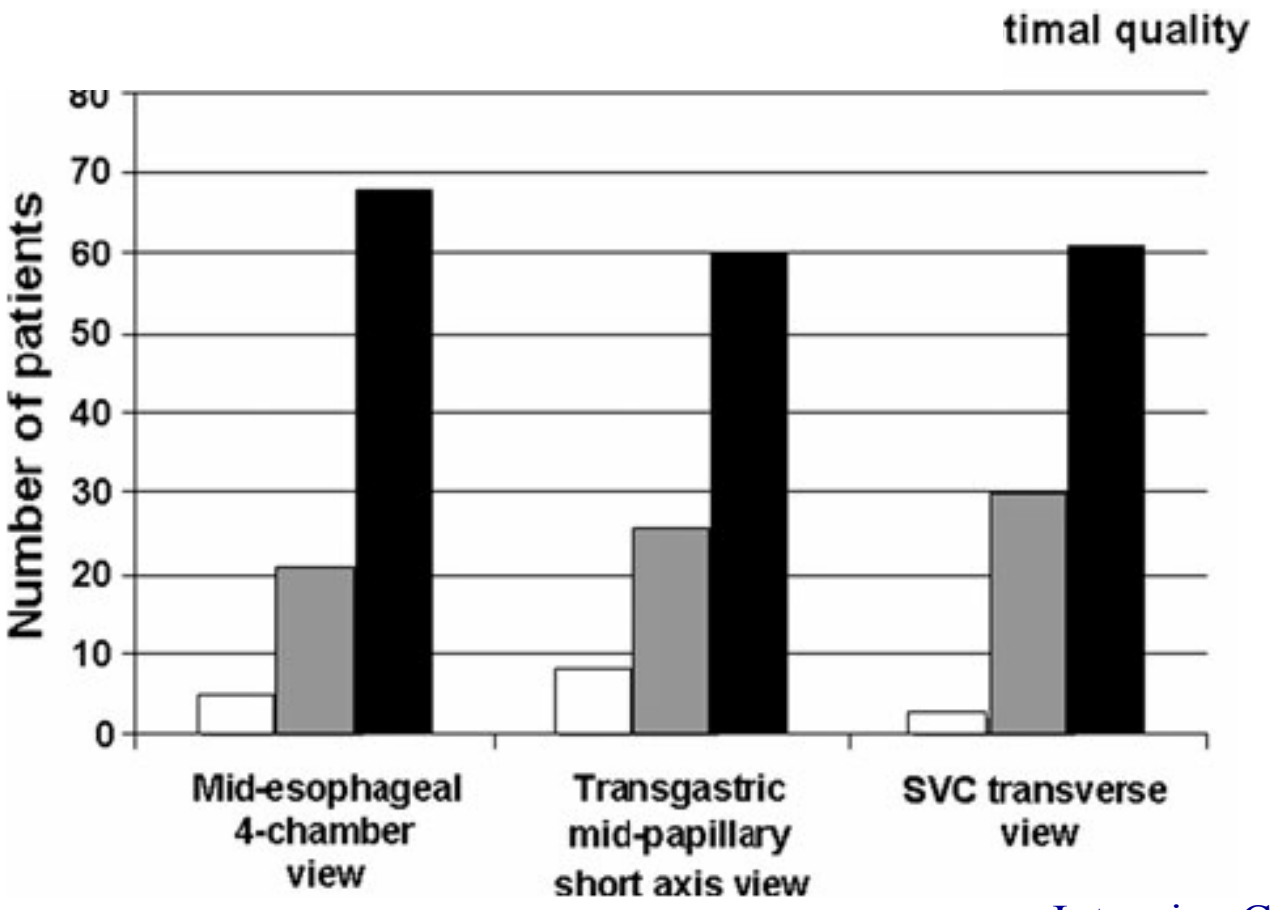
Begot et al Intensive Care Med 2015

ETO miniaturisés?

Aussi efficaces, utilisables plus longtemps

Antoine Vieillard-Baron
Michel Slama
Paul Mayo
Cyril Charron
Jean-Bernard Amiel
Cédric Esterez
François Leleu
Xavier Repesse
Philippe Vignon

A pilot study on safety and clinical utility of a single-use 72-hour indwelling transesophageal echocardiography probe



Intensive Care Med 2013

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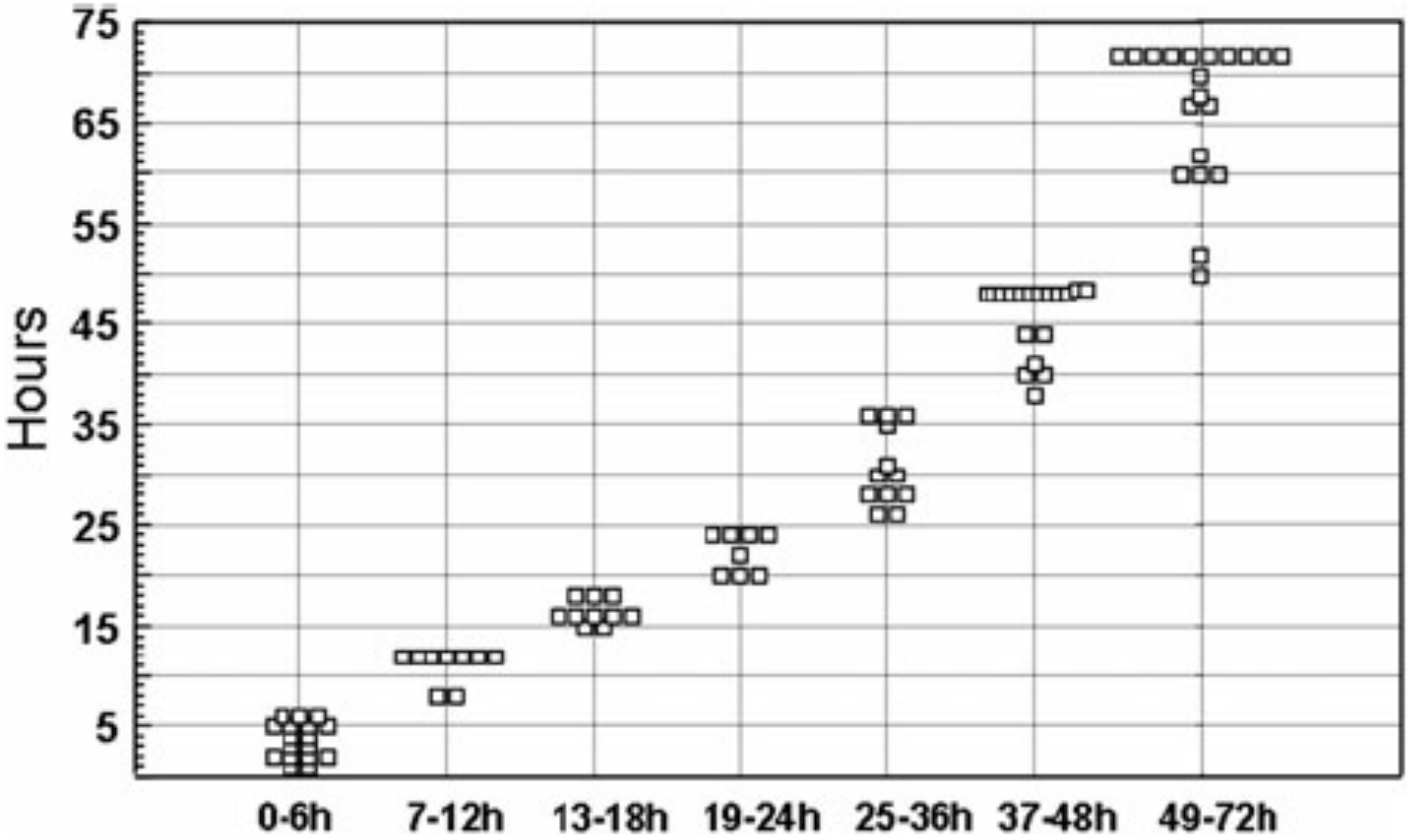
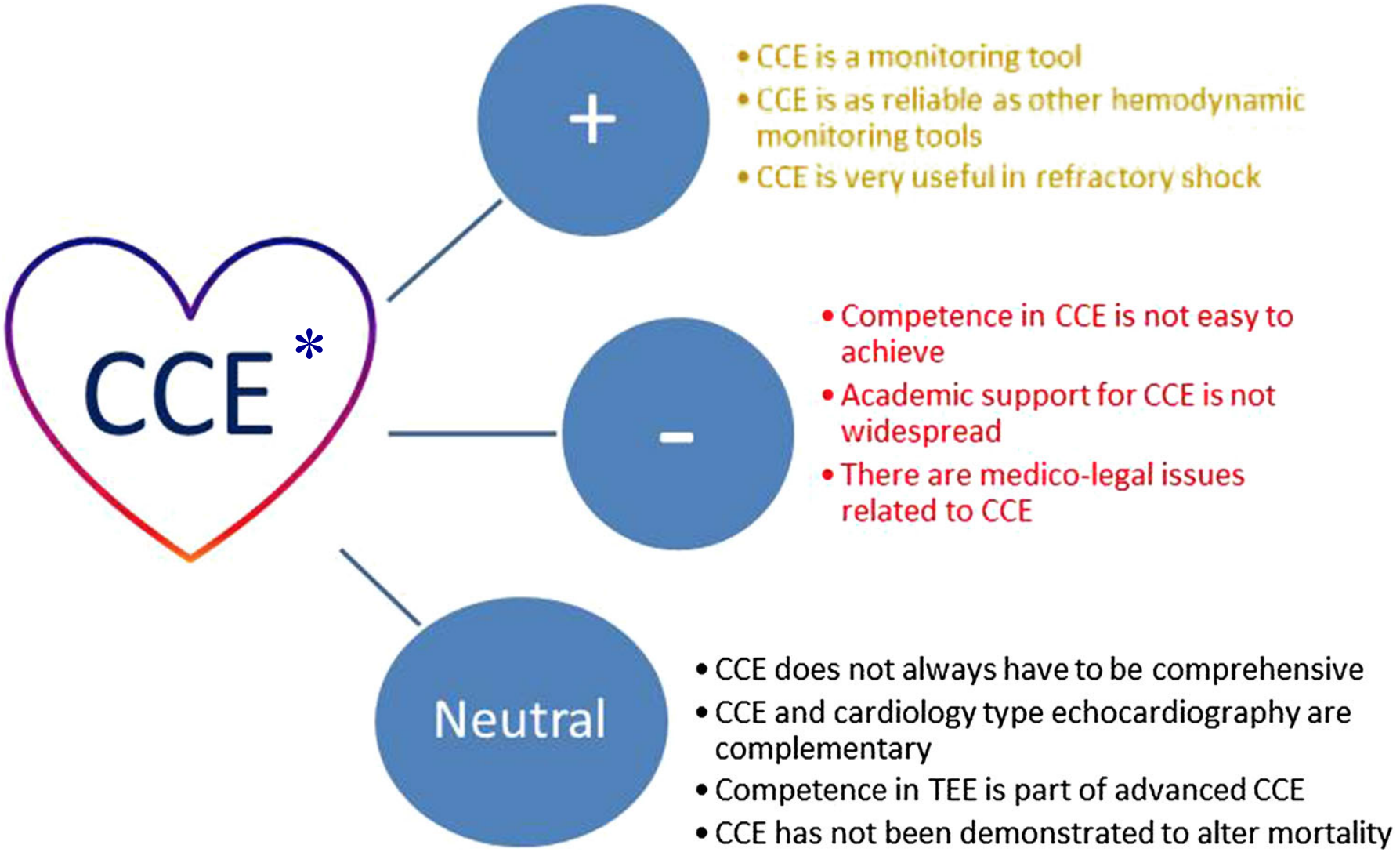


Intensive Care Med 2013

Nouveautés en échographie en réanimation :
Garder en tête ces 10 notions



* Critical Care Echo

Mayo, Mekontso-Dessap, Vieillard Baron. Intensive Care Med 2015

I have a dream…