

Optimal Resuscitation

Do we know?

What do we do?

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I have no disclosures

Surviving Sepsis Campaign

The logo for the Surviving Sepsis Campaign, featuring a vertical column of five blue circles of varying sizes on the right side of the text.

1. Screening for infection
Early identification
Treatment

qSOFA

Altered mental status

RR > 22

SBP < 100

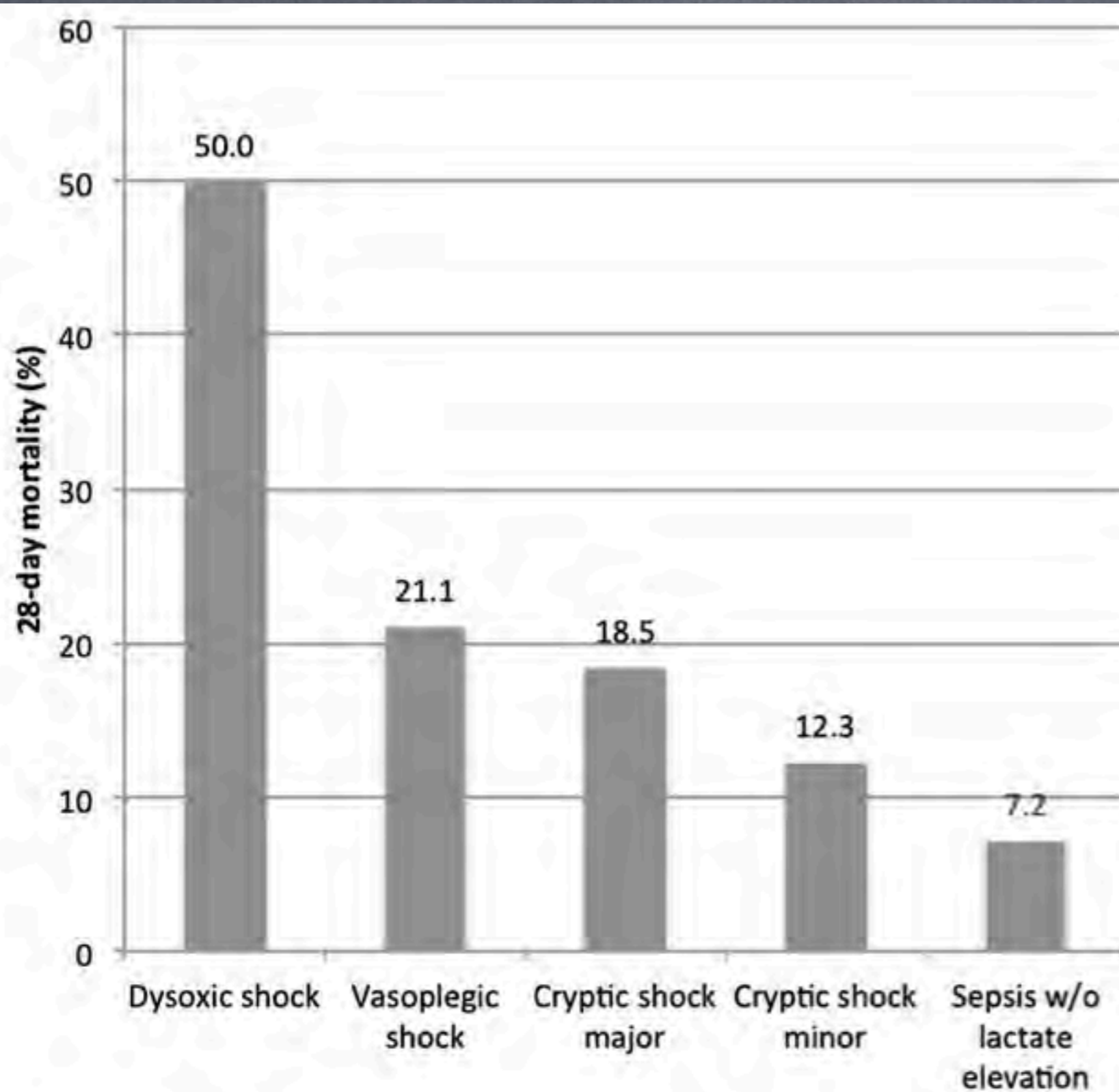


Fig. 2 Mortality rate at 28 days, by classification group

2. Screening for organ dysfunction and sepsis 3-hour bundle

TO BE COMPLETED WITHIN 3 HOURS:

- 1) Measure lactate level.
- 2) Obtain blood cultures prior to administration of antibiotics.
- 3) Administer broad spectrum antibiotics.
- 4) Administer 30 ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.

.L\|om\#s

4) Administer 30 ml/kg crystalloid for hypotension or lactate

3. Identification and management of initial
hypotension
Complete 6 hour bundle

TO BE COMPLETED WITHIN 6 HOURS:

- 5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mm Hg.
- 6) In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥ 4 mmol/L, re-assess volume status and tissue perfusion and document findings according to Table 1.
7. Re-measure lactate if initial lactate elevated.

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document findings according to Table 1.

SSC

How did the recommendations get scored?

GRADE

Strong vs weak

Voting

What's the evidence mean?

Strong – most would use in most situations

Weak – some want it, some don't

BPS = common sense, generally accepted

CMS

Sepsis

2 or more SIRS criteria

Temperature $>38^{\circ}\text{C}$ or $<36^{\circ}\text{C}$

Pulse rate >90 beats/min

Respiratory rate >20 breaths/min

WBC count $>12,000$ cells/mL³

Severe sepsis

Sepsis + evidence of organ dysfunction

Neurologic: altered mental status by history or examination

Cardiovascular: systolic blood pressure <90 mm Hg after fluid challenge

Metabolic: lactate >4.0 mmol/L

Hematologic: platelets $<100,000$ cells/mL³

Renal: creatinine >2.0 mg/dL, not known to be chronic

Pulmonary: respiratory rate >20 breaths/min or pulse oximetry $<90\%$
on room air or $<95\%$ while breathing supplemental oxygen >4 L/min

Septic shock

Sepsis + evidence of hypoperfusion

Vasopressor requirement

Hypotension after at least 2 L intravenous fluids

Hypotension after at least 2 L intravenous fluids

Vasopressor requirement

Within 3 hours of presentation:

- Measure serum lactate
- Obtain blood cultures prior to antibiotics
- Administer antibiotics

Within 6 hours of presentation:

- Repeat serum lactate if initial lactate is >2

For septic shock:

Within 3 hours of presentation:

- Measure serum lactate
- Obtain blood cultures prior to antibiotics
- Administer antibiotics
- Resuscitation with 30mL/kg crystalloid fluids

Within 6 hours of presentation:

- Repeat volume status and tissue perfusion assessment
- Vasopressor administration
(If hypotension persists after fluid)

(If hypotension persists after fluid)

Vasopressor administration

Performance improvement program (BPS)



Initial resuscitation

30 cc/kg within first 3 hours (strong)

Frequent reassessment of hemodynamic status (BPS)

Dynamic > static

Static



Dynamic

Central venous pressure

Pulmonary artery
catheter

LV end diastolic pressure





Static



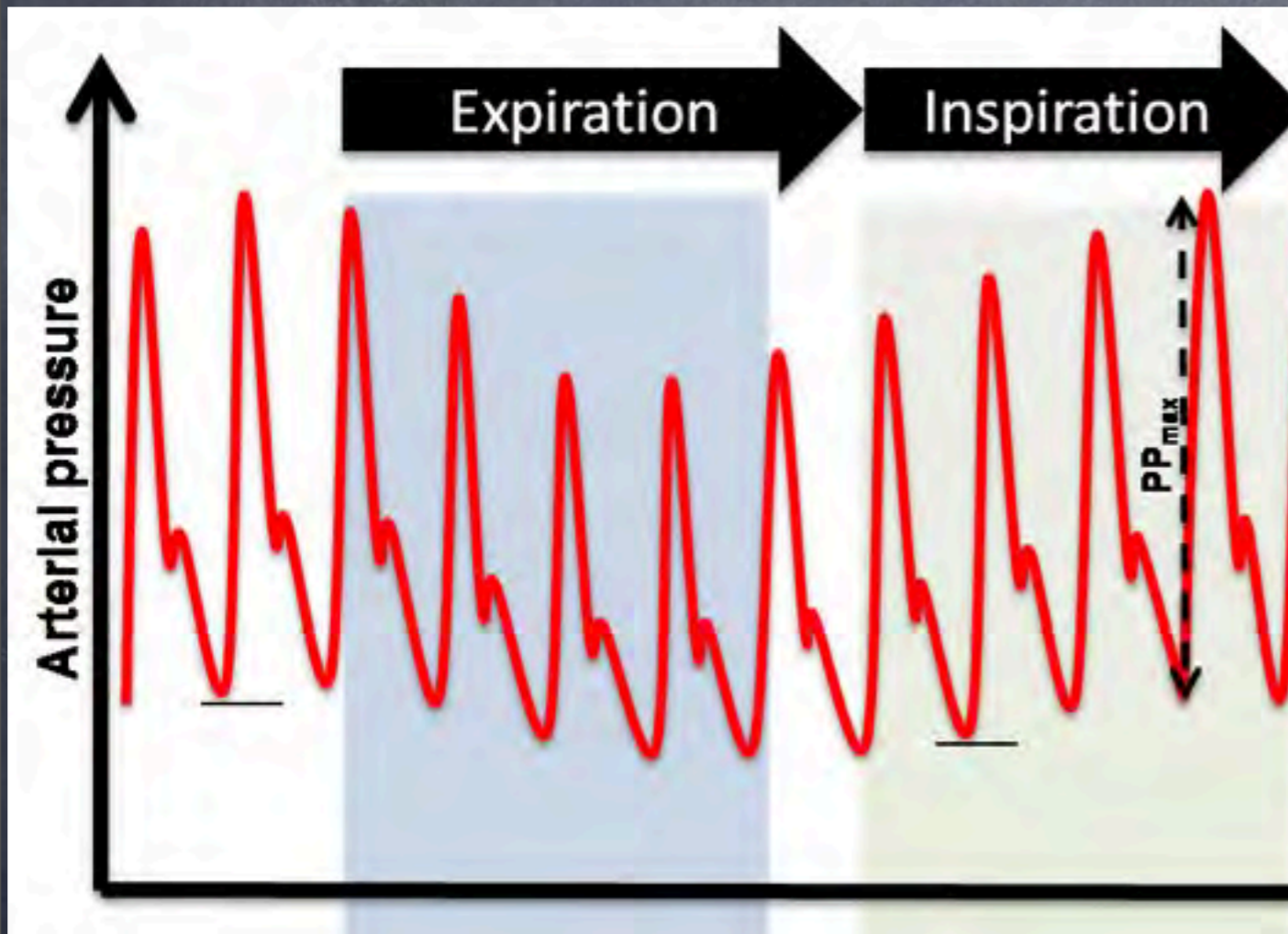
Dynamic

Central venous pressure
Pulmonary artery
catheter
LV end diastolic pressure

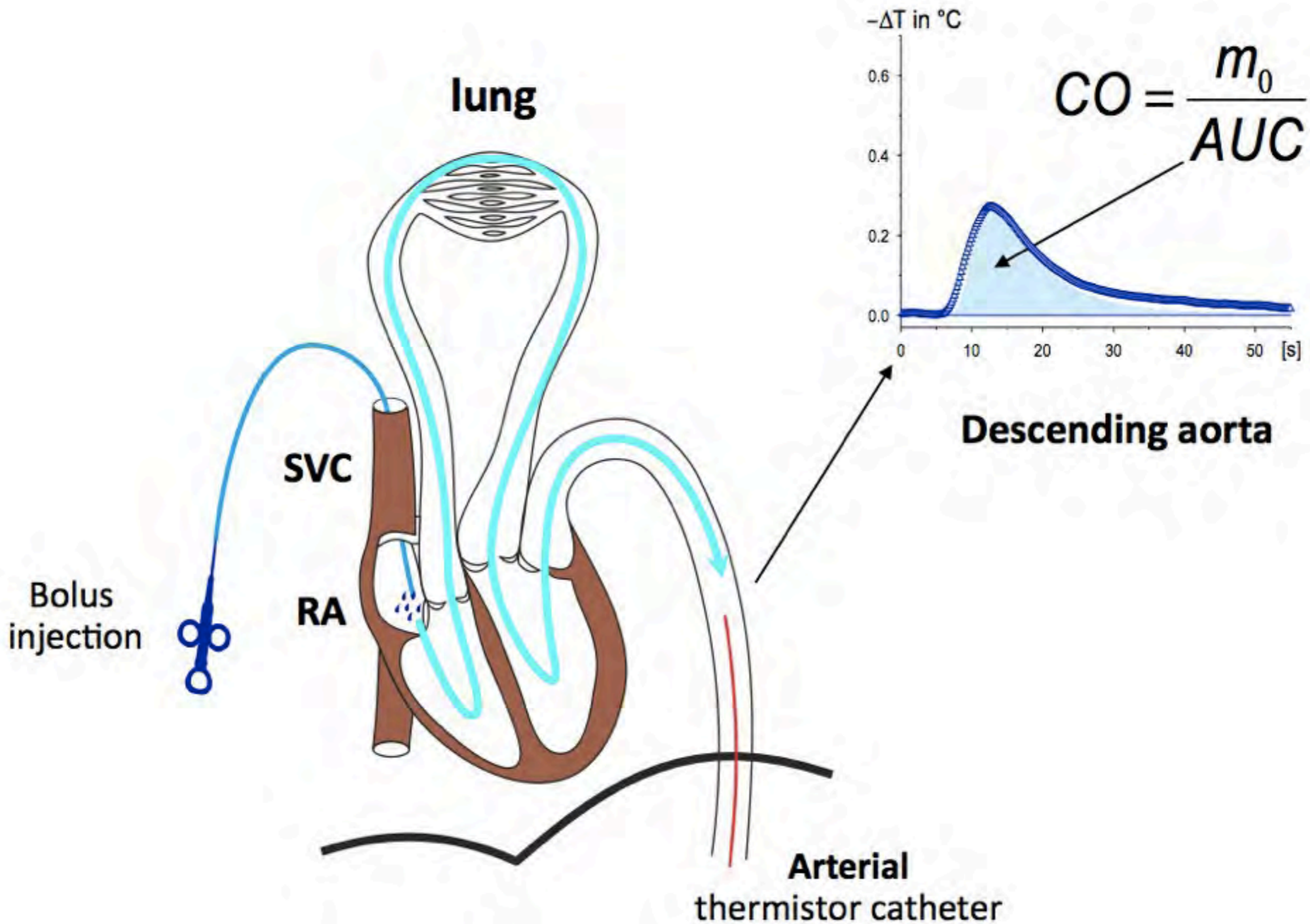
Pulse contour analysis
Thermodilution
Ultrasound techniques

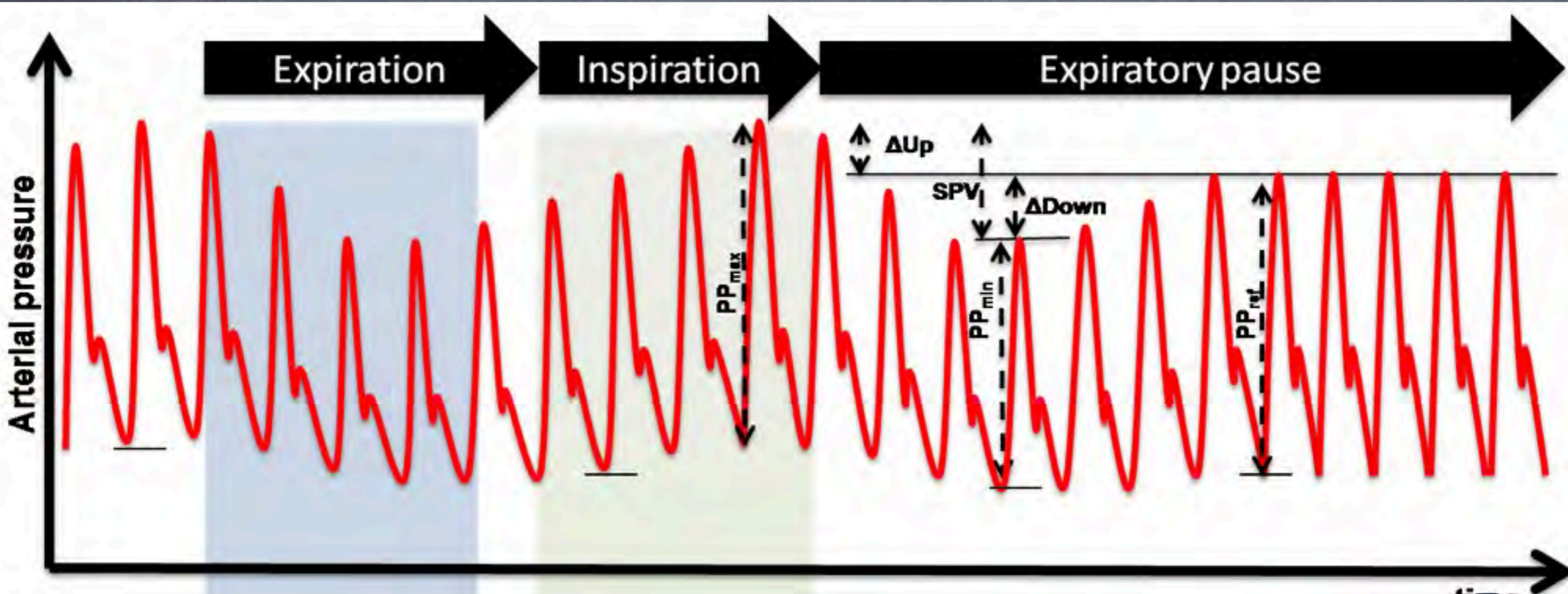


Pulse Contour Analysis



- mechanically vented
- no spontaneous effort
 - TV >8 ml/kg
 - HR/RR < 3.6
- no RV failure
- no elevated LV filling
- no arrhythmia





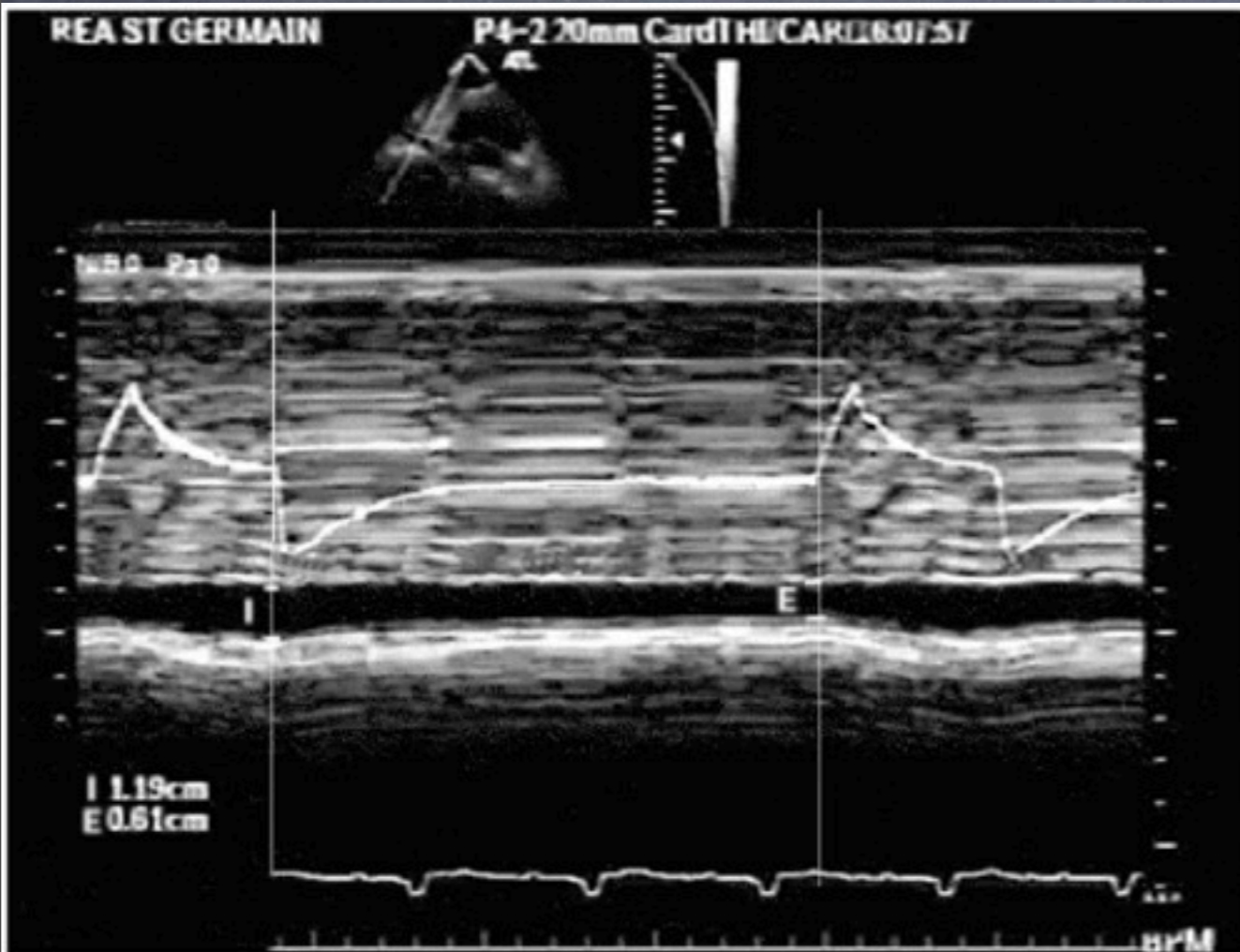
IVC Collapsibility



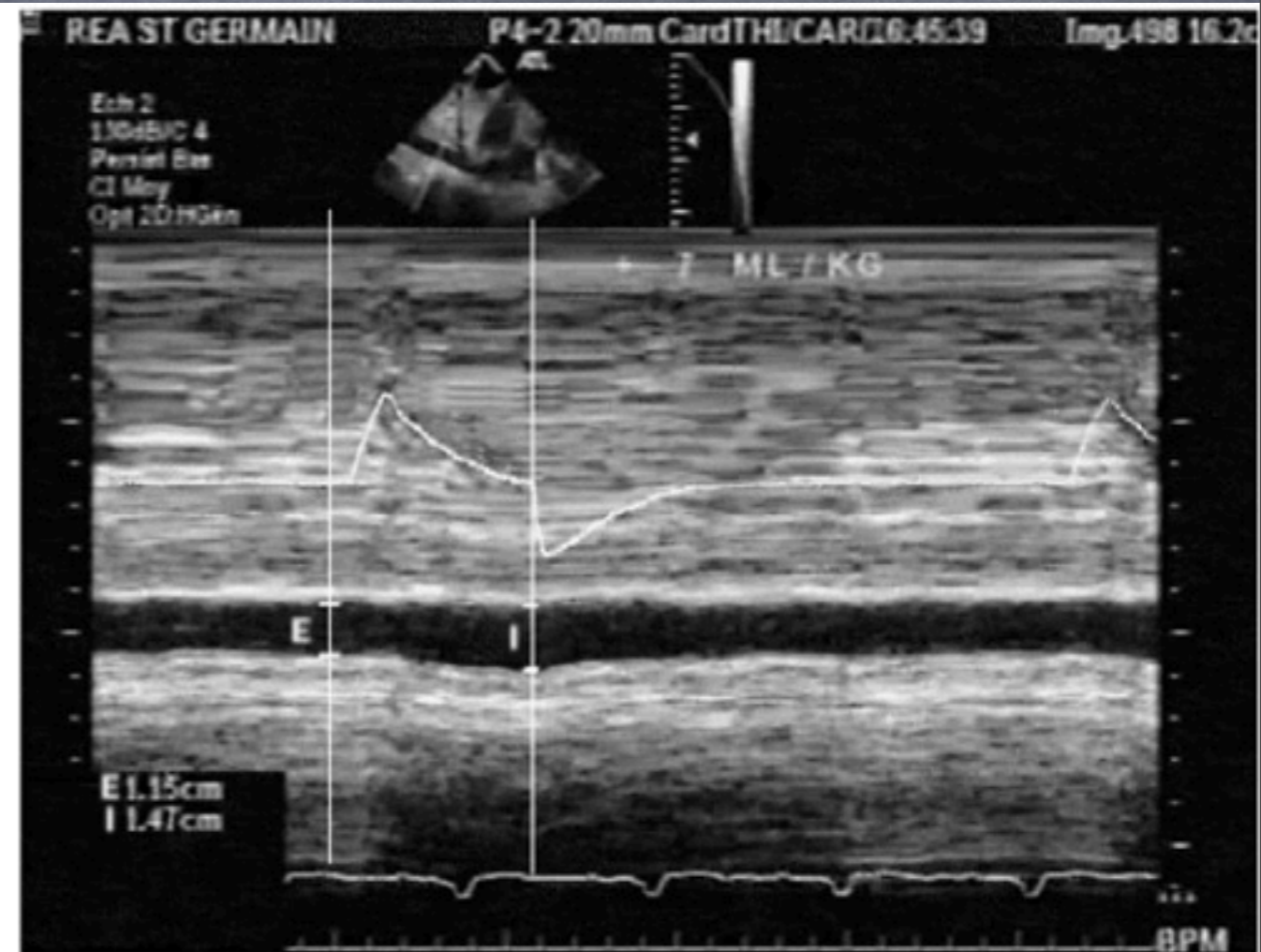
Caval index =

$$(IVC_{exp} - IVC_{insp}) / (IVC_{exp} \times 100)$$

IVC Distensibility

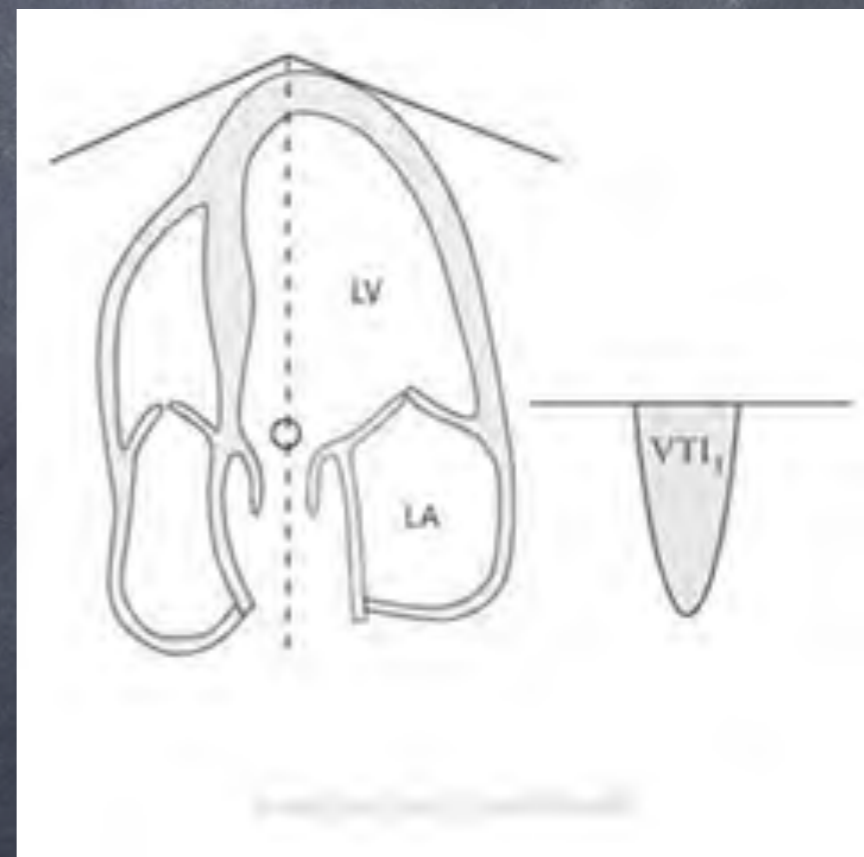
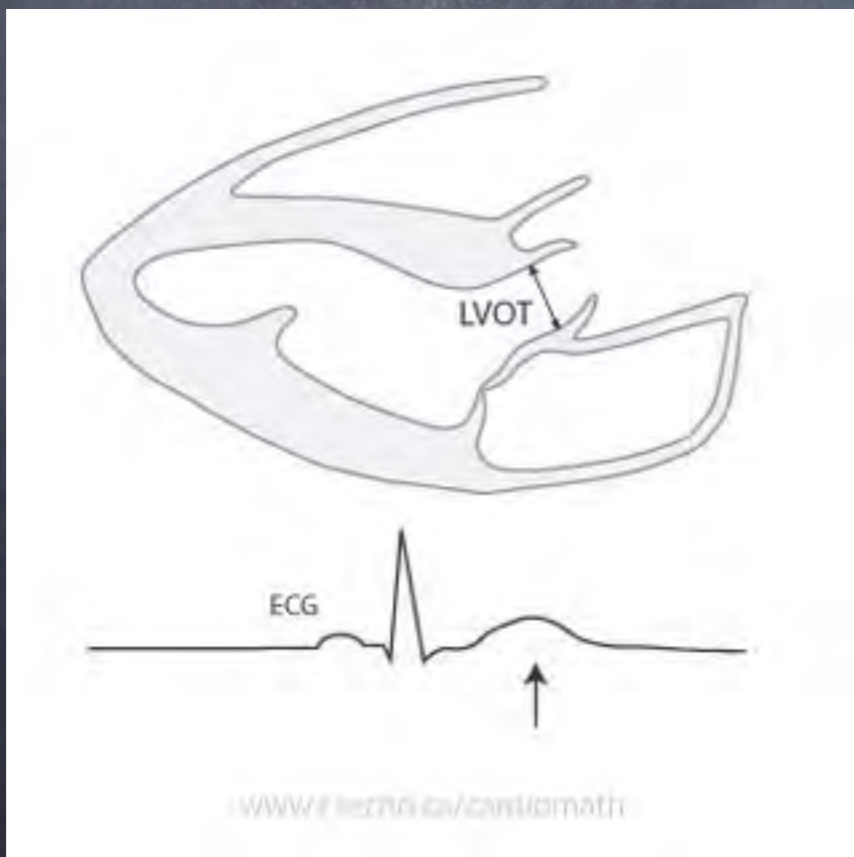
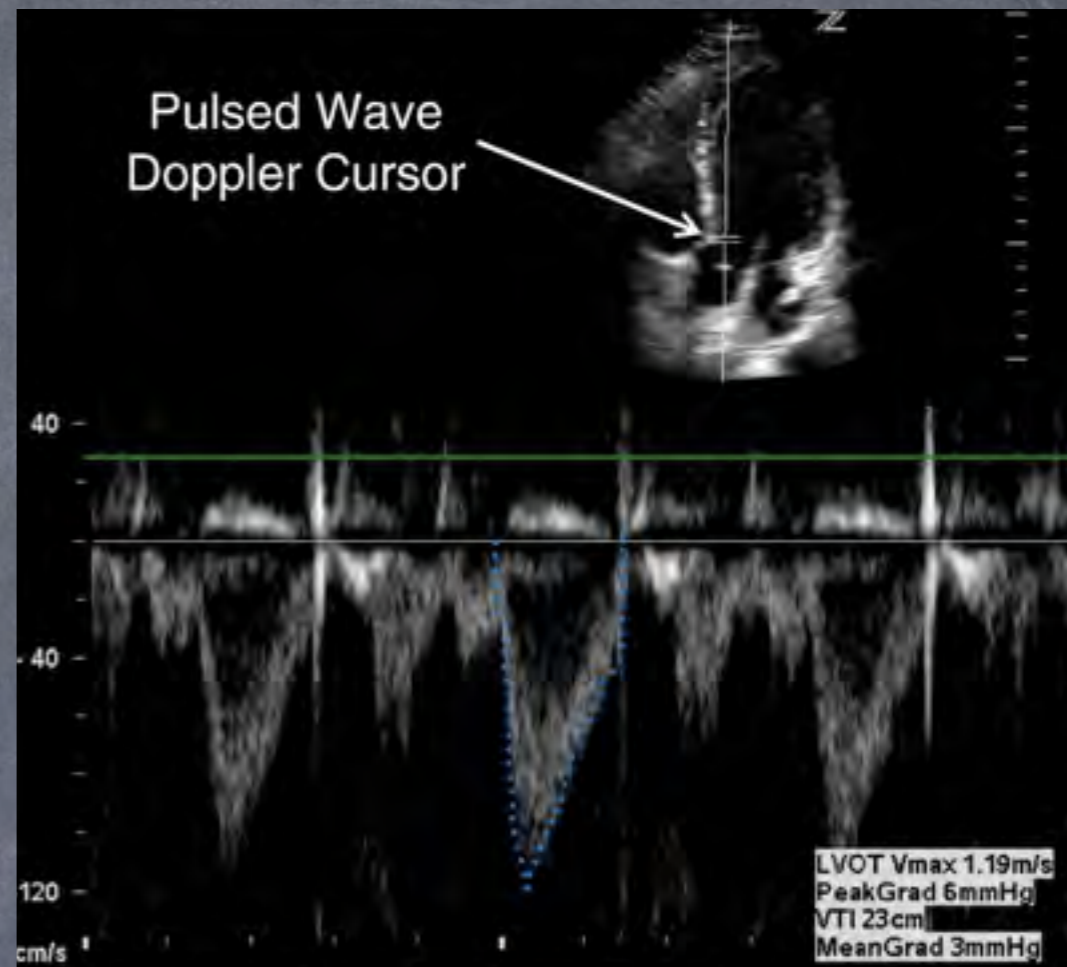
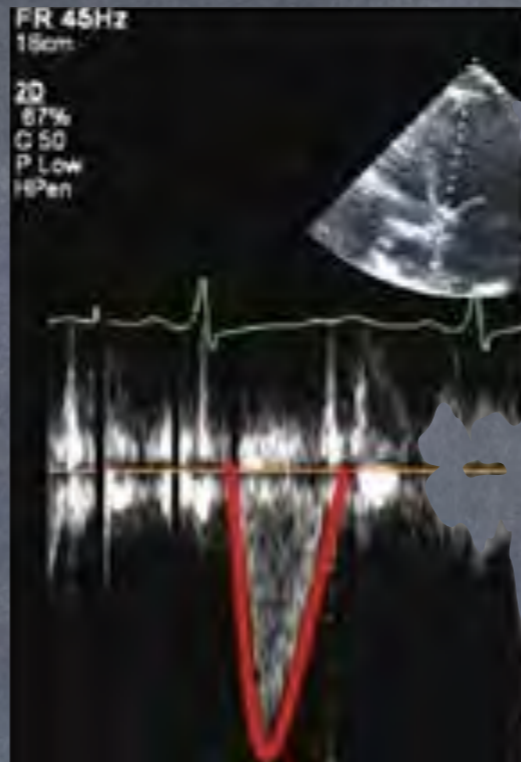


dIVC = 95 %
CI = 1.8 L/min/m²

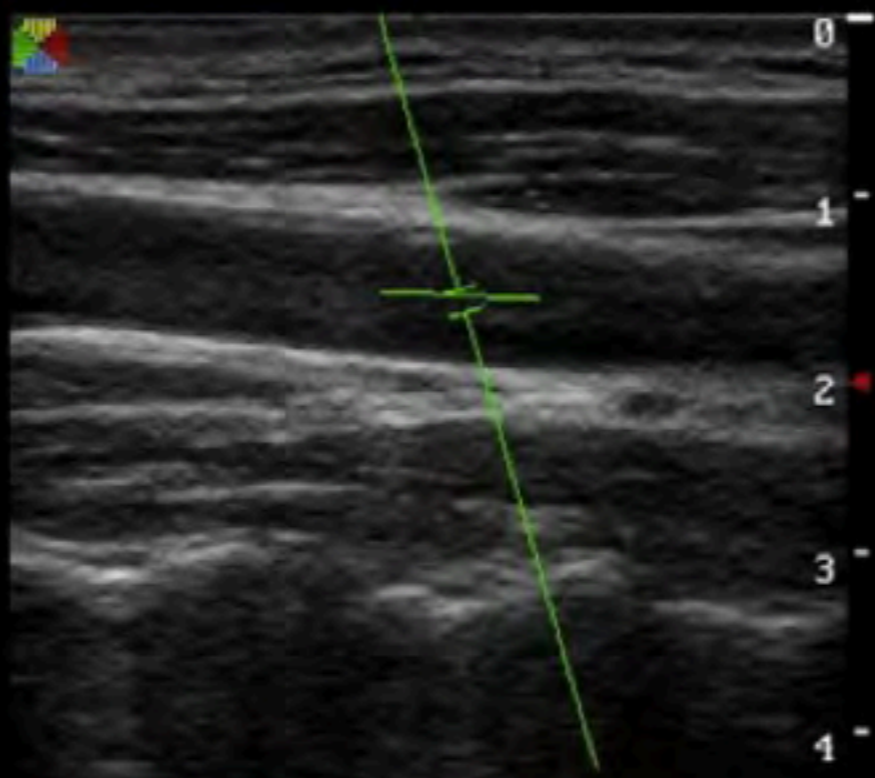


dIVC = 28 %
CI = 2.6 L/min/m²

B

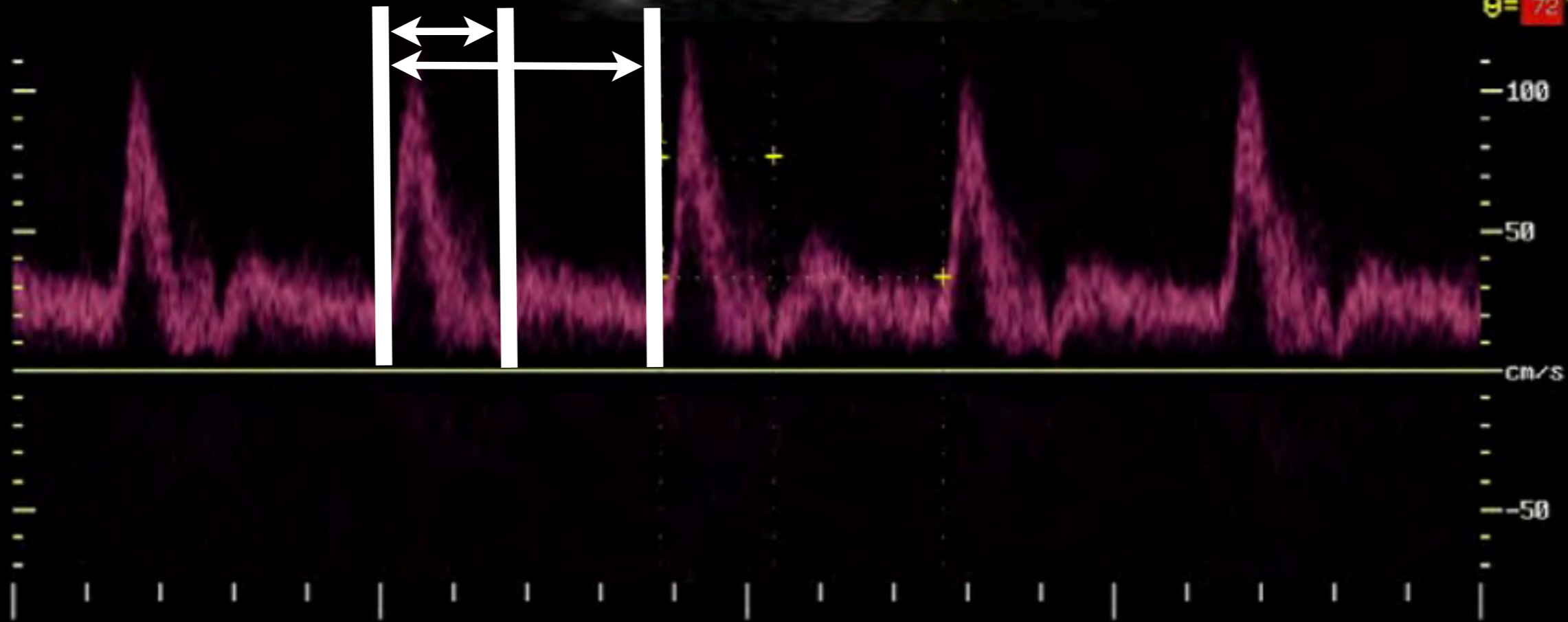


FPS
D/G 120/3
GN 20
I/P 2/10
PWR 70
FRQ 6-11
D 4.4cm



1 Doppler
Time 0.310 s
2 Doppler
Time 0.770 s

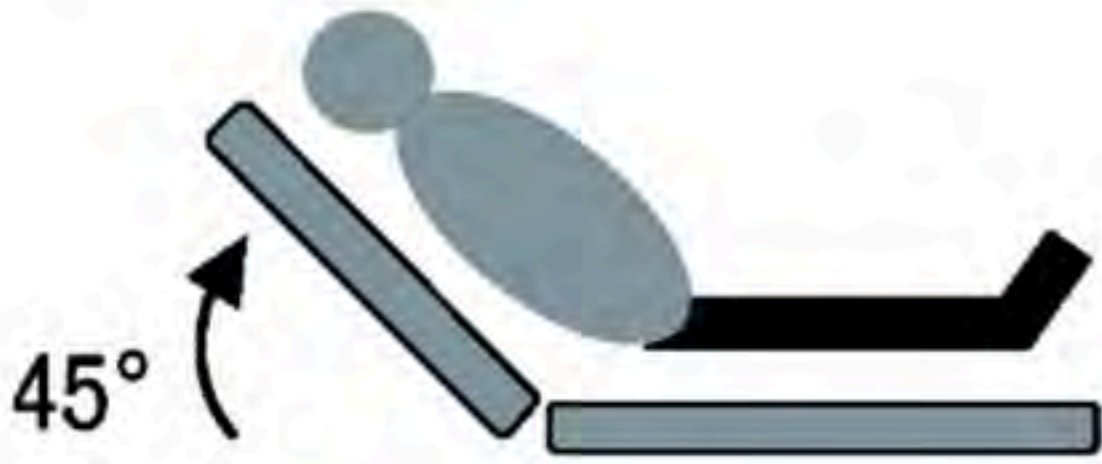
PRF 4.0
WF 100
GN 56
FRQ 5.1
PWR 70
DYN 5
SV 1.4



$\theta = 72^\circ$



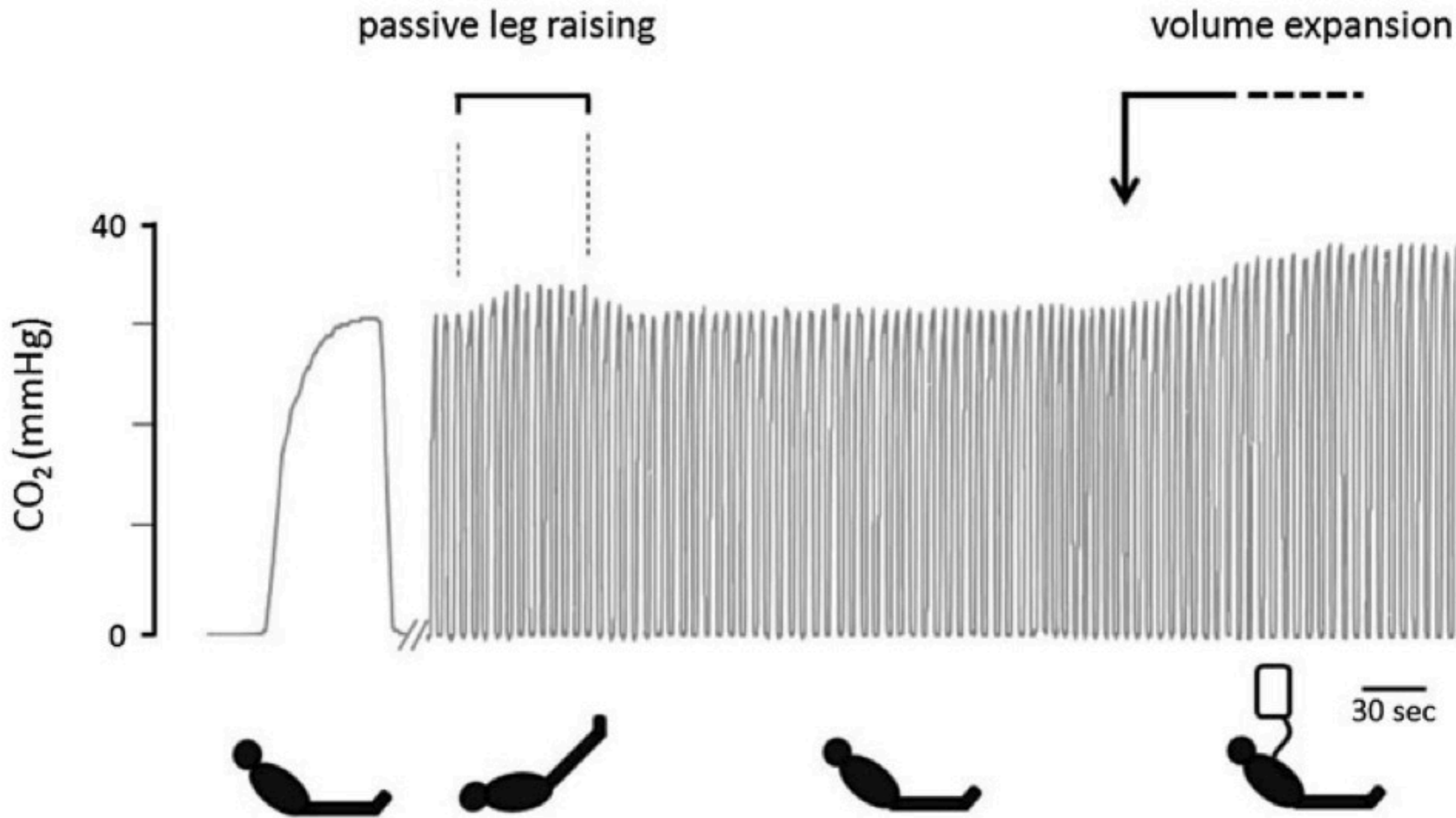
CINE



Semi-recumbent position



Passive leg raising



	Cut-off value	Sens	Spec	PPV	NPV	P-value
PLR-CI	10%	95	95	95	95	<0.0001
PLR-EtCO ₂	5%	71	100	100	76	<0.0001

What about pressors?

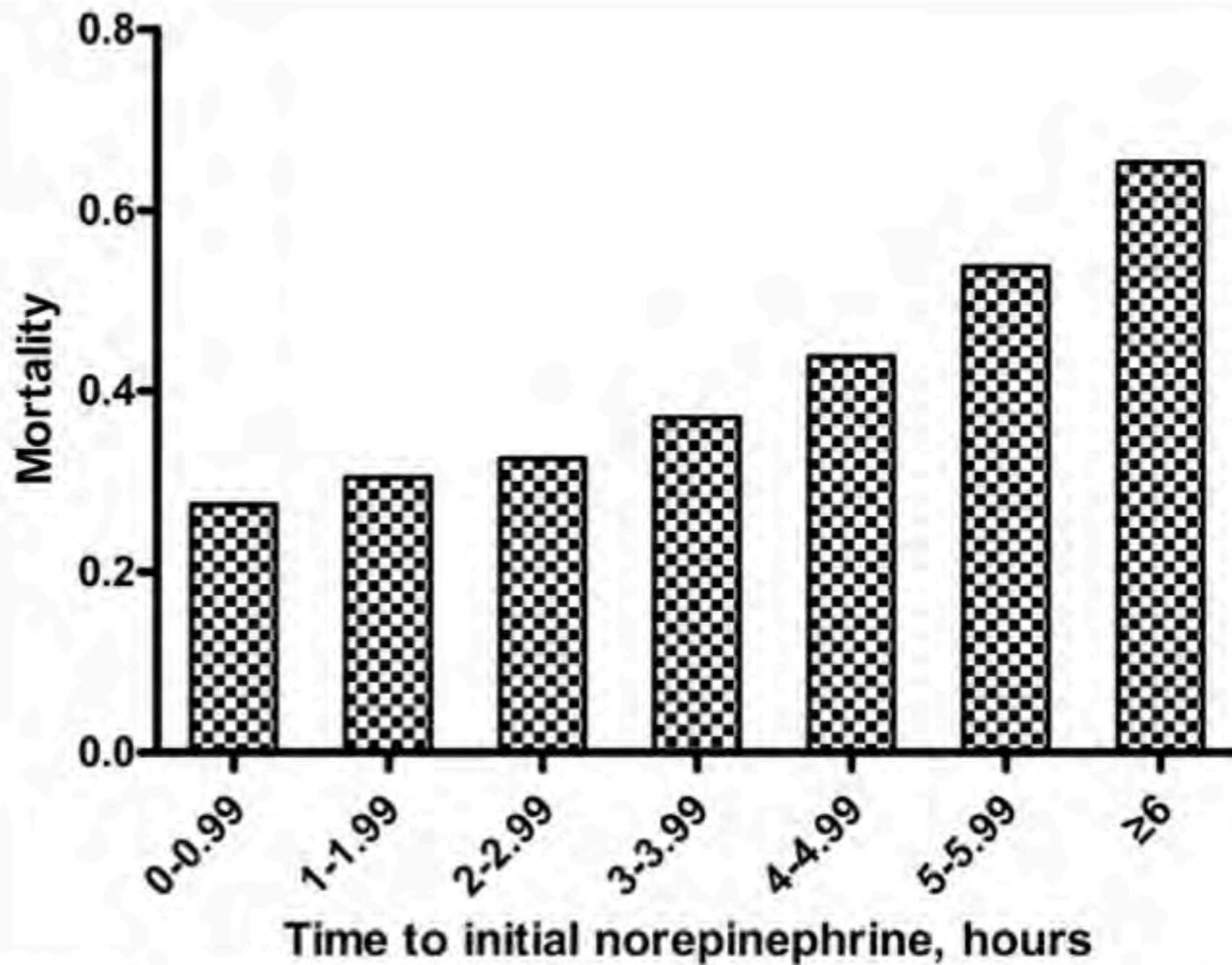


Figure 3 Mortality of patients whose initial norepinephrine administrations were within the indicated time interval.



Antimicrobial therapy

Empiric
Targeted
Broad-spectrum
Multidrug
Combination

Antimicrobial therapy

No prophylaxis for noninfectious states

Empiric combo therapy for initial septic shock

Combo tx for septic shock only*

Abx should be administered within 1 hour



Recruitment maneuvers
Prone positioning
No HFOV
NIV – no comment
NMBAAs
Lower tidal volumes



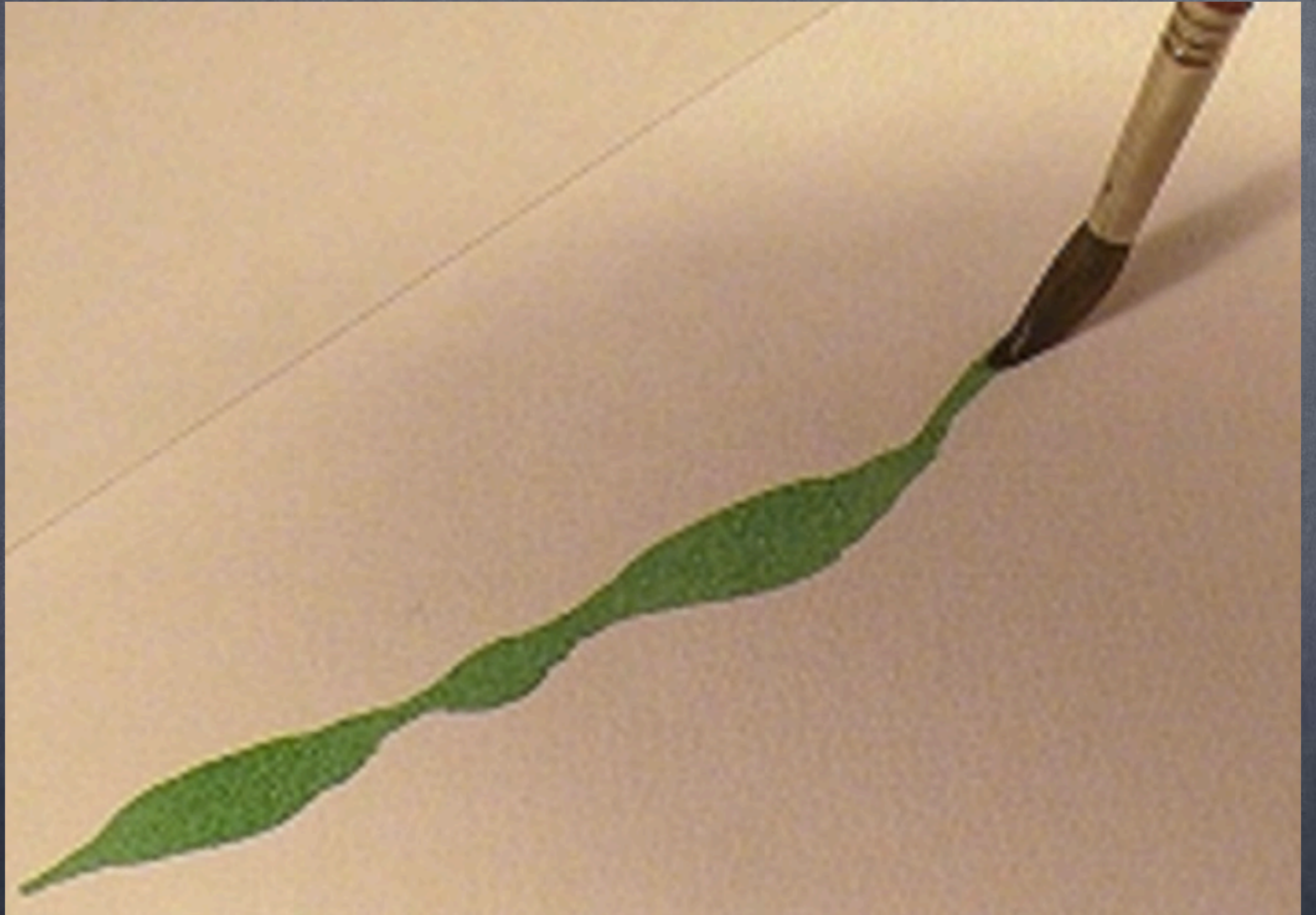
PULMONARY/ORIGINAL RESEARCH

Lung-Protective Ventilation Initiated in the Emergency Department (LOV-ED): A Quasi-Experimental, Before-After Trial

Brian M. Fuller, MD, MSCI*; Ian T. Ferguson, MPH; Nicholas M. Mohr, MD, MS; Anne M. Drewry, MD, MSCI;
Christopher Palmer, MD; Brian T. Wessman, MD; Enyo Ablordeppey, MD, MPH; Jacob Keeperman, MD;
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Thank you!
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