Rethinking the Bolus: Dynamic Fluid Assessment as the Emerging Standard of Care in Sepsis Resuscitation

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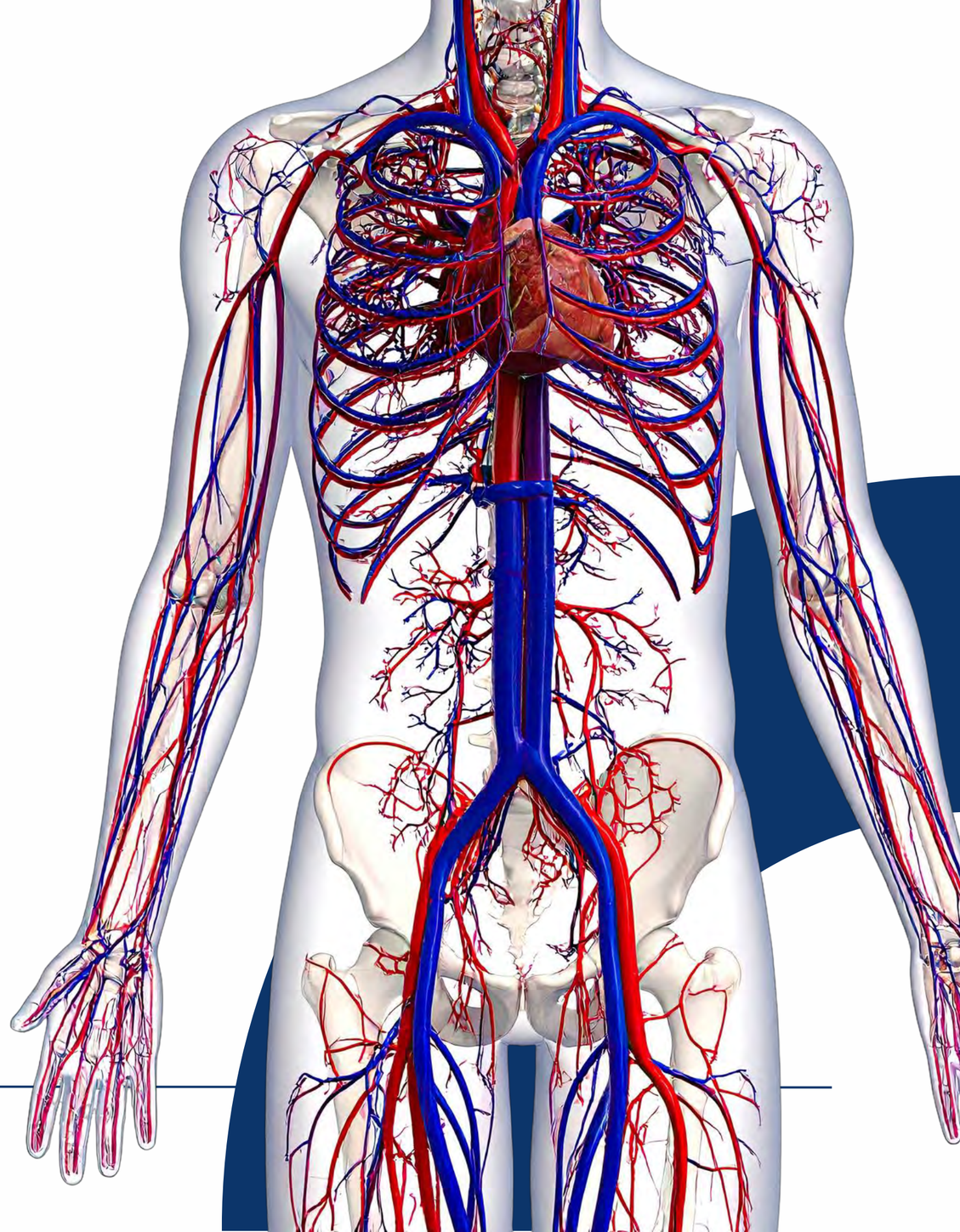

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Hi! I’m Jaclyn...

Experience

- 14+ years in Emergency & Critical Care Nursing
- Former Director of Nursing- 8 Specialty Teams
- 5x TJC Disease Specific Certification – Sepsis

National Speaker & Educator (2025 & 2026)

- NTI Conference
- ENA-On Webinar Session
- Health Information & Technology Symposium, Temecula, CA
- ENA Conference, New Orleans, LA

Media

- Rapid Response RN Podcast, Episode 138
- Rapid Response RN Podcast, Episode 154
- FreshRN Podcast, Episode - Leading Better Sepsis Care

Publications

- 2024 Publication on Nursing Led Sepsis Response Teams (DOI:100r.g1/107.711/2707/5203510321214214212990037 8)

Ever hang another liter of fluid and think…

”Why are we doing this?”

- WE DID TOO… UNTIL WE STOPPED

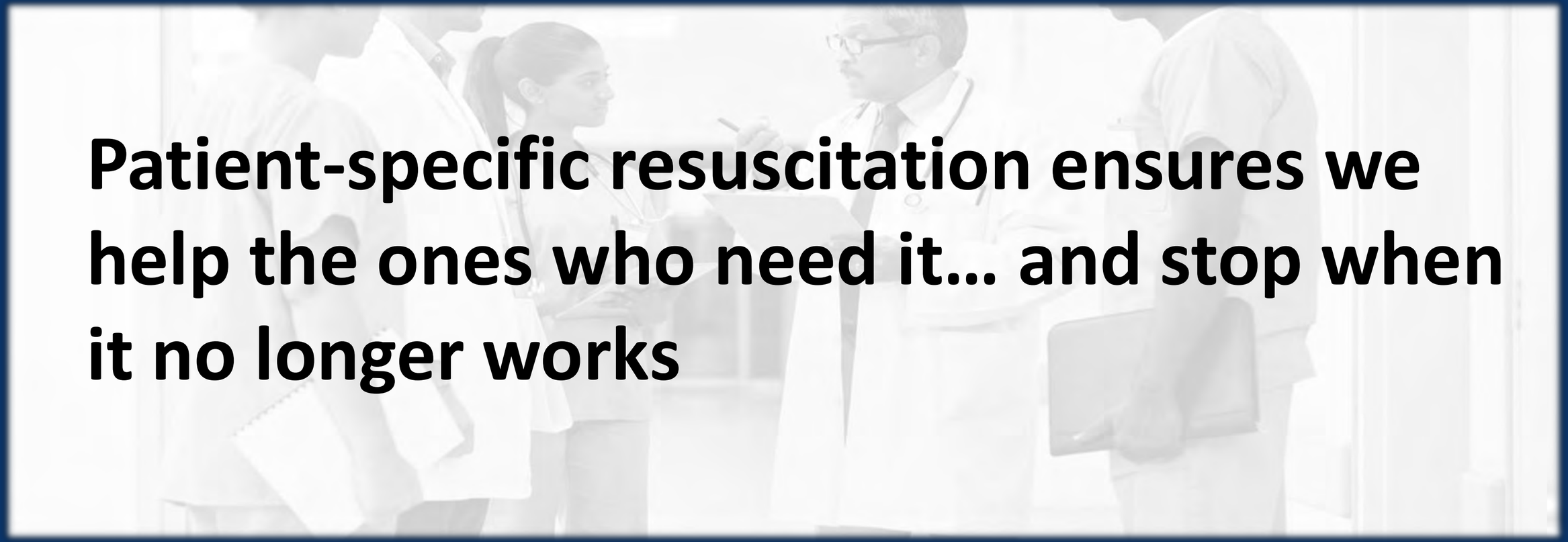
5%
Mortality Rate

82%
SEP-1 Compliance

35%
Decrease in ICU Admissions

Clinical Impact

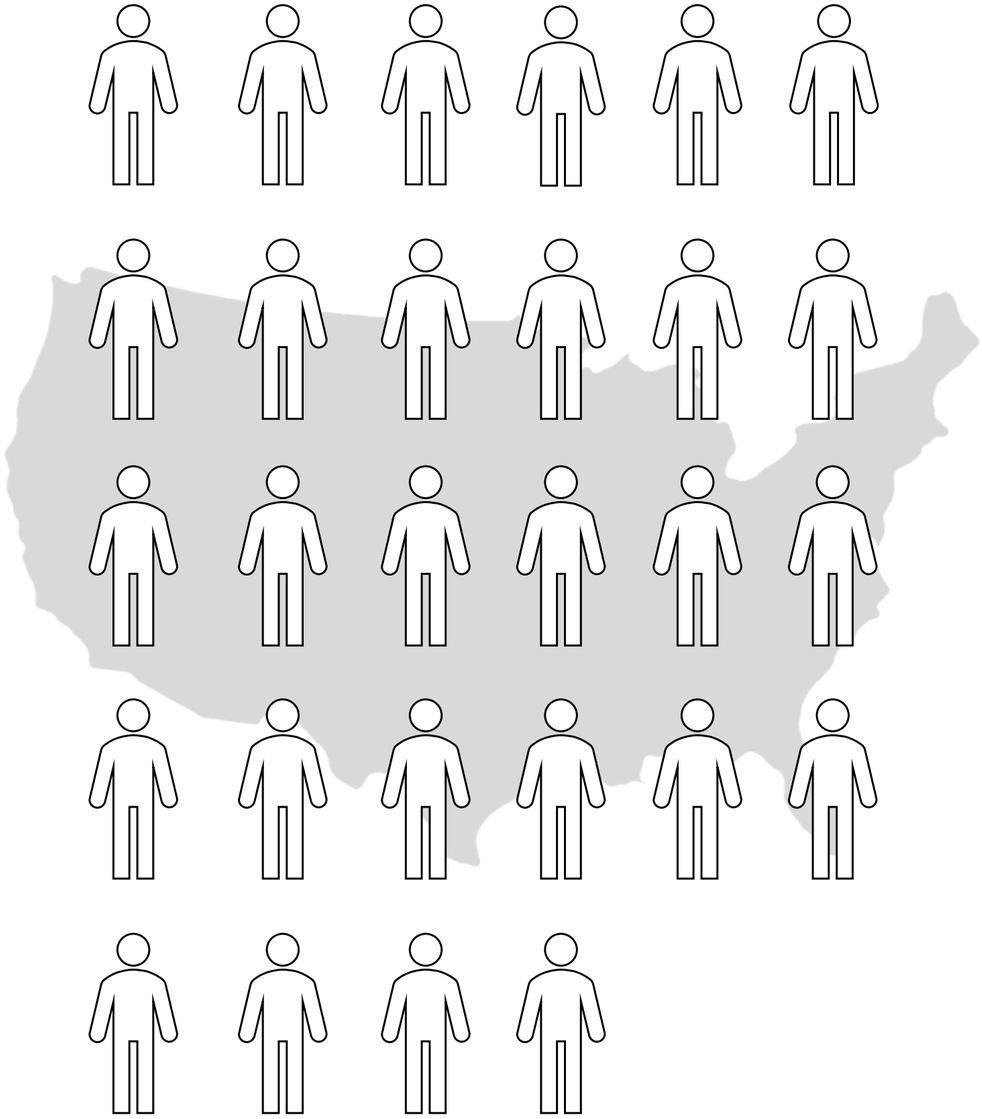
Protecting patients with precision care



Patient-specific resuscitation ensures we help the ones who need it… and stop when it no longer works

1.7 MILLION

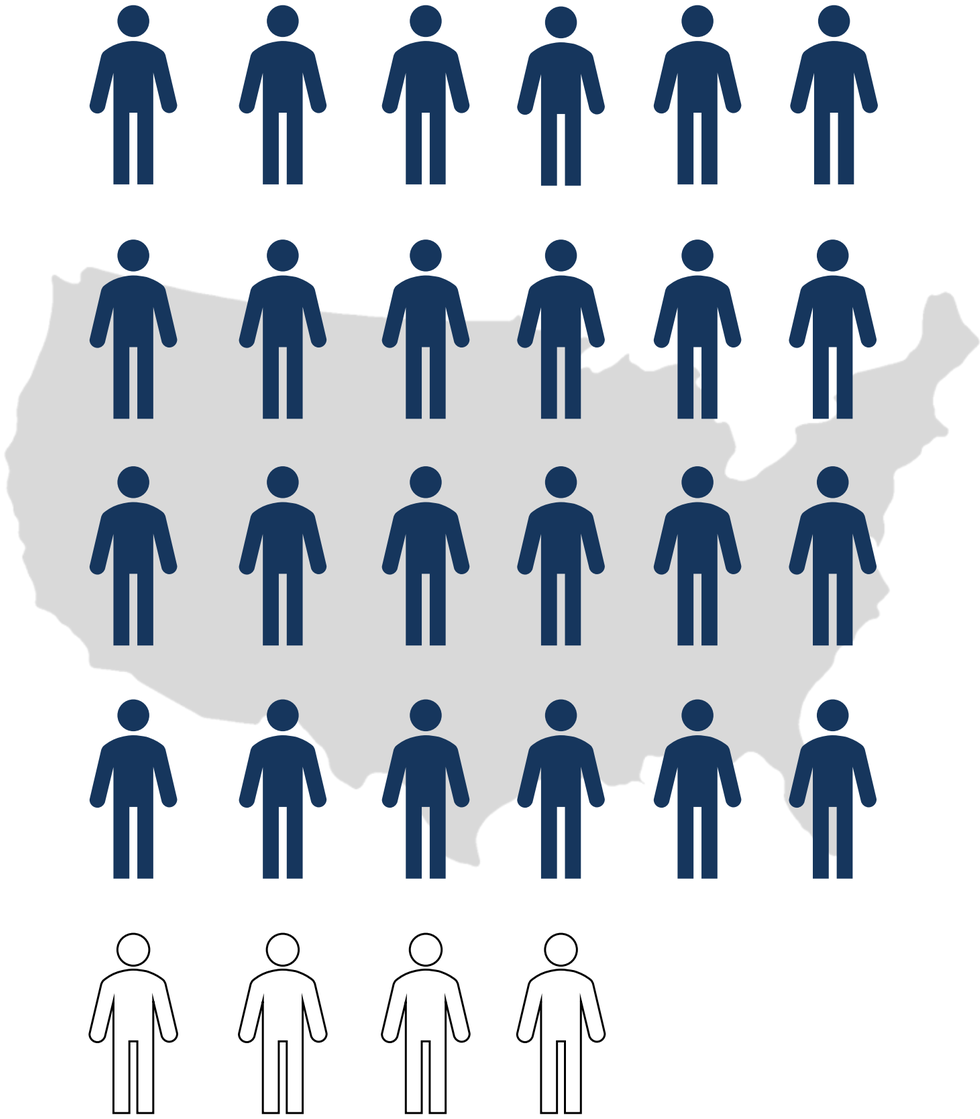
PEOPLE ARE DIAGNOSED WITH SEVERE SEPSIS OR SEPTIC SHOCK ANNUALLY IN THE US[1]



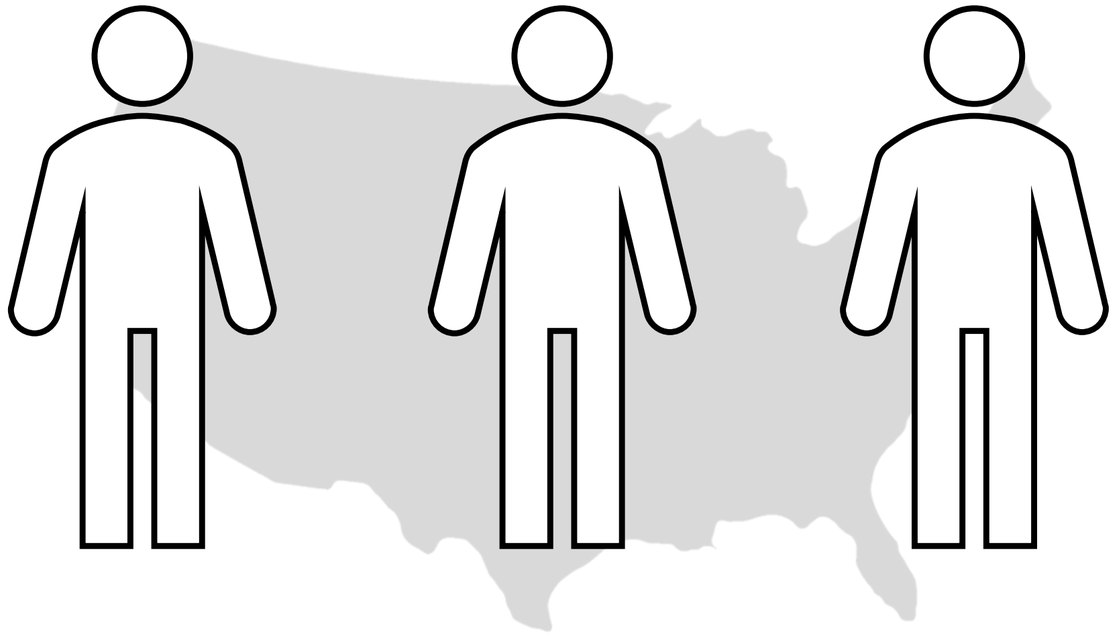
= 50,000 people

85%

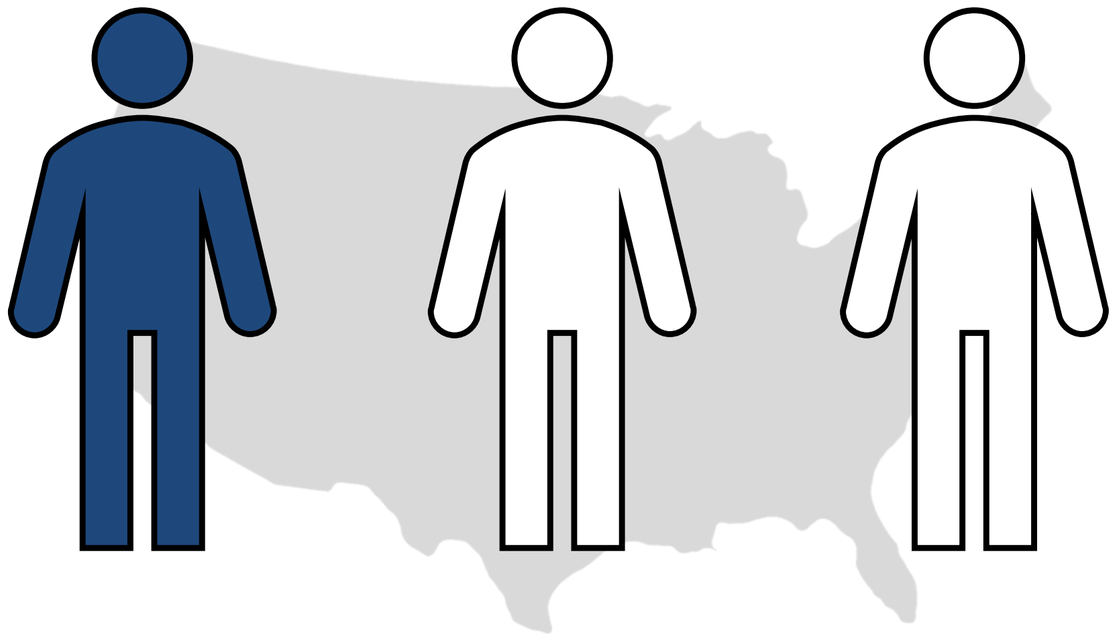
OF THESE PATIENTS MEET CRITERIA IN THE EMERGENCY DEPARTMENT[1]



= 50,000 people



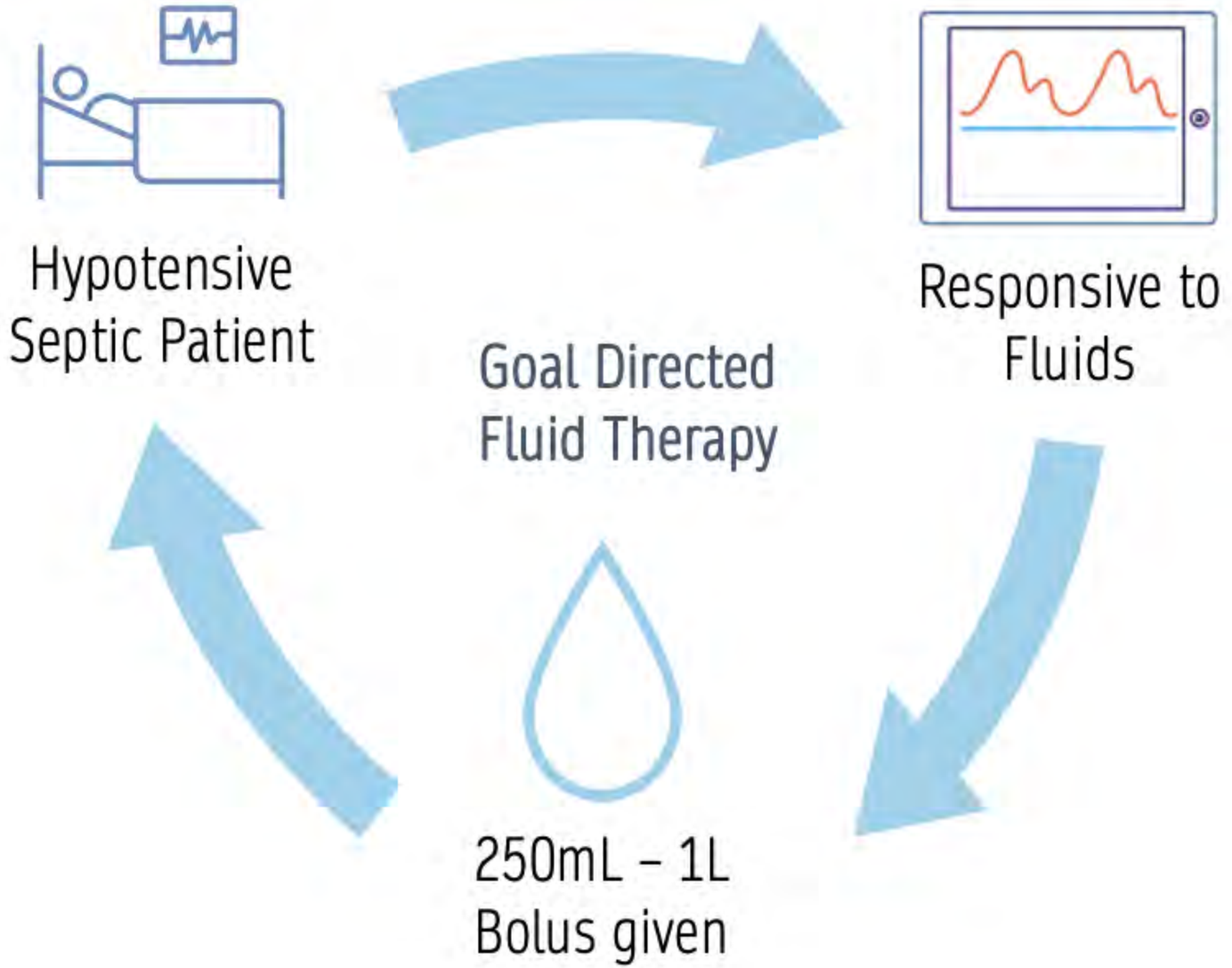
NEARLY 1 IN 3 SEPTIC PATIENTS WERE **FLUID UNRESPONSIVE** AFTER THE INITIAL BOLUS[13]



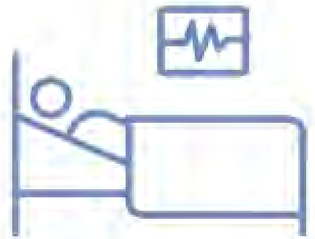
WE DO NOT GIVE 30 mL/kg

We Deliver Patient Specific Fluid Resuscitation Through Dynamic Repeatable Fluid Responsive Assessments

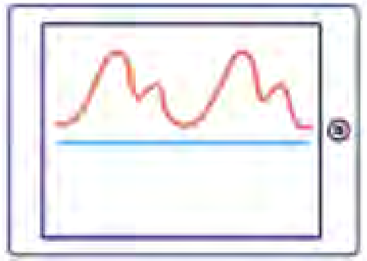
Dynamic Resuscitation Guide



Dynamic Resuscitation Guide



Hypotensive
Septic Patient



UNresponsive to
Fluids

Initiation of
pressors

STATIC VS. DYNAMIC ASSESSMENTS[14]

STATIC ASSESSMENT

- Single point-in-time measure. It's a snapshot of the current status.

DYNAMIC ASSESSMENT

- A measure of response to change.

Static tells you where you ARE.
Dynamic tells you where you're GOING.

EVIDENCED BASED DECISIONS
DYNAMIC IS BEST PRACTICE

Surviving Sepsis Campaign®

Critical Care Explorations
SCCM JOURNALS

CHEST®
AMERICAN COLLEGE of CHEST PHYSICIANS

"Evidence supports dynamic over static preload assessments."[3]

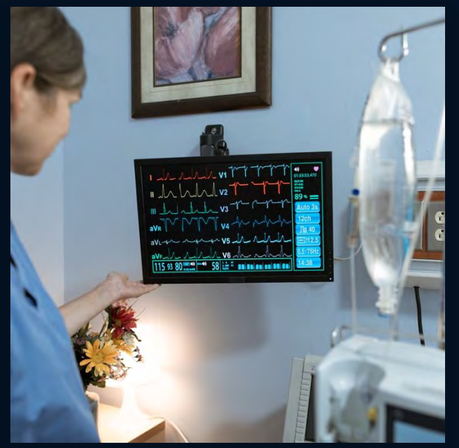
"Evidence suggests dynamic assessments may lower risk of acute kidney injury."[4]

"This study provides clinical evidence that dynamic assessments can lead to safer, more tailored resuscitation in septic shock, supporting a shift away from the one-size-fits-all approach."[17]

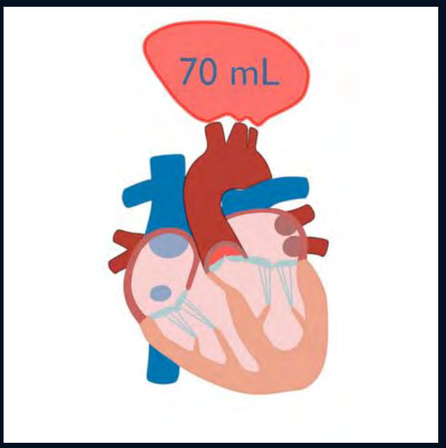
COMMON ASSESSMENTS OF FLUID RESPONSIVENESS[1,2]

MAP

Lactate



CVP



△ SV

BLOOD PRESSURE[1,2]

What is it measuring?

Average pressure pushing blood through vessels

Why we use it?

Easy, noninvasive, real-time

Mind the gap.

- Late indicator
- Does not predict fluid responsiveness
- Influenced by vasoconstriction, contractility, afterload - not just preload

LACTATE[1,2]

What is it measuring?

Byproduct of anaerobic metabolism

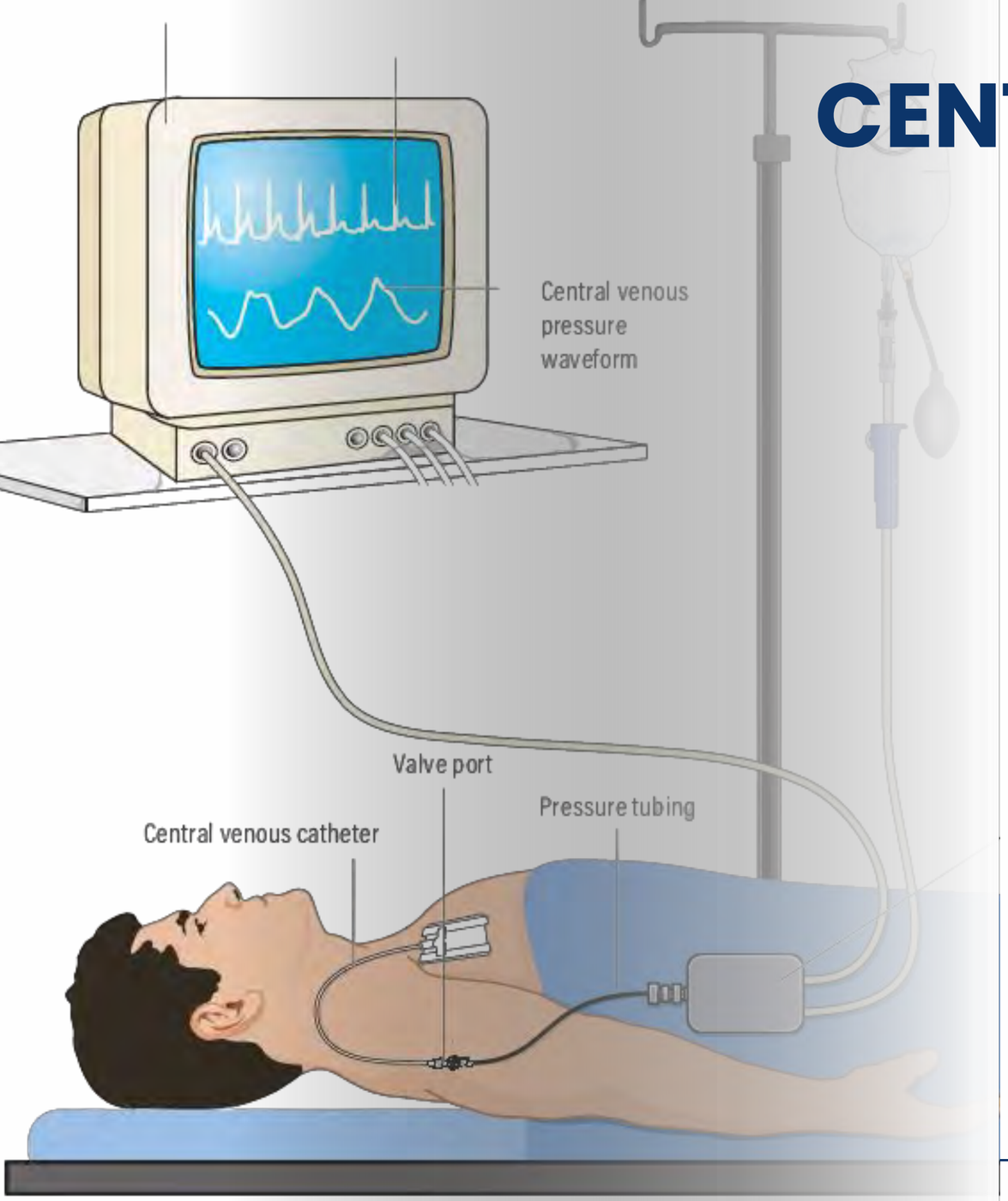
Why we use it?

Reflects tissue perfusion status

Mind the gap.

- Retrospective
- 2 - 4-hour lag
- Doesn’t differentiate Type A from Type B hyperlactemia

CENTRAL VENOUS PRESSURE[1,2]



What is it measuring?

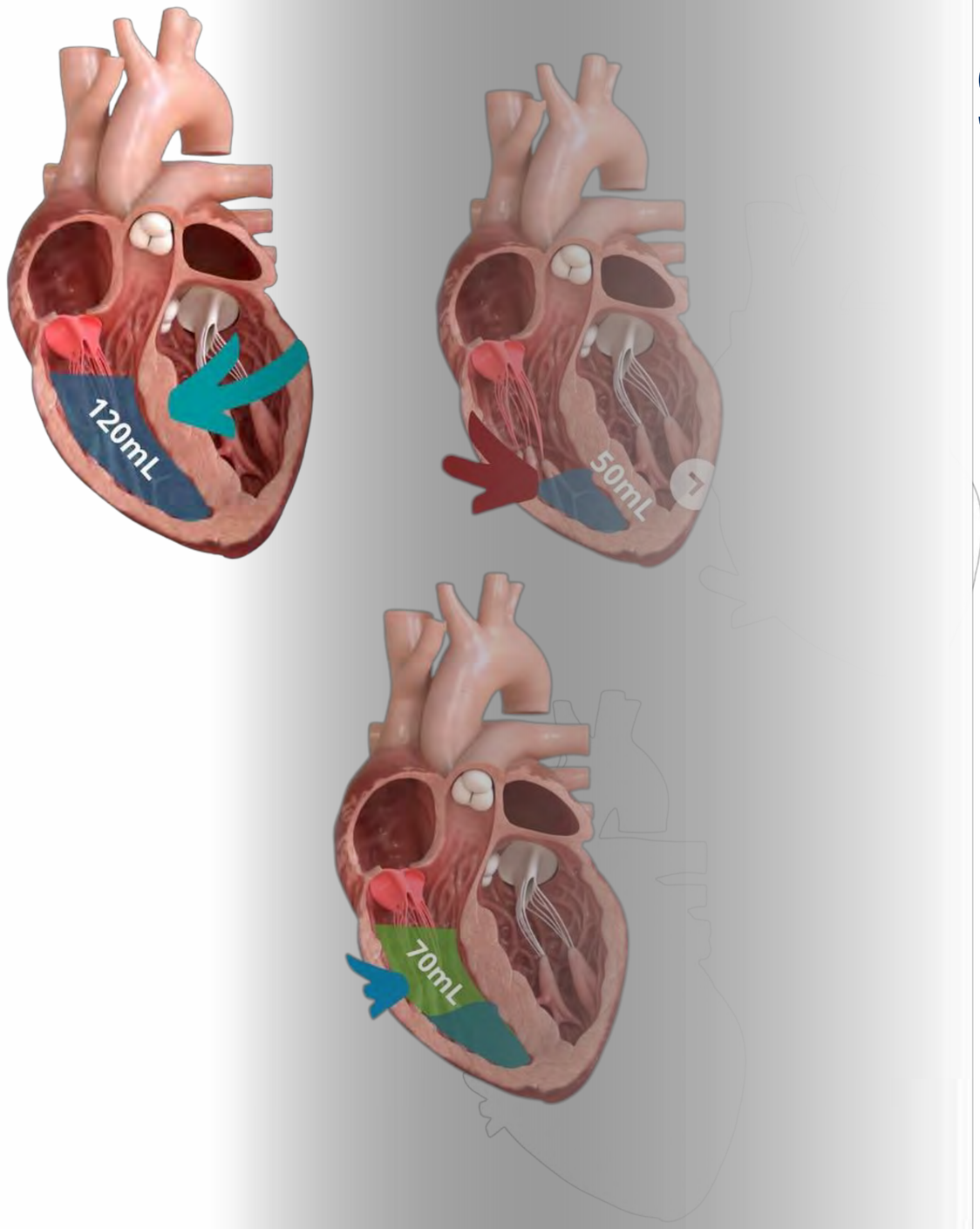
Pressure measurement in the right atrium

Why we use it?

Measures the intravascular volume

Mind the gap.

- Heavily influenced by at least a half dozen variables that has nothing to do with fluid responsiveness.
- Invasive line required.
- Largely debunked as a reliable method of fluid responsiveness



STROKE VOLUME[9]

What is it measuring?

Amount of blood ejected per heartbeat

Why we use it?

Direct link to cardiac output and preload

Mind the gap.

- Altered by arrhthmias
- Influenced by intrathoarcic pressures
- Calculation requires multiple assumptions

CAROTID FLOWTIME[6,7]

What is it measuring?

The velocity and duration of blood flow

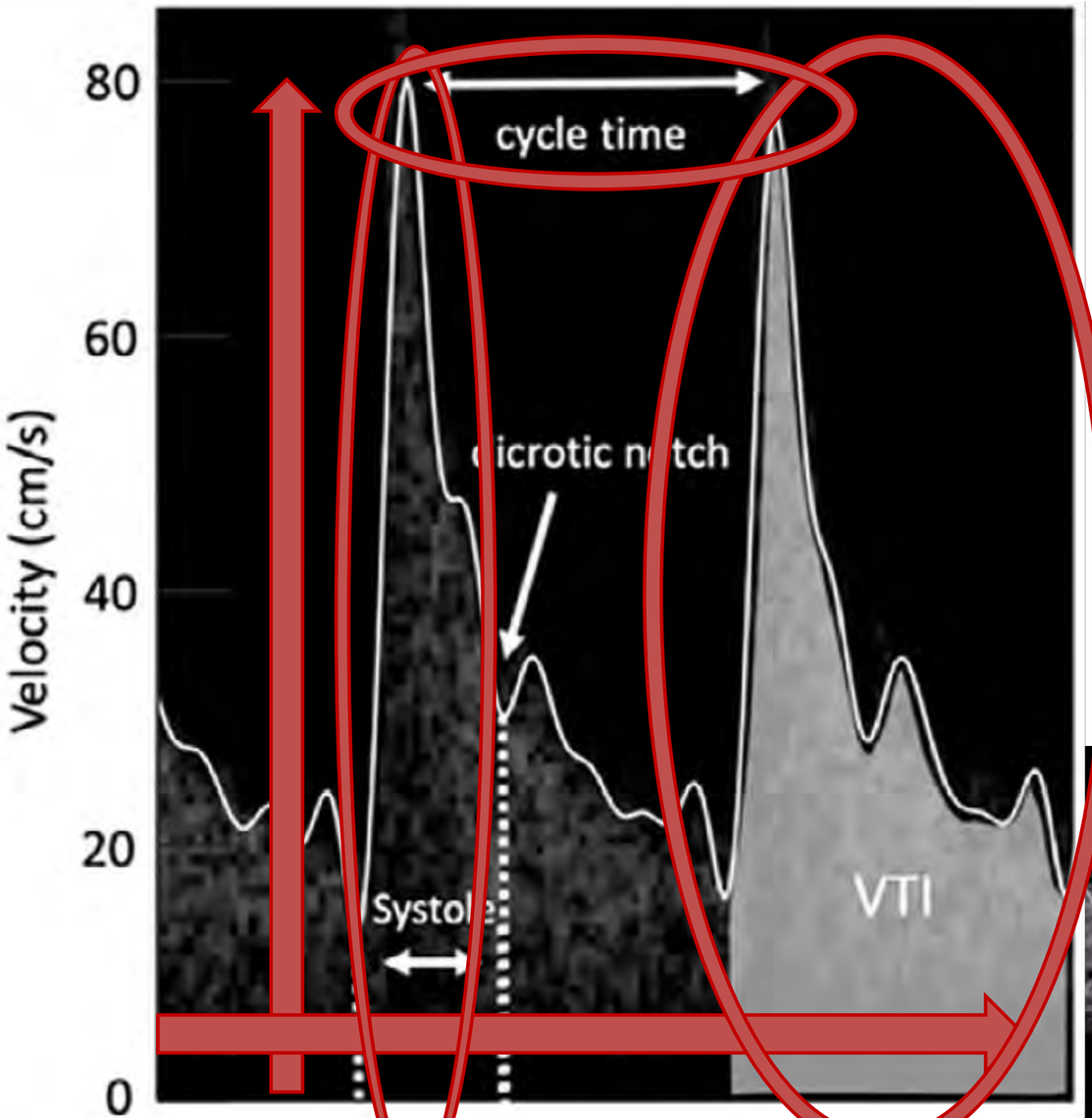
Why we use it?

Directly reflects aortic flow (systemic perfusion)

Mind the gap.

- Influenced by massive carotid stenosis
- Limited modalities for capture

WHAT DOES IT MEASURE EXACTLY[6]



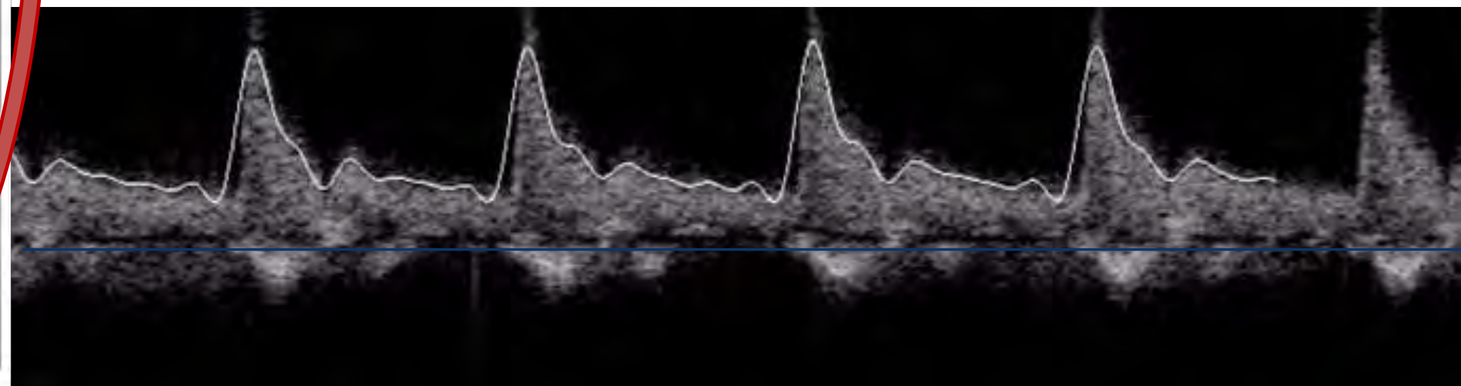
Y-Axis → Velocity (cm/s)

X-Axis → Time (ms)

Flow time = Systolic upstroke → Dicrotic notch (duration of ejection)

VTI = Area under the curve (volume of ejection)

Cycle Time = One full cardiac cycle (reflects heart rate)



CAROTID FLOWTIME IN REAL LIFE[6]

Fluid responsiveness is measured by the variance in milliseconds between the pre- and post-intervention waveform

≥ **7**ms change = **responsive**

< **7**ms change = **unresponsive**

Video provided courtesy of Flosonics Medical (personal communication, [February 2, 2026])

Dynamic Assessments will guide a patient specific resuscitation in the critically ill Septic Patient.

16%

Decrease in unexpected mechanical ventilation incidents[9]

0.65L

Average amount of **fluids needed** until patient remains unresponsive to fluids[7]

37%

Reduction in the odds of developing **AKI** following the implementation of a GDFT[12]

20%

Increase in likeliness of patients to be discharged home alive[9]

FINANCIAL IMPACT

AVOID PENALTIES. OPTIMIZE RESOURCE USE. PROTECT MARGINS

Dynamic assessments help you avoid unnecessary spending on fluids, escalated care, and compliance gaps. Smarter care means better outcomes *and* better financial performance.

NEW — CURRENT NATIONAL SCALE

$52.1B

annual U.S. hospital costs for sepsis

2.5M sepsis-related inpatient stays

$28,800 average cost per stay

9.2 days average length of stay

AHRQ, "An Assessment of Sepsis in the United States and the Burden of Sepsis on Hospital Care," Report to Congress, September 2024 (2021 data, most recent available).

FLUID OVERLOAD COSTS MORE THAN JUST LIVES

$3.6M

Fluid overload costs the average hospital every year

236

Fluid-overloaded patients at the average hospital, per year

$15,344

Average extra cost for one fluid-overloaded patient

3 days

Longer hospital stay for patients with fluid overload (7→ 10 days)

NEW

VALIDATED IN PRACTICE — NOT JUST A PROJECTION

$14,498 saved per patient — **$1,449,900** over 6 months at one health system, from a 2018 *Critical Care Medicine* cost analysis of Dynamic-guided fluid resuscitation.

Fluid-overload stats: American Hospital Directory, based on FFY2022 Medicare IPPS (MedPAR) claims data. • Savings stat: Latham HE, et al. Critical Care Medicine. 2018.

VALUE-BASED PURCHASING PERFORMANCE

Clinical Outcomes

COPD 30-day mortality

Patient Engagement

Communication with nurses

Safety (incl. SEP-1)

CAUTI rate, SEP-1

Cost Reduction

Medicare spend / beneficiary

Each domain weighted 25% (FY2025–26)

$1.5B

withheld annually into the value-based program

12.5%

of a hospital's entire VBP score is influenced by SEP-1

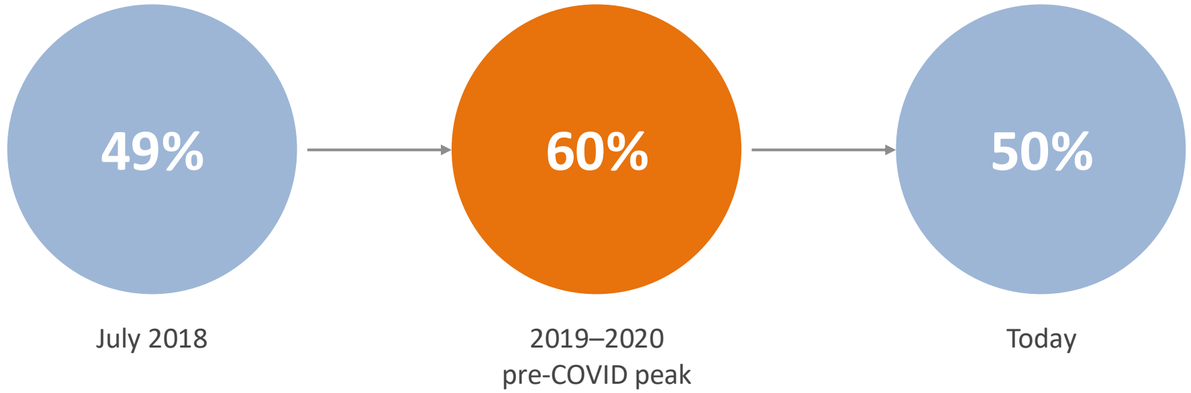
CONFIRMED UPDATE

The Hospital VBP program is funded with exactly 2 % of each hospital's Medicare IPPS base operating payments. All four scoring domains are equally weighted at 25% for FY2025–26, with SEP-1 inside the Safety domain.

Source: CMS / Quality Reporting Center, FY2026 Hospital VBP Program Quick Reference Guide (Jan 2025).

$1.5B / 12.5% figures retained from original source material — see speaker notes.

According to public reporting, average SEP-1 bundle compliance among reporting hospitals is 50% nationally.



NEW: compliance is a moving target — not stuck at 50%. We've been at 60% before.

Hemodynamic assessments improve compliance in SEP-1

- Justifies fluid adjustments with clinical evidence
- Meets the reassessment requirement within the 6-hour window
- Supports timely initiation of vasopressors when a patient is identified as persistently hypotensive
- Impacts multiple bundle elements at once — easier to achieve overall compliance

Compliance trend: Caretaker Medical, citing CMS Hospital Compare data. Bundle compliance figure: original source material.

COMPLIANCE & REIMBURSEMENT

A Documentation Change Worth Knowing

Beginning in 2026, CMS allows documentation of flow time to satisfy two septic-shock requirements:

- ✓ Crystalloid IV fluid administration
- ✓ The 6-hour hemodynamic reassessment for septic shock

*In practice: a Carotid flow-time measurement can support **both** the clinical decision and the compliance chart note in **one step**.*

ROI ANGLE

THE COST DOESN'T END AT DISCHARGE

30-day sepsis readmissions are a distinct cost center from the index-stay complications.

$16,852

Average cost of a single 30-day sepsis readmission

17.5%

Of sepsis patients are readmitted within 30 days

$3.5B

Total annual U.S. cost of sepsis readmissions

For scale: sepsis readmission costs alone exceed half the annual cost of Medicare's entire Hospital Readmissions Reduction Program — the AMI, congestive heart failure, COPD, and pneumonia penalty measures *combined* (~$7B/year).

CHEST journal study, 2019 (30-day sepsis readmission cost analysis).

ROI ANGLE

AVOIDING INVASIVE MONITORING

A noninvasive carotid Doppler assessment carries a cost advantage a CVP line doesn't: it can't cause a CLABSI.

$48,000 — Average attributable cost of a single CLABSI event

+20 days — Additional hospital length of stay attributable to CLABSI

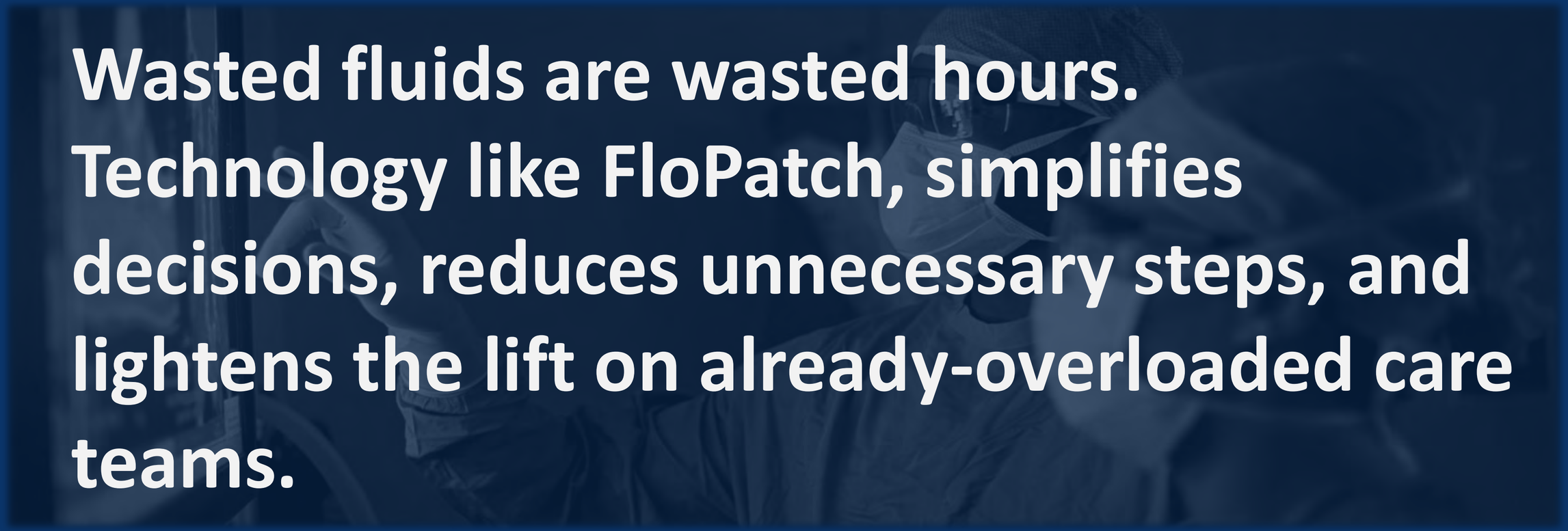
100% — Of that cost falls on the hospital — CMS classifies CLABSI as a non-reimbursable hospital-acquired condition

Applicable for a central line is placed specifically for hemodynamic monitoring, not to central lines placed for other indications.

CLABSI cost: AHRQ, Nov 2017. Added LOS: Mosquera et al., 2024. Non-reimbursable HAC status: CMS Hospital-Acquired Condition policy.

OPERATIONAL IMPACT

REDUCING STRAIN AND RECLAIMING NURSE TIME



Wasted fluids are wasted hours. Technology like FloPatch, simplifies decisions, reduces unnecessary steps, and lightens the lift on already-overloaded care teams.

How One Fluid Bolus Can Gridlock Your Hospital

Preventing one complication upstream can unlock throughput downstream

Blind Fluid Boluses

Patient is given 30 mL/kg without confirming fluid responsiveness

Preventable Complications

AKI, Intubation, CRRT, prolonged hypotension, etc.

ICU Admissions + Prolonged Stays

3 – 5+ extra ICU stay days

Hospital-Wide Throughput

ICU Beds, or beds in general, are being tied up longer limiting throughput

Higher Staffing Load + Lost Revenue

Overflow units are opened, Elective surgeries are cancelled, and labor costs increase to meet patient demand

Hemodynamic Monitoring Device Timeline

2013

Program Started

Developed and designed the rapid response team with a focus on hemodynamic resuscitation

Adoption: ScVO2 Monitoring

Required central line placement that was found very difficult and had a small window for placement with limited results.

2014

End-of-use: ScVO2 Monitoring

- Only provided ScVO2
- Costly Catheter
- Did not Provide Fluid Responsiveness

2015

Trial: Transdermal Sensors

- 6-month trial
- Poor staff satisfaction
- Excessive set up time
- Unreliable output
- Limitations on applicability of patient

2016

Adoption: A-line / Finger Cuffs

Capital purchase of Invasive / Non-invasive method of hemodynamic monitoring utilized in ICU, ED, and OR

2017

End-of-Use: A-line / Fingercuffs

- Increase in cost
- Unreliable for non-invasive methods
- Poor staff Utilization

2018

Adoption: A-line / Finger cufs (different company)

Lease agreement to replace current Fleet for another Invasive / Non-invasive monitoring device

2019

End-of-Use: A-line / Finger cuffs

- Highly inaccurate
- Extensive set up time
- Loss of Staff by-in

2020

Adoption: A-line / Finger cuffs (2nd generation)

Upgraded the modality for the newly “Improved” Hemosphere that was another invasive / noninvasive monitoring device

2021

End-of-Use: A-Line / Finger cuffs

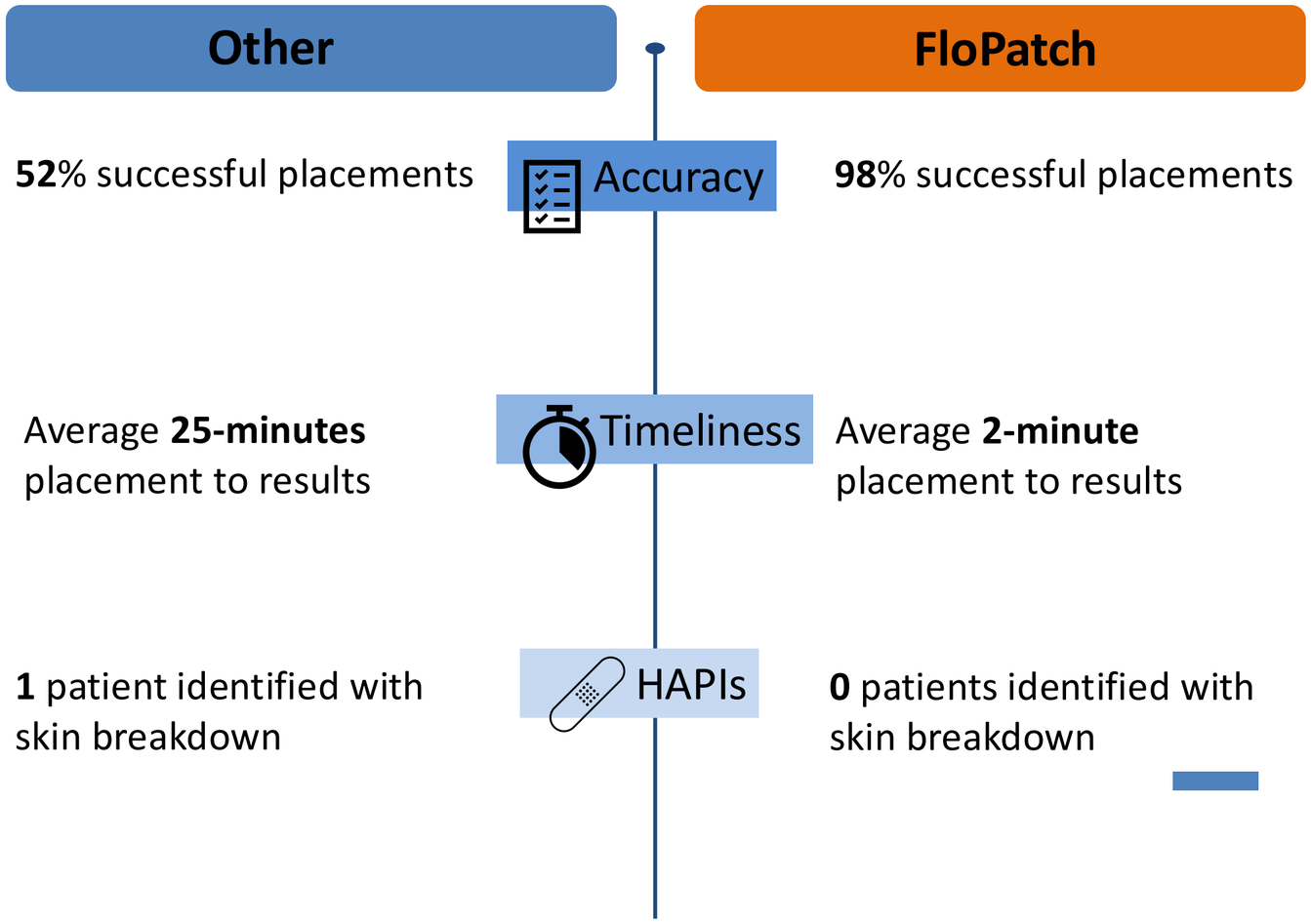
- Increase in cost
- Often broken cords with limited warranty
- Lengthy set up time
- Unreliable outputs
- Loss of Staff by-in

2022

Adoption: FloSonics FloPatch

Point-of-care Wireless Doppler ultrasound that is nurse driven to assessment patient fluid responsiveness

Evaluated 80 cases with the use of FloPatch and our current monitoring system at the time



Staff Feedback

- Easy to use
- More confidence on administering fluids and when to start pressors
- Easy to understand
- Easy to document
- Appreciated another monitor wasn't needed in the room
- Applicable to nearly all patients

RESULTS:
Post switch to FloPatch

27%

Increase in SEP-1 Compliance

35%

Decrease in ICU Admission

2 DAYS

Decrease in ICU LOS

NURSE DRIVEN[8,16]

- Nurses are 24/7 - positioned to lead hemodynamic assessments
- FTc requires minimal training and no invasive access
- Assessing the carotid flow can be done in a little as 3 minutes.

Opportunities for integration:

- Rapid Response Teams
- ED resuscitation
- Sepsis Bundles
- Post-surgical hemodynamic monitoring
- Post-resuscitation care (ICU)

Empower nurses to QUESTION empiric fluid orders

"The nurse who questions is the nurse who saves lives"

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THANK YOU

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