TRAUMA TIPS AND TRICKS FOR THE ANESTHESIA PROVIDER

BRIAN CORNELIUS DNP CRNA NRP

Learner Outcomes

- Review recent trends and advancements in trauma care, focusing on issues with:
- – Broad Visibility
  – Significant Clinical Impact
- Low Cost, High Yield
- Ease of Implementation
- Specific Topics to be discussed include Lung Protective Ventilation and Damage Control Resuscitation.

Conflict of Interest Disclosure Statement

- I have no financial relationships with any commercial interest related to the content of this activity.
- I will not discuss off-label use during my presentation.

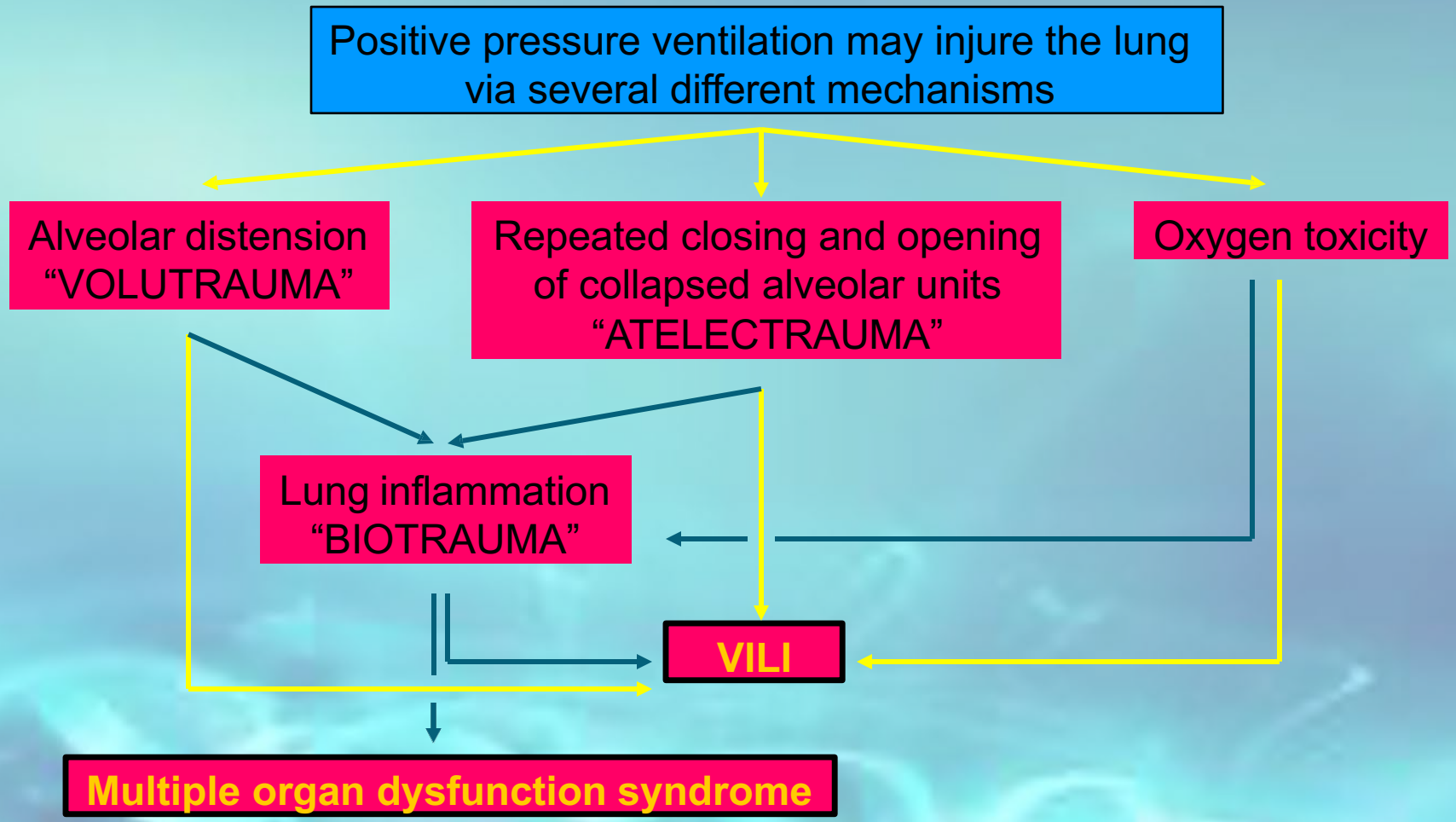
Outline

- Lung Protective Ventilation
- Thoracic Decompression
- Alternative Vascular Access
- POCUS-EFAST
- Permissive Hypotension
- Ketamine for Trauma
- Resuscitation Before Intubation
- Guided Resuscitation-Use of ROTEM/TEG

Lung Protective Ventilation

- During General Anesthesia Patients are at risk for several types of lung injury in the perioperative period including
- Atelectasis
- Pneumonia
- Pneumothorax
- ALI, ARDS

Ventilator Induced Lung Injury (VILI) Lung inflammation “biotrauma”



Respiratory Formulas

Ideal Body Weight= 50(Male)/45(female) +2.3 (height in inches-60)

4-8ml/kg IDW

Think of Respiratory Rate as it's components (MV/Vt)

CO2 Correction Formula
(Current CO2 x Current RR)/Desired CO2=New RR

Lung Protective Strategies

Low Tidal Volume 4-8 ml/kg (PBW)

P plat < 30cmH2O

Best PEEP

Permissive Hypercarbia

Recruitment maneuvers to open lung

Recruitment Maneuvers (RMs)

- Proposed for improving arterial oxygenation and enhancing alveolar recruitment

- All consisting of short-lasting increases in intrathoracic pressures
  - Vital capacity maneuver (inflation of the lungs up to 40 cm H_2O, maintained for 15- 26 seconds) *(Rothen HU. BJA. 1999; BJA 1993.)*
  - Intermittent sighs *(Pelosi P. Am J Respir Crit Care Med. 2003.)*
  - Extended sighs *(Lim CM. Crit Care Med. 2001.)*
  - Intermittent increase of PEEP *(Foti G. Intensive Care Med. 2000.)*
  - Continuous positive airway pressure (CPAP) *(Lapinsky SE. Intensive Care Med. 1999. Amato MB. N Engl J Med. 1998.)*
  - Increasing the ventilatory pressures to a plateau pressure of 50 cm H_2O for 1-2 minutes *(Marini JJ. Crit Care Med. 2004. Maggiore SM. Am J Respir Crit Care Med. 2003.)*

Lapinsky SE and Mehta S, Critical Care 2005

Prevention / Reversal of Atelectasis

- Healthy lungs
- Reversible by passive hyperinflation (*i.e.*, three successive inflations: a pressure of 20cmH20 for 10s; then a pressure of 30cm H20 for 15s; and third, a pressure of 40 cm H20 sustained for 15s)
- High initial pressures are needed to overcome the anesthesia-induced collapse and that PEEP of 5cm H20 or more is required to prevent collapse
- No evidence of barotrauma or pulmonary complications occurred in the high initial airway pressure

NIH NHLBI ARDS Clinical Network
Mechanical Ventilation Protocol Summary

INCLUSION CRITERIA: Acute onset of

1. $PaO_2/FiO_2 \leq 300$ (corrected for altitude)
2. Bilateral (patchy, diffuse, or homogeneous) infiltrates consistent with pulmonary edema
3. No clinical evidence of left atrial hypertension

PART I: VENTILATOR SETUP AND ADJUSTMENT

1. Calculate predicted body weight (PBW)
   Males = 50 + 2.3 [height (inches) - 60]
   Females = 45.5 + 2.3 [height (inches) -60]
2. Select any ventilator mode
3. Set ventilator settings to achieve initial V_T = 8 ml/kg PBW
4. Reduce V_T by 1 ml/kg at intervals ≤ 2 hours until V_T = 6ml/kg PBW.
5. Set initial rate to approximate baseline minute ventilation (not > 35 bpm).
6. Adjust V_T and RR to achieve pH and plateau pressure goals below.

OXYGENATION GOAL: PaO_2 55-80 mmHg or SpO_2 88-95%
Use a minimum PEEP of 5 cm H_2O. Consider use of incremental FiO_2/PEEP combinations such as shown below (not required) to achieve goal.

Lower PEEP/higher FiO2

FiO_2	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	10	12

FiO_2	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	14	14	14	16	18	18-24

Higher PEEP/lower FiO2

FiO_2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5
PEEP	5	8	10	12	14	14	16	16

FiO_2	0.5	0.5-0.8	0.8	0.9	1.0	1.0
PEEP	18	20	22	22	22	24

PLATEAU PRESSURE GOAL: ≤ 30 cm H_2O
Check Pplat (0.5 second inspiratory pause), at least q 4h and after each change in PEEP or V_T.
If Pplat > 30 cm H_2O: decrease V_T by 1ml/kg steps (minimum = 4 ml/kg).
If Pplat < 25 cm H_2O and V_T< 6 ml/kg, increase V_T by 1 ml/kg until Pplat > 25 cm H_2O or V_T = 6 ml/kg.
If Pplat < 30 and breath stacking or dys-synchrony occurs: may increase V_T in 1ml/kg increments to 7 or 8 ml/kg if Pplat remains ≤ 30 cm H_2O.

pH GOAL: 7.30-7.45

Acidosis Management: (pH < 7.30)

If pH 7.15-7.30: Increase RR until pH > 7.30 or $PaCO_2$ < 25 (Maximum set RR = 35).

.

If pH < 7.15: Increase RR to 35.

If pH remains < 7.15, V_T may be increased in 1 ml/kg steps until pH > 7.15 (Pplat target of 30 may be exceeded).

May give $NaHCO_3$

Alkalosis Management: (pH > 7.45) Decrease vent rate if possible.

I: E RATIO GOAL: Recommend that duration of inspiration be ≤ duration of expiration.

PART II: WEANING

A. Conduct a SPONTANEOUS BREATHING TRIAL daily when:

1. $FiO_2 \leq 0.40$ and PEEP ≤ 8 OR $FiO_2 \leq 0.50$ and PEEP ≤ 5.
2. PEEP and FiO_2 ≤ values of previous day.
3. Patient has acceptable spontaneous breathing efforts. (May decrease vent rate by 50% for 5 minutes to detect effort.)
4. Systolic BP ≥ 90 mmHg without vasopressor support.
5. No neuromuscular blocking agents or blockade.

B. SPONTANEOUS BREATHING TRIAL (SBT):

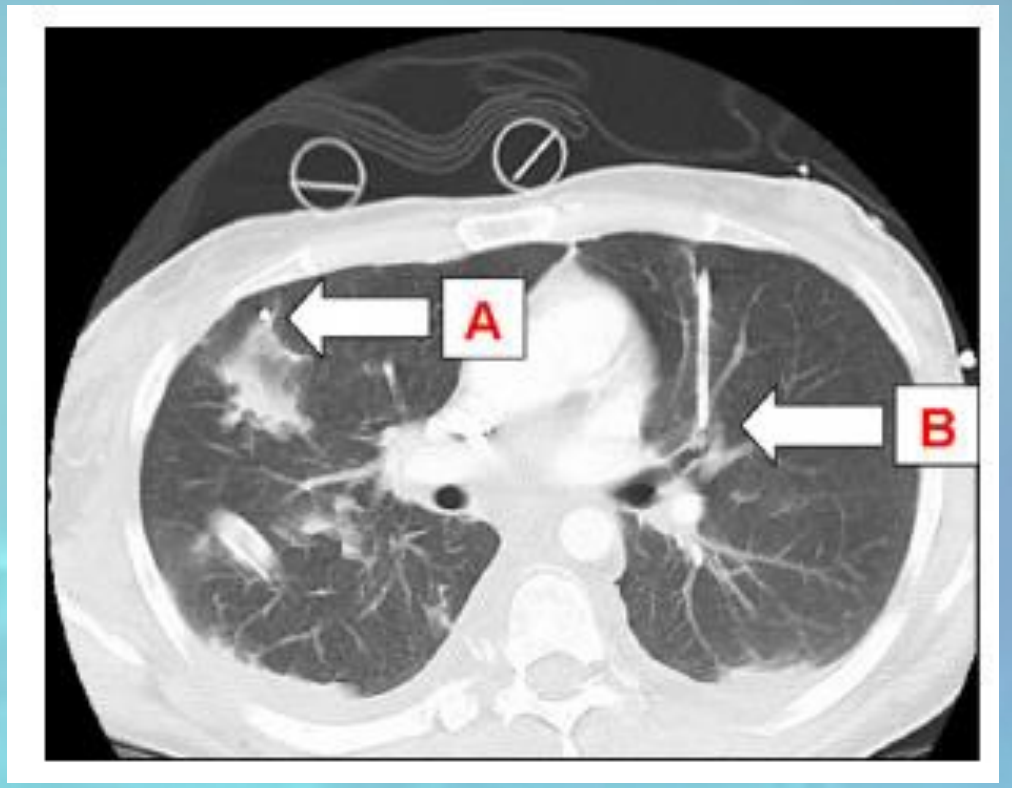
If all above criteria are met and subject has been in the study for at least 12 hours, initiate a trial of UP TO 120 minutes of spontaneous breathing with FiO2 ≤ 0.5 and PEEP ≤ 5:

1. Place on T-piece, trach collar, or CPAP ≤ 5 cm H_2O with PS ≤ 5
2. Assess for tolerance as below for up to two hours.
   a. $SpO_2 \geq 90$: and/or $PaO_2 \geq 60$ mmHg
   b. Spontaneous $V_T \geq 4$ ml/kg PBW
   c. RR ≤ 35/min
   d. pH ≥ 7.3
   e. No respiratory distress (distress= 2 or more)
      - HR > 120% of baseline
      - Marked accessory muscle use
      - Abdominal paradox
      - Diaphoresis
      - Marked dyspnea
3. If tolerated for at least 30 minutes, consider extubation.
4. If not tolerated resume pre-weaning settings.

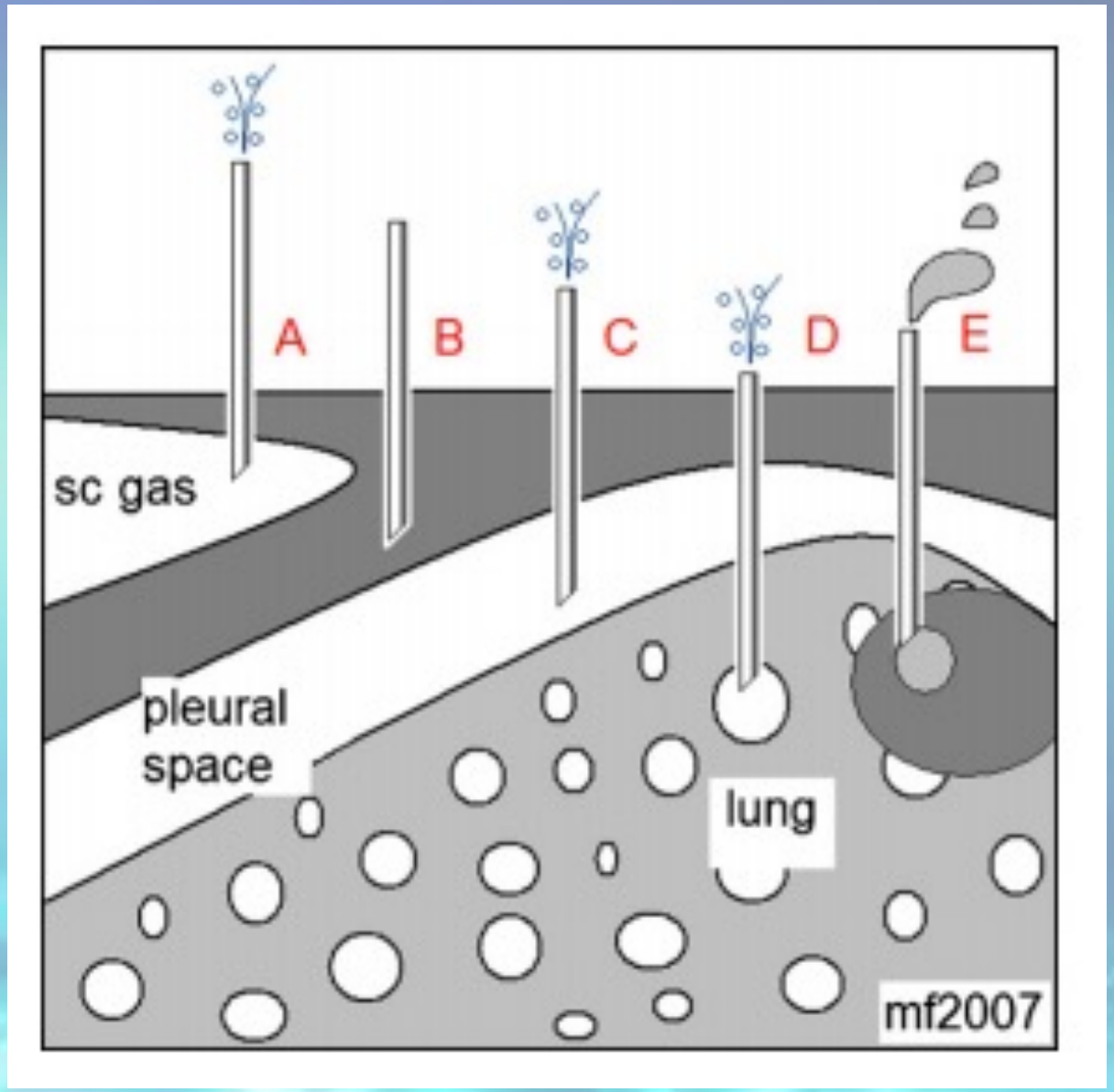
Definition of UNASSISTED BREATHING
(Different from the spontaneous breathing criteria as PS is not allowed)

1. Extubated with face mask, nasal prong oxygen, or room air, OR
2. T-tube breathing, OR
3. Tracheostomy mask breathing, OR
4. CPAP less than or equal to 5 cm H_20 **without pressure support or IMV assistance.**

Needle Decompression/Finger Thoracostomy

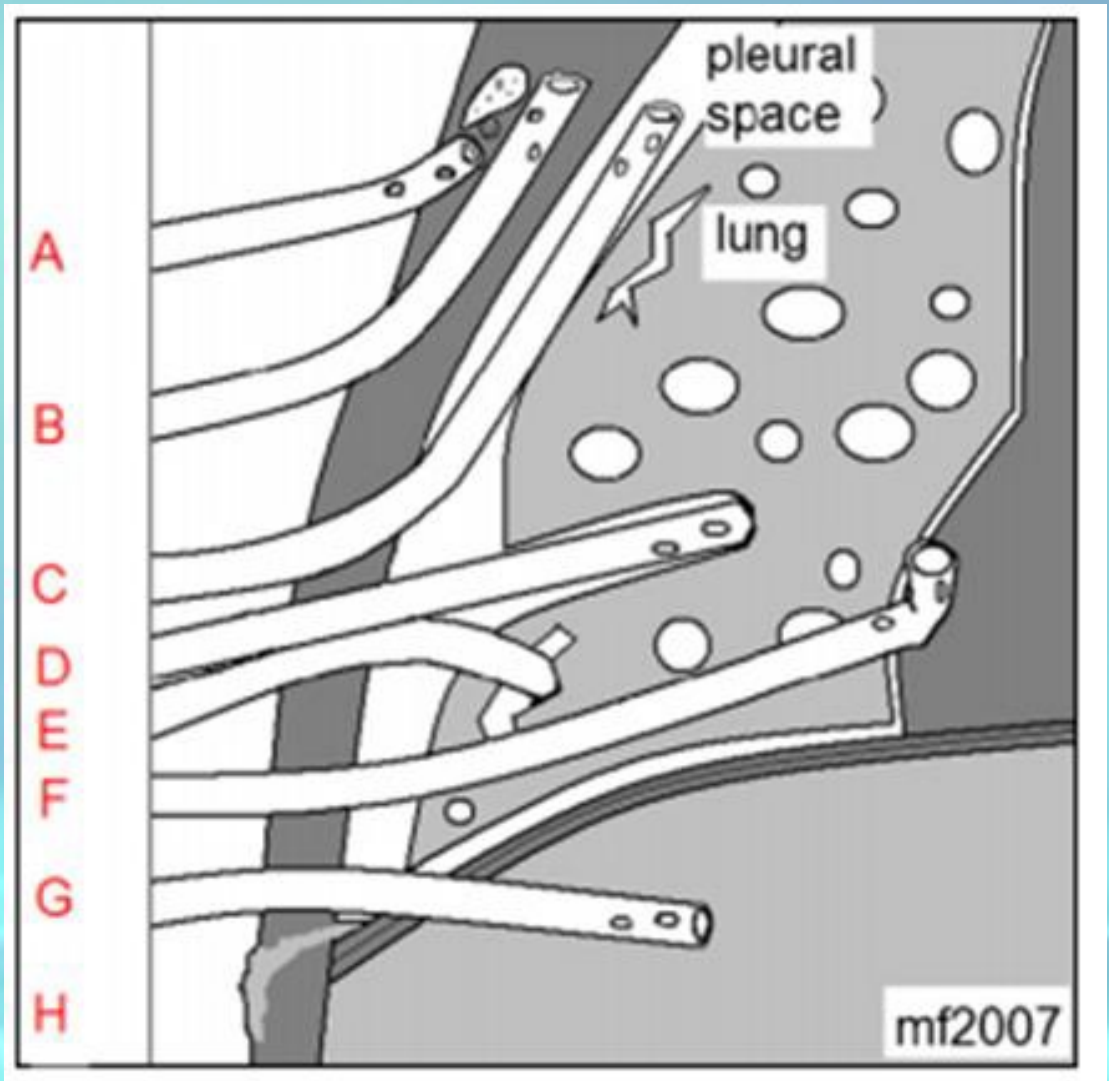


M Fitzgerald , Injury, Int. J. Care Injured (2008) 39, 9—20



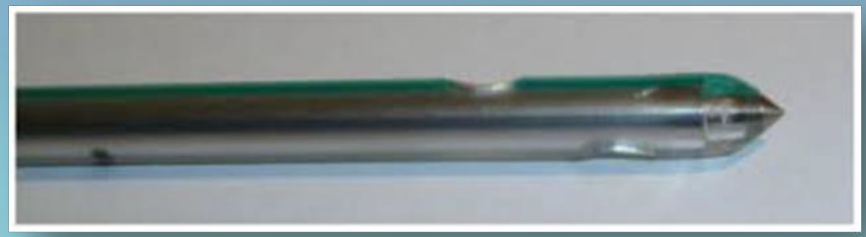
- M Fitzgerald , Injury, Int. J. Care Injured (2008) 39, 9—20

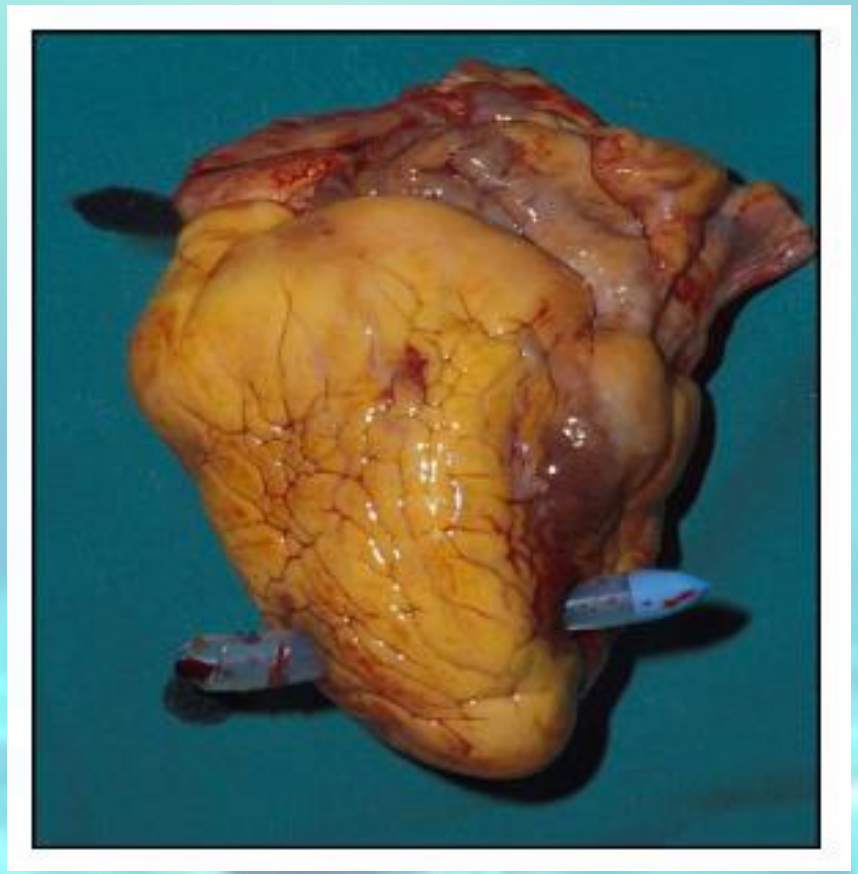
Chest tubes aren't any better



Injury, Int. J. Care Injured (2008) 39, 9—20

No trocars





Injury, Int. J. Care Injured (2008) 39, 9—20

So who needs to be decompressed

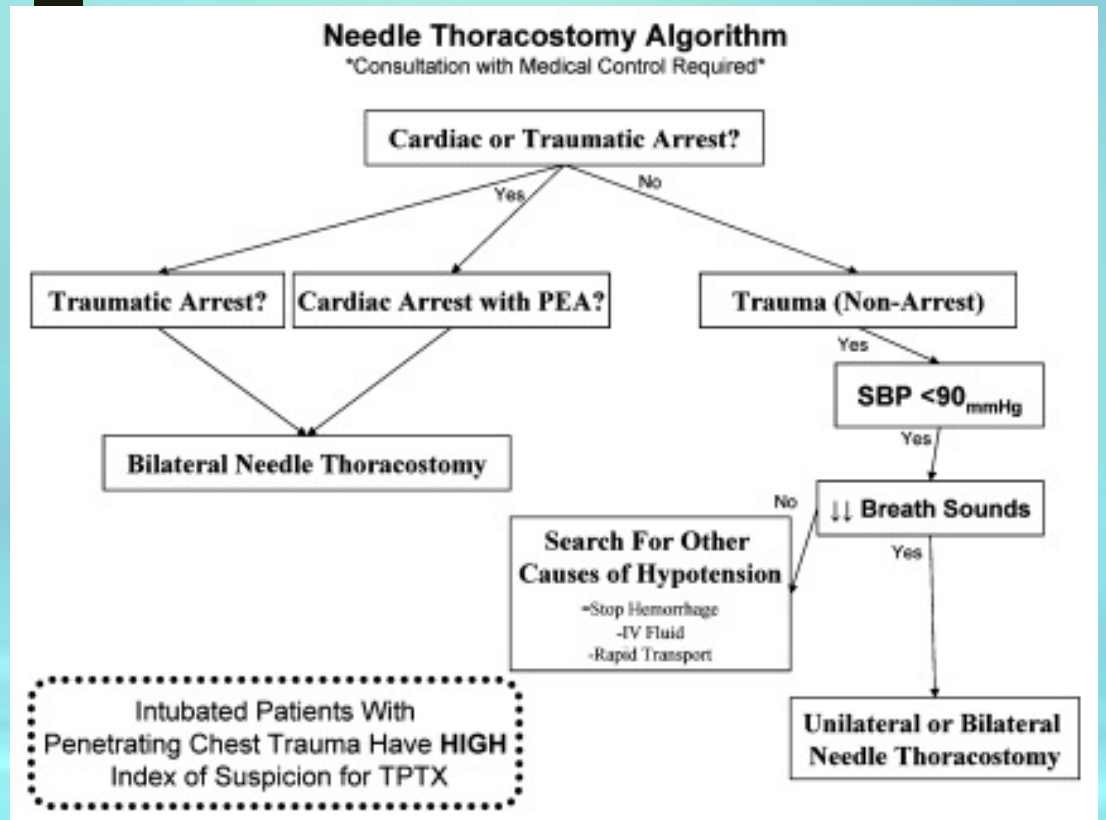


Table 2. Procedure-Related Complications

Complication	# Cases NA	TT
No chest wall penetration	5	1
Wrong site	1	0
Dislodged	3	0
Valve malfunction	3	0
Excess blood	1	5
Tube clamped	2	1
Placement in fissure	0	2
Organ perforation (abdomen)	0	1
Difficult insertion	5	12
Total	20	22

Number of procedure-related complications reported by flight nurses for prehospital NA and TT procedures.

PREHOSPITAL NEEDLE ASPIRATION AND TUBE THORACOSTOMY IN TRAUMA VICTIMS: A SIX-YEAR EXPERIENCE WITH AEROMEDICAL CREWS

Erik D. Barton, MD, MS,* Mike Epperson, RN, BSN,‡ David B. Hoyt, MD,† Dale Fortlage, BA,† and Peter Rosen, MD*

*Department of Emergency Medicine,
†Department of Surgery, Division of Trauma University of California, San Diego Medical Center, San Diego, California
‡San Diego Life Flight Air Medical Service, San Diego, California
Reprint Address: Peter Rosen, MD, Department of Medicine, Division of Emergency Medicine, MC 8676, University of California, San Diego Medical Center, 220 W. Arbor Drive, San Diego, CA 92013-8676

Needle Decompression for Tension Pneumothorax in Tactical Combat Casualty Care: Do Catheters Placed in the Midaxillary Line Kink More Often Than Those in the Midclavicular Line?

Andrew Beckett, MD, Erin Savage, MD, Dylan Pannell, MD, Sanjay Acharya, MD, Andy Kirkpatrick, MD, and Homer C. Tien, MD

Table 1 Comparison of male and female subjects

	Male		Female		*P*
	Mean	95% CI	Mean	95% CI	
Height (m)	1.75	1.73-1.78	1.67	1.64-1.7	<.01
Weight (kg)	85.6	79.57-91.62	83.18	72.04-94.33	.69
Chest circumference (cm)	42.61	41.12-44.09	41.63	41.63-38.99	.5
BMI	27.69	26.14-29.25	30	25.78-34.22	.29
Anterior CWT (cm)	2.09	1.91-2.26	2.26	1.74-2.69	.52
Lateral CWT (cm)	2.36	2.1-2.61	2.47	1.99-2.94	.67

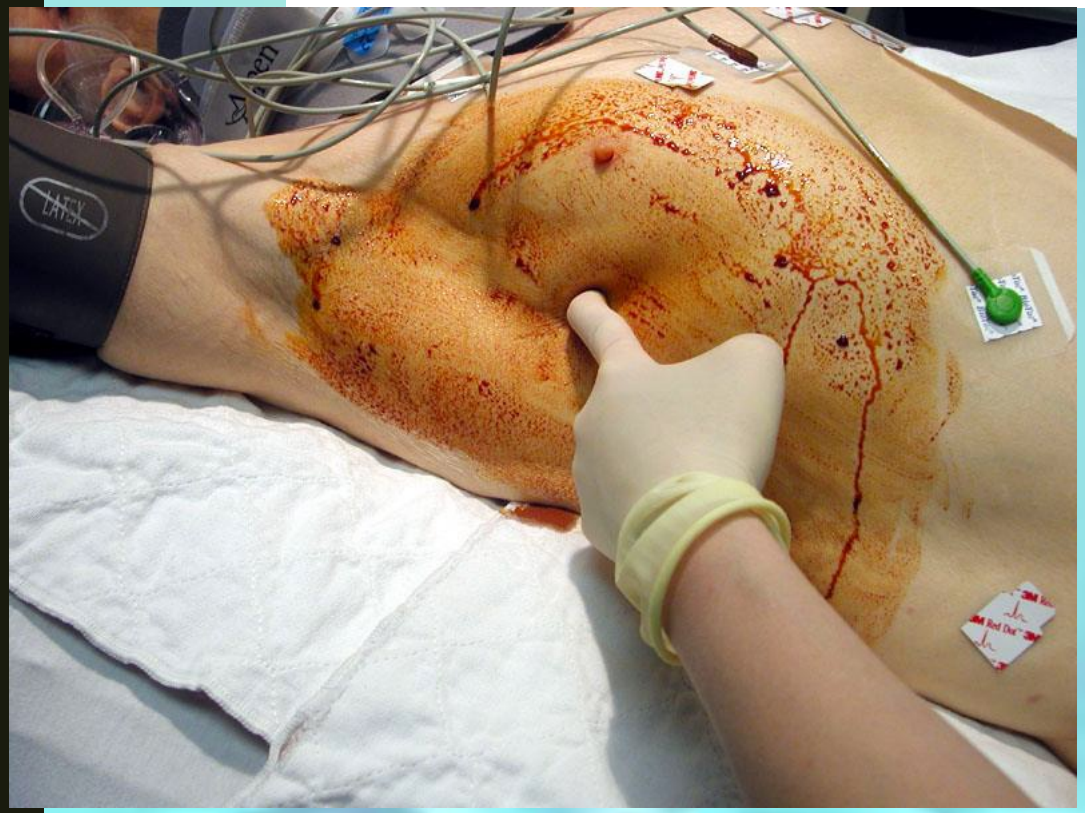
Simple Thoracostomy Avoids Chest Drain Insertion in Prehospital Trauma

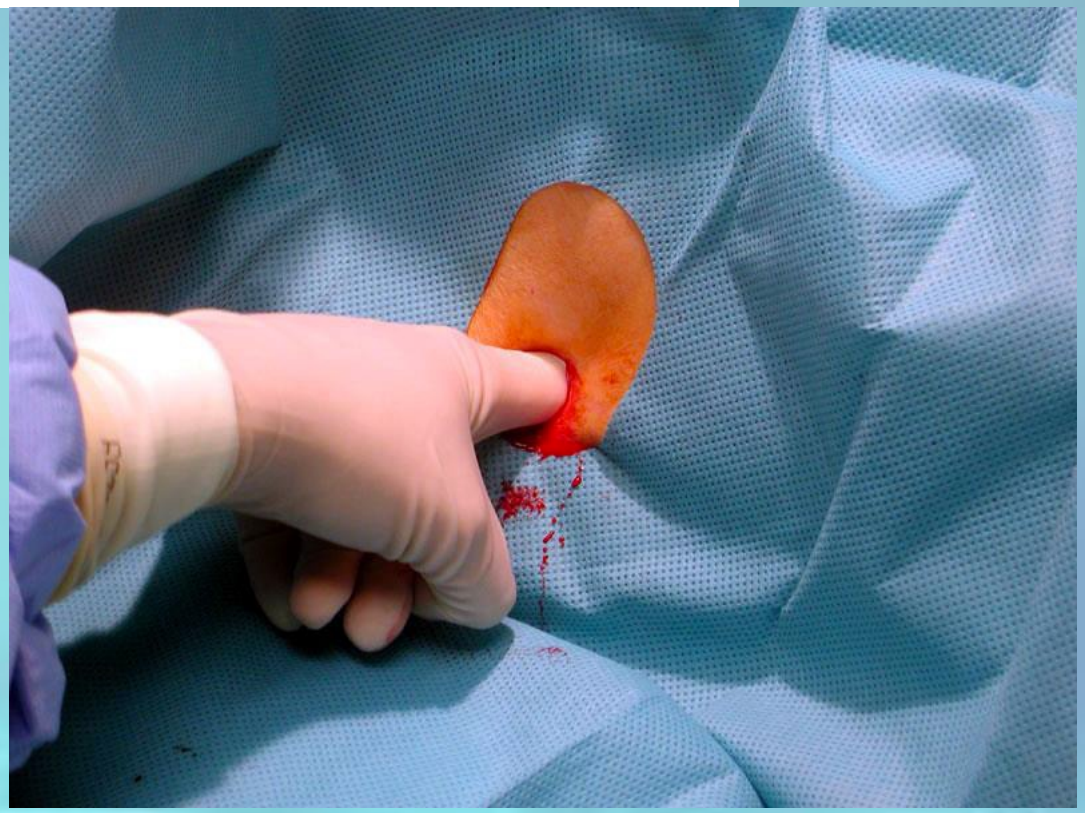
Deakin, C. D. MA, MRCP, FRCA; Davies, G. MRCP; Wilson, A. FRCS

Author Information

From the Helicopter Emergency Medical Service, Royal London Hospital, Whitechapel, London, England.

Address for reprints: Dr. C. D. Deakin, MA, MRCP, FRCA, Shackleton Department of Anaesthetics, Tremona Road, Southampton S016 6YD, England.





Alternative vascular access

- Intraosseous
  - *EZ IO*
  - *FAST 1/Talon*
- Rapid Infusion Catheter
- Don’t forget the EJ

:
http://www.teleflex.com/en/usa/ezioeducation/documents/8082_Rev_A_US_FDA_Intraosseous_Infusion_System_IFU.PDF

Why an IO

EZ-IO — AN EVIDENCE-BASED SOLUTION TO A UNIVERSAL PROBLEM

COMPARISON OF DIFFICULT VASCULAR ACCESS OPTIONS†

	INTRAOSSEOUS (EZ-IO)	CENTRAL LINE	PERIPHERAL IV††
TIME / SPEED	6-20 Seconds[1,2,3]	10-26 Minutes[4,5]	20-39 Minutes[6,7,8]
SAFETY PROFILE: COMPLICATIONS	< 1%[9]	15%[10]	32-70%[11,12,13]
RELIABILITY: SUCCESS RATE	90 - 98%[14,15,16]	60-89%[17,18]	33-77%[19,20,21]
RELIABILITY: FIRST ATTEMPT	90 - 97%[22,23]	22-86%[24,25]	49-71%[26,27]
STAFF RESOURCES	Nurse	Physician or mid-level provider and one assistant	Nurse
EQUIPMENT RESOURCES (for insertion)	driver, needle set, gloves, antiseptic, flush	Central line kit (or: catheter, guidewires, antiseptic prep, lidocaine, needles & syringes, scalpel & surgical blades, gauze), Benzoin, tape, suture, Cordis caps (prn), maximal barrier precautions (sterile gloves, sterile patient drape, sterile gowns, masks & cap for staff)	IV catheter set, gloves, antiseptic, tape, flush
FLOW RATES	Moderate to high flow rates	High flow rates	Dependent on catheter gauge
$ COST OF PROCEDURE	$100[28]	$290[29]	$32 per attempt[30] $96/3 attempts[31]

http://www.teleflex.com/en/usa/ezioeducation/documents/8082_Rev_A_US_FDA_Intraosseous_Infusion_System_IFU.PDF

Indications

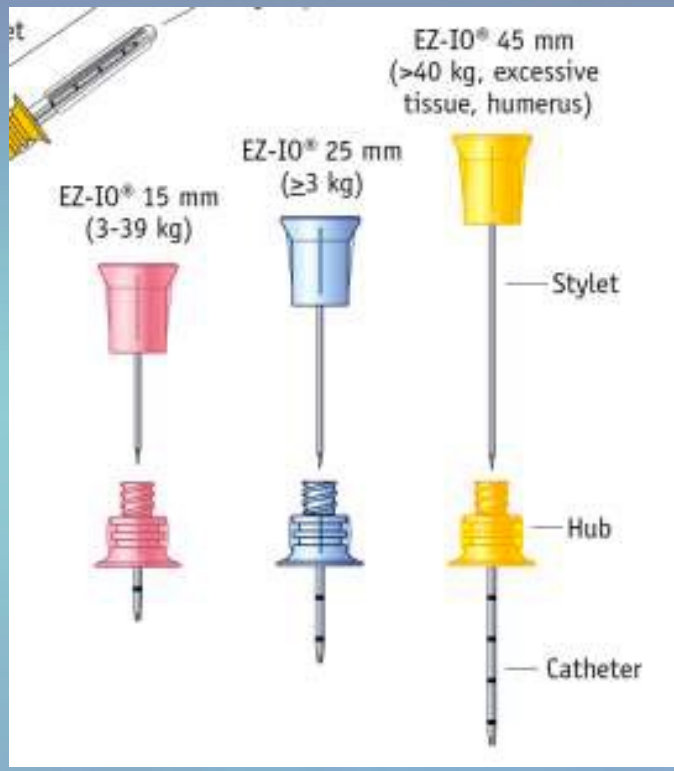
- Difficult vascular access in emergent, urgent or medically necessary cases
  - Fluid resuscitation
  - Medication administration, etc.

Contraindications

- Fracture in target bone
- Infection at the area of insertion
- Excessive tissue (i.e. severe obesity) and/or absence of adequate anatomical landmarks
- IO catheter use in past 48 hrs of the target bone
- Previous, significant orthopedic procedure at the site, prosthetic limb or joint

Complications

- Infection
- Extravasation which could result in compartment syndrome
- Pain
  - Insertion
  - Infusion
- Fracture of target bone
- Catheter breakage



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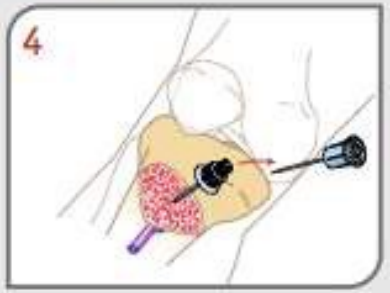
AND www.hospitalprocedures.org



To Insert Needle Set:

- Locate landmarks 1
- Clean site 2
- Insert EZ-IO® Needle Set 3
- Remove stylet from catheter 4
- Attach primed EZ-Connect®
- Consider IO 2% lidocaine without preservatives or epinephrine (cardiac lidocaine) for patients responsive to pain – prior to flush

  Follow institutional protocols/policy
- Medications intended to remain in the medullary space, such as a local anesthetic, must be administered very slowly until the desired anesthetic effect is achieved
- Syringe bolus (flush) IO with 10 ml normal saline.....5
- Start infusion under pressure 6

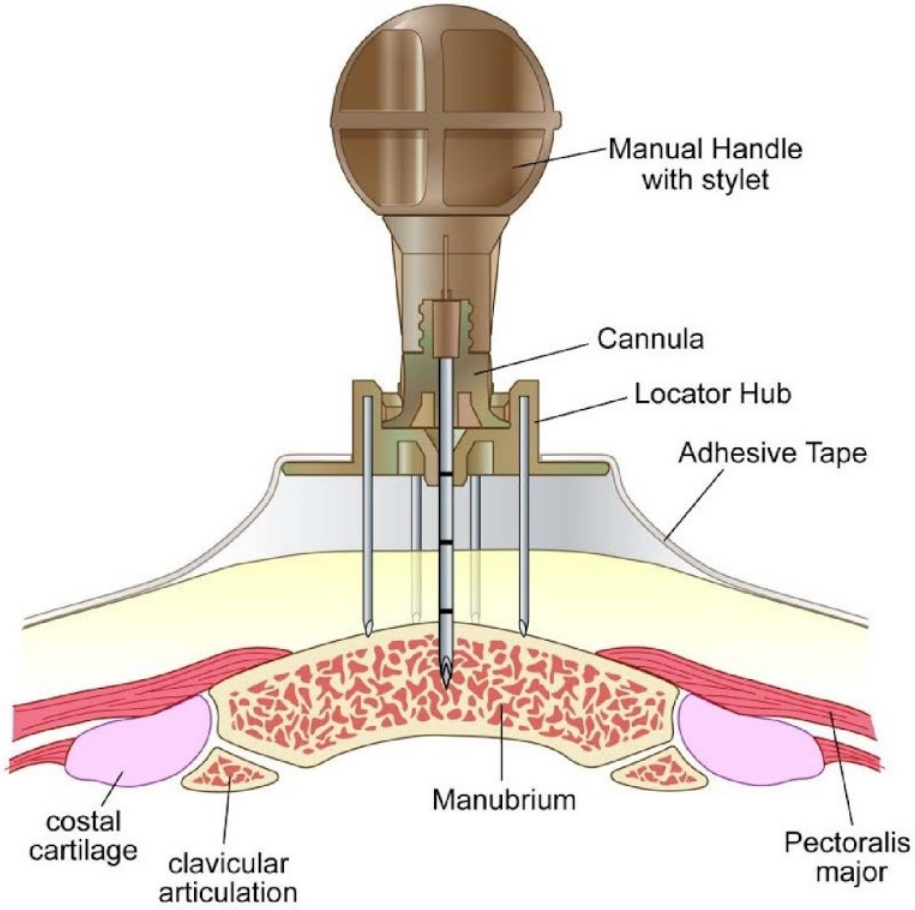
A Medical Director or qualified prescriber must authorize appropriate dosage range.

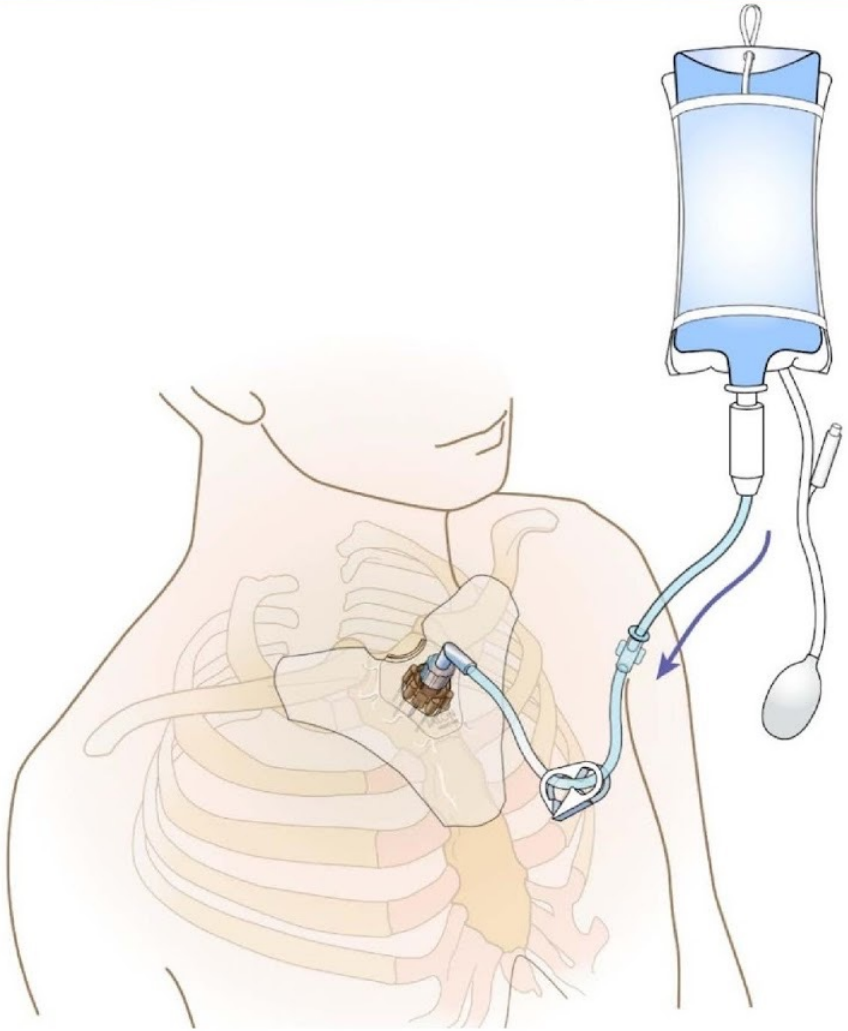
http://www.teleflex.com/en/usa/ezioeducation/documents/8082_Rev_A_US_FDA_Intraosseous_Infusion_System_IFU.PDF

Sternal IO

https://www.teleflex.com/usa/en/fast1-io-infusion-system/index.html

STERNAL SITE TECHNIQUE

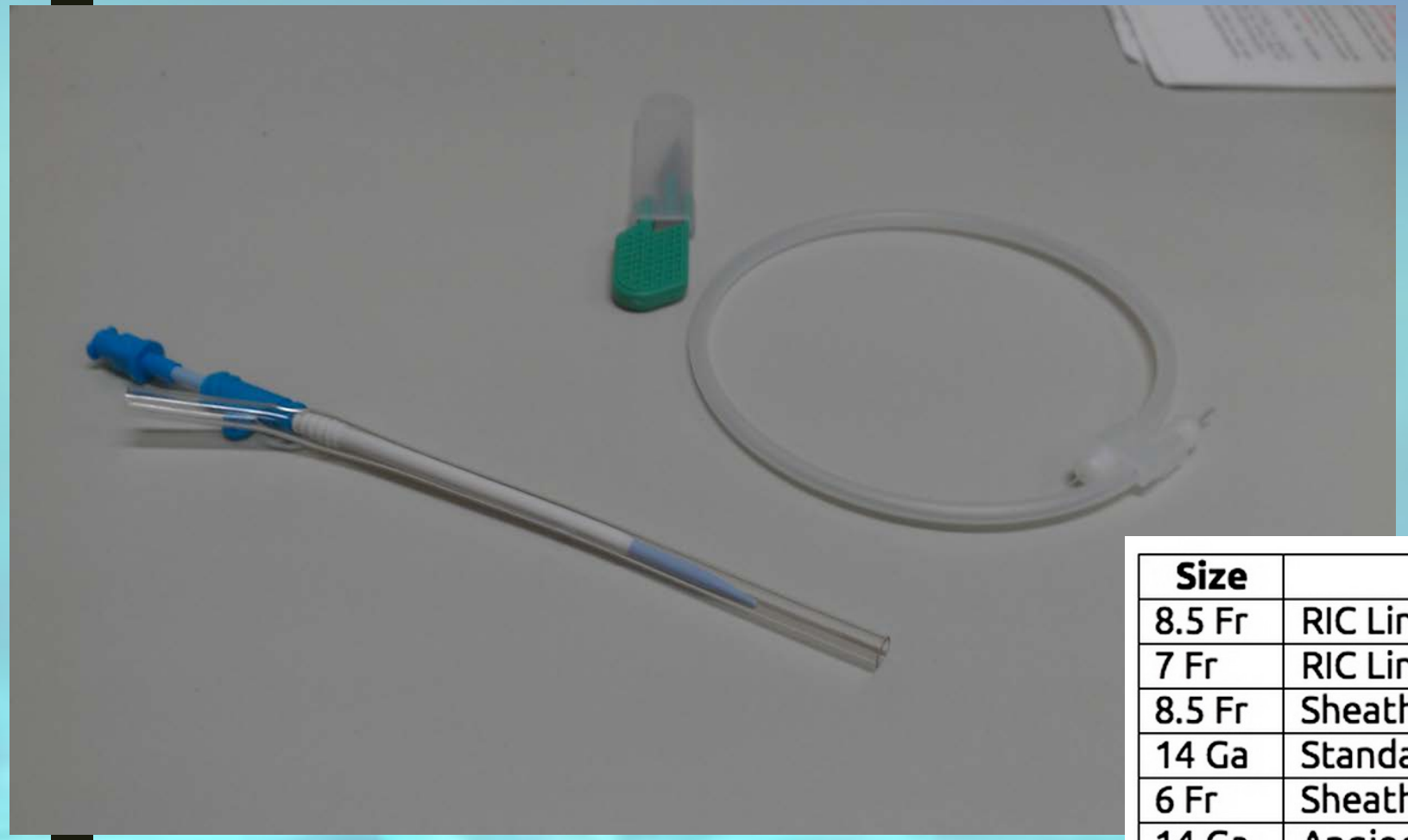




Teleflex®


FAST
Responder
Sternal Intraosseous Device

Rapid Infusion Catheter (RIC)



Size	Type	1000ml infusion time
8.5 Fr	RIC Line	0:46 sec
7 Fr	RIC Line	1:00 min
8.5 Fr	Sheath introducer	1:05 min
14 Ga	Standard IV cannula	1:30 min
6 Fr	Sheath introducer	2:10 min
14 Ga	Angiocath (13.3cm) IV	2:10 min
16 Ga	Standard IV cannula	2:20 min
18 Ga	Standard IV cannula	4:23 min
14 Ga	4-Lumen CVC	5:20 min
20 Ga	Standard IV cannula	6:47 min

External Jugular Cannulation

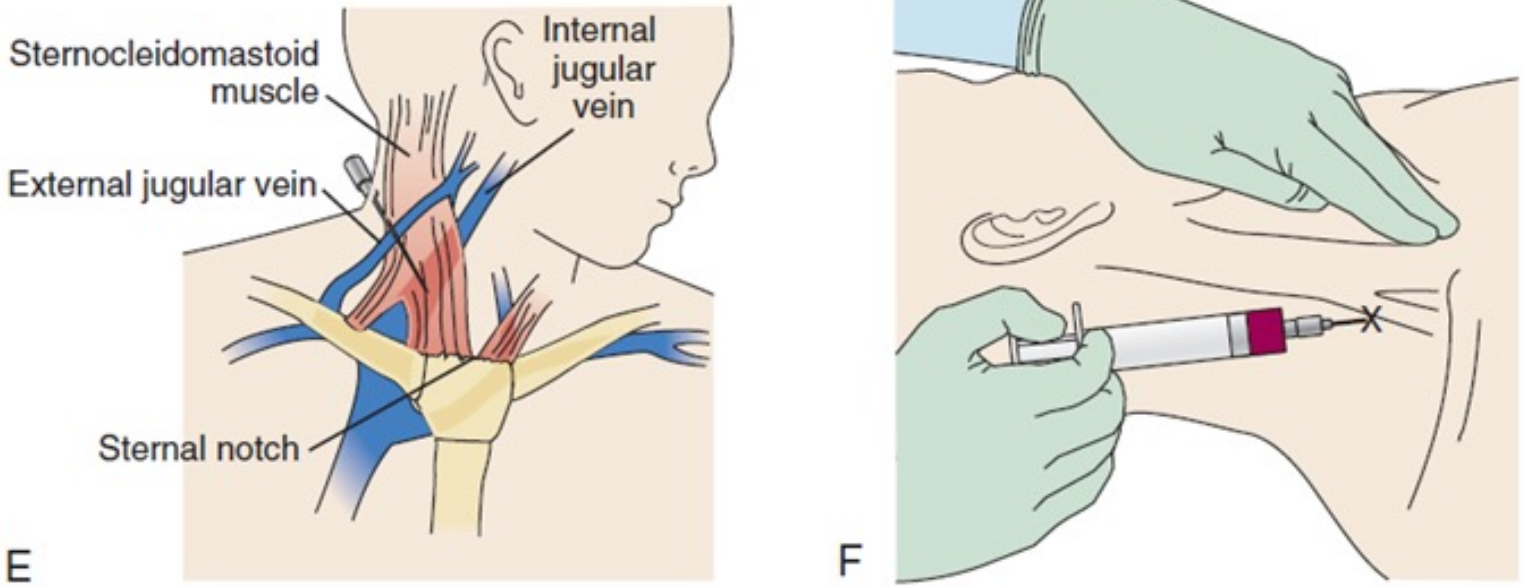
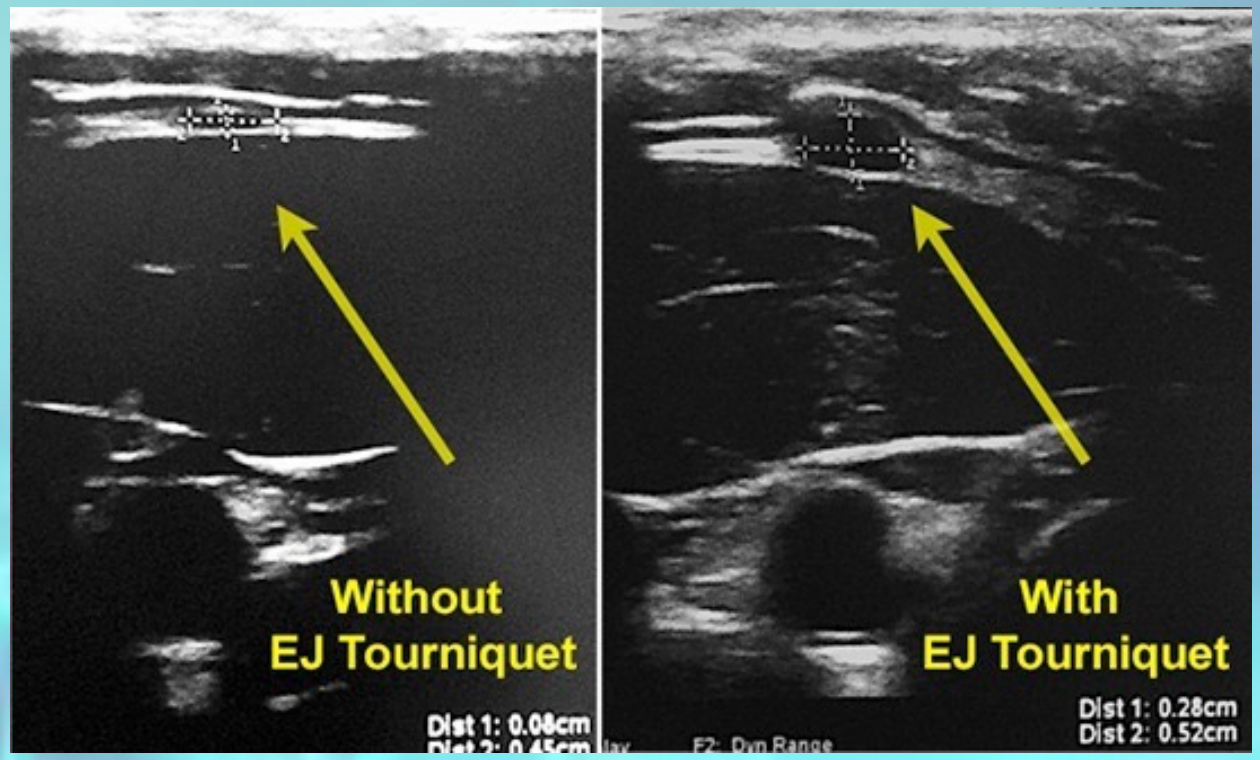


Figure 22–14 Approaches to the internal jugular vein. The patient is supine, in slight Trendelenburg position, with the neck extended over a shoulder roll and the head rotated away from the side of the approach. *A* and *B*, Middle approach. The introducer needle enters at the apex of the triangle formed by the heads of the sternocleidomastoid muscle and the clavicle and is directed toward the ipsilateral nipple at an angle of approximately 30 degrees with the skin. *C* and *D*, Anterior approach. The carotid pulse is palpated, with the course identified and marked by 2 fingers during needle placement. The artery may be slightly retracted medially. The introducer needle enters along the anterior margin of the sternocleidomastoid about halfway between the sternal notch and the mastoid process and is directed toward the ipsilateral nipple. *E* and *F*, Posterior approach. The introducer needle enters at the point where the external jugular vein crosses the posterior margin of the sternocleidomastoid and is directed under its heads toward the sternal notch. *(From Fuhrman BP, Zimmerman JJ. Pediatric Critical Care, ed 3. St. Louis, Mosby, 2005.)*

Making it easier



E-FAST

- Extended
- Focused
- Assessment with
- Sonography in
- Trauma

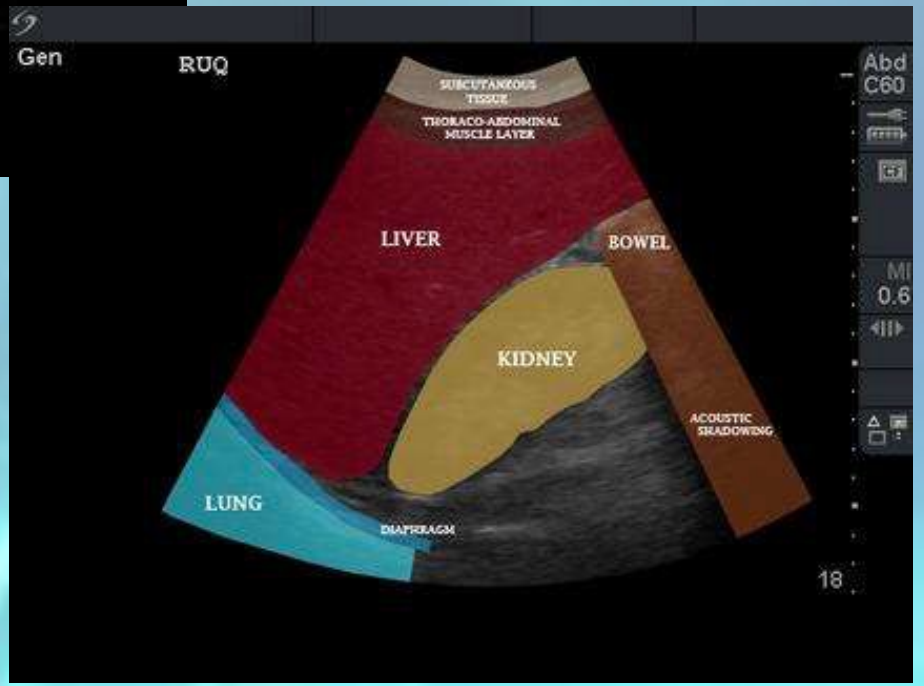
How do we use it

- **Answers specific Questions**
- Is there free fluid in the abdomen?
- Is there free fluid in the pericardium?
- Is there evidence of a pneumothorax/hemothorax?

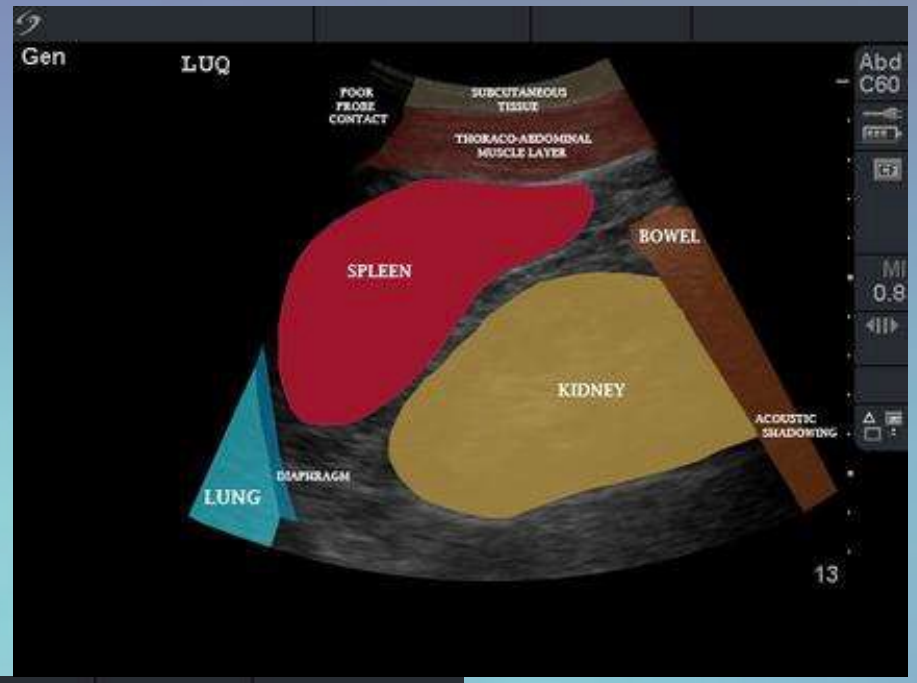
How’s it done

- **Real time Views**
- Abdominal
  - *Perihepatic/RUQ*
  - *Perisplenic/LUQ*
  - *Pelvic (Long and Trans)*
- Cardiac
  - *Pericardial (usually subcostal)*
- Thorax
  - *RUQ*
  - *LUQ*
  - *Parasternal*

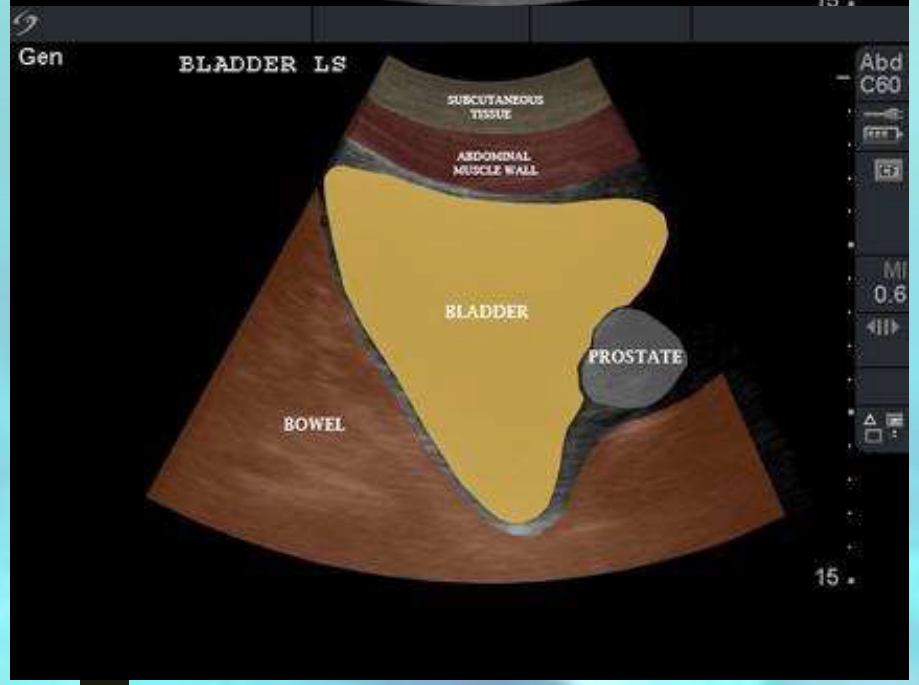
Perihepatic/RUQ

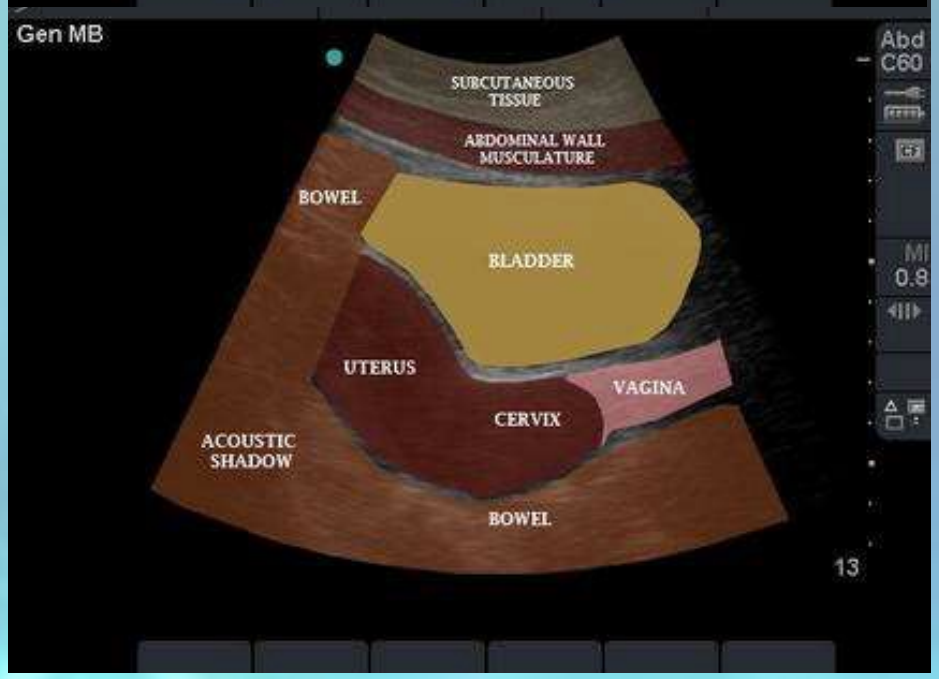


Perisplenic/LUQ



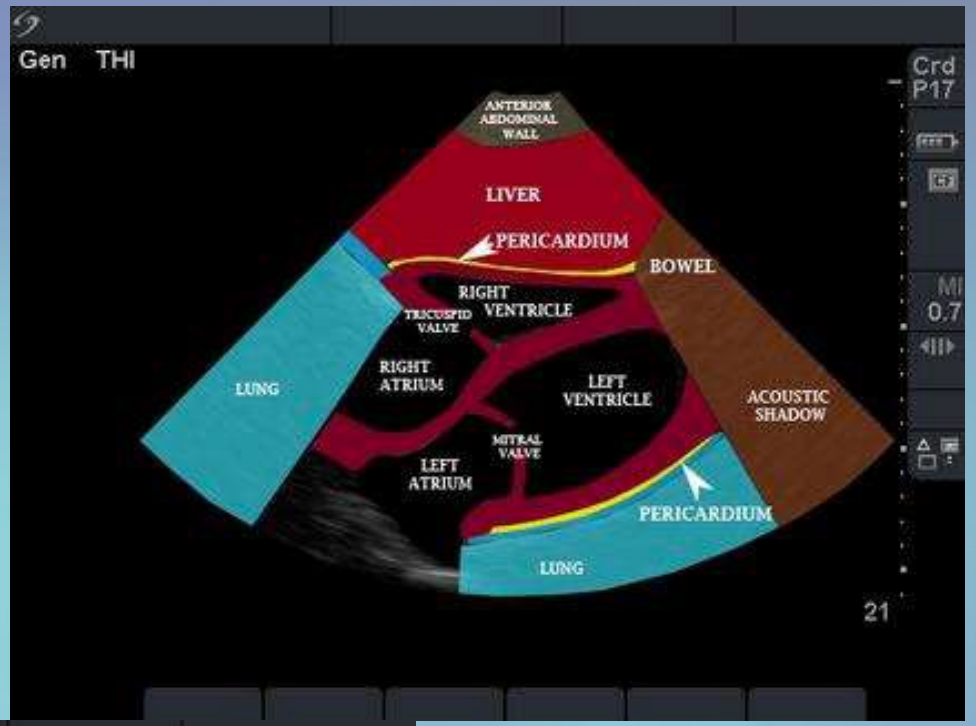
Pelvic





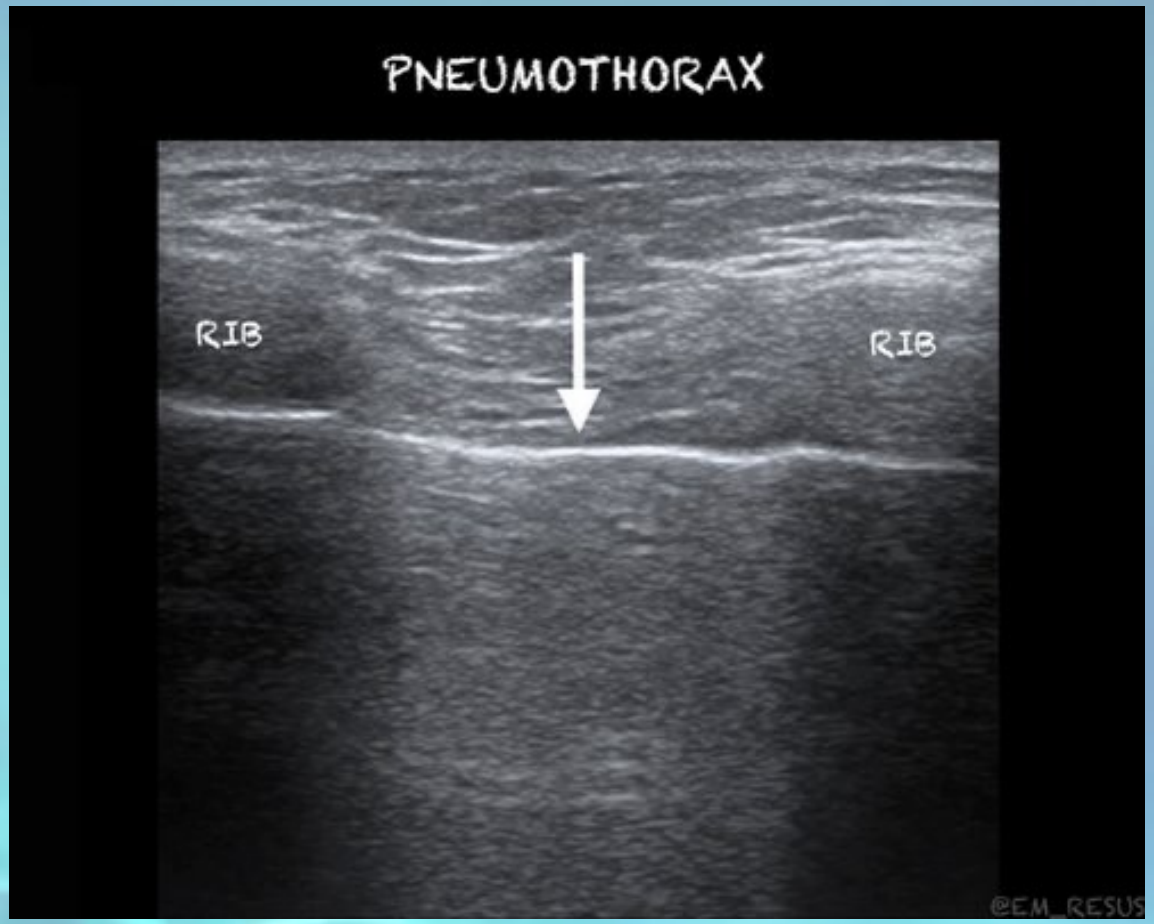
Male vs Female

Pericardial View



Lung

- Most anterior chest spaces in supine patient
- Parasternal, longitudinal
- Bat shape
- Lung sliding (“trail of ants”)
- Lung comets (Presence excludes PTx)
- PTx
  - *Loss of lung sliding*
  - *Lung point sign*



What does it mean and how does it help

- Free fluid is anechoic/sonolucent (Black) and has angularity to it's margins (ie. takes the shape of it's container)
- Clot appears echogenic
- Cannot differentiate fluid types
- Clinical context is important (+/- diagnostic aspiration)
- Generally require greater than 100-250mls free fluid
- Dependent on bladder fullness/patient size/sonographer skill

- Guides Management
  - *Prioritization*
  - *What should be dealt with first*
- Ensures more accurate assessment
- Thoroughness

Doesn't rule anything out

Just a quick aid

Permissive Hypotension and Hemodynamics

How low is too low??

Heart Rate Limitations

- 25% of hypotensive civilian trauma patients (SBP < 90) have a heart rate less than 90
- Absence of tachycardia is not reassuring
- Blood loss is still possible
- What falsely lowers HR? (examples)
  - *Traumatic injuries*
  - *Medications*
- Physiologic difference among pts

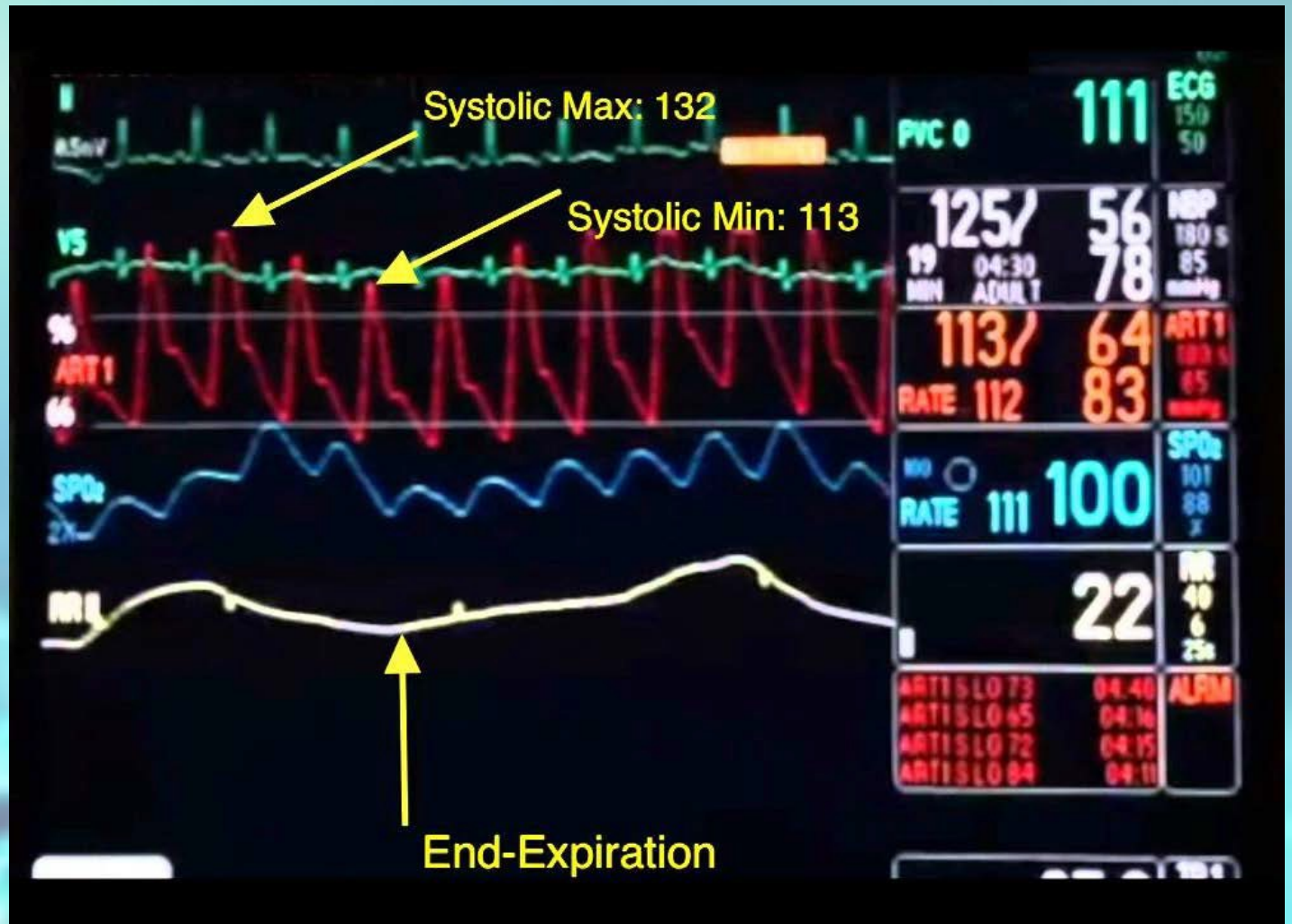
When to use BP for resuscitation

- Depends on type of bleeding –use goal **SBP~90** if bleeding is **non-compressible.**
- Where are the 4 areas in the body where *non-compressible* bleeding can occur?
- What 3 areas of the body are *semi-compressible* or difficult to compress?

Pressure variations

- Highly predictive of fluid responsiveness: Systolic pressure variation (SPV) (>12 mmHg)
- Stroke volume variation (SVV)
- Pulse oximeter amplitude variation
- LIMITATIONS
  - *Only works for ventilated patients (not spontaneous)*
  - *Must have Vt>8 ml/kg*
  - *R-R interval must be fixed on ECG*

SPV
“Eye-ball” test = 82% sensitive (Δ>12mmHg)

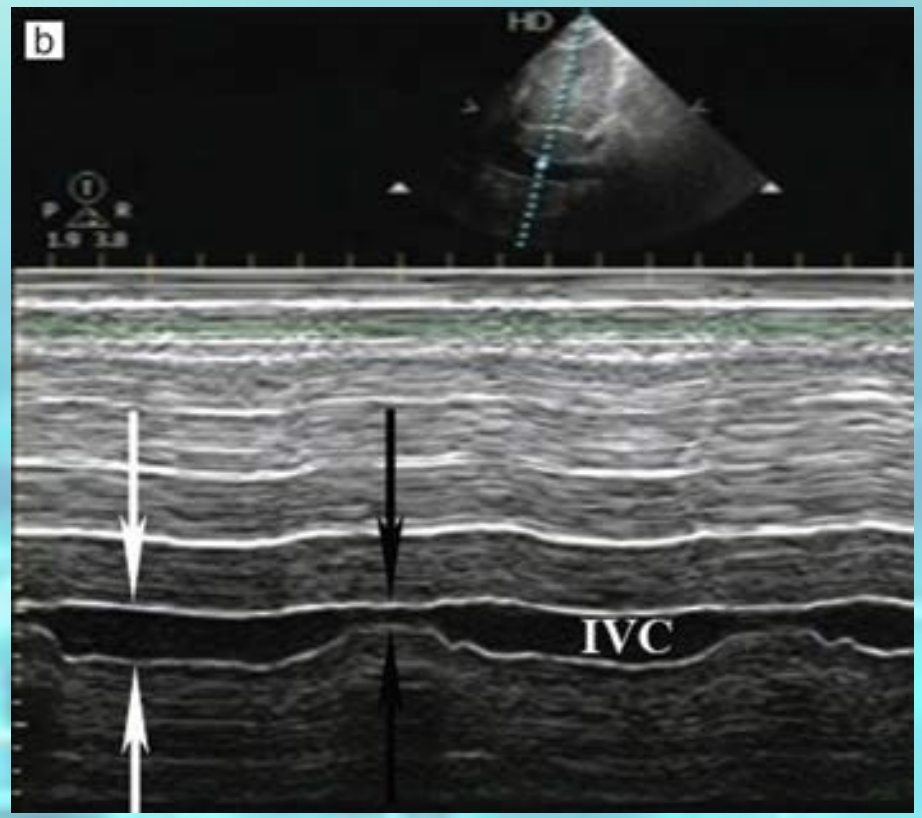


CVP

- >100 studies published to date
- NO relationship between CVP (or change in CVP) and fluid responsiveness
  - *Some weak evidence -extremes of CVP may be of value<6 may be fluid responsive*
- >15 more IVF may cause overload
  - *Don't use CVP in isolation*

Abd US: Imaging endpoints

- Respiratory changes in IVC diameter predicts fluid responsiveness
  - *Difficult to see with recent abdominal surgery (open abdomen)*



What a ”well resuscitated” trauma looks like

- SBP 100mmHg (if no TBI)
- Sat >92%
- temp > 95 (35)
- uop> 30 (0.5 ml/kg/h)
- Hb> 8.0
- BD > -0.4
- Lactate < 2.5
- INR < 1.5

Ketamine for trauma

- Multi Role
  - *Induction Agent*
  - *Analgesic*
- Debunking the Myths

Etomidate Vs Ketamine

Study Details

4 year evaluation (968 patients) of a protocol switch from Etomidate to Ketamine as the induction agent utilized in trauma.

Is Ketamine superior?

Upchurch et all, Annals Emerg Med 2016

Ketamine in Traumatic Brain injury (TBI)

- Contraindicated in Elevated Intracranial Pressure.....**Or is it?**
- Studies of patients with head injury have identified the link between outcomes and the occurrence of hypotension and hypoxia.

Mean Values	Etomidate	Ketamine	Midazolam	Overall
Length of Stay (Days)	15.8	29.5	14.1	17.0
LTAC[a] %	36.2	60.0	33.3	37.5
Home %	25.5	26.7	25.9	26.0
Expired %	38.3	13.3	40.7	36.5
Penetrating %	87.2	93.3	88.9	88.5
Blunt %	12.8	6.7	11.1	11.5
Time of Mortality (Days)	1.9	8.5	5.6	5.4

Cornelius et al, WJEM 2018

Subdissociative-Dose Ketamine Versus Morphine for Analgesia

- In this trial, 90 adults with acute pain were randomized in the emergency department in double blind fashion to receive either ketamine at 0.3 mg/kg or morphine at 0.1 mg/kg intravenously.
- Pain score reductions and the proportion of patients with complete pain relief were statistically similar between groups, with reasonable power to exclude clinically important differences.
- There were no serious adverse events.

Motov et al.,Annals Emerg Med 2015

And in children's noses

- What is already known on this topic
  - *Intranasal analgesia is increasingly used for children because it can be delivered quickly, with minimal upset.*
- What question this study addressed
  - *How does intranasal fentanyl 1.5 mg/kg compare with intranasal ketamine 1 mg/kg?*
- What this study adds to our knowledge
  - *Similar pain reduction was observed with either agent in this randomized double-blinded trial of 73 children with limb injuries. Ketamine had more adverse effects, but none serious. How this is relevant to clinical practice In the doses studied, intranasal ketamine appeared similarly effective to intranasal fentanyl.*

Resuscitation before intubation:

Intubation shouldn’t be the cause of death

Physiologic Killers

- Hypotension
- Hypoxemia
- Metabolic Acidosis

Hypotension Kills

- *At least 2 proximal peripheral IVs (PIVs)*
- *If unable to get PIVs, IO can be used as well for RSI*
- *Judicious bolus of IVF wide open or vasopressor support*
- *Shoot for a higher than normal BP before intubating if possible (SBP ≥140mmHg)*

Sedatives low, Paralytics high

- *Doses of induction agents and paralytics should be adjusted according to pre-RSI physiology. This means reducing the dose of your induction agent and increasing the dose of your paralytic agent for several reasons:*
- *Ketamine should be the induction agent of choice in shock patients (Gives simultaneous sympathetic surge and pain control).*
- *Rocuronium should be the paralytic agent of choice.*

Push dose Pressors

- Epinephrine
- Phenylephrine
- Vasopressin

Think NO DESAT (Nasal Oxygen During Efforts Securing A Tube)

- *NC at 15LPM + NRB at 15LPM*
- *Keep a PEEP Valve close*
- *If you cannot get the O2 Saturation ≥95%, then consider the following:*
  - Lung Shunt Physiology (i.e. Pulmonary Edema, Pneumonia, etc…).

Intervention One

- NC 15LPM + BVM 15LPM + PEEP Valve 5 – 15cmH20
- They’re breathing, keep a good seal and let the magic happen

Intervention two-cooperate before intubate

- Used for the uncooperative or combative patient
- Procedural sedation for preoxygenation
- Ketamine 0.5-1mg/kg

Intervention three-BUHE

- Back Up-Head Elevated
  - *If they can breath there, let them keep at it.*
  - *Don’t insist on laying everyone supine*

pH kills

- Try and avoid intubation in these patients if at all possible.
- Even consider a short trial of NIPPV while you try and correct the cause of metabolic acidosis.

Intervention One-Bicarbonate

Tenuous at Best-Bicarbonate->CO2

Already tachypneic-increased CO2 makes this even worse

Increased circulating CO2 could worsen acidosis

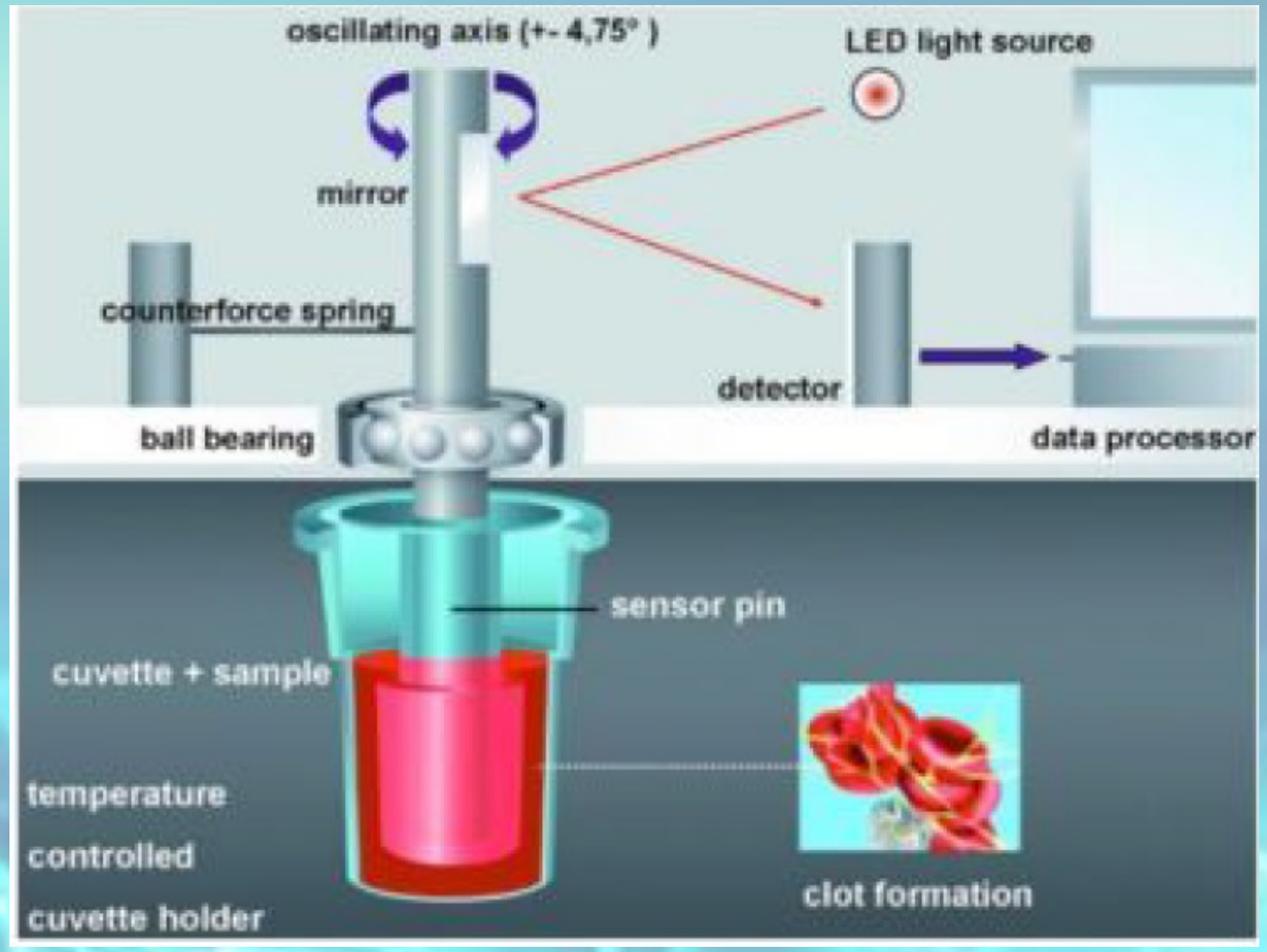
Leading to arrhythmias

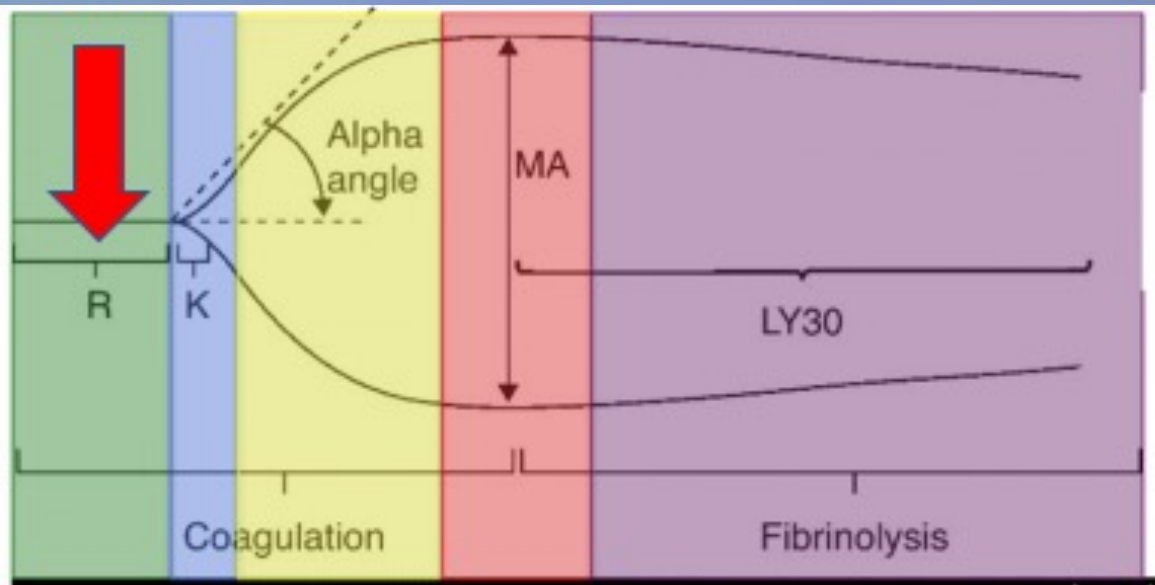
Intervention Two-Vapox

- Ventilator Assisted Pre-Oxygenation
- Even a brief apneic period can worsen acidosis
- Nasal Cannula at 15LPM
- SIMV+PSV
  - *VT 8ml/kg Predicted Body Weight*
  - *FiO2 100%*
  - *Pressure Support 5-10cmH20*
  - *PEEP-5*
  - *Decrease flow rate to avoid stomach insufflation but meet needs of minute ventilation*

Guided Resuscitation-Use of ROTEM/TEG

Viscoelastic testing





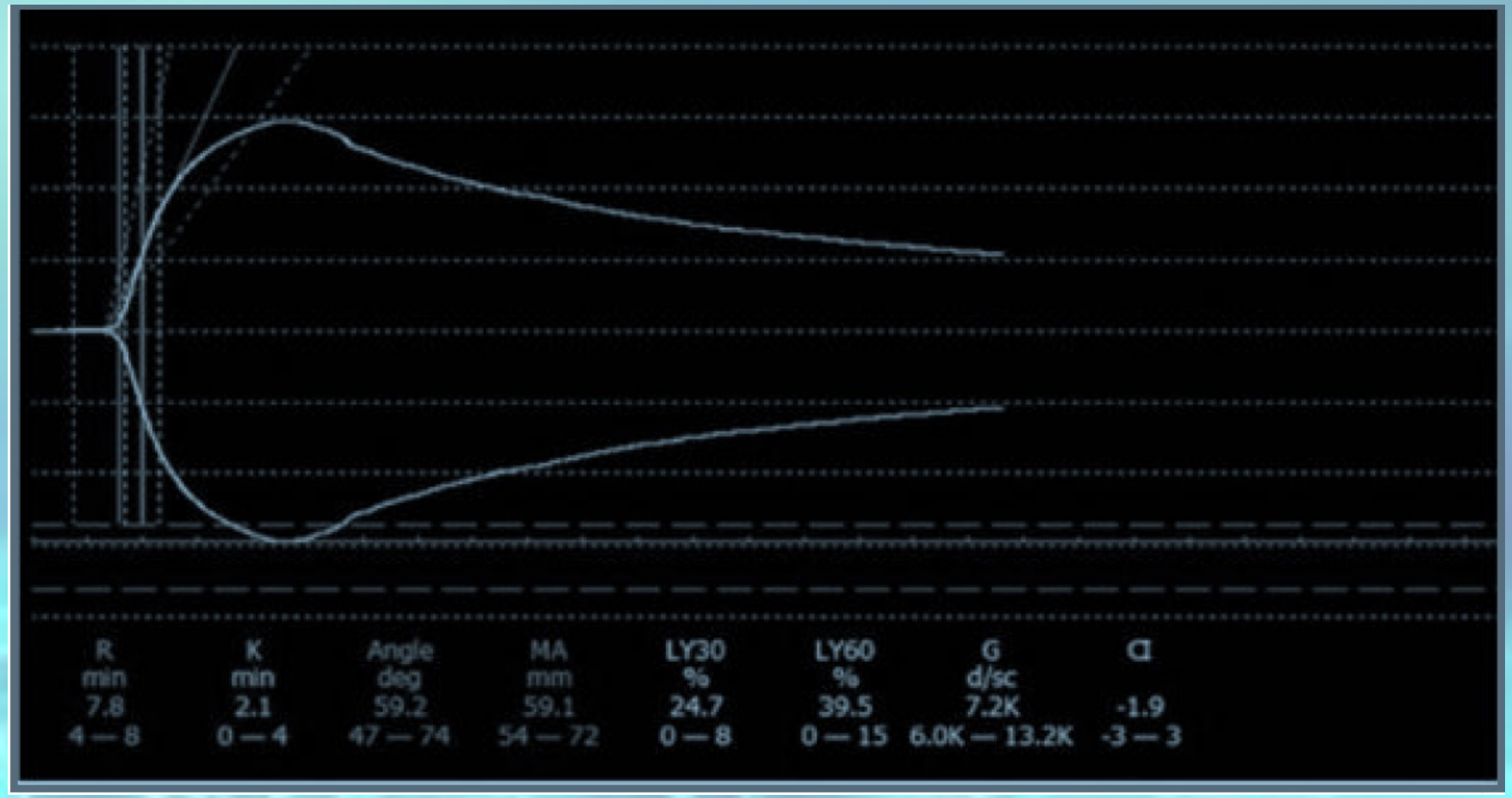
R.E.B.E.L. EM

rebelem.com

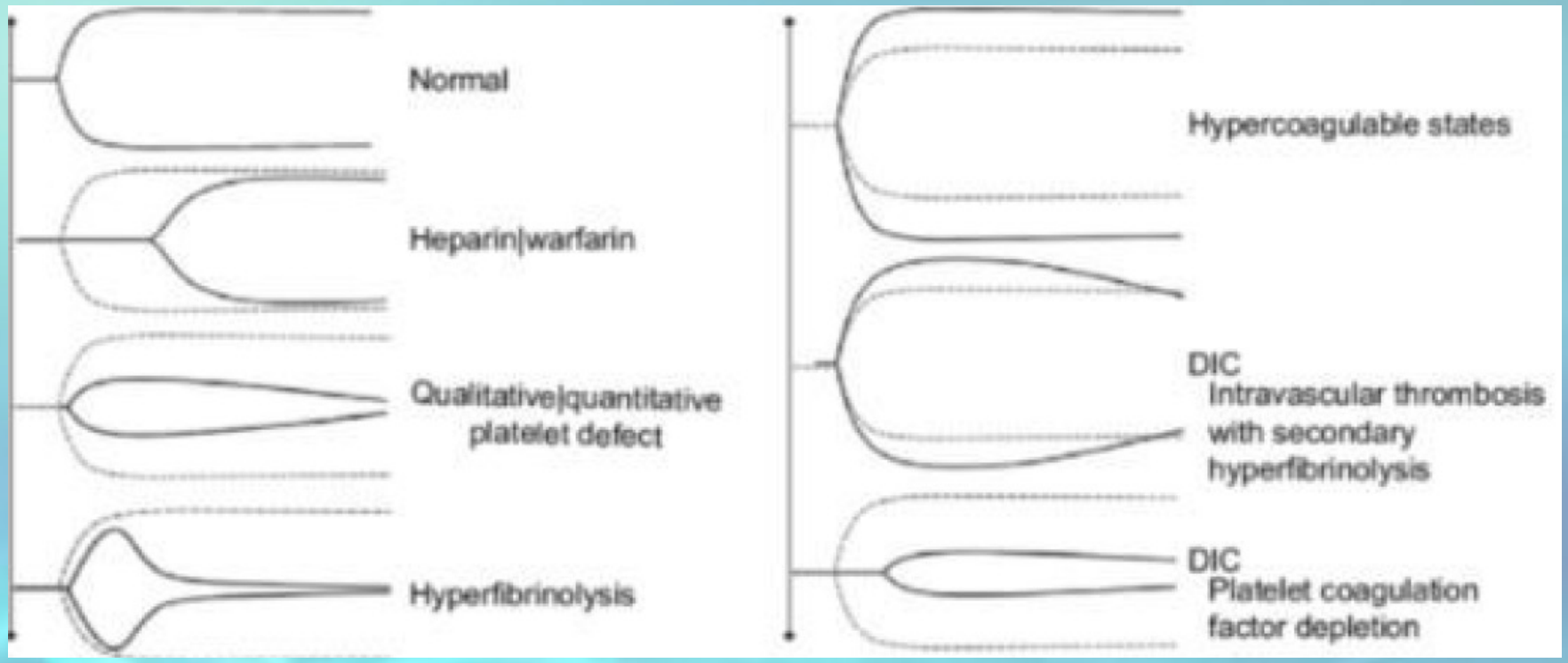
Thromboelastogram (TEG)

Components	Definition	Normal Values	Problem with...	Treatment
R Time	Time to start forming clot	5 - 10 minutes	Coagulation Factors	FFP PCC
K Time	Time until clot reaches a fixed strength	1 - 3 minutes	Fibrinogen	Cryoprecipitate
Alpha angle	Speed of fibrin accumulation	53 - 72 degrees	Fibrinogen	Cryoprecipitate
Maximum Amplitude (MA)	Highest vertical amplitude of the TEG	50 - 70 mm	Platelets	Platelets and/or DDAVP
Lysis at 30 Minutes (LY30)	Percentage of amplitude reduction 30 minutes after maximum amplitude	0 - 8%	Excess Fibrinolysis	Tranexemic Acid and/or Aminocaproic Acid

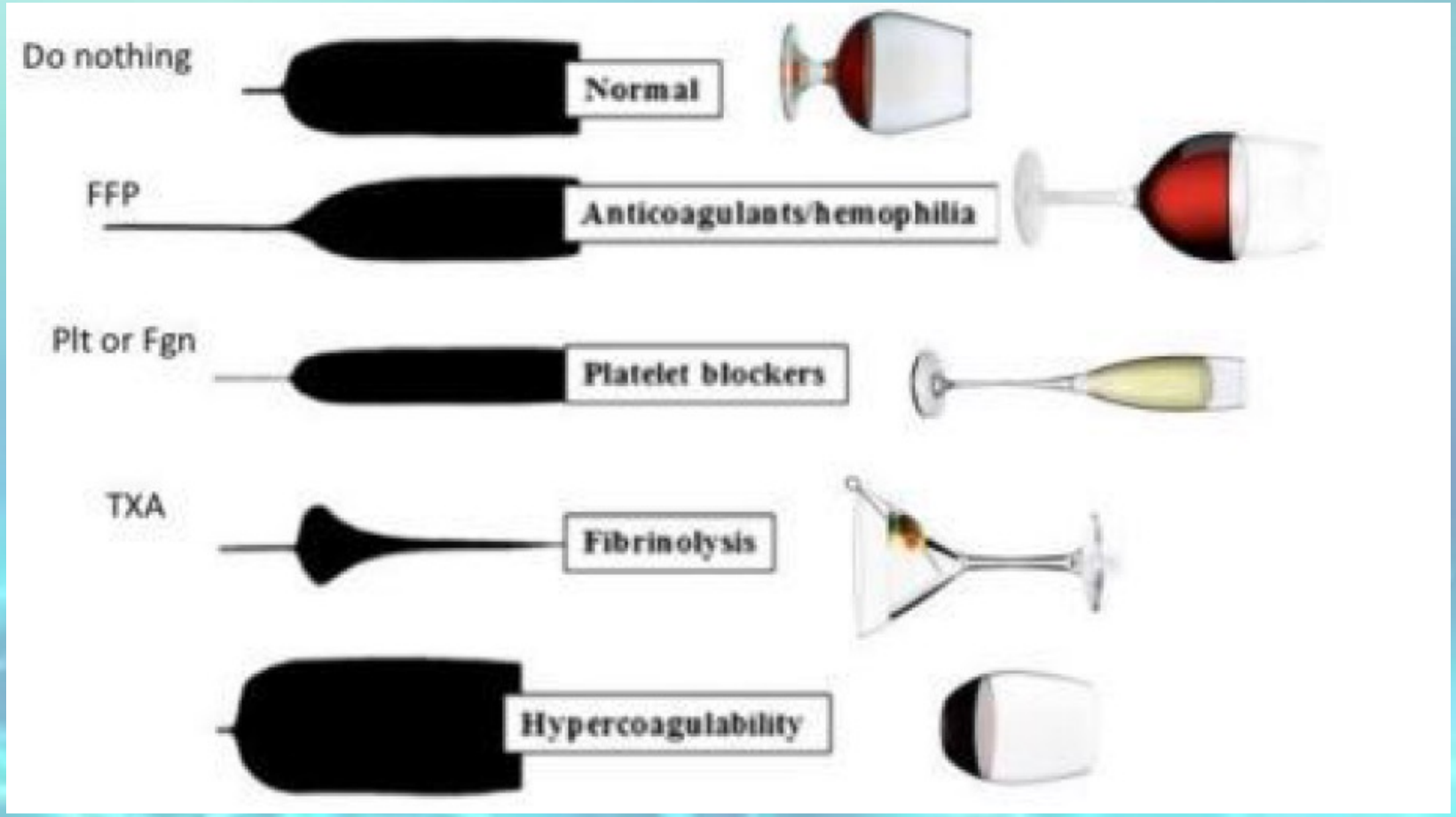
TEG Example


R
min
7.8
4 — 8
K
min
2.1
0 — 4
Angle
deg
59.2
47 — 74
MA
mm
59.1
54 — 72
LY30
%
24.7
0 — 8
LY60
%
39.5
0 — 15
G
d/sc
7.2K
6.0K — 13.2K
α
-1.9
-3 — 3

Examples


Normal
Heparin|warfarin
Qualitative|quantitative platelet defect
Hyperfibrinolysis
Hypercoagulable states
DIC
Intravascular thrombosis with secondary hyperfibrinolysis
DIC
Platelet coagulation factor depletion

Drinkers guide to viscoelastic testing



Questions