

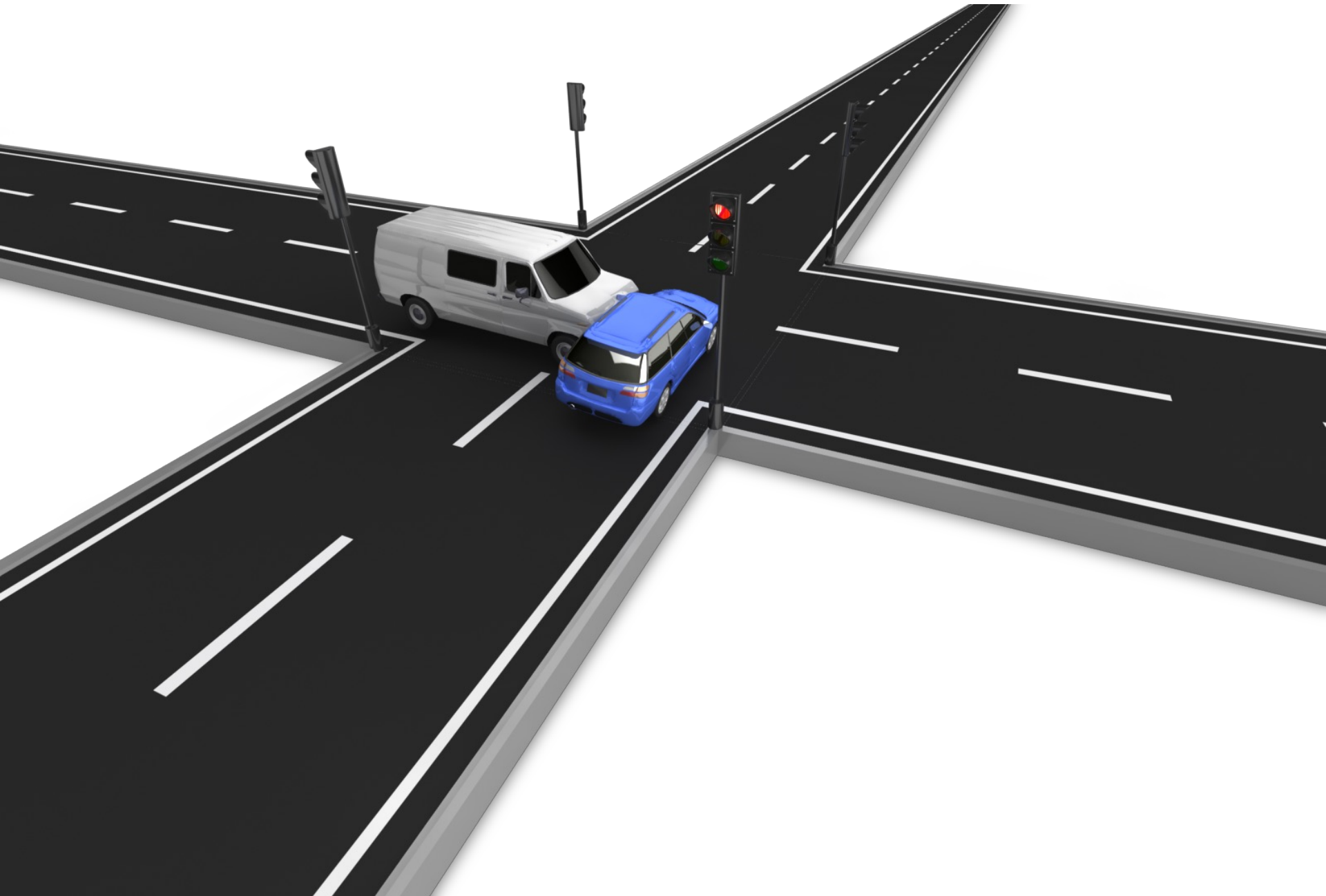
# The Obese Trauma Patient

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**Medical Director of Continuing Education & Simulation**  
**Denver Health & Hospital Authority**  
**Associate Professor of Emergency Medicine**  
**University of Colorado School of Medicine**





**NO FINANCIAL DISCLOSURES**





Assessment



Injury Patterns

Diagnostics

Procedures

Equipment



## OBJECTIVES

**Understand physiologic changes due to obesity**

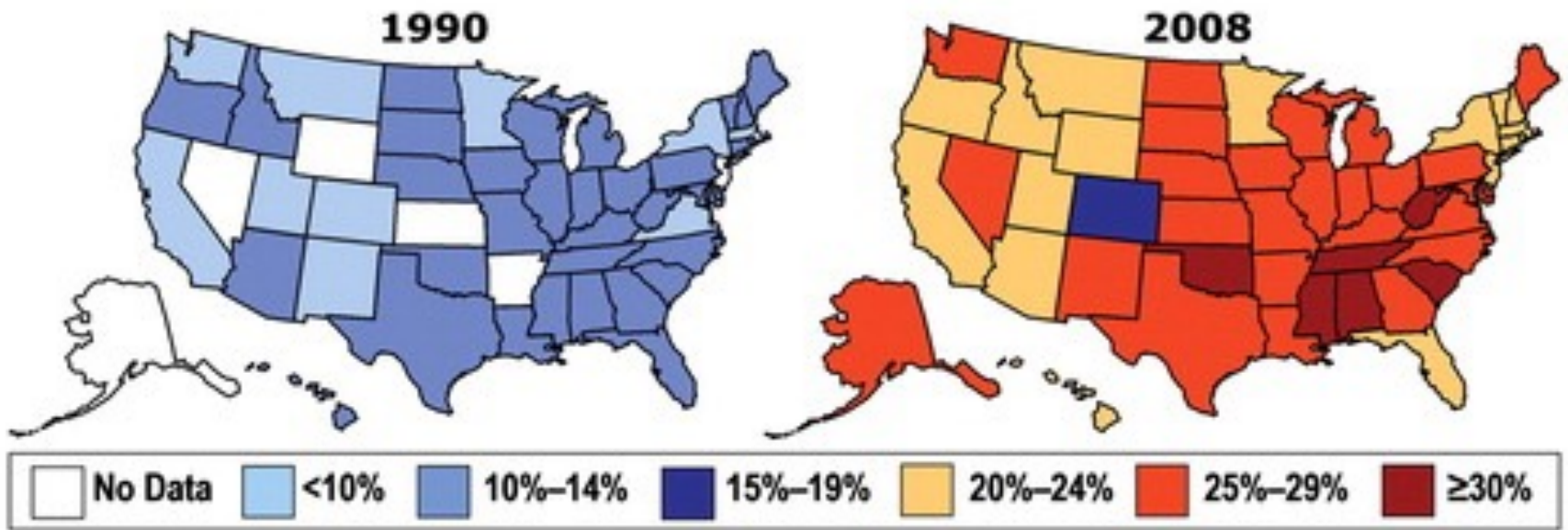
**Describe techniques to improve care of the obese trauma patient**

**> 1/3**



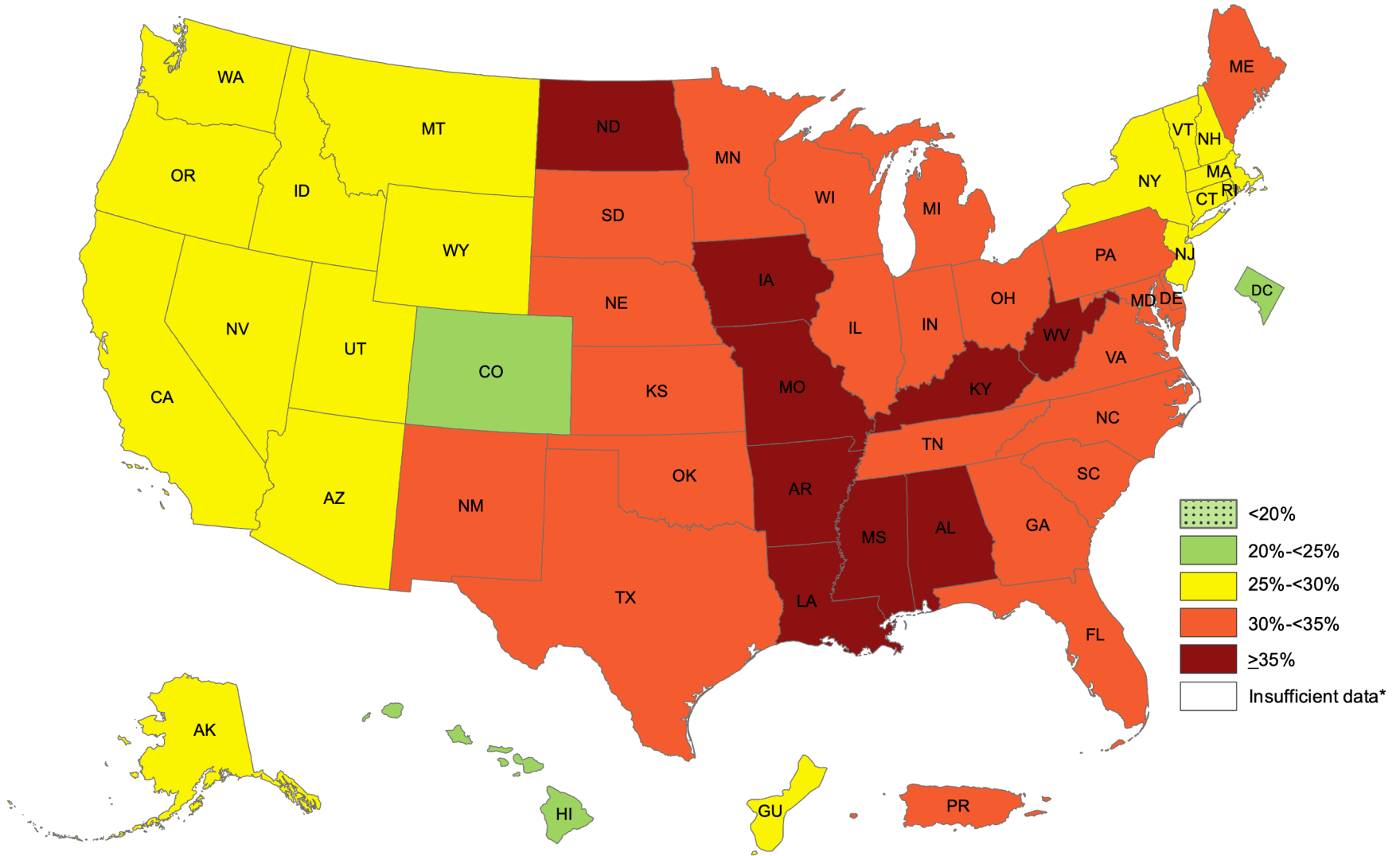
**42.4%**

**70%**

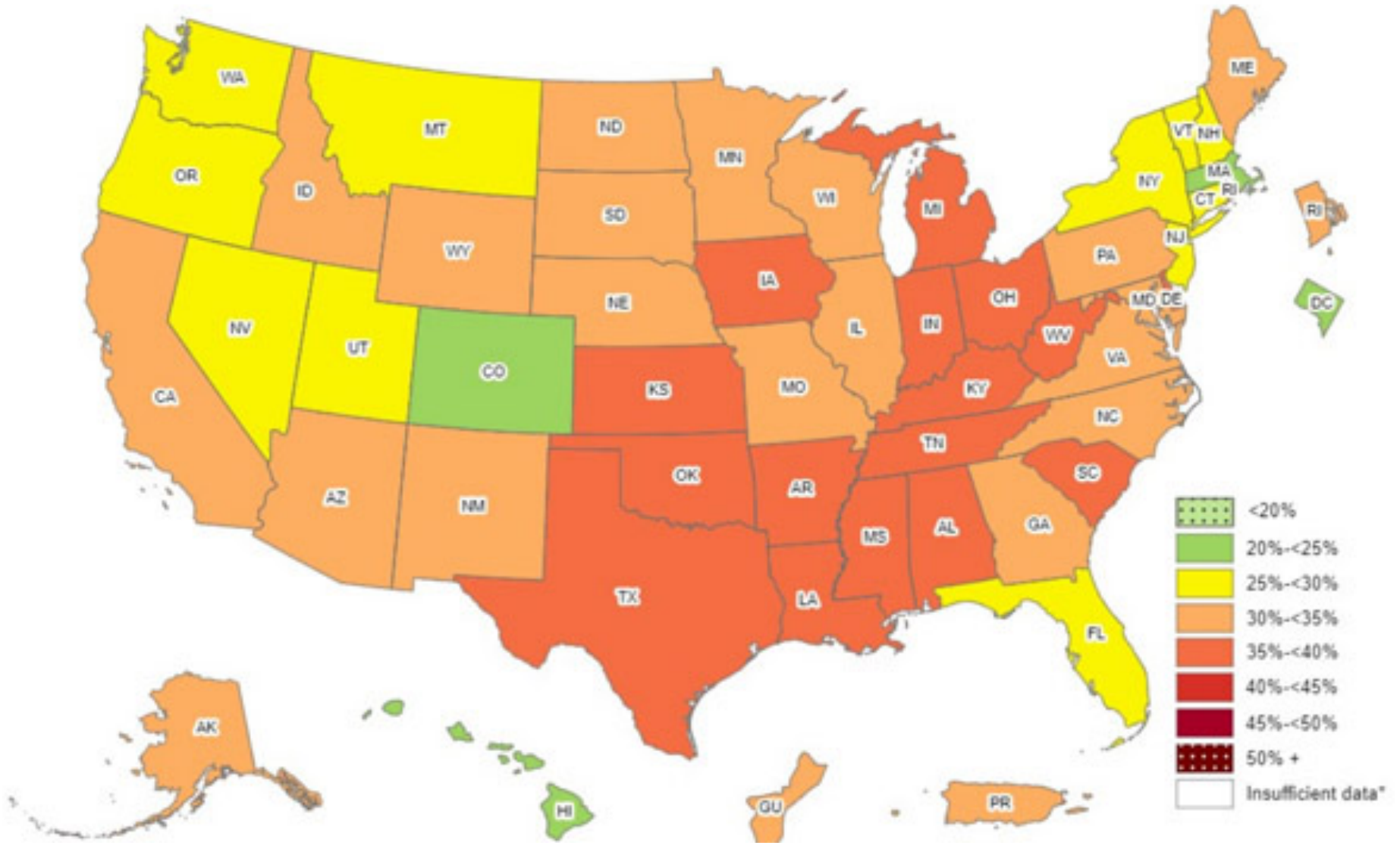




# 2019



# 2020



cdc.gov



**Overweight**

BMI > 25 to 29.9

**Obese**

BMI 30 to 39

**Morbidly  
Obese**

BMI 40 or greater



**Body Mass  
Index**

**=**

**Weight  
(in kg)**

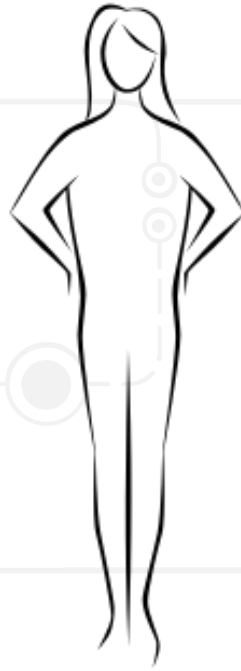
**Height<sup>2</sup>  
(in m)**

# BODY SHAPE

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Banana



Apple

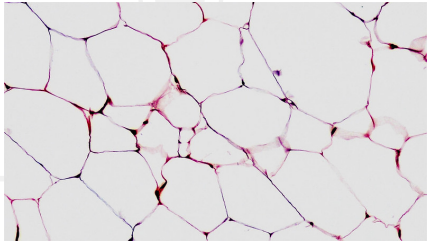


Pear



Hourglass

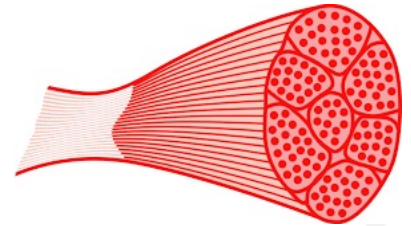
# BODY MASS INDEX



**ADIPOSE TISSUE**

+

**LEAN BODY MASS**

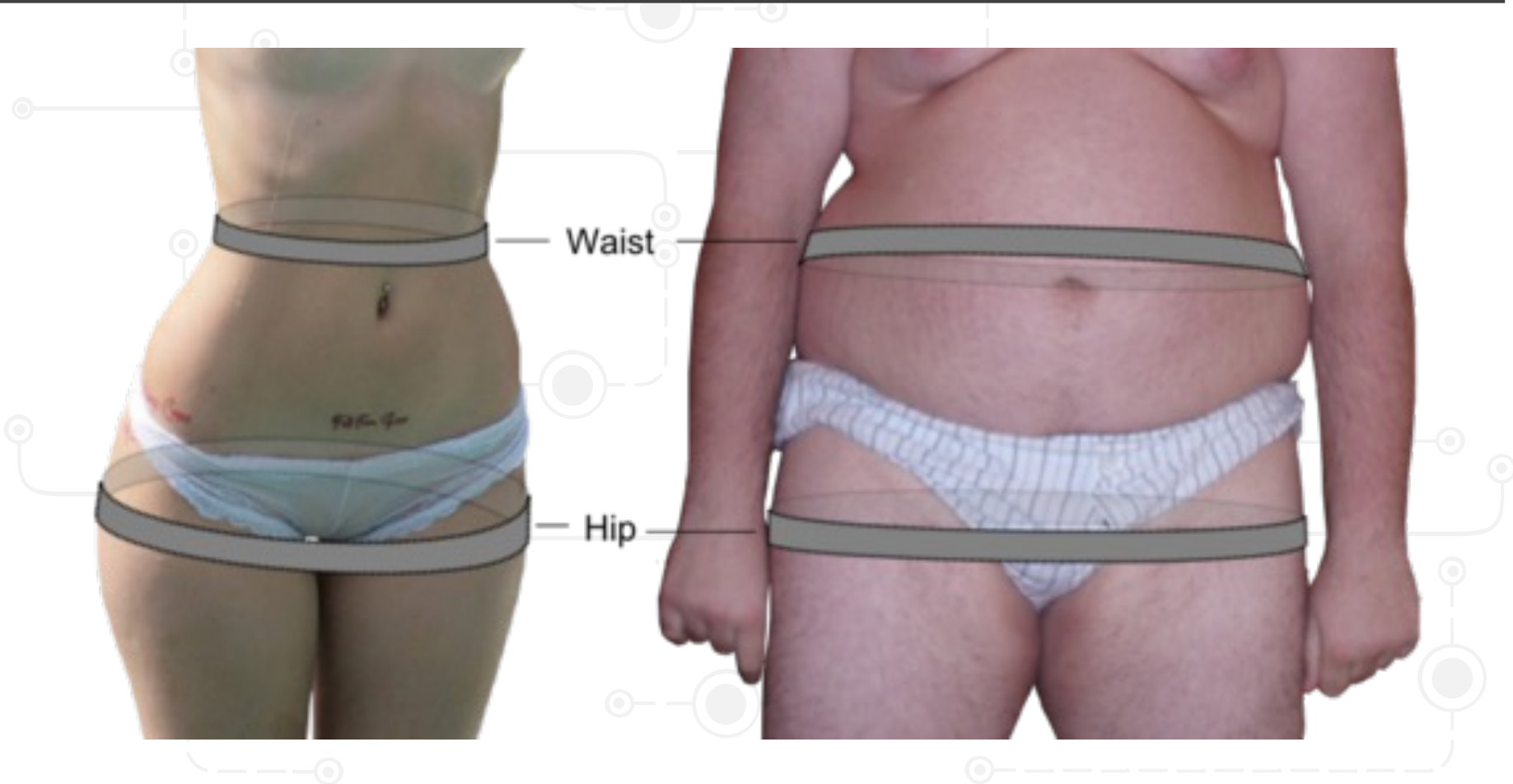


**? PROPORTION OF EACH**



# Waist To Hip Ratio

---





# Waist To Hip Ratio

---

**> 1.0**

The background features a light gray, stylized circuit board pattern. It consists of various nodes (small circles) connected by solid and dashed lines, creating a network-like structure. The lines are thin and light gray, while the nodes are slightly larger circles, some with a darker center. The overall aesthetic is clean and technical.



# **IMPACT OF OBESITY ON TRAUMA**

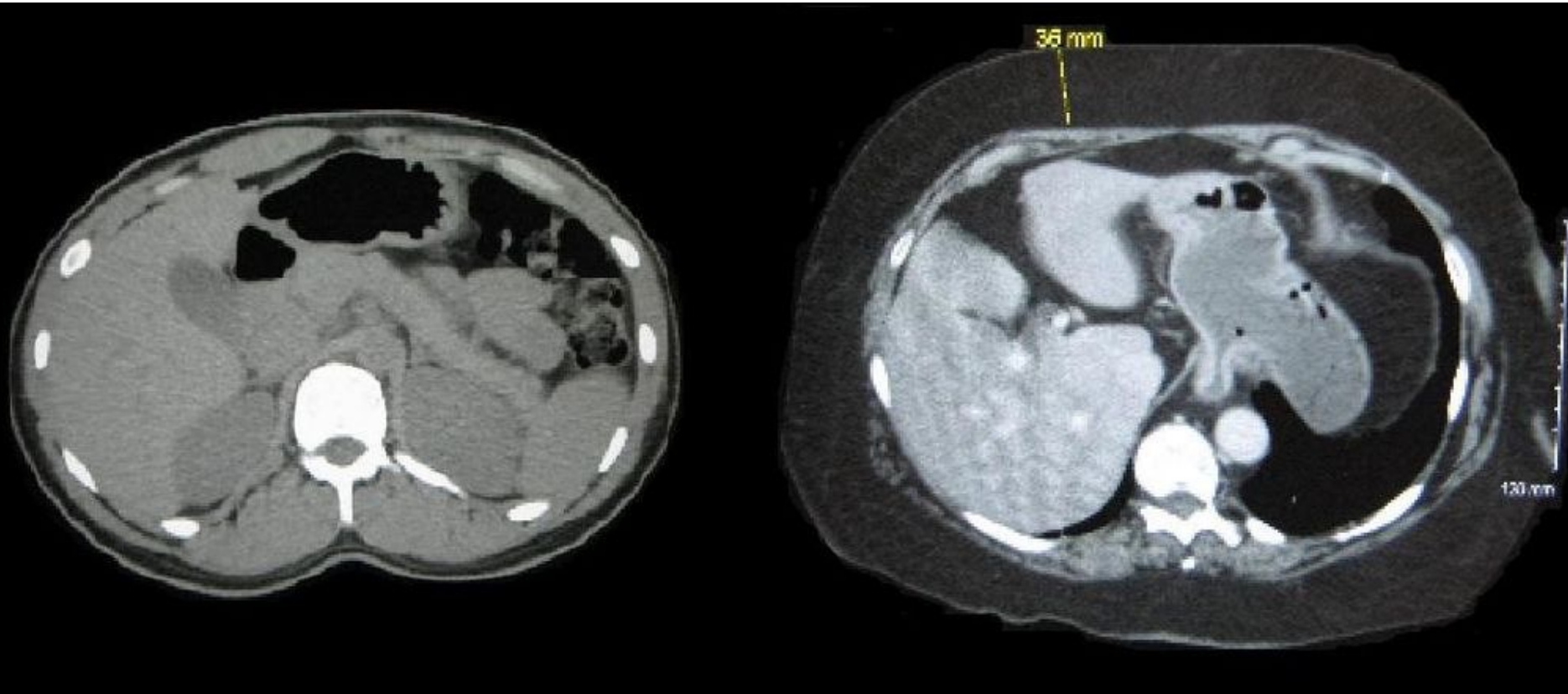
INJURY TYPE	FREQUENCY
Thoracic Injuries	Increased
Abdominal Injuries	Decreased (Cushioning Effect)
Pelvic Injuries	Increased
Extremity Injuries	Increased

# PENETRATING TRAUMA

---



# RISK OF PERITONEAL VIOLATION & VISCERAL INJURY





Systematic Review &  
Meta-Analysis  
9 Studies/5013 Patient  
29.6% Obese



Nontherapeutic Operations



ICU & Hospital  
Length of Stay

# COMPLICATIONS

Hypoxia

Pulmonary Hypertension & Heart Failure

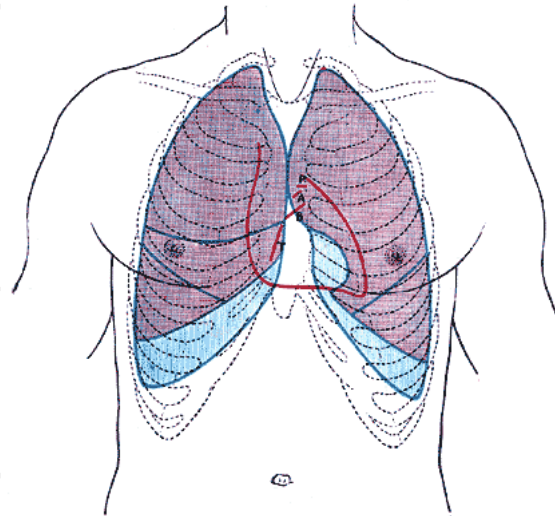
Mortality

**OBESITY**

# COMPLICATIONS

01

275,393 PATIENTS



02

12.6% CV AND  
RESPIRATORY  
COMPLICATIONS

03

5.2% CV AND  
RESPIRATORY  
COMPLICATIONS  
IN NON-OBESE



# PEDIATRICS

**01**

**149,817 PATIENTS**

**02**

**MORE  
EXTREMITY  
INJURIES**



**03**

**LESS HEAD,  
ABDOMEN,  
THORAX AND  
SPINE INJURIES**

**INCREASED LIKELIHOOD OF DEATH**



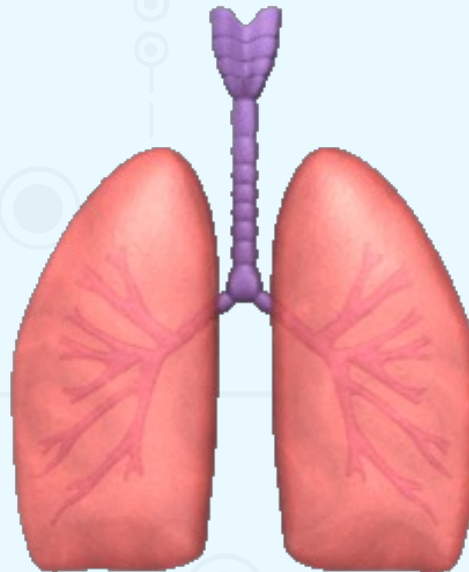
# PHYSIOLOGIC EFFECTS

01

DECREASED LUNG  
VOLUME

02

DECREASED  
CHEST WALL  
COMPLIANCE



03

DECREASED  
DIAPHRAGM  
MOVEMENT

# LOW RESERVE/HIGH CONSUMPTION

1.5X

1. INCREASED ADIPOSE  
TISSUES

2. INCREASED OXYGEN  
CONSUMPTION &  
CO2 PRODUCTION

3. DECREASED  
EFFECTIVE GAS  
EXCHANGE

4. DESATURATION  
TIME & SAFE APNEA  
PERIOD DECREASED



# LOW RESERVE/HIGH CONSUMPTION

FUNCTIONAL RESIDUAL CAPACITY



V/Q MISMATCH

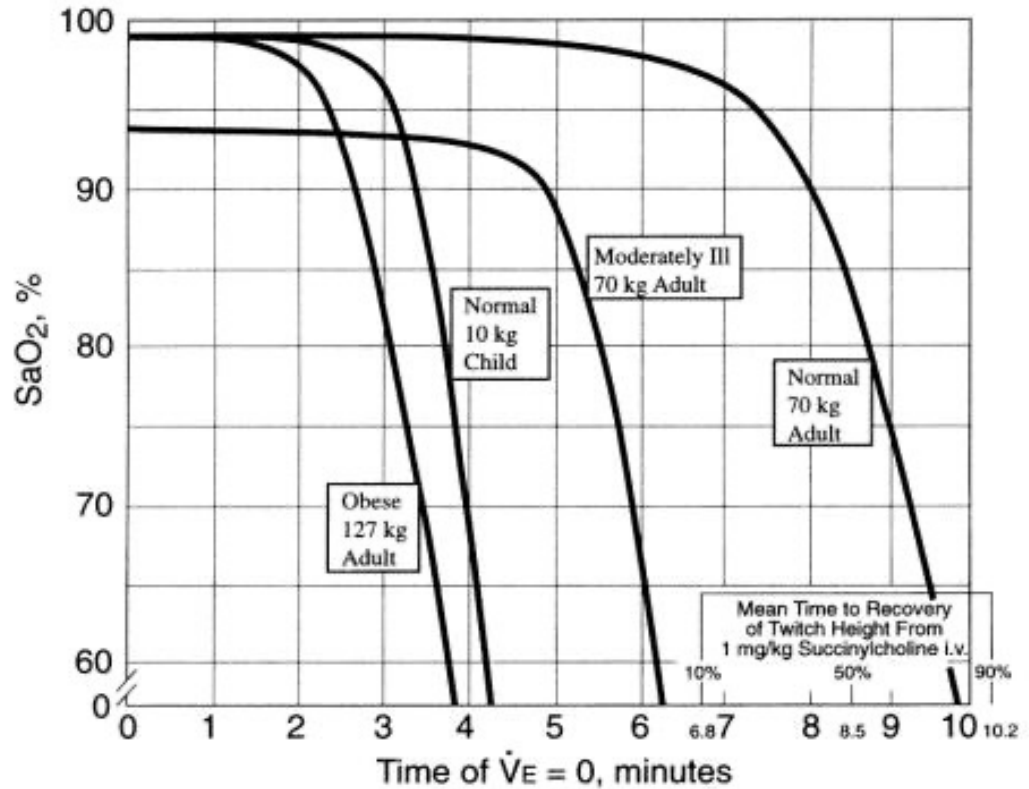


OXYGEN CONSUMPTION

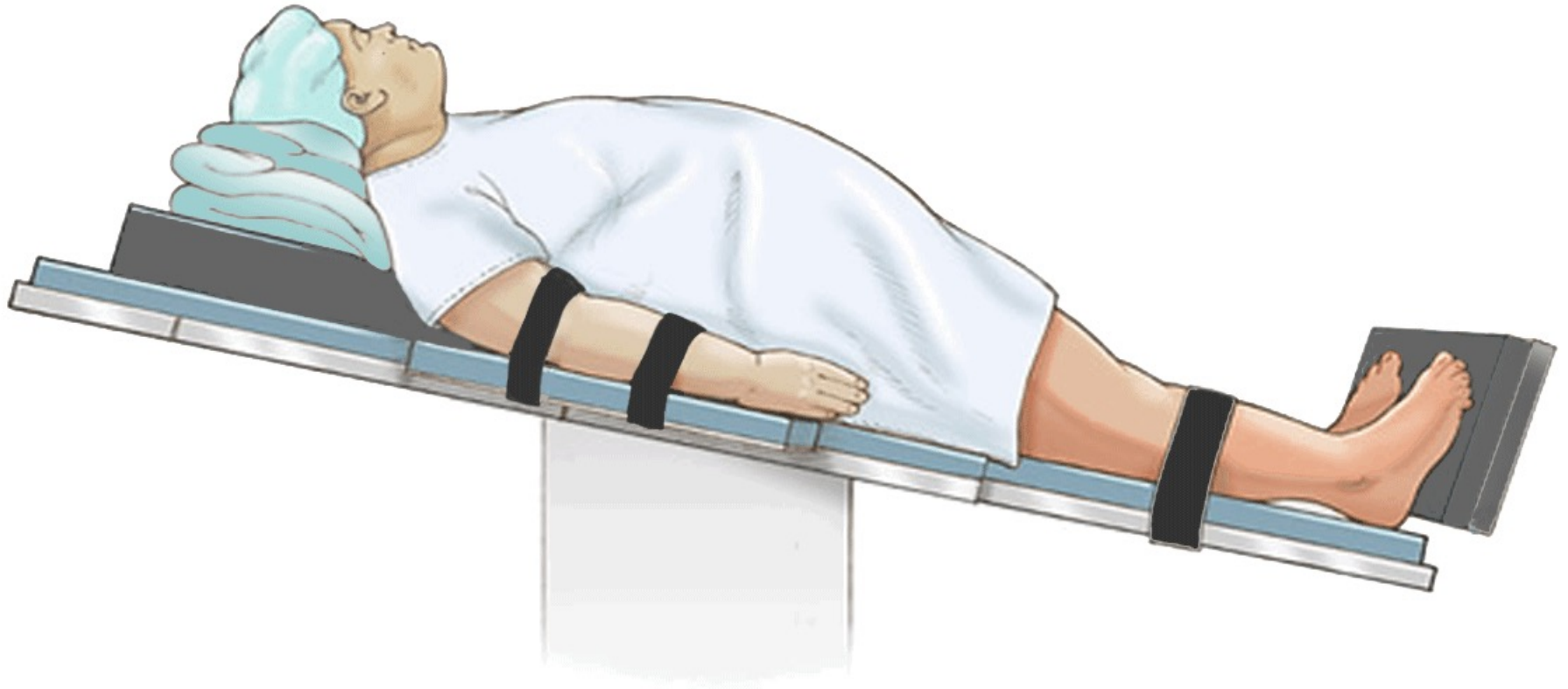


Anesthesiology  
1997

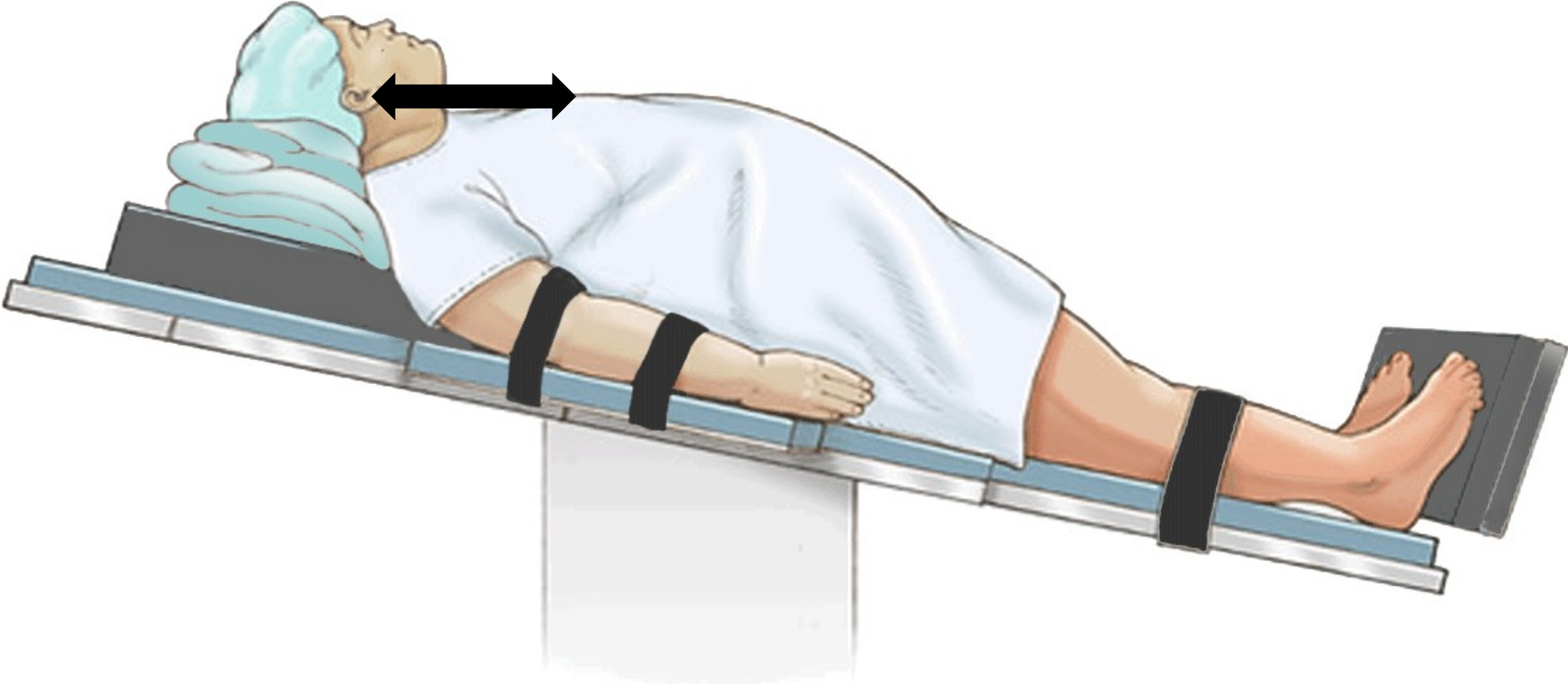
TIME TO HEMOGLOBIN DESATURATION WITH INITIAL  $F_{A}O_2 = 0.87$



# AIRWAY



# AIRWAY





# AIRWAY POSITIONING

**01**

**ASSISTS MANUAL  
OPENING OF THE  
AIRWAY**

**02**

**INCREASES  
PULMONARY  
COMPLIANCE**

**03**

**IMPROVES  
LUNG  
EXPANSION**

**04**

**INCREASES  
FUNCTIONAL  
RESIDUAL  
CAPACITY**

**05**

**RETURNS  
P(A-A) O<sub>2</sub> TO  
BASELINE**



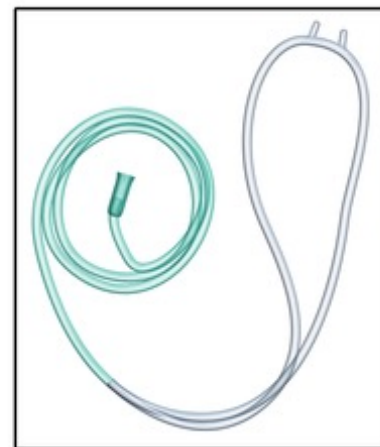
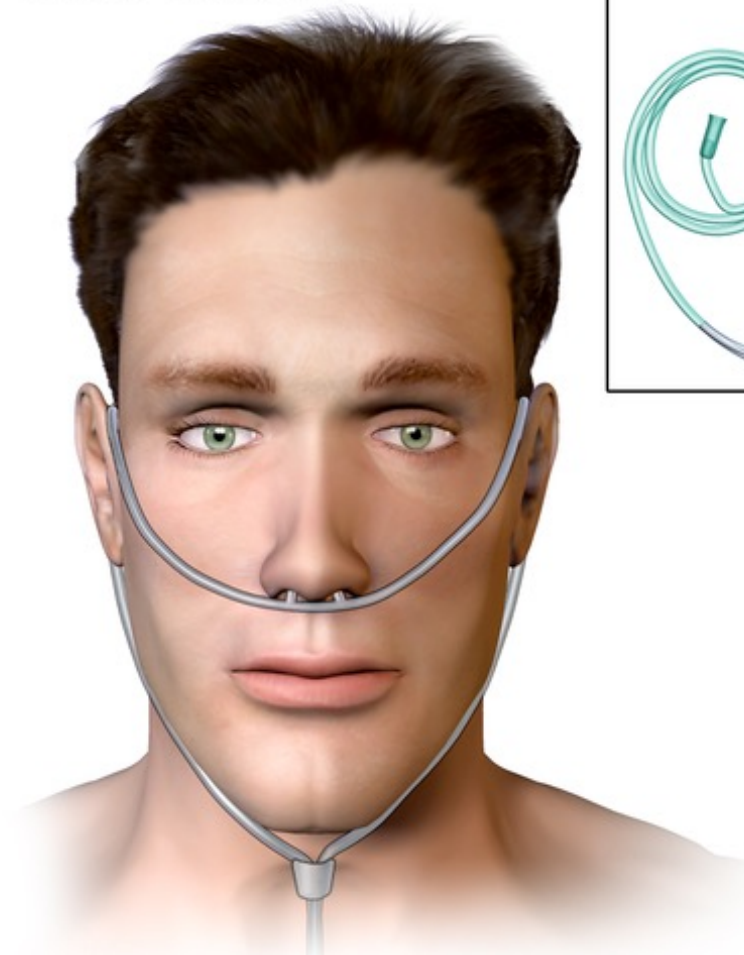


**AIRWAY**



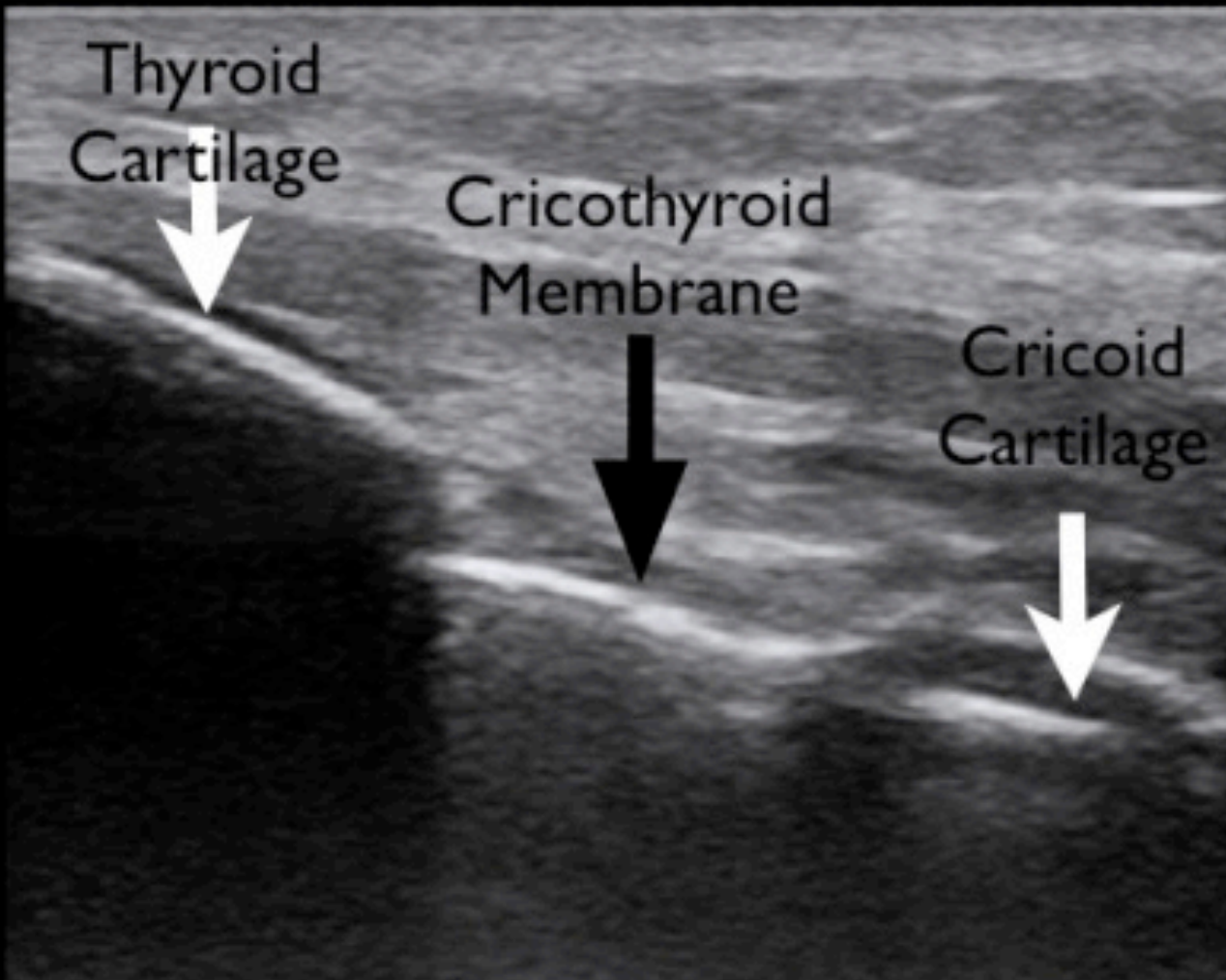
# AIRWAY

Nasal Cannula



5.29min vs 3.49min



**M****CRICOTHYROTOMY**

**BIG NECK**

**BIG INCISION**

**BIG RETRACTORS**



Respiratory  
Rate

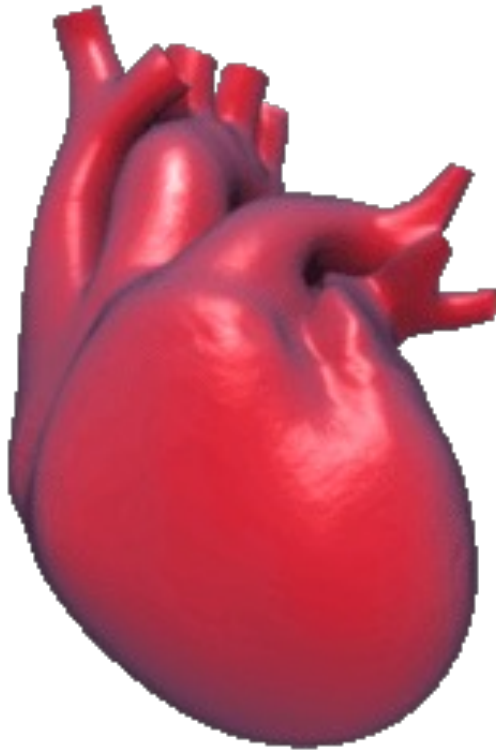


15 to 21  
Breaths per  
Minute

Tidal  
Volume



6-8 ml/kg  
Based on  
Ideal Body  
Weight



Circulating Blood Volume



Venous Return



RV mass



**Susceptible to hypotension  
&  
Inadequate fluid resuscitation**



# CIRCULATION COMPUTER SIMULATION STUDY



HOSPITAL

**SUBJECTS** VIRTUAL OBESE PATIENTS

**FINDINGS** INCREASE TO RESISTANCE  
IN VENOUS RETURN

**FINDINGS** GREATER FALL IN CARDIAC  
OUTPUT

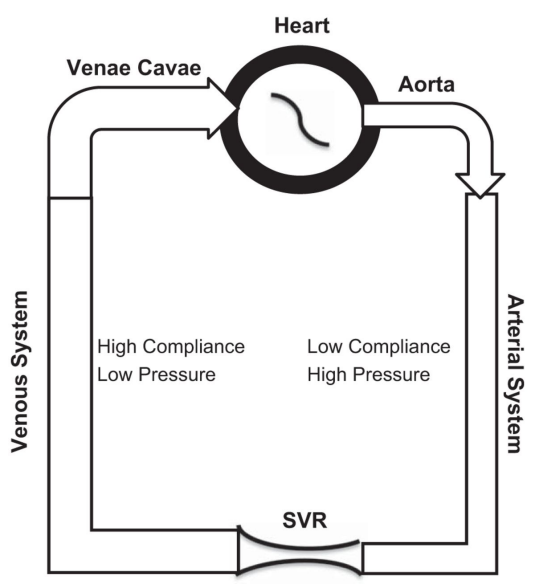
**FINDINGS** GREATER FALL IN MEAN  
ARTERIAL PRESSURE.

**IMPACT** HIGHER RISK FOR  
HEMODYNAMIC INSTABILITY

**IMPACT** MORE AGGRESSIVE  
RESUSCITATION

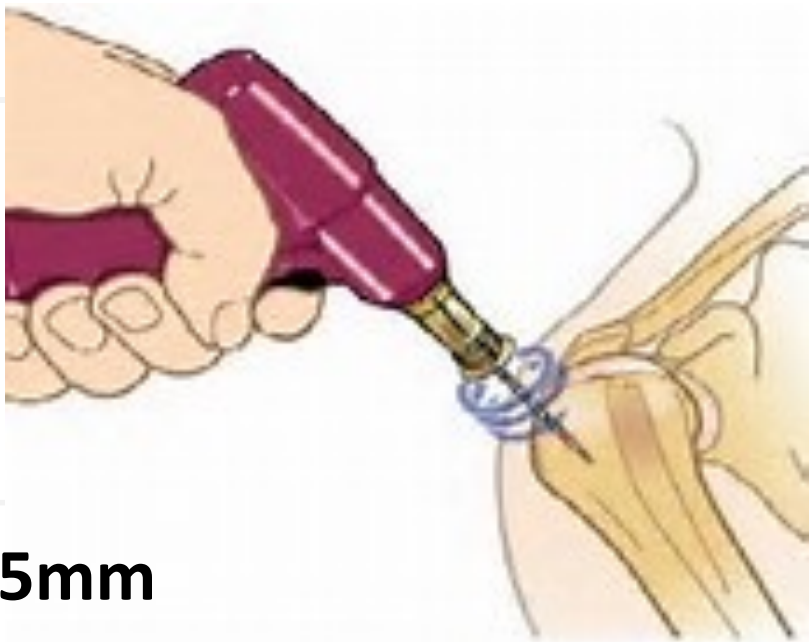
42%

44%

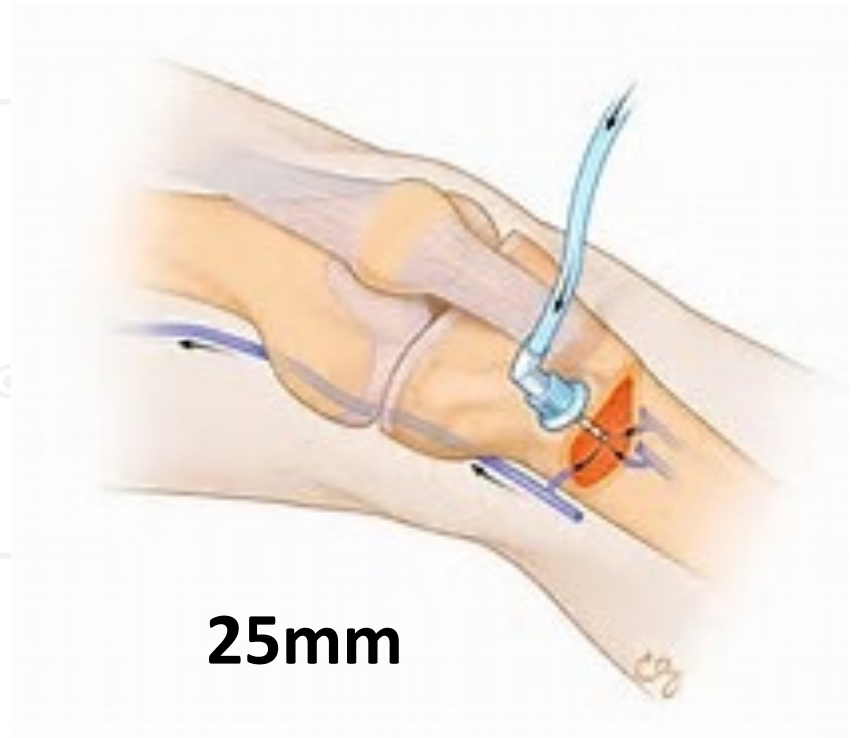


Variable	Value	Points	Score
Haemoglobin (g/dl)	< 7	8	
	< 9	6	
	< 10	4	
	< 11	3	
	< 12	2	
Base excess (mm)	< -10	4	
	< -6	3	
	< -2	1	
Systolic blood pressure (mmHg)	< 100	4	
	< 120	1	
Heart rate (bpm)	> 120	2	
Free intraabdominal fluid (e.g. by FAST)		3	
Clinically instable pelvic fracture		6	
Open or dislocated femur fracture		3	
Male gender		1	
<b>TASH &gt;</b> (sum of score points)			

Probability for massive transfusion (MT)	
TASH	P
1-8	< 5%
9	6%
10	8%
11	11%
12	14%
13	18%
14	23%
15	29%
16	35%
17	43%
18	50%
19	57%
20	65%
21	71%
22	77%
23	82%
24 +	>85%

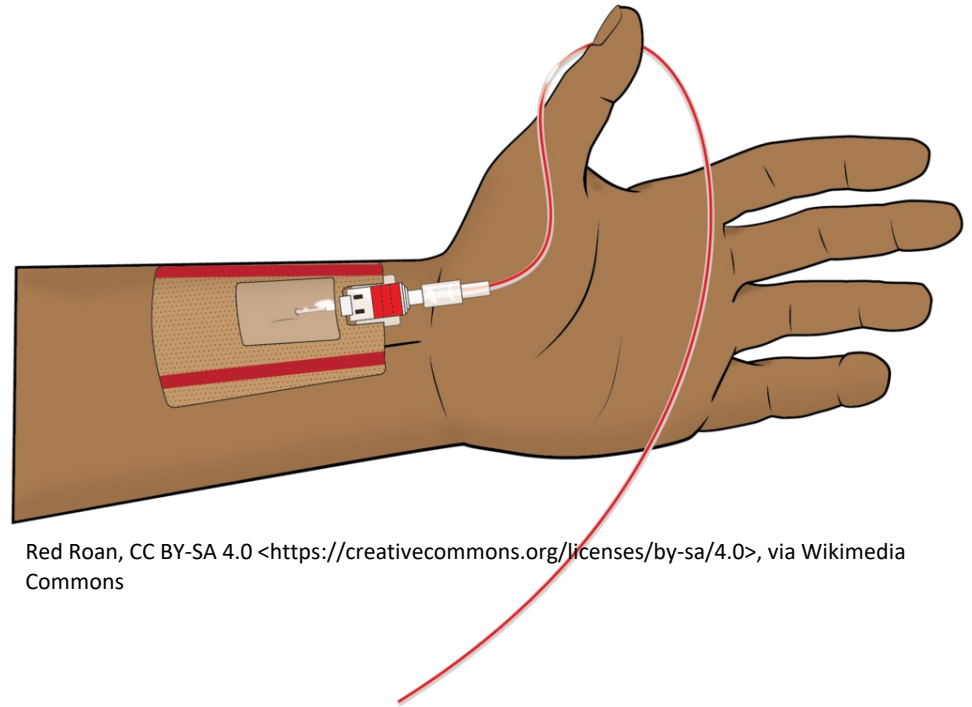


**45mm**



**25mm**

**ACCESS**



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[https://mfimedical.com/products/adc-prosphyg-785-pocket-aneroid-sphygmomanometer?variant=33292757794893&gclid=Cj0KCQiAsdKbBhD HARIsANJ6-jclgySdUEVYMLQYOeHL\\_OcO07gmm0jvaGClafCvFfTk93gHK-C2i0aAo5GEALw\\_wcB](https://mfimedical.com/products/adc-prosphyg-785-pocket-aneroid-sphygmomanometer?variant=33292757794893&gclid=Cj0KCQiAsdKbBhD HARIsANJ6-jclgySdUEVYMLQYOeHL_OcO07gmm0jvaGClafCvFfTk93gHK-C2i0aAo5GEALw_wcB)



## **C-SPINE PRECAUTIONS**

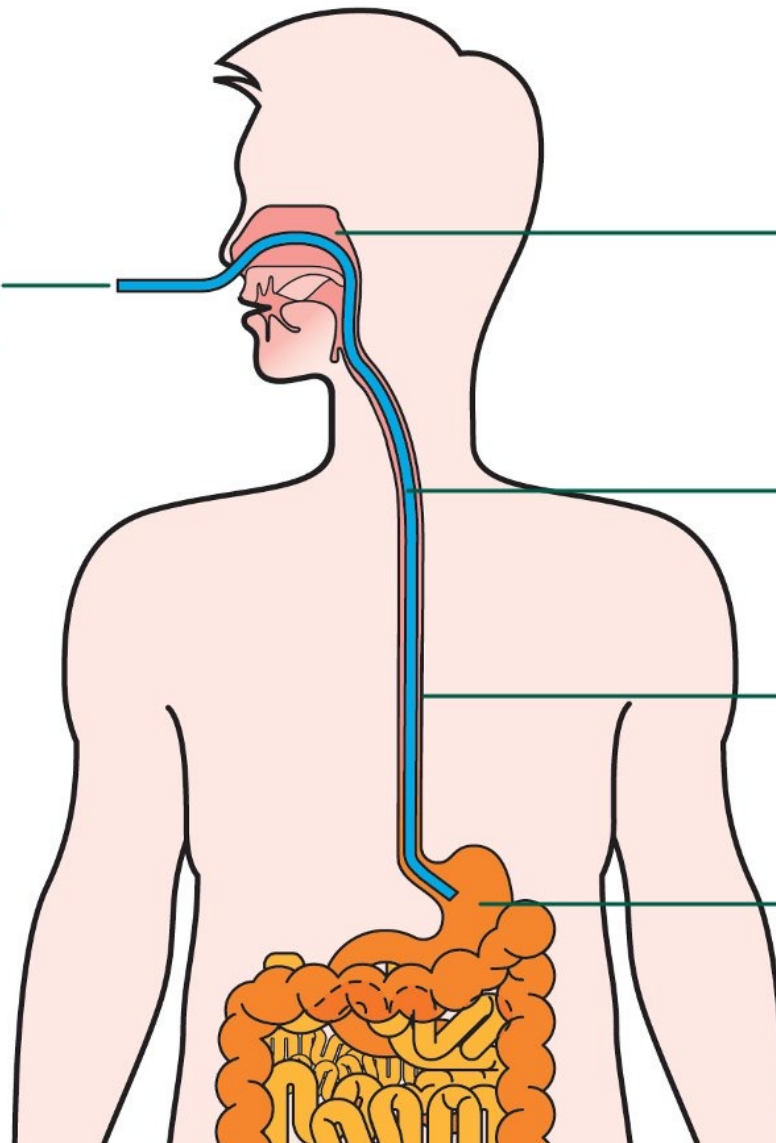
End of  
nasogastric  
tube

Nasal cavity

Nasogastric  
tube

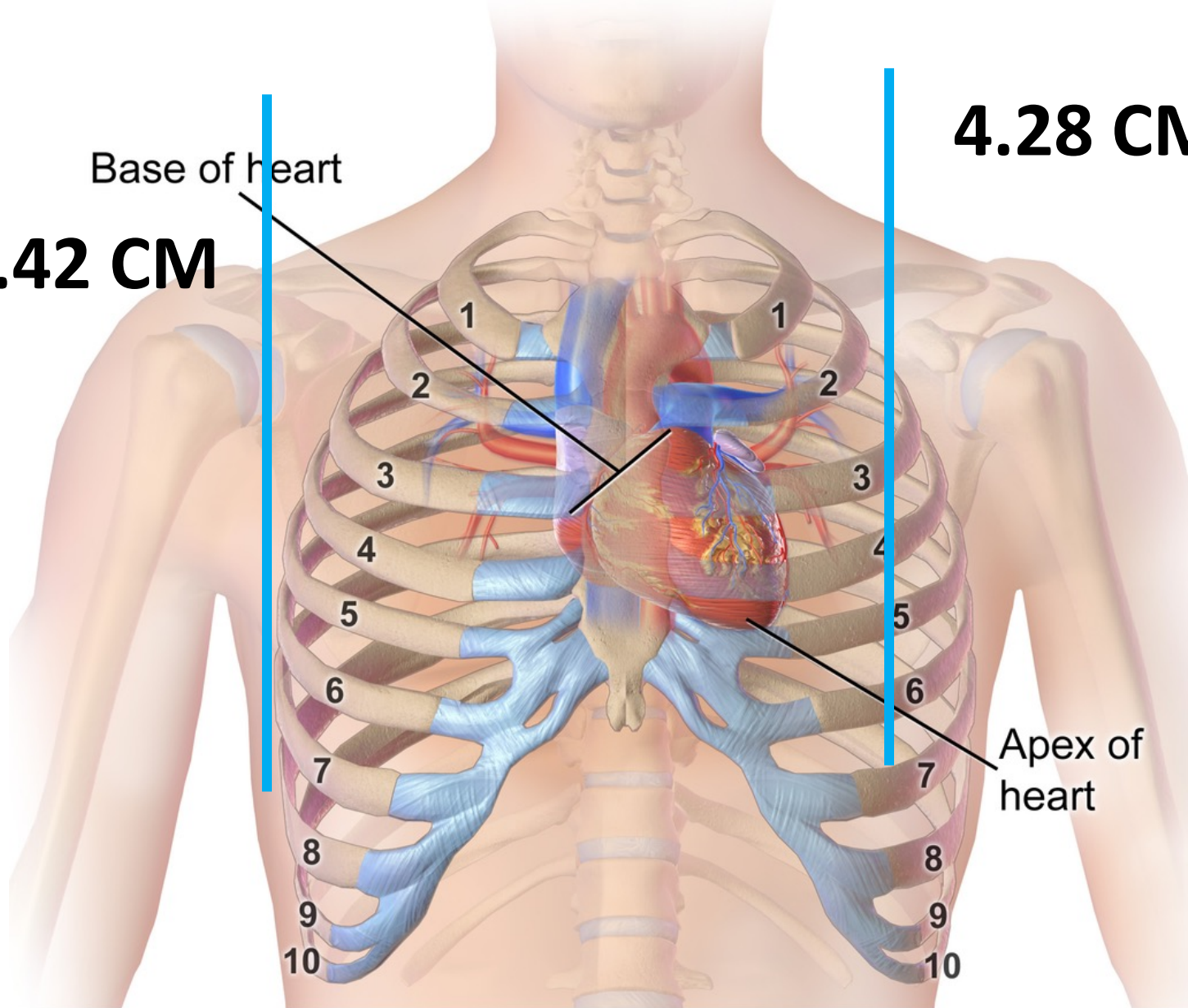
Oesophagus  
(gullet)

Stomach




Base of heart  
**3.42 CM**

**4.28 CM**



Apex of heart

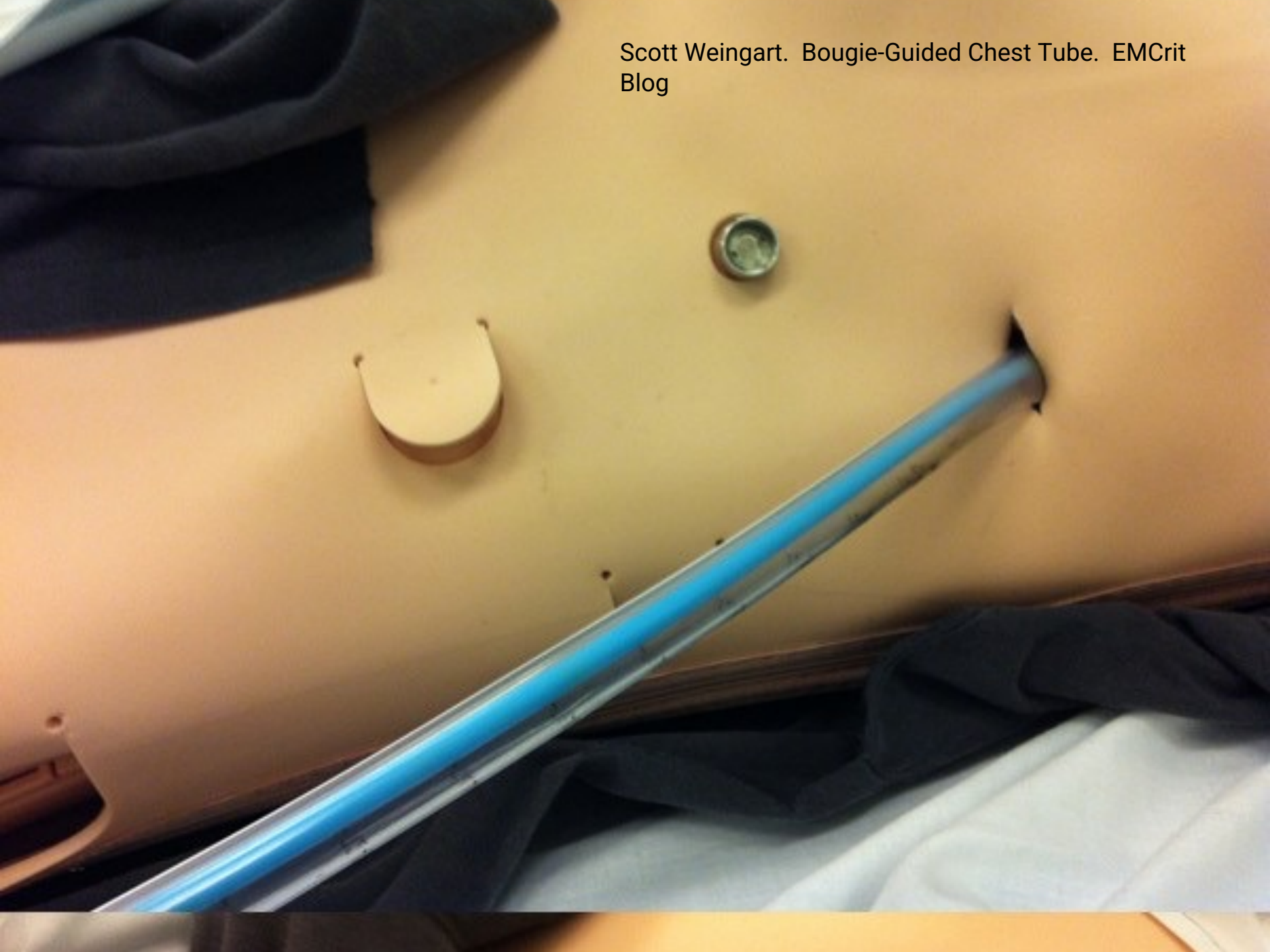
# CHEST DECOMPRESSION



**8.0 cm**  
**14 G needle**



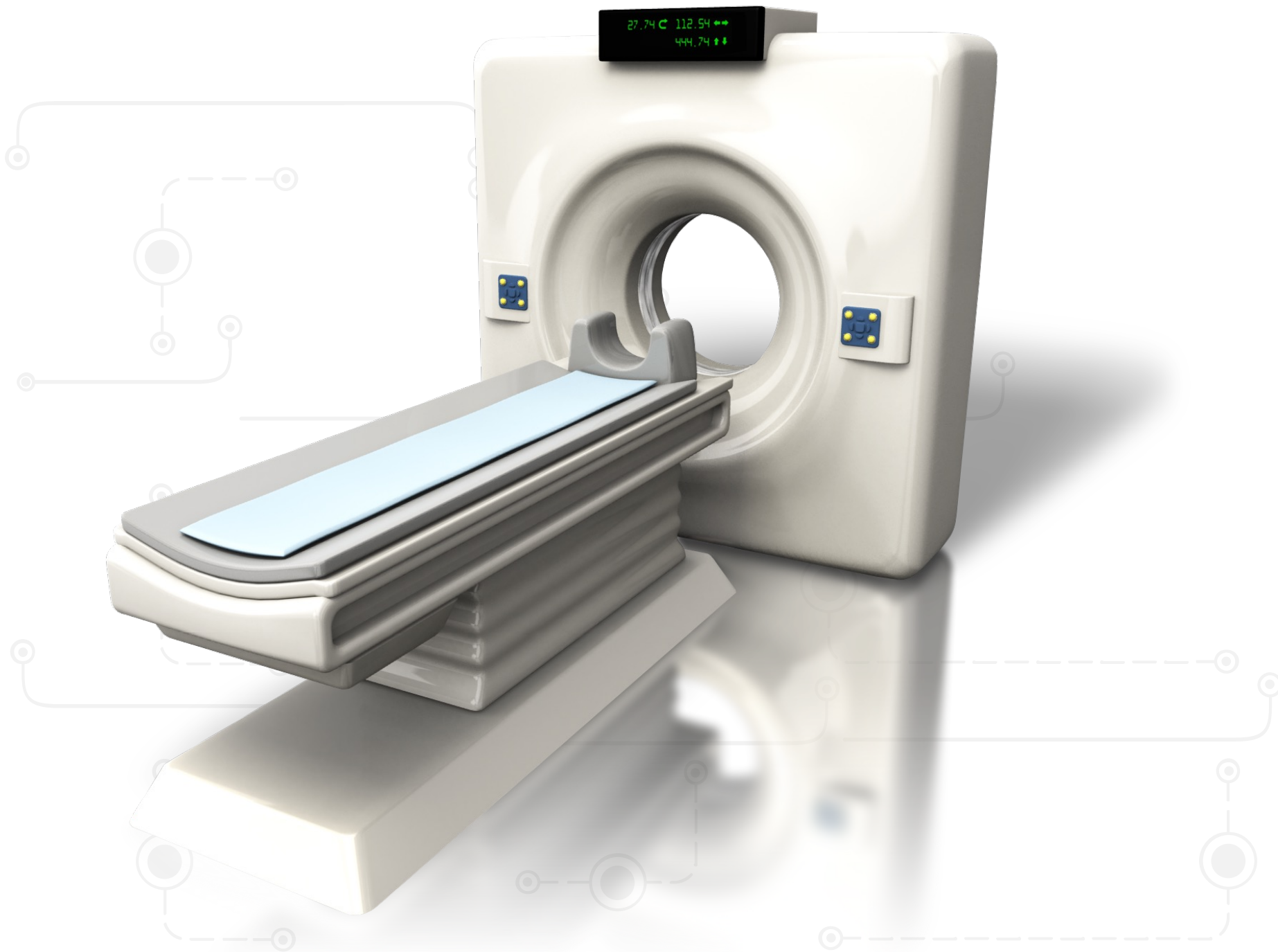
Scott Weingart. Bougie-Guided Chest Tube. EMCrit Blog



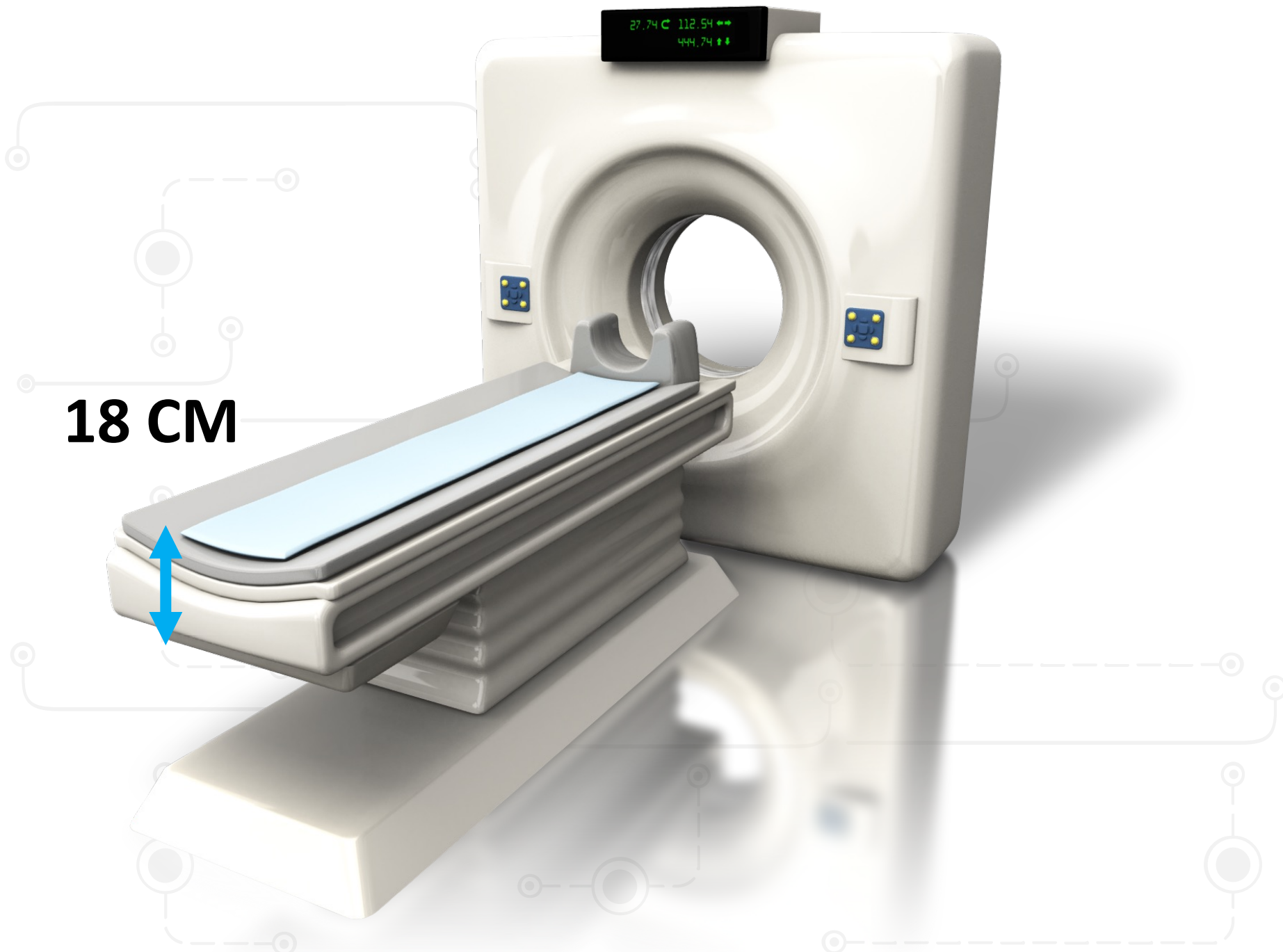


LOW FREQUENCY  
PROBE

ENABLE TISSUE  
HARMONIC IMAGING



	<b>GANTRY DIAMETER</b>	<b>TABLE WEIGHT CAPACITY</b>
TRADITIONAL CT SCANNERS	70 CM	450 POUNDS
NEW GENERATION CT SCANNERS	90 CM	680 POUNDS



**18 CM**

27.74 C  
112.54  
444.74

	<b>BORE DIAMETER</b>	<b>TABLE WEIGHT CAPACITY</b>
TRADITIONAL MRI	60 CM	350 POUNDS
NEW GENERATION MRI	70 CM	550 POUNDS

# MEDICATION CONSIDERATIONS

## PHYSIOLOGIC CHANGE

## DRUG CONSIDERATION

Increased adipose tissue

Increased  $V_d$  for lipophilic drugs

Higher glomerular filtration rates

Shorter half-life for renal excreted drugs

No liver excretion changes

No changes for liver excreted drugs

Whole  
Body Weight



Risk of  
Overdosing

Lean  
Body Weight



Risk of  
Underdosing

Ideal  
Body Weight



May Prevent  
Overdosing  
&  
Underdosing





# MEDICATION CONSIDERATIONS

DRUG TYPE	WEIGHT MEASUREMENT
Sedative Drugs	Ideal Body Weight
Induction Drugs	Lean Body Weight
Rocuronium	Ideal Body Weight
Succinylcholine	Total Body Weight

<b>LEAN BODY WEIGHT</b>	<b>CALCULATION (LBS)</b>
<b>MEN (12% STORAGE BODY FAT)</b>	<b>(1-0.12) X TBW</b>
<b>WOMAN (15% STORAGE BODY FAT)</b>	<b>(1-0.15) X TBW</b>

<b>IDEAL BODY WEIGHT</b>	<b>CALCULATION (LBS)</b>
<b>MEN</b>	<b>106 LBS (FOR 1<sup>ST</sup> 5 FT) PLUS 6 LBS FOR EACH ADDITIONAL INCH</b>
<b>WOMEN</b>	<b>100 LBS (FOR 1<sup>ST</sup> 5 FT) PLUS 5 LBS FOR EACH ADDITIONAL INCH</b>

# CONSIDERATIONS





# CONSIDERATIONS

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# SUMMARY

**01**

**SPECIAL PATIENT  
POPULATION**

**HIGH INDEX 02  
OF SUSPICION**



**03**

**KNOW YOUR  
RESOURCES**

[Maria.Moreira@dhha.org](mailto:Maria.Moreira@dhha.org)