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Obesity and Trauma

SOCIETY OF TRAUMA NURSES

Objectives

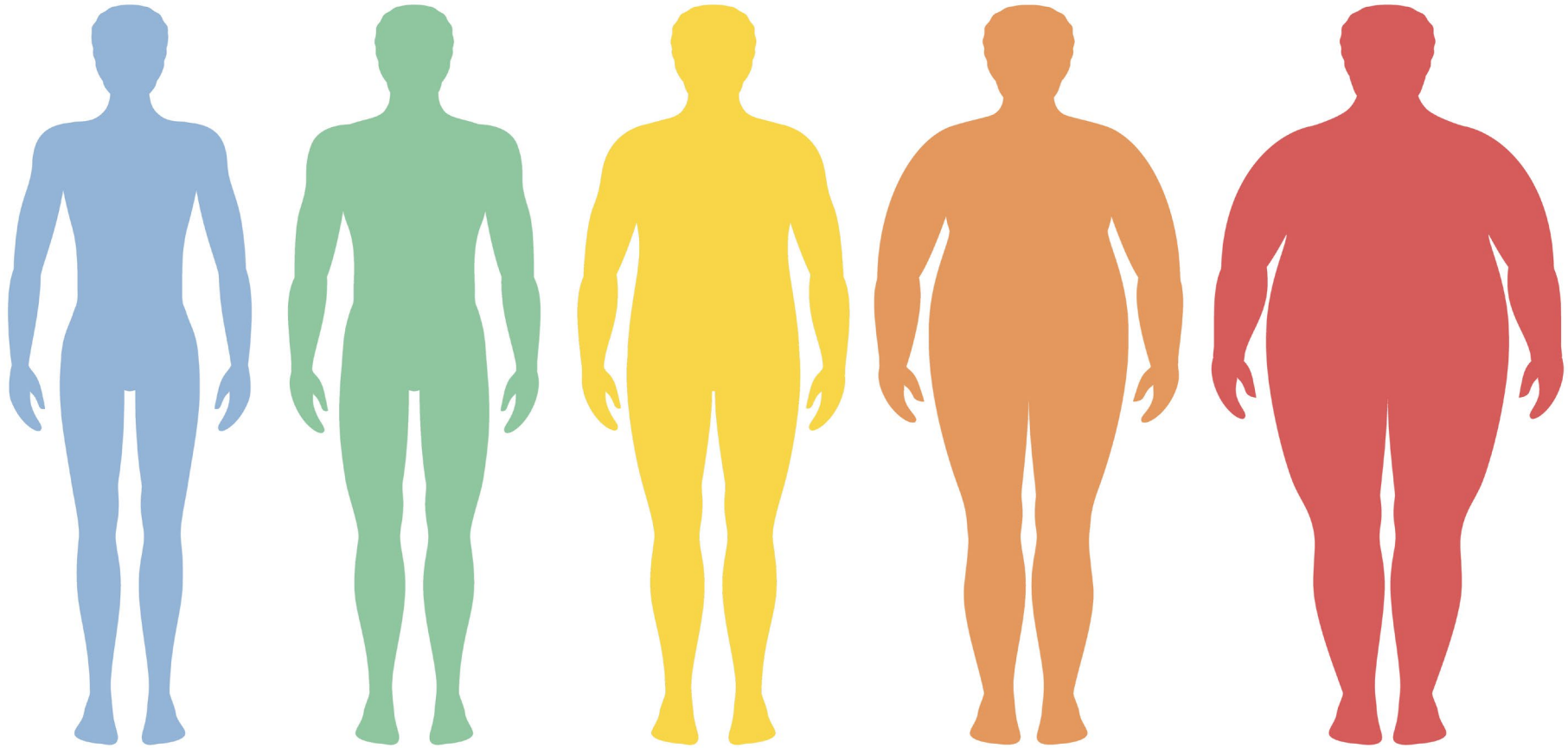
At the conclusion of this presentation, the participant will be able to:

- Describe how the obesity epidemic impacts the delivery of trauma care
- Describe how obesity impacts body systems
- Discuss the challenges and considerations associated with resuscitation and management of the obese trauma patient
- Describe management approaches to care of the injured obese patient with blunt, penetrating, or burn injuries

Introduction

1 out of every 3 U.S. adults is obese.
(Harvard, 2020)

Body Mass Index



<18,5	18,5-24,9	25-29,9	30-34,9	35<
UNDERWEIGHT	NORMAL	OVERWEIGHT	OBESE	EXTREMLY OBESE

Consequences of Obesity

- Obesity is associated with the leading causes of death in the United States and worldwide, including:
  - Diabetes
  - Heart disease
  - Stroke
  - A wide range of cancers
- Low quality of life
- Mental illness such as clinical depression, anxiety, and other mental disorders
- Body pain and difficulty with physical functioning

Societal Costs

Direct

- 2016, the aggregate in medical cost due to obesity among adults in the United States was $260.6 billion. (Cowley, 2021)
- The effects of obesity raised costs in every category of care: inpatient, outpatient, and prescription drugs.

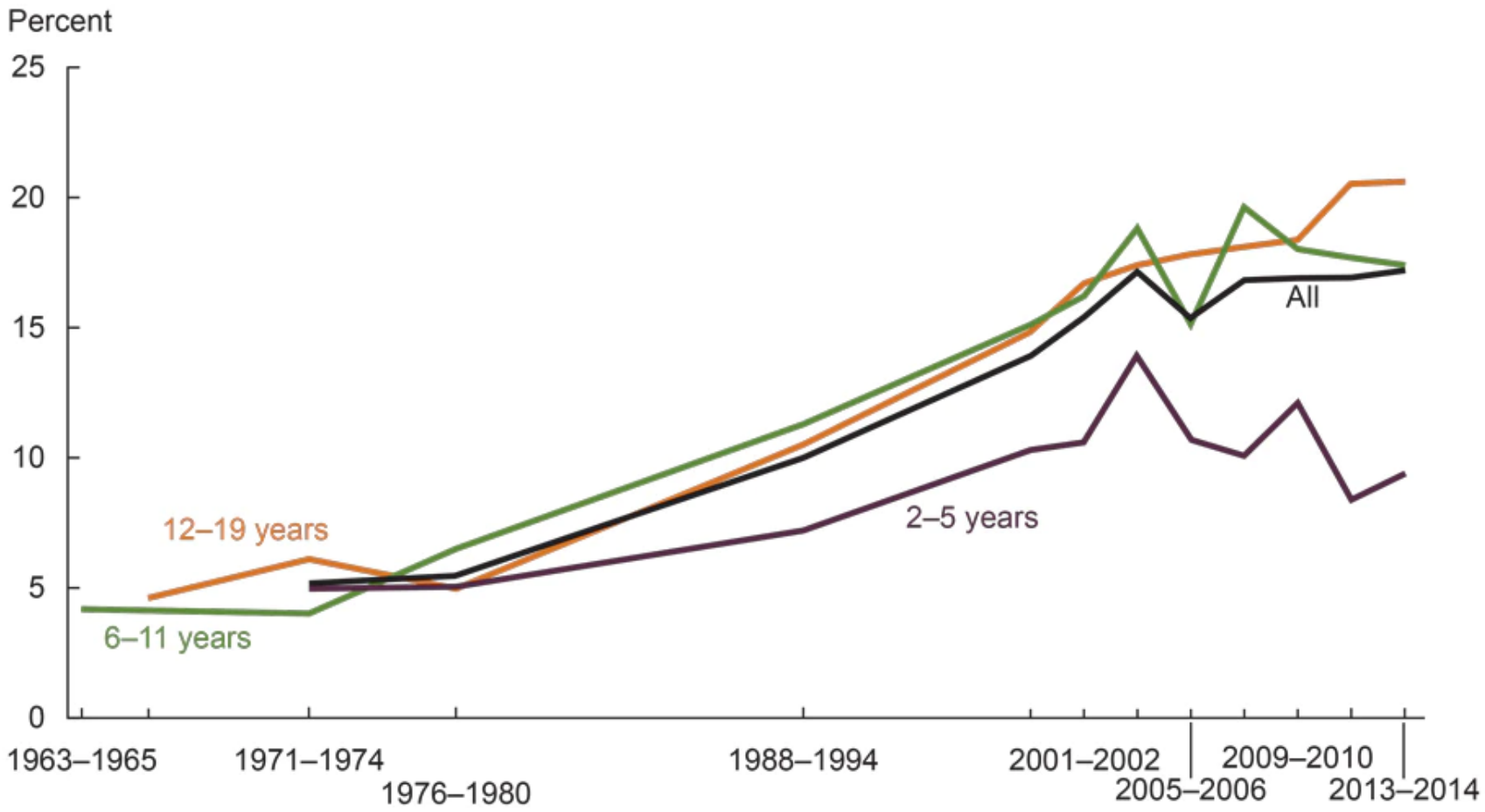
Indirect

- Absent from work for obesity-related health reasons
- Decreased productivity while at work
- Premature death and disability

Injury Patterns

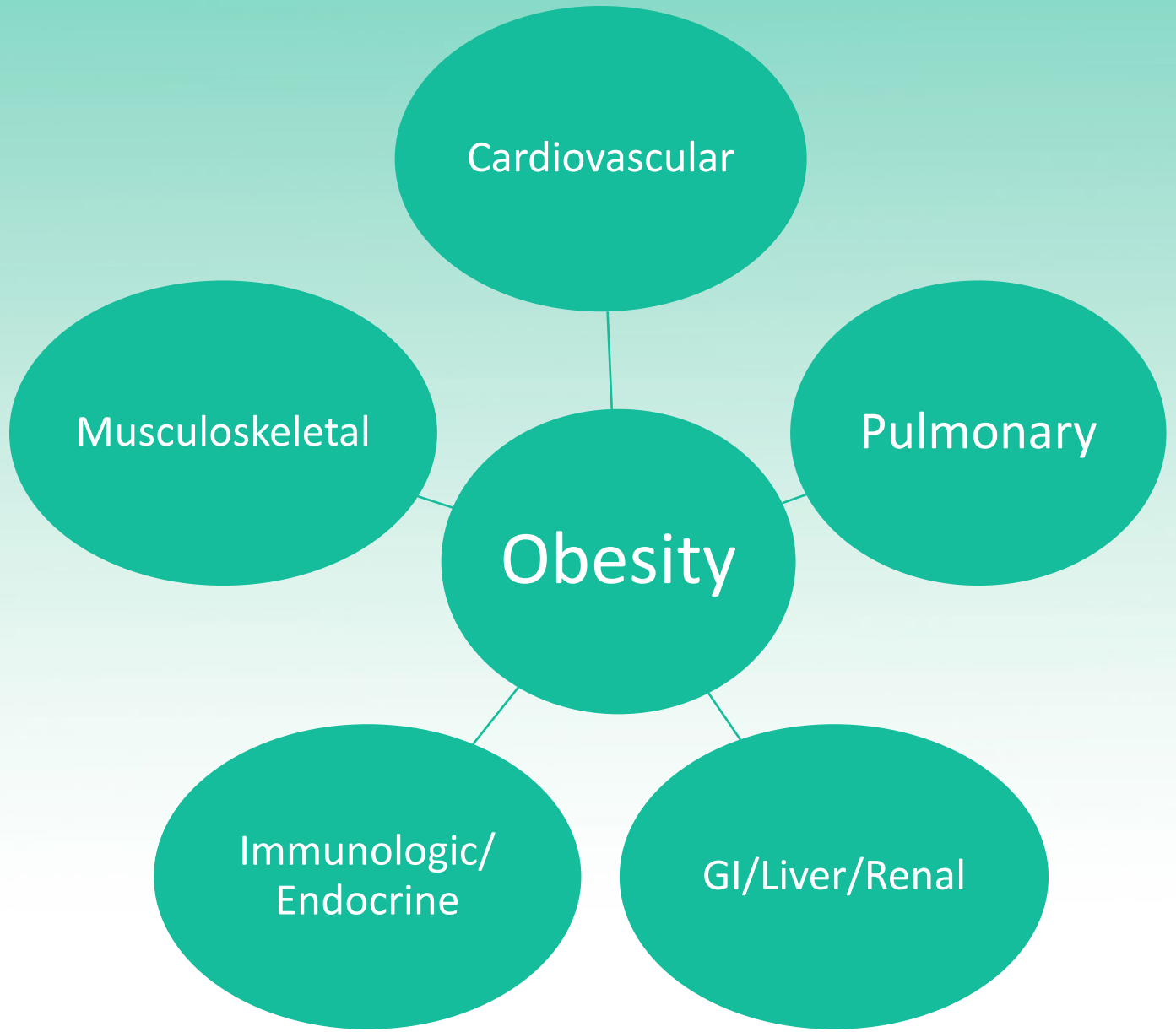
- Increased BMI = increased rates
  - Extremity fractures (humerus, femur, tibia/fibula)
  - Chest injuries
  - Spinal injuries
  - Increased mortality
  - Increased complications
- Increased BMI = decreased rates
  - Hip fractures
  - Head injuries (more fatal)
  - Liver lacerations

Trends in obesity among children and adolescents aged 2–19 years, by age: United States, 1963–1965 through 2013–2014



NOTES: Obesity is defined as body mass index (BMI) greater than or equal to the 95th percentile from the sex-specific BMI-for-age 2000 CDC Growth Charts.
SOURCES: NCHS, National Health Examination Surveys II (ages 6–11) and III (ages 12–17); and National Health and Nutrition Examination Surveys (NHANES) I–III, and NHANES 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, 2009–2010, 2011–2012, and 2013–2014.

Witt, Arbabi, Nathens, Vavilala, & Rivara, 2017. NIH, 2017)

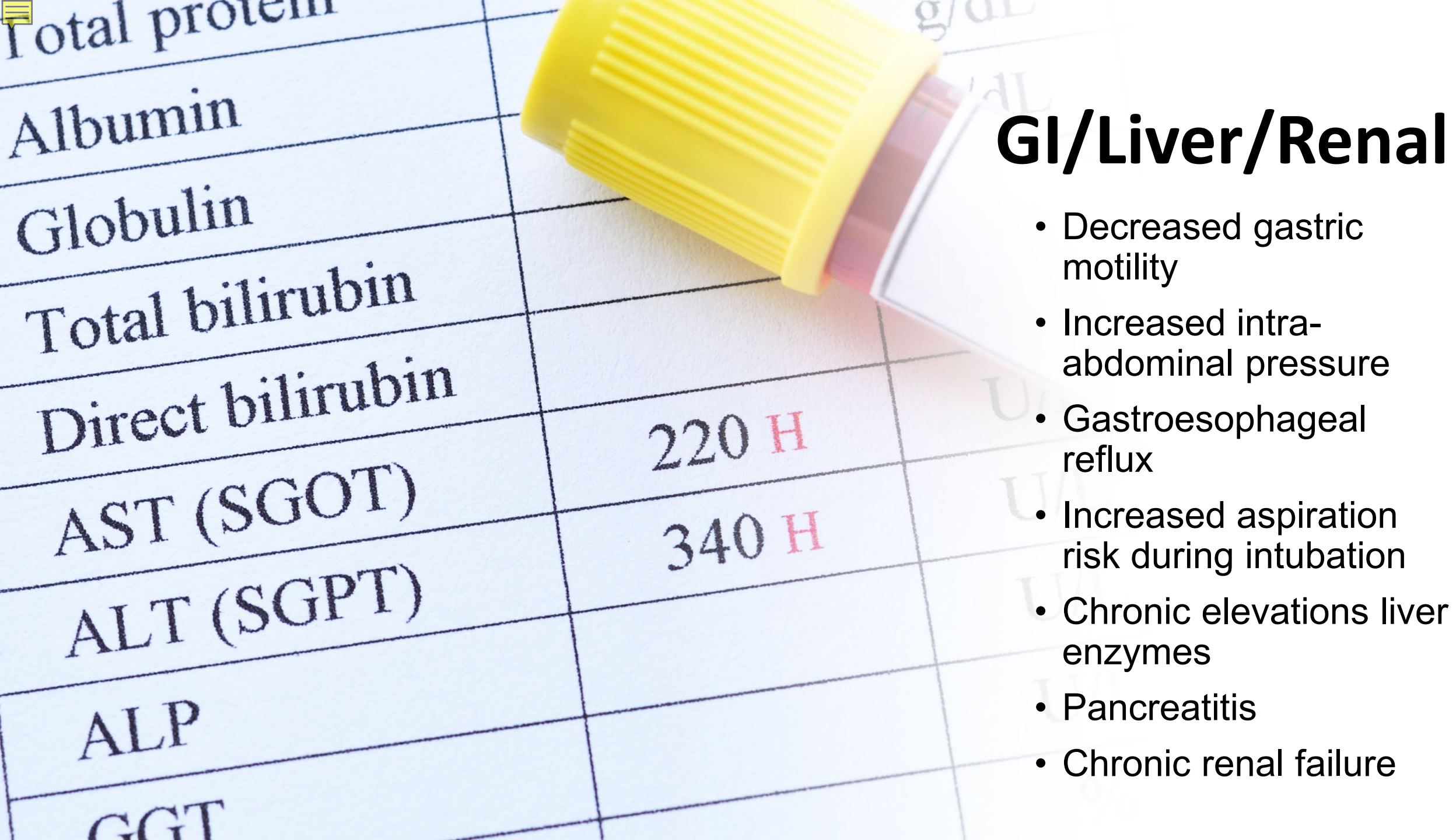

Cardiovascular
Musculoskeletal
Obesity
Pulmonary
Immunologic/
Endocrine
GI/Liver/Renal

Cardiovascular

- Obesity is an independent risk factor for cardiac disease.
- Increased circulating blood volume, cardiac output
- Increased risk of thromboembolism
- Increased systemic vascular resistance

Pulmonary

- Increased chest wall resistance
- Increased intra-abdominal pressure
- Dysfunctional chest wall
- Obstructive sleep apnea

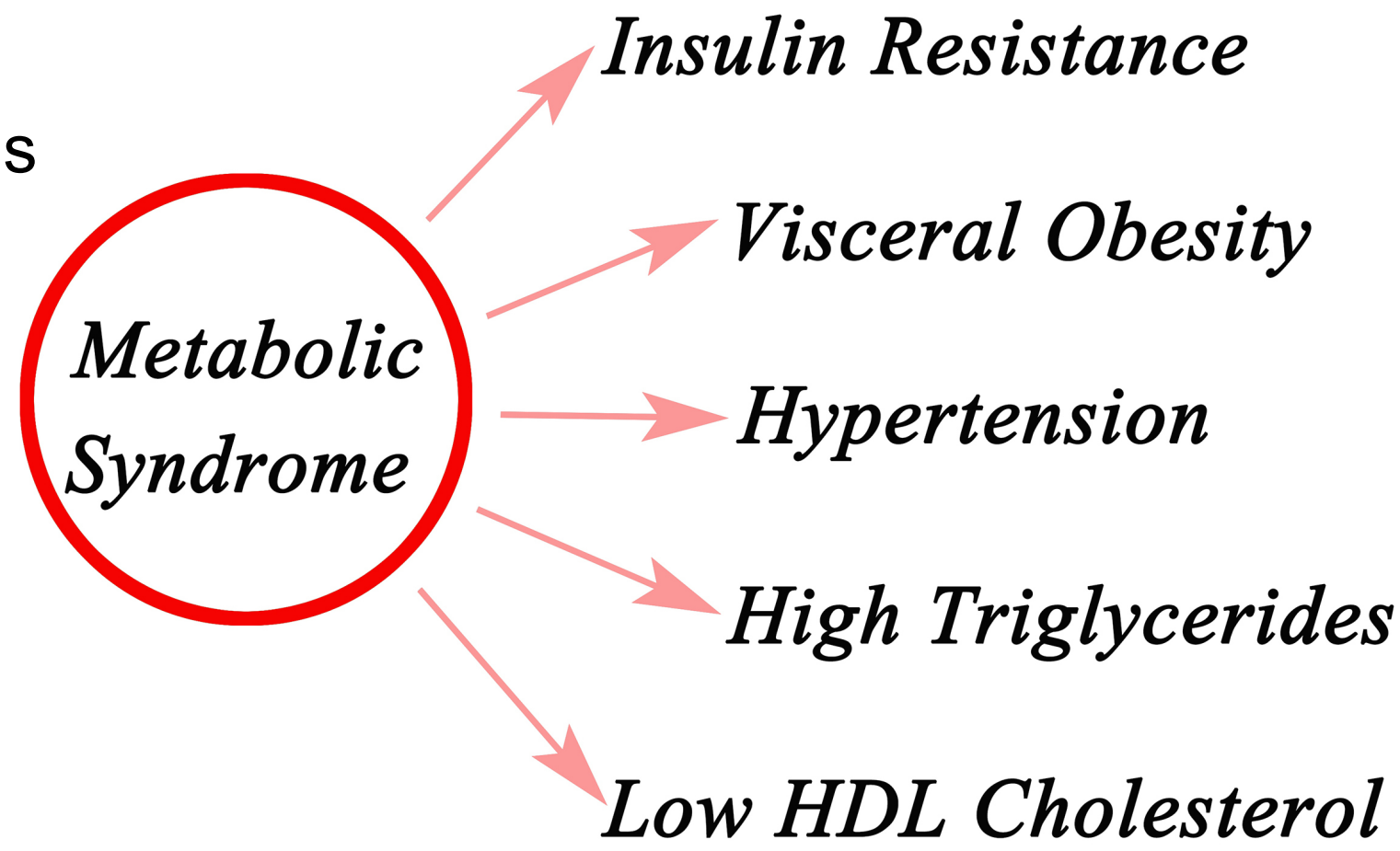


GI/Liver/Renal

- Decreased gastric motility
- Increased intra-abdominal pressure
- Gastroesophageal reflux
- Increased aspiration risk during intubation
- Chronic elevations liver enzymes
- Pancreatitis
- Chronic renal failure

Endocrine/Immunologic

- Inflammation
- Metabolic syndrome
- Elevated cortisol levels



Musculoskeletal

- Normal increased stress on bones and joints
  - Can be described as severe pain
- Osteoarthritis
- Osteoporosis

From the field, prehospital, to the acute care setting, obstacles arise that complicate and delay the care of the obese and morbidly obese patient.

Pre-Hospital

- Prolonged extrication time
- O2 masks may not fit
- Larger C Collars
- Inability to lie flat
- Stretchers/backboards limited size and loads
- Increased staff
- Assistive equipment
- Evacuation
- BP cuffs

The BEAR stair chair, Bearatrics.com

Emergency Department

- Monitoring
  - BP cuffs
  - Pulse ox
  - Introducers

- Supplies
  - Stretcher
  - Wheelchairs
  - Splints
  - Tourniquets
  - Scales
- Diagnostics
  - Radiology tables, plates
  - CT/MRI tables, circumference
  - OR
- Staffing ratio

Admitted Patient Care Rooms

- Bed
- Portable or fixed overhead lifts
- Scales
- Extra large BP cuffs
- Wheelchairs
- Toilets/shower/grab bars
- Bedside commode
- Gowns/bottoms

https://www.arjo.com/en-us/about-us/

Assessment Principles

- Primary
- Secondary
- Disposition
- Management

Airway (C-Spine Protection)

CHALLENGES

- Short thick necks
- Poor extension
- Loss of landmarks
- Adipose tissue
- Fat deposits in pharyngeal tissue
- Gastro-esophageal reflux
- Backboard weight limits

Airway (C-Spine Protection)

CONSIDERATIONS

- Position with head of bed slightly elevated or reverse Trendelenburg
- Use of sandbags and tape for immobilization
- Gastric tube insertion if concern for reflux/emesis/airway
- Dedicated member to maintain c-spine control
- Early surgical cricothyrotomy
- Optical equipment (i.e. video laryngoscope)
- History of gastric banding

Breathing

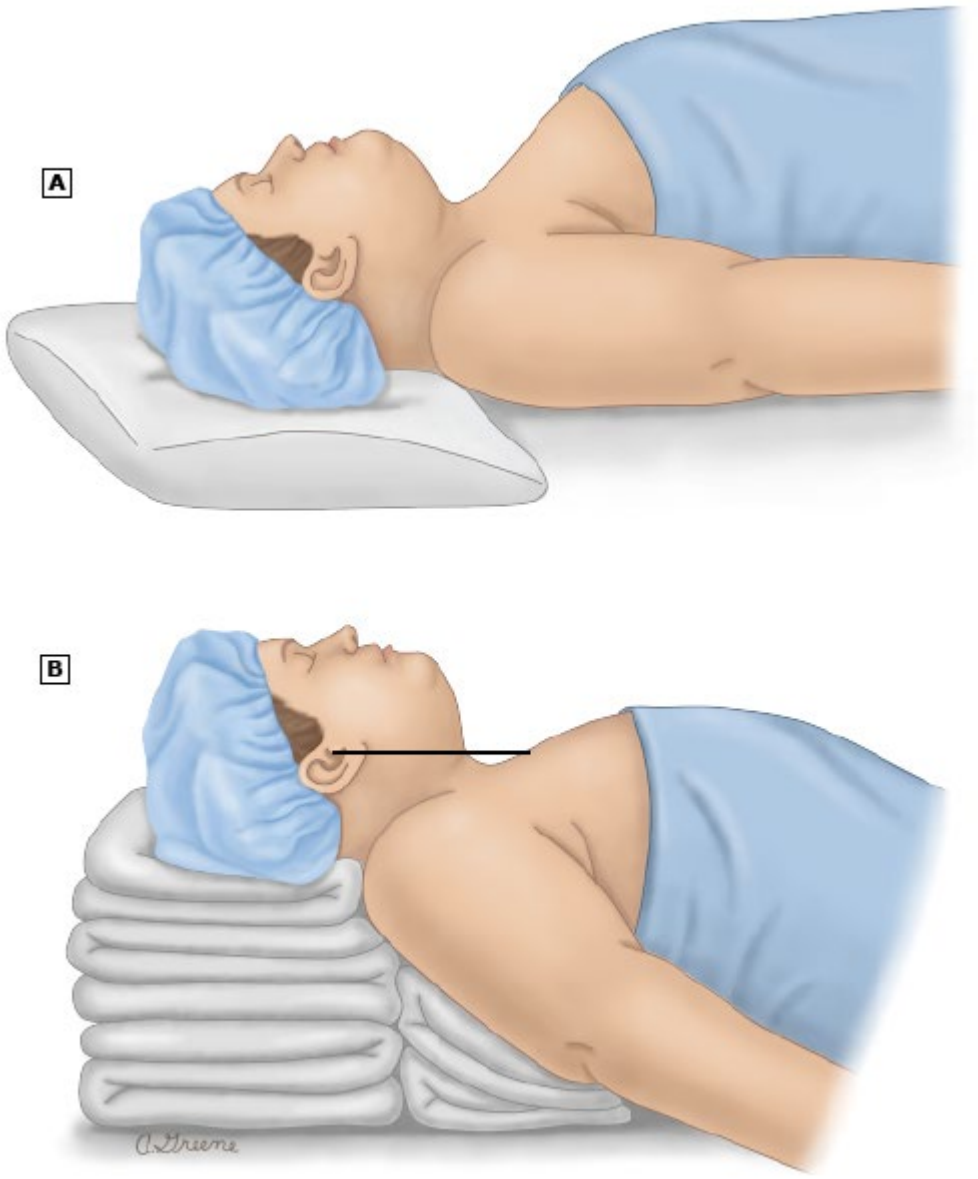
CHALLENGES

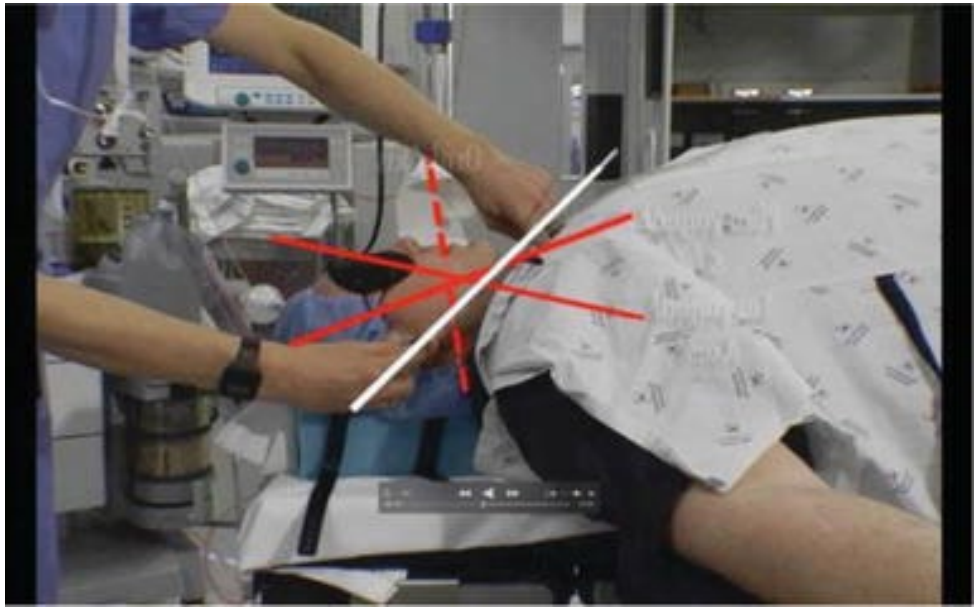
- Fat deposits in diaphragm and intercostal muscles
- Elevated diaphragm
- Rapid desaturation
- Chest weight
- Increased work of breathing
- Sleep apnea
- Impaired lung compliance
- Difficulty auscultating breath sounds

Breathing

CONSIDERATIONS

- CPAP/PEEP
- Reverse Trendelenburg
- 2-person bag-mask
- Needle decompression/chest tube placement
- “Awake” intubation vs RSI/DAI
- Longer recovery time with failed attempted intubation
- Neck circumference
- Ramping position





https://www.uptodate.com/contents/image?imageKey=ANEST%2F95285

Troop, 2018

Circulation

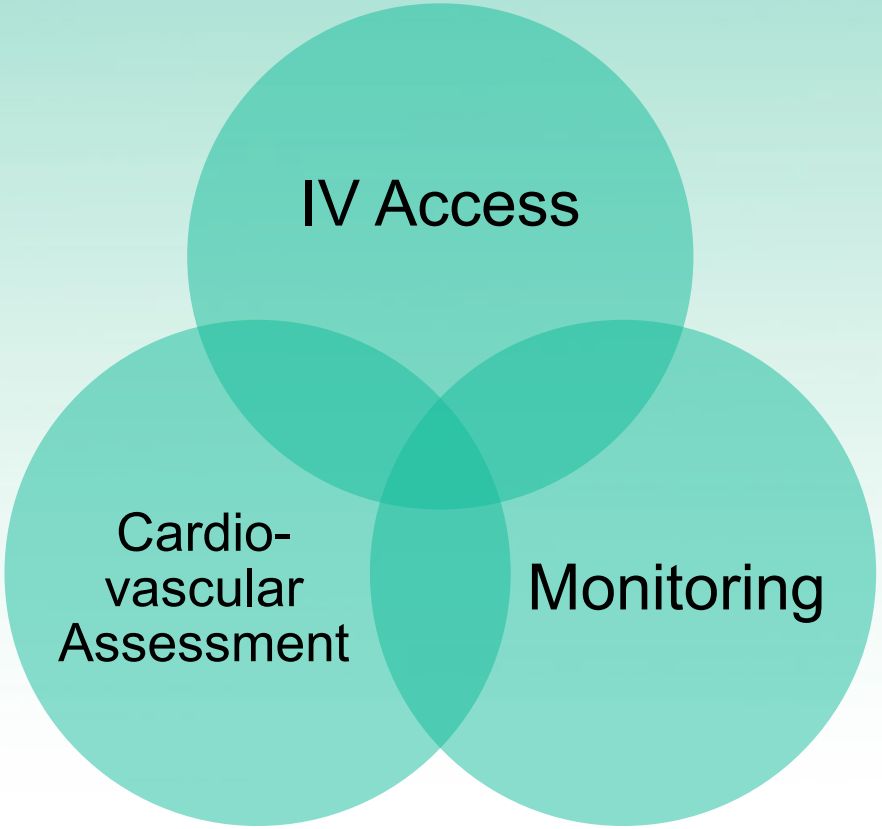
CHALLENGES

- Difficulty palpating central and peripheral pulses
- BP assessment
- Auscultation heart sounds
- High oxygen supply and demand
- IV access
- Accuracy of pulse ox

Circulation

CONSIDERATIONS

- Longer introducers
- Use of intra-osseous needle
- Arterial line
- Intra-abdominal hypertension
- Lactate
- pH
- CVP
- PA catheter
- TEE



Disability

Considerations

- CPAP at home?
- Lack of mobility
- Toileting

Challenges

- Establish baseline
- Early discharge planning

Exposure/Environment

- Skin shearing
- Hypothermia
- Inspect for skin rashes, fungal infections, decubitus, wounds
- Large pannus
- Larger patient gowns
- Moving boards
- Assistance
- Stretchers/ beds

Secondary Survey

CONSIDERATIONS

- Clinical exams less reliable
- Skin folds may mask penetrating injury
- Difficult to assess abdominal or bone tenderness
- Masses/deformities difficult to palpate
- Use of inappropriate cuff size
- Difficult to assess the back
- Imaging issues

Give Comfort

CHALLENGES

- Patient Size
- Bias
- Stigma
- Psychosocial Issues

CONSIDERATIONS

- Addressing bias may be first step to improving outcomes
- Medications
  - Right dose
  - Right route
- Specialized beds and equipment

History/Inspect Posterior

History

- Pre-hospital
- Referring Facility
- Medications
- Co-morbidities
- Surgeries

Inspect the Back

- Number of people needed to log roll
- Patient safety
- Bed width
- Skin folds

https://www.healthcaredailyonline.com/hospitals-using-obesity-suit-to-better-understand-patients/

Disposition

- Decide early if transfer is necessary.
- Inform transferring agency of patient's size.
- Inform admitting unit of the patient's size ASAP to allow them to prepare.
- Make preparations to ensure patient safety.
  - Interfacility
  - Intrafacility

Nutritional Requirements

- Nutritional requirements differ
- Increased caloric requirements in trauma, but hypocaloric high protein diet preferred in obese patients
- High percentage of Vitamin D deficiency in obesity
- May need indirect calorimetry to prescribe diet
- Maintain blood sugar control
- Monitor weight

Global Industrial™ Wheelchair Scale, 1,000 lb x 0.5 lb

Pharmacology

- Consult on admission for your PharmD or Clinical Pharmacist to review all current medications and to compute dosing of:
  - Antibiotics
  - Anti-thrombotics
  - Analgesics
- Restart home medications when appropriate
- Individualize pain management

- Calculations
  - Dose weight (DW)
  - Ideal body weight (IBW)
  - Total body weight (TBW)

$$DW = IBW + 0.3 (TBW – IBW)$$

Labs to Watch

- BUN
- Creatinine
- Insulin levels
- Cortisol
- Hyperlipidemia
- PT/PTT
- C-reactive protein
- Cytokine
- Lactate
- Amylase/lipase
- ABG
- Anti-Xa
- Growth hormone
- Prolactin
- TSH

Missed Injury/Delayed Diagnosis

- Sternal fractures
- Flail chest
- Pelvic fractures
- Rib fractures
- Pulmonary contusions
- Long bone fractures

Limitations with traditional evaluations:

- Chest x-ray
- Ortho x-rays
- FAST
- CT scan
- Exploratory laparotomy

Complications

- Atelectasis
- Anastomotic leaks
- Higher risk of re-operation
- Higher infection rates
- Abdominal compartment syndrome
- Thrombophlebitis/PE
- Urinary tract infections
- Decubiti

Fractures

- Strength of rods
- Compartment syndrome
- Casting more difficult
- Vascular assessment challenges
- Higher rate of amputation
- Vitamin D insufficiency
- During hip and knee arthroplasty, the infection rate is nearly 5% in obese patients and nearly 10% in obese, diabetic patients.

Consultations

- Nutrition
  - Hypocaloric
  - Higher protein
  - Prebiotics/probiotics
- Pharm D
- Primary care providers
- Case management
- Social work
- Sleep apnea

Functional Independence Measurement (FIM)

- Admission, discharge, 6 months post-discharge
- Domains
  - Self-care
  - Sphincter control
  - Mobility
  - Locomotion
  - Communication
  - Social cognition
- Compared with nonobese patients, the rate of recovery was reduced by 30% in overweight, 37% in obese, and 48% in morbidly obese patients. (Dhungel 2015)

Mortality Risk

- There was no statistically significant difference in mortality. (Drury 2021)
- Severely obese trauma patients were at least 30% more likely to die and approximately twice as likely to have a major complication. (Glance 2014)
- Obese trauma patients undergoing emergent trauma laparotomy have a high likelihood for both complications and mortality, with morbidly obese trauma patients having the highest likelihood for both. (Covarrubias 2021)
- In a cohort of matched patients, morbid obesity is a risk factor for the development of in-hospital complications and mortality after blunt traumatic injury. (Ditillo 2014)
- Increasing BMI by category was associated with a stepwise increase in odds of acute kidney injury, cardiovascular events, total hospital length of stay (LOS), intensive care unit LOS, and ventilator days. (Hakam 2021)

Summary

- Obesity places challenges on healthcare costs by stressing infrastructure, requiring specialized equipment, and evidence-based education.
- Obesity independently impacts body systems, thus increasing the complexity of trauma care.
- Anticipatory preparation for the challenges and barriers to providing good trauma care to the obese patient will lead to provision of optimum care.